INTENSIFICATION OF A LAPITA FISHERY

INTENSIFICATION OF A LAPITA FISHERY AT THE HOPOATE SITE ON TONGATAPU, KINGDOM OF TONGA

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Lay Abstract

This thesis explores fish use at the Hopoate site on Tongatapu, during the earliest periods of occupation in Tonga. The first inhabitants, the Lapita peoples, benefited from a mixed diet consisting of plant and marine foods. Archaeological evidence in Tonga and the Pacific Islands show intensive pressure on numerous native land and sea resources following initial settlement periods. The analysis of fish bones from this study recorded a high abundance of inshore reef fish, typical of most Lapita sites. Following the initial settlement period of the island, fishing efforts increased and a greater amount of fish were harvested. The intensification of the fishery over time may be related to a decline in shellfish harvested from the local lagoon. Overall, the results of this study indicate that the earliest inhabitants were heavily reliant on the local marine resources.

Abstract

Zooarchaeological analysis of fish bones is a valuable approach to understand prehistoric diet and resource exploitation in island and coastal settings. This thesis explores fish use at the Hopoate site on Tongatapu by identifying the various taxa which comprised the ichthyoarchaeological assemblage. The analysis focused on recovered materials which date to the earliest period of occupation in Tonga (2850 cal BP). This is the first detailed fishery study from Tongatapu; few have been conducted elsewhere in Tonga. The inhabitants at Hopoate focused fishing on inshore reef fish which is typical of Lapita fisheries. The first inhabitants, the Lapita peoples, benefited from a mixed subsistence economy of plant and marine foods. However, the relative contribution of fish to the Lapita diet was variable across the Pacific Islands. Eighteen fish taxa were identified from a total NISP of 5091. The analysis of fish bones from Hopoate indicated an intensification of the fishery during the mid-Lapita period (2690-2390 cal BP). Past archaeological studies on Tongatapu have recorded a severe decrease in the availability of shellfish from the Fanga ‘Uta Lagoon, following the initial settlement of the island. The increased fishing efforts are possibly related to the decreasing availability of shellfish from the lagoon.

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MNI – minimum number of individuals
NISP – number of identified specimens

Chapter 1 Introduction

Introduction to Problem

This thesis presents the analysis and interpretation of fish remains from the Hopoate site on Tongatapu, in the Kingdom of Tonga. The site is located on the Nukuleka peninsula which has been determined to be the earliest settlement in Tonga (Burley et al. 2018). Hopoate, therefore, will be considered within the context of the Lapita peoples, initial colonists of Tonga and Remote Oceania. Through the use of zooarchaeological analysis, I examine and interpret variation in fish remains within Lapita subsistence economy. The main objective of this project is to characterize the Hopoate site by recording the abundance and diversity of fish families exploited for food. Overall, this research will contribute to the understanding of the relationship between people and the marine environment at the Hopoate site, and its potential implications for early Lapita migration and settlement in other parts of the Pacific Islands.

Fish and other marine organisms are known to have been significant in the subsistence of the initial Pacific islanders and their descendants (Kinaston et al. 2014, 2015, 2016; Kirch 1997, 2000; Kirch and Dye 1979; Walter 1989). Zooarchaeological analysis of fish remains have contributed to a complex picture of the Lapita subsistence model which consists of a mixed economy of marine and terrestrial foods (Kinaston et al. 2014, 2015, 2016; Kirch 2000). Lapita sites consisted of stilt house settlements strategically positioned along offshore reefs and on small offshore islands or sand spits (Burley et al. 2018; Kirch 2000; Nunn and Heorake 2009). This type of settlement pattern, along with the fact that they traveled great distances to inhabit remote islands, demonstrates the familiarity between Lapita peoples and the ocean. Fish were therefore an important source of food to fuel their widespread migrations and settlements. Lapita peoples also exploited a variety of food sources other than fish and are deemed to have been 'opportunistic foragers' (Burley 1998; Burley et al. 2018; Clark et al. 2015). In addition to marine proteins, they exploited a diverse range of birds, iguana, sea turtle as well as transported and cultivated various plant foods (Clark et al. 2015; Kirch 1997).

Plant foods comprised an unknown proportion of the early Lapita diet. Excavations at Hopoate have recovered microfossil pollen samples from a number of Oceanic cultigens such as giant swamp taro (*Cyrtosperma merkusii*), cf. banana (*Musa sp.*), coconut (*Cocos nucifera*), candlenut tree (*Aleurites moluccana*), cf. ti (*Cordyline fruticosa*) and pandanus (*Pandanus tectorius*) (Burley et al. 2018: 13-14) dating to the initial occupation of the site. This indicated that horticulture was present and developing around the time of initial settlement. However, more detailed evidence of plant cultivation and consumption has been difficult to obtain, especially in comparison to fauna which more frequently leave behind remains in the archaeological record (Hather 1992). Increased efforts have since been made in archaeological sciences to identify evidence of plant cultivation by Lapita settlers. Specifically, isotopic analysis can indicate the range of contributions between marine and land proteins and plant foods (Stantis et al. 2015). However, there are limitations to measuring the contribution from marine and terrestrial foods, especially with mixed diets (Chisholm et al. 1982). As well, this approach does not address certain questions which faunal analysis can, such as species consumed, fishing behaviours and technologies, or environmental impact.

Zooarchaeological analysis reveals critical dietary information unrecoverable by other means and can provide specific information on the importance of fishing. Although the results can only provide a relative estimate of the contribution of fish to the overall diet, the analysis of relatively durable shell and bone remains serves as a valuable proxy for cultural practices, characteristics of fish habitat, and environmental change. Previous work has already set up many of the critical issues addressed in the current study, including resource use, paleodiet reconstruction and prehistoric human impact on the environment. In his dissertation work at the Australian National University, Spennemann (1987, 1989) analyzed the exploitation of various shellfish species from the Fanga 'Uta Lagoon on Tongatapu. The lagoon environment today has been altered by a decline in sea level of 1.2-1.4 m since Lapita times. This affected the paleoshoreline and affected the benthic habitats which were significant to the local shellfish populations (Burley 2016; Burley et al. 2001; Clark et al. 2015). These events were already underway as the first Lapita peoples inhabited the island and established settlements along the shoreline in order to exploit the lagoon. Spennemann's findings indicated that the availability of large *Andara* shellfish were diminishing primarily from environmental change as sea levels fell but also human predation. Another significant shellfish genus, *Gafrarium*, simultaneously experienced a decline in mean size caused by overexploitation. The findings determined that the earliest inhabitants did have an impact on local shellfish populations.

Settlement on Tongatapu was quick, spreading along the Fanga 'Uta shoreline in order to exploit the marine resources (Burley et al. 2001). The reef flat consists of a shallow lagoon which transitioned from being open to becoming closed off by the falling sea level (Spennemann 1987, 1989; Burley 2016; Burley et al. 2001). Due to the sheltered shoreline of the lagoon (Dickinson 2007) and the rich abundance of shellfish, Tongatapu attracted a fairly dense human population (Clark et al. 2015: 514). The inhabitants then went on to exploit the most efficiently harvested resources including shellfish and native land animals. Evidence from other faunal remains on Tongatapu have demonstrated that the Lapita peoples overexploited terrestrial bird species and a large-bodied iguana leading toward extirpations or extinction (Clark et al. 2015; Herrscher et al. 2018; Steadman 2006). A number of the land animals were extirpated while the shellfish species suffered from environmental changes and intensive predation pressures. It can be concluded, therefore, that a widespread reduction in food resources was taking place and the subsistence economy endured a declining availability of protein into the later Lapita periods. Spennemann (1987, 1989) queried whether the inhabitants responded to this decline by increasing fishing and/or horticultural efforts. At the time, there were no detailed ichthyoarchaeological studies from Tongatapu and the importance of the fishery was unknown.

Spennemann's hypothesis has provided the framework for my research, to evaluate the significance of the Hopoate fishery from the time of first colonization and into the subsequent period of occupation. One focus of this research is to look for signs of resource intensification or resource depression. Intensification and resource depression are two concepts widely discussed in Pacific Island fisheries studies. Intensification can have multiple meanings, yet for the purpose of this study its significance relates to increasing productivity (Butler and Campbell 2004). A predator population may increase their exploitation efforts on a select type of prey, sometimes with relatively little restraint or regulation. Resource intensification is associated with the prey choice model which analyzes "whether a forager will pursue or ignore a prey item when encountered" (Nagaoka 2002a: 422). Resource depression occurs when a certain prey, which was at one time highly abundant, decreases in availability. This behaviour, over time, may lead to unsustainability in the local ecosystem.

Human predation essentially consists of a form of selection. Selection is sometimes intended for favoured taxa based on taste or easier accessibility (Jones 2009b), but it is often a selection for individual size (Allen 2002; Broughton et al. 2011; Butler 2000, 2001; Butler and

Campbell 2004; Lupo et al. 2013; Nagaoka 2002a, 2002b; Ugan 2005). If larger individuals of a given taxon are constantly selected for and taken from a breeding population, then phenotypically smaller individuals could predominate over time (Giovas et al. 2016: 133). Researchers, however, must be aware of other factors which can mimic the effect of human predation on mean size. Disease, biotic and abiotic environmental factors, habitat destruction, and methods in recovery or quantification can lead to similar patterns in the data (Giovas et al. 2016). In Pacific Island prehistory, the selection of certain fish is believed to be solely for consumption. Shellfish, on the other hand, are utilized for multiple purposes including the manufacture of adzes, fishhooks, and other materials (Allen 2002; Kirch 1997, 2000). The patterns of fish use at Hopoate are associated with dietary practice as well as environmental constraints. The critical issues that I address in this thesis are the significance of zooarchaeology as a direct indicator of subsistence practices, the applicability of the prey choice model, and the intensity of fish harvest which has been limited in Pacific Island literature.

Resource Use at the Hopoate Site

There is a general recognition that Pacific Island landscapes and the native flora and fauna have undergone significant human-caused disturbance following colonization (Kirch 1982; Weisler et al. 2016). The most dramatic and permanent alteration was the widespread extirpation and extinction of various food faunas. Early Lapita faunal assemblages incorporate numerous species of birds, lizards, and bats (Kirch 1997; Summerhayes et al. 2009) that are not present in later periods (Steadman 2006; Steadman et al. 2002a, 2002b). Clark et al. (2015: 522) suggest that the intense harvest of marine shellfish on Tongatapu was greatly influenced by the rapid extinction of large bodied iguana, bat, and land and sea birds. Those native land and sea animals which were not pressured to extinction by humans were likely affected by environmental changes such as forest alterations (Summerhayes et al. 2009). Since the marine environments were so significant to settlement and food exploitation, archaeological research has been focused on measuring the intensity of marine exploitation in comparison to terrestrial protein sources. It is believed that the distribution and abundance of fish taxa in prehistory was the result of complex causal factors such as habitat alteration, variable predator and prey relationships, and direct predation by humans (Reitz et al. 2009). Human predation, specifically, is a factor that researchers believe greatly affected local fish populations, though archaeological studies present variable patterns.

The generalized theory is that there was a decrease in marine food consumption over time and an increase in plant food intake (Allen 1992, 2002, 2003, 2017; Allen et al. 2001; Anderson 2009b; Field et al. 2009; Herrscher et al. 2018; Kirch 2000, 2002; Kirch and Yen 1982; Sheppard 2011). Archaeologists attribute this change to the transition from Late Lapita to immediate post-Lapita populations. Data indicate that dietary patterns across the Pacific Islands varied in timing and mode of change. For instance, Herrscher and colleagues (2018: 308) expected to see a shift to plant dominated diets in human burials from Talasiu, Tongatapu, yet their results indicated a diet closer to that of the early Lapita population, in that they continued to heavily exploit marine resources. They suggested a slower rate of change, in comparison to other Pacific archipelagos, that could have been attributed to the size of the island, population, and additional cultural or social factors.

The focus of my study is to evaluate the intensity and the diversity of the Hopoate fishery and characterize it within the context of Tongan and other Pacific Island sites. First, I observe the diversity and taxonomic composition of the fishery. Lapita faunal assemblages are generally dominated by a diversity of fish remains which exhibit a focus on inshore taxa such as Acanthuridae, Scaridae, Lethrinidae, and Serranidae (Bouffandeau et al. 2018; Butler 1988, 1994; Clark et al. 2015; Kinaston et al. 2015; Kirch 1997, 2000; Kirch and Dye 1979; Morrison and Addison 2009; Summerhayes et al. 2009; Walter 1989). While some recorded sites differentiate from this generalization and demonstrate human selection for specific taxa offshore (Allen 2014, 2017; Leach et al. 1984; Ono and Intoh 2011; Walter 1989), focus on inshore fish is frequent in tropical islands with rich coral reef systems. The presence of food resources along coral reefs sustains complex ecosystems including an abundance of bony fish that are commonly recovered from archaeological sites (Morrison and Addison 2009). By identifying the remains from the Hopoate assemblage, I was able to observe whether the fishery adhered to the more common characteristics expected of Lapita populations at the time period.

The second major part of the study is to record the intensity of the fishery and any indications of human-induced resource depression. As mentioned, inshore fish were commonly harvested by Lapita peoples, with a few taxa often dominating the faunal assemblages. Families such as Acanthuridae, Labridae, Lethrinidae, Scaridae, and Serranidae are some of the most commonly identified taxa from prehistoric Pacific Island assemblages (Allen 2017). Proportions of taxa vary by site, but some studies have noted preference for specific fish, such as Scaridae in Palau (Giovas et al. 2016) and Serranidae in the Cook Islands (Butler 2001), for consumption. The intensity of marine harvest varies geographically, and the abundance of fish remains from Hopoate suggest the local lagoon was critical to the inhabitants' subsistence economy. Based on the growing research on fish resource use in the Pacific Islands and the variability between studies, I set out to evaluate the Hopoate fishery, examining its focus, intensity and potential variability over time.

Early observations of the temporal patterns in the assemblage indicated possible resource depression based on the decline in relative numbers of Lethrinidae (emperors, breams). Identifications showed a diverse collection of fish families, a characteristic that is commonly recorded in tropical Pacific Island studies (Vogel and Anderson 2012), but it also showed a focus on Lethrinidae during the earliest Lapita period. The percentage of Lethrinidae declined dramatically over time while Acanthuridae (surgeonfish, unicornfish) percentages rose in the mid-Lapita period. This suggested that the smaller-sized Acanthuridae may have been used by Lapita people to compensate for the loss of the larger Lethrinidae individuals. Resource depression, however, is complex and requires more than one line of evidence and large sample sizes to be properly evaluated.

Evidence of resource depression in Pacific Island fisheries has been seldom recorded (Butler 2001) and is difficult to determine (Cannon et al. 2018; Giovas et al. 2016; Jones 2010). Although change in relative abundance might suggest resource depression, additional evidence such as size variation, diet breadth, and environmental characteristics or disturbances, is needed to make a strong determination (Giovas et al. 2016). Size measurements, or osteometrics, is a common methodology in zooarchaeology (Butler 2001; Giovas et al. 2016) and was used in this study to evaluate further the possibility of depression of Lethrinids. Based on measurements of select vertebrae and jaw elements, as direct proxies of total body size, I was able to address critical details of size variation in relation to potential resource depression at Hopoate

Site and Assemblage Details

The focus of this research is the Hopoate site, which is attributed to the first recorded inhabitants of the island. The zooarchaeological material derived from an excavated trench targeting an occupational zone and a planting pit. The pit was dug for the purpose of plant cultivation. It was eventually filled in and a period of occupation followed. Excavations of the trench from 2014 recovered a considerable assemblage of fish remains from multiple Lapita contexts (total of 13,798 specimens). These fish elements represent part of the subsistence economy of the first recorded colonizers in Tonga. Initial settlement on Tongatapu occurred at Nukuleka at 2850 cal BP (Burley et al. 2018). The Lapita peoples were the first to colonize Polynesia and their archaeological presence is identified by distinct dentate stamped ceramics. The ‘end’ of the Lapita culture occurred with the end of decorated pottery and the increased use of plainware (Lilley 2006). The Polynesian Plainware phase occurred on Tonga between 2700 cal BP and 2350 cal BP (Burley et al. 2015, 2018). Dates from the occupation at Hopoate were also contemporary with those from Moala’s Mound, located north of Hopoate (Figure 1.1). Moala’s Mound was first excavated in 1964 by Poulsen and remains the earliest recorded archaeological deposit in Tonga (Burley et al. 2010; Poulsen 1987).

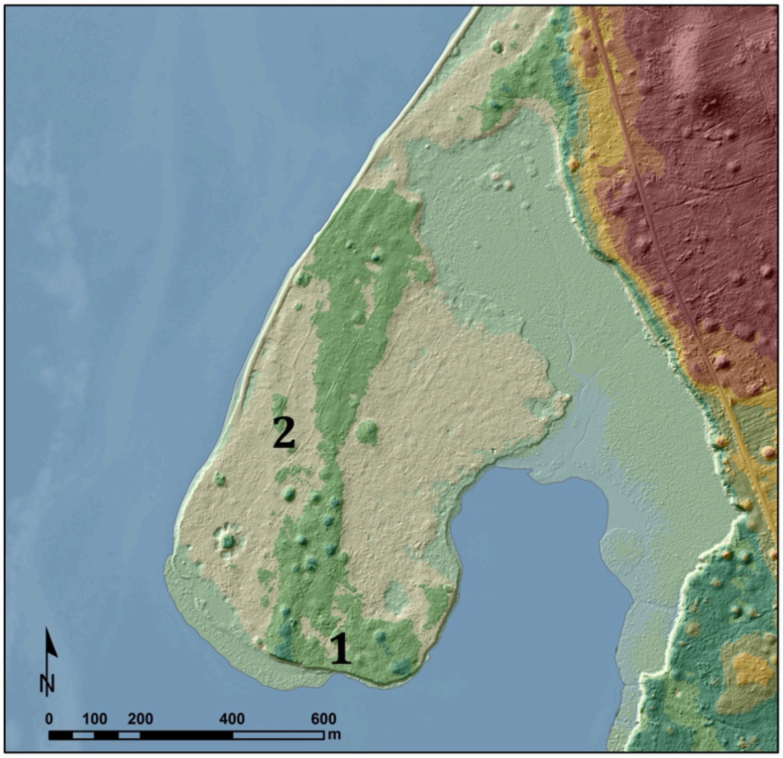

Figure 1.1 LiDAR imagery of the Nukuleka peninsula on Tongatapu. 1= Hopoate, 2= Moala's Mound. The small bumps represent late prehistoric burial mounds. Source: David Burley et al. 2018.

The Hopoate site is located on the Nukuleka peninsula on Tongatapu, the largest island in the Kingdom of Tonga (Figures 1.1 and 1.2). Sea levels during the time of initial settlement were 1.2 – 1.4 m higher than the present (Dickinson and Athens 2007) and the peninsula was then a paleo-islet (Burley et al. 2018). Towards the east and west of the islet were tidal sand flats abundant in various shellfish species (Spennemann 1987). The Hopoate site sits in close proximity to the Fanga ‘Uta lagoon, a rich source of fish. In addition to the convenience of exploiting inshore species, the peninsula also provided access to open ocean waters for pelagic (offshore, open water) fishing.

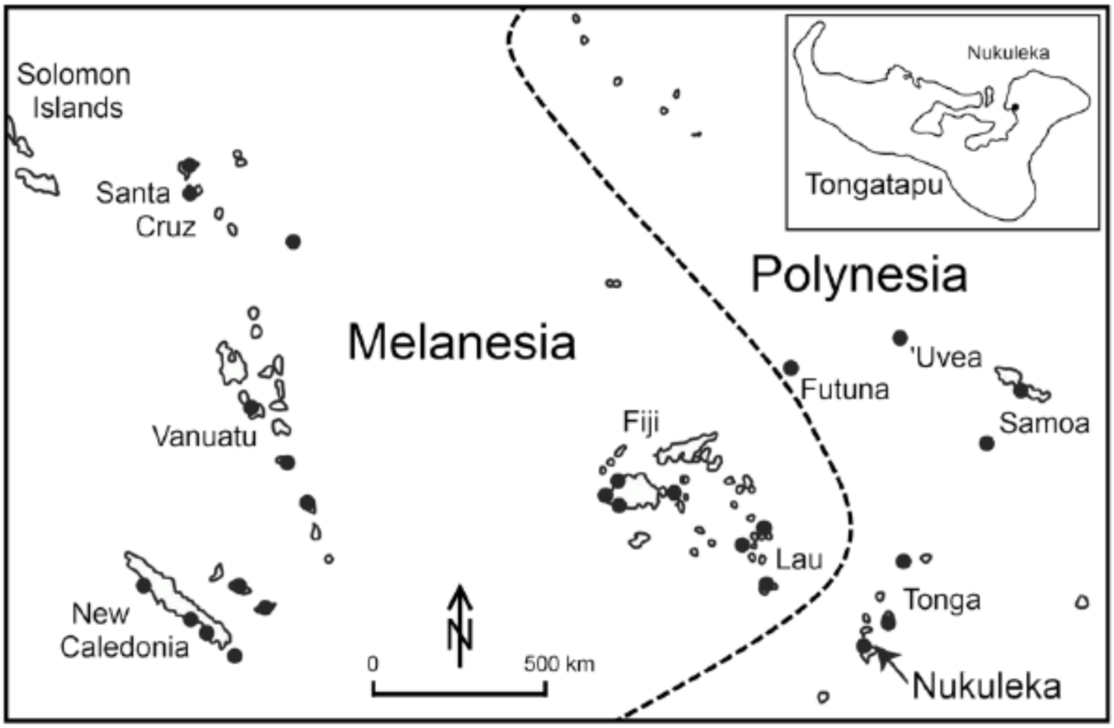

Figure 1.2 Location of Tongatapu within Polynesia. Dots represent select Lapita site locations. Source: Burley et al. 2018.

In 2010 bucket auger tests (4.5” diameter) were conducted along a shoreline erosional slope (Burley et al. 2018). These tests retrieved tightly packed shell and other archaeological materials to a minimum 2 m depth (Burley et al. 2018: 6). A few dentate stamped Lapita sherds were recovered from the lowest levels of these deep deposits. However, the 2 m deep deposits appeared to only occur over a 6 x 6 m area, with a surrounding occupational zone thinning out to 50 to 70 cm depths. Intensive investigations were conducted during a field school in 2014 led by Burley to cross section the feature. A 2 x 11 m trench was excavated, along with a 2 x 2 m excavation north of the trench. The excavation recovered a third of the pit feature which extends south past the excavated trench (Figure 1.3).

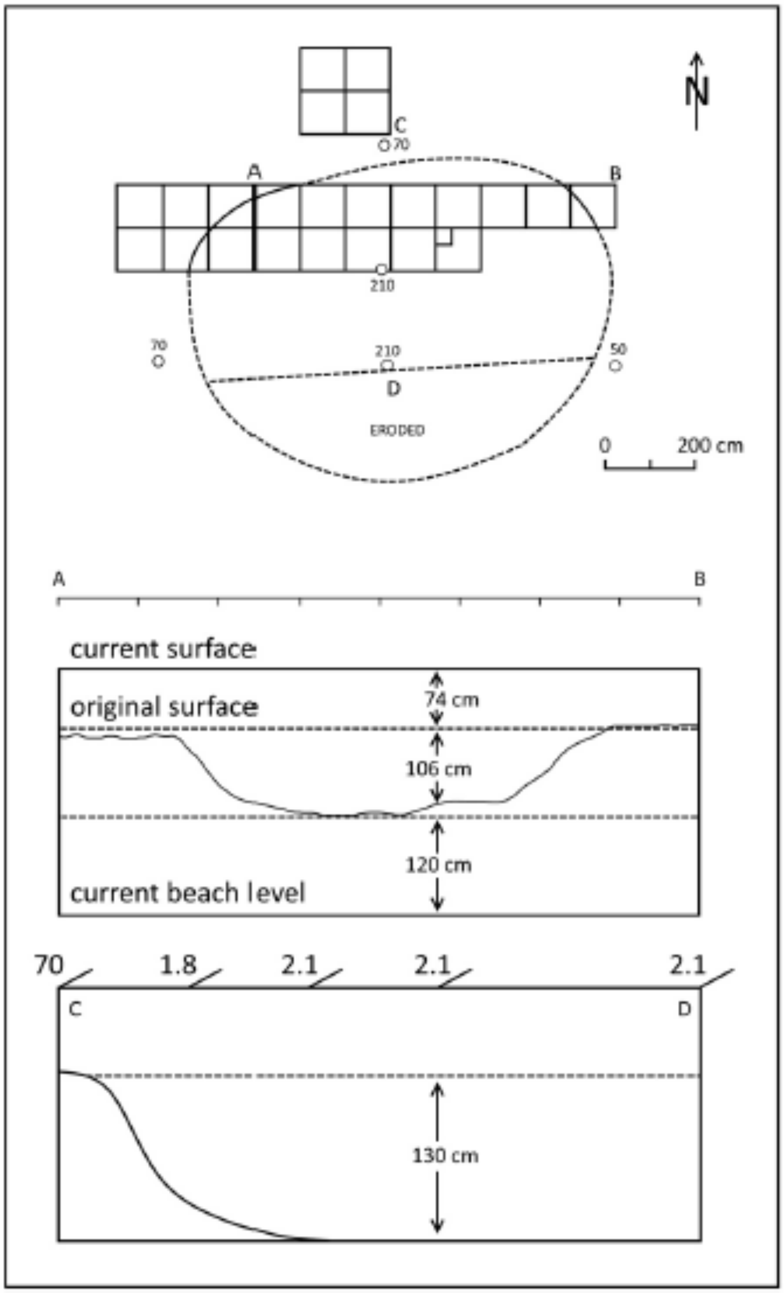

Figure 1.3 Reconstruction of the planting pit throughout the excavated trench. A-B is east to west, C-D is north to south. Also shown, depths below surface. Source: David Burley et al. 2018.

The Hopoate site is comprised of three chronological components. It contains an occupational area, as well as a planting pit which was dug either upon arrival or shortly after landfall (Burley et al. 2018). Within the pit are the two deposits, Planting Matrix and Pit Fill, which occurred consecutively before the Post-Fill Occupation Zone. Burley et al. (2018)

recorded three sequential events with U/Th and AMS radiocarbon dating. The Planting Matrix deposit is associated with the first landfall at Nukuleka, and the subsequent components are relatively close in time. The pit fill appears to be mid-Lapita, dated at 2690-2390 cal BP but likely filled in at the earliest portion of the interval. The fill seemed to occur over a relatively short period of time with household refuse which was abundant in faunal and shell remains, and ceramics. The following occupation component occurs after the pit was filled in and spans mid/late Lapita through to Polynesian Plainware based on the ceramic assemblage. Thus far, no evidence of occupation into the Aceramic period was found at Hopoate.

My analysis focuses primarily on the first two chronological components of the site: the Planting Matrix and the Pit Fill. The nature of the pit and the deposits make the site unique in comparison to other Lapita assemblages. A total of 13,798 fish remains were recovered from the Hopoate pit, of which 5091 were identified to the family taxonomic level from the Planting Pit and Pit Fill deposits. The abundance of fish remains within the finely defined temporal contexts provided the opportunity to examine short-term temporal patterns in fish exploitation following initial settlement and during a period shellfish appeared to have been depleted.

Pacific Island Fisheries

The importance of Lapita fisheries has been of interest to archaeologists for a number of years. Inferences on fishing technology, paleodiet, and environmental impact from human activities can be made through archaeological and zooarchaeological analysis. The South Pacific Ocean hosts an abundance of diverse tropical fish species, varying in size, behavioural suites and habitats. Many Pacific Islands are surrounded by coral fringing reefs which provide subsistence and shelter to a diverse range of fish taxa (Lowe 1987).

The Focus of Fisheries and Fishing Methods

The characterization of a fishery involves assessing the quantity and diversity of fish harvested, as well as patterns in the amount and types of fish which may or may not change over time. Some fisheries may focus on reef-based fish species, while others might select for larger carnivorous fish residing in pelagic waters. The types of fish exploited can potentially also provide information on the types of fishing techniques performed by a specific group, yet interpretations based on this method are known to encounter various issues such as within-family variation of feeding patterns and other behaviours (Allen 1992; Butler 1994, 1988; Colley 1987; Lambrides and Weisler 2016; Morrison and Addison 2009; Walter 1989; Weisler et al. 2010).

Due to a lack of archaeological evidence of fishing technology in the Pacific Islands, fish remains have been a significant source of information on Lapita practices (Butler 1994; Walter 1989). Fishing techniques likely developed as local responses to the distribution of fish and geography (Wheeler and Jones 1989: 10). Fishing strategies, however, can only be reconstructed to some extent, even with the help of archaeological remains and ecological knowledge. For instance, some species within families can reside in different ecological zones (e.g. Serranidae) (Vogel and Anderson 2012). Likewise, feeding and behaviour can vary between species of a family, and reconstruction of capture techniques based on food and habitat knowledge can sometimes be complex when such behaviours differ depending on time of day or the biotope of the reef (Lowe 1987). Although certain species are typically caught via certain capture techniques, the same type of fish can also be captured differently. For example, smaller reef species are usually harvested by nets or traps yet can also be taken by hook or spear (Allen 2014; Colley 1987; Vogel and Anderson 2012; Walter 1989). Despite these challenges and uncertainties, the use of faunal analysis to reconstruct fishing techniques can narrow down the possible techniques. It is important that researchers acknowledge the variability in fishing techniques and fish ecology when reconstructing fishing strategies.

The majority of Lapita and prehistoric sites in the Pacific Islands indicate a preference towards inshore fish species. Certain reef fish move around in schools as a survival strategy, and this makes them more susceptible to being caught by nets or traps (Wheeler and Jones 1989). While many of the inshore species are herbivorous, others are carnivorous. Larger pelagic carnivores may have been preferred based on taste or size, but inshore fish were more commonly harvested. There is also a level of risk when undergoing offshore pelagic fishing. First of all, the likelihood of fishing return is uncertain but seemingly not as productive as inshore capture (Allen 2014; Colley 1987; Walter 1989). Secondly, venturing out into deeper waters requires more investment and poses a risk to the safety of the fishermen (Kirch and Dye 1979; Walter 1989). Pelagic fish such as tunas (Scombridae) and jacks (Carangidae) are rarely recorded in abundance in most Pacific Island studies, although they may still be captured in nearshore environments (Randall et a. 1996; Spennemann 1987). These identified remains from assemblages are few and researchers consider them to be more opportunistic than targeted catches (Vogel and Anderson 2012). Interestingly though, however, there are recordings of certain populations focusing primarily on offshore fish (Davidson et al. 2000; Fraser 1998; Leach et al. 1984; Ono and Intoh 2011). Scholars suggest factors such as island physiography or technology account for these cases (Braje et al. 2017; Ono and Intoh 2011; Walter 1989).

Resource Depression in Pacific Island Studies

Lapita peoples impacted the native island environments by altering habitats and exploiting large amounts of birds, bats, iguanas, sea turtles and shellfish (Burley 1999; Clark et al. 2015; Kirch 1997, 2000; Spennemann 1987, 1989; Steadman et al. 2002a, 2002b; Summerhayes et al. 2009). There is a possibility that local fish populations were similarly impacted by human activities and this issue has provided the basis for analysis in this thesis. However, harvesting pressure in fishery studies is difficult to determine, and in Pacific Island contexts, results have been variable. Resource depression is difficult to investigate for a number of reasons. The faunal assemblage, for one, can only provide a relative composition of species and an estimate of the actual total numbers of fish caught in a given time period (Nicholson 1996). Also, a number of factors other than harvesting pressure can create the patterns observed in frequency data. Changes in population and body size can occur over time from reasons such as climate effects and primary productivity, not human pressure. It is therefore important to evaluate interpretations of fishing pressure with the use of taphonomic, independent stratigraphic, and environmental data (Plank et al. 2018: 43).

Change in the abundance of overexploited fish populations is commonly used as a line of evidence for resource depression (Reitz and Wing 2008: 328). While absolute abundance of prehistoric animal population levels and those exploited are difficult to measure, relative abundance in contemporary and past periods can be more easily understood (Butler and Campbell 2004). Fishery studies across the Pacific Islands have exhibited variable evidence in the discussion on intensification and resource depression. Butler and Allen both conducted separate studies at sites on Aitutaki Island in the Southern Cook Islands and documented incongruous results. Allen (1992, 2002) found that larger-bodied, and likely more preferential, fish increased in abundance at one site but decreased at another. The reasons behind the variable patterns, while potentially attributable to change in fishing technology, were unexplained and required further exploration. Butler (2001) documented declining numbers and size of fish over time, which she then attributed to overexploitation.

Tongan Fisheries

A few archaeological studies have touched on the contribution of fish to paleodiet in Tonga (Clark et a. 2015; Herrscher et al. 2018; Kirch and Dye 1979; Spennemann 1987; Stantis et al. 2015). However, only two other studies have conducted detailed analyses of fisheries. Cannon et al.'s (2018) study in the Ha'apai islands evaluated the relative importance of the local fisheries to the early Lapita inhabitants. Similarly, Densmore (2010) conducted a study on fish remains from the Vava'u archipelago which was also inhabited by Lapita peoples. Both studies, therefore, are excellent comparative studies to measure the importance of the fisheries during the early Lapita era.

Cannon et al. (2018) identified a large number of fish remains from five sites in the Ha'apai islands: Tongoleleka, Mele Havea, Faleloa, Vaipuna, and Pukotala. The purpose was to assess the variability within and between the island sites. Major taxa identified from the assemblages were reef-based which is consistent with Hopoate, Vava'u, and the majority of other sites in the Pacific Islands. Cannon et al. (2018) noticed a possible inverse pattern between Lethrinidae and Acanthuridae from the Lapita to the Plainware period. After further investigation however, the results were actually quite variable between sites. While patterns consistent with resource pressure were recorded at Mele Havea and Vaipuna, they were absent from the other sites. Cannon et al. (2018) argued that a single explanation for temporal patterns could not be applied to all sites. This variability between relatively close island sites only highlighted the complexity amongst Pacific Island fisheries.

Densmore (2010) determined that the reliance on fishing was less intense in Vava'u. There were no indications of resource pressure, and the harvest of fish declined over time. Like Cannon et al. (2018), Densmore noticed slight variability in the fishing practices in two sites: Vuna and Falevai. Falevai demonstrated continuous procurement of fish through all of the analyzed temporal periods, whereas at the other sites it became almost nonexistent. The density in Vuna during the Lapita occupation was high, similar to Ha'apai, and the taxonomic dominance was different from the remaining sites. In Ofu, 'Otea, and Falevai Lethrinidae were absent but highly abundant at Vuna along with Serranidae and Scaridae. No obvious explanation was available for these discrepancies but the variability between sites remains evident throughout Tonga.

A number of other archaeological projects have been conducted in Tonga, those involving some aspect of ichthyoarchaeological analysis include Kirch and Dye (1979) in Niuatoputapu, and Spennemann (1989) and Clark et al. (2015) in Tongatapu. Unfortunately, these studies do not provide the same detailed fish analysis as Cannon et al. (2018) and Densmore 2010). They are nonetheless important for comparison. The details of their analyses will be discussed later.

Thesis Overview and Significance

In the following chapter I will explore the archaeological, historical, and geographical background of Tonga and the Pacific Islands. After that discussion I will outline the methodology of this project before presenting the results. To conclude, I will interpret these results and discuss the implications for other Tongan and Pacific Island fishery studies.

The diverse composition of the Hopoate fishery was similar to other Lapita sites yet it was also unique in its own way. While temporal patterns suggested the possibility of resource depression, additional lines of evidence did not support this interpretation. The overall results indicate an intensification of the fishery which addresses Spennemann's (1987) hypothesis. Details of the results are presented in the fourth chapter, along with interpretations discussing the possible factors which may have influenced these patterns.

This study is significant because no other detailed fish analyses have been conducted for Hopoate or Tongatapu. Although some archaeological studies have taken place on Tongatapu (Clark et al. 2015; Poulsen 1987; Spennneman 1987), with fish remains being analyzed to some degree, they were not the sole focus of the studies and simply contributed as a part of the subsistence analysis. The goal of this project is to understand the nature of the local fishery within the context of Tonga and the Pacific Islands. After characterizing the Hopoate fishery, I will compare the abundance and diversity to Vava'u and Ha'apai which will highlight the variability between small geographical areas. A comparison to ichthyoarchaeological studies across Polynesia and the rest of the Pacific Islands will emphasize this nature of variability even further.

The site of Hopoate itself is unique to the prehistory of Tonga. Since occupation on the Nukuleka peninsula dates to the earliest Lapita time period on Tonga, it is important to understand the relationship the settlers had with the local fishery and whether this relationship changed over time. The multiple chronological components of the site add a unique complexity to the site formation. The fact that a change in the relative abundance of fish occurred over a relatively short period of time is both interesting and informative. The location of the site, near accessible water, is characteristic of a Lapita settlement. The proximity to the paleoshoreline indicates the inhabitants exploited the lagoon regularly. The Hopoate inhabitants were therefore opportunistic foragers, as this project will highlight.

Jones (2010) has commented that there is a growing trend in the Pacific Islands where archaeologists and historical ecologists illustrate the human and marine environment relationships as complex, which she believes is more accurate. This is contrary to simplistic explanations of human behaviour and straightforward environmental outcomes which neglect to consider the possibility of long-term stability (Jones 2010: 160). Jones (2010) argues that researchers often misinterpret their data because they are motivated to report overharvesting. In view of current environmental discussion, overfishing being a specific concern, I agree that researchers could be influenced to find instances of detrimental human impact. I maintain that verifying the presence of resource depression is a difficult conclusion to make for archaeological fish assemblages. First of all, evidence of impact on marine resources has been localized and for the most part, infrequent in the Pacific Islands. Secondly, a number of factors other than resource depression, which will be discussed subsequently, can lead to the decrease in one or more fish taxa. With this in mind, multiple lines of evidence must be provided to confidently infer the presence of resource depression (Cannon et al. 2018; Giovas et al. 2016).

It is important nevertheless to understand the relationship prehistoric people had with their local environments, no matter the intensity or the likelihood of over-exploitation. Fish bone analysis can provide valuable information other than resource use, such as fishing technology, cultural practices, and paleodiet and paleoenvironment reconstruction. This study therefore provides a valuable contribution not only to the prehistory of Tonga, but also to the growing collection of fishery research in the Pacific Islands.

Chapter 2 Environmental and Historical Context

The impact of humans on their local environments has been a significant topic of interest to researchers, both in contemporary and historical settings (Amorosi et al. 1996; Anderson 2009a; Balée 2006; Fitzpatrick et al. 2015; Hardesty 2007). Deliberate or unintentional human activities in terrestrial and aquatic environments can range from slight to dramatic and may occur rapidly or over long periods of time. Archaeologists are in a unique position to study and analyze such anthropogenic impressions on landscapes with deep-time history. They also use this historical knowledge and apply it to present-day environmental patterns and processes (see Balée 2006, Kirch and Hunt 1997). These two perspectives are encompassed within the framework of historical ecology. Historical ecology is a research program and theoretical perspective focused on the interactions between human societies and their environments through time (Balée 2006:76). The consequences of these relations are analyzed in order to understand the development of past and contemporary cultures and landscapes (Balée 2006: 76). Researchers working within historical ecology use interdisciplinary approaches and methods from anthropology, ecology, geography, and history.

Historical ecology plays a key role in this project. In this chapter, I provide a historical ecological overview of the region’s physical, cultural and chronological settings. I will compare large-scale trends of the Lapita peoples’ subsistence strategies across Tonga and Oceania while also discussing localized variability of human activity.

Historical Ecology in the Pacific Islands

Many anthropologists in the twentieth century viewed islands as being changeless, much like the "timeless 'ethnographic present' they invented in their monographs" (Kirch 2000: 315). Indigenous inhabitants were people without history, and their actions were not viewed to have significant environmental impact before the initial interactions with Europeans (Kirch and Hunt 1997). The social and cultural aspects of the people were far more interesting to anthropologists than their environments, and it was not until archaeologists and natural scientists unearthed evidence of sometimes radical environmental dynamics that this naïve notion of a changeless backdrop faded. Archaeology played a significant role in establishing the paleoenvironmental record (Kirch 2000). Application of historical ecological perspective developed as researchers sought to outline the changes in Pacific Island landscapes over varying scales of time. The belief that pre-industrialized peoples had minimal impact on their environments was altered once archaeologists discovered that the earliest Lapita settlers in fact modified the island ecosystems (Kirch and Hunt 1997). By the end of the 1960s, ecological perspectives became highly widespread in Western archaeology and in the 1980s Pacific Island zooarchaeologists adopted more refined methodologies and treatment of their evidence (Kirch and Hunt 1997). While in geographical isolation, the remote Pacific Islands developed ecosystems which were moderately stable before human arrival but were fragile and vulnerable to human impact (Kirch 1997: 31). After humans appeared, Pacific Island ecosystems underwent significant and sometimes irreversible changes.

Islands have long been used as 'laboratories' to reconstruct cultures considered to be semi-isolated, then results of these studies are used in comparative analysis of cultures. Islands vary in size, location, climate, and complexity, and provide a gradient of circumstances for comparison of naturally occurring phenomena (Clark and Terrell 1978: 293). The opportunities for controlled comparison are enhanced by the range of environmental variation among the Pacific islands, as well at the fact that a great number of modern societies possess common origins (Kirch 2000: 324-325). This has led to numerous studies on migration and settlement chronology, developments in subsistence economies, change in material culture sequences, interisland interaction, cultural diversification, resource use, and human impact (Kirch and Hunt 1997).

Kirch and Hunt (1997) have identified a number of themes critical in Pacific island historical ecology: 1) natural versus anthropogenic change, 2) anthropogenic impacts on island ecosystems, 3) environmental evidence for human colonization, and 4) the fragility or resilience of island ecosystems. These themes resonate through a number of subsistence studies, particularly in relation to the Lapita culture. Researchers are well aware by now that the Lapita peoples impacted and altered the island environments through the introduction of horticulture and the predation of various native resources (Kirch 1997, 2000; Kirch and Yen 1982; Weisler et al. 2016). These theoretical considerations are the basis for resource utilization studies in the Pacific Island setting. By and large, the Lapita peoples impacted both land and sea environments yet the intensity of this influence varied regionally. The degree of exploitation measured in archaeological studies can detail the type of impact produced by humans which is ultimately one of the main questions in historical ecology. My analysis of the Hopoate fishery observes exploitation patterns through the lens of historical ecology in the interest of measuring the importance of the fishery to the earliest inhabitants and the impacts these inhabitants had on the surrounding landscape. The outcome of this study is a unique account of short-term developments in the relationship between the Lapita people and the local marine environment.

This contributes to broader understandings in historical ecology by detailing the knowledge the inhabitants possessed of their local environment and their adaptability to environmental change.

Pacific Islands: Geography and Biological Diversity

The Hopoate site falls within the context of Tonga and the rest of Oceania. Since environmental factors are known to influence subsistence practices (Jones and Quinn 2009; Kinaston et al. 2015; Kirch 2000; Valentin et al. 2014; Walter 1989), it is important to understand the similarity and variability of environments on both fine and vast geographical scales.

Oceania covers an area of 8,000,000 km^2 with 25,000 Pacific islands divided into three distinctive cultural subregions: Polynesia, Melanesia, and Micronesia (Shutler and Shutler 1975). Polynesia is the largest area of the eastern Pacific Islands, spreading from Tonga and New Zealand to Hawaii and Rapa Nui. The islands of Melanesia are subequatorial and located in the Southwestern region of the Pacific. Finally, the Micronesian region comprises eastern Philippines and islands just north of the equator. Scholars have also applied the terms Near Oceania, which includes the western regions and expands eastwards to the Solomon Islands, and Remote Oceania where Fiji, Tonga and the remaining eastern islands exist (Figure 2.1).

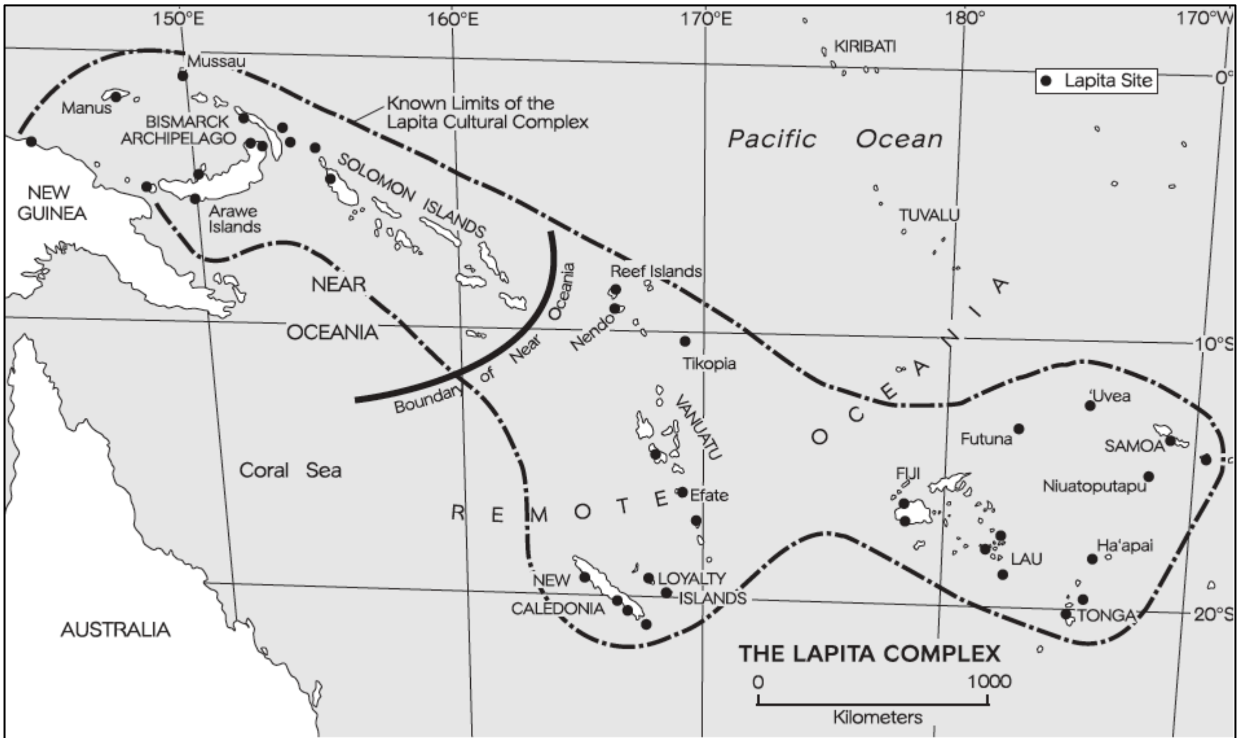

Figure 2.1 Map of Near and Remote Oceania with Lapita sites noted in dots. Source: Kirch 2010.

The ecological diversity of the Pacific Islands is seen across its great expanse but also within the various archipelagos as well. While many regions are tropical (Papua New Guinea, Fiji, Tonga), others are temperate (New Zealand). There is a four-type classification system for the Pacific Islands which has been outlined by Kirch (2000: 47): (1) coral atolls, (2) island-arc islands or continental islands, (3) high islands, and (4) makatea islands. Coral atolls are remnants of barrier reefs which are typically 2-3 m above sea level and possess poor coralline soils but vast encompassing reefs rich in marine life (Allen 2017; Lambrides and Weisler 2016). Island-arc islands consist of chains of volcanic land masses located in proximity to tectonic plate boundaries. High islands are also volcanic, rich in fresh water sources, productive soils and complex marine environments depending on the development of the fringing reefs. And finally, makatea islands are formed by uplifted reef limestone. Island types range in size and their geomorphology is rather complex (Allen 2017: 737-740; Lambrides and Weisler 2016: 278). Atolls lack sufficient fresh water sources while high islands are short of developed coral reefs but are more suitable for horticulture due to the presence of ground water and better quality soil (Kirch 2010). Archaeologically, this variability results in diverse prehistoric subsistence strategies. For instance, on coral atolls, streams are not present yet a thin lens of freshwater can be tapped by digging shallow wells (Burley et al. 2018; Kirch 2000). Specific crops such as giant swamp taro (*Cyrtosperma chamissonis*), can be cultivated in these excavated pits yet agriculture on atolls is risky. As discussed below, such a situation may have led to reliance on autochthonous resources such as marine foods. Tongatapu, on the other hand, is a raised coral limestone island rich in fertile soils which were produced by a mixture of various weathered tephra (Poulsen 1987: 3-4). The uplift of the island also resulted in the development of a protected reef flat on the northern leeward side which includes the shallow Fanga ʻUta Lagoon system that is rich in marine life (Spennemann 1987).

Tonga: Geographical and Chronological Context

The archipelago of Tonga consists of 170 islands spread over a linear distance of 600 km from outlier to outlier (Burley 2016: 84). Tonga is located in Remote Oceania, in the western region of Polynesia. The archipelago consists of three major groupings of islands: Vava'u, Ha'apai and Tongatapu (Figure 2.2). Tongatapu, being the largest island in Tonga, encompasses an area of 259 km^2 (Burley 2016: 85). Together, the island groupings form two parallel chains where the west is a series of volcanic formations and the east consists of coral limestone islands and sand cays (Burley 2016: 84). The first human inhabitants of Tongatapu arrived in 2850 cal BP. Colonization throughout the rest of the archipelago took place after an initial period of 50-80 years (Burley 2016; Burley et al. 2001). Uranium thorium dates suggest the Lapita colonization period started around 2850 B.P. (Burley 2016: 84) and the decorative Lapita pottery tradition disappeared by 2650 B.P. (Burley 2010: 138). The Hopoate site is located on the main island of Tongatapu (Figure 2.3). It is located on the south coast of the Nukuleka Peninsula, along the northeast entrance of Fanga'Uta lagoon (Burley 2016).

Burley, who has conducted extensive work in Tonga and the South Pacific, has identified Nukuleka as the first Lapita settlement in Polynesia (Burley et al. 2018). Landfall began on Tongatapu, and after a 50 to 80 year delay, was followed by a continuous expansion northward to Ha'apai and then Vava'u (Burley 2016; Burley et al. 2001). The Tongatapu settlement pattern is different from other island groups specifically in population and residency sizes (Burley et al. 2001). For example, settlements on Tongatapu were much larger than those on the significantly smaller Ha'apai islands (Clark et al. 2015) and were likely mobile and maritime adapted. The Ha'apai islands are surrounded by a complex mixture of fringing, apron and offshore reefs which provide a highly productive fishery (Cannon et al. 2018: 5). Ha'apai, along with the islands of Tongatapu and Vava'u have fertile agricultural soil allowing for agricultural success (Densmore 2010). Inter-island contact was likely established and maintained for social and economic reasons between the various island groups (Kirch 1997).

Geographical Distribution of Plants and Animals

To understand human movement and development throughout the Pacific Islands, it is important to know the geographical distribution of plants and animals and the state of natural landscapes prior to human arrival. The first inhabitants encountered a broad pattern of declining biodiversity of terrestrial resources from west to east, Near Oceania to Remote Oceania (Kirch 2000; Lambrides and Weisler 2016).

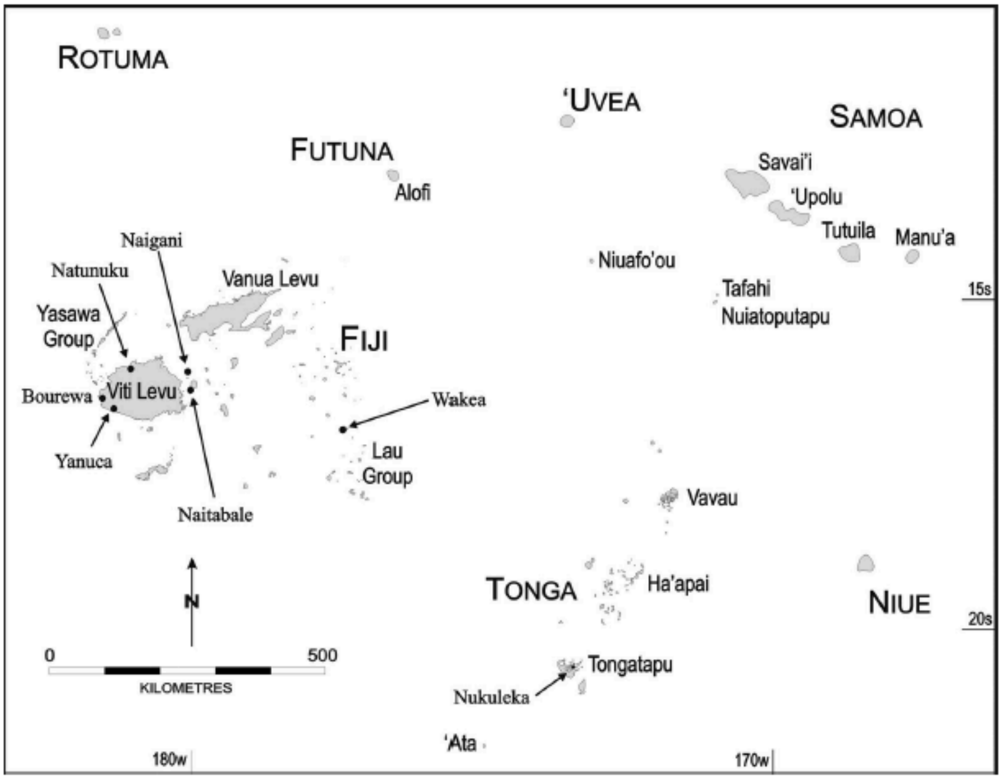

Figure 2.2 Map of the Kingdom of Tonga and the neighbouring archipelagos of Fiji and Samoa. Source: Burley 2010.

Although fish taxa in both regions were similar, the diversity of marine fish species in Remote Oceania has been recorded, in modern assessments, as low in comparison to Near Oceania (>1500 species in comparison to ~150 in the most remote Eastern locations) (Kulbicki et al. 2011: 9). Reasons behind the differences range from island size to reef productivity, yet a single explanation remains open to debate. Archaeologists believe that a lower biodiversity in the remote islands would have created problems for humans looking to settle permanently, unless they were capable of manipulating their environments. Many of the plant and animal species that inhabit the Pacific Islands today did not exist there prior to human colonization. Polynesian settlers and their ancestors transported their own biota to establish settlements and sustain life. Such transported 'Pacific packages' included pigs, dogs, chickens, rats and a series of roots and tuber crops (Kirch 1997). After European contact, more organisms were introduced to the Pacific Islands such as cattle, goats, and sheep (Kirch 2000).

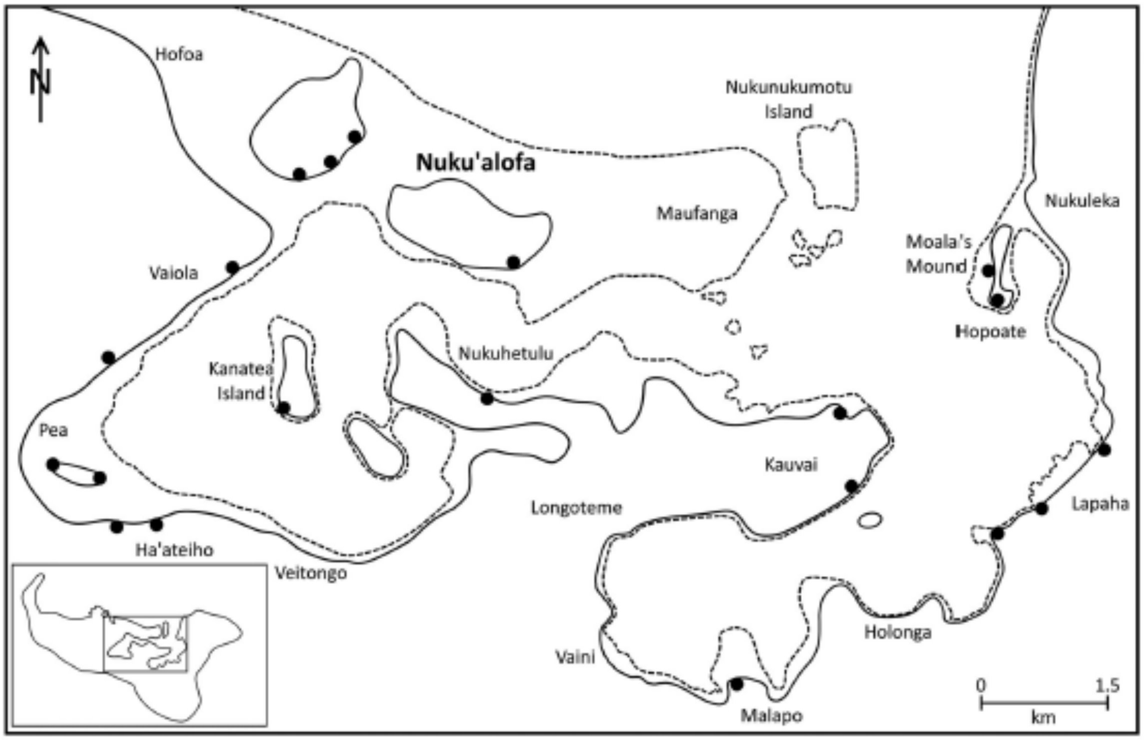

Figure 2.3 Map of Fanga 'Uta/Fanga Kakau Lagoons in Tongatapu, Lapita site locations plotted. Dotted lines indicate the modern shoreline while the solid line represents the Lapita shoreline. Source: Burley 2016.

Approaches to Resource Selection and Change

The prey choice model has been applied by researchers in the Pacific Islands to examine subsistence change, specifically resource depression. This model implies a pattern where the relative abundance of high-ranked, or preferential, taxa in the archaeological record fall and the relative abundance of lesser-ranked taxa increase (Giovas et al. 2016). This would indicate that numbers of preferred prey were exploited to the extent that these taxa populations were reduced to a point that people had to resort to a less ideal taxon, likely at a lower trophic level (Pauly et al. 1998).

Based on the prey choice model, inhabitants would select the most preferable fish which often relates to size (Broughton et al. 2011; Butler 2000, 2001; Butler and Campbell 2004; Jones 2009a; Lupo et al. 2013; Nagaoka 2002a, 2002b; Ugan 2005), although taste and physical features can also influence peoples' selections (Jones 2007). Habitat and behaviour also make certain fish more susceptible to capture than others. For instance, fish that reside in nearshore reef areas and travel in schools (i.e. Scaridae, Labridae, Acanthuridae) are vulnerable to mass capture techniques, particularly nets (Lowe 1987). The proximity of reefs to shoreline settlements make inshore fish more accessible than those from offshore areas. The abundance and distribution of fish species corresponds closely with location of food resources for these taxa (Morrison and Addison 2009: 189). Herbivores which feed on coralline algae are thus some of the most commonly identified fish from faunal assemblages in the Pacific Islands (Butler 1994; Weisler et al. 2016).

As harvesting pressure on a specific taxon increases, their availability declines and individuals are unable to mature which means the average age of the population becomes lower (Giovas et al. 2016). This, consequently, results in a diminished availability of large fish and the average caught individual is therefore smaller in size. The majority of archaeological studies on resource depression which identify declining prey populations attribute such outcomes to human forces (Broughton et al. 2011; Butler 2001; Harris et al. 2016; Lupo et al. 2013; Nagaoka 2002a, 2002b; O'Day 2004). Changes in available taxa may not only be caused by human predation; they might reflect environmental change, disease, habitat destruction, human and fish behavioural factors and recovery and quantification methods (Giovas et al. 2016; Jones 2009a; Leach et al. 1984; Plank et al. 2018; Ugan 2005). Cultural factors such as changes in technology, shift in culinary preference and changing settlement patterns and fishing grounds, can also affect fish distribution and growth rates (Anderson 2008). Each of these factors, along with overharvesting, can produce diverse archaeological signatures and these complex processes are often difficult to disentangle (Lambrides and Weisler 2016: 301). Christensen (2014) suggests that verifying occurrences of resource depression is challenging because fishers may change location, capture techniques, and target species based on a number of factors such as weather and island conditions, and fish behaviour.

Regardless of the cause of resource depression, humans can cope in a number of ways. Reitz and Wing (2008) list four possible solutions humans may enact to negotiate resource depression. They may (1) switch exploitation efforts to another prey, one that is likely less desirable; (2) expand their dietary breadth and target additional organisms to reduce the pressure on the depressed prey; (3) leave their settlement and move to another area which has not experienced overexploitation pressure; or (4) exchange food goods with other groups, thus relying on alternative foods and cooperation with other inhabitants. Although all four responses may be detected through archaeological evidence, the first two are of particular interest to this study, given the locally-available taxa represented in the assemblage (vs. taxa from other islands) and the continuity of occupation (vs. immigration to or from the site).

The prey choice model has been applied throughout the Pacific Islands, with variable accounts of exploitation leading to resource depression. Evidence of prehistoric populations pressuring land animals is copious. For instance, Nagaoka (2002a) used the prey choice model to explain subsistence change, particularly the reduction, of native bird species in New Zealand. She also applied the patch choice model which determines how humans selected the environments they exploited. Evidence of human-induced resource depression on fish, however, has been seldom recorded in this region. An exception was a study by Butler (2001) who identified indications of resource depression of Serranidae in the Southern Cook Islands based on temporal patterns of decreasing abundance, switching to lower ranked prey, and declining body size of Serranids. Butler has taken similar approaches to examining human's responses to changing availability of marine resources in North America and has advocated for applying historical knowledge to contemporary environmental issues. Butler and Delacorte (2004) investigated a severe decline in a native species of sucker in Owens Valley, California as well as a decreased body size since the earliest prehistoric deposits. Human selection affected the sucker population in early periods, but ultimately other factors influenced their abundance and body size. These conclusions could not be made without not only multiple faunal analyses but paleoenvironmental knowledge as well.

In contrast, Giovas et al. (2016) challenged an existing notion of overharvesting and prey switch at a site in the Palau Rock Islands by incorporating osteometrics to identify size variation in Scaridae. Their results found no indication of resource depression and they argued for the use of osteometrics and other multiple lines of evidence in ichthyoarchaeological analyses. Since various factors could be at play over long periods of time, multiple criteria are required to provide a sufficient argument for resource depression caused by intensive fishing (Giovas et al. 2016).

Studies on resource depression aim to identify specific patterns in the data related to human exploitation of finite environmental resources. Yet overall, the goal of historical ecologists is to illustrate the interactions between humans and the environment through time. Resource exploitation viewed through the lens of historical ecology, has been explored through recent research on marine and island ecosystems (summarized in Jones 2009a). The significance of anthropogenic impacts on the terrestrial landscapes of the Pacific Islands has been well noted in historical ecological studies. The fact that a number of native land animals were hunted to extinction and terrestrial environments were altered permanently by the earliest people has greatly influenced researchers to search for dramatic impact in marine settings. However, the perspectives on these relationships have varied in the Pacific Islands for quite some time.

Pacific Island Fisheries in Comparison to the Caribbean

Methodologically, fishery research in the Caribbean is similar to the Pacific Islands. Focus on subsistence practices, intensive exploitation and resource depression are also important topics. One noticeable difference is the low frequency of fishhooks found in the Caribbean compared to Oceania (Keegan 2009). This indicates that angling may not have been a prominent strategy and fish were likely caught by traps or nets. Archaeological evidence shows prehistoric Caribbean fisheries as focused and small scale (Wing and Wing 2001: 6). Reef fish contributed the most to the marine protein diet and large offshore fish were not often sought after. Much like the Pacific Islands, cultural and ecological differences between islands led to variations in resources used and remains recovered.

Wing (2001) found a temporal shift in several Caribbean sites (<2500 cal B.P.) in focus from reef fishes to inshore and pelagic fish (tuna specifically), which she attributed to overexploitation of reef fishes in earlier periods. A similar trend was noticed in Tobago which may have occurred a bit earlier (Steadman and Jones 2006) and in Puerto Rico where isotopic analysis recorded a decline in mean trophic level of consumed fish (Pestle 2013). Steadman and Jones recorded a decrease in terrestrial big game (Peccaries) in Tobago, West Indies, which may have influenced people to increase deep-water fishing, perhaps the marine equivalent of big game (2005: 332). Fish, therefore, were potentially used as compensation for the loss of other resources. As discussed in the previous chapter, the importance of fish to the Lapita diet is a significant topic in Pacific Island fishery studies and in this thesis. The reduction in various land animals and shellfish species is the same as the decline in big game in the Caribbean. The intensification of the Hopoate fishery thus emphasizes that fish were a reliable source of food, as they were in numerous regions around the world. Although prehistoric populations of the Caribbean and Oceania did not impact marine resources to the same degree as modern populations, the issue of human impact remains important and of interest to researchers worldwide. Part of this interest may be related to contemporary concerns of overfishing, since archaeologists believe knowledge of past human and environment interactions can be used to address and understand current environmental issues (Hardesty 2007). Apart from this perspective, researchers understand that fish remains provide valuable information on prehistoric diet, resource exploitation, and the relationships between people and their local environments.

Cultural Chronology and Lapita Migrations

Cultural development in prehistoric Near Oceania occurred some 35,000 years ago (Kirch 2000: 2). Humans first travelled from Southeast Asia into the realm of “Greater Australia” and the Solomon Islands and Bismarck archipelagos during the late Pleistocene (Lilley 2006: 5). The earliest known colonizers of Remote Oceania, those islands east of the main Solomon chain, were the Lapita peoples, ancestors of historic cultures in Polynesia and certain areas of Melanesia. Evidence from archaeology, biology, and linguistics have pointed towards Southeast Asia as the ‘original’ homeland. These people lived in Taiwan at the start of the third millennium B.C. and expanded south to the Philippines towards Near Oceania over the following 1500 years (Kirch 2000: 91). They were skilled seafarers and navigators who, once in Near Oceania, spread from the Bismarcks eastwards as far as Tonga and Samoa during the period 3200-2850 B.P. (Kirch 2010: 137). The rate of dispersal from Near to Remote Oceania was relatively rapid, occurring over the course of two to three centuries and spanning a distance of 4500 kilometres (Kirch 2000: 96). Their descendants, the Polynesians, would later travel further east and inhabit such islands as Hawaii and Rapa Nui (Kirch 1997).

Material Evidence

In 1952, the Lapita culture was first identified by Edward W. Gifford and Richard Shutler Jr. in New Caledonia in the form of sherds of highly decorated pottery (Kirch 2000: 91). These ceramic styles have remained the most diagnostic artifact of the Lapita peoples. Lapita pottery is characterized by geometric patterns and the occasional anthropogenic figure on a broad range of vessel forms (Fischer 2002; Kirch 1997; Kirch 2010). Although the ceramics unearthed in the Bismarck archipelago were similar to pottery excavated in Southeast Asia, they possessed their own decorative style unique to Near Oceania (Kirch 2000: 93). A number of archaeologists agree that this style emerged from the fusion of intrusive and indigenous cultures. These patterns and forms were found to be diverse in the earliest Lapita ceramic phase, and then diminish and transition into what is known as Polynesian Plainware (Kirch 1997; Lilley 2006). In Tonga, this transition occurred between 2650 to 2350 cal B.P (Burley et al. 2018). The loss of ceramic decoration marked a diversification among ancestral Polynesian cultures and the end of the Lapita cultural phenomenon (Lilley 2006).

“Lapita Cultural Complex” was coined by Green (1979, 1982) to avoid characterizing Lapita peoples solely on the basis of ceramics. Lapita, as a cultural and ceramic complex, emerged in the Bismarck Archipelago (Kirch 2000). Ceramic styles and other characteristics, such as the use of earth ovens, may not have originated solely with Lapita individuals but instead developed from the “fusion of intrusive Austronesian and indigenous Papuan cultures”, the indigenous occupants of Near Oceania (Kirch 2000: 93). As the Lapita people expanded in Remote Oceania, they occupied uninhabited islands. Pottery sherds were used to trace Lapita peoples’ movements through time and space. The cultural development of the Lapita Cultural Complex was viewed as a multilinear phenomenon and researchers sought to map Lapita movements throughout Oceania with more than ceramic evidence (Smith 1995). Galipaud (2006) argued that the ceramic artifacts only represent a fragment of Lapita culture. Other archaeological materials, faunal remains, settlement patterns, spatial arrangements, social interactions, anthropogenic impact on landscapes, and subsistence economy also comprised the cultural complex (Kirch 1997). All provide varying degrees of detail about the culture, and zooarchaeological materials in particular contribute directly to the understandings of the Lapita peoples.

Lapita Subsistence Economy

Researchers have long debated Lapita subsistence. The Lapita peoples had a maritime orientation, travelling long distances over water. Such an intimate relationship with the sea indicates frequent exploitation of marine resources (Kirch 2000). The question, however, has been whether colonists were primarily Neolithic southeast Asian horticulturalists or if they were reliant on autochthonous wild food sources to sustain settlement (Davidson and Leach 2001). Regardless subsistence strategies and any changes or developments in food choices and technologies would likely influence patterns of local fish use. On one hand, a high reliance on marine resources may lead to overharvesting which can be identified in the zooarchaeological record. On the other hand, exploiting a wider range of sustenance, from both aquatic and terrestrial sources would limit any pressure on marine ecosystems. In most cases, archaeologists turn to multi-component sites from initial settlement onward to answer diachronic questions of marine exploitation pressures. While there are limits to how much ichthyoarchaeological remains can inform about the overall subsistence of a prehistoric population (Nicholson 1996), the information available is nonetheless valuable.

Subsistence Strategies as They Relate to Settlement Patterns

A defining aspect of Lapita settlement patterns is a preference for coast and reef proximity (Burley 2016; Burley et al. 2018; Kirch 2000; Nunn and Heorake 2009). This suggests a strong reliance on marine resources. But to what extent were they exploited during the early periods in the Lapita expansion? An early theory by Groube's (1971) proposed a 'strandlooper' society where Lapita peoples were maritime focused with a rather faint 'footprint' on the landscape (Galipaud 2006: 230). Upon colonization, they relied primarily on marine environments and moved quickly to new locales or islands as resources declined (Burley 2001; Kirch 2000). According to Groube (1971), the expansion of horticulturalists across Oceania was a subsequent movement. However, archaeological data as well as zooarchaeological and paleoethnobotanical evidence challenges a strandlooper interpretation for Lapita peoples.

Kirch (2000) argues that the Lapita colonizers established permanent settlements and brought the domesticated plants and animals to recreate the landscapes of their homeland. Linguistic and archaeological evidence suggest that their seafaring and horticultural lifestyles derived from Southeast Asia (Kirch 2000). These activities and behaviours proved to be significant adaptations necessary for survival on the isolated and potentially precarious islands. Burley et al. (2001) argued contrary to Groube (1971) that Lapita settlers in Tonga were 'optimal foragers' with low level horticultural production rather than 'strandloopers' who moved on when resources became depleted. This argument is based on evidence of the subsequent Plainware phase which implies a permanent settlement, one enriched with natural resource use (Burley et al. 2001) but also where intensification in agricultural production has begun.

Recent advances in isotopic analysis and paleoethnobotanical techniques have allowed researchers to reconstruct Lapita paleodiets and subsistence practices by recovering evidence that is undetectable in traditional archaeological methods. Results suggest a combined subsistence economy of foraging marine exploitation and low-level agricultural food production (Crabtree 2016: 3; Burley et al. 2018; Jones and Quinn 2009). The degree to which population dispersals were sustained by foraging native resources relative to agricultural yields remains an issue in the Pacific Islands (Clark et al. 2015: 513). This is mainly due to the fact that patterns vary between archipelagos and within island chains, which may be a result of geographical differences and the capability for successful agriculture. For this reason, some have argued for the abandonment of simple taxonomies of subsistence strategies (Densmore 2010). In Tonga, accumulating evidence has indicated the variability in resources exploited by the Lapita peoples (Cannon et al. 2018; Clark et al. 2015; Densmore 2010).

Radical Transformers of the Environment

Research indicates the proportions of autochthonous and non-autochthonous foods varied geographically. Geographically, from Near Oceania to Remote Oceania, the diversity of exploitable terrestrial plants declines (Kirch 2010). This pattern demonstrates how long-term settlement and population growth in Remote Oceania could not be sustained solely on the basis of indigenous resources, which raises the question: how could the Lapita migration be so success? Part of their successful settlement was due to a collection of domesticated plants and animals from their homelands (Kirch 1997). This action is termed the 'transportation of landscapes' which refers to the recreation of one's home environment and the modification of a new location to suit one's needs (Kirch 1997). It is a process which involves not only the movement of physical goods, but also of cultural perspectives and ideals (Kirch 1997). Research interest on terrestrial food has been significant in Lapita archaeology since the transportation of cultural landscapes was viewed as a successful settlement strategy. Historical ecologists have utilized the concept of 'transported landscapes' as an explanation for some of the most interesting modifications and introductions in human migratory history. However, the movement of flora and fauna was not always intentional. For example, certain insects are known to have accompanied Lapita sea craft and flourished exponentially following settlement (Kirch 1997). Animals, such as chickens, were intentionally transported for the purpose of food; a source of protein in addition to marine food.

The transported biota allowed for Lapita peoples to be successful in their colonization efforts. It also shows the irreversible imprint non-native organisms had on island environments (Kirch 1997, 2000). These impressions were either produced by direct actions such as forest clearing from food-producing or food-procuring activities or were indirect from the insertion of domesticated animal and plant species (Kirch 2000: 314-315). In either case, the impacts caused by human populations, especially in the vulnerable ecosystems of Remote Oceania, were widespread and sometimes disastrous. Intense exploitation of terrestrial species resulted in the extinction of a number of birds, lizards, and bats (Clark et al. 2015; Kirch 1997, 2000). Pacific islanders were considered ‘radical transformers’ of their island environments (Kirch 1997: 30). In Tonga, a variety of indigenous land birds and iguana were extirpated quickly from a possible combination of hunting and other human activities at Lapita sites in the Ha’apai islands (Burley et al. 2001; Burley et al. 2018; Clark et al. 2015; Steadman et al. 2002a, 2002b).

Despite the range of impact inflicted by prehistoric Pacific islanders and the variable research perspectives which provide the complexity of Pacific Islands history, we see that overall the subsistence economy established by ‘transported landscapes’ and exploitation of indigenous resources was exceptionally successful and adaptive. That being said, human impact on the marine environments has somewhat fallen under the radar compared to human induced changes on terrestrial ecosystems. Part of this results from the lack of depositional records of environmental change in reefs and lagoons (Kirch 1997). This, however, does not mean that archaeologists have failed to characterize the various interactions between prehistoric people and their coastal environments. Changes in the excavated marine faunal materials have allowed for inferences on the effects of human predation. From years of ecologically-based studies there is a better understanding of the reliance on marine resources which ranged in intensity across different regions and over time.

Importance of Fishing and the Marine Environment

Lapita Fishing Techniques

Fishing was an important economic activity, which persisted from the earliest Lapita time periods to contemporary Pacific Island populations. It is important for anthropologists to understand the prehistoric fishing strategies for a number of reasons: (1) they may indicate the technological skill and knowledge of a society, (2) they show the significance of fish in the diet and economy, and (3) they can inform us about the energy and time involved in such practices (Colley 1987: 16). Although it is known that marine environments were of great importance to Pacific islanders, reconstructing prehistoric fishing strategies has been difficult. From the numerous possible fishing techniques, only a select few involve materials which remain preserved up to the time of excavation (Colley 1987). These include stones used for baskets and cages, sinkers from nets, barbs from spears and harpoons, or fish hooks (Colley 1987: 16). The latter are found relatively more often by Pacific Island archaeologists than other artifacts, and numerous past researchers have utilized them more for analyzing cultural differences and progressions than for reconstructing fishing practices (Allen 1992; Butler 1994; Colley 1987; Coutts 1975; Gerristen 2001; Kirch and Dye 1979; Owen and Merrick 1994; Szabo 2010; Walter 1989). Alongside these other strategies, one of the more effective methods of fishing reconstruction has been the direct analysis of archaeological fish remains. For instance, individuals of the larger size may be speared and depending on the size of their mouth they could be hooked. In the 1970s, researchers began to conduct studies which measured the relationship between fishhook morphology and fish mouth size (Allen 1992). They found that the fish's ability to swallow a hook was dependent on the size of its mouth and the fishhook size ranges could indicate a deliberate selection of specific species (Coutts 1975; Owen and Merrick 1994).

Due to a lack of fishhooks recovered throughout the Pacific Islands, subsequent studies focused on the composition of faunal assemblages to reconstruct fishing practices. The taxa identified can provide indications of the possible types of capture techniques utilized and fishing locales. For example, certain tropical fish families or species known to be herbivorous can often be caught in coral reef areas. The proximity to land can give an indication of the potential techniques used, such as netting or trapping. Colley (1987) argues that faunal remains provide the best potential for reconstructing prehistoric fishing methods. Taxonomic composition of an assemblage, in addition with material culture, ethnographic data, ecological data (i.e. fish feeding behaviour), age and size profiles, and environmental factors (i.e. reef development) can provide the best strategy to reconstruct prehistoric fishing strategies (Dye 1983; Lambrides and Weisler 2016; Walter 1989).

However, reconstructing prehistoric fishing techniques from fish remains has its difficulties. Although understanding the life history, habitats, and feeding behaviours of tropical fish can provide valuable information on possible fishing techniques, researchers must consider variability. Acanthuridae and Siganidae, two common families from the Hopoate assemblage, feed on algae (Lowe 1987) and can be caught by a number of different strategies including hooks, yet because of their small bodies, nets, and traps are more easily executed (Imirizaldu 2014; Stone 2014). All Serranidae species are carnivorous, they feed on benthic invertebrates and other fish. The taxon is comprised of a number of groups which were once regarded as separate families (Randall et al. 1996). The variability within the Serranidae family, and others, makes reconstructing fishing strategies complex since dietary preferences and behaviours differ so greatly among individual species. At the same time, species level identifications, though more informative, require additional work and resources, which may be unavailable. It is also unclear whether this level of identification would fully resolve ambiguities surrounding fishing methods.

Archaeologists, at times, make inferences about prehistoric fishing strategies based on historic and contemporary ethnographic observation of fishing techniques. Kirch and Dye (1979) embarked on a project in Niuatoputapu, Tonga to compare the species composition in the archaeofaunal assemblages to ethnographic accounts of fishing technologies. They believed that

Polynesian, Micronesian, and Melanesia practices most likely derived from Lapita strategies. Based on the ethnographic evidence, they argued that coastal environmental variation caused different fishing techniques to develop (Kirch and Dye 1979). For example, nets, traps, and poisons could be used to exploit lagoons while fringing reefs could allow for angling without the use of watercraft. From the majority of Lapita sites excavated thus far, the remains of fish species recovered are predominantly those which inhabited the inshore coral reef areas, including lagoons, fringing reefs, and reef edges (Allen 1992; Butler 1994; Colley 1987; Kirch and Dye 1979; Weisler et al. 2010).

From a combination of archaeological and ethnographic evidence, inshore reef fishing with the use of nets was determined to be the dominant strategy for capturing a wide range of taxa in Polynesia and most likely during the Lapita period (Butler 1994; Colley 1987; Walter 1989). Despite nets being the assumed most common strategy, researchers have recorded great variability in techniques. Through ethnographic observation, Masse (1986) defined six distinct fishing strategies in Palau, Kirch and Dye (1979) recorded thirty-seven in Niuatoputapu, and Kirch (1982) classified eight in Hawai'i. Lapita peoples throughout the Pacific Islands likely possessed a wide range of techniques yet were selective when exploiting different environmental conditions and particular species.

Certain regions in Oceania, where lagoons are absent or reef environments are limited, would host a smaller diversity of fish taxa (Ono and Intoh 2011). Prehistoric Maori fisheries were characterized as specialized because the early faunal assemblages were dominated by Lutjanidae (Snapper) (Allen 2014). Over time, the fishery became more generalized, and Carangidae (Jacks) and Scombridae (Tuna) were amongst the most common families. Allen (2014) argues that inhabitants used various fishing technologies and exploited different habitats to adapt to the ecologically diverse seascapes of New Zealand. Anderson (1997) had also determined similar patterns, by identifying mostly carnivorous species across widespread New Zealand sites.

A few sites in the Pacific Islands have recorded a focus on offshore fishing as opposed to nearshore (discussed in Allen 2017; Walter 1989). These researchers recorded the exploitation of large offshore fish species such as tuna and shark (Kirch and Dye 1979; Ono and Intoh 2011), turtle (Burley 1998, 1999; Burley et al. 2001; Herrscher et al. 2018) and dolphin (Leach et al. 1984), and seal in areas of New Zealand (Anderson 2008). Ono and Intoh (2011) believe this type of specialized fishing is rare in the tropical Pacific islands because it is an adaptation to temperate areas, like New Zealand, where horticulture was limited.

Fishing and Social Factors

Uncommonly discussed in archaeological studies is the way that fishing strategies relate to social factors. Such details are mainly discussed in ethnographic records where researchers observe day-to-day fishing practices. For instance, Jones' (2009a, 2009b) work in Fiji recorded modern fishing techniques of the inhabitants which were influenced by long-standing traditions. The method of fishing depended on factors such as the part of the reef exploited, water depth, currents, tides, weather, the types of fish targeted, the size of the fishing group and the technologies available (Jones 2009a: 117). Locals stated that netting was the preferred technique, producing the largest return. She also documented gender-based subsistence practices which are difficult to identify archaeologically but have been noted in various Oceanic ethnographic research (Chapman 1987; Jones 2009a; Kirch and Dye 1979; O'Day 2003; Spennemann 1987; Weisler and McNiven 2015).

Jones (2009b) and Chapman (1987) both recorded that throughout Oceania, women were contributing much more to the fishing yield than what was once believed by ethnographers. There were clear distinctions between male and female practices, where women and children would exploit the rich inshore areas and men would venture into pelagic waters. In Fiji, Lau women conducted the inshore fishing in groups while men fished unaccompanied on the outer reef edge with spears (Jones 2009a, 2009b). Men would also occasionally travel out in boats to angle for larger carnivorous fish or tend to gardens. Large pelagic fish would be used for special occasions such as feasts and have also been recorded to be given to individuals of higher status (Stantis et al. 2015). The remainder of daily meals, however, focused on varieties of inshore species. Women would utilize different technologies based on the factors listed above, including: nets, small hooks, line, spears, and baskets (Jones 2009a: 120). Both women and men had knowledge of the different areas where specific fish could be found or where larger varieties could be harvested.

Similar to gender, preference for specific fish features, other than size, is a complex factor which is often overlooked in Pacific Island archaeology. While the prey choice model hypothesizes that prey are targeted based on size and net return (Butler 2001), it does not take into consideration cultural preference (Jones 2009a). Weisler and McNiven stated that people of the Torres Strait preferred small fish to large because of their better taste and they fished “more for gastronomical reasons than calorific value” (2015: 772). Lauan people of Fiji were more attracted to the physical features of certain fish, such as big eyes or red lips (Jones 2007). Jones (2007) determined that the fish species preferred by the modern Lauan population were similar to those recovered from the Lapita assemblages.

These social aspects can create intriguing patterns in faunal assemblages and should be considered when interpreting variability amongst prehistoric sites. Unfortunately, definite conclusions cannot be made based on faunal remains alone. In fact, cultural factors which influence the selection of particular fish are seldom discussed or mentioned in Pacific Island ichthyoarchaeological studies. Although no direct evidence is available to disclose ‘who’ captured the fish or ‘why’, these social factors can nonetheless be considered when interpreting the taxonomic composition of prehistoric fisheries.

In Summary

Archaeologists have long observed subsistence practices, such as fishing, through the lens of historical ecology. This framework analyzes the relationship between people and the environment, especially in terms of mutual impacts over time. In regards to the Lapita migration throughout the Pacific Islands, research has focused on the severity of human impact on the island environments and the natural resources. The intensive pressure on numerous native land and sea food sources has prompted studies to search for similar results in prehistoric fisheries. However, evidence of marine exploitation resource depression is scarce in the Pacific Islands. Furthermore, there is a generalization that fishing declined in importance over time due to a growing reliance on plant foods. Although fish are frequently regarded as significant to the Lapita diet, there is much variability in the scale and focus of exploitation, based on ichthyoarchaeological analyses. The same can be said for the importance of horticulture, which has become better understood only recently.

Variability of the reliance on fish and other resources is often attributed to environmental differences such as island types (Allen 2014, 2017). Similarly, the focus of Pacific Island fisheries investigation has been linked to geographical locations. Tropical regions such as Tonga, host a diverse collection of fish species, in contrast to temperate areas like New Zealand where coral reefs are lacking and harvest is directed more toward offshore taxa. Hopoate is analyzed within the context of other tropical islands where Lapita fishing strategies concentrated on inshore fish, with netting as the proposed most common method due to a scarcity of recovered fishhooks and the taxonomic composition of prehistoric fisheries. Fish remains are the most available and useful evidence for reconstructing fishing strategies, but researchers must be aware of the variability in ecology, environment, and human behaviour that can impact patterns of exploitation. Therefore, they must understand how all of these factors may have contributed to the resulting faunal assemblage. Taphonomic factors, as well as methods in recovery and analysis can also influence the final interpretations made by archaeologists. The following chapter will discuss these points and outline the procedures undertaken for this study.

Chapter 3 Materials and Methods

The analysis of fish remains is a commonly used approach to reconstruct paleodiet and observe characteristics of prehistoric fisheries from various areas in the world and has been utilized extensively in a number of Lapita and non-Lapita sites in the Pacific Islands. It can indicate patterns of resource depression, as well as provide information on potential fishing strategies and changes in fishing behaviours over time.

The quality and quantity of faunal identifications depend on a number of factors: recovery, experience and training of the analyst, the comparative collection, funding and time available, and the condition of the remains. All factors affect the number of individual specimens identified, and the amount of information obtained from each element such as taxon level and body part. Overall, any issues or inconsistencies in methodology can influence the final interpretations of the data. Below, I detail the sampling strategies and methodologies for my study, taking into account these factors.

Excavation Methods and Screen Size

The Hopoate site was identified in 2007 following the archaeological survey of the Nukuleka peninsula where an abundance of Lapita ceramics was observed on the southern shore and along an erosional slope (Burley et al. 2018: 5). In 2010, an assessment of the Hopoate location was undertaken with bucket auger tests (11.5 cm diameter) which happened upon deep deposits with archaeological material buried to a minimum depth of 2 m (Burley et al. 2018: 6). The site was excavated in June to August 2014 by the Simon Fraser University South Pacific archaeological field school, led by Dr. David V. Burley. The excavation, for the most part, was undertaken employing small hand tools. As illustrated in Figure 3.1, the excavated trench at Hopoate was 11 m long and 2 m wide over 8 m of its length and 1 m wide for the remainder (also illustrated in Figure 3.2). North of this trench was an additional 2 x 2 m excavation. Proveniences were maintained in 1 x 1 m units which were labeled based on a grid system using letters north to south and numerals east to west. Vertical/stratigraphic provenience was maintained in 10 cm arbitrary levels or where a major stratigraphic break could be discerned.

The recovered materials included an abundance of vertebrate faunal remains, the majority being fish, ceramic sherds and other artifacts as well as a diverse range of shellfish species. Upper levels of the excavation units were initially dry sieved through 6.4 mm mesh until a depth of 65 cm where faunal abundance had notably increased. All matrices below 65 cm were water-washed. A 30 x 30 cm shell column was excavated where, after shell was removed, matrices were water-washed with sieves of 3.2 mm size as a control measure to assess loss in the 6.4 mm size mesh. Wet sieving proved to provide a considerable increase in faunal recovery. Due to this, the density of the upper assemblage may be underrepresented and cannot securely be compared directly to the Planting Matrix and Pit Fill. The results of the comparison between 6.4 mm and 3.2 mm screens showed significant disparity. Although the recovery rate for 3.2 mm mesh was double that of the 6.4 mm, a large proportion of faunal remains recovered from the 3.2 mm screens was unidentifiable fragments and fish spines (Burley 2018).

The standard method of recovery in ichthyoarchaeology utilizes fine-mesh screens to recover as much of the full range of fish present in the deposits as possible (Wheeler and Jones 1989: 130; Plank et al. 2018). Lambrides and Weisler (2016) have stated that this method was inconsistently used in the Pacific Islands before the 1970s but has since been well adopted.

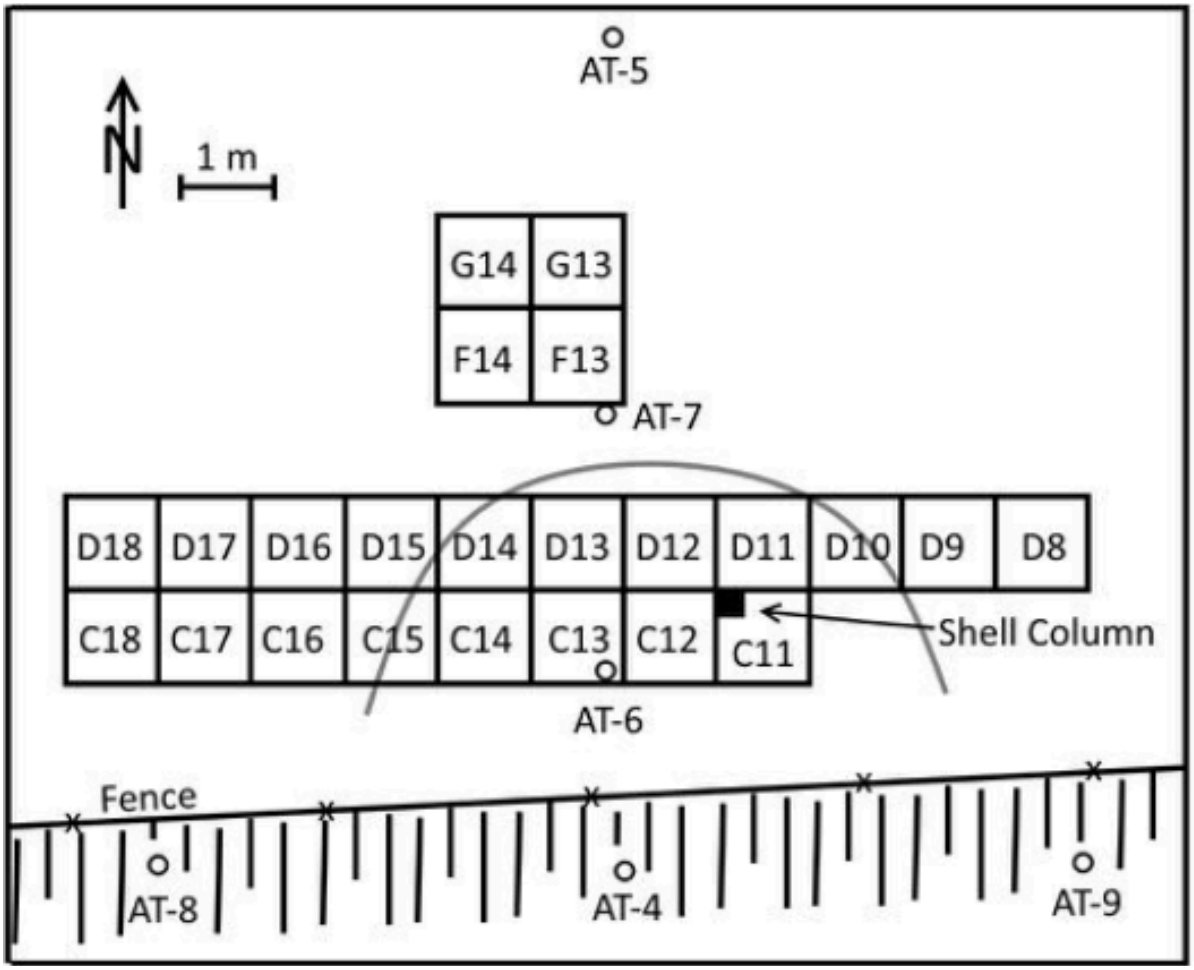

Figure 3.1 Central excavation plan, Hopoate 2014. Units are labelled based on a grid where numbers are applied east to west and letters from south to north. The 30 x 30 cm shell column is located in the 11C unit. Source: David V. Burley 2017.

Figure 3.2 Excavation of 2m wide trench, the South and East walls are in view. Depth of the trench is 2 m. Source: David V. Burley.

Screen size can affect the quantity of faunal material recovered which, as a result, influences the quality of data obtained. Smaller screen sizes recover smaller elements and taxa. Nagaoka's (2005) screening experiments on Pacific Island fish showed the impact of differential recovery on the interpretations of archaeological fish bones. The most significant point that pertains to this research project is the underrepresentation of small sized taxa such as Acanthuridae and Siganidae in comparison to larger taxa such as Lethrinidae and Serranidae (Nagaoka 2005: 942), due to excavation strategies. Acanthurids are smaller in body size, especially their mouth pieces which differ significantly from those of Lethrinidae. If these elements are lost in recovery, and the analyst foregoes the identification of postcranial elements (Butler 1988), the representation of families like Acanthuridae will be greatly impacted, biasing the overall interpretation of the assemblage.

Smaller screen sizes allow for a greater variety of recovered skeletal elements and higher richness in taxa (Allen 2003, 2014; Butler 1988; Gordon 1993; Nagaoka 1994; Plank et al. 2018). Systematic use of these strategies across excavations allows researchers to address questions of taxonomic diversity and relative abundance. Water screening has also proven to influence the recovery of sufficient sample sizes for statistical robusticity. The method enhances the visibility and recovery of faunal materials (Burley 2017; Ross and Duffy 2000), especially those of smaller size (Struever 1968). It also separates light and heavy fractions which reduce misidentification of fish bone and other material such as soil aggregates or charcoal (Ross and Duffy 2000). Since heavy and light materials are separated during washing, it consequently makes the sorting process faster and easier. Dry screening through a series of progressively smaller mesh-screens will result in more mechanical abrasion to faunal remains than water screening (Struever 1968). Bone affected by fire, however, may possibly be more prone to damage and fragmentation from the application of water. Nevertheless, water screening of ichthyoarchaeological remains is a more effective method of recovery.

Although researchers debate the validity of certain recovery methods, consistency within a site should remain paramount (Gordon 1993). Sediments from the Planting Matrix and Pit Fill are the focus of this project, as they were systematically collected through the use of consistent methods. They were sieved through size screens no larger than 6.4 mm, and the final results show a diverse fishing economy. The consistency of the excavation methods at Hopoate provided a large sample which is representative of the diversity and relative abundance of the fish taxa present.

Family Identifications

In zooarchaeological studies, taxonomic identifications may be conducted by experienced archaeologists, zoologists, biologists, or trained undergraduate and graduate students (Gobalet 2001). The taxonomic level to which identifications are made depends on the experience and confidence of the researcher, as well as the comprehensiveness of the comparative collection and time available. Researchers who attempt to identify to the species level may risk misidentifying individuals, especially when skeletons of multiple species are almost identical. Furthermore, various skeletal elements from a number of fish actually change as they develop into adults (Wheeler and Jones 1989). Vertebrae, for instance, in a juvenile of one species may be mistaken for vertebrae of another and just assumed to be a smaller sized individual.

An experienced analyst may be capable of identifying the smallest fragment based on one distinctive feature. Fortunately, with tropical fish, numerous families possess unique physical characteristics which are easily recognisable. For instance, the parrotfish (Scaridae) uses a dental plate along with two grinders to crush algae which it consumes as food (Lowe 1987). These dental elements preserve relatively well in the archaeological record and are unique to the Scaridae family.

All identifications and measurements were conducted in the McMaster University Fisheries laboratory, under the supervision and training of Dr. Aubrey Cannon. The comparative collections used for identifications were provided by McMaster University and Simon Fraser University. The collections are composed of 160 individual specimens from a variety of 33 tropical families (Appendix A). In addition, online images and published illustrations (Fowler

1955) were accessed to assist with the identification of families not present in the comparative collections.

Skeletal materials from Hopoate were first analyzed in June of 2015 and were intermittently analyzed until the fall of 2017. All units from Hopoate were analyzed and identified to the same standard, comparable to that of the analysis of fish from Ha'apai (Cannon et al. 2018). Skeletal elements were identified to the family level with no intention of classifying lower taxonomic ranks. Tropical fish species number in the thousands, and skeletal remains between species are at times physically undistinguishable. Fish bone analysis is both a time consuming and costly practice for researchers which ultimately may not be worth the additional effort. In addition, such identifications would require a fairly large comparative collection which was not available for this research project. The information provided by species-level identifications can be valuable depending on the goals of the researcher (Lambrides and Weisler 2016). Given my focus on the intensity of fish harvest and change in fishing behaviours over time, species-level identifications were unnecessary.

Element Selection

The process of identification varies depending on the researcher, their skill, and their work habits (Reitz and Wing 2008). Due to large quantities of bones that are often recovered, certain ichthyoarchaeologists working in the Pacific Islands have been selective in their identification protocols, specifically element identifications (Leach 1986). Since the mid-twentieth century, the initial methodology of fish identification focused on the five paired mouth bones – dentary, premaxilla, maxilla, articular, and quadrate – in addition to distinctive 'special' bones (e.g. the pharyngeal plates of Scaridae) (Campbell 2016: 18). These elements can be identified quickly and easily, whereas vertebrae can appear similar between taxa or variable within taxa. Although excluding post-cranial elements is a simpler method, a large portion of elements go unanalyzed and valuable data are consequently overlooked. More recently, researchers have included a wider set of elements to their identification processes. They argue that by doing this, the abundance and diversity of recorded fish taxa increase (Bouffandeau et al. 2018; Lambrides and Weisler 2013; Weisler et al. 2016). Since the goal of this thesis research was to analyze the diversity and variability of the fishing economy, both cranial and post-cranial elements were identified to meet these objectives.

Fish possess some of the smallest and most fragile bones compared to mammals. It is important for zooarchaeologists to understand the taxa they are recovering and the fragility of the remains. Certain carnivorous fish, for instance, have larger and denser cranial elements in comparison to others (Allen 2014; Nagaoka 2005). One example of a small-mouthed taxon is Acanthuridae. Their fragile mouth bones are more suited for grazing algae (Lowe 1987), and not often found in the archaeological record, unlike Scaridae which possess robust jaw bones and pharyngeals used to scrape algae and grind coral (Randall et al. 1996). Acanthuridae vertebrae, however, are distinctive and robust, preserving better. If no post-cranial elements are included in the identification process, then there is a bias toward taxa with large cranial bones (Lambrides and Weisler 2015; Nagaoka 2005). As a result, families such as Acanthuridae will be underrepresented in the analysis. Including more than the conventional set of elements provides more useful data, but studies cannot be effectively compared without some standardization in place. In the Pacific Islands, identification procedures were established by Leach and Davidson (1977) and Leach (1986) at the University of Otago using only the limited set of cranial and ‘special’ bones. Campbell (2016) states that a handful of regional zooarchaeologists continue to resist the use of an extended set of skeletal elements. The benefits of analyzing both cranial and post-cranial bones is clear and should therefore be established as a standardized method in ichthyoarchaeological studies. Studies from both Ha'apai and Vava'u identified an extended set of elements, including both cranial and post-cranial bones. Therefore, the taxonomic diversity and relative abundance fish from the Hopoate sample can be meaningfully compared to the other assemblages from Tonga, due to the consistency in identified elements across these studies.

Obstacles in Zooarchaeology: Taphonomy

The condition and state of skeletal remains are greatly affected by taphonomic factors which can disturb and damage bone before, during, and after burial. These factors can influence the rate of decay and overall preservation of the remains. The nature of fish remains are unique and are affected differently than other animals (Wheeler and Jones 1989). The following section will detail the various factors which affect fish in particular and lead to the given state of remains recovered from archaeological sites.

Bone Chemistry and Morphology

Fish remains differ greatly from those of mammals. Elements of various body parts are similar in functionality, such as cranial bones and vertebrae, yet vary in morphology. For an experienced zooarchaeologist, determining whether a bone is fish or mammal can be easy. The difficulty occurs when skeletal remains are broken or degraded from taphonomic effects to the point where the taxon of the individual is unidentifiable.

Since fish remains are typically small in size, they are more prone to damage from butchery practices, cooking, weathering and trampling from scavengers (Plank et al. 2018; Wheeler and Jones 198:61). Szpak (2011) analyzed the chemical composition of fish elements and their relation to preservation in archaeological sites. Based on his findings, it appears the loosely packed collagen allows for greater susceptibility to damage (Szpak 2011). However, the degree of degradation varies among not only the types of fish (e.g. cartilaginous fish), but also the habitat. Water temperatures can influence the rate of disarticulation as well as the chemical composition of bone (Elder and Smith 1984). For instance, warmer water increases the rate of disarticulation by influencing the bacterial gas in decaying fish (Elder and Smith 1984). On the other hand, hydroxyproline levels in the collagen of cold water fish differ from those of tropical fish and cause increased dissolution and chemical leaching (Szpak 2011: 3368). Given these factors, the survivability of fish remains are influenced considerably before even being handled and prepared by humans. In the Hopoate sample, smaller fish were likely prone to more damage than larger individuals during consumption and after disposal. As discussed earlier, certain skeletal elements of particular taxa are more fragile than others. This can potentially lead to the underrepresentation of certain fish and has been taken into consideration in the analysis and interpretation of fish remains in this study.

Butchering and Cooking

Although not a common finding in Pacific Island ichthyoarchaeology (Leach et al. 1984), evidence of butchering can affect the amount of bones recovered. Cut marks are most often found in the cranium due to decapitation, or along the vertebral column where large sections were divided for consumption (Campbell 2016). Such evidence provides answers to questions on butchering practices and food preparation. Cut marks were not observed during the identification process of this project yet burning and calcification were noted. The fact that cut marks were not observed and that both cranial and post-cranial elements were present indicates that fish heads were not processed at another location and fish were possibly cooked and consumed whole.

Another taphonomic effect which can be observed on faunal remains is heat attrition from cooking, such as boiling or burning. Lubinski (1996) studied the destruction patterns of heat on various skeletal elements of fish. He determined that cranial elements degraded quicker than vertebrae and ultimately these patterns could create a bias against the recovery of cranial elements. The absence of cranial bones could mimic such factors as butchering, thus producing complications for archaeofaunal comparisons.

From weathering, to butchering or cooking, some elements do not survive while others are degraded so severely that they cannot be identified. These taphonomic factors demonstrate the degree of loss of fish bone data which must be considered when interpreting zooarchaeological material (Plank et al. 2018). Although butchering was not recorded in the Hopoate assemblage, cooking and weathering likely resulted in the degradation and loss of various remains.

Quantification Methods

Specimen Count

Specimens, meaning individual pieces of bone, were counted and recorded for selected units and levels. Specimen counts are approached in a variety of ways, the most common methods being number of identified specimens (NISP) and minimum number of individuals

(MNI). NISP involves recording every complete and fragmented bone and regarding each piece as an individual specimen (Reitz and Wing 2008). Although a straight-forward and traditional counting method, it has been reviewed and criticized frequently and at length. Since each bone and fragment identified are being regarded as individual specimens, researchers worry that single organisms will be overrepresented by being counted more than once (Dominguez-Rodrigo 2012; Grayson 1984; Lyman 2018). This issue, known as interdependence, can occur if a site consists of numerous fragments from butchering or trampling, or if certain taxa in an assemblage possess more identifiable elements per individual than others (O'Connor 2000: 56), or if different parts of fish were processed in different locations to ease mobility or distribution. Moreover, individuals of the family Diodontidae (Porcupinefish) have bodies covered in hundreds of sharp spines which are easily identified in assemblages. If ten spines are identified, they are then recorded as ten specimens but may have derived from only one individual. Since these fish possess numerous spines, they can over-represent the proportion of Diodontidae in a given sample. Based mainly on this issue, the relationship between NISP and the actual number of individuals has been viewed as questionable (Lyman 2018).

MNI was developed as an alternative counting method to avoid issues of overrepresentation and interdependence. This technique differs from NISP by siding elements and sorting the most abundant skeletal parts. The highest of the right or left side numbers is then recorded as the minimum number of individuals of that taxon. A number of elements of the cranium consist of left and right counterparts, such as premaxillae or dentaries. Elements are paired based on size, colour, and morphology (Klein and Cruz-Uribe 1984), and are assumed to derive from a single individual. Another approach to MNI involves counting axial elements which are non-paired bones in the mid-line of the body (e.g. vomer) (Wheeler and Jones 1989).

Unfortunately, the problem with this approach is that these elements are generally less abundant in assemblages than paired bones. This can lead to under-representation if a single fish is assembled from elements actually belonging to a number of individuals.

MNI as a counting method becomes even more complex as the researcher attempts to determine the minimum number of vertebrae per individual fish. Fish possess a large number of vertebrae which vary in size and morphology along the spinal column (Colley 1990). Lambrides and Weisler (2013) utilized comparative specimens to determine the average vertebrae numbers for each family, genus, and species from local areas in Southeast Polynesia. However, not all researchers have access to extensive comparative collections, and Wheeler and Jones (1989) suggest recording solely the most distinctive vertebrae to save time. MNI calculations are also complicated by aggregation. As sediments are divided into smaller numbers of aggregates, MNI values of faunal material increase (Grayson 1984). Therefore, MNI calculated from the total sample of a site would likely be lower than MNI values calculated per individual levels or units (O'Connor 2000).

MNI was not used to quantify the specimens of the Hopoate site for a number of reasons including limits of time available for analysis. Lyman (2008) and Grayson (1984) have argued for the sole use of NISP, deeming it to be the more useful quantitative measure of relative abundance. Both measures share a strong correlation since MNI is derivative of NISP. Lyman (2018) has emphasized how MNI is redundant with NISP and since it is more affected by aggregation, it is less suitable for measuring taxonomic abundance than NISP (2008: 80-81). MNI values calculated from the Hopoate assemblage would likely be affected by aggregation, since the relative abundances of taxa were calculated by chronological components and not the entire sample. Also, in general, variation in aggregation units between studies can create differences in MNI values which make them less comparable. This issue, in addition to element selection for MNI calculations, would produce problems not worth the additional work in the analytical process given my research questions.

Grayson (1984) argues that criticisms of NISP address mainly one issue, interdependence and other issues are fixable. With this in mind, overrepresentation was noted for Diodontidae but they were not excluded from the analysis because their presence in the assemblage still remains important to the variability at the Hopoate fishery. Both NISP and MNI are measured values and estimates of the actual number of individuals (Lyman 2018: 5). The quantitative method I used in this study is not without flaws and does not directly provide the actual numbers from the fishing harvest. All observed patterns in abundance and taxonomic diversity are merely estimates. Researchers often use multiple measures as a means to standardize and to maximize comparisons, and it has become the consensus in Pacific ichthyoarchaeological literature (Allen 2014, 2017; Lambrides and Weisler 2016) that both NISP and MNI should be reported. Yet if NISP can provide a clear indication of the patterns in relative abundances, and relative abundance is the sole objective, then MNI would only be reiterating the same information. Using NISP as a counting measure for Hopoate, also ensures comparability to the studies of Ha'apai and Vava'u which used the same method of quantification.

A rank order of abundance was also not used during the analysis. O'Connor (2000: 73) notes two types of rank orders where the first type consists of a few taxa comprising the majority of the sample and the other involves a more gradual decline from most to least abundant taxa. Like the former, fish faunal studies in the Pacific Islands often note the same common taxa (Allen 2017) and providing a ranked order would provide little additional information. Rank order also has the potential to exaggerate relatively minor differences in abundance. Too much focus on these minor differences can lead one to over-interpret the data (Cannon et al. 2018). The more robust patterns, on the other hand, are less likely to be influenced by minor issues in preservation or sampling. Instead, taxa from Hopoate were separated into the categories of 'major' and 'minor' since it was clear certain families were more frequently identified in comparison to others which were rarely found. This allowed me to focus on temporal patterns of the major taxa that exhibited significant change over time.

Sample Size

Units from the Hopoate were chosen initially for the purpose of attaining a large sample. Subsequent units were then selected from various locations of the excavated trench to ensure a comprehensive representation of the site. In total, 13,798 fish bones were recovered from the entire site and 5091 specimens were identified from the analyzed Pit Fill and Planting Matrix deposits. A large and sufficient sample size is essential in a faunal analysis. By achieving an adequate sample size, the data will more accurately depict the distribution of taxa in a given assemblage. A sample is more diverse if the distribution of taxa is even, as opposed to a few dominant taxa which can suggest specialized adaptation and selection (Gordon 1993). The question of when a sample size is large enough to accurately characterize the taxonomic diversity has been addressed by a number of archaeologists (Lyman and Ames 2007; Monks 2000).

Lyman and Ames (2007) have studied the relationship between taxonomic richness and sample size. They found that the diversity within a sample increases to the point where additional samples become redundant. Abundant taxa are added initially, while rarer taxa are included more slowly. This issue differs by region, and in waters along coral reefs the plateau of species richness will be reached at a different point than a small freshwater source with low diversity

(Meltzer et al. 1992). For instance, Monks (2000) found that after half of an assemblage from the Northwest Coast was identified, only the smallest increase in taxa occurred. This may or may not be the case for a tropical island site with high numbers of species. Unfortunately, there is no one method available to predict a sufficient sample size for all archaeological assemblages.

The number of identified fish remains in Pacific Island studies is often high since fishbones are the most abundant remains in faunal assemblages (Morrison and Addison 2009; Nagaoka 1993). Individual sample sizes can range in the hundreds (Kirch and Dye 1979; Leach et al. 1984; Densmore 2010), the thousands (Allen 2002; Bouffandeau et al. 2018; Butler 1994, 2001; Clark et al. 2015; Harris et al. 2016; Jones 2009b; Jones et al. 2007; Morrison and Addison 2009; Weisler et al. 2010; Weisler and Green 2013), and even higher than ten thousand (Plank et al. 2018; Jones and Quinn 2009). The sample from Hopoate (5091 NISP) falls well into the middle range and is therefore consistent and comparable to other ichthyoarchaeological studies. In addition, the taxonomic richness (18 taxa) of the identified assemblage is also consistent with other fishery studies in Polynesia. Based on a review of the literature, the number of families identified can range from <10 to ~25 (Pacific Island studies which fall into this range include: Campbell 2016; Cannon et al. 2018; Clark et al. 2015; Densmore 2010; Gordon 1993; Kirch and Dye 1979; Kirch et al. 2010; Lambrides and Weisler 2013; Leach et al. 1984). Moreover, the continuous occupation of the Hopoate site, from the early to late Lapita periods, resulted in a dense accumulation of fish remains and a high rate of recovery. For these reasons, I am confident that the methods undertaken in this study provided an adequate sample size and representation of the fishery.

Osteometrics

Osteometrics involves measuring the size of skeletal remains. Size estimations are used to reconstruct the size of the living fish which can provide information about fishing methods, seasonality, and the contribution of fish to diet (Colley 1990: 218). Measurements done on jaw elements can indicate the type of fishing technique used to catch certain fish, such as angling on largemouth species (Owen and Merrick 1994). Elements which may be selected for measurements can derive from either the cranium or body. The bones selected for sizing must be of good condition, easily identifiable and have clear-cut features that will allow accurate and consistent measurements (Wheeler and Jones 1989: 140). Size estimations on single or multiple elements will give indications of size frequency changes over periods of time.

Osteometrics can be used to infer variation in prey size and indicate whether people were possibly overexploiting certain taxa. For example, Giovas et al. (2016) measured Scaridae pharyngeal plates to investigate the possibility of resource depression in Palau. Their results disproved the claim when no evidence of size decrease was found. Change in size frequency may occur from a number of factors other than human predation. The size of fish can also be influenced by factors in the environment such as water temperature, competitors, and availability of food (Boeuf and Payan 2001; Giovas et al. 2016: 141; Shin et al. 2005; Wheeler and Jones 1989). Size variation can also result from various human behaviours including changes in fishing technique, fishing location, and culinary preferences (Leach 2006). These factors should be considered in interpretations and osteometrics should not be the only line of evidence used to determine resource depression.

Researchers use single or multiple elements to create linear regression formulae to estimate body size. The types of bones used for size estimation in fish include vertebrae, otoliths, scales, or other abundant elements (Casteel 1976; Colley 1990). The method of sizing depends on the archaeological question being asked. Regression formulae are created to estimate the total body size of a fish which can provide information on specialized selection, meat yield, contribution to diet, and fishing methods (Colley 1990; Gosztonyi et al. 2007). Some studies on osteometrics are solely methodological and test the efficiency of such techniques (Lambrides and Weisler 2015; Orchard 2001).

For this study, osteometrics were needed to determine whether Lapita inhabitants were catching small or large sized Lethrinidae. Linear regression formulae were not used because the overall body size was not needed. The size of a single element is representative of the overall size of the individual's skeleton, therefore a relatively large cranial or vertebrae element would belong to a large-bodied fish.

Size measurements were conducted on Lethrinidae premaxillae and two types of vertebrae: atlas and thoracic. The majority of identifications were finished before commencing osteometrics. After examining the assemblage, premaxillae and vertebrae were determined to be the most abundant and distinguishable elements identified for Lethrinidae.

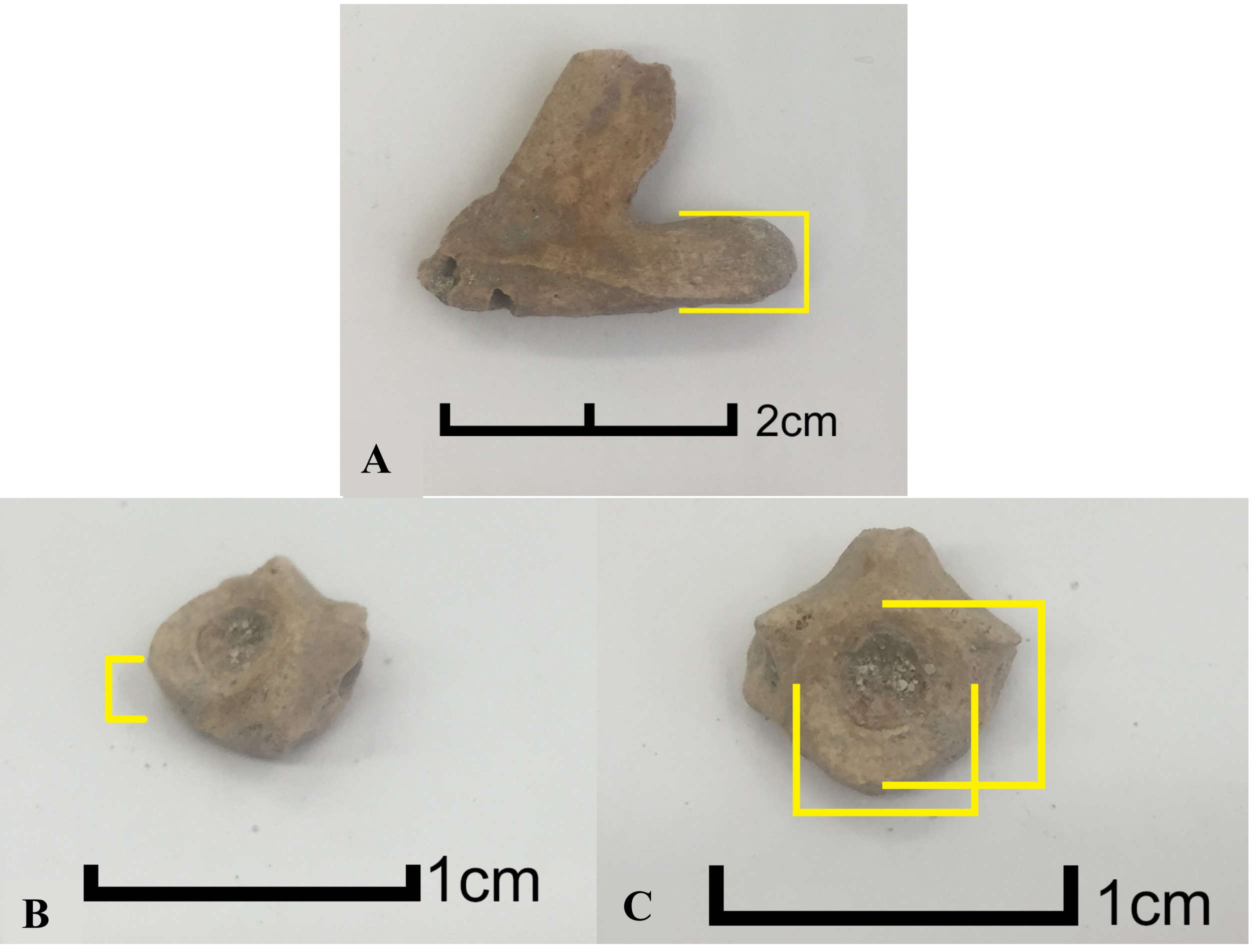

Figure 3.3 a-c. A= Premaxilla measurement of the shaft thickness of the postmaxillary process. B= Craniocaudal length of atlas. C= Dorso-ventral height and mediolateral width of atlas.

Figure 3.3a-c shows the measurements taken on all three elements using a set of Marathon electronic digital calipers. These measurements were based on studies by Lambrides and Weisler (2015), Orchard (2001), and Rojo (1987). Vertebral morphometrics were conducted on the centrum of the atlas and thoracic vertebrae (see Figure 3.3b – c). Measurements were recorded to the nearest 0.01 mm on the dorso-ventral height (Figure 3.3c), mediolateral width (Figure 3.3c), and craniocaudal length (Figure 3.3b) of the centrum. These measurements were only performed on complete vertebrae. A large number of premaxillae from the assemblage were fragmented which made it challenging to measure the lengths of the postmaxillary and ascending processes. Since an adequate sample size was needed, an alternative measurement was sought for the premaxillae. Based on Rojo's (1986) work, shaft thickness (Sth) was used as a measurement for all premaxillae samples (Figure 3.3a). The measurement is taken in the middle of the postmaxillary process which is often intact, whereas the ends of the premaxillae are not. Therefore, both complete and nearly complete premaxillae were utilized for full efficiency. In the end, sample sizes of 31 and 30 premaxillae were acquired for the Planting Matrix and Pit Fill respectively. Additional measurements could not be conducted due to the eroded and fragmented condition of the premaxillae which resulted from taphonomic factors.

Conclusion

This chapter has outlined the various methods undertaken for the Hopoate fish bone analysis. Debates on issues such as screen size and quantification in zooarchaeology are still ongoing inside and outside the Pacific Islands. The procedures conducted in this study were to ensure a high quality of analysis and interpretations, consistent with contemporary ichthyoarchaeological studies in Oceania. Recovery techniques adhered to the use of fine-mesh screens and water screening which are known to increase sample size and recover smaller-sized taxa. Approaches taken during the identification process involved the inclusion of an extended set of elements. This enhanced the opportunity for certain taxa to be more accurately represented and consequently increased the diversity of the assemblage.

Field techniques at Hopoate involved systematic recovery which ensured consistency, resulting in a considerable sample size. The size of the identified sample (5091 NISP) is comparable to other Pacific Island fishery studies which can range from hundreds to ten thousand or more identified specimens. On its own, it is adequate to evaluate the diversity and relative abundance of the identified taxa. It also provided a large number of Lethrinidae elements measured for size variation over time. Overall, the materials and methodology of this study were sufficient to address the questions outlined in the first chapter. The data resulting from the analysis are presented in the following chapter and provide a unique account of the local fishery.

Chapter 4 Analysis and Results

Introduction

In this chapter I present the results of my analysis of fishbones from Hopoate. The taxonomic diversity and relative abundance of the identified specimens are outlined to address questions of the importance of the fishery and change in fishing behaviours over time. All identified taxa are presented to show the diversity of the fishery. Focus will, however, be given to the five major families since they appear to have been preferred prey by the site inhabitants. Data from the major families are compared to other Pacific Island sites where preference for select fish has been recorded. Taxa which indicate the most significant changes in relative abundance over time will warrant particular attention as well.

As noted earlier, the Hopoate site is divided into three chronological components: Planting Matrix, Pit Fill, and the Post-Fill Occupation Zone (Burley et al. 2018). Details of levels, depth and units are provided in Appendix C. In total, 17 units of the excavated trench were analyzed in this study. Bones from a select number of levels were identified for units 11C, 11D-17D, while all levels from units 12C-15C, 8D-10D, 18D, and 14F were analyzed. The majority of analyzed levels are from the Lapita deposits and only a small number of Plainware levels were included in the analysis. Identifications from the Occupation Zone and Surface are included in this chapter but are not used for detailed analysis or comparison.

Family Representations

In Appendix B, I have attached a table which details certain characteristics of the major families from this study, such as habitat and feeding behaviours. These facts provide a better understanding of the types of fish harvested by the Hopoate inhabitants and the ecological factors which possibly influenced fishing behaviours. In total, 5091 elements, encompassing 18 taxa, were identified from the Planting Matrix and Pit Fill deposits at the Hopoate site. The fishery was relatively diverse and the range of taxa is comparable to other sites in the Pacific Islands (Cannon et al. 2018; Weisler and Green 2013). There were almost twice the number of bones from the Pit Fill as from the Planting Matrix. The excavated volume of material from the analyzed units of the Planting Matrix and Pit Fill were 6.9m^3 and 4.9m^3 respectively.

Family Representation Per Unit

Seventeen units were analyzed from the Hopoate site, and, as mentioned in Chapter 3, some units were analyzed in their entirety while only the Lapita levels of other units were examined. Table 4.1 lists taxonomic abundance by unit. Visual assessment showed that some units had more fish remains than others. These units were chosen for analysis initially to achieve a sufficient sample size. However, according to the site plan provided by Burley, the units with more fish bones were situated contiguously. As seen in Figure 3.1, these units are situated side by side towards the center of the planting pit. Units 12C-15C contained the largest numbers of identified, potentially identifiable, and unidentifiable bones. The highest numbers of taxa were identified from these units.

To obtain a comprehensive examination of the site, units located further away from the central area were also selected for analysis. A majority of the remaining analyzed units, apart from 14F and 17D-18D, are within the planting pit but did not yield as many specimens as Units

12C-15C. Nevertheless, they provided sufficient sample sizes from the two earliest contexts. Lethrinidae, Scaridae, and Serranidae are the most abundant taxa in all analyzed units. Therefore, although the identified remains from units 12C-15C account for 61.9% of the total sample, the family proportions are consistent throughout the excavated trench. There is clearly a preference for specific taxa and less common families are still present in many other units.

Element Recovery Rates

As previously discussed, early archaeological fish bone studies in the Pacific Islands used a limited set of elements for identifications including solely cranial and 'special' bones (Campbell 2016; Leach 1986). Recent studies have diverged from this approach to identify an extended range of elements (Bouffandeau et al. 2018; Lambrides and Weisler 2013; Weisler et al. 2016). By excluding post-cranial elements from the analysis, a number of families are underrepresented in the assemblage. This study follows this newer trend and incorporates both cranial and post-cranial bones. It is also worth demonstrating the difference this recent approach makes to ichthyoarchaeological studies.

Tables 4.2 and 4.3 provide the element representation by family, with a separate table for spinal elements (Table 4.3). Vertebrae account for 64% of the identified remains, while 36% derived from the cranium and other areas. A few elements are specific to certain taxa such as the fourth epibranchial of Scaridae; they were found in relatively low numbers. On the other hand, pharyngeals which are most distinctive in Labridae and Scaridae, numbered in the hundreds. Along with dentaries and premaxillae, they were the most abundant identified elements from the cranium. Regardless, the contribution of spinal elements to the total identified assemblage demonstrates that a selective approach to identification prevents analysts from identifying a larger, less biased sample.

These data also strengthen the argument against a selective approach by highlighting the underrepresentation of certain taxa. The bones of the mouth and other cranial areas do not preserve well for certain families such as Acanthuridae. This is taphonomic, relating primarily to size and robustness. Only 4 mouth elements were identified from Acanthuridae. While a few spines were analyzed, the majority of the identified elements were vertebrae (81%). Had only cranial elements been selected for analysis, Acanthuridae would be grossly underrepresented in both contexts (Nagaoka 2005). Not to mention, taxa including Mullidae, Muraenidae, Scombridae, Siganidae, and others were only identified by vertebrae. A selective approach would completely overlook these families. Without these taxa, the Hopoate fishery would not appear as diverse or productive. My more inclusive approach has allowed for the identification of a wider breadth of taxa.

Family	**Unit 11C**	**Unit 12C**	**Unit 13C**	**Unit 14C**	**Unit 15C**	**Unit 8D**	**Unit 9D**	**Unit 10D**	**Unit 11D**	**Unit 12D**	**Unit 13D**	**Unit 14D**	**Unit 15D**	**Unit 16D**	**Unit 17D**	**Unit 18D**	**Unit 14F**
Acanthuridae	2	62	96	93	51		11	4	1	7	18	15	10	1			
Balistidae	1	21	10	17	8		1			4	1	5	2				
Carangidae	2	18	15	17	8	1		2	3	3	3	4					
Congridae			3	1								4	2	1			
Diodontidae	1	21	35	25	20		3					1					
Holocentridae		13	17	17	3		3	2	3	3	3	2	2				
Labridae	4	22	22	24	16	1	4	5	5	7	8	12	5	2			
Lethrinidae	59	174	237	187	134	12	48	99	108	104	136	86	42	32	2	2	16
Mugilidae	9	27	23	30	17	1	9	9	5	15	8	3	5	3	1		
Mullidae	1	3	7	16	6		2	5	2	2	5	1	2			1	
Muraenidae	2	2	6	9	3				2		1			1			6
Ostraciidae		2		5													
Scaridae	43	230	232	216	124	5	36	28	39	42	54	47	38	20	2	2	1
Scombridae	6	12	23	39	30		2	6	4	7	8	11	13	1			
Serranidae	21	172	198	164	96	22	39	66	39	44	71	48	28	12	1	15	9
Shark		3			1			1									
Siganidae	2	44	47	76	33		4	6		7	6	7	10				
Sphyraenidae			3	2	1												
Total	153	826	974	938	551	42	162	233	211	245	322	246	159	73	6	20	32

Table 4.1 Family representation per unit, Hopoate

Percentage of Identified Remains

The Planting Matrix deposit yielded a greater volume of excavated matrix than the Pit Fill (6.9m^3 and 4.9m^3 respectively) (Burley et al. 2018). Since the faunal remains were perhaps utilized as organic mulch for plant cultivation, this led me to believe that there were possibly higher fragmentation rates of fish bone. If the Planting Matrix context presented a higher proportion of unidentified remains, this could indicate greater fragmentation.

The total number of fish bones recovered from the whole site is 13,798, with 3744 from the Planting Matrix and 7194 from the Pit Fill (Burley 2018). The number of specimens per level was not recorded, therefore I selected two units to provide an indication of the proportion of identifications. Unit 13C was selected for counting based on the large quantity of remains. Unit 10D did not have the same density of fish remains but was chosen because it was not situated next to 13C yet still provided a sufficient sample. While it was intended to count the identified and unidentified portions of a unit outside of the pit feature, those analyzed (Units 8D, 18D, and 14F) were too small and not sufficient to provide a reliable estimate. The proportion of identified remains averaged at 30.3% (Table 4.4), with the majority (69.7%) remaining unidentified. A great number of unidentifiable remains were fragmented to the extent that distinguishable features were no longer visible. In addition, a number of bones, mainly vertebrae, were eroded or covered in abrasive coral sand rendering them unrecognisable. Fortunately, these elements did not comprise the majority of the unidentified assemblage; therefore, I did not remove the coral sand from a few bones as it would not result in a significant addition of identifiable specimens.

Element	**Acant**	**Bali**	**Caran**	**Congr**	**Diodo**	**Holo**	**Lab**	**Lethr**	**Mugi**	**Mull**	**Mura**	**Ostra**	**Scar**	**Scom**	**Serr**	**Shark**	**Siga**	**Sphyr**	**Total**
Angular							2	73					9		22				106
Basioccipital		2					10	7	1				5		7				32
Ceratohyal								9											9
Dentary	1	2	9			2	8	66					49		58				195
Dentition	1						5	6							4				16
Dermal Plate												7							7
Dorsal Spine	48	24																	72
Epihyal								12							8				20
Exoccipital																		1	1
Fourth Epibranchial													13						13
Hyomandibular								11					2		4				17
Lower Pharyngeal							50						187						237
Maxilla			2			2	9	26					6		36				81
Opercle								1					1		2				4
Palatine								88					3		5				96
Posttemporal								1							9				10
Pharyngeal					3		1	1					1						6
Premaxilla	2	2	5			2	18	130					51		51				261
Quadrate		7				3	2	99					8		42				161
Scapula	1							16					1		9				27
Scute	8																		8
Spine	8	6			101														115
Sternum		1																	1
Tooth		5																	5
Upper Pharyngeal							21						176						197
Urohyal								8											8
Vomer		1	3				2	20							28				54
Total Elements Identified	69	50	19	0	104	9	128	574	1	0	0	7	512	0	285	0	0	0	1928

Table 4.2 Element representation by taxa in Planting Matrix and Pit Fill, excluding vertebrae.

Element	Acant	Bali	Caran	Congr	Diodo	Holo	Lab	Lethr	Mugi	Mull	Mura	Ostra	Scar	Scom	Serr	Shark	Sigani	Sphyr	Total
Atlas							1	106					14		48				169
Caudal Vertebra	240		40	1			2	272	90	32	21		354	85	219		186	4	1546
Penultimate Vertebra	1		1					1					2		19		1		25
Precaudal Vertebra	53	3	5	8		9	2	364	43	17	5		233	10	167		50		969
Thoracic Vertebra		17	10		2	50	4	160	30	2			5	66	222		5	1	575
Ultimate Vertebra			1										39						40
Vertebra				2					1							6			9
Total Elements Identified	294	20	57	11	2	59	9	903	164	51	26	0	647	161	675	6	242	5	3163

Table 4.3 Element representation by taxa in Planting Matrix and Pit Fill, vertebrae only.

Unit 13C	**#**	**%**	**Unit 10D**	**#**	**%**	**Average**	**#**	**%**
Identified	997	28.7		275	37.7		1272	30.3
Unidentified	2472	71.3		454	62.3		2926	69.7
Total	3469			729			4198	

Table 4.4 Proportion of assemblage identified and unidentified per unit.

Percentages of identified and unidentified remains were also calculated and compared between the Planting Matrix and Pit Fill (Table 4.5). No significant difference was observed, in fact the percentages were essentially identical to those averaged of all bones from Units 13C and 10D in Table 4.4. The proportion of identified elements between contexts and on average for the units in entirety remained consistently around 30%, while the percentage of unidentified was approximately 70%.

Planting Matrix	**#**	**%**
Identified	193	31.5
Unidentified	419	68.5
Total	612	
Pit Fill	**#**	**%**
Identified	985	29.2
Unidentified	2394	70.8
Total	3379	

Table 4.5 Proportion of assemblage identified and unidentified between contexts.

Proportions of identified and unidentified remains were compared to those from sites in the Ha'apai islands. The percentage of identified remains from Hopoate (~30%) were relatively high in comparison to the Ha'apai sites. The most analogous to Hopoate is Vaipuna which recorded identified remains at almost 30% from the Lapita contexts (Cannon et al. 2018). The remaining Ha'apai sites had identified proportions well below 30%, particularly the larger sites (i.e. Tongoleleka). Cannon et al. (2018) suggest that higher fragmentation occurred at these sites due to larger populations and possible increased damage from trampling. In Hopoate, the percentage of identified bones is consistent between the two Lapita deposits. Since the faunal remains were in a pit, they may have experienced less attrition by trampling as opposed to the other Tongan sites. Further research could be conducted on the two subsequent chronological contexts to measure proportions of identified remains. The interest would be in whether the percentage declines or remains consistent.

Relative Abundance

Table 4.6 provides the relative abundances of recorded taxa, including the NISP and percentages of families per chronological context. In the Planting Matrix (2850 cal BP), Lethrinidae are the most abundant taxon with an NISP of 755, which is almost half of the identified assemblage (41.7%). Scaridae and Serranidae are also abundant, in almost equal percentages (19.5% and 19.2% respectively). Acanthuridae and Mugilidae are also relatively abundant, though they represent much lower percentages. The remaining families are much less abundant some occurring in very small quantities (i.e. Ostraciidae, Diodontidae, shark). The five major families (Lethrinidae, Scaridae, Serranidae, Acanthuridae and Mugilidae) account for 87.7% of the total identified taxa from the Planting Matrix. This is a significant portion that suggests possible preference for these specific taxa.

The patterns in relative abundance change moderately within the Pit Fill (2690-2390 cal BP). The greatest difference is the decrease in the percentage of Lethrinidae. Based on the relative abundance recorded, Lethrinidae appear to decline significantly from 41.7% in the Planting Matrix to 22% in the Pit Fill. Simultaneously, Acanthuridae and another small-bodied taxon, Siganidae, more than double in relative abundance. The five most common taxa in the Pit Fill are Lethrinidae, Acanthuridae, Serranidae, Scaridae, and Siganidae, which comprise 80.6% of the assemblage. The percentages of most of the other taxa increase over time, although not as significantly as Acanthuridae and Siganidae. Diodontidae can be overrepresented in faunal assemblages because of their numerous spines. This bias in body part representation will be taken into consideration when comparing the relative abundance with other taxa. Sphyraenidae appeared to be absent in the Planting Matrix deposit but were identified in the Pit Fill at low numbers (i.e. 0.2%).

Figures 4.1 - 4.4 illustrate the patterns in relative abundance over time. By examining these graphs, it is clear how low the abundances of the minor taxa are in comparison to the major families. Since the abundances of less common taxa were so low and sometimes unnoticeable next to the major taxa in a single bar graph, two separate graphs were created. Two were made to focus on the major families, and two others showed the abundances of less common taxa. In Figures 4.1 and 4.3, all minor taxa are grouped together in a single category classified as "Other".

Family (Common Name)	**Planting Matrix**	**Pit Fill**
Acanthuridae (Surgeonfish, Unicornfish)	67 (3.7)	296 (9.0)
Balistidae (Triggerfish)	14 (0.8)	56 (1.7)
Carangidae (Trevally)	20 (1.1)	56 (1.7)
Congridae (Conger Eel)	7 (0.4)	4 (0.1)
Diodontidae (Porcupinefish)	2 (0.1)	104 (3.2)
Holocentridae (Squirrelfish)	18 (1.0)	50 (1.5)
Labridae (Wrasse)	46 (2.5)	91 (2.8)
Lethrinidae (Emperor, Bream)	755 (41.7)	722 (22.0)
Mugilidae (Mullet)	66 (3.6)	99 (3.0)
Mullidae (Goatfish)	14 (0.8)	37 (1.1)
Muraenidae (Moray Eel)	8 (0.4)	18 (0.5)
Ostraciidae (Boxfish)	1 (0.1)	6 (0.2)
Scaridae* (Parrotfish)	353 (19.5)	806 (24.6)
Scombridae (Tuna, Mackerel)	53 (2.9)	108 (3.3)
Serranidae (Grouper)	348 (19.2)	613 (18.7)
Shark	2 (0.1)	3 (0.1)
Siganidae (Rabbitfish)	37 (2.0)	205 (6.3)
Sphyraenidae (Barracuda)		6 (0.2)
Total	1811	3280

*Table 4.6 Number of identified specimens (NISP) and relative percentages of taxa in parentheses at Hopoate by chronological context: Planting Matrix and Pit Fill (2850 cal BP and 2690-2390 cal BP respectively) * According to recent nomenclature, parrotfish of the subfamily Scaridae has been positioned within the larger family of Labridae (Giovas 2018: 86). In this study, the traditional family-level designation of Scaridae for parrotfish remains distinct from Labridae (see Allen 2017:754).*

Family	**Post Fill Occupation**	**Surface/Top**
Acanthuridae (Surgeonfish, Unicornfish	16 (4.6)	
Balistidae (Triggerfish)	3 (0.9)	
Carangidae (Trevally)	2 (0.6)	
Diodontidae (Porcupinefish)	6 (1.7)	
Labridae (Wrasse)	8 (2.3)	1 (5)
Lethrinidae (Emperor, Bream)	138 (39.3)	8 (40)
Mugilidae (Mullet)	14 (4.0)	
Mullidae (Goatfish)	6 (1.7)	
Muraenidae (Moray Eel)	1 (0.3)	1 (5)
Scaridae (Parrotfish)	60 (17.1)	2 (10)
Scombridae (Tuna, Mackerel)	8 (2.3)	
Serranidae (Grouper)	76 (21.7)	8 (40)
Shark	1 (0.3)	
Siganidae (Rabbitfish)	12 (3.4)	
Total	351	20

Table 4.7 Number of identified specimens (NISP) and relative percentages of taxa in parentheses at Hopoate of the Post-Fill Occupation context (2750-2495 cal BP).

The significant decline in Lethrinidae is clearly demonstrated in Figure 4.3. Also interesting to note, Scaridae and Serranidae numbers increased considerably, as demonstrated in Figure 4.1. While the relative abundance of Serranids doubled in the Pit Fill context (2690-2390 cal BP), the percentage of Scarids almost tripled. Acanthuridae and Siganidae were not quite as abundant, but they too increased in relative abundance over time. Additionally, the percentage of Mugilidae declined to the point where it no longer was a dominant taxon in the later Pit Fill.

It is clear that Lethrinidae were the dominant taxa during the earliest Lapita context, comprising over 40% of the identified assemblage. Their relative decline suggests the possibility of resource depression, which is considered in more detail below. As mentioned in Chapter 3, the purpose of highlighting the most common taxa is not to provide rank order. Instead it is to exhibit their contribution to the Hopoate fishery and compare their proportions to the remaining less common taxa.

Table 4.7 shows the NISP and percentages of identified taxa from the Post Fill Occupation and the Surface deposits. These data are provided for information purposes since the sample size is too low for any in-depth comparative analysis and sampling strategies differed for these earlier excavations. A small sample size will not provide accurate representation of change in abundance or diversity and cannot be used to infer meaningful change in fishing patterns. It can, however, give an idea of the proportions of various families and their relative importance. With both components combined, 14 taxa were identified from an NISP of 371. The taxonomic diversity, although slightly lower than the earlier deposit, is still significant considering the smaller sample size. There is a clear continued preference for the same taxa as in the earlier Planting Matrix and Pit Fill. Lethrinidae are the most abundant family (39.3%) while Serranidae and Scaridae are also relatively important. Acanthuridae, Siganidae, and Mugilidae are less abundant than in the earlier contexts but still relatively abundant in relation to the minor families. Due to the smaller number of identified bones, most minor taxa occur in very low numbers. In addition, a number of the rarer families such as Ostraciidae, Congridae, and Sphyraenidae are absent from the identifications. Overall, these results indicate that the same taxa were important to the inhabitants from the time of settlement and into the post-Lapita contexts.

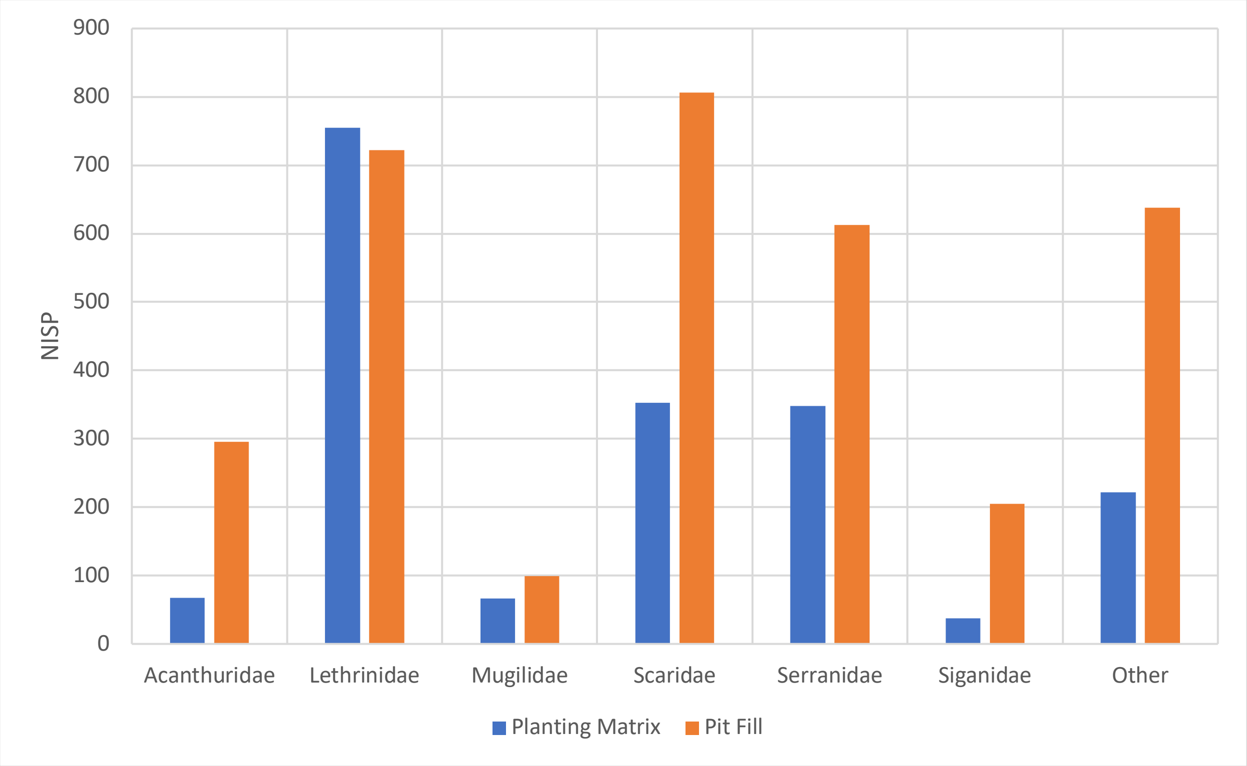

Figure 4.1 NISP of major families

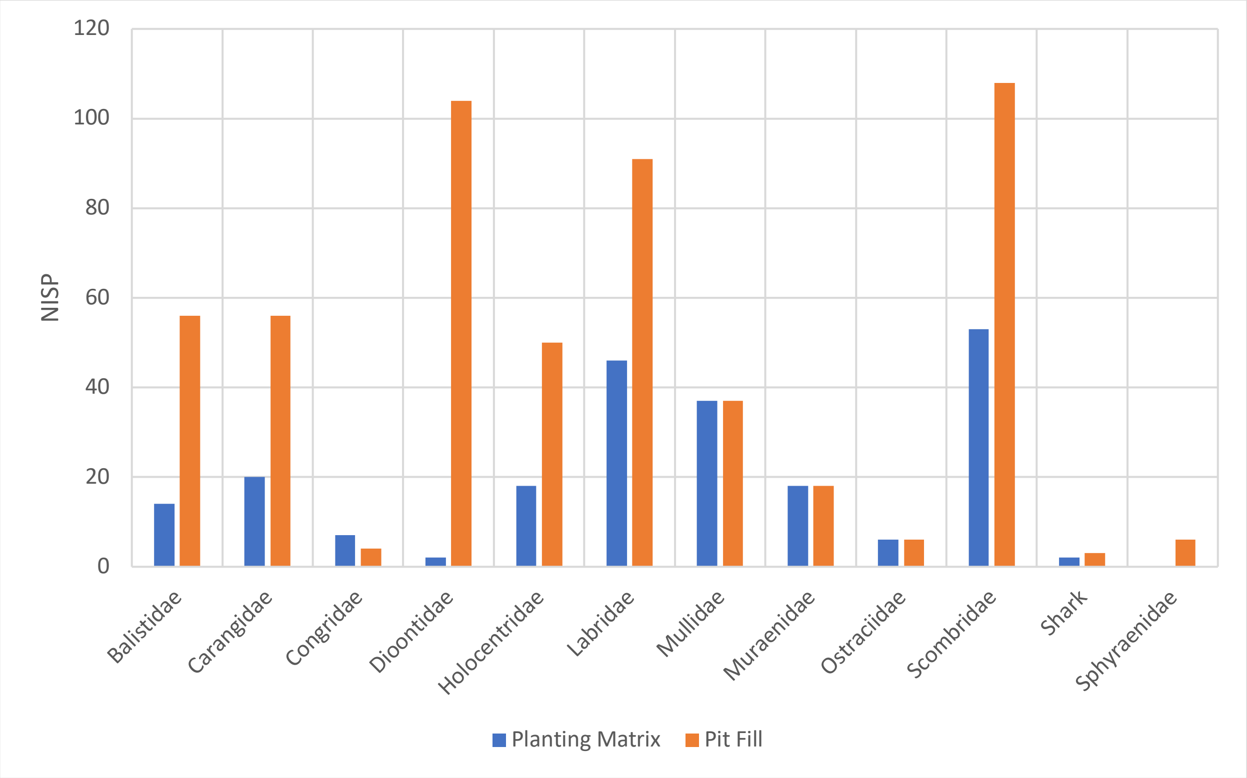

Figure 4.2 NISP of minor families

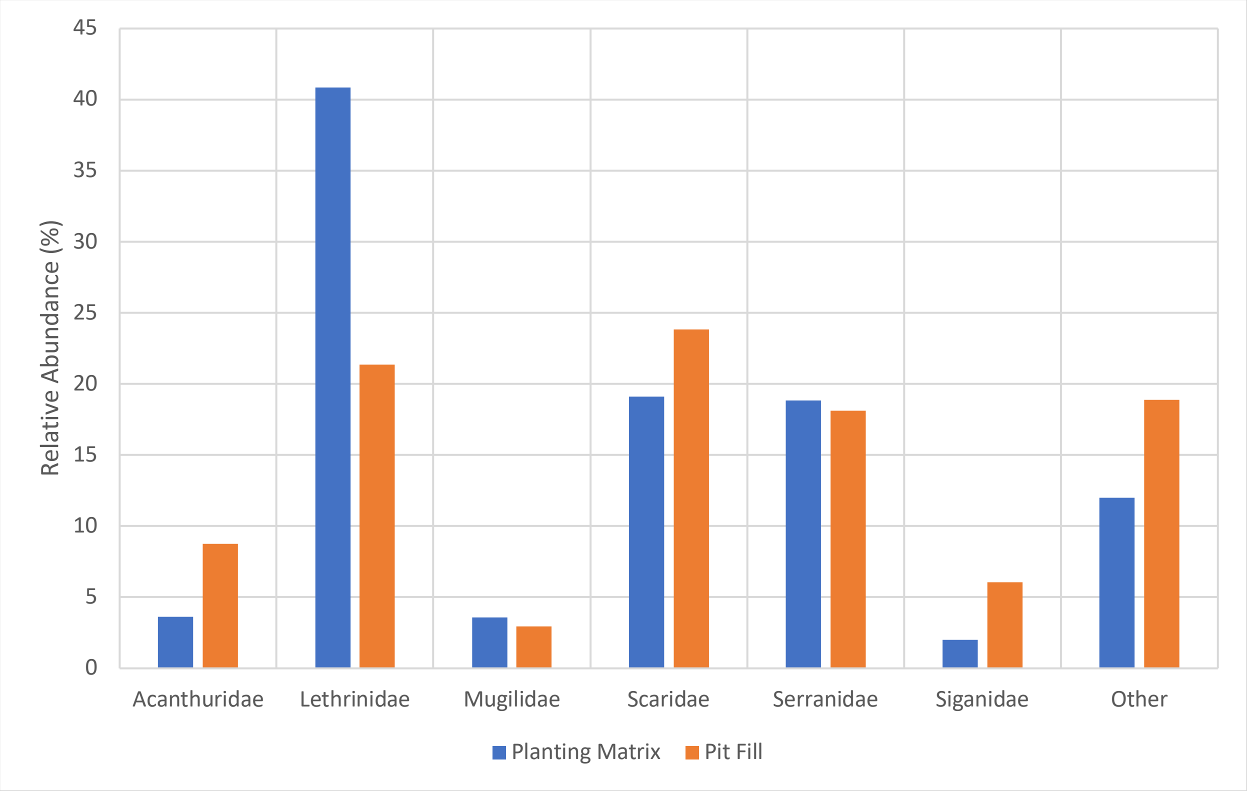

Figure 4.3 Relative abundance of major families

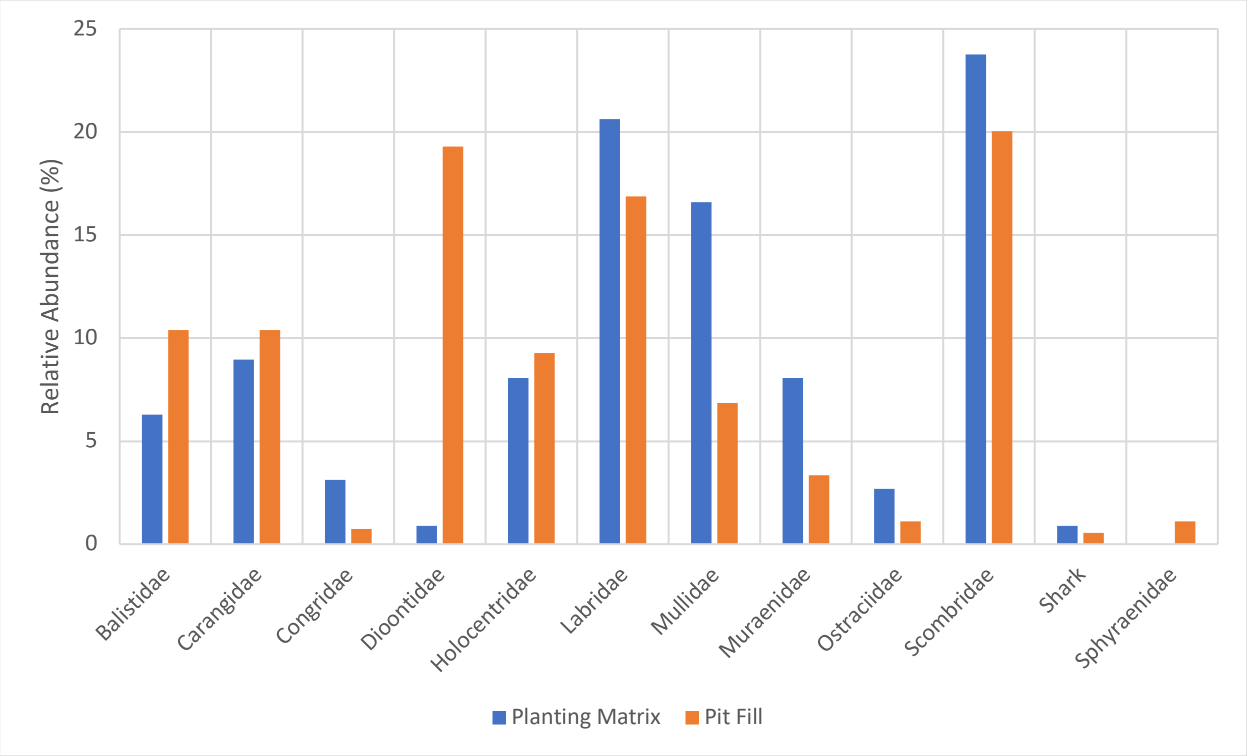

Figure 4.4 Relative abundance of minor families

Density of Fish Remains

The reduction in the relative abundance of Lethrinidae overtime is a pattern potentially associated with resource depression. This pattern, however, could be produced by relative percentage changes between the taxa instead of a decline in absolute numbers of Lethrinidae. Therefore, I needed to evaluate the cause of the declining percentage to determine if the increase in Acanthuridae was actually a response to the decrease in Lethrinids or whether both families increased due to an intensification of the fishery. Pacific Island studies show a preference for relying solely on relative abundance measures and the density of faunal remains are seldom calculated [for exceptions, see Allen (2002); Cannon et al. (2018); Fitzpatrick et al. (2011)]. Using density calculations in addition to relative abundance can reveal differing patterns.

Densities were calculated to assess absolute changes in the abundance of the Hopoate taxa. The results show a large increase in the density of bone from the Planting Matrix to the Pit Fill (Table 4.8). Overall, the total density of the identified Hopoate material was 375.3/m^3. The Pit Fill consisted of a smaller quantity of soil (4.9m^3) than the Planting Matrix (6.9m^3) yet possessed a higher number of bones and greater density (669.4/m^3).

	Planting Matrix (6.9m^3)	**Pit Fill (4.9m^3)**	**Post Fill Occupation (2.7m^3)**	**Total**
Density	262.5	669.4	130	375.3

Table 4.8 Density (identified elements/per m3) per chronological context.

Based on the density calculations for individual taxa, some of the results and patterns differ from the relative abundance figures discussed earlier. Specifically, in contrast to the trend shown in the percentages, the density of Lethrinidae increases into the Pit Fill context from 109.4/m^3 to 147.4/m^3 (Table 4.9). The densities of most of the other taxa also increased during the mid-Lapita context. Acanthuridae, Scaridae, Serranidae, and Siganidae showed the greatest increases in density per m^3. The densities of Acanthuridae and Siganidae were relatively low in the Planting Matrix yet increased to some of the highest values of the assemblage in the later Pit Fill. On the other hand, Serranidae and Scaridae were important food fish since the earliest deposits and in the Pit Fill there was a significant increase in the densities of both taxa. Scaridae experienced the greatest increase in both relative abundance and relative density. The significance of this temporal pattern will be discussed in the following chapter. Certain taxa including Congridae, Ostraciidae, Shark, and Sphyraenidae, remained fairly low in relative abundance and densities per m^3 throughout both deposits. The densities of the remaining minor taxa increased to a certain degree in the Pit Fill, though they were still far less abundant than the major taxa.

Figures 4.5 and 4.6 show the patterns in relative densities. In contrast to the significant percentage decline illustrated in Figures 4.3, there is no indication of a significant Lethrinidae decrease between contexts. Instead, the density of Lethrinidae increased slightly but overall remained relatively consistent. The change in density of some taxa was slight but it was significant in others such as Serranidae and Scaridae.

The density of identified fish in the Post Fill Occupation deposit was also calculated, even though the sample size was relatively smaller than the other components. The density was the lowest out of the three contexts with 130 bones per m^3. Only 2.7 m^3 of excavated soil was analyzed from the Occupation Zone which is low compared to the earlier deposits (Table 4.8). Additional research could be beneficial to determine the overall density of faunal remains at the site as inhabitants transitioned into the Plainware phase. It would be interesting to see whether the density of fish continued to increase in deposits post-dating the Pit Fill or declined over time, as suggested by the limited results presented here. A decrease in density could indicate a lower reliance on fish or less identifiable material produced by taphonomic factors such as damage from pigs or a larger population.

Family	**Planting Matrix**	**Pit Fill**
Acanthuridae	67 (9.7)	296 (60.4)
Balistidae	14 (2.0)	56 (11.4)
Carangidae	20 (2.9)	56 (11.4)
Congridae	7 (1.0)	4 (0.8)
Diodontidae	2 (0.3)	104 (21.2)
Holocentridae	18 (2.7)	50 (10.2)
Labridae	46 (6.7)	91 (18.6)
Lethrinidae	755 (109.4)	722 (147.4)
Mugilidae	66 (9.6)	99 (20.2)
Mullidae	14 (2.0)	37 (7.6)
Muraenidae	8 (1.2)	18 (3.7)
Ostraciidae	1 (0.2)	6 (1.2)
Scaridae	353 (51.2)	806 (164.5)
Scombridae	53 (7.7)	108 (22.0)
Serranidae	348 (50.4)	613 (125.1)
Shark	2 (0.3)	3 (1.2)
Siganidae	37 (5.4)	205 (41.8)
Sphyraenidae		6 (1.2)
Total	1811 (262.5)	3180 (669.4)

Table 4.9 NISP and densities (per m3) in parentheses of all families per context.

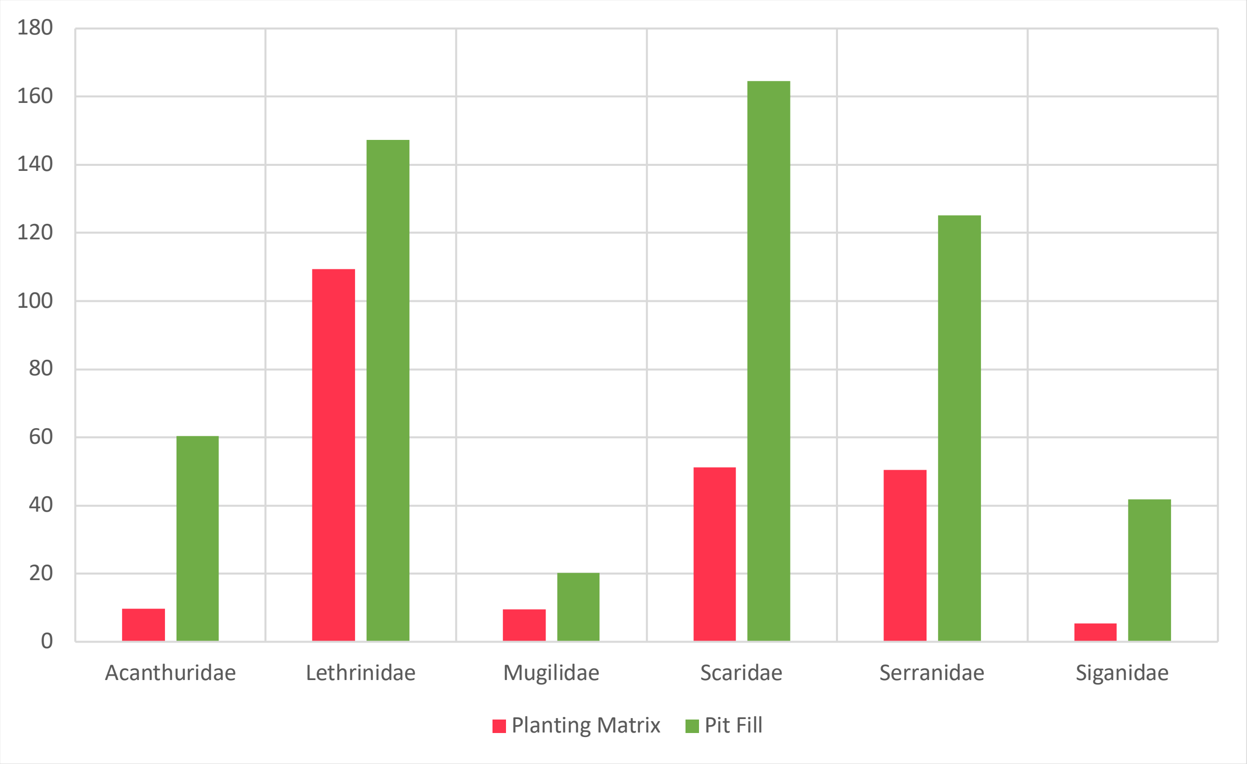

Figure 4.5 Density of major families

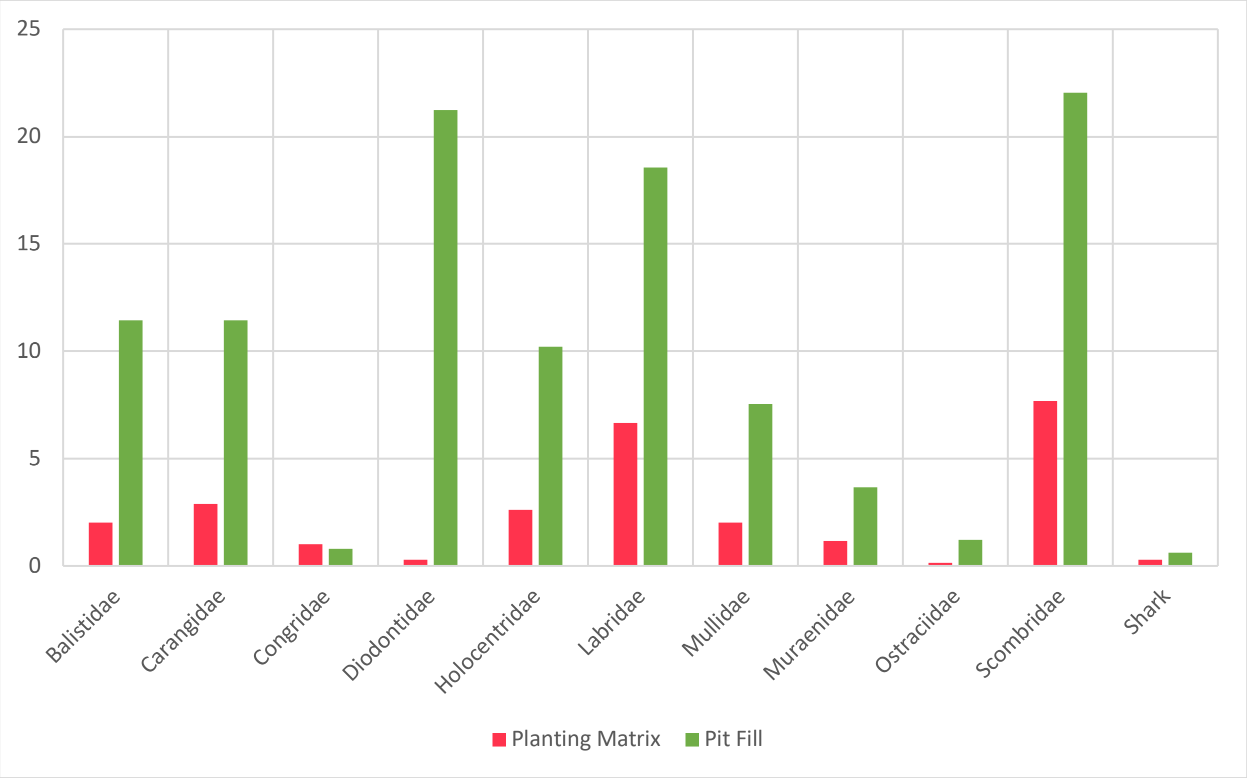

Figure 4.6 Density of minor families

Osteometrics

Researchers often look to prey size in regards to exploitation resource depression. This method has been applied in Pacific Island fishery studies, with variable results (Butler 2001; Giovas et al. 2016). According to the prey choice model, the higher ranked and larger prey of a population will be targeted and pressured until their availability is reduced (Giovas et al. 2016). Consequently, the captured individuals of that taxon following this depression will be smaller in size. Based on this concept, I applied osteometrics to Lethrinidae specimens from the Planting Matrix and Pit Fill.

Measurements were conducted on a total of 183 Lethrinidae elements, including the premaxillae (upper jaw) and the atlas and thoracic vertebrae (spinal column). These elements were selected because of their frequency and robustness. Lethrinidae was selected for osteometrics because of the possibility of resource depression presented in the relative abundance calculations. Based on the prey choice model, larger-sized prey would be targeted and the reduced availability of these fish can possibly be observed over time in the faunal record. Premaxillae, although fairly robust, often fragment at the ends of processes which does not allow for length measurements. Therefore, in order to achieve a sufficient sample size, measurements were taken of the shaft thickness (Sth) in the middle of the postmaxillary process. Premaxillae were measured from each component of the assemblage; 31 from the Planting Matrix and 30 from the Pit Fill. Based on these measurements there was no size difference over time (Table 4.10). Vertebra measurements also did not provide any indications of size change. The mean size of both atlas and thoracic elements were almost identical between contexts (Table 4.11). Since little variation occurred between all assessed elements, I do not believe additional size measurements would be needed or would provide any significantly different results.

	Planting Matrix	**Pit Fill**
	Shaft thickness (mm)	Shaft thickness (mm)
n	31	30
Mean	6.02	5.96
Median	5.35	5.79
Variance	3.37	2.31
Std. Deviation	1.83	1.52
Minimum	3.05	3.21
Maximum	10.76	8.8

Table 4.10 Statistical analysis of premaxillae measurements (illustrated in Figure 3.3).

Planting Matrix						
	Atlas			Thoracic		
	Height	Width	Length	Height	Width	Length
n	30	30	30	37	37	37
Mean	6.44	5.70	2.14	7.02	6.19	4.69
Median	6.11	5.13	2.02	6.95	6.02	4.44
Variance	1.93	1.84	0.31	3.42	2.42	1.33
Std. Deviation	1.39	1.36	0.56	1.85	1.56	1.15
Minimum	4.75	4.05	1.48	4.27	3.75	3.02
Maximum	10.99	8.95	3.99	15.18	11.64	9.38
Pit Fill						
	Atlas			Thoracic		
	Height	Width	Length	Height	Width	Length
n	29	29	29	26	26	26
Mean	6.51	5.56	1.92	7.10	6.38	4.74
Median	6.53	5.31	1.84	6.17	5.86	4.35
Variance	1.22	0.98	0.24	4.49	3.64	1.51
Std. Deviation	1.10	0.99	0.49	2.12	1.91	1.23
Minimum	4.67	3.86	1.26	4.41	4.22	3.29
Maximum	8.82	7.48	3.43	11.69	11.48	8.26

Table 4.11 Statistical analysis of Atlas and Thoracic vertebrae measurements (Measurements illustrated in Figure 3.2).

The osteometrics results are significant in understanding whether any change in fishing pressure or techniques occurred. Had the average size of Lethrinidae decreased over time it could indicate a couple of causes. The inhabitants could have been pressuring larger-bodied Lethrinids early on and reducing their availability. This would not only result in lower numbers but a significant decrease in the average size of individual fish. On the other hand, inhabitants could have changed their method of capture in a way that increased the harvest of smaller individuals (Anderson 2008; Giovas et al. 2016). Examples might include switching to techniques such as netting, trapping, or poisoning which are known to increase the harvest of smaller fish (Butler 1994; Colley 1987; Owen and Merrick 1994). A sudden change in technology would likely produce significantly reduced size measurements in the ichthyoarchaeological assemblage. The absence of size variation, however, does not suggest either of these possibilities. Instead, the consistent sizes suggest larger individuals were not targeted for intensive fishing by the local inhabitants. This pattern does not support resource depression.

Overview

The Hopoate site was the subject of continuous occupation from the Lapita settlement context to the mid and late-Lapita period. This allowed for a temporal analysis to observe variation in taxonomic diversity and fishing techniques or preference, though the focus was primarily on the short time span encompassed by the early (Planting Matrix) and later (Pit Fill) Lapita deposits.

The analysis of the Hopoate fish shows an assemblage rich in taxa, comparable to those from other Pacific Island archaeological sites (Cannon et al. 2018; Weisler and Green 2013). A total of 18 taxa were identified out of a total of 5091 bones collected from 11.8m^3 of excavated material from the Planting Matrix and Pit Fill deposits. Within this data set, it appears as though Hopoate inhabitants focused on inshore fish and rarely pursued offshore fish, which is also similar to patterns observed in most parts of the Pacific Island region (Bouffandeau et al. 2018; Butler 1988, 1994; Clark et al. 2015; Kinaston et al. 2015; Kirch 1997; Kirch and Dye 1979; Morrison and Addison 2009; Summerhayes et al. 2009; Walter 1989), with a few notable exceptions (Allen 2014, 2017; Leach et al. 1984; Ono and Intoh 2011; Walter 1989). As in other sites in Tonga, offshore taxa such as Scombridae and Lutjanidae are absent or few in number (Cannon et al. 2018; Clark et al. 2015; Densmore 2010; Kirch and Dye 1979).

The combination of relative abundance and relative density measures resulted in variable patterns. The abundance of Lethrinidae particularly demonstrated great variability between both calculations. While there was a decrease in the proportional abundance, the density of Lethrinids increased per m^3 of excavated material. The density values of the majority of other taxa also increased into the Pit Fill context. This pattern indicates an intensification of the fishery over time, as opposed to resource depression. Osteometrics showed a consistency in average body size of Lethrinids, further negating the possibility of resource depression in this case. While the density of a number of taxa increased slightly in the Pit Fill context, a few families increased to a much greater degree, particularly Scaridae and Serranidae. The following chapter will discuss the significance of these patterns, and the variability within the fishery. It will also consider possible relationships with environmental factors, fishing techniques and subsistence practices.

Chapter 5 Interpretations and Conclusions

Introduction

The purpose of this study was to characterize the Hopoate fishery and observe fishing behaviours through time. Zooarchaeological analysis was utilized to address these questions and provided a direct indication of the types of fish harvested and patterns of significant change in the fishery. At a grander scale, this research provides a deeper understanding of the relationship the initial inhabitants of the island had with their local marine environment and the relative importance of the fishery to their subsistence economy.

The previous chapter presented the results from the faunal analyses. My goal was to investigate taxonomic diversity and record any changes between the two chronological contexts: the Planting Matrix (2850 cal BP) and Pit Fill (2690-2390 cal BP). I focused my analysis on two fish families: Acanthuridae and Lethrinidae, due to a possible inverse pattern observed in the relative abundance calculations. What was previously believed to have been a possible case of resource depression is suggested instead to be an overall intensification of the fishing economy. I review and interpret these results below.

Absence of Resource Depression

As other researchers have recorded, patterns of resource depression in the Pacific Islands are difficult to identify and are rarely found (Anderson 2009a). The Lapita peoples did extirpate a number of native terrestrial species which has caused archaeologists to wonder whether similar impacts occurred on marine resources (Spennemann 1987). The initial inhabitants were known to establish settlements along coastal margins as indicated by numerous archaeological sites (Burley 2016; Burley et al. 2001, 2010; Kirch 1997). The degree of marine resource exploitation ranged from intensive to less intensive. Much of this is attributed to differential environmental conditions although a number of other factors such as cultural practices were likely to be at play as well. What is known is that fish and other marine resources were important to the earliest inhabitants and through time to modern populations.

Spennemann (1987, 1989) recorded a severe decline in shellfish at sites on Fanga ‘Uta lagoon resulting from a combination of environmental change and human predation. Into the late-Lapita era, the availability of *Andara antiquata* had been diminished by lagoon siltation while predation of *Gafarium sp.* had reduced both overall abundance and size. Spennemann (1987:92), thus, questioned whether the harvest of reef fish increased as a result of this depression of the shellfish resource. This had led me to investigate the degree of exploitation of the fishery during the early-to-mid Lapita periods at Hopoate.

In my study, identified specimens indicate a consistent harvest of reef fish as opposed to offshore taxa. During the early Lapita period, represented by the Planting Matrix, Lethrinidae was the most abundant family at 41.7% of the identified assemblage. A dramatic decline in the relative abundance was recorded into the mid-Lapita period, represented by the Pit Fill. This, along with a large increase in Acanthuridae, suggested the possibility of resource depression occurring over a relatively short period of exploitation. This type of inverse pattern is typical of resource depression because it proposes that people were resorting to lower-ranked fish (e.g. Acanthuridae) as the availability of a more preferred taxon (e.g. Lethrinidae) diminished (Butler 2001). While this pattern is suggestive of human impact, it is possible this pattern indexes other reasons such as environmental factors, disease, or change in fishing strategy to name a few (Giovas et al. 2016). Zooarchaeologists argue that more evidence is needed to prove this type of change occurred, especially with fish (Giovas et al. 2016).

During the time represented by the Pit Fill, the abundance of a number of fish taxa other than Lethrinidae increased. This pattern, along with diet-breadth expansion, are also both signs of possible resource depression (Giovas et al. 2016). In the diet-breadth expansion model, if a preferred taxon suddenly appears to significantly diminish, inhabitants might switch to multiple other taxa instead of just one. They may also change their fishing location to areas where certain fish are more abundant, however this was not the case for Hopoate. There is also the possibility of Lethrinidae decreasing due to a change in fishing techniques from one that is more selective, such as spearing, to another that would harvest various fish, like netting. However, the fact that the density of Lethrinidae showed no decline over time, but instead a slight *increase*, is indicative that this population was not depressed. Lethrinidae catches were not declining in absolute numbers but only relative to the increasing abundance of other taxa.

The increased abundance of a wider range of fish suggests more intensified fishing rather than prey switching caused by anthropogenic resource depression. The difference in taxonomic abundance provided by the density calculations emphasizes the issues that may arise if researchers solely rely on relative percentages. Zooarchaeologists should include density values along with counts and percentages, so that relative changes can be identified through comparison (Cannon et al. 2018).

Osteometrics confirmed the absence of resource depression, and therefore fairly consistent use of resources over time, as there was no decrease in the average size of Lethrinidae into the mid-Lapita period. Giovas et al. (2016) recorded similar results from Palau on Scaridae elements.

Their results showed that one taxon's mean size remained constant and another's even increased, disproving earlier claims of resource depression, and further supporting the argument for careful evaluation in exploitation studies.

My results not only discount the possibility of resource depression, they also suggest little change in other circumstances sometimes cited to explain decline in the relative abundance and size of preferred prey species. For instance, the inhabitants of a given region might change their fishing grounds which could host prey populations at different mean sizes (Allen 2014; Giovas et al. 2016). Season of capture, changes in fish locality, cultural preferences, and variation in technology could also affect prey availability and abundance (Leach 2006). Changes in temperature, salinity, sea level, availability of food are further factors that can disturb the growth process of fish (Boeuf and Payan 2001; Giovas et al. 2016; Shin et al. 2005; Wheeler and Jones 1989). In this case, the evidence does not support any significant change related to the abundance or size of Lethrinids, and points instead to a growth in the overall intensity of fishing at the site.

An increase in a single taxon but no others would indicate selection for a preferred fish. The high diversity of fish taxa at Hopoate instead shows that it is likely whatever could be caught was kept for food. Morrison and Addison (2009) discuss similar situations where the mean trophic level in a fishery declines though there is no depletion of high tropic level fish. The gradual decline in trophic exploitation is based on the relative increase in the representation of low trophic level herbivores. It is a case of "fishing through the food web" instead of "fishing down the food web" (Morrison and Addison 2009: 187). Evidence of resource exploitation varies, even within archipelagos. A great deal of this has been attributed to the diverse geographical conditions of the islands and the opportunities for successful agriculture. A simple generalization of whether traditional fishing resulted in overexploitation cannot be made, and any indications of resource depression depend on empirical evidence.

Intensification of the Hopoate Fishery

The relative abundance values showed a diverse fishing economy dominated by a handful of common families. These taxa in both components accounted for 83.5% of the identified assemblages, while the remaining 16.5% consisted of rarer taxa present in smaller numbers. It is worth repeating that the use of an extended set of skeletal elements for taxonomic identifications is significant for faunal analysis. In this study, a number of taxa, including Mullidae and Siganidae, were only identified by post-cranial elements. Had vertebrae been excluded from the analysis, the results and interpretations of the Hopoate assemblage would have differed considerably.

Lethrinidae, Scaridae, Serranidae, and Acanthuridae were consistently abundant, while Siganidae and Mugilidae varied in abundance between the two components. Although the percentage of Mugilidae decreased slightly into the Pit Fill period, the density calculation indicated an increase, though not to the same degree as Siganidae and the other major taxa. The fallout of Mugilidae from the major families was due to slight differences between the taxa; there was no significant reduction of Mugilids. Although Siganidae, Acanthuridae, and Mugilidae comprised part of the top five taxa, the abundance of Lethrinidae, Scaridae, and Serranidae was much higher in comparison. These three families were clearly preferred food fish and important contributors to the Hopoate diet.

The density calculations further emphasized the importance of these families but also of the minor taxa in the Planting Matrix context. The total density values depicted an increase in fishbone density into the Pit Fill context. Since the proportions of identified and unidentified remains in both deposits were practically identical, the large number of identified bones and higher density of the Pit Fill was likely an outcome of the intensification of the fishery.

The densities of most taxa increased and this included the smaller-bodied and less abundant families. The three most common medium-to-large sized families all increased, but the greatest increase in the fishery was from Scaridae. Scaridae rose in abundance (NISP 353 to 806; 19.5% to 24.6%) and density (51.2 to 125.1 bones/m^3) which made it the most common taxon in the Pit Fill. Scaridae is recorded as one of the most commonly identified fish in Pacific Island faunal assemblages. Giovas et al (2018) focused their analysis on Scaridae which dominated the fishery at Chelechol ra Orrak in Palau though it declined considerably over time. There was, however, no decline in average size which made the researchers consider influencing factors other than predation pressure which would account for the reduction. In Vogel and Anderson's study in Rapa Island, Scaridae dominated the assemblage at (40%) but fell 23% in the subsequent period due to an increase in Moray eel (2012: 117).

Few studies have noted an intensification of Scaridae fishing over time, most have only noted its significance at sites. Bouffandeau and colleagues recorded a dominance by Scaridae in Vanuatu, as well as a 10% increase over time (2018: 365). Kirch et al. recorded a rise in the abundance of Scaridae and Serranidae from a prehistoric site in Mangareva, the former increasing into the second cultural phase from an NISP of 15 to 363 and the latter increasing from 5 to 117 (2010: 7). Unfortunately, no discussion was provided for this increase and it should also be noted that the faunal analysis focused on the cranial and special elements, so certain taxa may have been underrepresented. Similar to Hopoate, Morrison and Addison (2009) identified an intensification at Fatu-ma-Futi, American Samoa, with specific focus on Scaridae and Acanthuridae. They showed a slight decline in high trophic levels, but this was due to an increase of herbivorous taxa and not a decrease in carnivores.

Scaridae are often identified in great abundance at many Pacific Island sites and this is often due to their distinctive, well-preserved elements (Lambrides and Weisler 2016; Weisler and Green 2013). The methodology used in this study incorporated a broad range of body parts for identification so that taxa without very distinctive, or well preserved, cranial elements would also be recorded. Acanthuridae, for instance, are mainly identified by their vertebrae and have also been recorded as abundant in a number of Pacific regions (Allen 2017; Morrison and Addison 2009). The branched coral reefs provide much needed protection and shelter for smaller fish. Scaridae are habitual with their resting areas and movements to such sites and feeding areas (Lowe 1987). This characteristic could mean that fishermen were able to understand their behaviours and thus use this knowledge to their advantage to exploit larger numbers. Parrotfish protect their bodies at night from nocturnal predators with a secreted mucous. During the day, their defense mechanism consists of traveling in schools, however this could only provide humans with greater harvests when nets are utilized (Wheeler and Jones 1989). Acanthuridae and Labridae are also frequent reef visitors that move in mixed schools. This behaviour makes these families highly susceptible to mass harvest and could strongly relate to the high numbers identified in archaeological assemblages.

The Significance of Variation in the Fishery

Spennemann (1987) observed the dramatic decline in shellfish abundance from the early to mid-Lapita era at the Fanga ʻUta lagoon. This pattern was later re-evaluated by Clark et al. (2015) from the Talasiu site on Tongatapu. Prior to the Lapita settlement at Nukuleka (Burley et al. 2010, 2018), a sea level fall caused an alteration in the lagoon including the loss of benthic habitats and the reduction of important shellfish. Spennemann (1987) determined that although one large species of shellfish (*Anadara*) diminished mainly from environmental change, two other valuable species were reduced in size as the result of human predation.

A number of studies in the Pacific Islands have recorded variability in shellfish abundance. Shellfish are often found in large quantities at Lapita sites meaning they were heavily exploited (Anderson 2009a; Bedford et al. 2006; Burley 2016; Kirch and Hunt 1988). Some studies recorded size decreases over time and prey switching to other shellfish species (Heorake 2009). While certain locales, such as Tongatapu represented selection for specific species and sizes (Spennemann 1987,1989), other shellfish assemblages depicted more diverse harvests (Szabo 2009). Researchers often relate variation in shellfish availability to change in environment, specifically the falling sea level which appeared to alter a number of marine environments (Heorake 2009; Seeto and Nunn 2012). Seeto and Nunn (2012) comment that environmental changes such as sea level fall, which occurred around the same time as the settlement periods, make it difficult for researchers to determine the root causes of observed changes in the faunal record. It is likely that both human and environmental factors impacted shellfish populations, and occurrences of extirpation was localized.

At the time of Spennemann's (1987) research in Tongatapu, no detailed fish bone studies had been conducted and he questioned the significance of reef fish following the decline of shellfish. The results of my research have addressed Spennemann's inquiry on the intensification of the local fishery. The faunal remains identified from the Hopoate pit have indicated that the inhabitants were intensifying their harvest of fish from the local lagoon. The abundance of reef fish increased, though there appeared to be no efforts to increase offshore fishing. Although a few identified offshore taxa (Scombridae, Carangidae) might suggest this type of practice, these taxa could possibly have been captured as they entered into the reef area to feed. Spennemann (1987) assessed that Carangidae and Sphyraenidae, though offshore families, could be caught in the lagoon. There is a possibility that the decline in shellfish is somewhat related to the intensification of the fish harvests. However, the decline in shellfish appeared to occur over a greater time span, into the late-Lapita period (Spennemann 1987), whereas the intensification of the fishery progressed over a short period of time. The direct relationship between shellfish harvest and reef fish remains unknown but both were part of a complex subsistence economy.

Due to the extinction and reduction of numerous land animals, both native and sometimes domesticated (Anderson 2009a; Kirch 2000; Steadman et al. 2002a, 2002b), the expectation is that fish harvest increased in importance as a result. Few studies, however, have recorded an intensification in fishing in relation to resource depression of shellfish or other proteins. Allen (2017) tested this hypothesis in East Polynesian assemblages and noted a reduction in fishing on a regional scale. A number of factors could account for the decline in fishbone, such as taphonomic processes or a change in bone deposition but she recorded this trend across a large regional and temporal scale. It is possible that resource depression of the fisheries occurred over long periods of time, but as it has been discussed extensively already, this is difficult to determine. Not many studies note intensification of the fishery following resource depression but instead more of an intensification caused by change in fishing focus. For instance, a number of sites in early East Polynesia changed focus from offshore fishing to inshore (Allen 2017). This change is often attributed to fishing techniques, yet a variety of other factors could be at play.

There are a number of possible reasons why there are so few records of fishery intensification following the depletion of another resource. The most common theory is the development and growth of agriculture throughout the Pacific Islands (Allen 1992, 2002, 2003; Allen et al. 2001; Anderson 2009a; Field et al. 2009; Herrscher et al. 2018; Kirch 2000, 2002; Kirch and Yen 1982; Sheppard 2011). Plant food contribution was once difficult to recover or measure, but recent studies have provided a greater understanding of prehistoric diet. Isotopic studies have indicated change in subsistence. Allen and Craig (2009), for example, determined that late prehistoric groups in Aitutaki were eating more plant foods and less marine protein than earlier inhabitants. Richards et al. (2009) confirmed the same occurrence in Hanamiai, while Field et al. (2009) and Valentin et al. (2011) noted somewhat similar patterns in Fiji and American Samoa respectively. According to these studies, agricultural practices appeared to compensate for certain regional losses in land and marine protein. In some locations, sea-level fall changed reef-flat ecology so profoundly at the end of the Lapita era, that marine foraging could no longer sustain coastal populations, who relocated elsewhere and became largely agriculturalists (Nunn 2009: 14). These patterns in subsistence change differ from those observed at Hopoate, yet these studies encompass a much greater time span.

At a shorter scale, studies of fishing patterns exhibit variable results. Observations at Ha’apai, for instance, included a mixture of modest and dramatic levels of intensification. The most intensive fishing was recorded at the Tongoleleka site between the Lapita and Plainware ceramic, periods, but the fine chronology of the Hopoate study provided a clear picture of intensification from the early to middle Lapita period. The difference in temporal scale between my study and others is important to note. Numerous Pacific Island studies that analyze change in fishing involve greater temporal and sometimes geographical scales (Anderson 2008; Butler 1994; Coutts 1975; Giovas et al. 2016; Kirch and Dye 1979; Kirch et al. 2010; Leach et al. 1984). Allen (2017), for instance, notes the intensification of inshore fish in Eastern Polynesia, yet this pattern occurs over millennia. The pattern exhibited at Hopoate is local and could not be observed at a greater temporal scale. Multiple stratigraphic divisions were available within the Lapita deposits, providing early, middle, and late time components. Other sites may not have multiple Lapita components; therefore, trends can only be examined over longer periods of time. The significance of this study is a result of the chronological control at the site which increased resolution and provided definitive results. A few pieces of the puzzle are still missing, however, such as temporal patterns of plant food consumption and the intensity of the fishery into the late-Lapita and Plainware phases. This information will provide a greater understanding of how the inhabitants responded to a changing marine environment and resource depletion.

Hopoate Fishery in Relation to Tonga and the Pacific Islands

Ha'apai and Vava'u Islands

The Hopoate fishery is unique in comparison to the other sites in Tonga. Although the taxonomic compositions were fairly similar, proportions varied, along with temporal changes in abundance. Cannon et al. (2018) analyzed the ichthyoarchaeological remains from the early Lapita settlement phase to the Plainware and Aceramic/Mixed periods in five Ha'apai island sites. Among these sites, twenty taxa were recorded which is two more than Hopoate. Lutjanidae and Priacanthidae were not identified in the Hopoate assemblage. Only a few of their bones were identified from Ha’apai, in Vava’u only one Lutjanidae specimen was recorded and Priacanthidae was not identified; therefore, they were not common taxa anywhere in Tonga. There is the possibility they were harvested at Hopoate and were even present in the assemblage. However, the remains may have been unidentifiable or did not preserve well due to taphonomic processes. Priacanthidae (Big Eyes), on the other hand, is a family of smaller-sized species which inhabit the reef (Atherton et al. 2015; Weisler and Green 2013) or offshore areas (Randall et al. 1996). Their skeletal elements are quite small, meaning they are prone to fragmentation. Lutjanidae (Snappers) are generally large-bodied and reside at the reef edge during the day and feed elsewhere at night (Newman and Williams 1996). They are not considered reef fish, however, and can be preyed upon by larger carnivores like groupers (Lowe 1987). Snappers are not commonly found in Pacific Island sites but were frequently harvested in specialized frequency such as in New Zealand where abundant reef fish were not available (Allen 2014). The inhabitants of Hopoate were not primarily offshore fishers, though they possibly came across minimal numbers of Lutjanidae just as they did with Sphyraenidae, another offshore family.

One aspect that makes Hopoate especially unique in comparison to Ha’apai and Vava’u is the large number of Lethrinidae recovered. Lethrinidae are a common food fish but are not found as abundantly in Pacific Island prehistoric assemblages as Acanthuridae or Scaridae (Allen 1992; Amesbury 2013; Butler 1988, 1994; Jones 2007, 2009b; Morrison and Addison 2009; Weisler et al. 2016). Lethrinidae comprised 41.7% of the Hopoate assemblage during the early Lapita period, while in Ha’apai, their abundance ranged from 5.7% in Tongoleleka to 20.1% in Mele Havea (Cannon et al. 2018: 44). Scaridae and Serranidae were abundant families throughout the Ha’apai sites, as they are at Hopoate and in many Pacific Island assemblages. Interestingly, Scombridae were only identified in Vaipuna and in low numbers (4 NISP in the Lapita period).

Higher numbers of Scombridae were recovered from Hopoate, though they still occurred in relatively low abundance in comparison to other taxa, which raises the question of whether these fish were targeted or if they were unintentional catches. Much like at Hopoate, the other taxa were not as abundant as the major taxa discussed.

The Acanthuridae numbers in Ha'apai were much greater in comparison to Hopoate. The abundance of Acanthuridae was also variable between the sites; increasing in Mele Havea and Tongoleleka and declining everywhere else. A dramatic drop in percentage of Lethrinidae and the simultaneous increase in Acanthuridae abundance was only recorded at Mele Havea and slightly at Vaipuna. A possible case for resource depression could be made for these sites, since the density calculations supported the inverse patterns first identified by relative abundance, but other explanations might account for the same pattern. At Pukotala and Tongoleleka, both Acanthuridae and Lethrinidae catches increased over time negating the possibility of exploitation resource depression.

The Ha'apai fisheries show variable patterns of intensification, sustainability, and possible resource depression. The fishery at Faleloa appeared more limited due to a lower density of bones, while Tongoleleka and Pukotala had larger human populations which would have warranted more intensive fisheries. The productivity of the Tongoleleka fishery surpassed that of the other Ha'apai sites, demonstrating intensification in the post-Lapita period.

The fisheries at Vava'u were restricted in comparison to Ha'apai and Hopoate (Densmore 2010). The densities of fish bones at all four sites examined by Densmore were considerably lower than in other Tongan areas, and only 15 taxa were identified in total. The most common taxa (Acanthuridae, Lethrinidae, Scaridae, and Serranidae) were the same as at Ha'apai and Hopoate. The most abundant families in the Vava'u islands were Serranidae in Ofu, Otea, and

Falevai, and Scaridae in Vuna (Densmore 2010: 53). These taxa dominated the assemblages and while the abundances of Acanthuridae and Lethrinidae were also relatively high, their abundance varied between sites.

Inhabitants at all island groups focused on reef fish yet harvested the occasional offshore carnivore. Cannon et al. (2018) emphasized variability throughout the fisheries in Ha'apai and I would like to reiterate this characteristic for all of the sites in Tonga. The high density of fish in Ha'apai indicates that the fishery was an essential part of the Lapita diet. It also points towards differing environmental conditions between islands groups such as the extensive and complex reefs in Ha'apai which provided more productive fisheries than Tongatapu and Vava'u (Cannon et al. 2018; Densmore 2010). This is not to say that the fisheries at Hopoate and Vava'u were not important, but demographic or environmental differences could likely account for this variation (Cannon et al. 2018).

As mentioned in chapter 4, the densities of fish remains from Ha'apai and Vava'u declined into the Plainware phases which is not yet evident in Hopoate because the remains of the early to mid-Lapita period where the primary focus of my analysis. This might suggest that marine subsistence was overtime compensated by plant foods and other protein sources. Future work could look more intently at the assemblage of the late-Lapita to Plainware time frame. The idea, and pattern found elsewhere, that marine reliance declined as agriculture increased in importance, could be further evaluated.

Talasiu, Tongatapu

Only one other contemporary faunal analysis has been conducted on Tongatapu, providing a brief but useful comparison of ichthyoarchaeological analysis. Clark et al. (2015)

conducted a study of Lapita settlement and subsistence at Talasiu, located along the Fanga 'Uta Lagoon and south of the Nukuleka peninsula. A 50 by 50 cm unit was excavated and 2476, primarily fish, vertebrate remains were recovered (Clark et al. 2015: 517). One aspect of particular interest from their study is the recording of Nemipteridae (Threadfin Bream) as an abundant family. This finding was curious since this taxon was not identified from the Hopoate, Ha'apai, or Vava'u assemblages. Nemipteridae is a family of 40 species, some residing in coral reefs and others in offshore areas (Randall et al. 1996). The taxa are typically small and quick moving. The remains of Nemipteridae hold a strong resemblance to Lethrinidae elements and a comparative specimen was not available for me to distinguish differences. The family is not one that is identified commonly in Pacific Island literature; only a handful of studies have found Nemipteridae present in prehistoric assemblages (Clark and Duncan 2005; Clark et al. 2015; Walter 1989). Nemipteridae are most commonly caught by hooks (Davidson and Leach 1996; Walter 1989) and fishing strategies on Tongatapu were not discussed in Clark and colleagues' study. I cannot account for the high number of Nemipteridae identified in Clark et al.'s (2015) analysis of faunal remains from Talasiu. Since Lethrinidae are recorded more often in Pacific Island studies than Nemipteridae, I was confident that Lethrinidae was the more abundant taxon in my study and the skeletal remains were identified correctly.

Fishing Techniques as they Relate to Family Representation

Archaeological fish bone analyses in Tonga are few, especially ones that provide detailed temporal patterns. What the faunal assemblages suggest about Lapita fishing is that the inhabitants exploited the reef and likely had a number of techniques in their repertoire. Prehistoric fishing techniques in Polynesia were generally similar across most tropical archipelagos, with nets being the dominant strategy (Weisler et al. 2010: 130). Netting would provide the inhabitants with a broad range of taxa in comparison to other technologies such as hook and line.

The presence of carnivores such as Serranidae, Carangidae, Scombridae, and Lethrinidae at Hopoate might suggest that angling may have been used occasionally. However, fish hooks were not recovered and the carnivores that reside in the reef could have easily been caught with nets. Serranidae, for instance are relatively easy to catch because they dwell in shallow waters (Wheeler and Jones 1989). And since there was not a majority of offshore fish at Hopoate, and a lack of material evidence, this leads me to believe angling was not the primary fishing strategy. Interestingly, Kirch and Dye’s (1979) ethnographic work recorded Niuan fishermen from Niuatoputapu, Tonga as preferring large deep-sea fish instead of small inshore catches. The archaeological evidence, on the other hand, indicated an absence of pelagic fish during the Lapita period. Kirch and Dye (1979) were thus cautious about inferring Lapita strategies from modern ethnographic data.

A few studies in the Pacific Islands have recorded focus on offshore fishing as opposed to inshore (Allen 2014, 2017; Leach et al. 1984; Ono and Intoh 2011; Walter 1989). Allen (2017) determined that carnivorous fish were most represented in early Eastern Polynesian sites, along with a greater number of fish hooks. Ono and Intoh (2011) believe this type of specialized fishing is rare in the tropical Pacific Islands because it is an adaptation to temperate areas, like New Zealand, where horticulture was marginal.

Taxonomic Diversity as it Relates to Environmental Variation

The high number of Lethrinidae in the earlier Planting Matrix could be an indication of selective technology, while the rise in other reef-based families during the later Pit Fill period could signify a change in strategy. The inhabitants may have increased their efforts in netting or trapping, which would account for the greater density of fish over time. Lethrinidae is a family consisting of bottom-feeding, carnivorous coastal fish. They can be caught via hooks, nets, traps, poison, and spear (Walter 1989). Fishhooks, however, are not commonly found in early Tongan sites (Clark et al. 2015; Poulsen 1987), and other fishing materials do not preserve well in the archaeological record (Lambrides and Weisler 2016). The majority of the other identified fish are essentially reef-based, and fishing strategies have strong relations to fish habitat and fish diet (Butler 1994; Morrison and Addison 2009).

A number of fish feed on a wide variety of resources and their feeding behaviors can alter depending on the size of the fish, time of day, and the biotope of the reef (Butler 1994; Lowe 1987). Also, a number of families are too large and diverse for researchers to generalize about fishing techniques or ecological circumstances (Anderson 2013; Lambrides and Weisler 2016). Although it is difficult, time consuming, and costly to identify fishbone assemblages to the species level, it is still important to acknowledge the complexity of Pacific Island fisheries, despite the limitations on the data available from most archaeological studies.

Diet, Preference, and Human Behaviours

How much of the actual consumed diet is represented by the faunal assemblage is difficult to pinpoint (Nicholson 1996), especially when certain foodstuffs do not leave any traces in the archaeological record. The lower numbers of Acanthuridae and Siganidae in the earliest Lapita period could be a result of a number of damaging taphonomic processes or consumption and processing may have occurred at different locations. Jones (2002, 2009a) recorded Lau women of Fiji consuming small fish and invertebrates on the beach during fishing expeditions. They were frequently eaten raw or cooked over small fires, but they often did not make their way back to the village. Similar behaviours were recorded for recent populations in Niuatoputapu by Kirch and Dye (1979). There is a possibility that the actual harvested numbers during the Planting Matrix period were much higher than what the faunal assemblage indicates. During foraging expeditions, inhabitants could have been consuming greater amounts of smaller inshore fish, therefore never being transported to the Hopoate pit. That said, the results from this study provide direct indications of the fish harvested, which likely contributed more to the inhabitants' diet than small fish eaten as snacks along the shores.

Conclusions and Future Directions

This research has contributed meaningful data to the literature on Pacific Island fisheries. The chronology of the site is significant, (1) for providing an understanding of the marine diet of the first Tongan settlers, and (2) for presenting considerable variation in taxonomic abundance over a relatively short period of time. Due to fine-grained chronology of the pit, I was able to assess the importance of the fishery from the time of colonization and through the following era. During the early Lapita period, Lethrinidae were the dominant family, which is uncommon, since most Pacific Island sites are dominated by Scaridae or Acanthuridae. However, ichthyoarchaeological assemblages in Oceania vary from site to site and taxonomic patterns often change over time at individual sites. The mid-Lapita period saw an intensification of the fishing economy with large increases in Scaridae and Serranidae. What made this finding so significant was the relatively short chronology afforded by the nature of the deposits. Continuous occupation from the early to late Lapita periods provided a rich sample and allowed me to observe fishing variation over a short time span. Archaeologists often find changes in subsistence over long periods of time (Allen 2017), such as the decline in marine food intake and the increase in agriculture throughout the South Pacific which has been observed over periods of centuries to millennia (Allen 1992, 2002, 2003; Allen et al. 2001; Anderson 2009a; Field et al. 2009; Herrscher et al. 2018; Kirch 2000, 2002; Kirch and Yen 1982; Sheppard 2011). In this study, however, the assemblages indexed fishing variation over a ~200-500-year period, a short period of time in comparison to a number of other fishery studies.

Future Analysis at Hopoate and Tongatapu

I briefly mentioned potential future analysis with material from the Post-Fill Occupation deposits in chapter 4. Based on the few identifications conducted on bones from the Occupation Zone, the most common fish families from earlier periods continued to dominate the assemblage. Further analysis would involve increasing the sample size to determine whether this pattern still holds true. I would be interested to know if the intensification of the fishery continued into the late and post-Lapita periods. Future analysis should focus on the abundance and density patterns of the major taxa, especially Scaridae. Furthermore, I am curious about the total density values of the fish taxa during Post-Fill Occupation context since other sites in Tonga have recorded declines in fishing over time based on similar density measures (Cannon et al. 2018; Densmore 2010). One factor to take into account in future research is the paleoshoreline of Tongatapu, which affected the resources in the Fanga ʻUta lagoon. The declining sea-level reduced the productivity of the lagoon, considerably impacting shellfish species which were later pressured by the initial Lapita inhabitants (Clark et al. 2015; Spennemann 1987, 1989). Detailed fish analyses at other sites along the Fanga ‘Uta lagoon could provide comparable patterns in the ichthyoarchaeological remains. However, they could also exhibit variability, similar to the Ha’apai islands which were on a small geographical scale (Cannon et al. 2018). This possibility should be taken into consideration moving forward.

Modern Approaches to Paleodiet

Fish remains are the most abundant in faunal assemblages throughout the Pacific Islands (Morrison and Addison 2009; Nagaoka 1993). The proportions of fish in the Lapita paleodiet are still unknown in a number of sites. Subsistence studies in the Pacific Islands, and other regions of the world as well, are utilizing multiple disciplines to understand various aspects of prehistoric diet. Researchers are increasingly employing stable isotope analysis in conjunction with faunal analysis to determine the breadth of diet and contributions between proteins, plant foods, marine and terrestrial resources. The issue of a changing environment in the Fanga ‘Uta Lagoon has already indicated that shellfish resources were severely impacted. A clearer picture of the Lapita diet in Tongatapu can show how the inhabitants adapted to this depletion in resources.

A number of Pacific Island studies have shown evidence of reduced reliance on marine resources (Allen 2003; Allen et al 2001; Field et al 2009; Herrscher et al. 2018; Kirch and Yen 1982; Morrison and Addison 2009). Specific causes of this pattern include resource depression or increased reliance on terrestrial food, while more general factors such as broader cultural changes and upland settlement are also possible factors (Morrison and Addison 2009; Morrison and Cochrane 2008; Pearl 2004). Researchers have often made generalizations that the exploitation of fish and shellfish by Lapita peoples reduced as horticulture intensified. Clark et al. (2015) suggest the decline in marine resources and the larger focus on terrestrial food plants were associated with movement away from settlements near marine resources and towards areas more suitable for horticulture. On Tongatapu, there is evidence of relocation, specifically inland expansion (Burley et al. 2010; Clark et al. 2015). In addition to reef fishes, Spennemann (1987) inquired about an intensification of horticulture which could have helped offset the decline in shellfish. Isotopic analysis studies on Tongatapu of late-Lapita (Herrscher et al. 2018) and post-Lapita (Stantis et al. 2015) groups have been conducted and provided illuminating results on dietary patterns. Additional studies on late and post-Lapita populations can help further address this question by determining the proportions of plant food to marine protein. It is important to understand that although fishing was a significant practice, the Lapita peoples were resourceful and their complex subsistence economy consisted of much more than solely marine foods (Jones and Quinn 2009; Leach and Davidson 2000). Therefore, the importance of prehistoric fisheries must be considered within the context of a wide range of subsistence practices in both land and sea settings.

There is also the factor of population growth which must be considered together with subsistence practices. On Tongatapu, this occurrence could have resulted in increasing pressure on reef fish, perhaps to the same degree as shellfish over time. This gives more reason to conduct further analysis on the Post Fill Occupation deposit, as well as at other sites along the paleoshoreline. Allen (1992) argues for a strong relationship between population and plant carbohydrates in general. As island populations became denser, agriculture expanded and energetic commitments increased (Allen 1992: 198). She suspects that other subsistence practices, such as fishing competed with the time and energy needed for agriculture and they were often abandoned. A growing population would require an abundance of resources, especially from an island where a number of native resources were already exhausted.

Standardization of Methodology and Variability Across Fishery Studies

On a final note, I would like to stress the methodological issues which have plagued ichthyoarchaeological studies for years. It is clear that fish were an essential part of the Lapita diet, and their contributions varied throughout Oceania. Fish bone analysis can only benefit from procedures that reduce bias and provide the largest sample sizes possible. I believe analysts, specifically in the Pacific Islands, now realize the importance of using fine mesh sieves and analyzing a broad range of elements. The majority of recent ichthyoarchaeological studies have adhered to these techniques and have even pointed out the methodological errors of the past (Allen 2014). These procedures will only help archaeologists understand the stories of the earliest Pacific Island inhabitants.

Archaeological fish analyses in other areas of the world including the Caribbean, Europe, and northeastern Pacific regularly utilize a comprehensive set of elements for identifications (Giovas 2018). Establishing a standard in methodology can ensure the results from different sites and studies are comparable. However, comparisons between such great geographical scales, such as the Pacific Islands and Europe for example, are complex. Overarching themes are difficult to formulate and often mask localized variability. If ichthyoarchaeological assemblages between sites in relatively close proximity, such as Tonga, demonstrate differences in fishing patterns, the degree of variability over greater geographical distances is immense. Specific fishing practices are related to local resource availability and change in subsistence is a complex matter influenced by numerous intersecting variables. What is certain, though, is that fish were integral to various prehistoric populations and contributed to a number of complex subsistence economies. Further research can only provide a deeper understanding of the importance of fish to prehistoric populations.

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Appendix A. Comparative Collections and Online Sources

Simon Fraser University Tongan Fish Collection

Cat#	Family	Genus	Species	Common Name	Source
50199	Acanthuridae	Naso	unicornis	Bluespine Unicornfish	Tonga
50207	Apogonidae	Chellodipterus	artus	Wolf Cardinalfish	Tonga
50113	Balistidae	Rhinecanthus	aculeatus	White-banded Triggerfish	Tonga
50163	Balistidae	Rhinecanthus	aculeatus	White-banded Triggerfish	Tonga
50164	Balistidae	Rhinecanthus	aculeatus	White-banded Triggerfish	Tonga
50165	Balistidae	Rhinecanthus	aculeatus	White-banded Triggerfish	Tonga
50166	Balistidae	Rhinecanthus	aculeatus	White-banded Triggerfish	Tonga
50133	Belonidae	Tylosurus	crocodilus	Crocodile Longtom	Tonga
50134	Belonidae	Tylosurus	crocodilus	Crocodile Longtom	Tonga
50184	Carangidae	Caranx	papuensis	Brassy Trevally	Tonga
50192	Carangidae	Caranx	papuensis	Brassy Trevally	Tonga
50193	Carangidae	Caranx	papuensis	Brassy Trevally	Tonga
50194	Carangidae	Caranx	papuensis	Brassy Trevally	Tonga
50189	Carangidae	Seriola	ialandi	Yellowtail Kingfish	Tonga
50149	Carangidae	Trachinotus	baillonii	Black-spotted Dart	Tonga
50135	Carangidae	Trachinotus	blochii	Snub-nosed Dart	Tonga
50145	Carangidae	Trachinotus	blochii	Snub-nosed Dart	Tonga
50146	Carangidae	Trachinotus	blochii	Snub-nosed Dart	Tonga
50147	Carangidae	Trachinotus	blochii	Snub-nosed Dart	Tonga
50148	Carangidae	Trachinotus	blochii	Snub-nosed Dart	Tonga
50156	Carangldae	Selar	crumenophthalmus	Purse-eyed Shad	Tonga
50157	Carangldae	Selar	crumenophthalmus	Purse-eyed Shad	Tonga
50158	Carangldae	Selar	crumenophthalmus	Purse-eyed Shad	Tonga
50159	Carangldae	Selar	crumenophthalmus	Purse-eyed Shad	Tonga
50161	Gerreidae	Gerres	oyena	Oceanic Silver Biddy	Tonga
50172	Holocentridae	Neoniphon	aurolineatus	Yellowstripe Squirrelfish	Tonga
50208	Holocentridae	Neoniphon	opercularis	Blackfin Squirrelfish	Tonga
50209	Holocentridae	Myripristls	kuntee	Epaulette Soldierfish	Tonga
50211	Holocentridae	Sargocentron	spiniferum	Sabre squirrelfish	Tonga
50186	Labridae	Chellinus	chlorourus	Floral Maori Wrasse	Tonga
50116	Labridae	Chellinus	digrammus	Cheek-lined Maori Wrasse	Tonga
50127	Lethrinidae	Gymnocranius	euanus	Japanese Sea Bream	Tonga
50128	Lethrinidae	Gymnocranius	euanus	Japanese Sea Bream	Tonga
50129	Lethrinidae	Gymnocranius	euanus	Japanese Sea Bream	Tonga
50130	Lethrinidae	Gymnocranius	euanus	Japanese Sea Bream	Tonga
50131	Lethrinidae	Lethrinus	lentjan	Pink-eared Emporer	Tonga

50119	Lethrinidae	Lethrinus	anthochilus	Yellowtlp Emporer	Tonga
50120	Lethrinidae	Lethrinus	anthochilus	Yellowtip Emporer	Tonga
50178	Lethrinidae	Lethrinus	miniatus	Sweetlip Emporer	Tonga
50182	Lethrinidae	Lethrinus	miniatus	Sweetlip Emporer	Tonga
50114	Lethrinidae	Lethrinus	obsoletus	Orange-striped Emporer	Tonga
50115	Lethrinidae	Lethrinus	obsoletus	Orange-striped Emporer	Tonga
50187	Lethrinidae	Lethrinus	obsoletus	Orange-striped Emporer	Tonga
50118	Lethrinidae	Lethrinus	olivaceus	Long-nosed Emporer	Tonga
50126	Lethrinidae	Lethrinus	rubrioperculatus	Red-eared Emporer	Tonga
50162	Lethrinidae	Lethrinus	rubrioperculatus	Red-eared Emporer	Tonga
50183	Lutjanldae	Aprion	virescens	Green Jobfish	Tonga
50190	Lutjanldae	Etelis	coruscans	Ruby Snapper	Tonga
50179	Lutjanldae	Lutjanus	boutton	Molluccan Snapper	Tonga
50188	Lutjanldae	Lutjanus	fulvus	Yellow-margined Seaperch	Tonga
50206	Lutjanldae	Lutjanus	kasmlra	Blue-striped Seaperch	Tonga
50173	Lutjanldae	Pristipomoides	auricilla	Goldflag Jobfish	Tonga
50174	Lutjanldae	Pristipomoides	auricilla	Goldflag Jobfish	Tonga
50175	Lutjanldae	Pristipomoides	auricilla	Goldflag Jobfish	Tonga
50176	Lutjanldae	Pristipomoides	auricilla	Goldflag Jobfish	Tonga
50177	Lutjanldae	Pristipomoides	auricilla	Goldflag Jobfish	Tonga
50160	Mugilidae	Crenimugli	crenilabis	Warty-lipped Mullet	Tonga
50151	Mullidae	Mulloides	valicolensis	Yellowfin Goatfish	Tonga
50152	Mullidae	Mulloides	valicolensis	Yellowfin Goatfish	Tonga
50153	Mullidae	Mulloides	valicolensis	Yellowfin Goatfish	Tonga
50154	Mullidae	Mulloides	valicolensis	Yellowfin Goatfish	Tonga
50155	Mullidae	Mulloides	valicolensis	Yellowfin Goatfish	Tonga
50185	Mullidae	Parupeneus	heptacanthus	Cinnabar Goatfish	Tonga
50195	Plotosldae	Plotosus	lineatus	Striped Catfish	Tonga
50196	Plotosldae	Plotosus	lineatus	Striped Catfish	Tonga
50197	Plotosldae	Plotosus	lineatus	Striped Catfish	Tonga
50198	Plotosldae	Plotosus	lineatus	Striped Catfish	Tonga
50203	Pomacentridae	Pomacentrus	coelestis	Neon Damsel	Tonga
50181	Priacanthidae	Heteropriacanthus	crueritatus	Glasseye	Tonga
50191	Scorpaenidae	Dendrochirus	brachypterus	Dwarf Lionfish	Tonga
50169	Serranidae	Epinephelus	areolatus	Aerolate Rockcod	Tonga
50171	Serranidae	Epinephelus	areolatus	Aerolate Rockcod	Tonga
50212	Serranidae	Epinephelus	fuscoguttatus	Flowery Cod	Tonga
50205	Serranidae	Epinephelus	howlandi	Blacksaddle Rockcod	Tonga
50204	Serranidae	Epinephelus	merra	Dwarf Spotted Rockcod	Tonga
50210	Serranidae	Plectropomus	leopardus	Coral Trout	Tonga
50200	Siganidae	Siganus	argenteus	Forktall Rabbitfish	Tonga

50201	Siganidae	Siganus	argenteus	Forktall Rabbitfish	Tonga
50202	Siganidae	Siganus	argenteus	Forktall Rabbitfish	Tonga
50136	Siganidae	Siganus	vermiculatus	Vermiculate Rabbitfish	Tonga
50150	Siganidae	Siganus	vermiculatus	Vermiculate Rabbitfish	Tonga
50121	Sparidae	Chrysophrys	auratus	Snapper	Tonga
50122	Sparidae	Chrysophrys	auratus	Snapper	Tonga
50123	Sparidae	Chrysophrys	auratus	Snapper	Tonga
50124	Sparidae	Chrysophrys	auratus	Snapper	Tonga
50125	Sparidae	Chrysophrys	auratus	Snapper	Tonga
50213	Sphyraenldae	Sphyraena	forsteri	Bigeye Barracuda	Tonga
50132	Syngnathidae	Corythoichthys	intestinalis	Banded Pipefish	Tonga
50137	Syngnathidae	Corythoichthys	intestinalis	Banded Pipefish	Tonga
50138	Syngnathidae	Corythoichthys	intestinalis	Banded Pipefish	Tonga
50139	Syngnathidae	Corythoichthys	intestinalis	Banded Pipefish	Tonga
50140	Syngnathidae	Corythoichthys	intestinalis	Banded Pipefish	Tonga
50141	Syngnathidae	Corythoichthys	intestinalis	Banded Pipefish	Tonga
50142	Syngnathidae	Corythoichthys	intestinalis	Banded Pipefish	Tonga
50143	Syngnathidae	Corythoichthys	intestinalis	Banded Pipefish	Tonga
50144	Syngnathidae	Corythoichthys	intestinalis	Banded Pipefish	Tonga
50117	Synodldae	Trachinocephalus	myops	Snakefish	Tonga
50167	Triakidae	Hemitriakia	japanica_	Japanese Topeshark	Tonga
50168	Triakidae	Hemitriakia	japanica_	Japanese Topeshark	Tonga

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Cat#	Family	Genus	Species	Common Name	Source
C23	Acanthuridae	Acanthurus	chirurgus	Doctorfish	Hamilton, ON
C24	Acanthuridae	Acanthurus	chirurgus	Doctorfish	Hamilton, ON
A4	Acanthuridae	Acanthurus	xanthopterus	Yellowfin Surgeonfish	Fiji
A5	Acanthuridae	Naso	brevirostris	Spotted Unicornfish	Fiji
A6	Acanthuridae	Naso	unicornis	Bluespine Unicornfish	Fiji
C18	Balistidae	Balistes	carolinensis	Grey Triggerfish	Hamilton, ON
C12	Balistidae	Balistes	vetula	Queen Triggerfish	Antigua
A20	Balistidae	Pseudobalistos	flavimarginatus	Yellow Margin Triggerfish	Fiji
A18	Carangidae	Alectis	indicus	Indian Threadfish	Fiji
A13	Carangidae	Carangoides	fulvoguttatus	Gold-spotted Trevally	Fiji
C16	Carangidae	Caranx	hippos	Crevalle Jack	Hamilton, ON
A25	Carangidae	Caranx	papuensis	Brassy Trevally	Fiji
C9	Carcharhinidae	Carcharhinus	perezi	Caribbean Reef Shark	Antigua
A37	Chanidae	Chanos	chanos	Milkfish	Fiji
C11	Congridae	Conger	triporiceps	Manytooth Conger	Antigua

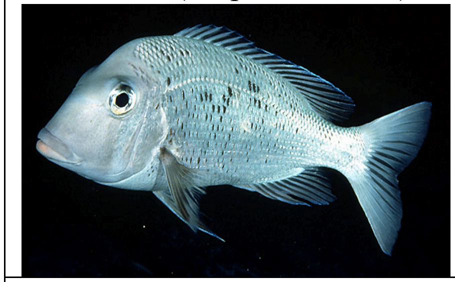
A24	Diodontidae	Diodon	hystrix	Spotfin Porcupinefish	Fiji
C10	Haemulidae	Lachnolaimus	maximus	Cottonwick Grunt	Antigua
C21	Hemiramphidae	Hemiramphus	balao	Balao Halfbeak	Hamilton, ON
C22	Hemiramphidae	Hemiramphus	balao	Balao Halfbeak	Hamilton, ON
A32	Holocentridae	Sargocentron	spiniferum	Sabre squirrelfish	Fiji
V19	Labridae	Lachnolaimus	maximus	Hogfish	Hamilton, ON
A1	Lethrinidae	Lethrinus	reticulatus	Red Snout Emperor	Fiji
A12	Lethrinidae	Lethrinus	rubrioperculatus	Red-eared Emperor	Fiji
A26	Lethrinidae	Lethrinus	nebulosus	Spangled Emperor	Fiji
A27	Lethrinidae	Lethrinus	rubrioperculatus	Red-eared Emporer	Fiji
A14	Lutjanldae	Lutjanus	russelli	Moses Perch	Fiji
A15	Lutjanldae	Lutjanus	sp.	Snapper	Fiji
A30	Mugilidae	Crenimugil	crenilabis	Fringelip Mullet	Fiji
A29	Mugilidae	Ellochelon	vaigiensis	Diamond-scale Mullet	Fiji
C2	Mullidae	Mullus	auratus	Red Goatfish	Hamilton, ON
C5	Ostraciidae	Lactophyrs	bicaudalis	Spotted Trunkfish	Antigua
C6	Ostraciidae	Lactophyrs	bicaudalis	Spotted Trunkfish	Antigua
C8	Ostraciidae	Lactophyrs	triqueter	Smooth Trunkfish	Antigua
C17	Pomacanthidae	Pomacanthus	arcuatus	Gray Angelfish	Antigua
C4	Priacanthidae	Heteropriacanthus	cruentatus	Glasseye	Antigua
A9	Scaridae	Chlorurus	microrhinus	Steephead Parrotfish	Fiji
A19	Scaridae	Chlorurus	microrhinus	Steephead Parrotfish	Fiji
A2	Scaridae	Scarus	niger	Dusky Parrotfish	Fiji
A10	Scaridae	Scarus	sp.	Parrotfish	Fiji
C14	Scaridae	Sparisoma	chrysopterum	Redtail Parrotfish	Hamilton, ON
C1	Sciaenidae	Micropogonias	furnieri	Whitemouth Croaker	Hamilton, ON
C3	Scombridae	Euthynnus	alletteratus	Little Tunny	Hamilton, ON
A17	Scombridae	Rastrelliger	kanagurta	Long-jawed Mackerel	Fiji
C15	Sebastidae	Sebastes	marinus	Rose Fish	Hamilton, ON
A23	Serranidae	Epinephelus	cyanopodus	Speckled Blue Grouper	Fiji
A34	Serranidae	Epinephelus	fusioguttus	Flowery cod	Fiji
A33	Serranidae	Epinephelus	ongus	Speckled-fin Rockcod	Fiji
A21	Serranidae	Epinephelus	polyphekadion	Camouflage Rockcod	Fiji
A22	Serranidae	Plectropomus	areolatus	Squaretail Coral Trout	Fiji
A8	Serranidae	Serranidae	sp.	Grouper	Fiji
A11	Serranidae	Serranidae	sp.	Grouper	Fiji
A28	Serranidae	Variola	albimarginata	Lyretail Trout	Fiji
A31	Siganidae	Siganus	argenteus	Forktail Rabbitfish	Fiji
A36	Siganidae	Siganus	argenteus	Forktail Rabbitfish	Fiji
A3	Siganidae	Siganus	doliatus	Barred Rabbitfish	Fiji
A35	Siganidae	Siganus	punctatus	Gold-spotted Rabbitfish	Fiji

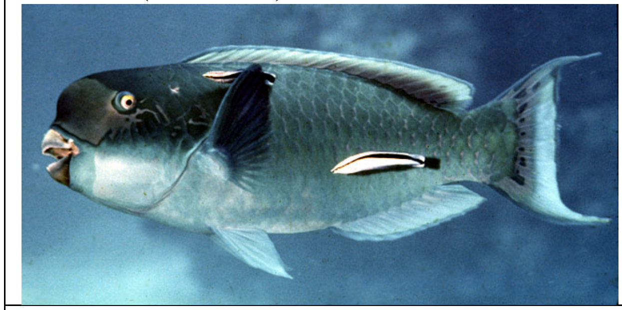
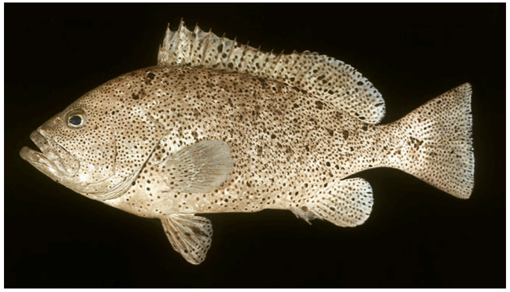
C13	Sparidae	Calamus	calamus	Saucereye Porgy	Antigua
C20	Sparidae	Calamus	pennatula	Pluma Porgy	Antigua
A16	Sphyraenidae	Sphyraena	forsteri	Bigeye Barracuda	Fiji
A7	Sphyraenidae	Sphyraena	genie	Chevron Barracuda	Fiji
C7	Sphyraenidae	Sphyraena	picudilla	Southern Sennet	Antigua

Online Sources:

Osteobase - http://osteobase.mnhn.fr/
Tercerie, S., Bearez, P., Pruvost, P., Bailly, N. & Vignes-Lebbe, R. 2016. Osteobase. World Wide Web electronic publication. osteobase.mnhn.fr
Archaeological Fish Resource - http://fishbone.nottingham.ac.uk/

Appendix B. Descriptions and Images of Major Families

Family	**Diet**	**Common Capture Method**	**Habitat**	**Other Notes**
Acanthuridae (Surgeonfish, Unicornfish) 	Herbivore/omnivore: Algae, detritus, zooplankton	Net	Reef flat, reef edge, lagoon	-slow moving -small mouth -sometimes travels in school
Lethrinidae (Emperor, Bream) 	Carnivore: Fishes, invertebrates	Hook and line	Reef flat, open-sea	-fast moving -large mouth
Mugilidae (Mullet) 	Herbivore/omnivore: Fine algae/detritus from bottom sediments	Net	Lagoons, reef flat Reef edge, offshore reefs	-slow moving -small mouth -travel in schools

Scaridae (Parrotfish) 	Herbivore/omnivore: Thin algal film or stubble on coral rock	Net	Reef flat, reef edge	-slow moving -small mouth -sometimes travels in schools
Serranidae (Grouper) 	Carnivore: Bottom feeding carnivores of fishes, crustaceans	Hook and line	Reef edge, open-sea	-fast moving -large mouth -numerous species within the family, different species living in different habitats
Siganidae (Rabbitfish) 	Herbivore/omnivore: Algae, seagrass, tunicates, sponges	Net	Reef flat	-slow moving -small mouth -some species travel in schools

Sources: (Butler 1994; Lowe 1987; Masse 1986; Myers 1989; Randall et al. 1996; Wheeler and Jones 1989; Images from fishbase.org)

Appendix C. Raw Data

Unit	Level	Mesh Size	Depth/ Feature	Family	Element	Side	Notes
8D	1		10-20 cm	Serranidae	Thoracic	A	
8D	1		10-20 cm	Serranidae	Thoracic	A	
8D	2		20-30 cm	Lethrinidae	Angular	L	
8D	6		60-70 cm	Mugilidae	Thoracic	A	
8D	6		60-70 cm	Carangidae	Dentary	R	
8D	6		60-70 cm	Lethrinidae	Maxilla	R	
8D	6		60-70 cm	Lethrinidae	Ultimate	A	
8D	6		60-70 cm	Labridae	Quadrate	R	
8D	6		NW corner	Scaridae	Quadrate	R	
8D	6		NW corner	Serranidae	Atlas	A	
8D	6		NW corner	Lethrinidae	Scapula	R	
8D	7		70-80 cm	Serranidae	Thoracic	A	
8D	7		70-80 cm	Serranidae	Thoracic	A	
8D	7		70-80 cm	Serranidae	Thoracic	A	
8D	7		70-80 cm	Serranidae	Atlas	A	
8D	7		70-80 cm	Serranidae	Atlas	A	
8D	7		70-80 cm	Serranidae	Premaxilla	R	Fragment
8D	7		70-80 cm	Scaridae	Ultimate	A	
8D	7		70-80 cm	Scaridae	First vertebra	A	
8D	7		70-80 cm	Scaridae	Angular	R	
8D	7		70-80 cm	Scaridae	Premaxilla	L	
8D	7		70-80 cm	Mugilidae	Caudal	A	
8D	7		70-80 cm	Lethrinidae	Thoracic	A	
8D	7		70-80 cm	Lethrinidae	Precaudal	A	
8D	7		70-80 cm	Lethrinidae	Precaudal	A	
8D	7		70-80 cm	Lethrinidae	Precaudal	A	
8D	7		70-80 cm	Lethrinidae	Precaudal	A	
8D	7		Pit feature	Scaridae	Lower pharyngeal	A	
8D	7		Pit feature	Scaridae	Dentary	L	
8D	7		Pit feature	Scaridae	Caudal	A	
8D	7		Pit feature	Scaridae	Caudal	A	
8D	7		Pit feature	Scaridae	Precaudal	A	
8D	7		Pit feature	Labridae	Lower pharyngeal	A	
8D	7		Pit feature	Labridae	Lower pharyngeal	A	

8D	7		Pit feature	Acanthuridae	Caudal	A	
8D	7		Pit feature	Serranidae	Premaxilla	L	
8D	7		Pit feature	Serranidae	Thoracic	A	
8D	7		Pit feature	Serranidae	Thoracic	A	
8D	7		Pit feature	Serranidae	Caudal	A	
8D	7		Pit feature	Serranidae	Caudal	A	
8D	7		Pit feature	Lethrinidae	Palatine	L	
8D	7		Pit feature	Lethrinidae	Palatine	R	
8D	7		Pit feature	Lethrinidae	Premaxilla	L	
8D	7		Pit feature	Lethrinidae	Premaxilla	R	
8D	7		Pit feature	Lethrinidae	Angular	R	
8D	7		Pit feature	Scaridae	Caudal	A	
8D	7		Pit feature	Scombridae	Thoracic	A	
8D	7		Pit feature	Serranidae	Basioccipital	A	
8D	7		Pit feature	Serranidae	Basioccipital	A	
8D	7		Pit feature	Serranidae	Caudal	A	
8D	7		Pit feature	Mugilidae	Precaudal	A	
8D	7		Pit feature	Mugilidae	Caudal	A	
8D	7		Pit feature	Lethrinidae	Thoracic	A	
8D	7		Pit feature	Lethrinidae	Thoracic	A	
8D	7		Pit feature	Lethrinidae	Thoracic	A	
8D	7		Pit feature	Lethrinidae	Precaudal	A	
8D	7		Pit feature	Lethrinidae	Precaudal	A	
8D	7		Pit feature	Lethrinidae	Precaudal	A	
8D	7		Pit feature	Lethrinidae	Precaudal	A	
8D	7		Pit feature	Lethrinidae	Precaudal	A	
8D	7		Pit feature	Lethrinidae	Precaudal	A	
8D	7		Pit feature	Lethrinidae	Caudal	A	
8D	8		80-90 cm	Lethrinidae	Palatine	L	
8D	8		80-90 cm	Lethrinidae	Angular	R	
8D	8		80-90 cm	Scaridae	Caudal	A	
8D	8		80-90 cm	Scaridae	Caudal	A	
8D	8		80-90 cm	Serranidae	Atlas	A	
8D	8		80-90 cm	Serranidae	Thoracic	A	
8D	8		80-90 cm	Serranidae	Thoracic	A	
8D	8		80-90 cm	Lethrinidae	Atlas	A	
8D	8		80-90 cm	Lethrinidae	Precaudal	A	
8D	8		80-90 cm	Lethrinidae	Precaudal	A	
8D	8		80-90 cm	Mugilidae	Caudal	A	

8D	9		90-100 cm	Labridae	Lower pharyngeal	A	
8D	9		90-100 cm	Scaridae	Fourth epibranchial	R	
8D	9		90-100 cm	Scaridae	Lower pharyngeal	A	
8D	9		90-100 cm	Scaridae	Dentary	R	
8D	9		90-100 cm	Serranidae	Precaudal	A	
8D	9		90-100 cm	Lethrinidae	Dentary	R	
8D	9		90-100 cm	Carangidae	Dentary	L	
8D	9		90-100 cm	Lethrinidae	Quadrate	R	
8D	9		90-100 cm	Lethrinidae	Precaudal	A	
8D	10		100-110 cm	Lethrinidae	Angular	L	
8D	10		100-110 cm	Serranidae	Caudal	A	
8D	10		100-110 cm	Lethrinidae	Precaudal	A	
8D	10		100-110 cm	Lethrinidae	Precaudal	A	
8D	10		100-110 cm	Lethrinidae	Caudal	A	
8D	10		100-110 cm	Lethrinidae	Caudal	A	
8D	10		100-110 cm	Lethrinidae	Caudal	A	
9D	4		40-50 cm	Scaridae	Precaudal	A	
9D	4		40-50 cm	Balistidae	Thoracic	A	
9D	4		40-50 cm	Lethrinidae	Precaudal	A	
9D	4		40-50 cm	Mugilidae	Caudal	A	
9D	6		60-70 cm	Serranidae	Precaudal	A	
9D	6		60-70 cm	Serranidae	Precaudal	A	
9D	6		60-70 cm	Scaridae	Caudal	A	
9D	7		70-80 cm	Diodontidae	Upper or lower pharyngeal	A	
9D	7		70-80 cm	Holocentridae	Thoracic	A	
9D	7		70-80 cm	Labridae	Lower pharyngeal	A	
9D	7		70-80 cm	Labridae	Lower pharyngeal	A	
9D	7		70-80 cm	Labridae	Upper pharyngeal	A	
9D	7		70-80 cm	Acanthuridae	Dorsal spine	A	
9D	7		70-80 cm	Acanthuridae	Caudal	A	
9D	7		70-80 cm	Acanthuridae	Caudal	A	
9D	7		70-80 cm	Balistidae	Quadrate	L	
9D	7		70-80 cm	Scaridae	Lower pharyngeal	A	
9D	7		70-80 cm	Scaridae	Lower pharyngeal	A	
9D	7		70-80 cm	Scaridae	Upper pharyngeal	A	
9D	7		70-80 cm	Scaridae	Upper pharyngeal	A	
9D	7		70-80 cm	Scaridae	Upper pharyngeal	A	
9D	7		70-80 cm	Scaridae	Premaxilla	L	

9D	7		70-80 cm	Scaridae	Precaudal	A	
9D	7		70-80 cm	Scaridae	Precaudal	A	
9D	7		70-80 cm	Scaridae	Precaudal	A	
9D	7		70-80 cm	Scaridae	Precaudal	A	
9D	7		70-80 cm	Scaridae	Precaudal	A	
9D	7		70-80 cm	Scaridae	Caudal	A	
9D	7		70-80 cm	Serranidae	Premaxilla	L	
9D	7		70-80 cm	Serranidae	Dentary	R	
9D	7		70-80 cm	Serranidae	Thoracic	A	
9D	7		70-80 cm	Serranidae	Thoracic	A	
9D	7		70-80 cm	Serranidae	Thoracic	A	
9D	7		70-80 cm	Serranidae	Precaudal	A	
9D	7		70-80 cm	Serranidae	Precaudal	A	
9D	7		70-80 cm	Serranidae	Caudal	A	
9D	7		70-80 cm	Serranidae	Quadrate	L	
9D	7		70-80 cm	Lethrinidae	Angular	R	
9D	7		70-80 cm	Lethrinidae	Premaxilla	L	
9D	7		70-80 cm	Lethrinidae	Thoracic	A	
9D	7		70-80 cm	Lethrinidae	Thoracic	A	
9D	7		70-80 cm	Scaridae	Caudal	A	
9D	7		70-80 cm	Mugilidae	Precaudal	A	
9D	7		70-80 cm	Mugilidae	Caudal	A	
9D	7		70-80 cm	Lethrinidae	Atlas	A	
9D	7		70-80 cm	Lethrinidae	Thoracic	A	
9D	7		70-80 cm	Lethrinidae	Precaudal	A	
9D	7		70-80 cm	Lethrinidae	Precaudal	A	
9D	7		70-80 cm	Lethrinidae	Caudal	A	
9D	7		70-80 cm	Siganidae	Caudal	A	
9D	8		80-90 cm	Diodontidae	Spine		
9D	8		80-90 cm	Scaridae	Upper pharyngeal	A	
9D	8		80-90 cm	Scaridae	Upper pharyngeal	A	
9D	8		80-90 cm	Scaridae	Lower pharyngeal	A	
9D	8		80-90 cm	Scaridae	Fourth epibranchial	L	
9D	8		80-90 cm	Scaridae	Precaudal	A	
9D	8		80-90 cm	Scaridae	Precaudal	A	
9D	8		80-90 cm	Scaridae	Precaudal	A	
9D	8		80-90 cm	Scaridae	Caudal	A	
9D	8		80-90 cm	Acanthuridae	Caudal	A	

9D	8		80-90 cm	Acanthuridae	Caudal	A	
9D	8		80-90 cm	Serranidae	Atlas	A	
9D	8		80-90 cm	Serranidae	Atlas	A	
9D	8		80-90 cm	Serranidae	Dentary	R	
9D	8		80-90 cm	Serranidae	Precaudal	A	
9D	8		80-90 cm	Serranidae	Precaudal	A	
9D	8		80-90 cm	Serranidae	Precaudal	A	
9D	8		80-90 cm	Serranidae	Caudal	A	
9D	8		80-90 cm	Serranidae	Thoracic	A	
9D	8		80-90 cm	Serranidae	Thoracic	A	
9D	8		80-90 cm	Serranidae	Quadrate	L	
9D	8		80-90 cm	Scaridae	Caudal	A	
9D	8		80-90 cm	Scaridae	Caudal	A	
9D	8		80-90 cm	Scaridae	Caudal	A	
9D	8		80-90 cm	Scaridae	Thoracic	A	
9D	8		80-90 cm	Serranidae	Atlas	A	
9D	8		80-90 cm	Serranidae	Caudal	A	
9D	8		80-90 cm	Serranidae	Posttemporal	R	
9D	8		80-90 cm	Mugilidae	Caudal	A	
9D	8		80-90 cm	Mullidae	Precaudal	A	
9D	8		80-90 cm	Mullidae	Precaudal	A	
9D	8		80-90 cm	Lethrinidae	Atlas	A	
9D	8		80-90 cm	Lethrinidae	Thoracic	A	
9D	8		80-90 cm	Lethrinidae	Thoracic	A	
9D	8		80-90 cm	Lethrinidae	Thoracic	A	
9D	8		80-90 cm	Lethrinidae	Precaudal	A	
9D	8		80-90 cm	Lethrinidae	Precaudal	A	
9D	8		80-90 cm	Lethrinidae	Precaudal	A	
9D	8		80-90 cm	Lethrinidae	Caudal	A	
9D	8		80-90 cm	Lethrinidae	Caudal	A	
9D	8		80-90 cm	Lethrinidae	Caudal	A	
9D	8		80-90 cm	Scombridae	Caudal	A	
9D	9		90-100 cm	Acanthuridae	Caudal	A	
9D	9		90-100 cm	Labridae	Lower pharyngeal	A	
9D	9		90-100 cm	Scaridae	Caudal	A	
9D	9		90-100 cm	Scaridae	Caudal	A	
9D	9		90-100 cm	Diodontidae	Spine		
9D	9		90-100 cm	Serranidae	Vomer	A	
9D	9		90-100 cm	Serranidae	Thoracic	A	

9D	9		90-100 cm	Mugilidae	Thoracic	A	
9D	9		90-100 cm	Siganidae	Caudal	A	
9D	9		90-100 cm	Scombridae	Thoracic	A	
9D	9		90-100 cm	Serranidae	Angular	R	
9D	9		90-100 cm	Lethrinidae	Atlas	A	
9D	9		90-100 cm	Lethrinidae	Basioccipital	A	
9D	9		90-100 cm	Lethrinidae	Thoracic	A	
9D	9		90-100 cm	Lethrinidae	Precaudal	A	
9D	9		90-100 cm	Lethrinidae	Precaudal	A	
9D	9		90-100 cm	Lethrinidae	Caudal	A	
9D	9		90-100 cm	Lethrinidae	Caudal	A	
9D	9		90-100 cm	Lethrinidae	Hyomandibular	L	
9D	10		100-110 cm	Serranidae	Thoracic	A	
9D	10		100-110 cm	Mugilidae	Thoracic	A	
9D	10		100-110 cm	Lethrinidae	Palatine	L	
9D	10		100-110 cm	Lethrinidae	Thoracic	A	
9D	10		100-110 cm	Lethrinidae	Thoracic	A	
9D	10		100-110 cm	Acanthuridae	Premaxilla	L	
9D	10		100-110 cm	Mugilidae	Caudal	A	
9D	10		100-110 cm	Lethrinidae	Atlas	A	
9D	10		100-110 cm	Lethrinidae	Atlas	A	
9D	10		100-110 cm	Lethrinidae	Thoracic	A	
9D	10		100-110 cm	Lethrinidae	Precaudal	A	
9D	10		100-110 cm	Lethrinidae	Precaudal	A	
9D	10		100-110 cm	Lethrinidae	Caudal	A	
9D	10		100-110 cm	Lethrinidae	Caudal	A	
9D	11		110-120 cm	Acanthuridae	Dorsal spine	A	
9D	11		110-120 cm	Acanthuridae	Scute		
9D	11		110-120 cm	Acanthuridae	Caudal	A	
9D	11		110-120 cm	Acanthuridae	Caudal	A	
9D	11		110-120 cm	Holocentridae	Thoracic	A	
9D	11		110-120 cm	Scaridae	Lower pharyngeal	A	
9D	11		110-120 cm	Scaridae	Atlas	A	
9D	11		110-120 cm	Scaridae	Caudal	A	
9D	11		110-120 cm	Scaridae	Caudal	A	
9D	11		110-120 cm	Scaridae	Precaudal	A	
9D	11		110-120 cm	Scaridae	Quadrate	R	
9D	11		110-120 cm	Serranidae	Thoracic	A	
9D	11		110-120 cm	Serranidae	Thoracic	A	

9D	11		110-120 cm	Serranidae	Thoracic	A	
9D	11		110-120 cm	Serranidae	Thoracic	A	
9D	11		110-120 cm	Serranidae	Thoracic	A	
9D	11		110-120 cm	Serranidae	Thoracic	A	
9D	11		110-120 cm	Serranidae	Precaudal	A	
9D	11		110-120 cm	Serranidae	Precaudal	A	
9D	11		110-120 cm	Serranidae	Precaudal	A	
9D	11		110-120 cm	Lethrinidae	Thoracic	A	
9D	11		110-120 cm	Lethrinidae	Quadrate	R	
9D	11		110-120 cm	Lethrinidae	Premaxilla	R	
9D	11		110-120 cm	Lethrinidae	Premaxilla	L	
9D	11		110-120 cm	Mugilidae	Thoracic	A	
9D	11		110-120 cm	Mugilidae	Thoracic	A	
9D	11		110-120 cm	Scaridae	Caudal	A	
9D	11		110-120 cm	Scaridae	Caudal	A	
9D	11		110-120 cm	Scaridae	Precaudal	A	
9D	11		110-120 cm	Siganidae	Caudal	A	
9D	11		110-120 cm	Holocentridae	Dentary	L	
9D	11		110-120 cm	Lethrinidae	Thoracic	A	
9D	11		110-120 cm	Lethrinidae	Precaudal	A	
9D	11		110-120 cm	Lethrinidae	Precaudal	A	
9D	11		110-120 cm	Lethrinidae	Caudal	A	
9D	11		110-120 cm	Lethrinidae	Caudal	A	
9D	11		110-120 cm	Lethrinidae	Caudal	A	
9D	11		110-120 cm	Lethrinidae	Caudal	A	
9D	11		110-120 cm	Mugilidae	Caudal	A	
9D	11		110-120 cm	Serranidae	Caudal	A	
9D	11		110-120 cm	Serranidae	Caudal	A	
9D	11		110-120 cm	Siganidae	Thoracic	A	
10D	Surface		0-10 cm	Serranidae	Thoracic	A	
10D	1		10-20 cm	Labridae	Upper Pharyngeal	A	
10D	1		10-20 cm	Serranidae	Thoracic	A	
10D	1		10-20 cm	Serranidae	Thoracic	A	
10D	1		10-20 cm	Lethrinidae	Thoracic	A	
10D	1		10-20 cm	Lethrinidae	Thoracic	A	
10D	1		10-20 cm	Lethrinidae	Precaudal	A	
10D	1		10-20 cm	Lethrinidae	Precaudal	A	
10D	1		10-20 cm	Lethrinidae	Quadrate	R	
10D	1		10-20 cm	Lethrinidae	Hyomandibular	L	

10D	1		10-20 cm	Serranidae	Precaudal	A	
10D	1		10-20 cm	Muraenidae	Caudal	A	
10D	1		10-20 cm	Serranidae	Thoracic	A	
10D	3		30-40 cm	Serranidae	Thoracic	A	
10D	3		30-40 cm	Scaridae	Precaudal	A	
10D	3		30-40 cm	Muraenidae	Caudal	A	
10D	3		30-40 cm	Acanthuridae	Caudal	A	
10D	5		50-60 cm	Diodontidae	Spine		
10D	5		50-60 cm	Lethrinidae	Caudal	A	
10D	5		50-60 cm	Scaridae	Precaudal	A	
10D	6		60-70 cm	Diodontidae	Spine		
10D	6		60-70 cm	Scaridae	Dentary	L	
10D	6		60-70 cm	Lethrinidae	Palatine	R	
10D	6		60-70 cm	Lethrinidae	Palatine	L	
10D	6		60-70 cm	Serranidae	Premaxilla	R	
10D	6		60-70 cm	Serranidae	Premaxilla	L	
10D	6		60-70 cm	Serranidae	Thoracic	A	
10D	6		60-70 cm	Serranidae	Thoracic	A	
10D	6		60-70 cm	Acanthuridae	Precaudal	A	
10D	6		60-70 cm	Acanthuridae	Caudal	A	
10D	6		60-70 cm	Acanthuridae	Caudal	A	
10D	6		60-70 cm	Siganidae	Precaudal	A	
10D	6		60-70 cm	Siganidae	Caudal	A	
10D	6		60-70 cm	Siganidae	Caudal	A	
10D	6		60-70 cm	Siganidae	Caudal	A	
10D	6		60-70 cm	Scaridae	Precaudal	A	
10D	6		60-70 cm	Scaridae	Caudal	A	
10D	6		60-70 cm	Scaridae	Caudal	A	
10D	6		60-70 cm	Scaridae	Caudal	A	
10D	6		60-70 cm	Serranidae	Thoracic	A	
10D	6		60-70 cm	Serranidae	Precaudal	A	
10D	6		60-70 cm	Serranidae	Precaudal	A	
10D	6		60-70 cm	Serranidae	Precaudal	A	
10D	6		60-70 cm	Serranidae	Precaudal	A	
10D	6		60-70 cm	Serranidae	Caudal	A	
10D	6		60-70 cm	Serranidae	Quadrate	R	
10D	6		60-70 cm	Serranidae	Angular	L	
10D	6		60-70 cm	Mugilidae	Caudal	A	
10D	6		60-70 cm	Lethrinidae	Quadrate	R	

10D	6		60-70 cm	Lethrinidae	Angular	L	
10D	6		60-70 cm	Lethrinidae	Atlas	A	
10D	6		60-70 cm	Lethrinidae	Thoracic	A	
10D	6		60-70 cm	Lethrinidae	Thoracic	A	
10D	6		60-70 cm	Lethrinidae	Thoracic	A	
10D	6		60-70 cm	Lethrinidae	Precaudal	A	large
10D	6		60-70 cm	Lethrinidae	Precaudal	A	
10D	6		60-70 cm	Lethrinidae	Caudal	A	
10D	6		60-70 cm	Lethrinidae	Caudal	A	
10D	6		60-70 cm	Scombridae	Caudal	A	Fragment
10D	8		80-90 cm	Scaridae	Lower pharyngeal	A	
10D	8		80-90 cm	Scaridae	Lower pharyngeal	A	
10D	8		80-90 cm	Scaridae	Lower pharyngeal	A	
10D	8		80-90 cm	Scaridae	Lower pharyngeal	A	
10D	8		80-90 cm	Scaridae	Upper Pharyngeal	A	
10D	8		80-90 cm	Scaridae	Precaudal	A	
10D	8		80-90 cm	Serranidae	Vomer	A	
10D	8		80-90 cm	Serranidae	Caudal	A	
10D	8		80-90 cm	Serranidae	Precaudal	A	
10D	8		80-90 cm	Serranidae	Thoracic	A	
10D	8		80-90 cm	Serranidae	Thoracic	A	
10D	8		80-90 cm	Lethrinidae	Premaxilla	L	
10D	8		80-90 cm	Mugilidae	Caudal	A	
10D	8		80-90 cm	Mugilidae	Caudal	A	
10D	8		80-90 cm	Mugilidae	Caudal	A	
10D	8		80-90 cm	Lethrinidae	Epihyal	L	
10D	8		80-90 cm	Lethrinidae	Atlas	A	
10D	8		80-90 cm	Lethrinidae	Thoracic	A	
10D	8		80-90 cm	Lethrinidae	Precaudal	A	
10D	8		80-90 cm	Lethrinidae	Precaudal	A	
10D	8		80-90 cm	Lethrinidae	Precaudal	A	
10D	8		80-90 cm	Lethrinidae	Precaudal	A	
10D	8		80-90 cm	Lethrinidae	Precaudal	A	
10D	8		80-90 cm	Lethrinidae	Caudal	A	
10D	8		80-90 cm	Lethrinidae	Caudal	A	
10D	8		80-90 cm	Lethrinidae	Caudal	A	
10D	8		80-90 cm	Siganidae	Caudal	A	
10D	8		80-90 cm	Siganidae	Caudal	A	
10D	8		80-90 cm	Siganidae	Caudal	A	

10D	8		80-90 cm	Scaridae	Precaudal	A	
10D	8		80-90 cm	Scaridae	Caudal	A	
10D	8		80-90 cm	Scaridae	Caudal	A	
10D	8		80-90 cm	Scaridae	Caudal	A	
10D	8		80-90 cm	Serranidae	Hyomandibular	L	
10D	8		80-90 cm	Serranidae	Caudal	A	
10D	8		80-90 cm	Serranidae	Caudal	A	
10D	8		80-90 cm	Serranidae	Caudal	A	
10D	8		80-90 cm	Carangidae	Thoracic	A	
10D	9		90-100 cm	Labridae	Lower pharyngeal	A	
10D	9		90-100 cm	Lethrinidae	Vomer	A	
10D	9		90-100 cm	Labridae	Thoracic	A	
10D	9		90-100 cm	Siganidae	Precaudal	A	
10D	9		90-100 cm	Mugilidae	Thoracic	A	
10D	9		90-100 cm	Lethrinidae	Epihyal	L	
10D	9		90-100 cm	Lethrinidae	Ceratohyal	R	
10D	9		90-100 cm	Lethrinidae	Quadrate	R	
10D	9		90-100 cm	Lethrinidae	Angular	R	
10D	9		90-100 cm	Lethrinidae	Basioccipital	A	
10D	9		90-100 cm	Lethrinidae	Thoracic	A	
10D	9		90-100 cm	Lethrinidae	Precaudal	A	
10D	9		90-100 cm	Lethrinidae	Precaudal	A	
10D	9		90-100 cm	Lethrinidae	Precaudal	A	
10D	9		90-100 cm	Lethrinidae	Precaudal	A	
10D	9		90-100 cm	Lethrinidae	Caudal	A	
10D	9		90-100 cm	Serranidae	Precaudal	A	
10D	9		90-100 cm	Serranidae	Precaudal	A	
10D	9		90-100 cm	Serranidae	Caudal	A	
10D	9		90-100 cm	Scaridae	Precaudal	A	
10D	9		90-100 cm	Scaridae	Caudal	A	
10D	9		90-100 cm	Scaridae	Caudal	A	
10D	9		90-100 cm	Mullidae	Precaudal	A	
10D	9		90-100 cm	Mullidae	Caudal	A	
10D	9		90-100 cm	Holocentridae	Quadrate	R	
10D	10		100-110 cm	Labridae	Upper Pharyngeal	A	
10D	10		100-110 cm	Serranidae	Thoracic	A	
10D	10		100-110 cm	Serranidae	Thoracic	A	
10D	10		100-110 cm	Serranidae	Palatine	R	
10D	10		100-110 cm	Lethrinidae	Premaxilla	R	

10D	10		100-110 cm	Scaridae	Precaudal	A	
10D	10		100-110 cm	Serranidae	Basioccipital	A	
10D	10		100-110 cm	Serranidae	Thoracic	A	Fragment
10D	10		100-110 cm	Mugilidae	Precaudal	A	Fragment
10D	10		100-110 cm	Lethrinidae	Atlas	A	
10D	10		100-110 cm	Lethrinidae	Thoracic	A	
10D	10		100-110 cm	Lethrinidae	Precaudal	A	
10D	10		100-110 cm	Lethrinidae	Precaudal	A	
10D	10		100-110 cm	Lethrinidae	Caudal	A	
10D	10		100-110 cm	Lethrinidae	Caudal	A	
10D	10		100-110 cm	Lethrinidae	Quadrate	R	
10D	10		100-110 cm	Lethrinidae	Dentary	R	Fragment
10D	10		100-110 cm	Lethrinidae	Scapula	R	
10D	10		100-110 cm	Scombridae	Thoracic	A	
10D	10		100-110 cm	Scombridae	Caudal	A	
10D	10		100-110 cm	Scombridae	Caudal	A	
10D	10		100-110 cm	Mullidae	Precaudal	A	
10D	10		100-110 cm	Mullidae	Caudal	A	
10D	11		110-120 cm	Labridae	Lower pharyngeal	A	
10D	11		110-120 cm	Scaridae	Lower pharyngeal	A	
10D	11		110-120 cm	Scaridae	Fourth epibranchial	R	
10D	11		110-120 cm	Scaridae	Atlas	A	
10D	11		110-120 cm	Lethrinidae	Premaxilla	L	
10D	11		110-120 cm	Lethrinidae	Urohyal	A	
10D	11		110-120 cm	Acanthuridae	Precaudal	A	
10D	11		110-120 cm	Siganidae	Caudal	A	
10D	11		110-120 cm	Mugilidae	Caudal	A	
10D	11		110-120 cm	Mugilidae	Caudal	A	
10D	11		110-120 cm	Mugilidae	Caudal	A	
10D	11		110-120 cm	Serranidae	Angular	R	
10D	11		110-120 cm	Serranidae	Atlas	A	
10D	11		110-120 cm	Serranidae	Thoracic	A	
10D	11		110-120 cm	Lethrinidae	Precaudal	A	
10D	11		110-120 cm	Lethrinidae	Precaudal	A	
10D	11		110-120 cm	Lethrinidae	Precaudal	A	
10D	11		110-120 cm	Lethrinidae	Precaudal	A	
10D	11		110-120 cm	Lethrinidae	Angular	R	
10D	11		110-120 cm	Lethrinidae	Angular	R	

10D	11		110-120 cm	Lethrinidae	Angular	L	
10D	11		110-120 cm	Lethrinidae	Quadrate	L	
10D	11		110-120 cm	Scaridae	Caudal	A	
10D	11		110-120 cm	Scaridae	Precaudal	A	
10D	12		120-130 cm	Acanthuridae	Scute		
10D	12		120-130 cm	Labridae	Upper Pharyngeal	A	
10D	12		120-130 cm	Serranidae	Vomer	A	
10D	12		120-130 cm	Serranidae	Atlas	A	
10D	12		120-130 cm	Serranidae	Atlas	A	
10D	12		120-130 cm	Lethrinidae	Dentary	L	
10D	12		120-130 cm	Scaridae	Caudal	A	
10D	12		120-130 cm	Lethrinidae	Atlas	A	
10D	12		120-130 cm	Lethrinidae	Thoracic	A	
10D	12		120-130 cm	Lethrinidae	Precaudal	A	
10D	12		120-130 cm	Lethrinidae	Precaudal	A	
10D	12		120-130 cm	Lethrinidae	Caudal	A	
10D	12		120-130 cm	Lethrinidae	Caudal	A	
10D	12		120-130 cm	Lethrinidae	Premaxilla	R	fragment
10D	12		120-130 cm	Lethrinidae	Quadrate	L	
10D	12		120-130 cm	Serranidae	Quadrate	R	
10D	12		120-130 cm	Serranidae	Quadrate	L	
10D	12		120-130 cm	Serranidae	Precaudal	A	
10D	12		120-130 cm	Serranidae	Precaudal	A	
10D	12		120-130 cm	Serranidae	Caudal	A	
10D	13		130-140 cm	Serranidae	Thoracic	A	
10D	13		130-140 cm	Lethrinidae	Premaxilla	L	
10D	13		130-140 cm	Scaridae	Precaudal	A	
10D	13		130-140 cm	Holocentridae	Thoracic	A	
10D	13		130-140 cm	Lethrinidae	Caudal	A	
10D	13		130-140 cm	Lethrinidae	Caudal	A	
10D	13		130-140 cm	Lethrinidae	Thoracic	A	
10D	13		130-140 cm	Lethrinidae	Premaxilla	L	
10D	13		130-140 cm	Lethrinidae	Premaxilla	L	
10D	13		130-140 cm	Mugilidae	Thoracic	A	
10D	13		130-140 cm	Serranidae	Quadrate	R	
10D	14		140-150 cm	Serranidae	Thoracic	A	
10D	14		140-150 cm	Scaridae	Precaudal	A	
10D	14		140-150 cm	Scaridae	Caudal	A	
10D	14		140-150 cm	Scaridae	Caudal	A	

10D	14		140-150 cm	Siganidae	Caudal	A	
10D	14		140-150 cm	Acanthuridae	Caudal	A	
10D	14		140-150 cm	Lethrinidae	Thoracic	A	
10D	14		140-150 cm	Lethrinidae	Precaudal	A	
10D	14		140-150 cm	Serranidae	Caudal	A	
10D	14		140-150 cm	Serranidae	Caudal	A	
10D	14		140-150 cm	Serranidae	Caudal	A	
10D	14		140-150 cm	Mullidae	Caudal	A	
10D	15		150-160 cm	Scaridae	Caudal	A	
10D	15		150-160 cm	Acanthuridae	Precaudal	A	
10D	15		150-160 cm	Scombridae	Precaudal	A	
10D	15		150-160 cm	Scombridae	Caudal	A	
10D	15		150-160 cm	Scombridae	Caudal	A	
10D	15		150-160 cm	Lethrinidae	Atlas	A	
10D	15		150-160 cm	Lethrinidae	Atlas	A	
10D	15		150-160 cm	Lethrinidae	Atlas	A	
10D	15		150-160 cm	Lethrinidae	Atlas	A	
10D	15		150-160 cm	Lethrinidae	Atlas	A	
10D	15		150-160 cm	Lethrinidae	Thoracic	A	
10D	15		150-160 cm	Lethrinidae	Thoracic	A	
10D	15		150-160 cm	Lethrinidae	Precaudal	A	
10D	15		150-160 cm	Lethrinidae	Precaudal	A	
10D	15		150-160 cm	Lethrinidae	Caudal	A	
10D	15		150-160 cm	Lethrinidae	Basioccipital	A	
10D	15		150-160 cm	Lethrinidae	Basioccipital	A	
10D	15		150-160 cm	Lethrinidae	Palatine	L	
10D	15		150-160 cm	Lethrinidae	Premaxilla	L	
10D	15		150-160 cm	Lethrinidae	Premaxilla	L	
10D	15		150-160 cm	Lethrinidae	Dentary	L	
10D	15		150-160 cm	Lethrinidae	Dentary	R	
10D	15		150-160 cm	Lethrinidae	Dentary	NA	Fragment
10D	15		150-160 cm	Carangidae	Caudal	A	Small
10D	15		150-160 cm	Serranidae	Thoracic	A	
10D	15		150-160 cm	Serranidae	Thoracic	A	
10D	15		150-160 cm	Serranidae	Thoracic	A	
10D	15		150-160 cm	Serranidae	Precaudal	A	
10D	15		150-160 cm	Serranidae	Caudal	A	
10D	15		150-160 cm	Serranidae	Caudal	A	
10D	15		150-160 cm	Serranidae	Maxilla	R	

10D	15		150-160 cm	Serranidae	Premaxilla	L	Fragment
10D	15		150-160 cm	Serranidae	Basioccipital	A	
10D	15		150-160 cm	Shark	Vertebra	A	
10D	16		160-170 cm	Scaridae	Upper Pharyngeal	A	
10D	16		160-170 cm	Scaridae	Lower pharyngeal	A	
10D	16		160-170 cm	Scaridae	Fourth epibranchial	R	
10D	16		160-170 cm	Lethrinidae	Palatine	L	
10D	16		160-170 cm	Lethrinidae	Palatine	L	
10D	16		160-170 cm	Lethrinidae	Palatine	L	
10D	16		160-170 cm	Lethrinidae	Vomer	A	
10D	16		160-170 cm	Lethrinidae	Premaxilla	R	
10D	16		160-170 cm	Lethrinidae	Premaxilla	R	
10D	16		160-170 cm	Serranidae	Premaxilla	R	
10D	16		160-170 cm	Serranidae	Precaudal	A	
10D	16		160-170 cm	Serranidae	Caudal	A	
10D	16		160-170 cm	Serranidae	Caudal	A	
10D	16		160-170 cm	Lethrinidae	Quadrate	R	
10D	16		160-170 cm	Lethrinidae	Quadrate	L	
10D	16		160-170 cm	Lethrinidae	Quadrate	L	
10D	16		160-170 cm	Lethrinidae	Basioccipital	A	
10D	16		160-170 cm	Lethrinidae	Thoracic	A	
10D	16		160-170 cm	Lethrinidae	Thoracic	A	
10D	16		160-170 cm	Lethrinidae	Thoracic	A	
10D	16		160-170 cm	Lethrinidae	Thoracic	A	
10D	16		160-170 cm	Lethrinidae	Precaudal	A	
10D	16		160-170 cm	Lethrinidae	Precaudal	A	
10D	16		160-170 cm	Lethrinidae	Precaudal	A	
10D	16		160-170 cm	Lethrinidae	Precaudal	A	
10D	16		160-170 cm	Lethrinidae	Precaudal	A	
10D	16		160-170 cm	Lethrinidae	Caudal	A	
10D	16		160-170 cm	Serranidae	Posttemporal	L	
10D	16		160-170 cm	Scaridae	Precaudal	A	
11D	12		120-130 cm	Acanthuridae	Caudal	A	
11D	12		120-130 cm	Muraenidae	Precaudal	A	
11D	12		120-130 cm	Muraenidae	Precaudal	A	
11D	12		120-130 cm	Scaridae	Precaudal	A	
11D	12		120-130 cm	Scaridae	Precaudal	A	
11D	12		120-130 cm	Scaridae	Caudal	A	

11D	12		120-130 cm	Scaridae	Atlas	A	
11D	12		120-130 cm	Scaridae	Maxilla	R	
11D	12		120-130 cm	Mullidae	Caudal	A	
11D	12		120-130 cm	Serranidae	Dentary	R	
11D	12		120-130 cm	Serranidae	Premaxilla	R	
11D	12		120-130 cm	Serranidae	Quadrate	L	
11D	12		120-130 cm	Serranidae	Thoracic	A	
11D	12		120-130 cm	Serranidae	Thoracic	A	
11D	12		120-130 cm	Serranidae	Caudal	A	
11D	12		120-130 cm	Serranidae	Precaudal	A	
11D	12		120-130 cm	Lethrinidae	Caudal	A	
11D	12		120-130 cm	Lethrinidae	Caudal	A	
11D	12		120-130 cm	Lethrinidae	Precaudal	A	
11D	12		120-130 cm	Lethrinidae	Angular	L	
11D	12		120-130 cm	Lethrinidae	Angular	L	
11D	12		120-130 cm	Lethrinidae	Dentary	R	Fragment
11D	13		130-140 cm	Labridae	Lower pharyngeal	A	
11D	13		130-140 cm	Scombridae	Thoracic	A	
11D	13		130-140 cm	Scaridae	Lower pharyngeal	A	
11D	13		130-140 cm	Scaridae	Precaudal	A	
11D	13		130-140 cm	Scaridae	Precaudal	A	
11D	13		130-140 cm	Scaridae	Precaudal	A	
11D	13		130-140 cm	Scaridae	Caudal	A	
11D	13		130-140 cm	Scaridae	Caudal	A	
11D	13		130-140 cm	Serranidae	Caudal	A	
11D	13		130-140 cm	Serranidae	Angular	L	
11D	13		130-140 cm	Lethrinidae	Atlas	A	
11D	13		130-140 cm	Lethrinidae	Thoracic	A	
11D	13		130-140 cm	Lethrinidae	Thoracic	A	
11D	13		130-140 cm	Lethrinidae	Thoracic	A	
11D	13		130-140 cm	Lethrinidae	Precaudal	A	
11D	13		130-140 cm	Lethrinidae	Precaudal	A	
11D	13		130-140 cm	Lethrinidae	Precaudal	A	
11D	13		130-140 cm	Lethrinidae	Caudal	A	
11D	13		130-140 cm	Lethrinidae	Caudal	A	
11D	13		130-140 cm	Lethrinidae	Palatine	L	
11D	13		130-140 cm	Holocentridae	Premaxilla	L	
11D	14		140-150 cm	Labridae	Upper pharyngeal	A	
11D	14		140-150 cm	Scaridae	Premaxilla	L	

11D	14		140-150 cm	Scaridae	Caudal	A	
11D	14		140-150 cm	Scaridae	Caudal	A	
11D	14		140-150 cm	Scaridae	Precaudal	A	
11D	14		140-150 cm	Scaridae	Lower pharyngeal	A	
11D	14		140-150 cm	Serranidae	Dentary	R	
11D	14		140-150 cm	Serranidae	Dentary	L	
11D	14		140-150 cm	Serranidae	Premaxilla	R	
11D	14		140-150 cm	Serranidae	Thoracic	A	
11D	14		140-150 cm	Lethrinidae	Atlas	A	
11D	14		140-150 cm	Lethrinidae	Thoracic	A	
11D	14		140-150 cm	Lethrinidae	Thoracic	A	
11D	14		140-150 cm	Lethrinidae	Precaudal	A	
11D	14		140-150 cm	Lethrinidae	Precaudal	A	
11D	14		140-150 cm	Lethrinidae	Precaudal	A	
11D	14		140-150 cm	Lethrinidae	Caudal	A	
11D	14		140-150 cm	Lethrinidae	Caudal	A	
11D	14		140-150 cm	Lethrinidae	Caudal	A	
11D	14		140-150 cm	Lethrinidae	Premaxilla	R	
11D	15		150-160 cm	Labridae	Lower pharyngeal	A	
11D	15		150-160 cm	Scombridae	Thoracic	A	
11D	15		150-160 cm	Holocentridae	Thoracic	A	
11D	15		150-160 cm	Serranidae	Premaxilla	R	Fragment
11D	15		150-160 cm	Serranidae	Thoracic	A	
11D	15		150-160 cm	Scaridae	Caudal	A	
11D	15		150-160 cm	Scaridae	Caudal	A	
11D	15		150-160 cm	Scaridae	Caudal	A	
11D	15		150-160 cm	Scaridae	Precaudal	A	
11D	15		150-160 cm	Scaridae	Lower pharyngeal	A	
11D	15		150-160 cm	Scaridae	Upper pharyngeal	A	
11D	15		150-160 cm	Lethrinidae	Atlas	A	
11D	15		150-160 cm	Lethrinidae	Atlas	A	
11D	15		150-160 cm	Lethrinidae	Thoracic	A	
11D	15		150-160 cm	Lethrinidae	Thoracic	A	
11D	15		150-160 cm	Lethrinidae	Precaudal	A	
11D	15		150-160 cm	Lethrinidae	Precaudal	A	
11D	15		150-160 cm	Lethrinidae	Precaudal	A	
11D	15		150-160 cm	Lethrinidae	Precaudal	A	
11D	15		150-160 cm	Lethrinidae	Caudal	A	
11D	15		150-160 cm	Lethrinidae	Caudal	A	

11D	15		150-160 cm	Lethrinidae	Caudal	A	
11D	15		150-160 cm	Lethrinidae	Caudal	A	
11D	15		150-160 cm	Lethrinidae	Caudal	A	
11D	15		150-160 cm	Lethrinidae	Caudal	A	
11D	15		150-160 cm	Lethrinidae	Quadrate	R	
11D	15		150-160 cm	Lethrinidae	Dentary	R	
11D	15		150-160 cm	Lethrinidae	Premaxilla	NA	Fragment
11D	15		150-160 cm	Lethrinidae	Angular	R	
11D	15		150-160 cm	Lethrinidae	Ceratohyal	L	
11D	16		160-170 cm	Scombridae	Thoracic	A	
11D	16		160-170 cm	Labridae	Thoracic	A	
11D	16		160-170 cm	Scaridae	Caudal	A	
11D	16		160-170 cm	Scaridae	Caudal	A	
11D	16		160-170 cm	Scaridae	Caudal	A	
11D	16		160-170 cm	Scaridae	Precaudal	A	
11D	16		160-170 cm	Scaridae	Precaudal	A	
11D	16		160-170 cm	Scaridae	Lower pharyngeal	A	
11D	16		160-170 cm	Scaridae	Upper pharyngeal	A	
11D	16		160-170 cm	Carangidae	Caudal	A	
11D	16		160-170 cm	Carangidae	Caudal	A	
11D	16		160-170 cm	Serranidae	Thoracic	A	
11D	16		160-170 cm	Serranidae	Thoracic	A	
11D	16		160-170 cm	Serranidae	Caudal	A	
11D	16		160-170 cm	Serranidae	Caudal	A	
11D	16		160-170 cm	Serranidae	Premaxilla	R	
11D	16		160-170 cm	Serranidae	Dentary	L	
11D	16		160-170 cm	Serranidae	Angular	L	
11D	16		160-170 cm	Serranidae	Scapula	R	
11D	16		160-170 cm	Lethrinidae	Palatine	R	
11D	16		160-170 cm	Lethrinidae	Palatine	R	
11D	16		160-170 cm	Lethrinidae	Palatine	L	
11D	16		160-170 cm	Lethrinidae	Maxilla	L	
11D	16		160-170 cm	Lethrinidae	Premaxilla	R	Fragment
11D	16		160-170 cm	Lethrinidae	Premaxilla	R	
11D	16		160-170 cm	Lethrinidae	Scapula	R	
11D	16		160-170 cm	Lethrinidae	Epihyal	L	
11D	16		160-170 cm	Lethrinidae	Posttemporal	R	
11D	16		160-170 cm	Lethrinidae	Angular	L	
11D	16		160-170 cm	Lethrinidae	Atlas	A	

11D	16		160-170 cm	Lethrinidae	Thoracic	A	
11D	16		160-170 cm	Lethrinidae	Thoracic	A	
11D	16		160-170 cm	Lethrinidae	Thoracic	A	
11D	16		160-170 cm	Lethrinidae	Precaudal	A	
11D	16		160-170 cm	Lethrinidae	Precaudal	A	
11D	16		160-170 cm	Lethrinidae	Precaudal	A	
11D	16		160-170 cm	Lethrinidae	Precaudal	A	
11D	16		160-170 cm	Lethrinidae	Precaudal	A	
11D	16		160-170 cm	Lethrinidae	Precaudal	A	
11D	16		160-170 cm	Lethrinidae	Precaudal	A	
11D	16		160-170 cm	Lethrinidae	Caudal	A	
11D	16		160-170 cm	Lethrinidae	Caudal	A	
11D	16		160-170 cm	Lethrinidae	Caudal	A	
11D	17/18		170-190 cm	Scombridae	Caudal	A	
11D	17/18		170-190 cm	Holocentridae	Thoracic	A	
11D	17/18		170-190 cm	Labridae	Maxilla	R	
11D	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
11D	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
11D	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
11D	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
11D	17/18		170-190 cm	Scaridae	Lower pharyngeal	A	
11D	17/18		170-190 cm	Scaridae	Caudal	A	
11D	17/18		170-190 cm	Scaridae	Precaudal	A	
11D	17/18		170-190 cm	Scaridae	Precaudal	A	
11D	17/18		170-190 cm	Scaridae	Precaudal	A	
11D	17/18		170-190 cm	Scaridae	Precaudal	A	
11D	17/18		170-190 cm	Mugilidae	Caudal	A	
11D	17/18		170-190 cm	Mugilidae	Caudal	A	
11D	17/18		170-190 cm	Mugilidae	Caudal	A	
11D	17/18		170-190 cm	Mugilidae	Precaudal	A	
11D	17/18		170-190 cm	Mugilidae	Precaudal	A	
11D	17/18		170-190 cm	Mullidae	Caudal	A	
11D	17/18		170-190 cm	Carangidae	Caudal	A	
11D	17/18		170-190 cm	Serranidae	Thoracic	A	
11D	17/18		170-190 cm	Serranidae	Thoracic	A	
11D	17/18		170-190 cm	Serranidae	Thoracic	A	
11D	17/18		170-190 cm	Serranidae	Thoracic	A	
11D	17/18		170-190 cm	Serranidae	Precaudal	A	
11D	17/18		170-190 cm	Serranidae	Precaudal	A	

11D	17/18		170-190 cm	Serranidae	Caudal	A	
11D	17/18		170-190 cm	Serranidae	Caudal	A	
11D	17/18		170-190 cm	Serranidae	Caudal	A	
11D	17/18		170-190 cm	Serranidae	Caudal	A	
11D	17/18		170-190 cm	Serranidae	Caudal	A	
11D	17/18		170-190 cm	Serranidae	Dentary	L	
11D	17/18		170-190 cm	Serranidae	Vomer	A	
11D	17/18		170-190 cm	Serranidae	Quadrate	R	
11D	17/18		170-190 cm	Serranidae	Quadrate	R	
11D	17/18		170-190 cm	Serranidae	Epihyal	L	
11D	17/18		170-190 cm	Lethrinidae	Atlas	A	
11D	17/18		170-190 cm	Lethrinidae	Atlas	A	
11D	17/18		170-190 cm	Lethrinidae	Atlas	A	
11D	17/18		170-190 cm	Lethrinidae	Atlas	A	
11D	17/18		170-190 cm	Lethrinidae	Atlas	A	
11D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
11D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
11D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
11D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
11D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
11D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
11D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
11D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
11D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
11D	17/18		170-190 cm	Lethrinidae	Caudal	A	
11D	17/18		170-190 cm	Lethrinidae	Caudal	A	
11D	17/18		170-190 cm	Lethrinidae	Caudal	A	
11D	17/18		170-190 cm	Lethrinidae	Caudal	A	
11D	17/18		170-190 cm	Lethrinidae	Caudal	A	
11D	17/18		170-190 cm	Lethrinidae	Caudal	A	
11D	17/18		170-190 cm	Lethrinidae	Caudal	A	
11D	17/18		170-190 cm	Lethrinidae	Caudal	A	
11D	17/18		170-190 cm	Lethrinidae	Palatine	L	
11D	17/18		170-190 cm	Lethrinidae	Palatine	L	
11D	17/18		170-190 cm	Lethrinidae	Dentary	R	
11D	17/18		170-190 cm	Lethrinidae	Dentary	L	
11D	17/18		170-190 cm	Lethrinidae	Premaxilla	R	
11D	17/18		170-190 cm	Lethrinidae	Premaxilla	R	
11D	17/18		170-190 cm	Lethrinidae	Premaxilla	R	

11D	17/18		170-190 cm	Lethrinidae	Premaxilla	R	
11D	17/18		170-190 cm	Lethrinidae	Premaxilla	L	
11D	17/18		170-190 cm	Lethrinidae	Premaxilla	L	
11D	17/18		170-190 cm	Lethrinidae	Premaxilla	L	
11D	17/18		170-190 cm	Lethrinidae	Scapula	R	
11D	17/18		170-190 cm	Lethrinidae	Scapula	R	
11D	17/18		170-190 cm	Lethrinidae	Quadrate	R	
11D	17/18		170-190 cm	Lethrinidae	Quadrate	L	
11D	17/18		170-190 cm	Lethrinidae	Ceratohyal	L	
11D	17/18		170-190 cm	Lethrinidae	Hyomandibular	L	
12D	13		130-140 cm	Acanthuridae	Caudal	A	
12D	13		130-140 cm	Acanthuridae	Caudal	A	
12D	13		130-140 cm	Acanthuridae	Caudal	A	
12D	13		130-140 cm	Acanthuridae	Precaudal	A	
12D	13		130-140 cm	Scaridae	Lower pharyngeal	A	
12D	13		130-140 cm	Scaridae	Upper pharyngeal	A	
12D	13		130-140 cm	Scaridae	Upper pharyngeal	A	
12D	13		130-140 cm	Scaridae	Ultimate	A	
12D	13		130-140 cm	Scaridae	Ultimate	A	
12D	13		130-140 cm	Scaridae	Caudal	A	
12D	13		130-140 cm	Scaridae	Caudal	A	
12D	13		130-140 cm	Scaridae	Caudal	A	
12D	13		130-140 cm	Labridae	Basioccipital	A	
12D	13		130-140 cm	Balistidae	Dorsal Spine	A	
12D	13		130-140 cm	Siganidae	Caudal	A	
12D	13		130-140 cm	Mugilidae	Precaudal	A	
12D	13		130-140 cm	Lethrinidae	Atlas	A	
12D	13		130-140 cm	Lethrinidae	Precaudal	A	
12D	13		130-140 cm	Lethrinidae	Precaudal	A	
12D	13		130-140 cm	Lethrinidae	Precaudal	A	
12D	13		130-140 cm	Lethrinidae	Quadrate	R	
12D	13		130-140 cm	Lethrinidae	Quadrate	L	
12D	13		130-140 cm	Lethrinidae	Angular	R	
12D	13		130-140 cm	Lethrinidae	Epihyal	L	
12D	13		130-140 cm	Serranidae	Thoracic	A	
12D	13		130-140 cm	Serranidae	Thoracic	A	
12D	13		130-140 cm	Serranidae	Thoracic	A	
12D	13		130-140 cm	Serranidae	Caudal	A	
12D	13		130-140 cm	Serranidae	Caudal	A	

12D	13		130-140 cm	Serranidae	Angular	L	
12D	14		140-150 cm	Acanthuridae	Dorsal Spine	A	
12D	14		140-150 cm	Scaridae	Upper pharyngeal	A	
12D	14		140-150 cm	Scaridae	Upper pharyngeal	A	
12D	14		140-150 cm	Scaridae	Caudal	A	
12D	14		140-150 cm	Scaridae	Caudal	A	
12D	14		140-150 cm	Scaridae	Precaudal	A	
12D	14		140-150 cm	Labridae	Quadrate	R	
12D	14		140-150 cm	Balistidae	Tooth	A	
12D	14		140-150 cm	Siganidae	Precaudal	A	
12D	14		140-150 cm	Mugilidae	Caudal	A	
12D	14		140-150 cm	Mugilidae	Caudal	A	
12D	14		140-150 cm	Mugilidae	Precaudal	A	
12D	14		140-150 cm	Lethrinidae	Dentary	L	
12D	14		140-150 cm	Lethrinidae	Quadrate	R	
12D	14		140-150 cm	Lethrinidae	Angular	R	
12D	14		140-150 cm	Lethrinidae	Angular	R	
12D	14		140-150 cm	Lethrinidae	Angular	L	
12D	14		140-150 cm	Lethrinidae	Palatine	R	
12D	14		140-150 cm	Lethrinidae	Premaxilla	R	
12D	14		140-150 cm	Lethrinidae	Caudal	A	
12D	14		140-150 cm	Lethrinidae	Caudal	A	
12D	14		140-150 cm	Lethrinidae	Caudal	A	
12D	14		140-150 cm	Lethrinidae	Caudal	A	
12D	14		140-150 cm	Lethrinidae	Precaudal	A	
12D	14		140-150 cm	Lethrinidae	Precaudal	A	
12D	14		140-150 cm	Serranidae	Thoracic	A	
12D	14		140-150 cm	Serranidae	Thoracic	A	
12D	14		140-150 cm	Serranidae	Thoracic	A	
12D	14		140-150 cm	Serranidae	Caudal	A	
12D	14		140-150 cm	Serranidae	Quadrate	R	
12D	14		140-150 cm	Serranidae	Vomer	A	
12D	14		140-150 cm	Serranidae	Dentition		Fragment
12D	15		150-160 cm	Scombridae	Caudal	A	
12D	15		150-160 cm	Scombridae	Caudal	A	
12D	15		150-160 cm	Labridae	Lower pharyngeal	A	
12D	15		150-160 cm	Scaridae	Precaudal	A	
12D	15		150-160 cm	Scaridae	Caudal	A	
12D	15		150-160 cm	Scaridae	Premaxilla	L	

12D	15		150-160 cm	Mugilidae	Caudal	A	
12D	15		150-160 cm	Mugilidae	Precaudal	A	Fragment
12D	15		150-160 cm	Lethrinidae	Caudal	A	
12D	15		150-160 cm	Lethrinidae	Caudal	A	
12D	15		150-160 cm	Lethrinidae	Precaudal	A	
12D	15		150-160 cm	Lethrinidae	Quadrate	L	
12D	15		150-160 cm	Lethrinidae	Dentary	R	
12D	15		150-160 cm	Lethrinidae	Vomer	A	
12D	15		150-160 cm	Serranidae	Thoracic	A	
12D	15		150-160 cm	Serranidae	Thoracic	A	
12D	15		150-160 cm	Serranidae	Caudal	A	
12D	15		150-160 cm	Serranidae	Caudal	A	
12D	15		150-160 cm	Serranidae	Posttemporal	L	
12D	15		150-160 cm	Carangidae	Premaxilla	R	Large
12D	15		150-160 cm	Carangidae	Dentary	R	
12D	16		160-150 cm	Scaridae	Upper pharyngeal	A	
12D	16		160-150 cm	Scombridae	Thoracic	A	
12D	16		160-150 cm	Acanthuridae	Scute	A	
12D	16		160-150 cm	Acanthuridae	Caudal	A	
12D	16		160-150 cm	Labridae	Lower pharyngeal	A	
12D	16		160-150 cm	Labridae	Premaxilla	R	
12D	16		160-150 cm	Balistidae	Tooth	A	Large
12D	16		160-150 cm	Mugilidae	Precaudal	A	
12D	16		160-150 cm	Mugilidae	Precaudal	A	
12D	16		160-150 cm	Mugilidae	Precaudal	A	
12D	16		160-150 cm	Mugilidae	Caudal	A	
12D	16		160-150 cm	Lethrinidae	Atlas	A	
12D	16		160-150 cm	Lethrinidae	Thoracic	A	
12D	16		160-150 cm	Lethrinidae	Thoracic	A	
12D	16		160-150 cm	Lethrinidae	Precaudal	A	
12D	16		160-150 cm	Lethrinidae	Precaudal	A	
12D	16		160-150 cm	Lethrinidae	Precaudal	A	
12D	16		160-150 cm	Lethrinidae	Precaudal	A	
12D	16		160-150 cm	Lethrinidae	Precaudal	A	
12D	16		160-150 cm	Lethrinidae	Precaudal	A	
12D	16		160-150 cm	Lethrinidae	Precaudal	A	
12D	16		160-150 cm	Lethrinidae	Caudal	A	
12D	16		160-150 cm	Lethrinidae	Caudal	A	
12D	16		160-150 cm	Lethrinidae	Caudal	A	

12D	16		160-150 cm	Lethrinidae	Premaxilla	L	
12D	16		160-150 cm	Lethrinidae	Angular	R	
12D	16		160-150 cm	Lethrinidae	Quadrate	L	
12D	16		160-150 cm	Lethrinidae	Vomer	A	
12D	16		160-150 cm	Serranidae	Dentary	R	
12D	16		160-150 cm	Serranidae	Atlas	A	
12D	16		160-150 cm	Serranidae	Atlas	A	
12D	16		160-150 cm	Serranidae	Thoracic	A	
12D	16		160-150 cm	Serranidae	Thoracic	A	
12D	16		160-150 cm	Siganidae	Precaudal	A	
12D	17/18		170-190 cm	Scombridae	Thoracic	A	
12D	17/18		170-190 cm	Scombridae	Thoracic	A	
12D	17/18		170-190 cm	Scombridae	Precaudal	A	
12D	17/18		170-190 cm	Siganidae	Caudal	A	
12D	17/18		170-190 cm	Siganidae	Caudal	A	
12D	17/18		170-190 cm	Holocentridae	Thoracic	A	
12D	17/18		170-190 cm	Holocentridae	Thoracic	A	
12D	17/18		170-190 cm	Holocentridae	Precaudal	A	
12D	17/18		170-190 cm	Labridae	Maxilla	R	
12D	17/18		170-190 cm	Labridae	Dentary	L	
12D	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
12D	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
12D	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
12D	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
12D	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
12D	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
12D	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
12D	17/18		170-190 cm	Scaridae	Lower pharyngeal	A	
12D	17/18		170-190 cm	Scaridae	Lower pharyngeal	A	
12D	17/18		170-190 cm	Scaridae	Precaudal	A	
12D	17/18		170-190 cm	Scaridae	Precaudal	A	
12D	17/18		170-190 cm	Scaridae	Precaudal	A	
12D	17/18		170-190 cm	Scaridae	Caudal	A	
12D	17/18		170-190 cm	Scaridae	Caudal	A	
12D	17/18		170-190 cm	Scaridae	Caudal	A	
12D	17/18		170-190 cm	Scaridae	Caudal	A	
12D	17/18		170-190 cm	Scaridae	Ultimate	A	
12D	17/18		170-190 cm	Mugilidae	Caudal	A	
12D	17/18		170-190 cm	Mugilidae	Caudal	A	

12D	17/18		170-190 cm	Mugilidae	Caudal	A	
12D	17/18		170-190 cm	Mullidae	Caudal	A	
12D	17/18		170-190 cm	Serranidae	Maxilla	L	
12D	17/18		170-190 cm	Serranidae	Maxilla	L	
12D	17/18		170-190 cm	Serranidae	Maxilla	L	
12D	17/18		170-190 cm	Serranidae	Dentary	L	
12D	17/18		170-190 cm	Serranidae	Dentary	R	
12D	17/18		170-190 cm	Serranidae	Angular	R	
12D	17/18		170-190 cm	Serranidae	Angular	R	
12D	17/18		170-190 cm	Serranidae	Quadrate	L	
12D	17/18		170-190 cm	Serranidae	Quadrate	L	
12D	17/18		170-190 cm	Serranidae	Atlas	A	
12D	17/18		170-190 cm	Serranidae	Thoracic	A	
12D	17/18		170-190 cm	Serranidae	Thoracic	A	
12D	17/18		170-190 cm	Serranidae	Thoracic	A	
12D	17/18		170-190 cm	Serranidae	Thoracic	A	
12D	17/18		170-190 cm	Serranidae	Precaudal	A	
12D	17/18		170-190 cm	Serranidae	Precaudal	A	
12D	17/18		170-190 cm	Serranidae	Precaudal	A	
12D	17/18		170-190 cm	Serranidae	Precaudal	A	
12D	17/18		170-190 cm	Serranidae	Caudal	A	
12D	17/18		170-190 cm	Serranidae	Caudal	A	
12D	17/18		170-190 cm	Lethrinidae	Atlas	A	
12D	17/18		170-190 cm	Lethrinidae	Atlas	A	
12D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
12D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
12D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
12D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
12D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
12D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
12D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
12D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
12D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
12D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
12D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
12D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
12D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
12D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
12D	17/18		170-190 cm	Lethrinidae	Precaudal	A	

12D	17/18		170-190 cm	Lethrinidae	Caudal	A	
12D	17/18		170-190 cm	Lethrinidae	Caudal	A	
12D	17/18		170-190 cm	Lethrinidae	Caudal	A	
12D	17/18		170-190 cm	Lethrinidae	Caudal	A	
12D	17/18		170-190 cm	Lethrinidae	Caudal	A	
12D	17/18		170-190 cm	Lethrinidae	Caudal	A	
12D	17/18		170-190 cm	Lethrinidae	Caudal	A	
12D	17/18		170-190 cm	Lethrinidae	Caudal	A	
12D	17/18		170-190 cm	Lethrinidae	Caudal	A	
12D	17/18		170-190 cm	Lethrinidae	Caudal	A	
12D	17/18		170-190 cm	Lethrinidae	Basioccipital	A	
12D	17/18		170-190 cm	Lethrinidae	Quadrate	R	
12D	17/18		170-190 cm	Lethrinidae	Quadrate	R	
12D	17/18		170-190 cm	Lethrinidae	Quadrate	L	
12D	17/18		170-190 cm	Lethrinidae	Hyomandibular	R	
12D	17/18		170-190 cm	Lethrinidae	Hyomandibular	L	
12D	17/18		170-190 cm	Lethrinidae	Scapula	L	
12D	17/18		170-190 cm	Lethrinidae	Scapula	L	
12D	17/18		170-190 cm	Lethrinidae	Epihyal	R	
12D	17/18		170-190 cm	Lethrinidae	Palatine	R	
12D	17/18		170-190 cm	Lethrinidae	Palatine	R	
12D	17/18		170-190 cm	Lethrinidae	Palatine	R	
12D	17/18		170-190 cm	Lethrinidae	Angular	R	
12D	17/18		170-190 cm	Lethrinidae	Maxilla	L	
12D	17/18		170-190 cm	Lethrinidae	Dentary	L	
12D	17/18		170-190 cm	Lethrinidae	Dentary	L	
12D	17/18		170-190 cm	Lethrinidae	Dentary	L	
12D	17/18		170-190 cm	Lethrinidae	Premaxilla	L	
12D	17/18		170-190 cm	Balistidae	Tooth	A	
12D	19/20		190-210 cm	Scombridae	Caudal	A	
12D	19/20		190-210 cm	Scaridae	Upper pharyngeal	A	
12D	19/20		190-210 cm	Scaridae	Lower pharyngeal	A	
12D	19/20		190-210 cm	Scaridae	Lower pharyngeal	A	Fragment
12D	19/20		190-210 cm	Scaridae	Dentary	R	
12D	19/20		190-210 cm	Scaridae	Precaudal	A	
12D	19/20		190-210 cm	Scaridae	Precaudal	A	
12D	19/20		190-210 cm	Scaridae	Precaudal	A	
12D	19/20		190-210 cm	Scaridae	Caudal	A	
12D	19/20		190-210 cm	Mullidae	Caudal	A	

12D	19/20		190-210 cm	Mugilidae	Precaudal	A	
12D	19/20		190-210 cm	Mugilidae	Caudal	A	
12D	19/20		190-210 cm	Siganidae	Caudal	A	
12D	19/20		190-210 cm	Siganidae	Caudal	A	
12D	19/20		190-210 cm	Lethrinidae	Atlas	A	
12D	19/20		190-210 cm	Lethrinidae	Thoracic	A	
12D	19/20		190-210 cm	Lethrinidae	Thoracic	A	
12D	19/20		190-210 cm	Lethrinidae	Precaudal	A	
12D	19/20		190-210 cm	Lethrinidae	Caudal	A	
12D	19/20		190-210 cm	Lethrinidae	Caudal	A	
12D	19/20		190-210 cm	Lethrinidae	Caudal	A	
12D	19/20		190-210 cm	Lethrinidae	Caudal	A	
12D	19/20		190-210 cm	Lethrinidae	Caudal	A	
12D	19/20		190-210 cm	Lethrinidae	Caudal	A	
12D	19/20		190-210 cm	Lethrinidae	Palatine	L	
12D	19/20		190-210 cm	Lethrinidae	Palatine	L	
12D	19/20		190-210 cm	Lethrinidae	Palatine	L	
12D	19/20		190-210 cm	Lethrinidae	Palatine	R	
12D	19/20		190-210 cm	Lethrinidae	Angular	L	
12D	19/20		190-210 cm	Serranidae	Caudal	A	
12D	19/20		190-210 cm	Carangidae	Dentary	L	
13D	13		130-140 cm	Labridae	Basioccipital	A	
13D	13		130-140 cm	Labridae	Lower pharyngeal	A	
13D	13		130-140 cm	Balistidae	Quadrate	R	
13D	13		130-140 cm	Scaridae	Upper pharyngeal	A	
13D	13		130-140 cm	Scaridae	Upper pharyngeal	A	
13D	13		130-140 cm	Scaridae	Upper pharyngeal	A	
13D	13		130-140 cm	Scaridae	Upper pharyngeal	A	
13D	13		130-140 cm	Scaridae	Lower pharyngeal	A	
13D	13		130-140 cm	Scaridae	Lower pharyngeal	A	
13D	13		130-140 cm	Scaridae	Lower pharyngeal	A	
13D	13		130-140 cm	Scaridae	Premaxilla	R	
13D	13		130-140 cm	Scaridae	Angular	R	
13D	13		130-140 cm	Scaridae	Caudal	A	
13D	13		130-140 cm	Scaridae	Caudal	A	
13D	13		130-140 cm	Scaridae	Precaudal	A	
13D	13		130-140 cm	Scaridae	Precaudal	A	
13D	13		130-140 cm	Scaridae	Ultimate	A	
13D	13		130-140 cm	Acanthuridae	Dorsal Spine	A	

13D	13		130-140 cm	Acanthuridae	Caudal	A	
13D	13		130-140 cm	Acanthuridae	Caudal	A	
13D	13		130-140 cm	Acanthuridae	Caudal	A	
13D	13		130-140 cm	Acanthuridae	Caudal	A	
13D	13		130-140 cm	Acanthuridae	Precaudal	A	
13D	13		130-140 cm	Acanthuridae	Precaudal	A	
13D	13		130-140 cm	Acanthuridae	Dentition	A	Fragment
13D	13		130-140 cm	Acanthuridae	Spine	A	
13D	13		130-140 cm	Mugilidae	Precaudal	A	
13D	13		130-140 cm	Lethrinidae	Dentary	R	
13D	13		130-140 cm	Lethrinidae	Dentary	L	
13D	13		130-140 cm	Lethrinidae	Palatine	R	
13D	13		130-140 cm	Lethrinidae	Palatine	L	
13D	13		130-140 cm	Lethrinidae	Quadrate	R	
13D	13		130-140 cm	Lethrinidae	Quadrate	R	
13D	13		130-140 cm	Lethrinidae	Maxilla	R	
13D	13		130-140 cm	Lethrinidae	Atlas	A	
13D	13		130-140 cm	Lethrinidae	Precaudal	A	
13D	13		130-140 cm	Lethrinidae	Precaudal	A	
13D	13		130-140 cm	Lethrinidae	Precaudal	A	
13D	13		130-140 cm	Lethrinidae	Precaudal	A	
13D	13		130-140 cm	Lethrinidae	Caudal	A	
13D	13		130-140 cm	Lethrinidae	Caudal	A	
13D	13		130-140 cm	Lethrinidae	Caudal	A	
13D	13		130-140 cm	Lethrinidae	Caudal	A	
13D	13		130-140 cm	Lethrinidae	Thoracic	A	
13D	13		130-140 cm	Serranidae	Premaxilla	L	
13D	13		130-140 cm	Serranidae	Quadrate	L	
13D	13		130-140 cm	Serranidae	Atlas	A	
13D	13		130-140 cm	Serranidae	Atlas	A	
13D	13		130-140 cm	Serranidae	Atlas	A	
13D	13		130-140 cm	Serranidae	Thoracic	A	
13D	13		130-140 cm	Serranidae	Precaudal	A	
13D	13		130-140 cm	Serranidae	Precaudal	A	
13D	13		130-140 cm	Serranidae	Precaudal	A	
13D	13		130-140 cm	Serranidae	Precaudal	A	
13D	13		130-140 cm	Serranidae	Caudal	A	
13D	13		130-140 cm	Serranidae	Caudal	A	
13D	13		130-140 cm	Serranidae	Caudal	A	

13D	13		130-140 cm	Serranidae	Posttemporal	R	
13D	13		130-140 cm	Serranidae	Scapula	R	
13D	13		130-140 cm	Carangidae	Premaxilla	R	
13D	14		140-150 cm	Acanthuridae	Caudal	A	
13D	14		140-150 cm	Acanthuridae	Dorsal Spine	A	
13D	14		140-150 cm	Labridae	Lower pharyngeal	A	
13D	14		140-150 cm	Scombridae	Thoracic	A	
13D	14		140-150 cm	Holocentridae	Thoracic	A	
13D	14		140-150 cm	Scaridae	Lower pharyngeal	A	
13D	14		140-150 cm	Scaridae	Lower pharyngeal	A	
13D	14		140-150 cm	Scaridae	Lower pharyngeal	A	
13D	14		140-150 cm	Scaridae	Upper pharyngeal	A	
13D	14		140-150 cm	Scaridae	Upper pharyngeal	A	
13D	14		140-150 cm	Scaridae	Dentary	L	
13D	14		140-150 cm	Scaridae	Precaudal	A	
13D	14		140-150 cm	Scaridae	Precaudal	A	
13D	14		140-150 cm	Scaridae	Precaudal	A	
13D	14		140-150 cm	Scaridae	Caudal	A	
13D	14		140-150 cm	Scaridae	Caudal	A	
13D	14		140-150 cm	Scaridae	Caudal	A	
13D	14		140-150 cm	Scaridae	Caudal	A	
13D	14		140-150 cm	Scaridae	Caudal	A	
13D	14		140-150 cm	Siganidae	Precaudal	A	
13D	14		140-150 cm	Mugilidae	Caudal	A	
13D	14		140-150 cm	Mugilidae	Caudal	A	
13D	14		140-150 cm	Mugilidae	Precaudal	A	
13D	14		140-150 cm	Mullidae	Caudal	A	
13D	14		140-150 cm	Serranidae	Vomer	A	
13D	14		140-150 cm	Serranidae	Atlas	A	
13D	14		140-150 cm	Serranidae	Atlas	A	
13D	14		140-150 cm	Serranidae	Atlas	A	
13D	14		140-150 cm	Serranidae	Thoracic	A	
13D	14		140-150 cm	Serranidae	Thoracic	A	
13D	14		140-150 cm	Serranidae	Thoracic	A	
13D	14		140-150 cm	Serranidae	Thoracic	A	
13D	14		140-150 cm	Serranidae	Caudal	A	
13D	14		140-150 cm	Serranidae	Caudal	A	
13D	14		140-150 cm	Serranidae	Caudal	A	
13D	14		140-150 cm	Serranidae	Caudal	A	

13D	14		140-150 cm	Serranidae	Caudal	A	
13D	14		140-150 cm	Serranidae	Caudal	A	
13D	14		140-150 cm	Lethrinidae	Palatine	R	
13D	14		140-150 cm	Lethrinidae	Palatine	R	
13D	14		140-150 cm	Lethrinidae	Palatine	R	
13D	14		140-150 cm	Lethrinidae	Palatine	L	
13D	14		140-150 cm	Lethrinidae	Palatine	L	
13D	14		140-150 cm	Lethrinidae	Ceratohyal	R	
13D	14		140-150 cm	Lethrinidae	Quadrate	L	
13D	14		140-150 cm	Lethrinidae	Quadrate	L	
13D	14		140-150 cm	Lethrinidae	Quadrate	L	
13D	14		140-150 cm	Lethrinidae	Quadrate	R	
13D	14		140-150 cm	Lethrinidae	Vomer	A	
13D	14		140-150 cm	Lethrinidae	Dentary	R	
13D	14		140-150 cm	Lethrinidae	Atlas	A	
13D	14		140-150 cm	Lethrinidae	Atlas	A	
13D	14		140-150 cm	Lethrinidae	Precaudal	A	
13D	14		140-150 cm	Lethrinidae	Precaudal	A	
13D	14		140-150 cm	Lethrinidae	Precaudal	A	
13D	14		140-150 cm	Lethrinidae	Precaudal	A	
13D	14		140-150 cm	Lethrinidae	Precaudal	A	
13D	14		140-150 cm	Lethrinidae	Caudal	A	
13D	14		140-150 cm	Lethrinidae	Caudal	A	
13D	14		140-150 cm	Lethrinidae	Premaxilla	L	
13D	14		140-150 cm	Muraenidae	Caudal	A	
13D	15		150-160 cm	Scaridae	Lower pharyngeal	A	
13D	15		150-160 cm	Scaridae	Lower pharyngeal	A	
13D	15		150-160 cm	Scaridae	Upper pharyngeal	A	
13D	15		150-160 cm	Scaridae	Precaudal	A	
13D	15		150-160 cm	Labridae	Lower pharyngeal	A	
13D	15		150-160 cm	Acanthuridae	Caudal	A	
13D	15		150-160 cm	Acanthuridae	Caudal	A	
13D	15		150-160 cm	Acanthuridae	Caudal	A	
13D	15		150-160 cm	Acanthuridae	Caudal	A	
13D	15		150-160 cm	Scombridae	Thoracic	A	
13D	15		150-160 cm	Scombridae	Caudal	A	
13D	15		150-160 cm	Siganidae	Caudal	A	
13D	15		150-160 cm	Siganidae	Caudal	A	
13D	15		150-160 cm	Siganidae	Caudal	A	

13D	15		150-160 cm	Mugilidae	Precaudal	A	
13D	15		150-160 cm	Serranidae	Quadrate	R	
13D	15		150-160 cm	Serranidae	Atlas	A	
13D	15		150-160 cm	Serranidae	Precaudal	A	
13D	15		150-160 cm	Serranidae	Caudal	A	
13D	15		150-160 cm	Serranidae	Caudal	A	
13D	15		150-160 cm	Serranidae	Caudal	A	
13D	15		150-160 cm	Serranidae	Caudal	A	
13D	15		150-160 cm	Serranidae	Penultimate	A	
13D	15		150-160 cm	Lethrinidae	Palatine	L	
13D	15		150-160 cm	Lethrinidae	Premaxilla	R	
13D	15		150-160 cm	Lethrinidae	Premaxilla	R	
13D	15		150-160 cm	Lethrinidae	Premaxilla	R	
13D	15		150-160 cm	Lethrinidae	Premaxilla	L	
13D	15		150-160 cm	Lethrinidae	Atlas	A	
13D	15		150-160 cm	Lethrinidae	Thoracic	A	
13D	15		150-160 cm	Lethrinidae	Thoracic	A	
13D	15		150-160 cm	Lethrinidae	Precaudal	A	
13D	15		150-160 cm	Lethrinidae	Precaudal	A	
13D	15		150-160 cm	Lethrinidae	Precaudal	A	
13D	15		150-160 cm	Lethrinidae	Precaudal	A	
13D	15		150-160 cm	Lethrinidae	Precaudal	A	
13D	15		150-160 cm	Lethrinidae	Precaudal	A	
13D	15		150-160 cm	Lethrinidae	Precaudal	A	
13D	15		150-160 cm	Lethrinidae	Precaudal	A	
13D	15		150-160 cm	Lethrinidae	Precaudal	A	
13D	15		150-160 cm	Lethrinidae	Caudal	A	
13D	15		150-160 cm	Lethrinidae	Caudal	A	
13D	15		150-160 cm	Lethrinidae	Caudal	A	
13D	15		150-160 cm	Lethrinidae	Caudal	A	
13D	15		150-160 cm	Lethrinidae	Caudal	A	
13D	15		150-160 cm	Lethrinidae	Caudal	A	
13D	15		150-160 cm	Lethrinidae	Caudal	A	
13D	15		150-160 cm	Lethrinidae	Maxilla	L	
13D	16		160-170 cm	Scaridae	Lower pharyngeal	A	
13D	16		160-170 cm	Scaridae	Upper pharyngeal	A	
13D	16		160-170 cm	Scaridae	Upper pharyngeal	A	
13D	16		160-170 cm	Acanthuridae	Caudal	A	
13D	16		160-170 cm	Labridae	Lower pharyngeal	A	Large

13D	16		160-170 cm	Labridae	Lower pharyngeal	A	
13D	16		160-170 cm	Holocentridae	Thoracic	A	
13D	16		160-170 cm	Scombridae	Caudal	A	
13D	16		160-170 cm	Serranidae	Dentary	L	
13D	16		160-170 cm	Serranidae	Angular	R	
13D	16		160-170 cm	Serranidae	Atlas	A	
13D	16		160-170 cm	Serranidae	Penultimate	A	
13D	16		160-170 cm	Serranidae	Thoracic	A	
13D	16		160-170 cm	Serranidae	Caudal	A	
13D	16		160-170 cm	Serranidae	Caudal	A	
13D	16		160-170 cm	Serranidae	Caudal	A	
13D	16		160-170 cm	Mugilidae	Caudal	A	
13D	16		160-170 cm	Mullidae	Caudal	A	
13D	16		160-170 cm	Lethrinidae	Thoracic	A	
13D	16		160-170 cm	Lethrinidae	Thoracic	A	
13D	16		160-170 cm	Lethrinidae	Precaudal	A	
13D	16		160-170 cm	Lethrinidae	Precaudal	A	
13D	16		160-170 cm	Lethrinidae	Precaudal	A	
13D	16		160-170 cm	Lethrinidae	Precaudal	A	
13D	16		160-170 cm	Lethrinidae	Precaudal	A	
13D	16		160-170 cm	Lethrinidae	Precaudal	A	
13D	16		160-170 cm	Lethrinidae	Precaudal	A	
13D	16		160-170 cm	Lethrinidae	Precaudal	A	
13D	16		160-170 cm	Lethrinidae	Precaudal	A	
13D	16		160-170 cm	Lethrinidae	Premaxilla	R	Fragment
13D	16		160-170 cm	Lethrinidae	Premaxilla	L	Fragment
13D	16		160-170 cm	Lethrinidae	Premaxilla	R	
13D	16		160-170 cm	Lethrinidae	Angular	L	
13D	16		160-170 cm	Lethrinidae	Hyomandibular	R	
13D	17/18		170-190 cm	Scaridae	Lower pharyngeal	A	
13D	17/18		170-190 cm	Scaridae	Lower pharyngeal	A	
13D	17/18		170-190 cm	Scaridae	Lower pharyngeal	A	
13D	17/18		170-190 cm	Scaridae	Lower pharyngeal	A	
13D	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	2 fragments
13D	17/18		170-190 cm	Scaridae	Dentary	R	
13D	17/18		170-190 cm	Scaridae	Ultimate	A	
13D	17/18		170-190 cm	Scaridae	Caudal	A	
13D	17/18		170-190 cm	Scaridae	Caudal	A	
13D	17/18		170-190 cm	Scaridae	Caudal	A	

13D	17/18		170-190 cm	Scaridae	Caudal	A	
13D	17/18		170-190 cm	Scaridae	Precaudal	A	
13D	17/18		170-190 cm	Scaridae	Precaudal	A	
13D	17/18		170-190 cm	Scaridae	Caudal	A	
13D	17/18		170-190 cm	Scaridae	Caudal	A	
13D	17/18		170-190 cm	Scaridae	Caudal	A	
13D	17/18		170-190 cm	Acanthuridae	Caudal	A	
13D	17/18		170-190 cm	Scombridae	Caudal	A	
13D	17/18		170-190 cm	Scombridae	Caudal	A	
13D	17/18		170-190 cm	Scombridae	Caudal	A	
13D	17/18		170-190 cm	Scombridae	Thoracic	A	
13D	17/18		170-190 cm	Siganidae	Caudal	A	
13D	17/18		170-190 cm	Mugilidae	Caudal	A	
13D	17/18		170-190 cm	Mugilidae	Caudal	A	
13D	17/18		170-190 cm	Mullidae	Precaudal	A	
13D	17/18		170-190 cm	Mullidae	Caudal	A	
13D	17/18		170-190 cm	Mullidae	Caudal	A	
13D	17/18		170-190 cm	Serranidae	Premaxilla	L	
13D	17/18		170-190 cm	Serranidae	Dentary	NA	Fragment
13D	17/18		170-190 cm	Serranidae	Vomer	A	
13D	17/18		170-190 cm	Serranidae	Vomer	A	
13D	17/18		170-190 cm	Serranidae	Vomer	A	
13D	17/18		170-190 cm	Serranidae	Atlas	A	
13D	17/18		170-190 cm	Serranidae	Atlas	A	
13D	17/18		170-190 cm	Serranidae	Thoracic	A	
13D	17/18		170-190 cm	Serranidae	Thoracic	A	
13D	17/18		170-190 cm	Serranidae	Thoracic	A	
13D	17/18		170-190 cm	Serranidae	Thoracic	A	
13D	17/18		170-190 cm	Serranidae	Thoracic	A	
13D	17/18		170-190 cm	Serranidae	Thoracic	A	
13D	17/18		170-190 cm	Serranidae	Thoracic	A	
13D	17/18		170-190 cm	Serranidae	Thoracic	A	
13D	17/18		170-190 cm	Serranidae	Precaudal	A	
13D	17/18		170-190 cm	Serranidae	Precaudal	A	
13D	17/18		170-190 cm	Serranidae	Caudal	A	
13D	17/18		170-190 cm	Serranidae	Caudal	A	
13D	17/18		170-190 cm	Serranidae	Penultimate	A	
13D	17/18		170-190 cm	Lethrinidae	Vomer	A	
13D	17/18		170-190 cm	Lethrinidae	Dentary	R	

13D	17/18		170-190 cm	Lethrinidae	Dentary	R	
13D	17/18		170-190 cm	Lethrinidae	Dentary	L	
13D	17/18		170-190 cm	Lethrinidae	Dentary	L	
13D	17/18		170-190 cm	Lethrinidae	Dentary	L	
13D	17/18		170-190 cm	Lethrinidae	Premaxilla	L	
13D	17/18		170-190 cm	Lethrinidae	Premaxilla	L	
13D	17/18		170-190 cm	Lethrinidae	Premaxilla	L	
13D	17/18		170-190 cm	Lethrinidae	Premaxilla	R	
13D	17/18		170-190 cm	Lethrinidae	Premaxilla	R	
13D	17/18		170-190 cm	Lethrinidae	Premaxilla	NA	Fragment
13D	17/18		170-190 cm	Lethrinidae	Palatine	L	
13D	17/18		170-190 cm	Lethrinidae	Quadrate	R	
13D	17/18		170-190 cm	Lethrinidae	Scapula	R	
13D	17/18		170-190 cm	Lethrinidae	Epihyal	L	
13D	17/18		170-190 cm	Lethrinidae	Epihyal	R	
13D	17/18		170-190 cm	Lethrinidae	Maxilla	R	
13D	17/18		170-190 cm	Lethrinidae	Angular	R	
13D	17/18		170-190 cm	Lethrinidae	Angular	R	
13D	17/18		170-190 cm	Lethrinidae	Angular	L	
13D	17/18		170-190 cm	Lethrinidae	Angular	L	
13D	17/18		170-190 cm	Lethrinidae	Atlas	A	
13D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
13D	17/18		170-190 cm	Lethrinidae	Thoracic	A	
13D	17/18		170-190 cm	Lethrinidae	Caudal	A	
13D	17/18		170-190 cm	Lethrinidae	Caudal	A	
13D	17/18		170-190 cm	Lethrinidae	Caudal	A	
13D	17/18		170-190 cm	Lethrinidae	Caudal	A	
13D	17/18		170-190 cm	Lethrinidae	Caudal	A	
13D	17/18		170-190 cm	Lethrinidae	Caudal	A	
13D	17/18		170-190 cm	Lethrinidae	Caudal	A	
13D	17/18		170-190 cm	Lethrinidae	Caudal	A	
13D	17/18		170-190 cm	Lethrinidae	Caudal	A	
13D	17/18		170-190 cm	Lethrinidae	Caudal	A	
13D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
13D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
13D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
13D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
13D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
13D	17/18		170-190 cm	Lethrinidae	Precaudal	A	

13D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
13D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
13D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
13D	17/18		170-190 cm	Lethrinidae	Precaudal	A	
13D	17/18		170-190 cm	Lethrinidae	Penultimate	A	
13D	17/18		170-190 cm	Carangidae	Thoracic	A	
13D	19/20		190-210 cm	Acanthuridae	Dorsal Spine	A	
13D	19/20		190-210 cm	Scaridae	Dentary	R	
13D	19/20		190-210 cm	Scaridae	Lower pharyngeal	A	
13D	19/20		190-210 cm	Scaridae	Caudal	A	
13D	19/20		190-210 cm	Holocentridae	Thoracic	A	
13D	19/20		190-210 cm	Labridae	Upper pharyngeal	A	
13D	19/20		190-210 cm	Labridae	Maxilla	L	
13D	19/20		190-210 cm	Siganidae	Precaudal	A	
13D	19/20		190-210 cm	Carangidae	Penultimate	A	
13D	19/20		190-210 cm	Serranidae	Thoracic	A	
13D	19/20		190-210 cm	Serranidae	Thoracic	A	
13D	19/20		190-210 cm	Serranidae	Premaxilla	L	2 fragments
13D	19/20		190-210 cm	Serranidae	Angular	R	
13D	19/20		190-210 cm	Serranidae	Quadrate	L	
13D	19/20		190-210 cm	Serranidae	Quadrate	L	
13D	19/20		190-210 cm	Lethrinidae	Palatine	L	
13D	19/20		190-210 cm	Lethrinidae	Atlas	A	
13D	19/20		190-210 cm	Lethrinidae	Thoracic	A	
13D	19/20		190-210 cm	Lethrinidae	Caudal	A	
13D	19/20		190-210 cm	Lethrinidae	Caudal	A	
13D	19/20		190-210 cm	Lethrinidae	Caudal	A	
13D	19/20		190-210 cm	Lethrinidae	Caudal	A	
13D	19/20		190-210 cm	Lethrinidae	Caudal	A	
13D	19/20		190-210 cm	Lethrinidae	Precaudal	A	
13D	19/20		190-210 cm	Lethrinidae	Ceratohyal	L	
14D	9		90-100 cm	Acanthuridae	Caudal	A	
14D	9		90-100 cm	Acanthuridae	Caudal	A	
14D	9		90-100 cm	Scombridae	Caudal	A	
14D	9		90-100 cm	Scombridae	Thoracic	A	
14D	9		90-100 cm	Scombridae	Thoracic	A	
14D	9		90-100 cm	Congridae	Precaudal	A	
14D	9		90-100 cm	Balistidae	Dorsal Spine	A	
14D	9		90-100 cm	Holocentridae	Thoracic	A	

14D	9		90-100 cm	Holocentridae	Thoracic	A	
14D	9		90-100 cm	Scaridae	Precaudal	A	
14D	9		90-100 cm	Scaridae	Precaudal	A	
14D	9		90-100 cm	Scaridae	Precaudal	A	
14D	9		90-100 cm	Scaridae	Caudal	A	
14D	9		90-100 cm	Scaridae	Caudal	A	
14D	9		90-100 cm	Scaridae	Caudal	A	
14D	9		90-100 cm	Scaridae	Caudal	A	
14D	9		90-100 cm	Scaridae	Fourth Epibranchial	L	
14D	9		90-100 cm	Mugilidae	Caudal	A	
14D	9		90-100 cm	Mugilidae	Precaudal	A	
14D	9		90-100 cm	Serranidae	Premaxilla	R	
14D	9		90-100 cm	Serranidae	Premaxilla	L	
14D	9		90-100 cm	Serranidae	Atlas	A	
14D	9		90-100 cm	Serranidae	Thoracic	A	
14D	9		90-100 cm	Serranidae	Thoracic	A	
14D	9		90-100 cm	Serranidae	Thoracic	A	
14D	9		90-100 cm	Serranidae	Precaudal	A	
14D	9		90-100 cm	Serranidae	Precaudal	A	
14D	9		90-100 cm	Serranidae	Caudal	A	
14D	9		90-100 cm	Serranidae	Caudal	A	
14D	9		90-100 cm	Serranidae	Caudal	A	
14D	9		90-100 cm	Serranidae	Palatine	R	
14D	9		90-100 cm	Carangidae	Dentary	L	
14D	9		90-100 cm	Lethrinidae	Atlas	A	
14D	9		90-100 cm	Lethrinidae	Atlas	A	
14D	9		90-100 cm	Lethrinidae	Precaudal	A	
14D	9		90-100 cm	Lethrinidae	Precaudal	A	
14D	9		90-100 cm	Lethrinidae	Precaudal	A	
14D	9		90-100 cm	Lethrinidae	Precaudal	A	
14D	9		90-100 cm	Lethrinidae	Precaudal	A	
14D	9		90-100 cm	Lethrinidae	Precaudal	A	
14D	9		90-100 cm	Lethrinidae	Precaudal	A	
14D	9		90-100 cm	Lethrinidae	Precaudal	A	
14D	9		90-100 cm	Lethrinidae	Caudal	A	
14D	9		90-100 cm	Lethrinidae	Caudal	A	
14D	9		90-100 cm	Lethrinidae	Caudal	A	
14D	9		90-100 cm	Lethrinidae	Caudal	A	

14D	9		90-100 cm	Lethrinidae	Caudal	A	
14D	9		90-100 cm	Lethrinidae	Caudal	A	
14D	9		90-100 cm	Lethrinidae	Premaxilla	L	
14D	9		90-100 cm	Lethrinidae	Premaxilla	L	
14D	9		90-100 cm	Lethrinidae	Premaxilla	R	
14D	9		90-100 cm	Lethrinidae	Premaxilla	R	
14D	9		90-100 cm	Lethrinidae	Quadrate	R	
14D	9		90-100 cm	Lethrinidae	Palatine	R	
14D	10		100-110 cm	Acanthuridae	Caudal	A	
14D	10		100-110 cm	Acanthuridae	Scute	A	
14D	10		100-110 cm	Acanthuridae	Scute	A	
14D	10		100-110 cm	Scombridae	Caudal	A	
14D	10		100-110 cm	Carangidae	Thoracic	A	
14D	10		100-110 cm	Scaridae	Lower pharyngeal	A	
14D	10		100-110 cm	Scaridae	Lower pharyngeal	A	
14D	10		100-110 cm	Scaridae	Lower pharyngeal	A	
14D	10		100-110 cm	Scaridae	Precaudal	A	
14D	10		100-110 cm	Scaridae	Precaudal	A	
14D	10		100-110 cm	Scaridae	Precaudal	A	
14D	10		100-110 cm	Scaridae	Caudal	A	
14D	10		100-110 cm	Scaridae	Caudal	A	
14D	10		100-110 cm	Serranidae	Thoracic	A	
14D	10		100-110 cm	Serranidae	Thoracic	A	
14D	10		100-110 cm	Serranidae	Thoracic	A	
14D	10		100-110 cm	Serranidae	Thoracic	A	
14D	10		100-110 cm	Serranidae	Dentary	R	Fragment
14D	10		100-110 cm	Serranidae	Premaxilla	L	Fragment
14D	10		100-110 cm	Lethrinidae	Dentary	L	
14D	10		100-110 cm	Lethrinidae	Premaxilla	R	
14D	10		100-110 cm	Lethrinidae	Caudal	A	
14D	10		100-110 cm	Lethrinidae	Caudal	A	
14D	10		100-110 cm	Lethrinidae	Caudal	A	
14D	10		100-110 cm	Lethrinidae	Caudal	A	
14D	10		100-110 cm	Lethrinidae	Caudal	A	
14D	10		100-110 cm	Lethrinidae	Caudal	A	
14D	10		100-110 cm	Lethrinidae	Precaudal	A	
14D	10		100-110 cm	Lethrinidae	Precaudal	A	
14D	10		100-110 cm	Lethrinidae	Precaudal	A	
14D	10		100-110 cm	Lethrinidae	Precaudal	A	

14D	10		100-110 cm	Lethrinidae	Maxilla	L	Fragment
14D	10		100-110 cm	Lethrinidae	Angular	L	
14D	10		100-110 cm	Lethrinidae	Thoracic	A	
14D	11		110-120 cm	Acanthuridae	Dorsal Spine	A	
14D	11		110-120 cm	Scombridae	Caudal	A	
14D	11		110-120 cm	Scombridae	Caudal	A	
14D	11		110-120 cm	Scombridae	Thoracic	A	
14D	11		110-120 cm	Mugilidae	Caudal	A	
14D	11		110-120 cm	Scaridae	Precaudal	A	
14D	11		110-120 cm	Scaridae	Caudal	A	
14D	11		110-120 cm	Scaridae	Caudal	A	
14D	11		110-120 cm	Scaridae	Premaxilla	R	
14D	11		110-120 cm	Serranidae	Precaudal	A	
14D	11		110-120 cm	Serranidae	Precaudal	A	
14D	11		110-120 cm	Serranidae	Caudal	A	
14D	11		110-120 cm	Serranidae	Thoracic	A	
14D	11		110-120 cm	Serranidae	Thoracic	A	
14D	11		110-120 cm	Serranidae	Dentary	R	
14D	11		110-120 cm	Mullidae	Caudal	A	
14D	11		110-120 cm	Lethrinidae	Quadrate	L	
14D	11		110-120 cm	Lethrinidae	Quadrate	L	
14D	11		110-120 cm	Lethrinidae	Scapula	L	
14D	11		110-120 cm	Lethrinidae	Palatine	R	
14D	11		110-120 cm	Lethrinidae	Epihyal	L	
14D	11		110-120 cm	Lethrinidae	Precaudal	A	
14D	11		110-120 cm	Lethrinidae	Precaudal	A	
14D	11		110-120 cm	Lethrinidae	Precaudal	A	
14D	11		110-120 cm	Lethrinidae	Precaudal	A	
14D	11		110-120 cm	Lethrinidae	Thoracic	A	
14D	12		120-130 cm	Scaridae	Upper pharyngeal	A	
14D	12		120-130 cm	Labridae	Lower pharyngeal	A	
14D	12		120-130 cm	Serranidae	Premaxilla	R	
14D	12		120-130 cm	Serranidae	Caudal	A	
14D	12		120-130 cm	Serranidae	Precaudal	A	
14D	12		120-130 cm	Lethrinidae	Premaxilla	R	Fragment
14D	12		120-130 cm	Lethrinidae	Caudal	A	
14D	12		120-130 cm	Lethrinidae	Caudal	A	
14D	12		120-130 cm	Lethrinidae	Precaudal	A	
14D	12		120-130 cm	Lethrinidae	Thoracic	A	

14D	12		120-130 cm	Lethrinidae	Vomer	A	
14D	12		120-130 cm	Lethrinidae	Quadrate	R	
14D	13		130-140 cm	Scaridae	Upper pharyngeal	A	
14D	13		130-140 cm	Acanthuridae	Dorsal Spine	A	
14D	13		130-140 cm	Serranidae	Thoracic	A	
14D	13		130-140 cm	Labridae	Lower pharyngeal	A	
14D	13		130-140 cm	Balistidae	Spine	A	
14D	13		130-140 cm	Serranidae	Thoracic	A	
14D	13		130-140 cm	Serranidae	Quadrate	L	
14D	13		130-140 cm	Serranidae	Quadrate	L	
14D	13		130-140 cm	Serranidae	Dentary	L	
14D	13		130-140 cm	Lethrinidae	Premaxilla	L	
14D	13		130-140 cm	Lethrinidae	Precaudal	A	
14D	13		130-140 cm	Lethrinidae	Caudal	A	
14D	13		130-140 cm	Lethrinidae	Thoracic	A	
14D	13		130-140 cm	Carangidae	Caudal	A	
14D	14		140-150 cm	Diodontidae	Spine	A	
14D	14		140-150 cm	Congridae	Precaudal	A	
14D	14		140-150 cm	Congridae	Precaudal	A	
14D	14		140-150 cm	Congridae	Precaudal	A	
14D	14		140-150 cm	Siganidae	Caudal	A	
14D	14		140-150 cm	Siganidae	Caudal	A	
14D	14		140-150 cm	Siganidae	Caudal	A	
14D	14		140-150 cm	Siganidae	Caudal	A	
14D	14		140-150 cm	Siganidae	Caudal	A	
14D	14		140-150 cm	Siganidae	Caudal	A	
14D	14		140-150 cm	Siganidae	Precaudal	A	
14D	14		140-150 cm	Acanthuridae	Caudal	A	
14D	14		140-150 cm	Acanthuridae	Caudal	A	
14D	14		140-150 cm	Acanthuridae	Caudal	A	
14D	14		140-150 cm	Acanthuridae	Caudal	A	
14D	14		140-150 cm	Acanthuridae	Precaudal	A	
14D	14		140-150 cm	Acanthuridae	Precaudal	A	
14D	14		140-150 cm	Acanthuridae	Precaudal	A	
14D	14		140-150 cm	Acanthuridae	Dorsal Spine	A	
14D	14		140-150 cm	Scombridae	Thoracic	A	
14D	14		140-150 cm	Scombridae	Precaudal	A	
14D	14		140-150 cm	Scombridae	Caudal	A	
14D	14		140-150 cm	Labridae	Lower pharyngeal	A	

14D	14		140-150 cm	Labridae	Premaxilla	R	
14D	14		140-150 cm	Balistidae	Dorsal Spine	A	
14D	14		140-150 cm	Balistidae	Thoracic	A	
14D	14		140-150 cm	Balistidae	Tooth	A	
14D	14		140-150 cm	Scaridae	Upper pharyngeal	A	
14D	14		140-150 cm	Scaridae	Upper pharyngeal	A	
14D	14		140-150 cm	Scaridae	Upper pharyngeal	A	
14D	14		140-150 cm	Scaridae	Lower pharyngeal	A	
14D	14		140-150 cm	Scaridae	Lower pharyngeal	A	
14D	14		140-150 cm	Scaridae	Dentary	L	
14D	14		140-150 cm	Scaridae	Premaxilla	R	
14D	14		140-150 cm	Scaridae	Caudal	A	
14D	14		140-150 cm	Scaridae	Caudal	A	
14D	14		140-150 cm	Scaridae	Caudal	A	
14D	14		140-150 cm	Scaridae	Caudal	A	
14D	14		140-150 cm	Scaridae	Caudal	A	
14D	14		140-150 cm	Scaridae	Caudal	A	
14D	14		140-150 cm	Scaridae	Caudal	A	
14D	14		140-150 cm	Scaridae	Caudal	A	
14D	14		140-150 cm	Scaridae	Caudal	A	
14D	14		140-150 cm	Scaridae	Caudal	A	
14D	14		140-150 cm	Scaridae	Precaudal	A	
14D	14		140-150 cm	Scaridae	Precaudal	A	
14D	14		140-150 cm	Scaridae	Precaudal	A	
14D	14		140-150 cm	Scaridae	Precaudal	A	
14D	14		140-150 cm	Scaridae	Fourth Epibranchial	R	
14D	14		140-150 cm	Scaridae	Angular	L	
14D	14		140-150 cm	Carangidae	Precaudal	A	
14D	14		140-150 cm	Serranidae	Dentary	R	
14D	14		140-150 cm	Serranidae	Dentary	R	
14D	14		140-150 cm	Serranidae	Dentary	R	
14D	14		140-150 cm	Serranidae	Dentary	R	
14D	14		140-150 cm	Serranidae	Dentary	R	
14D	14		140-150 cm	Serranidae	Maxilla	R	
14D	14		140-150 cm	Serranidae	Atlas	A	
14D	14		140-150 cm	Serranidae	Atlas	A	
14D	14		140-150 cm	Serranidae	Thoracic	A	
14D	14		140-150 cm	Serranidae	Thoracic	A	

14D	14		140-150 cm	Serranidae	Caudal	A	
14D	14		140-150 cm	Serranidae	Caudal	A	
14D	14		140-150 cm	Serranidae	Caudal	A	
14D	14		140-150 cm	Serranidae	Caudal	A	
14D	14		140-150 cm	Serranidae	Caudal	A	
14D	14		140-150 cm	Lethrinidae	Thoracic	A	
14D	14		140-150 cm	Lethrinidae	Precaudal	A	
14D	14		140-150 cm	Lethrinidae	Precaudal	A	
14D	14		140-150 cm	Lethrinidae	Precaudal	A	
14D	14		140-150 cm	Lethrinidae	Precaudal	A	
14D	14		140-150 cm	Lethrinidae	Precaudal	A	
14D	14		140-150 cm	Lethrinidae	Precaudal	A	
14D	14		140-150 cm	Lethrinidae	Precaudal	A	
14D	14		140-150 cm	Lethrinidae	Precaudal	A	
14D	14		140-150 cm	Lethrinidae	Caudal	A	
14D	14		140-150 cm	Lethrinidae	Caudal	A	
14D	14		140-150 cm	Lethrinidae	Caudal	A	Large
14D	14		140-150 cm	Lethrinidae	Premaxilla	R	
14D	14		140-150 cm	Lethrinidae	Premaxilla	R	
14D	14		140-150 cm	Lethrinidae	Premaxilla	R	
14D	14		140-150 cm	Lethrinidae	Premaxilla	L	
14D	14		140-150 cm	Lethrinidae	Dentary	L	
14D	14		140-150 cm	Lethrinidae	Palatine	R	
14D	14		140-150 cm	Lethrinidae	Quadrate	L	
14D	14		140-150 cm	Lethrinidae	Quadrate	L	
14D	14		140-150 cm	Lethrinidae	Maxilla	R	
14D	14		140-150 cm	Lethrinidae	Angular	R	
14D	14		140-150 cm	Lethrinidae	Vomer	A	
14D	14		140-150 cm	Labridae	Vomer	A	
14D	15		150-160 cm	Scombridae	Thoracic	A	
14D	15		150-160 cm	Scaridae	Caudal	A	
14D	15		150-160 cm	Labridae	Basioccipital	A	Fragment
14D	15		150-160 cm	Labridae	Atlas	A	
14D	15		150-160 cm	Labridae	Thoracic	A	
14D	15		150-160 cm	Labridae	Thoracic	A	
14D	15		150-160 cm	Labridae	Precaudal	A	
14D	15		150-160 cm	Labridae	Caudal	A	
14D	15		150-160 cm	Labridae	Premaxilla	NA	Fragment
14D	16		160-170 cm	Scaridae	Lower pharyngeal	A	

14D	16		160-170 cm	Serranidae	Precaudal	A	
14D	16		160-170 cm	Lethrinidae	Atlas	A	
14D	16		160-170 cm	Lethrinidae	Thoracic	A	
14D	16		160-170 cm	Lethrinidae	Palatine	L	
14D	16		160-170 cm	Lethrinidae	Dentary	L	
14D	16		160-170 cm	Lethrinidae	Angular	L	
15D	8		80-90 cm	Acanthuridae	Caudal	A	
15D	8		80-90 cm	Balistidae	Dorsal spine	A	
15D	8		80-90 cm	Labridae	Lower pharyngeal	A	
15D	8		80-90 cm	Labridae	Upper pharyngeal	A	
15D	8		80-90 cm	Serranidae	Thoracic	A	
15D	8		80-90 cm	Serranidae	Thoracic	A	
15D	8		80-90 cm	Serranidae	Thoracic	A	
15D	8		80-90 cm	Serranidae	Thoracic	A	
15D	8		80-90 cm	Serranidae	Precaudal	A	
15D	8		80-90 cm	Serranidae	Vomer	A	
15D	8		80-90 cm	Serranidae	Dentary	R	
15D	8		80-90 cm	Mullidae	Caudal	A	
15D	8		80-90 cm	Mugilidae	Caudal	A	
15D	8		80-90 cm	Mugilidae	Caudal	A	
15D	8		80-90 cm	Scombridae	Precaudal	A	
15D	8		80-90 cm	Scombridae	Precaudal	A	
15D	8		80-90 cm	Scombridae	Caudal	A	
15D	8		80-90 cm	Scombridae	Thoracic	A	
15D	8		80-90 cm	Scombridae	Thoracic	A	
15D	8		80-90 cm	Scaridae	Upper pharyngeal	A	
15D	8		80-90 cm	Scaridae	Premaxilla	L	
15D	8		80-90 cm	Scaridae	Precaudal	A	
15D	8		80-90 cm	Scaridae	Precaudal	A	
15D	8		80-90 cm	Scaridae	Caudal	A	
15D	8		80-90 cm	Scaridae	Caudal	A	
15D	8		80-90 cm	Scaridae	Caudal	A	
15D	8		80-90 cm	Scaridae	Caudal	A	
15D	8		80-90 cm	Scaridae	Penultimate	A	
15D	8		80-90 cm	Lethrinidae	Atlas	A	
15D	8		80-90 cm	Lethrinidae	Thoracic	A	
15D	8		80-90 cm	Lethrinidae	Thoracic	A	
15D	8		80-90 cm	Lethrinidae	Thoracic	A	
15D	8		80-90 cm	Lethrinidae	Thoracic	A	

15D	8		80-90 cm	Lethrinidae	Precaudal	A	
15D	8		80-90 cm	Lethrinidae	Precaudal	A	
15D	8		80-90 cm	Lethrinidae	Precaudal	A	
15D	8		80-90 cm	Lethrinidae	Precaudal	A	
15D	8		80-90 cm	Lethrinidae	Precaudal	A	
15D	8		80-90 cm	Lethrinidae	Caudal	A	
15D	8		80-90 cm	Lethrinidae	Caudal	A	
15D	8		80-90 cm	Lethrinidae	Caudal	A	
15D	8		80-90 cm	Lethrinidae	Caudal	A	
15D	8		80-90 cm	Lethrinidae	Quadrate	R	
15D	8		80-90 cm	Lethrinidae	Quadrate	R	
15D	8		80-90 cm	Lethrinidae	Quadrate	R	
15D	8		80-90 cm	Lethrinidae	Palatine	L	
15D	8		80-90 cm	Lethrinidae	Angular	R	
15D	8		80-90 cm	Lethrinidae	Angular	L	
15D	8		80-90 cm	Lethrinidae	Vomer	A	
15D	8		80-90 cm	Lethrinidae	Urohyal	A	
15D	8		80-90 cm	Lethrinidae	Dentary	R	
15D	9		90-100 cm	Holocentridae	Thoracic	A	
15D	9		90-100 cm	Scombridae	Caudal	A	
15D	9		90-100 cm	Labridae	Upper pharyngeal	A	
15D	9		90-100 cm	Siganidae	Caudal	A	
15D	9		90-100 cm	Mugilidae	Caudal	A	
15D	9		90-100 cm	Scaridae	Ultimate	A	
15D	9		90-100 cm	Scaridae	Lower pharyngeal	A	Fragment
15D	9		90-100 cm	Scaridae	Precaudal	A	
15D	9		90-100 cm	Serranidae	Thoracic	A	
15D	9		90-100 cm	Serranidae	Thoracic	A	
15D	9		90-100 cm	Serranidae	Caudal	A	
15D	9		90-100 cm	Serranidae	Atlas	A	
15D	9		90-100 cm	Serranidae	Penultimate	A	
15D	9		90-100 cm	Lethrinidae	Atlas	A	
15D	9		90-100 cm	Lethrinidae	Precaudal	A	
15D	9		90-100 cm	Lethrinidae	Precaudal	A	
15D	9		90-100 cm	Lethrinidae	Precaudal	A	
15D	9		90-100 cm	Lethrinidae	Caudal	A	
15D	9		90-100 cm	Lethrinidae	Caudal	A	
15D	9		90-100 cm	Lethrinidae	Premaxilla	NA	Fragment
15D	9		90-100 cm	Lethrinidae	Quadrate	R	

15D	10		100-110 cm	Scaridae	Precaudal	A	
15D	10		100-110 cm	Lethrinidae	Quadrate	R	
15D	10		100-110 cm	Lethrinidae	Premaxilla	NA	Fragment
15D	10		100-110 cm	Lethrinidae	Caudal	A	
15D	10		100-110 cm	Serranidae	Precaudal	A	
15D	10		100-110 cm	Serranidae	Caudal	A	
15D	10		100-110 cm	Serranidae	Angular	L	
15D	11		110-120 cm	Holocentridae	Thoracic	A	
15D	11		110-120 cm	Balistidae	Thoracic	A	
15D	11		110-120 cm	Labridae	Maxilla	R	
15D	11		110-120 cm	Labridae	Premaxilla	R	
15D	11		110-120 cm	Mullidae	Precaudal	A	
15D	11		110-120 cm	Mugilidae	Caudal	A	
15D	11		110-120 cm	Mugilidae	Precaudal	A	
15D	11		110-120 cm	Scombridae	Caudal	A	
15D	11		110-120 cm	Scombridae	Caudal	A	
15D	11		110-120 cm	Scombridae	Caudal	A	
15D	11		110-120 cm	Scombridae	Caudal	A	
15D	11		110-120 cm	Scombridae	Caudal	A	
15D	11		110-120 cm	Scombridae	Thoracic	A	
15D	11		110-120 cm	Scombridae	Thoracic	A	
15D	11		110-120 cm	Congridae	Precaudal	A	
15D	11		110-120 cm	Congridae	Precaudal	A	
15D	11		110-120 cm	Siganidae	Caudal	A	
15D	11		110-120 cm	Siganidae	Caudal	A	
15D	11		110-120 cm	Siganidae	Caudal	A	
15D	11		110-120 cm	Siganidae	Caudal	A	
15D	11		110-120 cm	Siganidae	Caudal	A	
15D	11		110-120 cm	Siganidae	Caudal	A	
15D	11		110-120 cm	Siganidae	Caudal	A	
15D	11		110-120 cm	Siganidae	Precaudal	A	
15D	11		110-120 cm	Siganidae	Precaudal	A	
15D	11		110-120 cm	Acanthuridae	Dorsal spine	A	
15D	11		110-120 cm	Acanthuridae	Dorsal spine	A	
15D	11		110-120 cm	Acanthuridae	Dorsal spine	A	
15D	11		110-120 cm	Acanthuridae	Dorsal spine	A	
15D	11		110-120 cm	Acanthuridae	Caudal	A	
15D	11		110-120 cm	Acanthuridae	Caudal	A	
15D	11		110-120 cm	Acanthuridae	Caudal	A	

15D	11		110-120 cm	Acanthuridae	Caudal	A	
15D	11		110-120 cm	Acanthuridae	Precaudal	A	
15D	11		110-120 cm	Scaridae	Lower pharyngeal	A	
15D	11		110-120 cm	Scaridae	Lower pharyngeal	A	
15D	11		110-120 cm	Scaridae	Lower pharyngeal	A	
15D	11		110-120 cm	Scaridae	Lower pharyngeal	A	
15D	11		110-120 cm	Scaridae	Upper pharyngeal	A	
15D	11		110-120 cm	Scaridae	Upper pharyngeal	A	
15D	11		110-120 cm	Scaridae	Upper pharyngeal	A	
15D	11		110-120 cm	Scaridae	Upper pharyngeal	A	
15D	11		110-120 cm	Scaridae	Upper pharyngeal	A	
15D	11		110-120 cm	Scaridae	Dentary	L	
15D	11		110-120 cm	Scaridae	Dentary	R	
15D	11		110-120 cm	Scaridae	Basioccipital	A	
15D	11		110-120 cm	Scaridae	Maxilla	R	
15D	11		110-120 cm	Scaridae	Caudal	A	
15D	11		110-120 cm	Scaridae	Caudal	A	
15D	11		110-120 cm	Scaridae	Caudal	A	
15D	11		110-120 cm	Scaridae	Caudal	A	
15D	11		110-120 cm	Scaridae	Caudal	A	
15D	11		110-120 cm	Scaridae	Caudal	A	
15D	11		110-120 cm	Scaridae	Caudal	A	
15D	11		110-120 cm	Scaridae	Precaudal	A	
15D	11		110-120 cm	Scaridae	Precaudal	A	
15D	11		110-120 cm	Scaridae	Precaudal	A	
15D	11		110-120 cm	Scaridae	Precaudal	A	
15D	11		110-120 cm	Scaridae	Precaudal	A	
15D	11		110-120 cm	Serranidae	Premaxilla	R	
15D	11		110-120 cm	Serranidae	Quadrate	R	
15D	11		110-120 cm	Serranidae	Caudal	A	
15D	11		110-120 cm	Serranidae	Caudal	A	
15D	11		110-120 cm	Serranidae	Caudal	A	
15D	11		110-120 cm	Serranidae	Caudal	A	
15D	11		110-120 cm	Serranidae	Caudal	A	
15D	11		110-120 cm	Serranidae	Caudal	A	
15D	11		110-120 cm	Serranidae	Precaudal	A	
15D	11		110-120 cm	Serranidae	Precaudal	A	
15D	11		110-120 cm	Serranidae	Premaxilla	L	
15D	11		110-120 cm	Serranidae	Dentary	L	

15D	11		110-120 cm	Serranidae	Vomer	A	
15D	11		110-120 cm	Lethrinidae	Atlas	A	
15D	11		110-120 cm	Lethrinidae	Precaudal	A	
15D	11		110-120 cm	Lethrinidae	Precaudal	A	
15D	11		110-120 cm	Lethrinidae	Precaudal	A	
15D	11		110-120 cm	Lethrinidae	Precaudal	A	
15D	11		110-120 cm	Lethrinidae	Thoracic	A	
15D	11		110-120 cm	Lethrinidae	Caudal	A	
15D	11		110-120 cm	Lethrinidae	Caudal	A	
16D	8		80-90 cm	Muraenidae	Precaudal	A	
16D	8		80-90 cm	Labridae	Premaxilla	R	
16D	8		80-90 cm	Labridae	Lower pharyngeal	A	
16D	8		80-90 cm	Congridae	Precaudal	A	
16D	8		80-90 cm	Scombridae	Thoracic	A	
16D	8		80-90 cm	Scaridae	Lower pharyngeal	A	
16D	8		80-90 cm	Scaridae	Lower pharyngeal	A	
16D	8		80-90 cm	Scaridae	Upper pharyngeal	A	
16D	8		80-90 cm	Scaridae	Upper pharyngeal	A	
16D	8		80-90 cm	Scaridae	Upper pharyngeal	A	
16D	8		80-90 cm	Scaridae	Upper pharyngeal	A	
16D	8		80-90 cm	Scaridae	Premaxilla	R	
16D	8		80-90 cm	Scaridae	Precaudal	A	
16D	8		80-90 cm	Scaridae	Precaudal	A	
16D	8		80-90 cm	Scaridae	Precaudal	A	
16D	8		80-90 cm	Scaridae	Precaudal	A	
16D	8		80-90 cm	Scaridae	Caudal	A	
16D	8		80-90 cm	Scaridae	Caudal	A	
16D	8		80-90 cm	Scaridae	Caudal	A	
16D	8		80-90 cm	Scaridae	Caudal	A	
16D	8		80-90 cm	Scaridae	Caudal	A	
16D	8		80-90 cm	Scaridae	Caudal	A	
16D	8		80-90 cm	Scaridae	Angular	L	
16D	8		80-90 cm	Serranidae	Atlas	A	
16D	8		80-90 cm	Serranidae	Thoracic	A	
16D	8		80-90 cm	Serranidae	Thoracic	A	
16D	8		80-90 cm	Serranidae	Caudal	A	
16D	8		80-90 cm	Serranidae	Caudal	A	
16D	8		80-90 cm	Serranidae	Caudal	A	
16D	8		80-90 cm	Serranidae	Quadrate	R	

16D	8		80-90 cm	Serranidae	Premaxilla	L	
16D	8		80-90 cm	Serranidae	Dentary	L	
16D	8		80-90 cm	Serranidae	Posttemporal	R	
16D	8		80-90 cm	Mugilidae	Caudal	A	
16D	8		80-90 cm	Mugilidae	Precaudal	A	
16D	8		80-90 cm	Mugilidae	Thoracic	A	
16D	8		80-90 cm	Lethrinidae	Thoracic	A	
16D	8		80-90 cm	Lethrinidae	Thoracic	A	
16D	8		80-90 cm	Lethrinidae	Precaudal	A	
16D	8		80-90 cm	Lethrinidae	Precaudal	A	
16D	8		80-90 cm	Lethrinidae	Precaudal	A	
16D	8		80-90 cm	Lethrinidae	Precaudal	A	
16D	8		80-90 cm	Lethrinidae	Precaudal	A	
16D	8		80-90 cm	Lethrinidae	Caudal	A	
16D	8		80-90 cm	Lethrinidae	Caudal	A	
16D	8		80-90 cm	Lethrinidae	Caudal	A	
16D	8		80-90 cm	Lethrinidae	Caudal	A	
16D	8		80-90 cm	Lethrinidae	Caudal	A	
16D	8		80-90 cm	Lethrinidae	Caudal	A	
16D	8		80-90 cm	Lethrinidae	Caudal	A	
16D	8		80-90 cm	Lethrinidae	Caudal	A	
16D	8		80-90 cm	Lethrinidae	Palatine	R	
16D	8		80-90 cm	Lethrinidae	Premaxilla	L	Fragment
16D	8		80-90 cm	Lethrinidae	Premaxilla	R	Fragment
16D	8		80-90 cm	Lethrinidae	Dentary	L	Fragment
16D	8		80-90 cm	Lethrinidae	Dentary	L	Fragment
16D	8		80-90 cm	Lethrinidae	Dentary	R	Fragment
16D	9		90-100 cm	Scaridae	Caudal	A	
16D	9		90-100 cm	Scaridae	Caudal	A	
16D	9		90-100 cm	Serranidae	Precaudal	A	
16D	9		90-100 cm	Serranidae	Precaudal	A	
16D	9		90-100 cm	Lethrinidae	Palatine	R	
16D	9		90-100 cm	Lethrinidae	Atlas	A	
16D	9		90-100 cm	Lethrinidae	Precaudal	A	
16D	9		90-100 cm	Lethrinidae	Caudal	A	
16D	9		90-100 cm	Lethrinidae	Maxilla	R	
16D	9		90-100 cm	Lethrinidae	Premaxilla	L	Fragment
16D	10		100-110 cm	Acanthuridae	Caudal	A	
16D	10		100-110 cm	Lethrinidae	Vomer	A	

16D	10		100-110 cm	Lethrinidae	Precaudal	A	
16D	10		100-110 cm	Lethrinidae	Caudal	A	
16D	10		100-110 cm	Lethrinidae	Premaxilla	R	Fragment
16D	10		100-110 cm	Lethrinidae	Maxilla	L	Fragment
17D	8		80-90 cm	Scaridae	Caudal	A	
17D	8		80-90 cm	Scaridae	Caudal	A	
17D	8		80-90 cm	Lethrinidae	Precaudal	A	
17D	8		80-90 cm	Serranidae	Caudal	A	
17D	8		80-90 cm	Mugilidae	Precaudal	A	
17D	9		90-100 cm	Lethrinidae	Caudal	A	
18D	2		20-30 cm	Lethrinidae	Precaudal	A	
18D	6		60-70 cm	Scaridae	Upper pharyngeal	A	
18D	6		60-70 cm	Scaridae	Premaxilla	L	
18D	6		60-70 cm	Labridae	Lower pharyngeal	A	
18D	6		60-70 cm	Lethrinidae	Palatine	R	
18D	6		60-70 cm	Lethrinidae	Premaxilla	R	
18D	6		60-70 cm	Lethrinidae	Dentary	L	
18D	6		60-70 cm	Lethrinidae	Vomer	A	
18D	6		60-70 cm	Serranidae	Dentary	L	
18D	6		60-70 cm	Serranidae	Thoracic	A	
18D	6		60-70 cm	Serranidae	Thoracic	A	
18D	6		60-70 cm	Serranidae	Thoracic	A	
18D	6		60-70 cm	Serranidae	Precaudal	A	
18D	6		60-70 cm	Serranidae	Premaxilla	L	
18D	6		60-70 cm	Scaridae	Caudal	A	
18D	6		60-70 cm	Scaridae	Precaudal	A	
18D	6		60-70 cm	Scombridae	Caudal	A	
18D	6		60-70 cm	Mugilidae	Thoracic	A	
18D	6		60-70 cm	Mugilidae	Precaudal	A	
18D	6		60-70 cm	Mugilidae	Caudal	A	Large
18D	6		60-70 cm	Mugilidae	Basioccipital	A	
18D	6		60-70 cm	Lethrinidae	Atlas	A	
18D	6		60-70 cm	Lethrinidae	Atlas	A	
18D	6		60-70 cm	Lethrinidae	Caudal	A	
18D	6		60-70 cm	Lethrinidae	Caudal	A	
18D	6		60-70 cm	Lethrinidae	Caudal	A	
18D	6		60-70 cm	Lethrinidae	Caudal	A	
18D	6		60-70 cm	Lethrinidae	Caudal	A	
18D	6		60-70 cm	Lethrinidae	Precaudal	A	

18D	6		60-70 cm	Lethrinidae	Precaudal	A	
18D	6		60-70 cm	Lethrinidae	Precaudal	A	
18D	6		60-70 cm	Lethrinidae	Precaudal	A	
18D	6		60-70 cm	Lethrinidae	Precaudal	A	
18D	6		60-70 cm	Lethrinidae	Precaudal	A	
18D	6		60-70 cm	Lethrinidae	Precaudal	A	
18D	6		60-70 cm	Lethrinidae	Precaudal	A	
18D	6		60-70 cm	Lethrinidae	Thoracic	A	
18D	6		60-70 cm	Lethrinidae	Epihyal	L	
18D	6		60-70 cm	Mullidae	Thoracic	A	
18D	6		60-70 cm	Serranidae	Precaudal	A	
18D	6		60-70 cm	Serranidae	Thoracic	A	
18D	7		70-80 cm	Scaridae	Lower pharyngeal	A	
18D	7		70-80 cm	Scaridae	Upper pharyngeal	A	
18D	7		70-80 cm	Scaridae	Caudal	A	
18D	7		70-80 cm	Labridae	Lower pharyngeal	A	
18D	7		70-80 cm	Labridae	Dentary	R	
18D	7		70-80 cm	Acanthuridae	Caudal	A	
18D	7		70-80 cm	Acanthuridae	Caudal	A	
18D	7		70-80 cm	Acanthuridae	Dorsal spine	A	
18D	7		70-80 cm	Serranidae	Thoracic	A	
18D	7		70-80 cm	Serranidae	Thoracic	A	
18D	7		70-80 cm	Serranidae	Thoracic	A	
18D	7		70-80 cm	Lethrinidae	Vomer	A	
18D	7		70-80 cm	Lethrinidae	Premaxilla	R	
18D	7		70-80 cm	Lethrinidae	Premaxilla	R	
18D	7		70-80 cm	Lethrinidae	Dentary	R	
18D	7		70-80 cm	Lethrinidae	Angular	L	
18D	7		70-80 cm	Acanthuridae	Caudal	A	
18D	7		70-80 cm	Scaridae	Caudal	A	
18D	7		70-80 cm	Scaridae	Caudal	A	
18D	7		70-80 cm	Lethrinidae	Precaudal	A	
18D	7		70-80 cm	Lethrinidae	Precaudal	A	
18D	7		70-80 cm	Lethrinidae	Precaudal	A	
18D	7		70-80 cm	Lethrinidae	Caudal	A	
18D	7		70-80 cm	Lethrinidae	Caudal	A	
18D	7		70-80 cm	Lethrinidae	Caudal	A	
18D	7		70-80 cm	Lethrinidae	Caudal	A	
18D	7		70-80 cm	Lethrinidae	Thoracic	A	

18D	7		70-80 cm	Lethrinidae	Thoracic	A	
18D	7		70-80 cm	Lethrinidae	Thoracic	A	
18D	7		70-80 cm	Lethrinidae	Thoracic	A	
18D	7		70-80 cm	Lethrinidae	Thoracic	A	
18D	7		70-80 cm	Lethrinidae	Thoracic	A	
18D	7		70-80 cm	Lethrinidae	Quadrate	L	
18D	7		70-80 cm	Siganidae	Caudal	A	
18D	7		70-80 cm	Siganidae	Caudal	A	
18D	7		70-80 cm	Serranidae	Atlas	A	
18D	7		70-80 cm	Serranidae	Thoracic	A	
18D	7		70-80 cm	Serranidae	Caudal	A	
18D	8		80-90 cm	Scaridae	Caudal	A	
18D	8		80-90 cm	Scaridae	Precaudal	A	
18D	8		80-90 cm	Lethrinidae	Maxilla	L	
18D	8		80-90 cm	Lethrinidae	Angular	R	
18D	9		90-100 cm	Serranidae	Precaudal	A	
11C	14		140-150 cm	Acanthuridae	Caudal	A	
11C	14		140-150 cm	Serranidae	Vomer	A	
11C	14		140-150 cm	Scaridae	Precaudal	A	
11C	14		140-150 cm	Scaridae	Precaudal	A	
11C	14		140-150 cm	Scaridae	Precaudal	A	
11C	14		140-150 cm	Lethrinidae	Caudal	A	
11C	14		140-150 cm	Lethrinidae	Precaudal	A	
11C	14		140-150 cm	Lethrinidae	Quadrate	L	
11C	15		150-160 cm	Scombridae	Thoracic	A	
11C	15		150-160 cm	Siganidae	Caudal	A	
11C	15		150-160 cm	Mugilidae	Precaudal	A	
11C	15		150-160 cm	Mullidae	Caudal	A	
11C	15		150-160 cm	Scaridae	Upper pharyngeal	A	
11C	15		150-160 cm	Scaridae	Upper pharyngeal	A	
11C	15		150-160 cm	Serranidae	Precaudal	A	
11C	15		150-160 cm	Serranidae	Caudal	A	
11C	15		150-160 cm	Serranidae	Opercle	L	
11C	15		150-160 cm	Lethrinidae	Precaudal	A	
11C	15		150-160 cm	Lethrinidae	Thoracic	A	
11C	15		150-160 cm	Lethrinidae	Hyomandibular	L	
11C	15		150-160 cm	Muraenidae	Caudal	A	
11C	16		160-170 cm	Acanthuridae	Caudal	A	
11C	16		160-170 cm	Scombridae	Thoracic	A	

11C	16		160-170 cm	Mugilidae	Precaudal	A	
11C	16		160-170 cm	Mugilidae	Precaudal	A	
11C	16		160-170 cm	Mugilidae	Precaudal	A	
11C	16		160-170 cm	Lethrinidae	Thoracic	A	
11C	16		160-170 cm	Lethrinidae	Thoracic	A	
11C	16		160-170 cm	Lethrinidae	Thoracic	A	
11C	16		160-170 cm	Lethrinidae	Precaudal	A	
11C	16		160-170 cm	Lethrinidae	Precaudal	A	
11C	16		160-170 cm	Lethrinidae	Caudal	A	
11C	16		160-170 cm	Serranidae	Precaudal	A	
11C	16		160-170 cm	Serranidae	Precaudal	A	
11C	16		160-170 cm	Serranidae	Caudal	A	
11C	16		160-170 cm	Scaridae	Dentary	L	
11C	16		160-170 cm	Scaridae	Caudal	A	
11C	17		170-180 cm	Scombridae	Caudal	A	
11C	17		170-180 cm	Labridae	Basioccipital	A	
11C	17		170-180 cm	Labridae	Upper pharyngeal	A	
11C	17		170-180 cm	Scaridae	Caudal	A	
11C	17		170-180 cm	Scaridae	Caudal	A	
11C	17		170-180 cm	Scaridae	Caudal	A	
11C	17		170-180 cm	Scaridae	Caudal	A	
11C	17		170-180 cm	Scaridae	Caudal	A	
11C	17		170-180 cm	Scaridae	Caudal	A	
11C	17		170-180 cm	Scaridae	Caudal	A	
11C	17		170-180 cm	Scaridae	Precaudal	A	
11C	17		170-180 cm	Scaridae	Precaudal	A	
11C	17		170-180 cm	Scaridae	Precaudal	A	
11C	17		170-180 cm	Scaridae	Lower pharyngeal	A	
11C	17		170-180 cm	Scaridae	Lower pharyngeal	A	
11C	17		170-180 cm	Scaridae	Lower pharyngeal	A	
11C	17		170-180 cm	Scaridae	Lower pharyngeal	A	
11C	17		170-180 cm	Scaridae	Upper pharyngeal	A	
11C	17		170-180 cm	Serranidae	Caudal	A	
11C	17		170-180 cm	Serranidae	Precaudal	A	
11C	17		170-180 cm	Serranidae	Precaudal	A	
11C	17		170-180 cm	Serranidae	Precaudal	A	
11C	17		170-180 cm	Serranidae	Precaudal	A	
11C	17		170-180 cm	Serranidae	Thoracic	A	
11C	17		170-180 cm	Serranidae	Thoracic	A	

11C	17		170-180 cm	Serranidae	Scapula	L	
11C	17		170-180 cm	Mugilidae	Caudal	A	
11C	17		170-180 cm	Mugilidae	Caudal	A	
11C	17		170-180 cm	Mugilidae	Caudal	A	
11C	17		170-180 cm	Lethrinidae	Thoracic	A	
11C	17		170-180 cm	Lethrinidae	Precaudal	A	
11C	17		170-180 cm	Lethrinidae	Precaudal	A	
11C	17		170-180 cm	Lethrinidae	Precaudal	A	
11C	17		170-180 cm	Lethrinidae	Caudal	A	
11C	17		170-180 cm	Lethrinidae	Caudal	A	
11C	17		170-180 cm	Lethrinidae	Caudal	A	
11C	17		170-180 cm	Lethrinidae	Caudal	A	
11C	17		170-180 cm	Lethrinidae	Caudal	A	
11C	17		170-180 cm	Lethrinidae	Caudal	A	
11C	17		170-180 cm	Lethrinidae	Caudal	A	
11C	17		170-180 cm	Lethrinidae	Quadrate	R	
11C	17		170-180 cm	Lethrinidae	Premaxilla	R	
11C	17		170-180 cm	Lethrinidae	Angular	R	
11C	17		170-180 cm	Lethrinidae	Angular	R	
11C	17		170-180 cm	Balistidae	Quadrate	R	
11C	17		170-180 cm	Carangidae	Precaudal	A	
Shell column	14	1/4"	140-150 cm	Lethrinidae	Caudal	A	
Shell column	14	1/4"	140-150 cm	Scaridae	Premaxilla	R	
Shell column	14	1/8"	140-150 cm	Serranidae	Thoracic	A	
Shell column	14	1/8"	140-150 cm	Lethrinidae	Dentary	R	
Shell column	14	1/8"	140-150 cm	Scaridae	Upper pharyngeal	A	
Shell column	14	1/8"	140-150 cm	Scaridae	Upper pharyngeal	A	
Shell column	14	1/8"	140-150 cm	Lethrinidae	Thoracic	A	
Shell column	15	1/4"	150-160 cm	Lethrinidae	Caudal	A	
Shell column	15	1/4"	150-160 cm	Muraenidae	Precaudal	A	

Shell column	15	1/8"	150-160 cm	Scaridae	Lower pharyngeal	A	
Shell column	15	1/8"	150-160 cm	Scaridae	Upper pharyngeal	A	
Shell column	15	1/8"	150-160 cm	Scaridae	Dentary	R	
Shell column	15	1/8"	150-160 cm	Lethrinidae	Caudal	A	
Shell column	15	1/8"	150-160 cm	Lethrinidae	Premaxilla	L	
Shell column	15	1/8"	150-160 cm	Serranidae	Atlas	A	
Shell column	16	1/4"	160-170 cm	Scaridae	Precaudal	A	
Shell column	16	1/8"	160-170 cm	Scaridae	Caudal	A	
Shell column	16	1/8"	160-170 cm	Scaridae	Precaudal	A	
Shell column	17	1/4"	170-180 cm	Labridae	Upper pharyngeal	A	
Shell column	17	1/4"	170-180 cm	Scombridae	Caudal	A	
Shell column	17	1/4"	170-180 cm	Scombridae	Caudal	A	
Shell column	17	1/4"	170-180 cm	Scaridae	Lower pharyngeal	A	
Shell column	17	1/4"	170-180 cm	Scaridae	Upper pharyngeal	A	
Shell column	17	1/4"	170-180 cm	Scaridae	Precaudal	A	
Shell column	17	1/4"	170-180 cm	Scaridae	Ultimate	A	
Shell column	17	1/4"	170-180 cm	Lethrinidae	Atlas	A	
Shell column	17	1/4"	170-180 cm	Lethrinidae	Thoracic	A	
Shell column	17	1/4"	170-180 cm	Lethrinidae	Precaudal	A	
Shell column	17	1/4"	170-180 cm	Lethrinidae	Precaudal	A	

Shell column	17	1/4"	170-180 cm	Lethrinidae	Caudal	A	
Shell column	17	1/4"	170-180 cm	Lethrinidae	Caudal	A	
Shell column	17	1/4"	170-180 cm	Lethrinidae	Quadrate	L	
Shell column	17	1/4"	170-180 cm	Lethrinidae	Quadrate	L	
Shell column	17	1/4"	170-180 cm	Lethrinidae	Quadrate	L	
Shell column	17	1/4"	170-180 cm	Lethrinidae	Dentary	R	
Shell column	17	1/4"	170-180 cm	Carangidae	Caudal	A	
Shell column	17	1/8"	170-180 cm	Scombridae	Thoracic	A	
Shell column	17	1/8"	170-180 cm	Scaridae	Caudal	A	
Shell column	17	1/8"	170-180 cm	Scaridae	Precaudal	A	
Shell column	17	1/8"	170-180 cm	Scaridae	Precaudal	A	
Shell column	17	1/8"	170-180 cm	Scaridae	Lower pharyngeal	A	
Shell column	17	1/8"	170-180 cm	Siganidae	Caudal	A	
Shell column	17	1/8"	170-180 cm	Lethrinidae	Thoracic	A	
Shell column	17	1/8"	170-180 cm	Lethrinidae	Thoracic	A	
Shell column	17	1/8"	170-180 cm	Lethrinidae	Precaudal	A	
Shell column	17	1/8"	170-180 cm	Lethrinidae	Precaudal	A	
Shell column	17	1/8"	170-180 cm	Lethrinidae	Caudal	A	
Shell column	17	1/8"	170-180 cm	Lethrinidae	Dentary	L	
Shell column	17	1/8"	170-180 cm	Serranidae	Caudal	A	

Shell column	17	1/8"	170-180 cm	Serranidae	Quadrate	L	
Shell column	18	1/4"	180-190 cm	Lethrinidae	Precaudal	A	
Shell column	18	1/8"	180-190 cm	Scaridae	Lower pharyngeal	A	
Shell column	18	1/8"	180-190 cm	Diodontidae	Spine	A	
Shell column	18	1/8"	180-190 cm	Labridae	Dentary	L	Fragment
Shell column	18	1/8"	180-190 cm	Serranidae	Premaxilla	R	
Shell column	18	1/8"	180-190 cm	Serranidae	Thoracic	A	
Shell column	19	1/4"	190-200 cm	Scaridae	Caudal	A	
Shell column	19	1/4"	190-200 cm	Mugilidae	Precaudal	A	
Shell column	19	1/4"	190-200 cm	Lethrinidae	Atlas	A	
Shell column	19	1/4"	190-200 cm	Lethrinidae	Atlas	A	
Shell column	19	1/4"	190-200 cm	Lethrinidae	Dentary	L	
Shell column	19	1/4"	190-200 cm	Lethrinidae	Precaudal	A	
Shell column	19	1/4"	190-200 cm	Lethrinidae	Precaudal	A	
Shell column	19	1/8"	190-200 cm	Scaridae	Dentary	R	
Shell column	19	1/8"	190-200 cm	Mugilidae	Caudal	A	
Shell column	19	1/8"	190-200 cm	Lethrinidae	Dentary	R	
Shell column	19	1/8"	190-200 cm	Lethrinidae	Caudal	A	
Shell column	20	1/4"	200-210 cm	Lethrinidae	Caudal	A	
Shell column	20	1/4"	200-210 cm	Lethrinidae	Hyomandibular	R	

Shell column	20	1/8"	200-210 cm	Scaridae	Lower pharyngeal	A	Fragment
12C	1		Surface	Lethrinidae	Maxilla	R	
12C	1		Surface	Serranidae	Thoracic	A	
12C	2		20-30 cm	Scaridae	Precaudal	A	
12C	2		20-30 cm	Serranidae	Thoracic	A	
12C	4		40-50 cm	Serranidae	Thoracic		
12C	4		40-50 cm	Serranidae	Premaxilla	R	
12C	4		40-50 cm	Lethrinidae	Quadrate	L	
12C	4		40-50 cm	Shark	Vertebra	A	
12C	4		40-50 cm	Lethrinidae	Thoracic	A	
12C	4		40-50 cm	Lethrinidae	Thoracic	A	
12C	4		40-50 cm	Lethrinidae	Precaudal	A	
12C	4		40-50 cm	Lethrinidae	Caudal	A	
12C	5		50-60 cm	Scaridae	Caudal	A	
12C	5		50-60 cm	Lethrinidae	Precaudal	A	
12C	6		60-70 cm	Labridae	Lower pharyngeal	A	
12C	6		60-70 cm	Scaridae	Upper pharyngeal	A	
12C	6		60-70 cm	Scaridae	Upper pharyngeal	A	
12C	6		60-70 cm	Scaridae	Upper pharyngeal	A	
12C	6		60-70 cm	Scaridae	Upper pharyngeal	A	
12C	6		60-70 cm	Scaridae	Premaxilla	L	
12C	6		60-70 cm	Scaridae	Ultimate	A	
12C	6		60-70 cm	Scaridae	Precaudal	A	
12C	6		60-70 cm	Scaridae	Precaudal	A	
12C	6		60-70 cm	Scaridae	Atlas	A	
12C	6		60-70 cm	Diodontidae	Spine		
12C	6		60-70 cm	Diodontidae	Spine		
12C	6		60-70 cm	Diodontidae	Lower pharyngeal	A	
12C	6		60-70 cm	Acanthuridae	Caudal	A	
12C	6		60-70 cm	Acanthuridae	Caudal	A	
12C	6		60-70 cm	Acanthuridae	Caudal	A	
12C	6		60-70 cm	Serranidae	Dentary	R	
12C	6		60-70 cm	Serranidae	Maxilla	R	
12C	6		60-70 cm	Lethrinidae	Palatine	L	
12C	6		60-70 cm	Lethrinidae	Palatine	L	
12C	6		60-70 cm	Lethrinidae	Quadrate	R	
12C	6		60-70 cm	Lethrinidae	Angular	R	
12C	6		60-70 cm	Lethrinidae	Thoracic	A	

12C	6		60-70 cm	Lethrinidae	Thoracic	A	
12C	6		60-70 cm	Lethrinidae	Atlas	A	
12C	6		60-70 cm	Siganidae	Caudal	A	
12C	6		60-70 cm	Siganidae	Caudal	A	
12C	6		60-70 cm	Mugilidae	Caudal	A	
12C	6		60-70 cm	Scaridae	Precaudal	A	
12C	7		70-80 cm	Diodontidae	Spine		
12C	7		70-80 cm	Diodontidae	Spine		
12C	7		70-80 cm	Diodontidae	Spine		
12C	7		70-80 cm	Diodontidae	Spine		
12C	7		70-80 cm	Scaridae	Lower pharyngeal	A	
12C	7		70-80 cm	Scaridae	Lower pharyngeal	A	
12C	7		70-80 cm	Scaridae	Upper pharyngeal	A	
12C	7		70-80 cm	Scaridae	Upper pharyngeal	A	
12C	7		70-80 cm	Scaridae	Upper pharyngeal	A	
12C	7		70-80 cm	Scaridae	Premaxilla	R	
12C	7		70-80 cm	Scaridae	Dentary	R	
12C	7		70-80 cm	Scaridae	Ultimate	A	
12C	7		70-80 cm	Scaridae	Caudal	A	
12C	7		70-80 cm	Scaridae	Precaudal	A	
12C	7		70-80 cm	Scaridae	Precaudal	A	
12C	7		70-80 cm	Scaridae	Precaudal	A	
12C	7		70-80 cm	Scaridae	Atlas	A	
12C	7		70-80 cm	Balistidae	Thoracic	A	
12C	7		70-80 cm	Balistidae	Dorsal spine	A	
12C	7		70-80 cm	Balistidae	Dentary	R	
12C	7		70-80 cm	Acanthuridae	Caudal	A	
12C	7		70-80 cm	Acanthuridae	Caudal	A	
12C	7		70-80 cm	Acanthuridae	Caudal	A	
12C	7		70-80 cm	Lethrinidae	Maxilla	R	
12C	7		70-80 cm	Lethrinidae	Dentary	L	
12C	7		70-80 cm	Lethrinidae	Palatine	R	
12C	7		70-80 cm	Lethrinidae	Thoracic	A	
12C	7		70-80 cm	Lethrinidae	Angular	L	
12C	7		70-80 cm	Serranidae	Maxilla	L	
12C	7		70-80 cm	Serranidae	Premaxilla	R	
12C	7		70-80 cm	Serranidae	Thoracic	A	
12C	7		70-80 cm	Serranidae	Thoracic	A	
12C	7		70-80 cm	Serranidae	Thoracic	A	

12C	7		70-80 cm	Serranidae	Precaudal	A	
12C	7		70-80 cm	Serranidae	Precaudal	A	
12C	7		70-80 cm	Serranidae	Caudal	A	
12C	7		70-80 cm	Serranidae	Caudal	A	
12C	7		70-80 cm	Serranidae	Caudal	A	
12C	7		70-80 cm	Serranidae	Caudal	A	
12C	7		70-80 cm	Serranidae	Quadrate	L	
12C	7		70-80 cm	Holocentridae	Thoracic	A	
12C	7		70-80 cm	Scaridae	Precaudal	A	
12C	7		70-80 cm	Scaridae	Precaudal	A	
12C	7		70-80 cm	Scaridae	Caudal	A	
12C	7		70-80 cm	Siganidae	Precaudal	A	
12C	7		70-80 cm	Siganidae	Caudal	A	
12C	7		70-80 cm	Siganidae	Caudal	A	
12C	7		70-80 cm	Siganidae	Caudal	A	
12C	7		70-80 cm	Siganidae	Caudal	A	
12C	7		70-80 cm	Siganidae	Caudal	A	
12C	7		70-80 cm	Mugilidae	Thoracic	A	
12C	7		70-80 cm	Mugilidae	Thoracic	A	
12C	7		70-80 cm	Serranidae	Precaudal	A	
12C	7		70-80 cm	Serranidae	Caudal	A	
12C	7		70-80 cm	Serranidae	Caudal	A	
12C	7		70-80 cm	Serranidae	Caudal	A	
12C	7		70-80 cm	Balistidae	Vomer	A	
12C	7		70-80 cm	Mullidae	Caudal	A	
12C	7		70-80 cm	Lethrinidae	Thoracic	A	
12C	7		70-80 cm	Lethrinidae	Precaudal	A	
12C	7		70-80 cm	Lethrinidae	Precaudal	A	
12C	7		70-80 cm	Lethrinidae	Precaudal	A	
12C	7		70-80 cm	Lethrinidae	Precaudal	A	
12C	7		70-80 cm	Lethrinidae	Precaudal	A	
12C	7		70-80 cm	Lethrinidae	Precaudal	A	
12C	7		70-80 cm	Lethrinidae	Caudal	A	
12C	8		80-90 cm	Ostraciidae	Dermal plate		
12C	8		80-90 cm	Holocentridae	Thoracic	A	
12C	8		80-90 cm	Labridae	Lower pharyngeal	A	
12C	8		80-90 cm	Labridae	Lower pharyngeal	A	
12C	8		80-90 cm	Labridae	Upper pharyngeal	A	
12C	8		80-90 cm	Labridae	Premaxilla	L	

12C	8		80-90 cm	Labridae	Dentary	R	
12C	8		80-90 cm	Diodontidae	Thoracic	A	
12C	8		80-90 cm	Diodontidae	Spine		
12C	8		80-90 cm	Diodontidae	Spine		
12C	8		80-90 cm	Diodontidae	Spine		
12C	8		80-90 cm	Diodontidae	Spine		
12C	8		80-90 cm	Diodontidae	Spine		
12C	8		80-90 cm	Diodontidae	Spine		
12C	8		80-90 cm	Diodontidae	Spine		
12C	8		80-90 cm	Diodontidae	Spine		
12C	8		80-90 cm	Diodontidae	Spine		
12C	8		80-90 cm	Diodontidae	Spine		
12C	8		80-90 cm	Acanthuridae	Dorsal spine	A	
12C	8		80-90 cm	Acanthuridae	Caudal	A	
12C	8		80-90 cm	Acanthuridae	Caudal	A	
12C	8		80-90 cm	Acanthuridae	Caudal	A	
12C	8		80-90 cm	Acanthuridae	Caudal	A	
12C	8		80-90 cm	Acanthuridae	Caudal	A	
12C	8		80-90 cm	Acanthuridae	Caudal	A	
12C	8		80-90 cm	Acanthuridae	Caudal	A	
12C	8		80-90 cm	Acanthuridae	Caudal	A	
12C	8		80-90 cm	Acanthuridae	Caudal	A	
12C	8		80-90 cm	Acanthuridae	Precaudal	A	
12C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
12C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
12C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
12C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
12C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
12C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
12C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
12C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
12C	8		80-90 cm	Scaridae	Upper pharyngeal	A	
12C	8		80-90 cm	Scaridae	Upper pharyngeal	A	
12C	8		80-90 cm	Scaridae	Upper pharyngeal	A	
12C	8		80-90 cm	Scaridae	Upper pharyngeal	A	
12C	8		80-90 cm	Scaridae	Upper pharyngeal	A	
12C	8		80-90 cm	Scaridae	Upper pharyngeal	A	
12C	8		80-90 cm	Scaridae	Premaxilla	L	
12C	8		80-90 cm	Scaridae	Premaxilla	L	

12C	8		80-90 cm	Scaridae	Premaxilla	R	
12C	8		80-90 cm	Scaridae	Dentary	L	
12C	8		80-90 cm	Scaridae	Dentary	L	
12C	8		80-90 cm	Scaridae	Dentary	R	
12C	8		80-90 cm	Scaridae	Ultimate	A	
12C	8		80-90 cm	Scaridae	Ultimate	A	
12C	8		80-90 cm	Scaridae	Maxilla	R	
12C	8		80-90 cm	Scaridae	Caudal	A	
12C	8		80-90 cm	Scaridae	Caudal	A	
12C	8		80-90 cm	Scaridae	Caudal	A	
12C	8		80-90 cm	Scaridae	Caudal	A	
12C	8		80-90 cm	Scaridae	Caudal	A	
12C	8		80-90 cm	Scaridae	Caudal	A	
12C	8		80-90 cm	Scaridae	Caudal	A	
12C	8		80-90 cm	Scaridae	Precaudal	A	
12C	8		80-90 cm	Scaridae	Precaudal	A	
12C	8		80-90 cm	Scaridae	Precaudal	A	
12C	8		80-90 cm	Scaridae	Precaudal	A	
12C	8		80-90 cm	Scaridae	Precaudal	A	
12C	8		80-90 cm	Scaridae	Precaudal	A	
12C	8		80-90 cm	Scaridae	Precaudal	A	
12C	8		80-90 cm	Scaridae	Precaudal	A	
12C	8		80-90 cm	Scaridae	Precaudal	A	
12C	8		80-90 cm	Lethrinidae	Maxilla	R	
12C	8		80-90 cm	Lethrinidae	Premaxilla	L	
12C	8		80-90 cm	Lethrinidae	Thoracic	A	
12C	8		80-90 cm	Lethrinidae	Thoracic	A	
12C	8		80-90 cm	Lethrinidae	Angular	R	
12C	8		80-90 cm	Balistidae	Quadrate	L	
12C	8		80-90 cm	Balistidae	Dorsal spine	A	
12C	8		80-90 cm	Balistidae	Basio occipital	A	
12C	8		80-90 cm	Carangidae	Maxilla	R	
12C	8		80-90 cm	Carangidae	Caudal	A	
12C	8		80-90 cm	Carangidae	Caudal	A	
12C	8		80-90 cm	Carangidae	Caudal	A	
12C	8		80-90 cm	Carangidae	Caudal	A	
12C	8		80-90 cm	Carangidae	Caudal	A	
12C	8		80-90 cm	Carangidae	Caudal	A	Small
12C	8		80-90 cm	Carangidae	Caudal	A	Large

12C	8		80-90 cm	Carangidae	Caudal	A	Large
12C	8		80-90 cm	Serranidae	Vomer	A	
12C	8		80-90 cm	Serranidae	Vomer	A	
12C	8		80-90 cm	Serranidae	Premaxilla	R	
12C	8		80-90 cm	Serranidae	Quadrate	R	
12C	8		80-90 cm	Serranidae	Quadrate	L	
12C	8		80-90 cm	Serranidae	Atlas	A	
12C	8		80-90 cm	Serranidae	Palatine	R	
12C	8		80-90 cm	Serranidae	Palatine	L	
12C	8		80-90 cm	Serranidae	Caudal	A	
12C	8		80-90 cm	Serranidae	Caudal	A	
12C	8		80-90 cm	Serranidae	Caudal	A	
12C	8		80-90 cm	Serranidae	Caudal	A	
12C	8		80-90 cm	Serranidae	Precaudal	A	
12C	8		80-90 cm	Serranidae	Precaudal	A	
12C	8		80-90 cm	Serranidae	Precaudal	A	
12C	8		80-90 cm	Serranidae	Precaudal	A	
12C	8		80-90 cm	Serranidae	Precaudal	A	
12C	8		80-90 cm	Serranidae	Precaudal	A	
12C	8		80-90 cm	Serranidae	Precaudal	A	
12C	8		80-90 cm	Serranidae	Precaudal	A	
12C	8		80-90 cm	Serranidae	Precaudal	A	
12C	8		80-90 cm	Serranidae	Thoracic	A	
12C	8		80-90 cm	Serranidae	Thoracic	A	
12C	8		80-90 cm	Serranidae	Thoracic	A	
12C	8		80-90 cm	Serranidae	Thoracic	A	
12C	8		80-90 cm	Serranidae	Thoracic	A	
12C	8		80-90 cm	Serranidae	Thoracic	A	
12C	8		80-90 cm	Mugilidae	Thoracic	A	
12C	8		80-90 cm	Acanthuridae	Precaudal	A	
12C	8		80-90 cm	Acanthuridae	Precaudal	A	
12C	8		80-90 cm	Acanthuridae	Precaudal	A	
12C	8		80-90 cm	Acanthuridae	Precaudal	A	
12C	8		80-90 cm	Scaridae	Precaudal	A	
12C	8		80-90 cm	Scaridae	Caudal	A	
12C	8		80-90 cm	Scaridae	Caudal	A	
12C	8		80-90 cm	Siganidae	Precaudal	A	
12C	8		80-90 cm	Siganidae	Precaudal	A	
12C	8		80-90 cm	Siganidae	Caudal	A	

12C	8		80-90 cm	Siganidae	Caudal	A	
12C	8		80-90 cm	Siganidae	Caudal	A	
12C	8		80-90 cm	Siganidae	Caudal	A	
12C	8		80-90 cm	Siganidae	Caudal	A	
12C	8		80-90 cm	Siganidae	Caudal	A	
12C	8		80-90 cm	Siganidae	Caudal	A	
12C	8		80-90 cm	Siganidae	Caudal	A	
12C	8		80-90 cm	Siganidae	Caudal	A	
12C	8		80-90 cm	Siganidae	Caudal	A	
12C	8		80-90 cm	Siganidae	Caudal	A	
12C	8		80-90 cm	Siganidae	Caudal	A	
12C	8		80-90 cm	Siganidae	Caudal	A	
12C	8		80-90 cm	Lethrinidae	Atlas	A	
12C	8		80-90 cm	Lethrinidae	Precaudal	A	
12C	8		80-90 cm	Lethrinidae	Precaudal	A	
12C	8		80-90 cm	Lethrinidae	Precaudal	A	
12C	8		80-90 cm	Lethrinidae	Precaudal	A	
12C	8		80-90 cm	Lethrinidae	Precaudal	A	
12C	8		80-90 cm	Lethrinidae	Precaudal	A	
12C	8		80-90 cm	Lethrinidae	Precaudal	A	
12C	8		80-90 cm	Lethrinidae	Caudal	A	
12C	8		80-90 cm	Lethrinidae	Caudal	A	
12C	8		80-90 cm	Lethrinidae	Caudal	A	
12C	8		80-90 cm	Lethrinidae	Caudal	A	
12C	8		80-90 cm	Lethrinidae	Caudal	A	
12C	8		80-90 cm	Mugilidae	Thoracic	A	
12C	8		80-90 cm	Mugilidae	Thoracic	A	
12C	8		80-90 cm	Mugilidae	Thoracic	A	
12C	8		80-90 cm	Mugilidae	Caudal	A	
12C	8		80-90 cm	Mugilidae	Caudal	A	
12C	8		80-90 cm	Serranidae	Basioccipital	A	
12C	8		80-90 cm	Serranidae	Precaudal	A	
12C	8		80-90 cm	Serranidae	Caudal	A	
12C	8		80-90 cm	Serranidae	Caudal	A	
12C	8		80-90 cm	Serranidae	Penultimate	A	
12C	8		80-90 cm	Serranidae	Penultimate	A	
12C	8		80-90 cm	Holocentridae	Precaudal	A	
12C	8		80-90 cm	Holocentridae	Precaudal	A	
12C	8		80-90 cm	Carangidae	Caudal	A	

12C	8		80-90 cm	Carangidae	Caudal	A	
12C	9		90-100 cm	Balistidae	Dorsal spine	A	
12C	9		90-100 cm	Balistidae	Dorsal spine	A	
12C	9		90-100 cm	Balistidae	Quadrate	L	
12C	9		90-100 cm	Serranidae	Vomer	A	
12C	9		90-100 cm	Serranidae	Vomer	A	
12C	9		90-100 cm	Serranidae	Premaxilla	L	
12C	9		90-100 cm	Serranidae	Dentary	L	
12C	9		90-100 cm	Serranidae	Thoracic	A	
12C	9		90-100 cm	Serranidae	Thoracic	A	
12C	9		90-100 cm	Serranidae	Thoracic	A	
12C	9		90-100 cm	Serranidae	Thoracic	A	
12C	9		90-100 cm	Serranidae	Thoracic	A	
12C	9		90-100 cm	Serranidae	Thoracic	A	
12C	9		90-100 cm	Serranidae	Thoracic	A	
12C	9		90-100 cm	Serranidae	Thoracic	A	
12C	9		90-100 cm	Serranidae	Maxilla	R	
12C	9		90-100 cm	Serranidae	Maxilla	L	
12C	9		90-100 cm	Serranidae	Maxilla	L	
12C	9		90-100 cm	Serranidae	Maxilla	L	
12C	9		90-100 cm	Serranidae	Angular	L	
12C	9		90-100 cm	Serranidae	Precaudal	A	
12C	9		90-100 cm	Serranidae	Precaudal	A	
12C	9		90-100 cm	Serranidae	Precaudal	A	
12C	9		90-100 cm	Serranidae	Precaudal	A	
12C	9		90-100 cm	Serranidae	Precaudal	A	
12C	9		90-100 cm	Serranidae	Precaudal	A	
12C	9		90-100 cm	Serranidae	Precaudal	A	
12C	9		90-100 cm	Serranidae	Precaudal	A	
12C	9		90-100 cm	Serranidae	Precaudal	A	
12C	9		90-100 cm	Serranidae	Precaudal	A	
12C	9		90-100 cm	Serranidae	Precaudal	A	
12C	9		90-100 cm	Serranidae	Caudal	A	
12C	9		90-100 cm	Serranidae	Caudal	A	
12C	9		90-100 cm	Serranidae	Caudal	A	
12C	9		90-100 cm	Labridae	Basio occipital	A	
12C	9		90-100 cm	Labridae	Lower pharyngeal	A	
12C	9		90-100 cm	Labridae	Premaxilla	R	
12C	9		90-100 cm	Acanthuridae	Dorsal spine	A	

12C	9		90-100 cm	Acanthuridae	Dorsal spine	A	
12C	9		90-100 cm	Acanthuridae	Dorsal spine	A	
12C	9		90-100 cm	Acanthuridae	Dorsal spine	A	
12C	9		90-100 cm	Acanthuridae	Dorsal spine	A	
12C	9		90-100 cm	Acanthuridae	Dorsal spine	A	
12C	9		90-100 cm	Acanthuridae	Caudal	A	
12C	9		90-100 cm	Acanthuridae	Caudal	A	
12C	9		90-100 cm	Acanthuridae	Caudal	A	
12C	9		90-100 cm	Acanthuridae	Caudal	A	
12C	9		90-100 cm	Acanthuridae	Caudal	A	
12C	9		90-100 cm	Acanthuridae	Caudal	A	
12C	9		90-100 cm	Acanthuridae	Caudal	A	
12C	9		90-100 cm	Acanthuridae	Caudal	A	
12C	9		90-100 cm	Acanthuridae	Caudal	A	
12C	9		90-100 cm	Acanthuridae	Scapula	R	
12C	9		90-100 cm	Lethrinidae	Vomer	A	
12C	9		90-100 cm	Lethrinidae	Premaxilla	R	
12C	9		90-100 cm	Lethrinidae	Premaxilla	R	
12C	9		90-100 cm	Lethrinidae	Premaxilla	L	
12C	9		90-100 cm	Lethrinidae	Dentary	R	Distal fragment
12C	9		90-100 cm	Lethrinidae	Dentary	R	Proximal end fragment
12C	9		90-100 cm	Lethrinidae	Dentary	L	
12C	9		90-100 cm	Lethrinidae	Angular	L	
12C	9		90-100 cm	Lethrinidae	Angular	R	
12C	9		90-100 cm	Lethrinidae	Thoracic	A	
12C	9		90-100 cm	Lethrinidae	Quadrate	R	
12C	9		90-100 cm	Lethrinidae	Quadrate	R	
12C	9		90-100 cm	Lethrinidae	Quadrate	L	
12C	9		90-100 cm	Lethrinidae	Maxilla	R	
12C	9		90-100 cm	Lethrinidae	Maxilla	R	
12C	9		90-100 cm	Lethrinidae	Maxilla	R	
12C	9		90-100 cm	Diodontidae	Spine		
12C	9		90-100 cm	Diodontidae	Spine		
12C	9		90-100 cm	Diodontidae	Thoracic	A	
12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	

12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
12C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
12C	9		90-100 cm	Scaridae	Upper pharyngeal	A	
12C	9		90-100 cm	Scaridae	Upper pharyngeal	A	
12C	9		90-100 cm	Scaridae	Upper pharyngeal	A	
12C	9		90-100 cm	Scaridae	Upper pharyngeal	A	
12C	9		90-100 cm	Scaridae	Upper pharyngeal	A	
12C	9		90-100 cm	Scaridae	Upper pharyngeal	A	
12C	9		90-100 cm	Scaridae	Upper pharyngeal	A	
12C	9		90-100 cm	Scaridae	Basio occipital	A	
12C	9		90-100 cm	Scaridae	Basio occipital	A	
12C	9		90-100 cm	Scaridae	Premaxilla	L	
12C	9		90-100 cm	Scaridae	Dentary	L	
12C	9		90-100 cm	Scaridae	Atlas	A	
12C	9		90-100 cm	Scaridae	Atlas	A	
12C	9		90-100 cm	Scaridae	Ultimate	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Precaudal	A	
12C	9		90-100 cm	Scaridae	Precaudal	A	
12C	9		90-100 cm	Scaridae	Precaudal	A	
12C	9		90-100 cm	Scaridae	Precaudal	A	

12C	9		90-100 cm	Scaridae	Precaudal	A	
12C	9		90-100 cm	Scaridae	Precaudal	A	
12C	9		90-100 cm	Scaridae	Precaudal	A	
12C	9		90-100 cm	Scaridae	Precaudal	A	
12C	9		90-100 cm	Acanthuridae	Precaudal	A	
12C	9		90-100 cm	Mugilidae	Thoracic	A	
12C	9		90-100 cm	Mugilidae	Precaudal	A	
12C	9		90-100 cm	Mugilidae	Caudal	A	
12C	9		90-100 cm	Mugilidae	Caudal	A	
12C	9		90-100 cm	Mugilidae	Caudal	A	
12C	9		90-100 cm	Mugilidae	Caudal	A	
12C	9		90-100 cm	Mullidae	Caudal	A	
12C	9		90-100 cm	Siganidae	Precaudal	A	
12C	9		90-100 cm	Siganidae	Precaudal	A	
12C	9		90-100 cm	Siganidae	Caudal	A	
12C	9		90-100 cm	Siganidae	Caudal	A	
12C	9		90-100 cm	Siganidae	Caudal	A	
12C	9		90-100 cm	Siganidae	Caudal	A	
12C	9		90-100 cm	Lethrinidae	Ceratohyal	L	
12C	9		90-100 cm	Lethrinidae	Atlas	A	
12C	9		90-100 cm	Lethrinidae	Thoracic	A	
12C	9		90-100 cm	Lethrinidae	Thoracic	A	
12C	9		90-100 cm	Lethrinidae	Thoracic	A	
12C	9		90-100 cm	Lethrinidae	Thoracic	A	
12C	9		90-100 cm	Lethrinidae	Precaudal	A	
12C	9		90-100 cm	Lethrinidae	Precaudal	A	
12C	9		90-100 cm	Lethrinidae	Precaudal	A	
12C	9		90-100 cm	Lethrinidae	Precaudal	A	
12C	9		90-100 cm	Lethrinidae	Precaudal	A	
12C	9		90-100 cm	Lethrinidae	Precaudal	A	
12C	9		90-100 cm	Lethrinidae	Precaudal	A	
12C	9		90-100 cm	Lethrinidae	Precaudal	A	
12C	9		90-100 cm	Lethrinidae	Caudal	A	
12C	9		90-100 cm	Lethrinidae	Caudal	A	
12C	9		90-100 cm	Lethrinidae	Caudal	A	
12C	9		90-100 cm	Lethrinidae	Caudal	A	
12C	9		90-100 cm	Lethrinidae	Caudal	A	
12C	9		90-100 cm	Lethrinidae	Caudal	A	
12C	9		90-100 cm	Serranidae	Thoracic	A	

12C	9		90-100 cm	Serranidae	Caudal	A	
12C	9		90-100 cm	Serranidae	Caudal	A	
12C	9		90-100 cm	Serranidae	Caudal	A	
12C	9		90-100 cm	Serranidae	Caudal	A	
12C	9		90-100 cm	Serranidae	Caudal	A	
12C	9		90-100 cm	Serranidae	Caudal	A	
12C	9		90-100 cm	Serranidae	Caudal	A	
12C	9		90-100 cm	Serranidae	Caudal	A	
12C	9		90-100 cm	Serranidae	Opercle	R	
12C	9		90-100 cm	Scaridae	Precaudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scaridae	Caudal	A	
12C	9		90-100 cm	Scombridae	Thoracic	A	
12C	9		90-100 cm	Scombridae	Thoracic	A	
12C	9		90-100 cm	Holocentridae	Precaudal	A	
12C	9		90-100 cm	Carangidae	Thoracic	A	
12C	10		100-110 cm	Lethrinidae	Palatine	L	
12C	10		100-110 cm	Lethrinidae	Thoracic	A	
12C	10		100-110 cm	Labridae	Lower pharyngeal	A	
12C	10		100-110 cm	Scaridae	Lower pharyngeal	A	
12C	10		100-110 cm	Scaridae	Lower pharyngeal	A	
12C	10		100-110 cm	Scaridae	Upper pharyngeal	A	
12C	10		100-110 cm	Scaridae	Upper pharyngeal	A	
12C	10		100-110 cm	Scaridae	Atlas	A	
12C	10		100-110 cm	Scaridae	Caudal	A	
12C	10		100-110 cm	Scaridae	Precaudal	A	
12C	10		100-110 cm	Holocentridae	Thoracic	A	
12C	10		100-110 cm	Holocentridae	Thoracic	A	
12C	10		100-110 cm	Holocentridae	Thoracic	A	
12C	10		100-110 cm	Serranidae	Dentary	R	
12C	10		100-110 cm	Serranidae	Premaxilla	R	
12C	10		100-110 cm	Serranidae	Thoracic	A	
12C	10		100-110 cm	Serranidae	Thoracic	A	
12C	10		100-110 cm	Serranidae	Thoracic	A	
12C	10		100-110 cm	Serranidae	Precaudal	A	
12C	10		100-110 cm	Acanthuridae	Caudal	A	
12C	10		100-110 cm	Acanthuridae	Caudal	A	

12C	10		100-110 cm	Acanthuridae	Caudal	A	
12C	10		100-110 cm	Acanthuridae	Caudal	A	
12C	10		100-110 cm	Acanthuridae	Penultimate	A	
12C	10		100-110 cm	Acanthuridae	Precaudal	A	
12C	10		100-110 cm	Acanthuridae	Caudal	A	
12C	10		100-110 cm	Acanthuridae	Caudal	A	
12C	10		100-110 cm	Siganidae	Caudal	A	
12C	10		100-110 cm	Siganidae	Caudal	A	
12C	10		100-110 cm	Siganidae	Caudal	A	
12C	10		100-110 cm	Carangidae	Caudal	A	
12C	10		100-110 cm	Scaridae	Caudal	A	
12C	10		100-110 cm	Scaridae	Caudal	A	
12C	10		100-110 cm	Scaridae	Caudal	A	
12C	10		100-110 cm	Lethrinidae	Precaudal	A	
12C	10		100-110 cm	Lethrinidae	Precaudal	A	
12C	10		100-110 cm	Lethrinidae	Precaudal	A	
12C	10		100-110 cm	Lethrinidae	Precaudal	A	
12C	10		100-110 cm	Lethrinidae	Caudal	A	
12C	10		100-110 cm	Lethrinidae	Caudal	A	
12C	10		100-110 cm	Lethrinidae	Caudal	A	
12C	10		100-110 cm	Mugilidae	Caudal	A	
12C	10		100-110 cm	Scombridae	Thoracic	A	
12C	10		100-110 cm	Scombridae	Caudal	A	
12C	10		100-110 cm	Serranidae	Penultimate	A	
12C	10		100-110 cm	Muraenidae	Precaudal	A	
12C	11		110-120 cm	Acanthuridae	Precaudal	A	
12C	11		110-120 cm	Scombridae	Thoracic	A	
12C	11		110-120 cm	Scombridae	Thoracic	A	
12C	11		110-120 cm	Scombridae	Caudal	A	
12C	11		110-120 cm	Siganidae	Caudal	A	
12C	11		110-120 cm	Siganidae	Caudal	A	
12C	11		110-120 cm	Siganidae	Caudal	A	
12C	11		110-120 cm	Lethrinidae	Atlas	A	
12C	11		110-120 cm	Lethrinidae	Atlas	A	
12C	11		110-120 cm	Lethrinidae	Atlas	A	
12C	11		110-120 cm	Lethrinidae	Thoracic	A	
12C	11		110-120 cm	Lethrinidae	Thoracic	A	
12C	11		110-120 cm	Lethrinidae	Precaudal	A	
12C	11		110-120 cm	Lethrinidae	Precaudal	A	

12C	11		110-120 cm	Lethrinidae	Precaudal	A	
12C	11		110-120 cm	Lethrinidae	Caudal	A	
12C	11		110-120 cm	Lethrinidae	Caudal	A	
12C	11		110-120 cm	Serranidae	Thoracic	A	
12C	11		110-120 cm	Serranidae	Precaudal	A	
12C	11		110-120 cm	Serranidae	Precaudal	A	
12C	11		110-120 cm	Serranidae	Caudal	A	
12C	11		110-120 cm	Serranidae	Caudal	A	
12C	11		110-120 cm	Serranidae	Caudal	A	
12C	11		110-120 cm	Scaridae	Caudal	A	
12C	11		110-120 cm	Scaridae	Caudal	A	
12C	11		110-120 cm	Scaridae	Caudal	A	
12C	11		110-120 cm	Scaridae	Caudal	A	
12C	11		110-120 cm	Scaridae	Caudal	A	
12C	11		110-120 cm	Scaridae	Caudal	A	
12C	11		110-120 cm	Scaridae	Caudal	A	
12C	11		110-120 cm	Mugilidae	Caudal	A	
12C	12		120-130 cm	Acanthuridae	Scute		
12C	12		120-130 cm	Acanthuridae	Dorsal spine	A	
12C	12		120-130 cm	Acanthuridae	Caudal	A	
12C	12		120-130 cm	Acanthuridae	Caudal	A	
12C	12		120-130 cm	Acanthuridae	Caudal	A	
12C	12		120-130 cm	Acanthuridae	Caudal	A	
12C	12		120-130 cm	Balistidae	Dorsal spine	A	
12C	12		120-130 cm	Balistidae	Dorsal spine	A	
12C	12		120-130 cm	Balistidae	Dorsal spine	A	
12C	12		120-130 cm	Balistidae	Thoracic	A	
12C	12		120-130 cm	Balistidae	Premaxilla	L	
12C	12		120-130 cm	Balistidae	Dentary	R	
12C	12		120-130 cm	Lethrinidae	Dentary	L	
12C	12		120-130 cm	Lethrinidae	Thoracic	A	
12C	12		120-130 cm	Lethrinidae	Angular	L	
12C	12		120-130 cm	Lethrinidae	Basio occipital	A	
12C	12		120-130 cm	Labridae	Upper pharyngeal	A	
12C	12		120-130 cm	Labridae	Upper pharyngeal	A	
12C	12		120-130 cm	Labridae	Lower pharyngeal	A	
12C	12		120-130 cm	Labridae	Lower pharyngeal	A	
12C	12		120-130 cm	Labridae	Basio occipital	A	
12C	12		120-130 cm	Scaridae	Lower pharyngeal	A	

12C	12		120-130 cm	Scaridae	Lower pharyngeal	A	
12C	12		120-130 cm	Scaridae	Lower pharyngeal	A	
12C	12		120-130 cm	Scaridae	Upper pharyngeal	A	
12C	12		120-130 cm	Scaridae	Upper pharyngeal	A	
12C	12		120-130 cm	Scaridae	Upper pharyngeal	A	
12C	12		120-130 cm	Scaridae	Upper pharyngeal	A	
12C	12		120-130 cm	Scaridae	Upper pharyngeal	A	
12C	12		120-130 cm	Scaridae	Upper pharyngeal	A	
12C	12		120-130 cm	Scaridae	Upper pharyngeal	A	
12C	12		120-130 cm	Scaridae	Upper pharyngeal	A	
12C	12		120-130 cm	Scaridae	Premaxilla	R	
12C	12		120-130 cm	Scaridae	Premaxilla	R	
12C	12		120-130 cm	Scaridae	Precaudal	A	
12C	12		120-130 cm	Scaridae	Precaudal	A	
12C	12		120-130 cm	Scaridae	Caudal	A	
12C	12		120-130 cm	Scaridae	Caudal	A	
12C	12		120-130 cm	Serranidae	Premaxilla	R	
12C	12		120-130 cm	Serranidae	Palatine	R	
12C	12		120-130 cm	Serranidae	Dentary	L	
12C	12		120-130 cm	Serranidae	Quadrate	L	
12C	12		120-130 cm	Serranidae	Thoracic	A	
12C	12		120-130 cm	Serranidae	Precaudal	A	
12C	12		120-130 cm	Serranidae	Precaudal	A	
12C	12		120-130 cm	Serranidae	Precaudal	A	
12C	12		120-130 cm	Serranidae	Caudal	A	
12C	12		120-130 cm	Serranidae	Caudal	A	
12C	12		120-130 cm	Shark	Vertebra	A	
12C	13		130-140 cm	Holocentridae	Thoracic	A	
12C	13		130-140 cm	Holocentridae	Thoracic	A	
12C	13		130-140 cm	Holocentridae	Thoracic	A	
12C	13		130-140 cm	Balistidae	Dorsal spine	A	
12C	13		130-140 cm	Balistidae	Thoracic	A	
12C	13		130-140 cm	Scaridae	Lower pharyngeal	A	
12C	13		130-140 cm	Scaridae	Lower pharyngeal	A	
12C	13		130-140 cm	Scaridae	Lower pharyngeal	A	
12C	13		130-140 cm	Scaridae	Lower pharyngeal	A	
12C	13		130-140 cm	Scaridae	Lower pharyngeal	A	
12C	13		130-140 cm	Scaridae	Upper pharyngeal	A	
12C	13		130-140 cm	Scaridae	Upper pharyngeal	A	

12C	13		130-140 cm	Scaridae	Upper pharyngeal	A	
12C	13		130-140 cm	Scaridae	Premaxilla	R	
12C	13		130-140 cm	Scaridae	Dentary	R	
12C	13		130-140 cm	Scaridae	Precaudal	A	
12C	13		130-140 cm	Scaridae	Precaudal	A	
12C	13		130-140 cm	Scaridae	Precaudal	A	
12C	13		130-140 cm	Scaridae	Caudal	A	
12C	13		130-140 cm	Scaridae	Caudal	A	
12C	13		130-140 cm	Scaridae	Caudal	A	
12C	13		130-140 cm	Scaridae	Caudal	A	
12C	13		130-140 cm	Scaridae	Caudal	A	
12C	13		130-140 cm	Scaridae	Caudal	A	
12C	13		130-140 cm	Scaridae	Angular	L	
12C	13		130-140 cm	Labridae	Lower pharyngeal	A	
12C	13		130-140 cm	Labridae	Dentary	R	
12C	13		130-140 cm	Labridae	Premaxilla	L	
12C	13		130-140 cm	Labridae	Premaxilla	L	
12C	13		130-140 cm	Labridae	Dentition		
12C	13		130-140 cm	Serranidae	Vomer	A	
12C	13		130-140 cm	Serranidae	Dentary	L	
12C	13		130-140 cm	Serranidae	Dentary	L	
12C	13		130-140 cm	Serranidae	Dentary	L	
12C	13		130-140 cm	Serranidae	Quadrate	L	
12C	13		130-140 cm	Serranidae	Atlas	A	
12C	13		130-140 cm	Serranidae	Thoracic	A	
12C	13		130-140 cm	Serranidae	Thoracic	A	
12C	13		130-140 cm	Serranidae	Thoracic	A	
12C	13		130-140 cm	Serranidae	Thoracic	A	
12C	13		130-140 cm	Serranidae	Thoracic	A	
12C	13		130-140 cm	Serranidae	Caudal	A	
12C	13		130-140 cm	Lethrinidae	Palatine	L	
12C	13		130-140 cm	Lethrinidae	Palatine	R	
12C	13		130-140 cm	Lethrinidae	Premaxilla	L	
12C	13		130-140 cm	Lethrinidae	Dentition		Fragment
12C	13		130-140 cm	Lethrinidae	Dentition		Fragment
12C	13		130-140 cm	Lethrinidae	Dentition		Fragment
12C	13		130-140 cm	Lethrinidae	Angular	L	
12C	13		130-140 cm	Lethrinidae	Angular	R	
12C	13		130-140 cm	Diodontidae	Spine		

12C	13		130-140 cm	Shark	Vertebra	A	Small
12C	13		130-140 cm	Carangidae	Caudal	A	
12C	13		130-140 cm	Carangidae	Caudal	A	
12C	13		130-140 cm	Serranidae	Precaudal	A	
12C	13		130-140 cm	Carangidae	Thoracic	A	
12C	13		130-140 cm	Mugilidae	Thoracic	A	
12C	13		130-140 cm	Mugilidae	Caudal	A	
12C	13		130-140 cm	Acanthuridae	Precaudal	A	
12C	13		130-140 cm	Acanthuridae	Precaudal	A	
12C	13		130-140 cm	Lethrinidae	Atlas	A	
12C	13		130-140 cm	Lethrinidae	Atlas	A	
12C	13		130-140 cm	Lethrinidae	Thoracic	A	
12C	13		130-140 cm	Lethrinidae	Precaudal	A	
12C	13		130-140 cm	Lethrinidae	Precaudal	A	
12C	13		130-140 cm	Lethrinidae	Precaudal	A	
12C	13		130-140 cm	Lethrinidae	Precaudal	A	
12C	13		130-140 cm	Lethrinidae	Precaudal	A	
12C	13		130-140 cm	Scaridae	Precaudal	A	
12C	13		130-140 cm	Scaridae	Caudal	A	
12C	13		130-140 cm	Scaridae	Caudal	A	
12C	13		130-140 cm	Scaridae	Caudal	A	
12C	13		130-140 cm	Scombridae	Thoracic	A	
12C	13		130-140 cm	Scombridae	Thoracic	A	
12C	13		130-140 cm	Scombridae	Caudal	A	
12C	13		130-140 cm	Scombridae	Caudal	A	
12C	13		130-140 cm	Siganidae	Precaudal	A	
12C	13		130-140 cm	Siganidae	Precaudal	A	
12C	13		130-140 cm	Siganidae	Precaudal	A	
12C	13		130-140 cm	Siganidae	Precaudal	A	
12C	13		130-140 cm	Siganidae	Caudal	A	
12C	13		130-140 cm	Siganidae	Caudal	A	
12C	13		130-140 cm	Siganidae	Caudal	A	
12C	14		140-150 cm	Diodontidae	Spine		
12C	14		140-150 cm	Labridae	Lower pharyngeal	A	
12C	14		140-150 cm	Balistidae	Thoracic	A	
12C	14		140-150 cm	Acanthuridae	Caudal	A	
12C	14		140-150 cm	Acanthuridae	Caudal	A	
12C	14		140-150 cm	Serranidae	Premaxilla	L	
12C	14		140-150 cm	Serranidae	Caudal	A	

12C	14		140-150 cm	Lethrinidae	Urohyal	A	
12C	14		140-150 cm	Lethrinidae	Angular	R	
12C	14		140-150 cm	Lethrinidae	Quadrate	L	
12C	14		140-150 cm	Lethrinidae	Quadrate	L	
12C	14		140-150 cm	Lethrinidae	Thoracic	A	
12C	14		140-150 cm	Scaridae	Lower pharyngeal	A	
12C	14		140-150 cm	Scaridae	Lower pharyngeal	A	
12C	14		140-150 cm	Scaridae	Upper pharyngeal	A	
12C	14		140-150 cm	Scaridae	Upper pharyngeal	A	
12C	14		140-150 cm	Scaridae	Premaxilla	L	
12C	14		140-150 cm	Scaridae	Premaxilla	R	
12C	14		140-150 cm	Scaridae	Ultimate	A	
12C	14		140-150 cm	Scaridae	Fourth epibranchial	R	
12C	14		140-150 cm	Scaridae	Maxilla	R	
12C	14		140-150 cm	Scaridae	Caudal	A	
12C	14		140-150 cm	Scaridae	Caudal	A	
12C	14		140-150 cm	Scaridae	Precaudal	A	
12C	14		140-150 cm	Scaridae	Precaudal	A	
12C	14		140-150 cm	Scaridae	Precaudal	A	
12C	14		140-150 cm	Scaridae	Caudal	A	
12C	14		140-150 cm	Scaridae	Caudal	A	
12C	14		140-150 cm	Scaridae	Caudal	A	
12C	14		140-150 cm	Scombridae	Thoracic	A	
12C	14		140-150 cm	Siganidae	Caudal	A	
12C	14		140-150 cm	Lethrinidae	Precaudal	A	
12C	14		140-150 cm	Lethrinidae	Precaudal	A	
12C	14		140-150 cm	Lethrinidae	Precaudal	A	
12C	14		140-150 cm	Lethrinidae	Precaudal	A	
12C	14		140-150 cm	Lethrinidae	Caudal	A	
12C	14		140-150 cm	Serranidae	Quadrate	L	
12C	14		140-150 cm	Serranidae	Quadrate	L	
12C	14		140-150 cm	Serranidae	Posttemporal	L	
12C	14		140-150 cm	Serranidae	Caudal	A	
12C	14		140-150 cm	Serranidae	Caudal	A	
12C	14		140-150 cm	Serranidae	Caudal	A	
12C	14		140-150 cm	Mugilidae	Thoracic	A	
12C	15		150-160 cm	Scaridae	Lower pharyngeal	A	
12C	15		150-160 cm	Scaridae	Upper pharyngeal	A	

12C	15		150-160 cm	Scaridae	Dentary	R	
12C	15		150-160 cm	Scaridae	Dentary	R	
12C	15		150-160 cm	Scaridae	Precaudal	A	
12C	15		150-160 cm	Labridae	Lower pharyngeal	a	
12C	15		150-160 cm	Diodontidae	Spine		
12C	15		150-160 cm	Lethrinidae	Dentary	R	
12C	15		150-160 cm	Lethrinidae	Angular	R	
12C	15		150-160 cm	Lethrinidae	Quadrate	R	
12C	15		150-160 cm	Lethrinidae	Palatine	L	
12C	15		150-160 cm	Serranidae	Precaudal	A	
12C	15		150-160 cm	Serranidae	Precaudal	A	
12C	15		150-160 cm	Serranidae	Thoracic	A	
12C	15		150-160 cm	Acanthuridae	Precaudal	A	
12C	15		150-160 cm	Balistidae	Dorsal spine	A	
12C	15		150-160 cm	Lethrinidae	Atlas	A	
12C	15		150-160 cm	Lethrinidae	Atlas	A	
12C	15		150-160 cm	Lethrinidae	Thoracic	A	
12C	15		150-160 cm	Lethrinidae	Hyomandibular	L	
12C	15		150-160 cm	Siganidae	Caudal	A	
12C	15		150-160 cm	Siganidae	Caudal	A	
12C	15		150-160 cm	Mugilidae	Precaudal	A	
12C	15		150-160 cm	Mugilidae	Caudal	A	
12C	15		150-160 cm	Serranidae	Precaudal	A	
12C	15		150-160 cm	Serranidae	Caudal	A	
12C	15		150-160 cm	Mullidae	Precaudal	A	
12C	15		150-160 cm	Scaridae	Precaudal	A	
12C	15		150-160 cm	Scaridae	Caudal	A	
12C	16		160-170 cm	Acanthuridae	Caudal	A	
12C	16		160-170 cm	Scaridae	Basio occipital	A	
12C	16		160-170 cm	Scaridae	Upper pharyngeal	A	
12C	16		160-170 cm	Scaridae	Upper pharyngeal	A	
12C	16		160-170 cm	Scaridae	Lower pharyngeal	A	
12C	16		160-170 cm	Scaridae	Lower pharyngeal	A	
12C	16		160-170 cm	Scaridae	Ultimate	A	
12C	16		160-170 cm	Scaridae	Quadrate	R	
12C	16		160-170 cm	Scaridae	Caudal	A	
12C	16		160-170 cm	Scaridae	Caudal	A	
12C	16		160-170 cm	Serranidae	Caudal	A	
12C	16		160-170 cm	Lethrinidae	Premaxilla	L	

12C	16		160-170 cm	Siganidae	Precaudal	A	
12C	16		160-170 cm	Lethrinidae	Thoracic	A	
12C	16		160-170 cm	Lethrinidae	Precaudal	A	
12C	16		160-170 cm	Lethrinidae	Caudal	A	
12C	16		160-170 cm	Lethrinidae	Epihyal	R	
12C	16		160-170 cm	Mugilidae	Caudal	A	
12C	16		160-170 cm	Serranidae	Precaudal	A	
12C	16		160-170 cm	Serranidae	Precaudal	A	
12C	16		160-170 cm	Scaridae	Hyomandibular	R	
12C	17/18		170-190 cm	Acanthuridae	Dorsal spine	A	
12C	17/18		170-190 cm	Labridae	Lower pharyngeal	A	
12C	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
12C	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
12C	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
12C	17/18		170-190 cm	Scaridae	Upper pharyngeal	A	
12C	17/18		170-190 cm	Scaridae	Lower pharyngeal	A	
12C	17/18		170-190 cm	Scaridae	Lower pharyngeal	A	
12C	17/18		170-190 cm	Scaridae	Lower pharyngeal	A	
12C	17/18		170-190 cm	Scaridae	Dentary	R	
12C	17/18		170-190 cm	Scaridae	Caudal	A	
12C	17/18		170-190 cm	Scaridae	Caudal	A	
12C	17/18		170-190 cm	Scaridae	Caudal	A	
12C	17/18		170-190 cm	Scaridae	Precaudal	A	
12C	17/18		170-190 cm	Scaridae	Precaudal	A	
12C	17/18		170-190 cm	Lethrinidae	Palatine	L	
12C	17/18		170-190 cm	Lethrinidae	Palatine	R	
12C	17/18		170-190 cm	Lethrinidae	Quadrate	L	
12C	17/18		170-190 cm	Lethrinidae	Quadrate	R	
12C	17/18		170-190 cm	Lethrinidae	Angular	L	
12C	17/18		170-190 cm	Lethrinidae	Thoracic	A	
12C	17/18		170-190 cm	Lethrinidae	Dentary	L	
12C	17/18		170-190 cm	Lethrinidae	Premaxilla	R	
12C	17/18		170-190 cm	Lethrinidae	Premaxilla	R	
12C	17/18		170-190 cm	Lethrinidae	Premaxilla	L	
12C	17/18		170-190 cm	Carangidae	Premaxilla	R	
12C	17/18		170-190 cm	Serranidae	Dentary	L	
12C	17/18		170-190 cm	Serranidae	Maxilla	R	
12C	17/18		170-190 cm	Serranidae	Atlas	A	
12C	17/18		170-190 cm	Serranidae	Caudal	A	

12C	17/18		170-190 cm	Serranidae	Thoracic	A	
12C	17/18		170-190 cm	Serranidae	Thoracic	A	
12C	17/18		170-190 cm	Serranidae	Thoracic	A	
12C	17/18		170-190 cm	Serranidae	Quadrate	L	
12C	17/18		170-190 cm	Holocentridae	Quadrate	R	
12C	17/18		170-190 cm	Mugilidae	Caudal	A	
12C	17/18		170-190 cm	Mugilidae	Caudal	A	
12C	17/18		170-190 cm	Serranidae	Caudal	A	
12C	17/18		170-190 cm	Serranidae	Caudal	A	
12C	17/18		170-190 cm	Serranidae	Posttemporal	R	
12C	17/18		170-190 cm	Lethrinidae	Atlas	A	
12C	17/18		170-190 cm	Lethrinidae	Precaudal	A	
12C	17/18		170-190 cm	Lethrinidae	Precaudal	A	
12C	17/18		170-190 cm	Lethrinidae	Precaudal	A	
12C	17/18		170-190 cm	Lethrinidae	Precaudal	A	
12C	17/18		170-190 cm	Lethrinidae	Caudal	A	
12C	17/18		170-190 cm	Lethrinidae	Caudal	A	
12C	17/18		170-190 cm	Scaridae	Precaudal	A	
12C	17/18		170-190 cm	Muraenidae	Caudal	A	
12C	19/20		190-210 cm	Shark	Vertebra	A	Large
12C	19/20		190-210 cm	Acanthuridae	Dorsal spine	A	
12C	19/20		190-210 cm	Acanthuridae	Scute		
12C	19/20		190-210 cm	Balistidae	Dorsal spine	A	
12C	19/20		190-210 cm	Ostraciidae	Dermal plate		
12C	19/20		190-210 cm	Serranidae	Thoracic	A	
12C	19/20		190-210 cm	Serranidae	Thoracic	A	
12C	19/20		190-210 cm	Serranidae	Thoracic	A	
12C	19/20		190-210 cm	Serranidae	Thoracic	A	
12C	19/20		190-210 cm	Serranidae	Thoracic	A	
12C	19/20		190-210 cm	Serranidae	Precaudal	A	
12C	19/20		190-210 cm	Serranidae	Angular	R	
12C	19/20		190-210 cm	Serranidae	Atlas	A	
12C	19/20		190-210 cm	Serranidae	Premaxilla	L	
12C	19/20		190-210 cm	Scaridae	Lower pharyngeal	A	
12C	19/20		190-210 cm	Scaridae	Lower pharyngeal	A	
12C	19/20		190-210 cm	Scaridae	Upper pharyngeal	A	
12C	19/20		190-210 cm	Scaridae	Upper pharyngeal	A	
12C	19/20		190-210 cm	Scaridae	Dentary	L	
12C	19/20		190-210 cm	Scaridae	Precaudal	A	

12C	19/20		190-210 cm	Scaridae	Precaudal	A	
12C	19/20		190-210 cm	Scaridae	Precaudal	A	
12C	19/20		190-210 cm	Scaridae	Caudal	A	
12C	19/20		190-210 cm	Scaridae	Caudal	A	
12C	19/20		190-210 cm	Lethrinidae	Palatine	R	
12C	19/20		190-210 cm	Lethrinidae	Palatine	L	
12C	19/20		190-210 cm	Lethrinidae	Premaxilla	R	
12C	19/20		190-210 cm	Lethrinidae	Premaxilla	R	
12C	19/20		190-210 cm	Lethrinidae	Premaxilla	R	
12C	19/20		190-210 cm	Lethrinidae	Premaxilla	R	
12C	19/20		190-210 cm	Lethrinidae	Premaxilla	R	
12C	19/20		190-210 cm	Lethrinidae	Premaxilla	L	
12C	19/20		190-210 cm	Lethrinidae	Dentition		
12C	19/20		190-210 cm	Lethrinidae	Dentition		
12C	19/20		190-210 cm	Lethrinidae	Thoracic	A	
12C	19/20		190-210 cm	Lethrinidae	Thoracic	A	
12C	19/20		190-210 cm	Holocentridae	Thoracic	A	
12C	19/20		190-210 cm	Mugilidae	Caudal	A	
12C	19/20		190-210 cm	Mugilidae	Caudal	A	
12C	19/20		190-210 cm	Mugilidae	Thoracic	A	
12C	19/20		190-210 cm	Serranidae	Penultimate	A	
12C	19/20		190-210 cm	Serranidae	Caudal	A	
12C	19/20		190-210 cm	Scaridae	Opercle	R	
12C	19/20		190-210 cm	Scaridae	Precaudal	A	
12C	19/20		190-210 cm	Scaridae	Precaudal	A	
12C	19/20		190-210 cm	Lethrinidae	Atlas	A	
12C	19/20		190-210 cm	Lethrinidae	Thoracic	A	
12C	19/20		190-210 cm	Lethrinidae	Thoracic	A	
12C	19/20		190-210 cm	Lethrinidae	Thoracic	A	
12C	19/20		190-210 cm	Lethrinidae	Thoracic	A	
12C	19/20		190-210 cm	Lethrinidae	Precaudal	A	
12C	19/20		190-210 cm	Lethrinidae	Precaudal	A	
12C	19/20		190-210 cm	Lethrinidae	Precaudal	A	
12C	19/20		190-210 cm	Lethrinidae	Precaudal	A	
12C	19/20		190-210 cm	Lethrinidae	Caudal	A	
12C	19/20		190-210 cm	Lethrinidae	Scapula	L	
12C	19/20		190-210 cm	Lethrinidae	Hyomandibular	L	
12C	21/22		210-230 cm	Lethrinidae	Thoracic	A	
12C	21/22		210-230 cm	Lethrinidae	Precaudal	A	

12C	21/22		210-230 cm	Lethrinidae	Precaudal	A	
12C	21/22		210-230 cm	Lethrinidae	Premaxilla	R	
12C	21/22		210-230 cm	Carangidae	Premaxilla	L	
12C	21/22		210-230 cm	Scaridae	Upper pharyngeal	A	
12C	21/22		210-230 cm	Serranidae	Thoracic	A	
12C	21/22		210-230 cm	Serranidae	Precaudal	A	
13C	Surface			Scaridae	Precaudal	A	
13C	3		30-40 cm	Lethrinidae	Precaudal	A	
13C	3		30-40 cm	Lethrinidae	Thoracic	A	
13C	3		30-40 cm	Scaridae	Atlas	A	
13C	3		30-40 cm	Serranidae	Thoracic	A	
13C	3		30-40 cm	Serranidae	Atlas	A	
13C	3		30-40 cm	Serranidae	Thoracic	A	
13C	3		30-40 cm	Scaridae	Precaudal	A	
13C	4		40-50 cm	Serranidae	Atlas	A	
13C	4		40-50 cm	Serranidae	Thoracic	A	
13C	5		50-60 cm	Lethrinidae	Hyomandibular	R	
13C	5		50-60 cm	Lethrinidae	Caudal	A	
13C	6		60-70 cm	Scaridae	Lower Pharyngeal	A	
13C	6		60-70 cm	Scaridae	Lower Pharyngeal	A	
13C	6		60-70 cm	Scaridae	Upper Pharyngeal	A	
13C	6		60-70 cm	Scaridae	Dentary	L	
13C	6		60-70 cm	Balistidae	Thoracic	A	
13C	6		60-70 cm	Labridae	Lower Pharyngeal	A	
13C	6		60-70 cm	Lethrinidae	Atlas	A	
13C	6		60-70 cm	Lethrinidae	Atlas	A	
13C	6		60-70 cm	Lethrinidae	Quadrate	R	
13C	6		60-70 cm	Lethrinidae	Angular	L	
13C	6		60-70 cm	Serranidae	Premaxilla	R	
13C	6		60-70 cm	Serranidae	Thoracic	A	
13C	6		60-70 cm	Serranidae	Thoracic	A	
13C	6		60-70 cm	Acanthuridae	Caudal	A	
13C	6		60-70 cm	Scaridae	Ultimate	A	
13C	6		60-70 cm	Scaridae	Ultimate	A	
13C	6		60-70 cm	Serranidae	Caudal	A	
13C	6		60-70 cm	Serranidae	Caudal	A	
13C	6		60-70 cm	Siganidae	Caudal	A	
13C	6		60-70 cm	Siganidae	Caudal	A	
13C	6		60-70 cm	Lethrinidae	Atlas	A	

13C	6		60-70 cm	Lethrinidae	Atlas	A	
13C	6		60-70 cm	Lethrinidae	Precaudal	A	
13C	7		70-80 cm	Diodontidae	Spine	A	
13C	7		70-80 cm	Diodontidae	Spine	A	
13C	7		70-80 cm	Diodontidae	Spine	A	
13C	7		70-80 cm	Labridae	Lower Pharyngeal	A	
13C	7		70-80 cm	Labridae	Premaxilla	R	
13C	7		70-80 cm	Scaridae	Upper Pharyngeal	A	
13C	7		70-80 cm	Scaridae	Upper Pharyngeal	A	
13C	7		70-80 cm	Scaridae	Premaxilla	L	
13C	7		70-80 cm	Scaridae	Premaxilla	R	
13C	7		70-80 cm	Scaridae	Dentary	L	
13C	7		70-80 cm	Lethrinidae	Atlas	A	
13C	7		70-80 cm	Lethrinidae	Atlas	A	
13C	7		70-80 cm	Lethrinidae	Angular	R	
13C	7		70-80 cm	Lethrinidae	Premaxilla	L	
13C	7		70-80 cm	Lethrinidae	Premaxilla	L	
13C	7		70-80 cm	Lethrinidae	Premaxilla	R	
13C	7		70-80 cm	Lethrinidae	Premaxilla or dentary		
13C	7		70-80 cm	Lethrinidae	Vomer		
13C	7		70-80 cm	Acanthuridae	Spine	A	
13C	7		70-80 cm	Serranidae	Dentary	R	Anterior end fragment
13C	7		70-80 cm	Serranidae	Dentary	R	Posterior end fragment
13C	7		70-80 cm	Serranidae	Thoracic	A	
13C	7		70-80 cm	Serranidae	Maxilla	L	
13C	7		70-80 cm	Lethrinidae	Quadrate	R	
13C	7		70-80 cm	Acanthuridae	Caudal	A	
13C	7		70-80 cm	Scaridae	Precaudal	A	
13C	7		70-80 cm	Scaridae	Precaudal	A	
13C	7		70-80 cm	Scaridae	Precaudal	A	
13C	7		70-80 cm	Mugilidae	Precaudal	A	
13C	7		70-80 cm	Mugilidae	Caudal	A	
13C	7		70-80 cm	Acanthuridae	Caudal	A	
13C	7		70-80 cm	Acanthuridae	Caudal	A	
13C	7		70-80 cm	Acanthuridae	Caudal	A	
13C	7		70-80 cm	Siganidae	Caudal	A	
13C	7		70-80 cm	Scaridae	Caudal	A	

13C	7		70-80 cm	Scaridae	Caudal	A	
13C	7		70-80 cm	Scaridae	Caudal	A	
13C	7		70-80 cm	Scaridae	Ultimate	A	
13C	7		70-80 cm	Scaridae	Ultimate	A	
13C	7		70-80 cm	Scaridae	Palatine	L	
13C	7		70-80 cm	Scombridae	Thoracic	A	
13C	7		70-80 cm	Scombridae	Thoracic	A	
13C	7		70-80 cm	Scombridae	Caudal	A	
13C	7		70-80 cm	Balistidae	Sternum	A	
13C	7		70-80 cm	Balistidae	Thoracic	A	
13C	7		70-80 cm	Mullidae	Precaudal	A	
13C	7		70-80 cm	Mullidae	Caudal	A	
13C	7		70-80 cm	Holocentridae	Precaudal	A	
13C	7		70-80 cm	Serranidae	Maxilla	A	
13C	7		70-80 cm	Serranidae	Caudal	A	
13C	7		70-80 cm	Serranidae	Precaudal	A	
13C	7		70-80 cm	Carangidae	Caudal	A	
13C	7		70-80 cm	Lethrinidae	Atlas	A	
13C	7		70-80 cm	Lethrinidae	Thoracic	A	
13C	7		70-80 cm	Lethrinidae	Thoracic	A	
13C	7		70-80 cm	Lethrinidae	Precaudal	A	
13C	7		70-80 cm	Lethrinidae	Precaudal	A	
13C	7		70-80 cm	Lethrinidae	Precaudal	A	
13C	7		70-80 cm	Lethrinidae	Precaudal	A	
13C	7		70-80 cm	Lethrinidae	Precaudal	A	
13C	7		70-80 cm	Lethrinidae	Precaudal	A	
13C	7		70-80 cm	Lethrinidae	Caudal	A	
13C	7		70-80 cm	Lethrinidae	Caudal	A	
13C	7		70-80 cm	Lethrinidae	Caudal	A	
13C	7		70-80 cm	Lethrinidae	Caudal	A	
13C	7		70-80 cm	Lethrinidae	Caudal	A	
13C	7		70-80 cm	Lethrinidae	Quadrate	R	
13C	7		70-80 cm	Lethrinidae	Quadrate	R	
13C	7		70-80 cm	Lethrinidae	Scapula	L	
13C	8		80-90 cm	Holocentridae	Thoracic	A	
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		

13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Diodontidae	Spine		
13C	8		80-90 cm	Balistidae	Thoracic	A	
13C	8		80-90 cm	Balistidae	Tooth		
13C	8		80-90 cm	Balistidae	Quadrate	L	
13C	8		80-90 cm	Labridae	Lower pharyngeal	A	
13C	8		80-90 cm	Labridae	Premaxilla	L	
13C	8		80-90 cm	Labridae	Maxilla	R	
13C	8		80-90 cm	Labridae	Maxilla	L	
13C	8		80-90 cm	Acanthuridae	Dorsal spine	A	
13C	8		80-90 cm	Acanthuridae	Dorsal spine	A	
13C	8		80-90 cm	Acanthuridae	Dorsal spine	A	
13C	8		80-90 cm	Acanthuridae	Dorsal spine	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	

13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Spine	A	
13C	8		80-90 cm	Acanthuridae	Premaxilla	R	
13C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
13C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
13C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
13C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
13C	8		80-90 cm	Scaridae	Upper pharygneal	A	
13C	8		80-90 cm	Scaridae	Upper pharygneal	A	
13C	8		80-90 cm	Scaridae	Upper pharygneal	A	
13C	8		80-90 cm	Scaridae	Ultimate	A	
13C	8		80-90 cm	Scaridae	Ultimate	A	
13C	8		80-90 cm	Scaridae	Premaxilla	L	
13C	8		80-90 cm	Scaridae	Premaxilla	L	
13C	8		80-90 cm	Scaridae	Premaxilla	L	
13C	8		80-90 cm	Scaridae	Premaxilla	L	
13C	8		80-90 cm	Scaridae	Premaxilla	R	
13C	8		80-90 cm	Scaridae	Premaxilla	R	
13C	8		80-90 cm	Scaridae	Dentary	R	
13C	8		80-90 cm	Scaridae	Caudal	A	
13C	8		80-90 cm	Scaridae	Caudal	A	
13C	8		80-90 cm	Scaridae	Caudal	A	
13C	8		80-90 cm	Scaridae	Caudal	A	
13C	8		80-90 cm	Scaridae	Caudal	A	
13C	8		80-90 cm	Scaridae	Caudal	A	
13C	8		80-90 cm	Scaridae	Caudal	A	
13C	8		80-90 cm	Scaridae	Caudal	A	
13C	8		80-90 cm	Scaridae	Caudal	A	

13C	8		80-90 cm	Scaridae	Caudal	A	
13C	8		80-90 cm	Scaridae	Caudal	A	
13C	8		80-90 cm	Scaridae	Caudal	A	
13C	8		80-90 cm	Scaridae	Precaudal	A	
13C	8		80-90 cm	Scaridae	Precaudal	A	
13C	8		80-90 cm	Scaridae	Precaudal	A	
13C	8		80-90 cm	Scaridae	Precaudal	A	
13C	8		80-90 cm	Scaridae	Precaudal	A	
13C	8		80-90 cm	Scaridae	Precaudal	A	
13C	8		80-90 cm	Lethrinidae	Palatine	L	
13C	8		80-90 cm	Lethrinidae	Vomer	A	
13C	8		80-90 cm	Lethrinidae	Scapula	L	
13C	8		80-90 cm	Lethrinidae	Scapula	L	
13C	8		80-90 cm	Lethrinidae	Premaxilla	R	
13C	8		80-90 cm	Lethrinidae	Premaxilla	R	
13C	8		80-90 cm	Lethrinidae	Pharyngeal		
13C	8		80-90 cm	Serranidae	Vomer	A	
13C	8		80-90 cm	Serranidae	Maxilla	R	
13C	8		80-90 cm	Serranidae	Maxilla	L	
13C	8		80-90 cm	Serranidae	Premaxilla	R	
13C	8		80-90 cm	Serranidae	Premaxilla	R	
13C	8		80-90 cm	Serranidae	Premaxilla	L	
13C	8		80-90 cm	Serranidae	Premaxilla	L	
13C	8		80-90 cm	Serranidae	Dentary	R	
13C	8		80-90 cm	Serranidae	Dentary	L	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Precaudal	A	
13C	8		80-90 cm	Serranidae	Precaudal	A	

13C	8		80-90 cm	Serranidae	Precaudal	A	
13C	8		80-90 cm	Serranidae	Precaudal	A	
13C	8		80-90 cm	Serranidae	Thoracic	A	
13C	8		80-90 cm	Serranidae	Thoracic	A	
13C	8		80-90 cm	Serranidae	Thoracic	A	
13C	8		80-90 cm	Serranidae	Thoracic	A	
13C	8		80-90 cm	Serranidae	Thoracic	A	
13C	8		80-90 cm	Serranidae	Thoracic	A	
13C	8		80-90 cm	Serranidae	Thoracic	A	
13C	8		80-90 cm	Serranidae	Hyomandibular	R	
13C	8		80-90 cm	Carangidae	Premaxilla	R	
13C	8		80-90 cm	Acanthuridae	Precaudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Acanthuridae	Caudal	A	
13C	8		80-90 cm	Scombridae	Caudal	A	
13C	8		80-90 cm	Scaridae	Precaudal	A	
13C	8		80-90 cm	Scaridae	Precaudal	A	
13C	8		80-90 cm	Siganidae	Thoracic	A	
13C	8		80-90 cm	Siganidae	Precaudal	A	
13C	8		80-90 cm	Siganidae	Caudal	A	
13C	8		80-90 cm	Siganidae	Caudal	A	
13C	8		80-90 cm	Siganidae	Caudal	A	
13C	8		80-90 cm	Siganidae	Caudal	A	
13C	8		80-90 cm	Lethrinidae	Thoracic	A	
13C	8		80-90 cm	Lethrinidae	Precaudal	A	
13C	8		80-90 cm	Lethrinidae	Precaudal	A	
13C	8		80-90 cm	Lethrinidae	Precaudal	A	
13C	8		80-90 cm	Lethrinidae	Precaudal	A	
13C	8		80-90 cm	Lethrinidae	Precaudal	A	
13C	8		80-90 cm	Lethrinidae	Precaudal	A	
13C	8		80-90 cm	Lethrinidae	Caudal	A	
13C	8		80-90 cm	Lethrinidae	Caudal	A	
13C	8		80-90 cm	Lethrinidae	Opercle	R	
13C	8		80-90 cm	Lethrinidae	Angular	L	
13C	8		80-90 cm	Serranidae	Precaudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Caudal	A	

13C	8		80-90 cm	Serranidae	Caudal	A	
13C	8		80-90 cm	Serranidae	Hyomandibular	L	
13C	9		80-90 cm	Muraenidae	Caudal	A	
13C	9		90-100 cm	Diodontidae	Spine	A	
13C	9		90-100 cm	Diodontidae	Spine	A	
13C	9		90-100 cm	Diodontidae	Spine	A	
13C	9		90-100 cm	Diodontidae	Spine	A	
13C	9		90-100 cm	Diodontidae	Spine	A	
13C	9		90-100 cm	Diodontidae	Spine	A	
13C	9		90-100 cm	Diodontidae	Spine	A	
13C	9		90-100 cm	Scaridae	Lower Pharyngeal	A	
13C	9		90-100 cm	Scaridae	Lower Pharyngeal	A	
13C	9		90-100 cm	Scaridae	Lower Pharyngeal	A	
13C	9		90-100 cm	Scaridae	Lower Pharyngeal	A	
13C	9		90-100 cm	Scaridae	Lower Pharyngeal	A	
13C	9		90-100 cm	Scaridae	Lower Pharyngeal	A	
13C	9		90-100 cm	Scaridae	Upper Pharyngeal	A	
13C	9		90-100 cm	Scaridae	Dentary	R	
13C	9		90-100 cm	Scaridae	Dentary	R	
13C	9		90-100 cm	Labridae	Lower Pharyngeal	A	Fragment
13C	9		90-100 cm	Labridae	Lower Pharyngeal	A	Fragment
13C	9		90-100 cm	Labridae	Lower Pharyngeal	A	Fragment
13C	9		90-100 cm	Labridae	Dentary	L	
13C	9		90-100 cm	Labridae	Premaxilla	L	
13C	9		90-100 cm	Labridae	Dentary or premaxilla		
13C	9		90-100 cm	Labridae	Dentary or premaxilla		
13C	9		90-100 cm	Serranidae	Premaxilla	L	
13C	9		90-100 cm	Serranidae	Atlas	A	
13C	9		90-100 cm	Serranidae	Atlas	A	
13C	9		90-100 cm	Serranidae	Angular	L	
13C	9		90-100 cm	Serranidae	Caudal	A	
13C	9		90-100 cm	Lethrinidae	Atlas	A	
13C	9		90-100 cm	Lethrinidae	Atlas	A	
13C	9		90-100 cm	Lethrinidae	Vomer	A	
13C	9		90-100 cm	Lethrinidae	Palatine	R	
13C	9		90-100 cm	Lethrinidae	Palatine	L	
13C	9		90-100 cm	Lethrinidae	Palatine	L	
13C	9		90-100 cm	Lethrinidae	Premaxilla	L	
13C	9		90-100 cm	Lethrinidae	Premaxilla	L	

13C	9		90-100 cm	Lethrinidae	Premaxilla	L	
13C	9		90-100 cm	Lethrinidae	Premaxilla	L	
13C	9		90-100 cm	Lethrinidae	Premaxilla	R	
13C	9		90-100 cm	Lethrinidae	Premaxilla	R	
13C	9		90-100 cm	Lethrinidae	Dentary	R	
13C	9		90-100 cm	Lethrinidae	Dentary	L	
13C	9		90-100 cm	Lethrinidae	Quadrate	R	
13C	9		90-100 cm	Lethrinidae	Quadrate	R	
13C	9		90-100 cm	Lethrinidae	Quadrate	L	
13C	9		90-100 cm	Lethrinidae	Angular	R	
13C	9		90-100 cm	Lethrinidae	Angular	R	
13C	9		90-100 cm	Lethrinidae	Angular	R	
13C	9		90-100 cm	Acanthuridae	Spine	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Scaridae	Caudal	A	
13C	9		90-100 cm	Scaridae	Caudal	A	
13C	9		90-100 cm	Scaridae	Caudal	A	
13C	9		90-100 cm	Scaridae	Caudal	A	
13C	9		90-100 cm	Scaridae	Caudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	

13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Precaudal	A	
13C	9		90-100 cm	Scaridae	Thoracic	A	
13C	9		90-100 cm	Scaridae	Premaxilla	L	
13C	9		90-100 cm	Holocentridae	Thoracic	A	
13C	9		90-100 cm	Holocentridae	Thoracic	A	
13C	9		90-100 cm	Holocentridae	Thoracic	A	
13C	9		90-100 cm	Serranidae	Maxilla	R	
13C	9		90-100 cm	Serranidae	Thoracic	A	
13C	9		90-100 cm	Serranidae	Thoracic	A	
13C	9		90-100 cm	Serranidae	Thoracic	A	
13C	9		90-100 cm	Serranidae	Thoracic	A	
13C	9		90-100 cm	Serranidae	Thoracic	A	
13C	9		90-100 cm	Serranidae	Precaudal	A	
13C	9		90-100 cm	Serranidae	Caudal	A	
13C	9		90-100 cm	Serranidae	Penultimate	A	
13C	9		90-100 cm	Serranidae	Penultimate	A	
13C	9		90-100 cm	Acanthuridae	Precaudal	A	
13C	9		90-100 cm	Acanthuridae	Precaudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Acanthuridae	Caudal	A	
13C	9		90-100 cm	Siganidae	Precaudal	A	
13C	9		90-100 cm	Siganidae	Precaudal	A	
13C	9		90-100 cm	Siganidae	Caudal	A	
13C	9		90-100 cm	Siganidae	Caudal	A	
13C	9		90-100 cm	Siganidae	Caudal	A	
13C	9		90-100 cm	Siganidae	Caudal	A	
13C	9		90-100 cm	Siganidae	Caudal	A	
13C	9		90-100 cm	Siganidae	Caudal	A	
13C	9		90-100 cm	Siganidae	Caudal	A	
13C	9		90-100 cm	Siganidae	Caudal	A	
13C	9		90-100 cm	Siganidae	Caudal	A	
13C	9		90-100 cm	Siganidae	Caudal	A	

13C	9		90-100 cm	Siganidae	Caudal	A	
13C	9		90-100 cm	Siganidae	Caudal	A	
13C	9		90-100 cm	Scaridae	Caudal	A	
13C	9		90-100 cm	Scaridae	Palatine	R	
13C	9		90-100 cm	Scaridae	Scapula	R	
13C	9		90-100 cm	Scombridae	Caudal	A	
13C	9		90-100 cm	Scombridae	Caudal	A	
13C	9		90-100 cm	Scombridae	Thoracic	A	
13C	9		90-100 cm	Mullidae	Caudal	A	
13C	9		90-100 cm	Mugilidae	Thoracic	A	
13C	9		90-100 cm	Mugilidae	Thoracic	A	
13C	9		90-100 cm	Mugilidae	Thoracic	A	
13C	9		90-100 cm	Mugilidae	Thoracic	A	
13C	9		90-100 cm	Mugilidae	Caudal	A	
13C	9		90-100 cm	Lethrinidae	Atlas	A	
13C	9		90-100 cm	Lethrinidae	Thoracic	A	
13C	9		90-100 cm	Lethrinidae	Thoracic	A	
13C	9		90-100 cm	Lethrinidae	Thoracic	A	
13C	9		90-100 cm	Lethrinidae	Precaudal	A	
13C	9		90-100 cm	Lethrinidae	Precaudal	A	
13C	9		90-100 cm	Lethrinidae	Precaudal	A	
13C	9		90-100 cm	Lethrinidae	Precaudal	A	
13C	9		90-100 cm	Lethrinidae	Precaudal	A	
13C	9		90-100 cm	Lethrinidae	Precaudal	A	
13C	9		90-100 cm	Lethrinidae	Precaudal	A	
13C	9		90-100 cm	Lethrinidae	Precaudal	A	
13C	9		90-100 cm	Lethrinidae	Caudal	A	
13C	9		90-100 cm	Lethrinidae	Caudal	A	
13C	9		90-100 cm	Lethrinidae	Caudal	A	
13C	9		90-100 cm	Lethrinidae	Caudal	A	
13C	9		90-100 cm	Lethrinidae	Caudal	A	
13C	9		90-100 cm	Lethrinidae	Caudal	A	
13C	9		90-100 cm	Lethrinidae	Quadrate	R	
13C	9		90-100 cm	Lethrinidae	Quadrate	R	
13C	9		90-100 cm	Lethrinidae	Quadrate	L	
13C	9		90-100 cm	Lethrinidae	Angular	R	
13C	9		90-100 cm	Serranidae	Thoracic	A	
13C	9		90-100 cm	Serranidae	Precaudal	A	
13C	9		90-100 cm	Serranidae	Precaudal	A	

13C	9		90-100 cm	Serranidae	Caudal	A	
13C	9		90-100 cm	Serranidae	Caudal	A	
13C	9		90-100 cm	Serranidae	Caudal	A	
13C	9		90-100 cm	Serranidae	Posttemporal	R	
13C	9		90-100 cm	Holocentridae	Maxilla	L	
13C	9		90-100 cm	Holocentridae	Thoracic	A	
13C	9		90-100 cm	Holocentridae	Precaudal	A	
13C	10		100-110 cm	Scaridae	Basioccipital	A	
13C	10		100-110 cm	Scaridae	Premaxilla	R	
13C	10		100-110 cm	Scaridae	Fourth epibranchial		
13C	10		100-110 cm	Acanthuridae	Spine	A	
13C	10		100-110 cm	Carangidae	Vomer	A	
13C	10		100-110 cm	Scaridae	Caudal	A	
13C	10		100-110 cm	Scaridae	Precaudal	A	
13C	10		100-110 cm	Scaridae	Precaudal	A	
13C	10		100-110 cm	Acanthuridae	Caudal	A	
13C	10		100-110 cm	Lethrinidae	Maxilla	R	
13C	10		100-110 cm	Serranidae	Precaudal	A	
13C	10		100-110 cm	Serranidae	Caudal	A	
13C	10		100-110 cm	Acanthuridae	Caudal	A	
13C	10		100-110 cm	Scaridae	Caudal	A	
13C	10		100-110 cm	Serranidae	Caudal	A	
13C	10		100-110 cm	Lethrinidae	Caudal	A	
13C	10		100-110 cm	Lethrinidae	Precaudal	A	
13C	10		100-110 cm	Lethrinidae	Thoracic	A	
13C	10		100-110 cm	Lethrinidae	Angular	L	
13C	10		100-110 cm	Siganidae	Caudal	A	
13C	10		100-110 cm	Mugilidae	Thoracic	A	Fragment
13C	10		100-110 cm	Carangidae	Caudal	A	Fragment
13C	11		110-120 cm	Scaridae	Lower Pharyngeal	A	Fragment
13C	11		110-120 cm	Scaridae	Lower Pharyngeal	A	Fragment
13C	11		110-120 cm	Scaridae	Upper Pharyngeal	A	
13C	11		110-120 cm	Scaridae	Upper Pharyngeal	A	
13C	11		110-120 cm	Scaridae	Upper Pharyngeal	A	
13C	11		110-120 cm	Lethrinidae	Atlas	A	
13C	11		110-120 cm	Lethrinidae	Atlas	A	Fragment
13C	11		110-120 cm	Lethrinidae	Atlas	A	Fragment
13C	11		110-120 cm	Lethrinidae	Atlas	A	Posterior end fragment

13C	11		110-120 cm	Lethrinidae	Palatine	R	Posterior end fragment
13C	11		110-120 cm	Lethrinidae	Premaxilla	L	Anterior end fragment
13C	11		110-120 cm	Lethrinidae	Premaxilla	R	
13C	11		110-120 cm	Lethrinidae	Dentary	L	
13C	11		110-120 cm	Labridae	Lower Pharyngeal	A	
13C	11		110-120 cm	Labridae	Lower Pharyngeal	A	
13C	11		110-120 cm	Labridae	Vomer	A	
13C	11		110-120 cm	Labridae	Upper Pharyngeal	A	
13C	11		110-120 cm	Balistidae	Spine	A	
13C	11		110-120 cm	Serranidae	Premaxilla	R	
13C	11		110-120 cm	Serranidae	Premaxilla	R	
13C	11		110-120 cm	Serranidae	Dentary	R	
13C	11		110-120 cm	Serranidae	Dentary	L	Anterior end fragment
13C	11		110-120 cm	Serranidae	Dentary	L	Posterior end fragment
13C	11		110-120 cm	Serranidae	Atlas	A	
13C	11		110-120 cm	Serranidae	Atlas	A	
13C	11		110-120 cm	Serranidae	Atlas	A	
13C	11		110-120 cm	Serranidae	Atlas	A	
13C	11		110-120 cm	Serranidae	Thoracic	A	
13C	11		110-120 cm	Acanthuridae	Caudal	A	
13C	11		110-120 cm	Acanthuridae	Caudal	A	
13C	11		110-120 cm	Acanthuridae	Caudal	A	
13C	11		110-120 cm	Sphyraenidae	Caudal	A	
13C	11		110-120 cm	Sphyraenidae	Caudal	A	
13C	11		110-120 cm	Congridae	Vertebra	A	
13C	11		110-120 cm	Acanthuridae	Caudal	A	
13C	11		110-120 cm	Acanthuridae	Caudal	A	
13C	11		110-120 cm	Acanthuridae	Caudal	A	
13C	11		110-120 cm	Acanthuridae	Caudal	A	
13C	11		110-120 cm	Acanthuridae	Caudal	A	
13C	11		110-120 cm	Serranidae	Thoracic	A	
13C	11		110-120 cm	Serranidae	Thoracic	A	
13C	11		110-120 cm	Serranidae	Thoracic	A	
13C	11		110-120 cm	Serranidae	Thoracic	A	
13C	11		110-120 cm	Serranidae	Thoracic	A	

13C	11		110-120 cm	Serranidae	Thoracic	A	
13C	11		110-120 cm	Serranidae	Caudal	A	
13C	11		110-120 cm	Serranidae	Precaudal	A	
13C	11		110-120 cm	Serranidae	Maxilla	R	
13C	11		110-120 cm	Serranidae	Scapula		
13C	11		110-120 cm	Scaridae	Caudal	A	
13C	11		110-120 cm	Scaridae	Caudal	A	
13C	11		110-120 cm	Scaridae	Caudal	A	
13C	11		110-120 cm	Scaridae	Caudal	A	
13C	11		110-120 cm	Scaridae	Caudal	A	
13C	11		110-120 cm	Scaridae	Precaudal	A	
13C	11		110-120 cm	Scaridae	Precaudal	A	
13C	11		110-120 cm	Scaridae	Precaudal	A	
13C	11		110-120 cm	Scaridae	Precaudal	A	
13C	11		110-120 cm	Scaridae	Precaudal	A	
13C	11		110-120 cm	Scaridae	Precaudal	A	
13C	11		110-120 cm	Scaridae	Thoracic	A	
13C	11		110-120 cm	Scaridae	Ultimate	A	
13C	11		110-120 cm	Scaridae	Quadrate	L	
13C	11		110-120 cm	Lethrinidae	Urohyal	A	
13C	11		110-120 cm	Lethrinidae	Maxilla	L	
13C	11		110-120 cm	Acanthuridae	Precaudal	A	
13C	11		110-120 cm	Acanthuridae	Precaudal	A	
13C	11		110-120 cm	Acanthuridae	Caudal	A	
13C	11		110-120 cm	Acanthuridae	Caudal	A	
13C	11		110-120 cm	Scombridae	Thoracic	A	
13C	11		110-120 cm	Scombridae	Thoracic	A	
13C	11		110-120 cm	Scombridae	Thoracic	A	
13C	11		110-120 cm	Scombridae	Thoracic	A	
13C	11		110-120 cm	Scombridae	Caudal	A	
13C	11		110-120 cm	Scombridae	Caudal	A	
13C	11		110-120 cm	Scombridae	Caudal	A	
13C	11		110-120 cm	Siganidae	Precaudal	A	
13C	11		110-120 cm	Siganidae	Precaudal	A	
13C	11		110-120 cm	Siganidae	Precaudal	A	
13C	11		110-120 cm	Siganidae	Caudal	A	
13C	11		110-120 cm	Siganidae	Caudal	A	
13C	11		110-120 cm	Siganidae	Caudal	A	
13C	11		110-120 cm	Siganidae	Caudal	A	

13C	11		110-120 cm	Siganidae	Caudal	A	
13C	11		110-120 cm	Siganidae	Caudal	A	
13C	11		110-120 cm	Serranidae	Atlas	A	
13C	11		110-120 cm	Serranidae	Atlas	A	
13C	11		110-120 cm	Serranidae	Precaudal	A	
13C	11		110-120 cm	Serranidae	Precaudal	A	
13C	11		110-120 cm	Serranidae	Precaudal	A	
13C	11		110-120 cm	Serranidae	Precaudal	A	
13C	11		110-120 cm	Serranidae	Precaudal	A	
13C	11		110-120 cm	Serranidae	Caudal	A	
13C	11		110-120 cm	Serranidae	Caudal	A	
13C	11		110-120 cm	Serranidae	Penultimate	A	
13C	11		110-120 cm	Serranidae	Penultimate	A	
13C	11		110-120 cm	Serranidae	Epihyal	R	
13C	11		110-120 cm	Serranidae	Scapula	R	
13C	11		110-120 cm	Mugilidae	Caudal	A	
13C	11		110-120 cm	Scaridae	Hyomandibular	L	
13C	11		110-120 cm	Scaridae	Atlas	A	
13C	11		110-120 cm	Scaridae	Precaudal	A	
13C	11		110-120 cm	Scaridae	Precaudal	A	
13C	11		110-120 cm	Scaridae	Caudal	A	
13C	11		110-120 cm	Lethrinidae	Atlas	A	
13C	11		110-120 cm	Lethrinidae	Atlas	A	
13C	11		110-120 cm	Lethrinidae	Atlas	A	
13C	11		110-120 cm	Lethrinidae	Atlas	A	
13C	11		110-120 cm	Lethrinidae	Thoracic	A	
13C	11		110-120 cm	Lethrinidae	Thoracic	A	
13C	11		110-120 cm	Lethrinidae	Thoracic	A	
13C	11		110-120 cm	Lethrinidae	Thoracic	A	
13C	11		110-120 cm	Lethrinidae	Precaudal	A	
13C	11		110-120 cm	Lethrinidae	Precaudal	A	
13C	11		110-120 cm	Lethrinidae	Caudal	A	
13C	11		110-120 cm	Lethrinidae	Caudal	A	
13C	11		110-120 cm	Lethrinidae	Quadrate	R	
13C	11		110-120 cm	Lethrinidae	Angular	R	
13C	11		110-120 cm	Carangidae	Caudal	A	
13C	13		130-140 cm	Balistidae	Spine	A	
13C	13		130-140 cm	Labridae	Upper Pharyngeal	A	
13C	13		130-140 cm	Labridae	Lower Pharyngeal	A	

13C	13		130-140 cm	Acanthuridae	Caudal	A	
13C	13		130-140 cm	Acanthuridae	Dorsal spine	A	
13C	13		130-140 cm	Scaridae	Lower Pharyngeal	A	
13C	13		130-140 cm	Scaridae	Lower Pharyngeal	A	
13C	13		130-140 cm	Scaridae	Lower Pharyngeal	A	
13C	13		130-140 cm	Scaridae	Lower Pharyngeal	A	
13C	13		130-140 cm	Scaridae	Lower Pharyngeal	A	
13C	13		130-140 cm	Scaridae	Lower Pharyngeal	A	
13C	13		130-140 cm	Scaridae	Upper Pharyngeal	A	
13C	13		130-140 cm	Scaridae	Upper Pharyngeal	A	
13C	13		130-140 cm	Scaridae	Upper Pharyngeal	A	
13C	13		130-140 cm	Scaridae	Upper Pharyngeal	A	
13C	13		130-140 cm	Scaridae	Upper Pharyngeal	A	
13C	13		130-140 cm	Scaridae	Dentary	L	
13C	13		130-140 cm	Scaridae	Dentary	R	
13C	13		130-140 cm	Scaridae	Premaxilla	R	
13C	13		130-140 cm	Scaridae	Fourth epibranchial		
13C	13		130-140 cm	Lethrinidae	Atlas	A	
13C	13		130-140 cm	Lethrinidae	Atlas	A	
13C	13		130-140 cm	Lethrinidae	Atlas	A	
13C	13		130-140 cm	Lethrinidae	Atlas	A	
13C	13		130-140 cm	Lethrinidae	Vomer	A	
13C	13		130-140 cm	Lethrinidae	Vomer	A	
13C	13		130-140 cm	Lethrinidae	Palatine	L	
13C	13		130-140 cm	Lethrinidae	Dentary	R	
13C	13		130-140 cm	Lethrinidae	Dentary	L	
13C	13		130-140 cm	Lethrinidae	Premaxilla	R	
13C	13		130-140 cm	Lethrinidae	Premaxilla		
13C	13		130-140 cm	Lethrinidae	Ceratohyal	L	
13C	13		130-140 cm	Lethrinidae	Epihyal	L	
13C	13		130-140 cm	Serranidae	Dentary	L	
13C	13		130-140 cm	Serranidae	Dentary	L	
13C	13		130-140 cm	Serranidae	Dentary		
13C	13		130-140 cm	Serranidae	Caudal	A	
13C	13		130-140 cm	Serranidae	Caudal	A	
13C	13		130-140 cm	Serranidae	Caudal	A	
13C	13		130-140 cm	Serranidae	Precaudal	A	
13C	13		130-140 cm	Serranidae	Premaxilla	R	
13C	13		130-140 cm	Lethrinidae	Palatine	R	

13C	13		130-140 cm	Lethrinidae	Angular	R	
13C	13		130-140 cm	Sphyraenidae	Caudal	A	
13C	13		130-140 cm	Lethrinidae	Palatine	R	
13C	13		130-140 cm	Scaridae	Caudal	A	
13C	13		130-140 cm	Scaridae	Caudal	A	
13C	13		130-140 cm	Scaridae	Caudal	A	
13C	13		130-140 cm	Scaridae	Caudal	A	
13C	13		130-140 cm	Scaridae	Caudal	A	
13C	13		130-140 cm	Scaridae	Caudal	A	
13C	13		130-140 cm	Scaridae	Precaudal	A	
13C	13		130-140 cm	Scaridae	Precaudal	A	
13C	13		130-140 cm	Scaridae	Precaudal	A	
13C	13		130-140 cm	Acanthuridae	Caudal	A	
13C	13		130-140 cm	Serranidae	Thoracic	A	
13C	13		130-140 cm	Serranidae	Thoracic	A	
13C	13		130-140 cm	Serranidae	Caudal	A	
13C	13		130-140 cm	Holocentridae	Thoracic	A	
13C	13		130-140 cm	Holocentridae	Thoracic	A	
13C	13		130-140 cm	Acanthuridae	Precaudal	A	
13C	13		130-140 cm	Acanthuridae	Caudal	A	
13C	13		130-140 cm	Acanthuridae	Caudal	A	Fragment
13C	13		130-140 cm	Scombridae	Thoracic	A	
13C	13		130-140 cm	Scombridae	Thoracic	A	
13C	13		130-140 cm	Scombridae	Caudal	A	
13C	13		130-140 cm	Siganidae	Caudal	A	
13C	13		130-140 cm	Siganidae	Caudal	A	
13C	13		130-140 cm	Siganidae	Caudal	A	
13C	13		130-140 cm	Siganidae	Caudal	A	
13C	13		130-140 cm	Siganidae	Caudal	A	
13C	13		130-140 cm	Mullidae	Precaudal	A	
13C	13		130-140 cm	Lethrinidae	Atlas	A	
13C	13		130-140 cm	Lethrinidae	Thoracic	A	
13C	13		130-140 cm	Lethrinidae	Precaudal	A	
13C	13		130-140 cm	Lethrinidae	Precaudal	A	
13C	13		130-140 cm	Lethrinidae	Precaudal	A	
13C	13		130-140 cm	Lethrinidae	Precaudal	A	
13C	13		130-140 cm	Lethrinidae	Precaudal	A	
13C	13		130-140 cm	Lethrinidae	Precaudal	A	
13C	13		130-140 cm	Lethrinidae	Precaudal	A	

13C	13		130-140 cm	Lethrinidae	Precaudal	A	
13C	13		130-140 cm	Lethrinidae	Caudal	A	
13C	13		130-140 cm	Lethrinidae	Caudal	A	
13C	13		130-140 cm	Lethrinidae	Scapula	A	
13C	13		130-140 cm	Lethrinidae	Epihyal	L	
13C	13		130-140 cm	Lethrinidae	Ceratohyal	L	
13C	13		130-140 cm	Lethrinidae	Angular	R	
13C	13		130-140 cm	Serranidae	Precaudal	A	
13C	13		130-140 cm	Serranidae	Precaudal	A	
13C	13		130-140 cm	Serranidae	Precaudal	A	
13C	13		130-140 cm	Serranidae	Precaudal	A	
13C	13		130-140 cm	Serranidae	Caudal	A	
13C	13		130-140 cm	Serranidae	Caudal	A	
13C	13		130-140 cm	Serranidae	Caudal	A	
13C	13		130-140 cm	Serranidae	Caudal	A	
13C	13		130-140 cm	Serranidae	Caudal	A	
13C	13		130-140 cm	Serranidae	Caudal	A	
13C	13		130-140 cm	Serranidae	Penultimate	A	
13C	13		130-140 cm	Serranidae	Angular	R	
13C	13		130-140 cm	Mugilidae	Thoracic	A	
13C	13		130-140 cm	Scaridae	Precaudal	A	
13C	13		130-140 cm	Scaridae	Precaudal	A	
13C	13		130-140 cm	Scaridae	Precaudal	A	
13C	13		130-140 cm	Scaridae	Precaudal	A	
13C	13		130-140 cm	Scaridae	Caudal	A	
13C	13		130-140 cm	Scaridae	Caudal	A	
13C	13		130-140 cm	Scaridae	Caudal	A	
13C	13		130-140 cm	Scaridae	Caudal	A	
13C	13		130-140 cm	Scaridae	Caudal	A	
13C	13		130-140 cm	Scaridae	Ultimate	A	
13C	13		130-140 cm	Carangidae	Caudal	A	
13C	13		130-140 cm	Carangidae	Caudal	A	
13C	14		140-150 cm	Scaridae	Lower Pharyngeal	A	
13C	14		140-150 cm	Scaridae	Lower Pharyngeal	A	
13C	14		140-150 cm	Lethrinidae	Palatine	R	
13C	14		140-150 cm	Lethrinidae	Dentary	R	
13C	14		140-150 cm	Lethrinidae	Maxilla	R	
13C	14		140-150 cm	Lethrinidae	Maxilla	R	
13C	14		140-150 cm	Serranidae	Angular	L	

13C	14		140-150 cm	Serranidae	Thoracic	A	
13C	14		140-150 cm	Holocentridae	Thoracic	A	
13C	14		140-150 cm	Lethrinidae	Premaxilla	L	
13C	14		140-150 cm	Lethrinidae	Precaudal	A	
13C	14		140-150 cm	Lethrinidae	Precaudal	A	
13C	14		140-150 cm	Lethrinidae	Caudal	A	
13C	15		150-160 cm	Lethrinidae	Palatine	R	
13C	15		150-160 cm	Diodontidae	Spine	A	
13C	15		150-160 cm	Scaridae	Lower Pharyngeal	A	
13C	15		150-160 cm	Scaridae	Lower Pharyngeal	A	
13C	15		150-160 cm	Scaridae	Lower Pharyngeal	A	
13C	15		150-160 cm	Scaridae	Lower Pharyngeal	A	
13C	15		150-160 cm	Scaridae	Upper Pharyngeal	A	Fragment
13C	15		150-160 cm	Scaridae	Upper Pharyngeal	A	Fragment
13C	15		150-160 cm	Scaridae	Dentary	L	
13C	15		150-160 cm	Serranidae	Vomer	A	
13C	15		150-160 cm	Serranidae	Dentary	R	Posterior end fragment
13C	15		150-160 cm	Serranidae	Premaxilla	R	Anterior end fragment
13C	15		150-160 cm	Acanthuridae	Caudal	A	
13C	15		150-160 cm	Acanthuridae	Caudal	A	
13C	15		150-160 cm	Acanthuridae	Caudal	A	
13C	15		150-160 cm	Carangidae	Vomer	A	
13C	15		150-160 cm	Serranidae	Caudal	A	
13C	15		150-160 cm	Serranidae	Caudal	A	small
13C	15		150-160 cm	Serranidae	Caudal	A	large
13C	15		150-160 cm	Serranidae	Thoracic	A	large
13C	15		150-160 cm	Serranidae	Thoracic	A	
13C	15		150-160 cm	Serranidae	Thoracic	A	
13C	15		150-160 cm	Holocentridae	Thoracic	A	
13C	15		150-160 cm	Scaridae	Precaudal	A	
13C	15		150-160 cm	Scaridae	Precaudal	A	
13C	15		150-160 cm	Scaridae	Precaudal	A	
13C	15		150-160 cm	Scaridae	Caudal	A	
13C	15		150-160 cm	Scaridae	Caudal	A	
13C	15		150-160 cm	Scaridae	Caudal	A	
13C	15		150-160 cm	Scaridae	Caudal	A	
13C	15		150-160 cm	Scaridae	Caudal	A	

13C	15		150-160 cm	Siganidae	Caudal	A	
13C	15		150-160 cm	Siganidae	Caudal	A	
13C	15		150-160 cm	Siganidae	Caudal	A	
13C	15		150-160 cm	Siganidae	Caudal	A	
13C	15		150-160 cm	Siganidae	Caudal	A	
13C	15		150-160 cm	Lethrinidae	Precaudal	A	
13C	15		150-160 cm	Lethrinidae	Precaudal	A	
13C	15		150-160 cm	Lethrinidae	Caudal	A	
13C	15		150-160 cm	Mugilidae	Thoracic	A	
13C	15		150-160 cm	Mugilidae	Caudal	A	
13C	15		150-160 cm	Mugilidae	Caudal	A	
13C	15		150-160 cm	Mullidae	Precaudal	A	
13C	15		150-160 cm	Serranidae	Thoracic	A	
13C	15		150-160 cm	Serranidae	Caudal	A	
13C	15		150-160 cm	Serranidae	Precaudal	A	
13C	15		150-160 cm	Serranidae	Precaudal	A	
13C	15		150-160 cm	Serranidae	Precaudal	A	
13C	15		150-160 cm	Serranidae	Precaudal	A	
13C	15		150-160 cm	Serranidae	Penultimate	A	
13C	15		150-160 cm	Muraenidae	Caudal	A	
13C	16		160-170 cm	Diodontidae	Spine	A	
13C	16		160-170 cm	Scaridae	Dentary	L	
13C	16		160-170 cm	Scaridae	Lower Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Lower Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Lower Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Lower Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Lower Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Lower Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Lower Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Lower Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Lower Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Lower Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Upper Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Upper Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Upper Pharyngeal	A	
13C	16		160-170 cm	Scaridae	Upper Pharyngeal	A	Fragment
13C	16		160-170 cm	Scaridae	Upper Pharyngeal	A	Fragment
13C	16		160-170 cm	Scaridae	Upper Pharyngeal	A	Fragment
13C	16		160-170 cm	Scaridae	Upper Pharyngeal	A	Fragment

13C	16		160-170 cm	Lethrinidae	Vomer	A	
13C	16		160-170 cm	Lethrinidae	Palatine	R	
13C	16		160-170 cm	Lethrinidae	Premaxilla	R	
13C	16		160-170 cm	Lethrinidae	Premaxilla	R	
13C	16		160-170 cm	Lethrinidae	Premaxilla	L	Fragment
13C	16		160-170 cm	Lethrinidae	Premaxilla	L	Fragment
13C	16		160-170 cm	Lethrinidae	Premaxilla		Posterior end fragment
13C	16		160-170 cm	Lethrinidae	Premaxilla		Posterior end fragment
13C	16		160-170 cm	Lethrinidae	Dentary	R	Anterior end fragment
13C	16		160-170 cm	Labridae	Upper Pharyngeal	A	
13C	16		160-170 cm	Acanthuridae	Spine	A	
13C	16		160-170 cm	Acanthuridae	Spine	A	
13C	16		160-170 cm	Acanthuridae	Caudal	A	
13C	16		160-170 cm	Acanthuridae	Caudal	A	
13C	16		160-170 cm	Scaridae	Caudal	A	
13C	16		160-170 cm	Scaridae	Caudal	A	
13C	16		160-170 cm	Scaridae	Precaudal	A	
13C	16		160-170 cm	Scaridae	Precaudal	A	
13C	16		160-170 cm	Acanthuridae	Caudal	A	
13C	16		160-170 cm	Serranidae	Caudal	A	Fragment
13C	16		160-170 cm	Serranidae	Thoracic	A	Fragment
13C	16		160-170 cm	Acanthuridae	Caudal	A	
13C	16		160-170 cm	Scombridae	Caudal	A	
13C	16		160-170 cm	Scaridae	Caudal	A	
13C	16		160-170 cm	Scaridae	Caudal	A	
13C	16		160-170 cm	Scaridae	Caudal	A	
13C	16		160-170 cm	Scaridae	Ultimate	A	
13C	16		160-170 cm	Scaridae	Quadrate	L	
13C	16		160-170 cm	Mugilidae	Thoracic	A	
13C	16		160-170 cm	Mugilidae	Caudal	A	
13C	16		160-170 cm	Mugilidae	Caudal	A	
13C	16		160-170 cm	Lethrinidae	Precaudal	A	
13C	16		160-170 cm	Lethrinidae	Precaudal	A	
13C	16		160-170 cm	Lethrinidae	Precaudal	A	
13C	16		160-170 cm	Lethrinidae	Caudal	A	
13C	16		160-170 cm	Lethrinidae	Caudal	A	

13C	16		160-170 cm	Lethrinidae	Caudal	A	
13C	16		160-170 cm	Lethrinidae	Caudal	A	
13C	16		160-170 cm	Lethrinidae	Quadrate	L	
13C	16		160-170 cm	Lethrinidae	Quadrate	R	
13C	16		160-170 cm	Lethrinidae	Maxilla	R	
13C	16		160-170 cm	Lethrinidae	Hyomandibular	L	
13C	16		160-170 cm	Serranidae	Hyomandibular	L	
13C	16		160-170 cm	Serranidae	Precaudal	A	
13C	16		160-170 cm	Serranidae	Precaudal	A	
13C	16		160-170 cm	Serranidae	Caudal	A	
13C	16		160-170 cm	Serranidae	Caudal	A	
13C	16		160-170 cm	Serranidae	Caudal	A	
13C	16		160-170 cm	Mullidae	Caudal	A	
13C	16		160-170 cm	Carangidae	Caudal	A	
13C	17		170-180 cm	Scaridae	Lower Pharyngeal	A	
13C	17		170-180 cm	Scaridae	Lower Pharyngeal	A	
13C	17		170-180 cm	Scaridae	Fourth epibranchial		
13C	17		170-180 cm	Scaridae	Upper Pharyngeal	A	
13C	17		170-180 cm	Scaridae	Premaxilla	R	
13C	17		170-180 cm	Acanthuridae	Caudal	A	
13C	17		170-180 cm	Acanthuridae	Caudal	A	
13C	17		170-180 cm	Lethrinidae	Atlas	A	
13C	17		170-180 cm	Lethrinidae	Atlas	A	
13C	17		170-180 cm	Lethrinidae	Atlas	A	
13C	17		170-180 cm	Serranidae	Dentary	L	
13C	17		170-180 cm	Serranidae	Dentary	R	
13C	17		170-180 cm	Serranidae	Premaxilla	R	
13C	17		170-180 cm	Labridae	Maxilla	R	
13C	17		170-180 cm	Serranidae	Maxilla	R	
13C	17		170-180 cm	Serranidae	Maxilla	L	
13C	17		170-180 cm	Serranidae	Thoracic	A	
13C	17		170-180 cm	Serranidae	Thoracic	A	
13C	17		170-180 cm	Serranidae	Atlas	A	
13C	17		170-180 cm	Acanthuridae	Caudal	A	
13C	17		170-180 cm	Acanthuridae	Precaudal	A	
13C	17		170-180 cm	Acanthuridae	Caudal	A	
13C	17		170-180 cm	Acanthuridae	Caudal	A	
13C	17		170-180 cm	Siganidae	Caudal	A	
13C	17		170-180 cm	Scombridae	Caudal	A	

13C	17		170-180 cm	Scombridae	Caudal	A	
13C	17		170-180 cm	Scombridae	Caudal	A	
13C	17		170-180 cm	Scombridae	Caudal	A	
13C	17		170-180 cm	Scombridae	Thoracic	A	
13C	17		170-180 cm	Scaridae	Caudal	A	
13C	17		170-180 cm	Mugilidae	Thoracic	A	
13C	17		170-180 cm	Mullidae	Thoracic	A	
13C	17		170-180 cm	Serranidae	Epihyal	R	
13C	17		170-180 cm	Serranidae	Precaudal	A	
13C	17		170-180 cm	Serranidae	Precaudal	A	
13C	17		170-180 cm	Lethrinidae	Atlas	A	
13C	17		170-180 cm	Lethrinidae	Thoracic	A	
13C	17		170-180 cm	Lethrinidae	Precaudal	A	
13C	17		170-180 cm	Lethrinidae	Precaudal	A	
13C	17		170-180 cm	Lethrinidae	Precaudal	A	
13C	17		170-180 cm	Lethrinidae	Caudal	A	
13C	17		170-180 cm	Lethrinidae	Quadrate	L	
13C	17		170-180 cm	Holocentridae	Precaudal	A	
13C	17		170-180 cm	Holocentridae	Thoracic	A	
13C	17		170-180 cm	Carangidae	Precaudal	A	
13C	17		170-180 cm	Carangidae	Thoracic	A	
13C	17		170-180 cm	Muraenidae	Caudal	A	
13C	18		180-190 cm	Scaridae	Lower Pharyngeal	A	
13C	18		180-190 cm	Scaridae	Lower Pharyngeal	A	
13C	18		180-190 cm	Scaridae	Upper Pharyngeal	A	
13C	18		180-190 cm	Scaridae	Upper Pharyngeal	A	
13C	18		180-190 cm	Scaridae	Upper Pharyngeal	A	Fragment
13C	18		180-190 cm	Scaridae	Upper Pharyngeal	A	Fragment
13C	18		180-190 cm	Scaridae	Dentary	L	
13C	18		180-190 cm	Scaridae	Dentary	L	
13C	18		180-190 cm	Scaridae	Premaxilla	R	
13C	18		180-190 cm	Scaridae	Premaxilla	L	
13C	18		180-190 cm	Labridae	Lower Pharyngeal	A	
13C	18		180-190 cm	Balistidae	Spine	A	
13C	18		180-190 cm	Balistidae	Spine	A	
13C	18		180-190 cm	Balistidae	Spine	A	Fragment
13C	18		180-190 cm	Lethrinidae	Palatine	L	
13C	18		180-190 cm	Acanthuridae	Caudal	A	
13C	18		180-190 cm	Acanthuridae	Spine	A	

13C	18		180-190 cm	Lethrinidae	Premaxilla	L	
13C	18		180-190 cm	Lethrinidae	Palatine	R	
13C	18		180-190 cm	Lethrinidae	Palatine	R	
13C	18		180-190 cm	Lethrinidae	Quadrate	L	
13C	18		180-190 cm	Lethrinidae	Atlas	A	
13C	18		180-190 cm	Serranidae	Vomer	A	
13C	18		180-190 cm	Serranidae	Precaudal	A	
13C	18		180-190 cm	Serranidae	Precaudal	A	
13C	18		180-190 cm	Serranidae	Precaudal	A	
13C	18		180-190 cm	Serranidae	Atlas	A	
13C	18		180-190 cm	Congridae	Caudal	A	
13C	18		180-190 cm	Congridae	Precaudal	A	
13C	18		180-190 cm	Scaridae	Precaudal	A	
13C	18		180-190 cm	Scaridae	Caudal	A	
13C	18		180-190 cm	Scaridae	Ultimate	A	
13C	18		180-190 cm	Scaridae	Ultimate	A	
13C	18		180-190 cm	Serranidae	Thoracic	A	
13C	18		180-190 cm	Serranidae	Thoracic	A	
13C	18		180-190 cm	Acanthuridae	Caudal	A	
13C	18		180-190 cm	Holocentridae	Thoracic	A	
13C	18		180-190 cm	Holocentridae	Dentary	L	
13C	18		180-190 cm	Acanthuridae	Precaudal	A	
13C	18		180-190 cm	Scaridae	Caudal	A	
13C	18		180-190 cm	Scaridae	Ultimate	A	
13C	18		180-190 cm	Scaridae	Ultimate	A	
13C	18		180-190 cm	Scaridae	Palatine	L	
13C	18		180-190 cm	Siganidae	Thoracic	A	
13C	18		180-190 cm	Siganidae	Precaudal	A	
13C	18		180-190 cm	Siganidae	Precaudal	A	
13C	18		180-190 cm	Siganidae	Precaudal	A	
13C	18		180-190 cm	Mugilidae	Precaudal	A	
13C	18		180-190 cm	Mugilidae	Precaudal	A	
13C	18		180-190 cm	Mugilidae	Caudal	A	
13C	18		180-190 cm	Serranidae	Thoracic	A	
13C	18		180-190 cm	Serranidae	Precaudal	A	
13C	18		180-190 cm	Serranidae	Precaudal	A	
13C	18		180-190 cm	Serranidae	Caudal	A	
13C	18		180-190 cm	Serranidae	Caudal	A	
13C	18		180-190 cm	Serranidae	Quadrate	L	

13C	18		180-190 cm	Lethrinidae	Angular	L	
13C	18		180-190 cm	Lethrinidae	Angular	R	
13C	18		180-190 cm	Lethrinidae	Quadrate	R	
13C	18		180-190 cm	Lethrinidae	Thoracic	A	
13C	18		180-190 cm	Lethrinidae	Thoracic	A	
13C	18		180-190 cm	Lethrinidae	Precaudal	A	
13C	18		180-190 cm	Lethrinidae	Precaudal	A	
13C	18		180-190 cm	Lethrinidae	Precaudal	A	
13C	18		180-190 cm	Lethrinidae	Caudal	A	
13C	18		180-190 cm	Lethrinidae	Caudal	A	
13C	18		180-190 cm	Lethrinidae	Caudal	A	
13C	18		180-190 cm	Holocentridae	Thoracic	A	
13C	18		180-190 cm	Carangidae	Caudal	A	
13C	18		180-190 cm	Carangidae	Dentary	L	
13C	18		180-190 cm	Muraenidae	Caudal	A	
13C	18		180-190 cm	Muraenidae	Caudal	A	
13C	19		190-200 cm	Scaridae	Lower Pharyngeal	A	
13C	19		190-200 cm	Scaridae	Lower Pharyngeal	A	Fragment
13C	19		190-200 cm	Lethrinidae	Atlas	A	
13C	19		190-200 cm	Lethrinidae	Atlas	A	
13C	19		190-200 cm	Lethrinidae	Atlas	A	
13C	19		190-200 cm	Lethrinidae	Premaxilla	L	
13C	19		190-200 cm	Lethrinidae	Dentary	R	
13C	19		190-200 cm	Lethrinidae	Quadrate	R	
13C	19		190-200 cm	Lethrinidae	Quadrate	R	
13C	19		190-200 cm	Lethrinidae	Quadrate	L	
13C	19		190-200 cm	Lethrinidae	Quadrate	L	
13C	19		190-200 cm	Serranidae	Thoracic	A	
13C	19		190-200 cm	Serranidae	Thoracic	A	
13C	19		190-200 cm	Carangidae	Caudal	A	
13C	19		190-200 cm	Lethrinidae	Atlas	A	
13C	19		190-200 cm	Lethrinidae	Atlas	A	
13C	19		190-200 cm	Lethrinidae	Atlas	A	
13C	19		190-200 cm	Lethrinidae	Thoracic	A	
13C	19		190-200 cm	Lethrinidae	Thoracic	A	
13C	19		190-200 cm	Lethrinidae	Precaudal	A	
13C	19		190-200 cm	Lethrinidae	Precaudal	A	
13C	19		190-200 cm	Lethrinidae	Caudal	A	
13C	19		190-200 cm	Lethrinidae	Scapula	L	

13C	19		190-200 cm	Mugilidae	Vertebra	A	
13C	19		190-200 cm	Serranidae	Basioccipital	A	
13C	19		190-200 cm	Serranidae	Quadrate	L	
13C	19		190-200 cm	Serranidae	Thoracic	A	
13C	19		190-200 cm	Serranidae	Precaudal	A	
13C	19		190-200 cm	Serranidae	Scapula	L	
13C	20		200-210 cm	Scaridae	Lower Pharyngeal	A	
13C	20		200-210 cm	Scaridae	Lower Pharyngeal	A	
13C	20		200-210 cm	Scaridae	Upper Pharyngeal	A	
13C	20		200-210 cm	Scaridae	Upper Pharyngeal	A	
13C	20		200-210 cm	Scaridae	Premaxilla	L	
13C	20		200-210 cm	Serranidae	Premaxilla	L	
13C	20		200-210 cm	Lethrinidae	Premaxilla	L	
13C	20		200-210 cm	Lethrinidae	Premaxilla	R	
13C	20		200-210 cm	Lethrinidae	Premaxilla	R	
13C	20		200-210 cm	Serranidae	Thoracic	A	
13C	20		200-210 cm	Scaridae	Precaudal	A	
13C	20		200-210 cm	Scaridae	Caudal	A	
13C	20		200-210 cm	Scaridae	Ultimate	A	
13C	20		200-210 cm	Scaridae	Ultimate	A	
13C	20		200-210 cm	Acanthuridae	Caudal	A	
13C	20		200-210 cm	Lethrinidae	Maxilla	L	
13C	20		200-210 cm	Carangidae	Dentary	L	
13C	20		200-210 cm	Scaridae	Precaudal	A	
13C	20		200-210 cm	Scaridae	Caudal	A	
13C	20		200-210 cm	Mugilidae	Caudal	A	
13C	20		200-210 cm	Mugilidae	Caudal	A	
13C	20		200-210 cm	Serranidae	Epihyal	A	
13C	20		200-210 cm	Serranidae	Precaudal	A	
13C	20		200-210 cm	Lethrinidae	Atlas	A	
13C	20		200-210 cm	Lethrinidae	Thoracic	A	
13C	20		200-210 cm	Lethrinidae	Thoracic	A	
13C	20		200-210 cm	Lethrinidae	Precaudal	A	
13C	20		200-210 cm	Lethrinidae	Precaudal	A	
13C	20		200-210 cm	Lethrinidae	Precaudal	A	
13C	20		200-210 cm	Lethrinidae	Precaudal	A	
13C	20		200-210 cm	Lethrinidae	Precaudal	A	
13C	20		200-210 cm	Lethrinidae	Caudal	A	
13C	20		200-210 cm	Siganidae	Thoracic	A	

13C	20		200-210 cm	Muraenidae	Caudal	A	
14C	3		30-40 cm	Serranidae	Thoracic	A	
14C	3		30-40 cm	Mugilidae	Precaudal	A	
14C	4		40-50 cm	Serranidae	Thoracic	A	
14C	4		40-50 cm	Serranidae	Thoracic	A	
14C	4		40-50 cm	Serranidae	Thoracic	A	
14C	4		40-50 cm	Serranidae	Thoracic	A	
14C	4		40-50 cm	Acanthuridae	Caudal	A	
14C	4		40-50 cm	Lethrinidae	Thoracic	A	
14C	4		40-50 cm	Lethrinidae	Precaudal	A	
14C	5		50-60 cm	Serranidae	Caudal	A	
14C	5		50-60 cm	Lethrinidae	Thoracic	A	
14C	6		60-70 cm	Serranidae	Thoracic	A	
14C	6		60-70 cm	Scaridae	Precaudal	A	
14C	6		60-70 cm	Scaridae	Ultimate	A	
14C	6		60-70 cm	Lethrinidae	Premaxilla	R	
14C	6		60-70 cm	Lethrinidae	Epihyal	R	
14C	6		60-70 cm	Lethrinidae	Caudal	A	
14C	7		70-80 cm	Ostraciidae	Dermal plate		
14C	7		70-80 cm	Diodontidae	Spine		
14C	7		70-80 cm	Diodontidae	Spine		
14C	7		70-80 cm	Diodontidae	Spine		
14C	7		70-80 cm	Diodontidae	Spine		
14C	7		70-80 cm	Scaridae	Upper pharyngeal	A	
14C	7		70-80 cm	Scaridae	Upper pharyngeal	A	
14C	7		70-80 cm	Scaridae	Lower pharyngeal	A	
14C	7		70-80 cm	Scaridae	Lower pharyngeal	A	
14C	7		70-80 cm	Scaridae	Premaxilla	R	
14C	7		70-80 cm	Scaridae	Dentary	L	
14C	7		70-80 cm	Scaridae	Precaudal	A	
14C	7		70-80 cm	Scaridae	Precaudal	A	
14C	7		70-80 cm	Scaridae	Caudal	A	
14C	7		70-80 cm	Scaridae	Caudal	A	
14C	7		70-80 cm	Scaridae	Quadrate	L	
14C	7		70-80 cm	Labridae	Premaxilla	R	
14C	7		70-80 cm	Labridae	Dentition		
14C	7		70-80 cm	Labridae	Maxilla	L	
14C	7		70-80 cm	Carangidae	Maxilla	L	
14C	7		70-80 cm	Carangidae	Dentary	R	

14C	7		70-80 cm	Holocentridae	Thoracic	A	
14C	7		70-80 cm	Acanthuridae	Dorsal spine	A	
14C	7		70-80 cm	Acanthuridae	Caudal	A	
14C	7		70-80 cm	Acanthuridae	Caudal	A	
14C	7		70-80 cm	Acanthuridae	Caudal	A	
14C	7		70-80 cm	Acanthuridae	Precaudal	A	
14C	7		70-80 cm	Lethrinidae	Palatine	L	
14C	7		70-80 cm	Lethrinidae	Dentary	L	
14C	7		70-80 cm	Lethrinidae	Premaxilla	L	
14C	7		70-80 cm	Serranidae	Vomer	A	
14C	7		70-80 cm	Serranidae	Dentary	L	
14C	7		70-80 cm	Serranidae	Premaxilla	R	
14C	7		70-80 cm	Serranidae	Premaxilla	L	
14C	7		70-80 cm	Serranidae	Maxilla	R	
14C	7		70-80 cm	Serranidae	Thoracic	A	
14C	7		70-80 cm	Serranidae	Thoracic	A	
14C	7		70-80 cm	Serranidae	Atlas	A	
14C	7		70-80 cm	Serranidae	Caudal	A	
14C	7		70-80 cm	Balistidae	Quadrate	L	
14C	7		70-80 cm	Scombridae	Thoracic	A	
14C	7		70-80 cm	Scombridae	Thoracic	A	
14C	7		70-80 cm	Scombridae	Caudal	A	
14C	7		70-80 cm	Mullidae	Caudal	A	
14C	7		70-80 cm	Mugilidae	Precaudal	A	
14C	7		70-80 cm	Mugilidae	Precaudal	A	
14C	7		70-80 cm	Siganidae	Caudal	A	
14C	7		70-80 cm	Siganidae	Caudal	A	
14C	7		70-80 cm	Siganidae	Caudal	A	
14C	7		70-80 cm	Siganidae	Precaudal	A	
14C	7		70-80 cm	Siganidae	Precaudal	A	
14C	7		70-80 cm	Siganidae	Precaudal	A	
14C	7		70-80 cm	Siganidae	Precaudal	A	
14C	7		70-80 cm	Lethrinidae	Thoracic	A	
14C	7		70-80 cm	Lethrinidae	Caudal	A	
14C	7		70-80 cm	Lethrinidae	Precaudal	A	
14C	7		70-80 cm	Lethrinidae	Precaudal	A	
14C	7		70-80 cm	Lethrinidae	Precaudal	A	
14C	7		70-80 cm	Serranidae	Caudal	A	
14C	7		70-80 cm	Acanthuridae	Precaudal	A	

14C	7		70-80 cm	Acanthuridae	Precaudal	A	
14C	7		70-80 cm	Carangidae	Thoracic	A	
14C	7		70-80 cm	Muraenidae	Caudal	A	
14C	8		80-90 cm	Ostraciidae	Dermal plate		
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Spine	A	
14C	8		80-90 cm	Diodontidae	Upper or lower pharyngeal	A	
14C	8		80-90 cm	Balistidae	Dorsal spine	A	
14C	8		80-90 cm	Balistidae	Dorsal spine	A	
14C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
14C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
14C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
14C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
14C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
14C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
14C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
14C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
14C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
14C	8		80-90 cm	Scaridae	Upper pharyngeal	A	
14C	8		80-90 cm	Scaridae	Upper pharyngeal	A	
14C	8		80-90 cm	Scaridae	Upper pharyngeal	A	
14C	8		80-90 cm	Scaridae	Upper pharyngeal	A	
14C	8		80-90 cm	Scaridae	Upper pharyngeal	A	
14C	8		80-90 cm	Scaridae	Premaxilla	L	

14C	8		80-90 cm	Scaridae	Dentary	R	
14C	8		80-90 cm	Scaridae	Dentary	L	
14C	8		80-90 cm	Scaridae	Angular	L	
14C	8		80-90 cm	Scaridae	Caudal	A	
14C	8		80-90 cm	Scaridae	Caudal	A	
14C	8		80-90 cm	Scaridae	Caudal	A	
14C	8		80-90 cm	Scaridae	Caudal	A	
14C	8		80-90 cm	Scaridae	Caudal	A	
14C	8		80-90 cm	Scaridae	Precaudal	A	
14C	8		80-90 cm	Scaridae	Precaudal	A	
14C	8		80-90 cm	Scaridae	Atlas	A	
14C	8		80-90 cm	Scaridae	Thoracic	A	
14C	8		80-90 cm	Scaridae	Thoracic	A	
14C	8		80-90 cm	Scaridae	Ultimate	A	
14C	8		80-90 cm	Holocentridae	Thoracic	A	
14C	8		80-90 cm	Holocentridae	Thoracic	A	
14C	8		80-90 cm	Labridae	Basio occipital	A	
14C	8		80-90 cm	Labridae	Basio occipital	A	
14C	8		80-90 cm	Labridae	Dentary	R	
14C	8		80-90 cm	Labridae	Premaxilla	L	
14C	8		80-90 cm	Congridae	Vertebra	A	
14C	8		80-90 cm	Acanthuridae	Dorsal spine	A	Large
14C	8		80-90 cm	Acanthuridae	Dorsal spine	A	Small
14C	8		80-90 cm	Acanthuridae	Caudal	A	
14C	8		80-90 cm	Acanthuridae	Caudal	A	
14C	8		80-90 cm	Acanthuridae	Caudal	A	
14C	8		80-90 cm	Acanthuridae	Caudal	A	
14C	8		80-90 cm	Acanthuridae	Caudal	A	
14C	8		80-90 cm	Acanthuridae	Caudal	A	
14C	8		80-90 cm	Acanthuridae	Caudal	A	
14C	8		80-90 cm	Acanthuridae	Caudal	A	
14C	8		80-90 cm	Acanthuridae	Caudal	A	
14C	8		80-90 cm	Acanthuridae	Caudal	A	
14C	8		80-90 cm	Acanthuridae	Caudal	A	
14C	8		80-90 cm	Acanthuridae	Precaudal	A	
14C	8		80-90 cm	Acanthuridae	Precaudal	A	
14C	8		80-90 cm	Lethrinidae	Palatine	L	
14C	8		80-90 cm	Lethrinidae	Palatine	L	
14C	8		80-90 cm	Lethrinidae	Palatine	R	

14C	8		80-90 cm	Lethrinidae	Palatine	R	
14C	8		80-90 cm	Lethrinidae	Palatine	R	
14C	8		80-90 cm	Lethrinidae	Thoracic	A	
14C	8		80-90 cm	Lethrinidae	Premaxilla	R	
14C	8		80-90 cm	Lethrinidae	Premaxilla	L	
14C	8		80-90 cm	Lethrinidae	Premaxilla	L	
14C	8		80-90 cm	Lethrinidae	Dentary	R	
14C	8		80-90 cm	Lethrinidae	Dentary	L	
14C	8		80-90 cm	Lethrinidae	Quadrate	R	
14C	8		80-90 cm	Lethrinidae	Quadrate	L	
14C	8		80-90 cm	Lethrinidae	Quadrate	L	
14C	8		80-90 cm	Lethrinidae	Quadrate	L	
14C	8		80-90 cm	Lethrinidae	Maxilla	L	
14C	8		80-90 cm	Lethrinidae	Angular	L	
14C	8		80-90 cm	Lethrinidae	Angular	R	
14C	8		80-90 cm	Serranidae	Basio occipital	A	
14C	8		80-90 cm	Serranidae	Quadrate	R	
14C	8		80-90 cm	Serranidae	Atlas	A	
14C	8		80-90 cm	Serranidae	Atlas	A	
14C	8		80-90 cm	Serranidae	Atlas	A	
14C	8		80-90 cm	Serranidae	Thoracic	A	
14C	8		80-90 cm	Serranidae	Thoracic	A	
14C	8		80-90 cm	Serranidae	Thoracic	A	
14C	8		80-90 cm	Serranidae	Thoracic	A	
14C	8		80-90 cm	Serranidae	Thoracic	A	
14C	8		80-90 cm	Serranidae	Thoracic	A	
14C	8		80-90 cm	Serranidae	Thoracic	A	
14C	8		80-90 cm	Serranidae	Premaxilla	R	
14C	8		80-90 cm	Serranidae	Premaxilla	R	
14C	8		80-90 cm	Serranidae	Premaxilla	R	
14C	8		80-90 cm	Serranidae	Dentary	R	
14C	8		80-90 cm	Serranidae	Dentary	L	
14C	8		80-90 cm	Serranidae	Dentary	L	
14C	8		80-90 cm	Serranidae	Dentition		
14C	8		80-90 cm	Serranidae	Dentition		
14C	8		80-90 cm	Serranidae	Dentition		
14C	8		80-90 cm	Serranidae	Maxilla	L	
14C	8		80-90 cm	Serranidae	Angular	R	
14C	8		80-90 cm	Serranidae	Angular	R	

14C	8		80-90 cm	Serranidae	Scapula	L	
14C	8		80-90 cm	Serranidae	Caudal	A	
14C	8		80-90 cm	Serranidae	Caudal	A	
14C	8		80-90 cm	Serranidae	Caudal	A	
14C	8		80-90 cm	Serranidae	Precaudal	A	
14C	8		80-90 cm	Serranidae	Precaudal	A	
14C	8		80-90 cm	Serranidae	Precaudal	A	
14C	8		80-90 cm	Serranidae	Precaudal	A	
14C	8		80-90 cm	Serranidae	Precaudal	A	
14C	8		80-90 cm	Serranidae	Precaudal	A	
14C	8		80-90 cm	Carangidae	Precaudal	A	
14C	8		80-90 cm	Carangidae	Caudal	A	
14C	8		80-90 cm	Acanthuridae	Precaudal	A	
14C	8		80-90 cm	Acanthuridae	Precaudal	A	
14C	8		80-90 cm	Lethrinidae	Precaudal	A	
14C	8		80-90 cm	Lethrinidae	Precaudal	A	
14C	8		80-90 cm	Lethrinidae	Precaudal	A	
14C	8		80-90 cm	Lethrinidae	Precaudal	A	
14C	8		80-90 cm	Lethrinidae	Precaudal	A	
14C	8		80-90 cm	Lethrinidae	Precaudal	A	
14C	8		80-90 cm	Lethrinidae	Precaudal	A	
14C	8		80-90 cm	Lethrinidae	Precaudal	A	
14C	8		80-90 cm	Lethrinidae	Ceratohyal	R	
14C	8		80-90 cm	Lethrinidae	Caudal	A	
14C	8		80-90 cm	Lethrinidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Precaudal	A	
14C	8		80-90 cm	Siganidae	Precaudal	A	
14C	8		80-90 cm	Siganidae	Precaudal	A	
14C	8		80-90 cm	Siganidae	Precaudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	

14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Siganidae	Caudal	A	
14C	8		80-90 cm	Mugilidae	Precaudal	A	
14C	8		80-90 cm	Mugilidae	Precaudal	A	
14C	8		80-90 cm	Mugilidae	Precaudal	A	
14C	8		80-90 cm	Mugilidae	Caudal	A	
14C	8		80-90 cm	Mugilidae	Caudal	A	
14C	8		80-90 cm	Mugilidae	Caudal	A	
14C	8		80-90 cm	Mugilidae	Caudal	A	
14C	8		80-90 cm	Mugilidae	Caudal	A	
14C	8		80-90 cm	Mugilidae	Caudal	A	
14C	8		80-90 cm	Mugilidae	Caudal	A	
14C	8		80-90 cm	Mugilidae	Basioccipital	A	
14C	8		80-90 cm	Holocentridae	Thoracic	A	
14C	8		80-90 cm	Holocentridae	Precaudal	A	
14C	8		80-90 cm	Scombridae	Thoracic	A	
14C	8		80-90 cm	Scombridae	Thoracic	A	
14C	8		80-90 cm	Scombridae	Caudal	A	
14C	8		80-90 cm	Scombridae	Caudal	A	
14C	8		80-90 cm	Serranidae	Thoracic	A	
14C	8		80-90 cm	Serranidae	Thoracic	A	
14C	8		80-90 cm	Serranidae	Epihyal	R	
14C	8		80-90 cm	Scaridae	Precaudal	A	
14C	8		80-90 cm	Scaridae	Precaudal	A	
14C	8		80-90 cm	Scaridae	Caudal	A	
14C	8		80-90 cm	Scaridae	Caudal	A	
14C	8		80-90 cm	Scaridae	Caudal	A	
14C	8		80-90 cm	Scaridae	Caudal	A	
14C	8		80-90 cm	Mullidae	Caudal	A	
14C	8		80-90 cm	Mullidae	Caudal	A	
14C	8		80-90 cm	Mullidae	Thoracic	A	
14C	8		80-90 cm	Muraenidae	Caudal	A	
14C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
14C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
14C	9		90-100 cm	Scaridae	Lower pharyngeal	A	

14C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
14C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
14C	9		90-100 cm	Scaridae	Upper pharyngeal	A	
14C	9		90-100 cm	Scaridae	Upper pharyngeal	A	
14C	9		90-100 cm	Scaridae	Upper pharyngeal	A	
14C	9		90-100 cm	Scaridae	Upper pharyngeal	A	
14C	9		90-100 cm	Scaridae	Fourth epibranchial	R	
14C	9		90-100 cm	Scaridae	Premaxilla	L	
14C	9		90-100 cm	Scaridae	Quadrate	L	
14C	9		90-100 cm	Scaridae	Caudal	A	
14C	9		90-100 cm	Scaridae	Caudal	A	
14C	9		90-100 cm	Scaridae	Caudal	A	
14C	9		90-100 cm	Scaridae	Caudal	A	
14C	9		90-100 cm	Scaridae	Caudal	A	
14C	9		90-100 cm	Scaridae	Caudal	A	
14C	9		90-100 cm	Scaridae	Caudal	A	
14C	9		90-100 cm	Scaridae	Precaudal	A	
14C	9		90-100 cm	Scaridae	Precaudal	A	
14C	9		90-100 cm	Scaridae	Atlas	A	
14C	9		90-100 cm	Holocentridae	Thoracic	A	
14C	9		90-100 cm	Holocentridae	Thoracic	A	
14C	9		90-100 cm	Holocentridae	Premaxilla	L	
14C	9		90-100 cm	Balistidae	Thoracic	A	
14C	9		90-100 cm	Acanthuridae	Dorsal spine	A	
14C	9		90-100 cm	Acanthuridae	Dorsal spine	A	
14C	9		90-100 cm	Acanthuridae	Caudal	A	
14C	9		90-100 cm	Acanthuridae	Caudal	A	
14C	9		90-100 cm	Acanthuridae	Caudal	A	
14C	9		90-100 cm	Acanthuridae	Caudal	A	
14C	9		90-100 cm	Acanthuridae	Caudal	A	
14C	9		90-100 cm	Acanthuridae	Caudal	A	
14C	9		90-100 cm	Acanthuridae	Caudal	A	
14C	9		90-100 cm	Lethrinidae	Palatine	R	
14C	9		90-100 cm	Lethrinidae	Palatine	R	
14C	9		90-100 cm	Lethrinidae	Palatine	L	
14C	9		90-100 cm	Lethrinidae	Palatine	L	
14C	9		90-100 cm	Lethrinidae	Quadrate	R	
14C	9		90-100 cm	Lethrinidae	Quadrate	L	

14C	9		90-100 cm	Lethrinidae	Angular	L	
14C	9		90-100 cm	Lethrinidae	Angular	L	
14C	9		90-100 cm	Lethrinidae	Angular	L	
14C	9		90-100 cm	Lethrinidae	Premaxilla	L	
14C	9		90-100 cm	Lethrinidae	Dentary	R	
14C	9		90-100 cm	Lethrinidae	Dentary	R	
14C	9		90-100 cm	Lethrinidae	Thoracic	A	
14C	9		90-100 cm	Serranidae	Vomer	A	
14C	9		90-100 cm	Serranidae	Dentary	L	Large
14C	9		90-100 cm	Serranidae	Dentary	L	
14C	9		90-100 cm	Serranidae	Angular	L	
14C	9		90-100 cm	Serranidae	Thoracic	A	
14C	9		90-100 cm	Serranidae	Thoracic	A	
14C	9		90-100 cm	Serranidae	Caudal	A	
14C	9		90-100 cm	Serranidae	Caudal	A	
14C	9		90-100 cm	Serranidae	Caudal	A	
14C	9		90-100 cm	Serranidae	Caudal	A	
14C	9		90-100 cm	Serranidae	Caudal	A	
14C	9		90-100 cm	Serranidae	Caudal	A	
14C	9		90-100 cm	Carangidae	Caudal	A	
14C	9		90-100 cm	Serranidae	Scapula	L	
14C	9		90-100 cm	Serranidae	Quadrate	L	
14C	9		90-100 cm	Serranidae	Precaudal	A	
14C	9		90-100 cm	Serranidae	Precaudal	A	
14C	9		90-100 cm	Serranidae	Thoracic	A	
14C	9		90-100 cm	Siganidae	Caudal	A	
14C	9		90-100 cm	Siganidae	Caudal	A	
14C	9		90-100 cm	Siganidae	Caudal	A	
14C	9		90-100 cm	Siganidae	Caudal	A	
14C	9		90-100 cm	Siganidae	Caudal	A	
14C	9		90-100 cm	Siganidae	Caudal	A	
14C	9		90-100 cm	Mugilidae	Caudal	A	
14C	9		90-100 cm	Mugilidae	Caudal	A	
14C	9		90-100 cm	Mugilidae	Precaudal	A	
14C	9		90-100 cm	Mugilidae	Precaudal	A	
14C	9		90-100 cm	Mugilidae	Precaudal	A	
14C	9		90-100 cm	Mugilidae	Precaudal	A	
14C	9		90-100 cm	Mugilidae	Precaudal	A	
14C	9		90-100 cm	Acanthuridae	Precaudal	A	

14C	9		90-100 cm	Acanthuridae	Precaudal	A	
14C	9		90-100 cm	Acanthuridae	Precaudal	A	
14C	9		90-100 cm	Acanthuridae	Precaudal	A	
14C	9		90-100 cm	Acanthuridae	Caudal	A	
14C	9		90-100 cm	Acanthuridae	Caudal	A	
14C	9		90-100 cm	Mullidae	Caudal	A	
14C	9		90-100 cm	Scaridae	Precaudal	A	
14C	9		90-100 cm	Scaridae	Caudal	A	
14C	9		90-100 cm	Scaridae	Caudal	A	
14C	9		90-100 cm	Scaridae	Caudal	A	
14C	9		90-100 cm	Lethrinidae	Atlas	A	
14C	9		90-100 cm	Lethrinidae	Atlas	A	
14C	9		90-100 cm	Lethrinidae	Atlas	A	
14C	9		90-100 cm	Lethrinidae	Precaudal	A	
14C	9		90-100 cm	Lethrinidae	Precaudal	A	
14C	9		90-100 cm	Lethrinidae	Precaudal	A	
14C	9		90-100 cm	Lethrinidae	Precaudal	A	
14C	9		90-100 cm	Lethrinidae	Precaudal	A	
14C	9		90-100 cm	Lethrinidae	Precaudal	A	
14C	9		90-100 cm	Lethrinidae	Precaudal	A	
14C	9		90-100 cm	Lethrinidae	Precaudal	A	
14C	9		90-100 cm	Lethrinidae	Caudal	A	
14C	9		90-100 cm	Lethrinidae	Caudal	A	
14C	9		90-100 cm	Carangidae	Caudal	A	
14C	10		100-110 cm	Diodontidae	Spine		
14C	10		100-110 cm	Diodontidae	Spine		
14C	10		100-110 cm	Acanthuridae	Dorsal spine	A	
14C	10		100-110 cm	Acanthuridae	Caudal	A	
14C	10		100-110 cm	Labridae	Upper pharyngeal	A	
14C	10		100-110 cm	Labridae	Upper pharyngeal	A	
14C	10		100-110 cm	Labridae	Angular	L	
14C	10		100-110 cm	Scaridae	Lower pharyngeal	A	
14C	10		100-110 cm	Scaridae	Caudal	A	
14C	10		100-110 cm	Scaridae	Caudal	A	
14C	10		100-110 cm	Scaridae	Precaudal	A	
14C	10		100-110 cm	Scaridae	Premaxilla	R	
14C	10		100-110 cm	Scaridae	Maxilla	R	
14C	10		100-110 cm	Scaridae	Quadrate	R	
14C	10		100-110 cm	Serranidae	Premaxilla	R	

14C	10		100-110 cm	Serranidae	Dentary	L	
14C	10		100-110 cm	Serranidae	Maxilla	L	
14C	10		100-110 cm	Serranidae	Thoracic	A	
14C	10		100-110 cm	Serranidae	Thoracic	A	
14C	10		100-110 cm	Serranidae	Caudal	A	
14C	10		100-110 cm	Serranidae	Caudal	A	
14C	10		100-110 cm	Lethrinidae	Premaxilla	R	
14C	10		100-110 cm	Lethrinidae	Vomer	A	
14C	10		100-110 cm	Lethrinidae	Dentary	R	
14C	10		100-110 cm	Lethrinidae	Angular	R	
14C	10		100-110 cm	Lethrinidae	Thoracic	A	
14C	10		100-110 cm	Lethrinidae	Quadrate	L	
14C	10		100-110 cm	Siganidae	Caudal	A	
14C	10		100-110 cm	Siganidae	Precaudal	A	
14C	10		100-110 cm	Scombridae	Caudal	A	
14C	10		100-110 cm	Scombridae	Thoracic	A	
14C	10		100-110 cm	Lethrinidae	Caudal	A	
14C	10		100-110 cm	Lethrinidae	Caudal	A	
14C	10		100-110 cm	Lethrinidae	Precaudal	A	
14C	10		100-110 cm	Serranidae	Thoracic	A	
14C	10		100-110 cm	Serranidae	Posttemporal	L	
14C	10		100-110 cm	Scaridae	Caudal	A	
14C	10		100-110 cm	Scaridae	Caudal	A	
14C	10		100-110 cm	Scaridae	Caudal	A	
14C	10		100-110 cm	Scaridae	Caudal	A	
14C	10		100-110 cm	Mullidae	Precaudal	A	
14C	10		100-110 cm	Mullidae	Precaudal	A	
14C	10		100-110 cm	Mullidae	Precaudal	A	
14C	10		100-110 cm	Muraenidae	Caudal	A	
14C	11		110-120 cm	Scaridae	Lower pharyngeal	A	
14C	11		110-120 cm	Scaridae	Lower pharyngeal	A	
14C	11		110-120 cm	Scaridae	Lower pharyngeal	A	
14C	11		110-120 cm	Scaridae	Upper pharyngeal	A	
14C	11		110-120 cm	Scaridae	Upper pharyngeal	A	
14C	11		110-120 cm	Scaridae	Upper pharyngeal	A	
14C	11		110-120 cm	Scaridae	Premaxilla	L	
14C	11		110-120 cm	Scaridae	Dentary	R	
14C	11		110-120 cm	Scaridae	Dentary	R	
14C	11		110-120 cm	Scaridae	Ultimate	A	

14C	11		110-120 cm	Scaridae	Caudal	A	
14C	11		110-120 cm	Scaridae	Caudal	A	
14C	11		110-120 cm	Scaridae	Caudal	A	
14C	11		110-120 cm	Scaridae	Caudal	A	
14C	11		110-120 cm	Scaridae	Precaudal	A	
14C	11		110-120 cm	Scaridae	Precaudal	A	
14C	11		110-120 cm	Scaridae	Precaudal	A	
14C	11		110-120 cm	Scaridae	Precaudal	A	
14C	11		110-120 cm	Scaridae	Precaudal	A	
14C	11		110-120 cm	Acanthuridae	Caudal	A	
14C	11		110-120 cm	Acanthuridae	Caudal	A	
14C	11		110-120 cm	Acanthuridae	Caudal	A	
14C	11		110-120 cm	Acanthuridae	Caudal	A	
14C	11		110-120 cm	Acanthuridae	Caudal	A	
14C	11		110-120 cm	Labridae	Lower pharyngeal	A	
14C	11		110-120 cm	Labridae	Premaxilla	L	
14C	11		110-120 cm	Labridae	Dentition		
14C	11		110-120 cm	Labridae	Angular	L	
14C	11		110-120 cm	Lethrinidae	Palatine	L	
14C	11		110-120 cm	Lethrinidae	Quadrate	L	
14C	11		110-120 cm	Lethrinidae	Thoracic	A	
14C	11		110-120 cm	Serranidae	Vomer	A	
14C	11		110-120 cm	Serranidae	Premaxilla	L	
14C	11		110-120 cm	Serranidae	Dentary	L	
14C	11		110-120 cm	Serranidae	Thoracic	A	
14C	11		110-120 cm	Serranidae	Thoracic	A	
14C	11		110-120 cm	Serranidae	Thoracic	A	
14C	11		110-120 cm	Serranidae	Caudal	A	
14C	11		110-120 cm	Serranidae	Caudal	A	
14C	11		110-120 cm	Serranidae	Precaudal	A	
14C	11		110-120 cm	Serranidae	Precaudal	A	
14C	11		110-120 cm	Serranidae	Precaudal	A	
14C	11		110-120 cm	Serranidae	Precaudal	A	
14C	11		110-120 cm	Serranidae	Precaudal	A	
14C	11		110-120 cm	Serranidae	Precaudal	A	
14C	11		110-120 cm	Serranidae	Angular	L	
14C	11		110-120 cm	Carangidae	Dentary	L	
14C	11		110-120 cm	Serranidae	Thoracic	A	
14C	11		110-120 cm	Serranidae	Penultimate	A	

14C	11		110-120 cm	Lethrinidae	Hyomandibular	L	
14C	11		110-120 cm	Lethrinidae	Precaudal	A	
14C	11		110-120 cm	Lethrinidae	Caudal	A	
14C	11		110-120 cm	Lethrinidae	Caudal	A	
14C	11		110-120 cm	Lethrinidae	Premaxilla	R	
14C	11		110-120 cm	Acanthuridae	Caudal	A	
14C	11		110-120 cm	Acanthuridae	Precaudal	A	
14C	11		110-120 cm	Acanthuridae	Precaudal	A	
14C	11		110-120 cm	Scombridae	Caudal	A	
14C	11		110-120 cm	Scombridae	Caudal	A	
14C	11		110-120 cm	Scombridae	Caudal	A	
14C	11		110-120 cm	Scombridae	Caudal	A	
14C	11		110-120 cm	Scombridae	Thoracic	A	
14C	11		110-120 cm	Scombridae	Thoracic	A	
14C	11		110-120 cm	Scombridae	Thoracic	A	
14C	11		110-120 cm	Scombridae	Precaudal	A	
14C	11		110-120 cm	Scaridae	Caudal	A	
14C	11		110-120 cm	Scaridae	Caudal	A	
14C	11		110-120 cm	Scaridae	Caudal	A	
14C	11		110-120 cm	Scaridae	Caudal	A	
14C	11		110-120 cm	Scaridae	Precaudal	A	
14C	11		110-120 cm	Scaridae	Precaudal	A	
14C	11		110-120 cm	Siganidae	Precaudal	A	
14C	11		110-120 cm	Siganidae	Precaudal	A	
14C	11		110-120 cm	Siganidae	Precaudal	A	
14C	11		110-120 cm	Siganidae	Caudal	A	
14C	11		110-120 cm	Siganidae	Caudal	A	
14C	11		110-120 cm	Siganidae	Caudal	A	
14C	11		110-120 cm	Siganidae	Caudal	A	
14C	11		110-120 cm	Siganidae	Caudal	A	
14C	11		110-120 cm	Siganidae	Caudal	A	
14C	11		110-120 cm	Siganidae	Caudal	A	
14C	11		110-120 cm	Siganidae	Caudal	A	
14C	11		110-120 cm	Mullidae	Caudal	A	
14C	11		110-120 cm	Mullidae	Caudal	A	
14C	11		110-120 cm	Mullidae	Precaudal	A	
14C	11		110-120 cm	Mullidae	Precaudal	A	
14C	11		110-120 cm	Muraenidae	Caudal	A	
14C	11		110-120 cm	Muraenidae	Caudal	A	

14C	11		110-120 cm	Muraenidae	Caudal	A	
14C	12		120-130 cm	Diodontidae	Spine		
14C	12		120-130 cm	Ostraciidae	Dermal plate		
14C	12		120-130 cm	Labridae	Lower pharyngeal	A	
14C	12		120-130 cm	Labridae	Basio occipital	A	
14C	12		120-130 cm	Labridae	Basio occipital	A	
14C	12		120-130 cm	Holocentridae	Thoracic	A	
14C	12		120-130 cm	Holocentridae	Thoracic	A	
14C	12		120-130 cm	Balistidae	Premaxilla	L	
14C	12		120-130 cm	Balistidae	Thoracic	A	
14C	12		120-130 cm	Balistidae	Thoracic	A	
14C	12		120-130 cm	Balistidae	Thoracic	A	
14C	12		120-130 cm	Scaridae	Lower pharyngeal	A	
14C	12		120-130 cm	Scaridae	Lower pharyngeal	A	
14C	12		120-130 cm	Scaridae	Lower pharyngeal	A	
14C	12		120-130 cm	Scaridae	Lower pharyngeal	A	
14C	12		120-130 cm	Scaridae	Lower pharyngeal	A	
14C	12		120-130 cm	Scaridae	Upper pharyngeal	A	
14C	12		120-130 cm	Scaridae	Upper pharyngeal	A	
14C	12		120-130 cm	Scaridae	Upper pharyngeal	A	
14C	12		120-130 cm	Scaridae	Upper pharyngeal	A	
14C	12		120-130 cm	Scaridae	Premaxilla	R	
14C	12		120-130 cm	Scaridae	Dentary	L	
14C	12		120-130 cm	Scaridae	Dentary	L	
14C	12		120-130 cm	Scaridae	Ultimate	A	
14C	12		120-130 cm	Scaridae	Ultimate	A	
14C	12		120-130 cm	Scaridae	Caudal	A	
14C	12		120-130 cm	Scaridae	Caudal	A	
14C	12		120-130 cm	Scaridae	Caudal	A	
14C	12		120-130 cm	Scaridae	Caudal	A	
14C	12		120-130 cm	Scaridae	Caudal	A	
14C	12		120-130 cm	Scaridae	Caudal	A	
14C	12		120-130 cm	Scaridae	Caudal	A	
14C	12		120-130 cm	Scaridae	Precaudal	A	
14C	12		120-130 cm	Scaridae	Precaudal	A	
14C	12		120-130 cm	Scaridae	Atlas	A	
14C	12		120-130 cm	Scaridae	Maxilla	L	Fragment
14C	12		120-130 cm	Acanthuridae	Caudal	A	
14C	12		120-130 cm	Acanthuridae	Caudal	A	

14C	12		120-130 cm	Acanthuridae	Caudal	A	
14C	12		120-130 cm	Acanthuridae	Caudal	A	
14C	12		120-130 cm	Acanthuridae	Caudal	A	
14C	12		120-130 cm	Acanthuridae	Caudal	A	
14C	12		120-130 cm	Acanthuridae	Caudal	A	
14C	12		120-130 cm	Lethrinidae	Palatine	L	
14C	12		120-130 cm	Lethrinidae	Palatine	L	
14C	12		120-130 cm	Lethrinidae	Thoracic	A	
14C	12		120-130 cm	Lethrinidae	Thoracic	A	
14C	12		120-130 cm	Serranidae	Maxilla	L	
14C	12		120-130 cm	Serranidae	Quadrate	R	
14C	12		120-130 cm	Serranidae	Atlas	A	
14C	12		120-130 cm	Serranidae	Thoracic	A	
14C	12		120-130 cm	Serranidae	Precaudal	A	
14C	12		120-130 cm	Serranidae	Precaudal	A	
14C	12		120-130 cm	Serranidae	Caudal	A	
14C	12		120-130 cm	Serranidae	Caudal	A	
14C	12		120-130 cm	Serranidae	Caudal	A	
14C	12		120-130 cm	Serranidae	Caudal	A	
14C	12		120-130 cm	Serranidae	Caudal	A	
14C	12		120-130 cm	Serranidae	Caudal	A	
14C	12		120-130 cm	Sphyraenidae	Thoracic	A	
14C	12		120-130 cm	Siganidae	Precaudal	A	
14C	12		120-130 cm	Siganidae	Precaudal	A	
14C	12		120-130 cm	Siganidae	Precaudal	A	
14C	12		120-130 cm	Siganidae	Caudal	A	
14C	12		120-130 cm	Siganidae	Caudal	A	
14C	12		120-130 cm	Siganidae	Caudal	A	
14C	12		120-130 cm	Siganidae	Caudal	A	
14C	12		120-130 cm	Siganidae	Caudal	A	
14C	12		120-130 cm	Siganidae	Caudal	A	
14C	12		120-130 cm	Siganidae	Caudal	A	
14C	12		120-130 cm	Siganidae	Caudal	A	
14C	12		120-130 cm	Siganidae	Caudal	A	
14C	12		120-130 cm	Siganidae	Caudal	A	
14C	12		120-130 cm	Scombridae	Caudal	A	
14C	12		120-130 cm	Scombridae	Caudal	A	
14C	12		120-130 cm	Scombridae	Caudal	A	
14C	12		120-130 cm	Scombridae	Caudal	A	

14C	12		120-130 cm	Scombridae	Caudal	A	
14C	12		120-130 cm	Scombridae	Precaudal	A	
14C	12		120-130 cm	Scombridae	Precaudal	A	
14C	12		120-130 cm	Scombridae	Thoracic	A	
14C	12		120-130 cm	Scombridae	Thoracic	A	
14C	12		120-130 cm	Scombridae	Thoracic	A	
14C	12		120-130 cm	Scombridae	Thoracic	A	
14C	12		120-130 cm	Acanthuridae	Precaudal	A	
14C	12		120-130 cm	Acanthuridae	Precaudal	A	
14C	12		120-130 cm	Acanthuridae	Precaudal	A	
14C	12		120-130 cm	Acanthuridae	Caudal	A	
14C	12		120-130 cm	Acanthuridae	Caudal	A	
14C	12		120-130 cm	Balistidae	Basioccipital	A	
14C	12		120-130 cm	Scaridae	Caudal	A	
14C	12		120-130 cm	Scaridae	Caudal	A	
14C	12		120-130 cm	Scaridae	Caudal	A	
14C	12		120-130 cm	Scaridae	Caudal	A	
14C	12		120-130 cm	Lethrinidae	Atlas	A	
14C	12		120-130 cm	Lethrinidae	Atlas	A	
14C	12		120-130 cm	Lethrinidae	Thoracic	A	
14C	12		120-130 cm	Lethrinidae	Precaudal	A	
14C	12		120-130 cm	Lethrinidae	Precaudal	A	
14C	12		120-130 cm	Lethrinidae	Precaudal	A	
14C	12		120-130 cm	Lethrinidae	Precaudal	A	
14C	12		120-130 cm	Lethrinidae	Precaudal	A	
14C	12		120-130 cm	Lethrinidae	Caudal	A	
14C	12		120-130 cm	Serranidae	Caudal	A	
14C	12		120-130 cm	Serranidae	Caudal	A	
14C	12		120-130 cm	Serranidae	Caudal	A	
14C	12		120-130 cm	Serranidae	Caudal	A	
14C	12		120-130 cm	Serranidae	Penultimate	A	
14C	12		120-130 cm	Serranidae	Penultimate	A	
14C	12		120-130 cm	Serranidae	Epihyal	L	
14C	12		120-130 cm	Mullidae	Precaudal	A	
14C	12		120-130 cm	Mullidae	Precaudal	A	
14C	12		120-130 cm	Holocentridae	Maxilla	R	
14C	12		120-130 cm	Muraenidae	Caudal	A	
14C	13		130-140 cm	Ostraciidae	Dermal plate		
14C	13		130-140 cm	Labridae	Lower pharyngeal	A	

14C	13		130-140 cm	Labridae	Premaxilla	L	
14C	13		130-140 cm	Holocentridae	Thoracic	A	
14C	13		130-140 cm	Holocentridae	Thoracic	A	
14C	13		130-140 cm	Holocentridae	Thoracic	A	
14C	13		130-140 cm	Holocentridae	Thoracic	A	
14C	13		130-140 cm	Balistidae	Dorsal spine	A	
14C	13		130-140 cm	Balistidae	Dorsal spine	A	
14C	13		130-140 cm	Balistidae	Precaudal	A	
14C	13		130-140 cm	Scaridae	Premaxilla	R	
14C	13		130-140 cm	Scaridae	Premaxilla	R	
14C	13		130-140 cm	Scaridae	Premaxilla	R	
14C	13		130-140 cm	Scaridae	Dentary	R	
14C	13		130-140 cm	Scaridae	Upper pharyngeal	A	
14C	13		130-140 cm	Scaridae	Upper pharyngeal	A	
14C	13		130-140 cm	Scaridae	Upper pharyngeal	A	
14C	13		130-140 cm	Scaridae	Upper pharyngeal	A	
14C	13		130-140 cm	Scaridae	Lower pharyngeal	A	
14C	13		130-140 cm	Scaridae	Lower pharyngeal	A	
14C	13		130-140 cm	Scaridae	Lower pharyngeal	A	
14C	13		130-140 cm	Scaridae	Lower pharyngeal	A	
14C	13		130-140 cm	Scaridae	Ultimate	A	
14C	13		130-140 cm	Scaridae	Ultimate	A	
14C	13		130-140 cm	Scaridae	Quadrate	L	
14C	13		130-140 cm	Scaridae	Precaudal	A	
14C	13		130-140 cm	Scaridae	Precaudal	A	
14C	13		130-140 cm	Scaridae	Precaudal	A	
14C	13		130-140 cm	Scaridae	Caudal	A	
14C	13		130-140 cm	Scaridae	Caudal	A	
14C	13		130-140 cm	Scaridae	Caudal	A	
14C	13		130-140 cm	Scaridae	Caudal	A	
14C	13		130-140 cm	Scaridae	Caudal	A	
14C	13		130-140 cm	Scaridae	Caudal	A	
14C	13		130-140 cm	Scaridae	Caudal	A	
14C	13		130-140 cm	Scaridae	Caudal	A	
14C	13		130-140 cm	Acanthuridae	Dorsal spine	A	
14C	13		130-140 cm	Acanthuridae	Dorsal spine	A	
14C	13		130-140 cm	Acanthuridae	Dorsal spine	A	
14C	13		130-140 cm	Acanthuridae	Dorsal spine	A	
14C	13		130-140 cm	Acanthuridae	Caudal	A	

14C	13		130-140 cm	Acanthuridae	Caudal	A	
14C	13		130-140 cm	Acanthuridae	Caudal	A	
14C	13		130-140 cm	Acanthuridae	Caudal	A	
14C	13		130-140 cm	Acanthuridae	Caudal	A	
14C	13		130-140 cm	Acanthuridae	Caudal	A	
14C	13		130-140 cm	Acanthuridae	Caudal	A	
14C	13		130-140 cm	Acanthuridae	Caudal	A	
14C	13		130-140 cm	Lethrinidae	Palatine	R	
14C	13		130-140 cm	Lethrinidae	Palatine	R	
14C	13		130-140 cm	Lethrinidae	Vomer	A	
14C	13		130-140 cm	Lethrinidae	Quadrate	R	
14C	13		130-140 cm	Lethrinidae	Quadrate	L	
14C	13		130-140 cm	Lethrinidae	Urohyal	A	
14C	13		130-140 cm	Lethrinidae	Angular	R	
14C	13		130-140 cm	Lethrinidae	Angular	L	
14C	13		130-140 cm	Lethrinidae	Premaxilla	R	
14C	13		130-140 cm	Lethrinidae	Premaxilla	R	
14C	13		130-140 cm	Lethrinidae	Premaxilla	R	
14C	13		130-140 cm	Lethrinidae	Premaxilla	L	
14C	13		130-140 cm	Lethrinidae	Premaxilla	L	
14C	13		130-140 cm	Lethrinidae	Dentary	L	
14C	13		130-140 cm	Lethrinidae	Thoracic	A	
14C	13		130-140 cm	Serranidae	Dentary	L	
14C	13		130-140 cm	Serranidae	Precaudal	A	
14C	13		130-140 cm	Serranidae	Precaudal	A	
14C	13		130-140 cm	Serranidae	Precaudal	A	
14C	13		130-140 cm	Serranidae	Precaudal	A	
14C	13		130-140 cm	Serranidae	Atlas	A	
14C	13		130-140 cm	Serranidae	Thoracic	A	
14C	13		130-140 cm	Serranidae	Thoracic	A	
14C	13		130-140 cm	Serranidae	Thoracic	A	
14C	13		130-140 cm	Carangidae	Thoracic	A	
14C	13		130-140 cm	Scombridae	Caudal	A	
14C	13		130-140 cm	Scombridae	Caudal	A	
14C	13		130-140 cm	Scombridae	Thoracic	A	
14C	13		130-140 cm	Scombridae	Thoracic	A	
14C	13		130-140 cm	Siganidae	Caudal	A	
14C	13		130-140 cm	Siganidae	Caudal	A	
14C	13		130-140 cm	Siganidae	Caudal	A	

14C	13		130-140 cm	Siganidae	Caudal	A	
14C	13		130-140 cm	Siganidae	Caudal	A	
14C	13		130-140 cm	Siganidae	Caudal	A	
14C	13		130-140 cm	Siganidae	Caudal	A	
14C	13		130-140 cm	Siganidae	Caudal	A	
14C	13		130-140 cm	Siganidae	Precaudal	A	
14C	13		130-140 cm	Siganidae	Precaudal	A	
14C	13		130-140 cm	Mugilidae	Caudal	A	
14C	13		130-140 cm	Mugilidae	Caudal	A	
14C	13		130-140 cm	Mugilidae	Caudal	A	
14C	13		130-140 cm	Lethrinidae	Caudal	A	
14C	13		130-140 cm	Lethrinidae	Caudal	A	
14C	13		130-140 cm	Lethrinidae	Caudal	A	
14C	13		130-140 cm	Lethrinidae	Caudal	A	
14C	13		130-140 cm	Lethrinidae	Caudal	A	
14C	13		130-140 cm	Lethrinidae	Precaudal	A	
14C	13		130-140 cm	Lethrinidae	Precaudal	A	
14C	13		130-140 cm	Lethrinidae	Precaudal	A	
14C	13		130-140 cm	Lethrinidae	Precaudal	A	
14C	13		130-140 cm	Lethrinidae	Thoracic	A	
14C	13		130-140 cm	Lethrinidae	Thoracic	A	
14C	13		130-140 cm	Lethrinidae	Thoracic	A	
14C	13		130-140 cm	Serranidae	Thoracic	A	
14C	13		130-140 cm	Serranidae	Thoracic	A	
14C	13		130-140 cm	Serranidae	Caudal	A	
14C	13		130-140 cm	Serranidae	Caudal	A	
14C	13		130-140 cm	Serranidae	Caudal	A	
14C	13		130-140 cm	Serranidae	Precaudal	A	
14C	13		130-140 cm	Holocentridae	Precaudal	A	
14C	13		130-140 cm	Scaridae	Ultimate	A	
14C	13		130-140 cm	Scaridae	Caudal	A	
14C	13		130-140 cm	Scaridae	Caudal	A	
14C	13		130-140 cm	Scaridae	Caudal	A	
14C	13		130-140 cm	Scaridae	Caudal	A	
14C	13		130-140 cm	Scaridae	Precaudal	A	
14C	13		130-140 cm	Carangidae	Thoracic	A	
14C	13		130-140 cm	Acanthuridae	Caudal	A	
14C	13		130-140 cm	Acanthuridae	Caudal	A	
14C	14		140-150 cm	Ostraciidae	Dermal plate		

14C	14		140-150 cm	Scaridae	Lower pharyngeal	A	
14C	14		140-150 cm	Scaridae	Upper pharyngeal	A	
14C	14		140-150 cm	Scaridae	Fourth epibranchial	R	
14C	14		140-150 cm	Scaridae	Angular	L	
14C	14		140-150 cm	Scaridae	Precaudal	A	
14C	14		140-150 cm	Scaridae	Precaudal	A	
14C	14		140-150 cm	Scaridae	Precaudal	A	
14C	14		140-150 cm	Scaridae	Caudal	A	
14C	14		140-150 cm	Scaridae	Caudal	A	
14C	14		140-150 cm	Scaridae	Caudal	A	
14C	14		140-150 cm	Scaridae	Caudal	A	
14C	14		140-150 cm	Scaridae	Caudal	A	
14C	14		140-150 cm	Scaridae	Caudal	A	
14C	14		140-150 cm	Labridae	Premaxilla	L	
14C	14		140-150 cm	Labridae	Lower pharyngeal	A	
14C	14		140-150 cm	Labridae	Lower pharyngeal	A	
14C	14		140-150 cm	Balistidae	Thoracic	A	
14C	14		140-150 cm	Acanthuridae	Dorsal spine	A	
14C	14		140-150 cm	Acanthuridae	Caudal	A	
14C	14		140-150 cm	Acanthuridae	Caudal	A	
14C	14		140-150 cm	Acanthuridae	Caudal	A	
14C	14		140-150 cm	Serranidae	Dentary	R	
14C	14		140-150 cm	Serranidae	Premaxilla	L	
14C	14		140-150 cm	Serranidae	Thoracic	A	
14C	14		140-150 cm	Serranidae	Thoracic	A	
14C	14		140-150 cm	Serranidae	Thoracic	A	
14C	14		140-150 cm	Serranidae	Maxilla	R	
14C	14		140-150 cm	Serranidae	Maxilla	L	
14C	14		140-150 cm	Serranidae	Caudal	A	Large
14C	14		140-150 cm	Lethrinidae	Premaxilla	L	
14C	14		140-150 cm	Lethrinidae	Premaxilla	L	
14C	14		140-150 cm	Lethrinidae	Dentary	R	
14C	14		140-150 cm	Lethrinidae	Angular	L	
14C	14		140-150 cm	Lethrinidae	Urohyal	A	
14C	14		140-150 cm	Scombridae	Thoracic	A	
14C	14		140-150 cm	Scombridae	Caudal	A	
14C	14		140-150 cm	Scombridae	Caudal	A	
14C	14		140-150 cm	Scombridae	Caudal	A	

14C	14		140-150 cm	Acanthuridae	Precaudal	A	
14C	14		140-150 cm	Acanthuridae	Caudal	A	
14C	14		140-150 cm	Siganidae	Precaudal	A	
14C	14		140-150 cm	Siganidae	Caudal	A	
14C	14		140-150 cm	Scaridae	Precaudal	A	
14C	14		140-150 cm	Scaridae	Caudal	A	
14C	14		140-150 cm	Scaridae	Caudal	A	
14C	14		140-150 cm	Scaridae	Angular	R	
14C	14		140-150 cm	Scaridae	Penultimate	A	
14C	14		140-150 cm	Mugilidae	Caudal	A	
14C	14		140-150 cm	Mugilidae	Caudal	A	
14C	14		140-150 cm	Mugilidae	Caudal	A	
14C	14		140-150 cm	Mugilidae	Thoracic	A	
14C	14		140-150 cm	Lethrinidae	Atlas	A	
14C	14		140-150 cm	Lethrinidae	Atlas	A	
14C	14		140-150 cm	Lethrinidae	Thoracic	A	
14C	14		140-150 cm	Lethrinidae	Thoracic	A	
14C	14		140-150 cm	Lethrinidae	Thoracic	A	
14C	14		140-150 cm	Lethrinidae	Precaudal	A	
14C	14		140-150 cm	Lethrinidae	Precaudal	A	
14C	14		140-150 cm	Lethrinidae	Caudal	A	
14C	14		140-150 cm	Lethrinidae	Caudal	A	
14C	14		140-150 cm	Lethrinidae	Caudal	A	
14C	14		140-150 cm	Lethrinidae	Caudal	A	
14C	14		140-150 cm	Lethrinidae	Caudal	A	
14C	14		140-150 cm	Lethrinidae	Caudal	A	
14C	14		140-150 cm	Lethrinidae	Dentary	L	
14C	14		140-150 cm	Lethrinidae	Epihyal	R	
14C	14		140-150 cm	Serranidae	Basioccipital	A	
14C	14		140-150 cm	Serranidae	Thoracic	A	
14C	14		140-150 cm	Serranidae	Precaudal	A	
14C	14		140-150 cm	Carangidae	Thoracic	A	
14C	14		140-150 cm	Carangidae	Caudal	A	
14C	14		140-150 cm	Carangidae	Dentary	R	
14C	14		140-150 cm	Labridae	Quadrate	L	
14C	15		150-160 cm	Diodontidae	Spine		
14C	15		150-160 cm	Balistidae	Thoracic	A	
14C	15		150-160 cm	Balistidae	Thoracic	A	
14C	15		150-160 cm	Balistidae	Dorsal spine	A	

14C	15		150-160 cm	Balistidae	Dorsal spine	A	
14C	15		150-160 cm	Acanthuridae	Caudal	A	
14C	15		150-160 cm	Acanthuridae	Caudal	A	
14C	15		150-160 cm	Acanthuridae	Caudal	A	
14C	15		150-160 cm	Acanthuridae	Scute		
14C	15		150-160 cm	Scaridae	Lower pharyngeal	A	
14C	15		150-160 cm	Scaridae	Upper pharyngeal	A	
14C	15		150-160 cm	Scaridae	Upper pharyngeal	A	
14C	15		150-160 cm	Scaridae	Premaxilla	R	
14C	15		150-160 cm	Scaridae	Premaxilla	R	
14C	15		150-160 cm	Scaridae	Dentary	R	
14C	15		150-160 cm	Scaridae	Dentary	R	
14C	15		150-160 cm	Scaridae	Ultimate	A	
14C	15		150-160 cm	Scaridae	Atlas	A	
14C	15		150-160 cm	Scaridae	Precaudal	A	
14C	15		150-160 cm	Scaridae	Precaudal	A	
14C	15		150-160 cm	Scaridae	Precaudal	A	
14C	15		150-160 cm	Scaridae	Precaudal	A	
14C	15		150-160 cm	Scaridae	Caudal	A	
14C	15		150-160 cm	Scaridae	Caudal	A	
14C	15		150-160 cm	Scaridae	Caudal	A	
14C	15		150-160 cm	Scaridae	Caudal	A	
14C	15		150-160 cm	Scaridae	Caudal	A	
14C	15		150-160 cm	Labridae	Lower pharyngeal	A	
14C	15		150-160 cm	Lethrinidae	Palatine	R	
14C	15		150-160 cm	Lethrinidae	Palatine	R	
14C	15		150-160 cm	Lethrinidae	Quadrate	R	
14C	15		150-160 cm	Lethrinidae	Quadrate	L	
14C	15		150-160 cm	Lethrinidae	Angular	R	
14C	15		150-160 cm	Lethrinidae	Angular	R	
14C	15		150-160 cm	Lethrinidae	Premaxilla	L	
14C	15		150-160 cm	Lethrinidae	Dentary	L	
14C	15		150-160 cm	Lethrinidae	Thoracic	A	
14C	15		150-160 cm	Lethrinidae	Palatine	L	
14C	15		150-160 cm	Serranidae	Premaxilla	R	
14C	15		150-160 cm	Serranidae	Premaxilla	R	
14C	15		150-160 cm	Serranidae	Premaxilla	R	
14C	15		150-160 cm	Serranidae	Premaxilla	L	
14C	15		150-160 cm	Serranidae	Vomer	A	

14C	15		150-160 cm	Serranidae	Thoracic	A	
14C	15		150-160 cm	Serranidae	Thoracic	A	
14C	15		150-160 cm	Serranidae	Maxilla	L	Large
14C	15		150-160 cm	Serranidae	Maxilla	L	
14C	15		150-160 cm	Serranidae	Maxilla	R	
14C	15		150-160 cm	Acanthuridae	Dentary	L	
14C	15		150-160 cm	Scombridae	Caudal	A	
14C	15		150-160 cm	Scombridae	Caudal	A	
14C	15		150-160 cm	Mullidae	Caudal	A	
14C	15		150-160 cm	Mugilidae	Precaudal	A	
14C	15		150-160 cm	Mugilidae	Caudal	A	
14C	15		150-160 cm	Siganidae	Caudal	A	
14C	15		150-160 cm	Siganidae	Caudal	A	
14C	15		150-160 cm	Siganidae	Caudal	A	
14C	15		150-160 cm	Siganidae	Penultimate	A	
14C	15		150-160 cm	Acanthuridae	Precaudal	A	
14C	15		150-160 cm	Acanthuridae	Caudal	A	
14C	15		150-160 cm	Acanthuridae	Caudal	A	
14C	15		150-160 cm	Scaridae	Precaudal	A	
14C	15		150-160 cm	Scaridae	Caudal	A	
14C	15		150-160 cm	Scaridae	Caudal	A	
14C	15		150-160 cm	Scaridae	Caudal	A	
14C	15		150-160 cm	Scaridae	Caudal	A	
14C	15		150-160 cm	Carangidae	Caudal	A	
14C	15		150-160 cm	Carangidae	Caudal	A	
14C	15		150-160 cm	Lethrinidae	Atlas	A	
14C	15		150-160 cm	Lethrinidae	Atlas	A	
14C	15		150-160 cm	Lethrinidae	Thoracic	A	
14C	15		150-160 cm	Lethrinidae	Thoracic	A	
14C	15		150-160 cm	Lethrinidae	Thoracic	A	
14C	15		150-160 cm	Lethrinidae	Thoracic	A	
14C	15		150-160 cm	Lethrinidae	Thoracic	A	
14C	15		150-160 cm	Lethrinidae	Thoracic	A	
14C	15		150-160 cm	Lethrinidae	Thoracic	A	
14C	15		150-160 cm	Lethrinidae	Precaudal	A	
14C	15		150-160 cm	Lethrinidae	Precaudal	A	
14C	15		150-160 cm	Lethrinidae	Precaudal	A	
14C	15		150-160 cm	Lethrinidae	Precaudal	A	
14C	15		150-160 cm	Lethrinidae	Precaudal	A	

14C	15		150-160 cm	Lethrinidae	Caudal	A	
14C	15		150-160 cm	Lethrinidae	Caudal	A	
14C	15		150-160 cm	Lethrinidae	Caudal	A	
14C	15		150-160 cm	Lethrinidae	Caudal	A	
14C	15		150-160 cm	Lethrinidae	Caudal	A	
14C	15		150-160 cm	Lethrinidae	Caudal	A	
14C	15		150-160 cm	Lethrinidae	Scapula	L	
14C	15		150-160 cm	Serranidae	Caudal	A	
14C	15		150-160 cm	Serranidae	Caudal	A	
14C	15		150-160 cm	Serranidae	Precaudal	A	
14C	15		150-160 cm	Muraenidae	Caudal	A	
14C	16		160-170 cm	Scaridae	Dentary	R	Large
14C	16		160-170 cm	Scaridae	Dentary	L	
14C	16		160-170 cm	Scaridae	Ultimate	A	
14C	16		160-170 cm	Scaridae	Angular	R	
14C	16		160-170 cm	Scaridae	Precaudal	A	
14C	16		160-170 cm	Scaridae	Precaudal	A	
14C	16		160-170 cm	Acanthuridae	Dorsal spine	A	
14C	16		160-170 cm	Acanthuridae	Caudal	A	
14C	16		160-170 cm	Lethrinidae	Premaxilla	R	
14C	16		160-170 cm	Lethrinidae	Dentary	L	
14C	16		160-170 cm	Lethrinidae	Dentary	L	
14C	16		160-170 cm	Lethrinidae	Angular	L	
14C	16		160-170 cm	Lethrinidae	Thoracic	A	
14C	16		160-170 cm	Lethrinidae	Thoracic	A	
14C	16		160-170 cm	Lethrinidae	Premaxilla	L	
14C	16		160-170 cm	Serranidae	Vomer	A	
14C	16		160-170 cm	Serranidae	Thoracic	A	
14C	16		160-170 cm	Serranidae	Thoracic	A	
14C	16		160-170 cm	Serranidae	Precaudal	A	
14C	16		160-170 cm	Serranidae	Precaudal	A	
14C	16		160-170 cm	Serranidae	Basio occipital	A	
14C	16		160-170 cm	Serranidae	Quadrate	L	
14C	16		160-170 cm	Holocentridae	Quadrate	R	
14C	16		160-170 cm	Sphyraenidae	Exoccipital		
14C	16		160-170 cm	Siganidae	Caudal	A	
14C	16		160-170 cm	Serranidae	Precaudal	A	
14C	16		160-170 cm	Serranidae	Caudal	A	
14C	16		160-170 cm	Mugilidae	Thoracic	A	

14C	16		160-170 cm	Carangidae	Caudal	A	
14C	16		160-170 cm	Carangidae	Ultimate	A	
14C	16		160-170 cm	Lethrinidae	Thoracic	A	
14C	16		160-170 cm	Lethrinidae	Precaudal	A	
14C	16		160-170 cm	Lethrinidae	Precaudal	A	
14C	16		160-170 cm	Lethrinidae	Caudal	A	
14C	16		160-170 cm	Lethrinidae	Caudal	A	
14C	16		160-170 cm	Lethrinidae	Caudal	A	
14C	16		160-170 cm	Muraenidae	Caudal	A	
14C	19/20		190-210 cm	Lethrinidae	Angular	L	
14C	19/20		190-210 cm	Lethrinidae	Premaxilla	R	
14C	19/20		190-210 cm	Acanthuridae	Caudal	A	
14C	19/20		190-210 cm	Mullidae	Caudal	A	
14C	19/20		190-210 cm	Scombridae	Caudal	A	
14C	19/20		190-210 cm	Lethrinidae	Caudal	A	
15C	Surface		0-20 cm	Scaridae	Precaudal	A	
15C	Surface		0-20 cm	Lethrinidae	Precaudal	A	
15C	2		20-30 cm	Serranidae	Thoracic	A	
15C	4		40-50 cm	Balistidae	Dorsal spine	A	
15C	4		40-50 cm	Diodontidae	Lower pharyngeal	A	
15C	4		40-50 cm	Mullidae	Precaudal	A	
15C	5		50-60 cm	Scaridae	Caudal	A	
15C	5		50-60 cm	Acanthuridae	Caudal	A	
15C	5		50-60 cm	Siganidae	Thoracic	A	
15C	5		50-60 cm	Mullidae	Caudal	A	
15C	5		50-60 cm	Mullidae	Caudal	A	
15C	5		50-60 cm	Serranidae	Caudal	A	
15C	5		50-60 cm	Serranidae	Precaudal	A	
15C	5		50-60 cm	Serranidae	Penultimate	A	
15C	5		50-60 cm	Lethrinidae	Atlas	A	
15C	5		50-60 cm	Lethrinidae	Thoracic	A	
15C	5		50-60 cm	Lethrinidae	Precaudal	A	
15C	5		50-60 cm	Lethrinidae	Precaudal	A	
15C	5		50-60 cm	Lethrinidae	Precaudal	A	
15C	5		50-60 cm	Lethrinidae	Precaudal	A	
15C	5		50-60 cm	Lethrinidae	Precaudal	A	
15C	5		50-60 cm	Lethrinidae	Caudal	A	
15C	6		60-70 cm	Scaridae	Lower pharyngeal	A	
15C	6		60-70 cm	Lethrinidae	Palatine	L	

15C	6		60-70 cm	Scombridae	Thoracic	A	
15C	6		60-70 cm	Scombridae	Caudal	A	
15C	6		60-70 cm	Scombridae	Caudal	A	
15C	6		60-70 cm	Mullidae	Caudal	A	
15C	6		60-70 cm	Serranidae	Quadrate	L	
15C	6		60-70 cm	Scaridae	Ultimate	A	
15C	6		60-70 cm	Scaridae	Precaudal	A	
15C	6		60-70 cm	Acanthuridae	Caudal	A	
15C	6		60-70 cm	Siganidae	Precaudal	A	
15C	6		60-70 cm	Lethrinidae	Caudal	A	
15C	6		60-70 cm	Lethrinidae	Caudal	A	
15C	6		60-70 cm	Lethrinidae	Precaudal	A	
15C	6		60-70 cm	Lethrinidae	Quadrate	R	
15C	6		60-70 cm	Carangidae	Caudal	A	
15C	7		70-80 cm	Diodontidae	Spine		
15C	7		70-80 cm	Diodontidae	Spine		
15C	7		70-80 cm	Diodontidae	Spine		
15C	7		70-80 cm	Scaridae	Upper Pharyngeal	A	
15C	7		70-80 cm	Scaridae	Upper Pharyngeal	A	
15C	7		70-80 cm	Scaridae	Lower or upper pharyngeal	A	
15C	7		70-80 cm	Scaridae	Ultimate	A	
15C	7		70-80 cm	Labridae	Lower pharyngeal	A	
15C	7		70-80 cm	Labridae	Upper Pharyngeal	A	
15C	7		70-80 cm	Balistidae	Thoracic	A	
15C	7		70-80 cm	Acanthuridae	Dorsal spine	A	
15C	7		70-80 cm	Serranidae	Maxilla	R	
15C	7		70-80 cm	Acanthuridae	Caudal	A	
15C	7		70-80 cm	Scombridae	Thoracic	A	
15C	7		70-80 cm	Scaridae	Caudal	A	
15C	7		70-80 cm	Scaridae	Caudal	A	
15C	7		70-80 cm	Scaridae	Caudal	A	
15C	7		70-80 cm	Scaridae	Caudal	A	
15C	7		70-80 cm	Scaridae	Precaudal	A	
15C	7		70-80 cm	Siganidae	Caudal	A	
15C	7		70-80 cm	Siganidae	Caudal	A	
15C	7		70-80 cm	Siganidae	Caudal	A	
15C	7		70-80 cm	Siganidae	Caudal	A	
15C	7		70-80 cm	Siganidae	Thoracic	A	

15C	7		70-80 cm	Siganidae	Precaudal	A	
15C	7		70-80 cm	Mullidae	Caudal	A	
15C	7		70-80 cm	Lethrinidae	Thoracic	A	
15C	7		70-80 cm	Lethrinidae	Caudal	A	
15C	7		70-80 cm	Lethrinidae	Caudal	A	
15C	7		70-80 cm	Lethrinidae	Caudal	A	
15C	7		70-80 cm	Lethrinidae	Caudal	A	
15C	7		70-80 cm	Lethrinidae	Caudal	A	
15C	7		70-80 cm	Lethrinidae	Caudal	A	
15C	7		70-80 cm	Lethrinidae	Precaudal	A	
15C	7		70-80 cm	Lethrinidae	Precaudal	A	
15C	7		70-80 cm	Lethrinidae	Precaudal	A	
15C	7		70-80 cm	Lethrinidae	Precaudal	A	
15C	7		70-80 cm	Lethrinidae	Precaudal	A	
15C	7		70-80 cm	Lethrinidae	Precaudal	A	
15C	7		70-80 cm	Lethrinidae	Atlas	A	
15C	7		70-80 cm	Lethrinidae	Quadrate	L	
15C	7		70-80 cm	Serranidae	Precaudal	A	
15C	7		70-80 cm	Serranidae	Precaudal	A	
15C	7		70-80 cm	Serranidae	Precaudal	A	
15C	7		70-80 cm	Serranidae	Caudal	A	
15C	7		70-80 cm	Serranidae	Caudal	A	
15C	7		70-80 cm	Serranidae	Thoracic	A	
15C	7		70-80 cm	Serranidae	Thoracic	A	
15C	7		70-80 cm	Serranidae	Thoracic	A	
15C	7		70-80 cm	Labridae	Precaudal	A	
15C	7		70-80 cm	Labridae	Caudal	A	
15C	7		70-80 cm	Carangidae	Precaudal	A	
15C	8		80-90 cm	Shark	Vertebra	A	
15C	8		80-90 cm	Balistidae	Dorsal spine	A	
15C	8		80-90 cm	Balistidae	Dorsal spine	A	
15C	8		80-90 cm	Balistidae	Dorsal spine	A	
15C	8		80-90 cm	Diodontidae	Spine		
15C	8		80-90 cm	Diodontidae	Spine		
15C	8		80-90 cm	Diodontidae	Spine		
15C	8		80-90 cm	Diodontidae	Spine		
15C	8		80-90 cm	Acanthuridae	Dorsal spine	A	
15C	8		80-90 cm	Acanthuridae	Dorsal spine	A	
15C	8		80-90 cm	Acanthuridae	Dorsal spine	A	

15C	8		80-90 cm	Acanthuridae	Dorsal spine	A	
15C	8		80-90 cm	Acanthuridae	Caudal	A	
15C	8		80-90 cm	Acanthuridae	Caudal	A	
15C	8		80-90 cm	Labridae	Lower pharyngeal	A	
15C	8		80-90 cm	Labridae	Lower pharyngeal	A	
15C	8		80-90 cm	Labridae	Dentary	R	
15C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
15C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
15C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
15C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
15C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
15C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
15C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
15C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
15C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
15C	8		80-90 cm	Scaridae	Lower pharyngeal	A	
15C	8		80-90 cm	Scaridae	Upper Pharyngeal	A	
15C	8		80-90 cm	Scaridae	Upper Pharyngeal	A	
15C	8		80-90 cm	Scaridae	Upper Pharyngeal	A	
15C	8		80-90 cm	Scaridae	Upper Pharyngeal	A	
15C	8		80-90 cm	Scaridae	Upper Pharyngeal	A	
15C	8		80-90 cm	Scaridae	Upper Pharyngeal	A	
15C	8		80-90 cm	Scaridae	Upper Pharyngeal	A	
15C	8		80-90 cm	Scaridae	Upper Pharyngeal	A	
15C	8		80-90 cm	Scaridae	Premaxilla	L	
15C	8		80-90 cm	Scaridae	Dentary	R	
15C	8		80-90 cm	Scaridae	Dentary	L	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Ultimate	A	
15C	8		80-90 cm	Lethrinidae	Palatine	L	
15C	8		80-90 cm	Lethrinidae	Palatine	L	
15C	8		80-90 cm	Lethrinidae	Palatine	L	
15C	8		80-90 cm	Lethrinidae	Palatine	L	
15C	8		80-90 cm	Lethrinidae	Palatine	R	
15C	8		80-90 cm	Lethrinidae	Palatine	R	
15C	8		80-90 cm	Lethrinidae	Vomer	A	
15C	8		80-90 cm	Serranidae	Dentary	L	
15C	8		80-90 cm	Serranidae	Dentary	L	
15C	8		80-90 cm	Serranidae	Dentary	L	

15C	8		80-90 cm	Serranidae	Atlas	A	
15C	8		80-90 cm	Serranidae	Maxilla	L	
15C	8		80-90 cm	Scombridae	Caudal	A	
15C	8		80-90 cm	Scombridae	Caudal	A	
15C	8		80-90 cm	Scombridae	Caudal	A	
15C	8		80-90 cm	Scombridae	Caudal	A	
15C	8		80-90 cm	Scombridae	Caudal	A	
15C	8		80-90 cm	Scombridae	Caudal	A	
15C	8		80-90 cm	Scombridae	Thoracic	A	
15C	8		80-90 cm	Scombridae	Thoracic	A	
15C	8		80-90 cm	Siganidae	Precaudal	A	
15C	8		80-90 cm	Siganidae	Caudal	A	
15C	8		80-90 cm	Siganidae	Caudal	A	
15C	8		80-90 cm	Siganidae	Caudal	A	
15C	8		80-90 cm	Siganidae	Caudal	A	
15C	8		80-90 cm	Siganidae	Caudal	A	
15C	8		80-90 cm	Siganidae	Caudal	A	
15C	8		80-90 cm	Siganidae	Caudal	A	
15C	8		80-90 cm	Siganidae	Caudal	A	
15C	8		80-90 cm	Siganidae	Caudal	A	
15C	8		80-90 cm	Mugilidae	Precaudal	A	
15C	8		80-90 cm	Mugilidae	Precaudal	A	
15C	8		80-90 cm	Mugilidae	Precaudal	A	
15C	8		80-90 cm	Mugilidae	Caudal	A	
15C	8		80-90 cm	Mugilidae	Caudal	A	
15C	8		80-90 cm	Mugilidae	Caudal	A	
15C	8		80-90 cm	Acanthuridae	Precaudal	A	
15C	8		80-90 cm	Acanthuridae	Precaudal	A	
15C	8		80-90 cm	Acanthuridae	Precaudal	A	
15C	8		80-90 cm	Acanthuridae	Caudal	A	
15C	8		80-90 cm	Acanthuridae	Caudal	A	
15C	8		80-90 cm	Acanthuridae	Caudal	A	
15C	8		80-90 cm	Acanthuridae	Caudal	A	
15C	8		80-90 cm	Acanthuridae	Caudal	A	
15C	8		80-90 cm	Acanthuridae	Caudal	A	
15C	8		80-90 cm	Acanthuridae	Caudal	A	
15C	8		80-90 cm	Acanthuridae	Caudal	A	
15C	8		80-90 cm	Acanthuridae	Caudal	A	
15C	8		80-90 cm	Mullidae	Caudal	A	

15C	8		80-90 cm	Mullidae	Caudal	A	
15C	8		80-90 cm	Mullidae	Caudal	A	
15C	8		80-90 cm	Holocentridae	Thoracic	A	
15C	8		80-90 cm	Scaridae	Atlas	A	
15C	8		80-90 cm	Scaridae	Precaudal	A	
15C	8		80-90 cm	Scaridae	Precaudal	A	
15C	8		80-90 cm	Scaridae	Precaudal	A	
15C	8		80-90 cm	Scaridae	Precaudal	A	
15C	8		80-90 cm	Scaridae	Precaudal	A	
15C	8		80-90 cm	Scaridae	Precaudal	A	
15C	8		80-90 cm	Scaridae	Precaudal	A	
15C	8		80-90 cm	Scaridae	Precaudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Caudal	A	
15C	8		80-90 cm	Scaridae	Ultimate	A	
15C	8		80-90 cm	Scaridae	Angular	L	
15C	8		80-90 cm	Carangidae	Caudal	A	
15C	8		80-90 cm	Carangidae	Caudal	A	
15C	8		80-90 cm	Carangidae	Caudal	A	
15C	8		80-90 cm	Carangidae	Caudal	A	
15C	8		80-90 cm	Lethrinidae	Atlas	A	
15C	8		80-90 cm	Lethrinidae	Atlas	A	
15C	8		80-90 cm	Lethrinidae	Precaudal	A	
15C	8		80-90 cm	Lethrinidae	Precaudal	A	
15C	8		80-90 cm	Lethrinidae	Precaudal	A	

15C	8		80-90 cm	Lethrinidae	Precaudal	A	
15C	8		80-90 cm	Lethrinidae	Precaudal	A	
15C	8		80-90 cm	Lethrinidae	Precaudal	A	
15C	8		80-90 cm	Lethrinidae	Precaudal	A	
15C	8		80-90 cm	Lethrinidae	Precaudal	A	
15C	8		80-90 cm	Lethrinidae	Precaudal	A	
15C	8		80-90 cm	Lethrinidae	Caudal	A	
15C	8		80-90 cm	Lethrinidae	Caudal	A	
15C	8		80-90 cm	Lethrinidae	Caudal	A	
15C	8		80-90 cm	Lethrinidae	Caudal	A	
15C	8		80-90 cm	Lethrinidae	Caudal	A	
15C	8		80-90 cm	Lethrinidae	Caudal	A	
15C	8		80-90 cm	Lethrinidae	Caudal	A	
15C	8		80-90 cm	Lethrinidae	Caudal	A	
15C	8		80-90 cm	Lethrinidae	Caudal	A	
15C	8		80-90 cm	Lethrinidae	Thoracic	A	
15C	8		80-90 cm	Lethrinidae	Thoracic	A	
15C	8		80-90 cm	Lethrinidae	Thoracic	A	
15C	8		80-90 cm	Lethrinidae	Thoracic	A	
15C	8		80-90 cm	Lethrinidae	Maxilla	R	
15C	8		80-90 cm	Lethrinidae	Maxilla	R	
15C	8		80-90 cm	Lethrinidae	Dentary	R	
15C	8		80-90 cm	Lethrinidae	Dentary	R	
15C	8		80-90 cm	Lethrinidae	Premaxilla	R	
15C	8		80-90 cm	Lethrinidae	Premaxilla	R	
15C	8		80-90 cm	Lethrinidae	Premaxilla	R	
15C	8		80-90 cm	Lethrinidae	Premaxilla	L	
15C	8		80-90 cm	Lethrinidae	Angular	R	
15C	8		80-90 cm	Lethrinidae	Angular	R	
15C	8		80-90 cm	Lethrinidae	Angular	R	
15C	8		80-90 cm	Lethrinidae	Quadrate	R	
15C	8		80-90 cm	Lethrinidae	Quadrate	R	
15C	8		80-90 cm	Lethrinidae	Quadrate	L	
15C	8		80-90 cm	Lethrinidae	Quadrate	L	
15C	8		80-90 cm	Lethrinidae	Quadrate	L	
15C	8		80-90 cm	Lethrinidae	Quadrate	L	
15C	8		80-90 cm	Lethrinidae	Quadrate	L	
15C	8		80-90 cm	Lethrinidae	Urohyal	A	
15C	8		80-90 cm	Serranidae	Precaudal	A	

15C	8		80-90 cm	Serranidae	Precaudal	A	
15C	8		80-90 cm	Serranidae	Precaudal	A	
15C	8		80-90 cm	Serranidae	Precaudal	A	
15C	8		80-90 cm	Serranidae	Caudal	A	
15C	8		80-90 cm	Serranidae	Caudal	A	
15C	8		80-90 cm	Serranidae	Caudal	A	
15C	8		80-90 cm	Serranidae	Caudal	A	
15C	8		80-90 cm	Serranidae	Caudal	A	
15C	8		80-90 cm	Serranidae	Caudal	A	
15C	8		80-90 cm	Serranidae	Thoracic	A	
15C	8		80-90 cm	Serranidae	Thoracic	A	
15C	8		80-90 cm	Serranidae	Thoracic	A	
15C	8		80-90 cm	Serranidae	Penultimate	A	
15C	8		80-90 cm	Serranidae	Vomer	A	
15C	8		80-90 cm	Serranidae	Quadrate	L	
15C	8		80-90 cm	Serranidae	Quadrate	R	
15C	8		80-90 cm	Serranidae	Quadrate	R	
15C	8		80-90 cm	Serranidae	Quadrate	R	
15C	8		80-90 cm	Serranidae	Angular	R	
15C	8		80-90 cm	Serranidae	Angular	L	
15C	8		80-90 cm	Serranidae	Angular	L	
15C	8		80-90 cm	Serranidae	Maxilla	R	
15C	8		80-90 cm	Serranidae	Maxilla	R	
15C	8		80-90 cm	Serranidae	Maxilla	L	
15C	8		80-90 cm	Serranidae	Premaxilla	L	
15C	8		80-90 cm	Serranidae	Dentary	R	
15C	8		80-90 cm	Sphyraenidae	Caudal	A	
15C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
15C	9		90-100 cm	Scaridae	Lower pharyngeal	A	
15C	9		90-100 cm	Scaridae	Upper Pharyngeal	A	
15C	9		90-100 cm	Scaridae	Upper Pharyngeal	A	
15C	9		90-100 cm	Scaridae	Upper Pharyngeal	A	
15C	9		90-100 cm	Scaridae	Upper Pharyngeal	A	
15C	9		90-100 cm	Scaridae	Upper Pharyngeal	A	
15C	9		90-100 cm	Scaridae	Upper Pharyngeal	A	
15C	9		90-100 cm	Scaridae	Upper Pharyngeal	A	
15C	9		90-100 cm	Scaridae	Upper Pharyngeal	A	
15C	9		90-100 cm	Scaridae	Fourth epibranchial		
15C	9		90-100 cm	Scaridae	Dentary	R	

15C	9		90-100 cm	Scaridae	Dentary	R	
15C	9		90-100 cm	Scaridae	Dentary	L	
15C	9		90-100 cm	Scaridae	Premaxilla	L	
15C	9		90-100 cm	Acanthuridae	Dorsal spine	A	
15C	9		90-100 cm	Acanthuridae	Caudal	A	
15C	9		90-100 cm	Diodontidae	Spine		
15C	9		90-100 cm	Balistidae	Dorsal spine	A	
15C	9		90-100 cm	Labridae	Premaxilla	L	
15C	9		90-100 cm	Lethrinidae	Palatine	R	
15C	9		90-100 cm	Lethrinidae	Palatine	L	
15C	9		90-100 cm	Lethrinidae	Dentary	R	
15C	9		90-100 cm	Serranidae	Premaxilla	L	
15C	9		90-100 cm	Serranidae	Vomer	A	
15C	9		90-100 cm	Serranidae	Dentary	R	
15C	9		90-100 cm	Serranidae	Precaudal	A	Large
15C	9		90-100 cm	Carangidae	Caudal	A	
15C	9		90-100 cm	Mugilidae	Caudal	A	
15C	9		90-100 cm	Mugilidae	Caudal	A	
15C	9		90-100 cm	Mullidae	Caudal	A	
15C	9		90-100 cm	Siganidae	Caudal	A	
15C	9		90-100 cm	Siganidae	Caudal	A	
15C	9		90-100 cm	Siganidae	Caudal	A	
15C	9		90-100 cm	Siganidae	Caudal	A	
15C	9		90-100 cm	Siganidae	Caudal	A	
15C	9		90-100 cm	Acanthuridae	Precaudal	A	
15C	9		90-100 cm	Acanthuridae	Precaudal	A	
15C	9		90-100 cm	Acanthuridae	Caudal	A	
15C	9		90-100 cm	Acanthuridae	Caudal	A	
15C	9		90-100 cm	Acanthuridae	Caudal	A	
15C	9		90-100 cm	Acanthuridae	Caudal	A	
15C	9		90-100 cm	Acanthuridae	Caudal	A	
15C	9		90-100 cm	Acanthuridae	Caudal	A	
15C	9		90-100 cm	Acanthuridae	Caudal	A	
15C	9		90-100 cm	Scombridae	Thoracic	A	
15C	9		90-100 cm	Scombridae	Thoracic	A	
15C	9		90-100 cm	Scombridae	Caudal	A	
15C	9		90-100 cm	Scombridae	Caudal	A	
15C	9		90-100 cm	Scombridae	Caudal	A	
15C	9		90-100 cm	Scombridae	Caudal	A	

15C	9		90-100 cm	Scombridae	Caudal	A	
15C	9		90-100 cm	Scombridae	Caudal	A	
15C	9		90-100 cm	Scombridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Atlas	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Caudal	A	
15C	9		90-100 cm	Scaridae	Precaudal	A	
15C	9		90-100 cm	Scaridae	Precaudal	A	
15C	9		90-100 cm	Scaridae	Precaudal	A	
15C	9		90-100 cm	Scaridae	Precaudal	A	
15C	9		90-100 cm	Scaridae	Precaudal	A	
15C	9		90-100 cm	Scaridae	Ultimate	A	
15C	9		90-100 cm	Lethrinidae	Atlas	A	
15C	9		90-100 cm	Lethrinidae	Atlas	A	
15C	9		90-100 cm	Lethrinidae	Caudal	A	
15C	9		90-100 cm	Lethrinidae	Caudal	A	
15C	9		90-100 cm	Lethrinidae	Caudal	A	
15C	9		90-100 cm	Lethrinidae	Caudal	A	
15C	9		90-100 cm	Lethrinidae	Caudal	A	
15C	9		90-100 cm	Lethrinidae	Precaudal	A	
15C	9		90-100 cm	Lethrinidae	Precaudal	A	
15C	9		90-100 cm	Lethrinidae	Precaudal	A	
15C	9		90-100 cm	Lethrinidae	Precaudal	A	
15C	9		90-100 cm	Lethrinidae	Precaudal	A	
15C	9		90-100 cm	Lethrinidae	Precaudal	A	
15C	9		90-100 cm	Lethrinidae	Thoracic	A	

15C	9		90-100 cm	Lethrinidae	Thoracic	A	
15C	9		90-100 cm	Lethrinidae	Quadrate	R	
15C	9		90-100 cm	Lethrinidae	Quadrate	L	
15C	9		90-100 cm	Lethrinidae	Premaxilla	R	
15C	9		90-100 cm	Lethrinidae	Angular	L	
15C	9		90-100 cm	Serranidae	Thoracic	A	
15C	9		90-100 cm	Serranidae	Thoracic	A	
15C	9		90-100 cm	Serranidae	Thoracic	A	
15C	9		90-100 cm	Serranidae	Thoracic	A	
15C	9		90-100 cm	Serranidae	Caudal	A	
15C	9		90-100 cm	Serranidae	Maxilla	R	
15C	9		90-100 cm	Serranidae	Vomer	A	
15C	9		90-100 cm	Serranidae	Quadrate	R	
15C	9		90-100 cm	Serranidae	Quadrate	R	
15C	9		90-100 cm	Serranidae	Scapula	L	
15C	10		100-110 cm	Scaridae	Upper Pharyngeal	A	
15C	10		100-110 cm	Scaridae	Upper Pharyngeal	A	
15C	10		100-110 cm	Scaridae	Premaxilla	R	
15C	10		100-110 cm	Scaridae	Dentary	L	
15C	10		100-110 cm	Labridae	Upper Pharyngeal	A	
15C	10		100-110 cm	Lethrinidae	Palatine	R	
15C	10		100-110 cm	Lethrinidae	maxilla	L	
15C	10		100-110 cm	Acanthuridae	Caudal	A	
15C	10		100-110 cm	Acanthuridae	Caudal	A	
15C	10		100-110 cm	Serranidae	Thoracic	A	
15C	10		100-110 cm	Acanthuridae	Caudal	A	
15C	10		100-110 cm	Acanthuridae	Precaudal	A	
15C	10		100-110 cm	Scombridae	Thoracic	A	
15C	10		100-110 cm	Scombridae	Caudal	A	
15C	10		100-110 cm	Scaridae	Precaudal	A	
15C	10		100-110 cm	Scaridae	Precaudal	A	
15C	10		100-110 cm	Scaridae	Caudal	A	
15C	10		100-110 cm	Scaridae	Caudal	A	
15C	10		100-110 cm	Scaridae	Caudal	A	
15C	10		100-110 cm	Mugilidae	Precaudal	A	
15C	10		100-110 cm	Mugilidae	Caudal	A	
15C	10		100-110 cm	Lethrinidae	Atlas	A	
15C	10		100-110 cm	Lethrinidae	Atlas	A	
15C	10		100-110 cm	Lethrinidae	Caudal	A	

15C	10		100-110 cm	Lethrinidae	Caudal	A	
15C	10		100-110 cm	Lethrinidae	Precaudal	A	
15C	10		100-110 cm	Lethrinidae	Precaudal	A	
15C	10		100-110 cm	Lethrinidae	Precaudal	A	
15C	10		100-110 cm	Lethrinidae	Precaudal	A	
15C	10		100-110 cm	Lethrinidae	Thoracic	A	
15C	10		100-110 cm	Lethrinidae	Premaxilla	R	
15C	10		100-110 cm	Lethrinidae	Quadrate	R	
15C	10		100-110 cm	Serranidae	Thoracic	A	
15C	10		100-110 cm	Serranidae	Thoracic	A	
15C	10		100-110 cm	Serranidae	Caudal	A	
15C	10		100-110 cm	Serranidae	Caudal	A	
15C	10		100-110 cm	Serranidae	Caudal	A	
15C	10		100-110 cm	Serranidae	Caudal	A	
15C	10		100-110 cm	Serranidae	Precaudal	A	
15C	10		100-110 cm	Siganidae	Caudal	A	
15C	10		100-110 cm	Siganidae	Caudal	A	
15C	10		100-110 cm	Siganidae	Caudal	A	
15C	11		110-120 cm	Diodontidae	Spine		
15C	11		110-120 cm	Diodontidae	Spine		
15C	11		110-120 cm	Scaridae	Lower pharyngeal	A	Fragmented in 2 pieces
15C	11		110-120 cm	Scaridae	Upper Pharyngeal	A	
15C	11		110-120 cm	Scaridae	Premaxilla	R	
15C	11		110-120 cm	Labridae	Upper Pharyngeal	A	
15C	11		110-120 cm	Acanthuridae	Dorsal spine	A	
15C	11		110-120 cm	Acanthuridae	Caudal	A	
15C	11		110-120 cm	Carangidae	Caudal	A	
15C	11		110-120 cm	Balistidae	Precaudal	A	
15C	11		110-120 cm	Scombridae	Caudal	A	
15C	11		110-120 cm	Scombridae	Caudal	A	
15C	11		110-120 cm	Scombridae	Caudal	A	
15C	11		110-120 cm	Scombridae	Precaudal	A	
15C	11		110-120 cm	Scombridae	Precaudal	A	
15C	11		110-120 cm	Scombridae	Thoracic	A	
15C	11		110-120 cm	Scombridae	Thoracic	A	
15C	11		110-120 cm	Scombridae	Thoracic	A	
15C	11		110-120 cm	Acanthuridae	Caudal	A	
15C	11		110-120 cm	Acanthuridae	Caudal	A	

15C	11		110-120 cm	Acanthuridae	Caudal	A	
15C	11		110-120 cm	Acanthuridae	Caudal	A	
15C	11		110-120 cm	Siganidae	Precaudal	A	
15C	11		110-120 cm	Siganidae	Precaudal	A	
15C	11		110-120 cm	Siganidae	Caudal	A	
15C	11		110-120 cm	Siganidae	Caudal	A	
15C	11		110-120 cm	Siganidae	Caudal	A	
15C	11		110-120 cm	Siganidae	Caudal	A	
15C	11		110-120 cm	Mugilidae	Thoracic	A	
15C	11		110-120 cm	Mugilidae	Caudal	A	
15C	11		110-120 cm	Mugilidae	Caudal	A	
15C	11		110-120 cm	Mugilidae	Caudal	A	
15C	11		110-120 cm	Mullidae	Caudal	A	
15C	11		110-120 cm	Scaridae	Precaudal	A	
15C	11		110-120 cm	Scaridae	Precaudal	A	
15C	11		110-120 cm	Scaridae	Precaudal	A	
15C	11		110-120 cm	Scaridae	Caudal	A	
15C	11		110-120 cm	Scaridae	Caudal	A	
15C	11		110-120 cm	Scaridae	Caudal	A	
15C	11		110-120 cm	Scaridae	Caudal	A	
15C	11		110-120 cm	Scaridae	Caudal	A	
15C	11		110-120 cm	Scaridae	Caudal	A	
15C	11		110-120 cm	Lethrinidae	Atlas	A	
15C	11		110-120 cm	Lethrinidae	Atlas	A	
15C	11		110-120 cm	Lethrinidae	Caudal	A	
15C	11		110-120 cm	Lethrinidae	Caudal	A	
15C	11		110-120 cm	Lethrinidae	Precaudal	A	
15C	11		110-120 cm	Lethrinidae	Precaudal	A	
15C	11		110-120 cm	Lethrinidae	Precaudal	A	
15C	11		110-120 cm	Lethrinidae	Precaudal	A	
15C	11		110-120 cm	Lethrinidae	Precaudal	A	
15C	11		110-120 cm	Lethrinidae	Precaudal	A	
15C	11		110-120 cm	Lethrinidae	Precaudal	A	
15C	11		110-120 cm	Lethrinidae	Precaudal	A	
15C	11		110-120 cm	Lethrinidae	Thoracic	A	
15C	11		110-120 cm	Lethrinidae	Thoracic	A	
15C	11		110-120 cm	Lethrinidae	Quadrate	R	
15C	11		110-120 cm	Lethrinidae	Quadrate	L	
15C	11		110-120 cm	Lethrinidae	Angular	L	

15C	11		110-120 cm	Serranidae	Atlas	A	
15C	11		110-120 cm	Serranidae	Caudal	A	
15C	11		110-120 cm	Serranidae	Caudal	A	
15C	11		110-120 cm	Serranidae	Caudal	A	
15C	11		110-120 cm	Serranidae	Precaudal	A	
15C	11		110-120 cm	Serranidae	Thoracic	A	
15C	11		110-120 cm	Serranidae	Thoracic	A	
15C	11		110-120 cm	Serranidae	Thoracic	A	
15C	11		110-120 cm	Serranidae	Quadrate	R	
15C	11		110-120 cm	Serranidae	Quadrate	R	
15C	11		110-120 cm	Serranidae	Maxilla	R	
15C	11		110-120 cm	Serranidae	Penultimate	A	
15C	11		110-120 cm	Serranidae	Epihyal	L	
15C	12		120-130 cm	Diodontidae	Spine		
15C	12		120-130 cm	Diodontidae	Spine		
15C	12		120-130 cm	Diodontidae	Spine		
15C	12		120-130 cm	Diodontidae	Spine		
15C	12		120-130 cm	Labridae	Lower pharyngeal	A	
15C	12		120-130 cm	Labridae	Upper Pharyngeal	A	
15C	12		120-130 cm	Labridae	Dentary	R	
15C	12		120-130 cm	Balistidae	Precaudal	A	
15C	12		120-130 cm	Serranidae	Premaxilla	L	
15C	12		120-130 cm	Scombridae	Caudal	A	
15C	12		120-130 cm	Acanthuridae	Caudal	A	
15C	12		120-130 cm	Acanthuridae	Precaudal	A	
15C	12		120-130 cm	Scaridae	Caudal	A	
15C	12		120-130 cm	Scaridae	Caudal	A	
15C	12		120-130 cm	Scaridae	Caudal	A	
15C	12		120-130 cm	Siganidae	Caudal	A	
15C	12		120-130 cm	Mugilidae	Thoracic	A	
15C	12		120-130 cm	Mugilidae	Caudal	A	
15C	12		120-130 cm	Serranidae	Thoracic	A	
15C	12		120-130 cm	Serranidae	Caudal	A	
15C	12		120-130 cm	Lethrinidae	Maxilla	L	
15C	12		120-130 cm	Lethrinidae	Atlas	A	
15C	12		120-130 cm	Lethrinidae	Caudal	A	
15C	12		120-130 cm	Lethrinidae	Precaudal	A	
15C	12		120-130 cm	Lethrinidae	Precaudal	A	
15C	12		120-130 cm	Lethrinidae	Precaudal	A	

15C	12		120-130 cm	Lethrinidae	Premaxilla	L	
15C	12		120-130 cm	Balistidae	Thoracic	A	
15C	12		120-130 cm	Muraenidae	Caudal	A	
15C	13		130-140 cm	Acanthuridae	Dorsal spine	A	
15C	13		130-140 cm	Acanthuridae	Caudal	A	
15C	13		130-140 cm	Acanthuridae	Caudal	A	
15C	13		130-140 cm	Scaridae	Upper Pharyngeal	A	
15C	13		130-140 cm	Scaridae	Premaxilla	L	
15C	13		130-140 cm	Diodontidae	Spine		
15C	13		130-140 cm	Diodontidae	Spine		
15C	13		130-140 cm	Diodontidae	Spine		
15C	13		130-140 cm	Diodontidae	Spine		
15C	13		130-140 cm	Diodontidae	Spine		
15C	13		130-140 cm	Diodontidae	Lower or upper pharyngeal	A	
15C	13		130-140 cm	Labridae	Maxilla	L	
15C	13		130-140 cm	Scombridae	Caudal	A	
15C	13		130-140 cm	Acanthuridae	Caudal	A	
15C	13		130-140 cm	Mugilidae	Caudal	A	
15C	13		130-140 cm	Lethrinidae	Precaudal	A	
15C	13		130-140 cm	Lethrinidae	Precaudal	A	
15C	13		130-140 cm	Lethrinidae	Caudal	A	
15C	13		130-140 cm	Lethrinidae	Angular	R	
15C	13		130-140 cm	Lethrinidae	Scapula	R	
15C	13		130-140 cm	Lethrinidae	Quadrate	R	
15C	13		130-140 cm	Serranidae	Caudal	A	
15C	13		130-140 cm	Serranidae	Caudal	A	
15C	13		130-140 cm	Serranidae	Caudal	A	
15C	13		130-140 cm	Serranidae	Precaudal	A	
15C	13		130-140 cm	Serranidae	Thoracic	A	
15C	13		130-140 cm	Serranidae	Epihyal	R	
15C	13		130-140 cm	Holocentridae	Thoracic	A	
15C	13		130-140 cm	Muraenidae	Caudal	A	
15C	14		140-150 cm	Muraenidae	Caudal	A	
15C	14		140-150 cm	Labridae	Lower or upper pharyngeal	A	
15C	14		140-150 cm	Serranidae	Maxilla	L	
15C	14		140-150 cm	Scaridae	Precaudal	A	
15C	14		140-150 cm	Acanthuridae	Caudal	A	
15C	14		140-150 cm	Acanthuridae	Caudal	A	

15C	14		140-150 cm	Serranidae	Precaudal	A	
15C	14		140-150 cm	Lethrinidae	Caudal	A	
15C	14		140-150 cm	Lethrinidae	Dentary	NA	
15C	15/16		150-170 cm	Scaridae	Premaxilla	R	
15C	15/16		150-170 cm	Lethrinidae	Palatine	L	
15C	15/16		150-170 cm	Labridae	Lower pharyngeal	A	Fragment
15C	15/16		150-170 cm	Carangidae	Vomer	A	
15C	15/16		150-170 cm	Siganidae	Precaudal	A	
15C	15/16		150-170 cm	Siganidae	Caudal	A	
15C	15/16		150-170 cm	Holocentridae	Thoracic	A	
15C	15/16		150-170 cm	Serranidae	Precaudal	A	
15C	15/16		150-170 cm	Serranidae	Precaudal	A	
15C	15/16		150-170 cm	Serranidae	Precaudal	A	
15C	15/16		150-170 cm	Serranidae	Thoracic	A	
15C	15/16		150-170 cm	Lethrinidae	Premaxilla	R	
14F	7		70-80 cm	Scaridae	Caudal	A	
14F	7		70-80 cm	Scaridae	Caudal	A	
14F	7		70-80 cm	Scaridae	Caudal	A	
14F	7		70-80 cm	Scaridae	Upper pharyngeal	A	
14F	7		70-80 cm	Scaridae	Lower pharyngeal	A	
14F	7		70-80 cm	Scombridae	Thoracic	A	
14F	7		70-80 cm	Scombridae	Caudal	A	
14F	7		70-80 cm	Mullidae	Caudal	A	
14F	7		70-80 cm	Mugilidae	Precaudal	A	
14F	7		70-80 cm	Mugilidae	Precaudal	A	
14F	7		70-80 cm	Serranidae	Vomer	A	
14F	7		70-80 cm	Serranidae	Thoracic	A	
14F	7		70-80 cm	Serranidae	Thoracic	A	
14F	7		70-80 cm	Serranidae	Caudal	A	
14F	7		70-80 cm	Serranidae	Premaxilla	L	
14F	7		70-80 cm	Lethrinidae	Atlas	A	
14F	7		70-80 cm	Lethrinidae	Thoracic	A	
14F	7		70-80 cm	Lethrinidae	Thoracic	A	
14F	7		70-80 cm	Lethrinidae	Precaudal	A	
14F	7		70-80 cm	Lethrinidae	Precaudal	A	
14F	7		70-80 cm	Lethrinidae	Precaudal	A	
14F	7		70-80 cm	Lethrinidae	Precaudal	A	
14F	7		70-80 cm	Lethrinidae	Caudal	A	
14F	7		70-80 cm	Lethrinidae	Caudal	A	

14F	7		70-80 cm	Lethrinidae	Caudal	A	
14F	7		70-80 cm	Lethrinidae	Caudal	A	
14F	7		70-80 cm	Lethrinidae	Caudal	A	
14F	7		70-80 cm	Lethrinidae	Caudal	A	
14F	7		70-80 cm	Lethrinidae	Caudal	A	
14F	7		70-80 cm	Lethrinidae	Caudal	A	
14F	7		70-80 cm	Lethrinidae	Angular	R	
14F	8		80-90 cm	Scaridae	Lower pharyngeal	A	
14F	8		80-90 cm	Serranidae	Thoracic	A	
14F	8		80-90 cm	Serranidae	Thoracic	A	
14F	8		80-90 cm	Serranidae	Precaudal	A	
14F	8		80-90 cm	Serranidae	Precaudal	A	
14F	8		80-90 cm	Lethrinidae	Quadrate	R	
14F	8		80-90 cm	Lethrinidae	Quadrate	R	
14F	8		80-90 cm	Lethrinidae	Quadrate	R	
14F	8		80-90 cm	Lethrinidae	Caudal	A	
14F	8		80-90 cm	Lethrinidae	Caudal	A	
14F	8		80-90 cm	Lethrinidae	Caudal	A	
14F	8		80-90 cm	Lethrinidae	Precaudal	A	
14F	8		80-90 cm	Lethrinidae	Precaudal	A	
14F	8		80-90 cm	Lethrinidae	Precaudal	A	
14F	8		80-90 cm	Lethrinidae	Precaudal	A	
14F	8		80-90 cm	Lethrinidae	Precaudal	A	
14F	8		80-90 cm	Lethrinidae	Precaudal	A	
14F	8		80-90 cm	Lethrinidae	Thoracic	A	
14F	8		80-90 cm	Lethrinidae	Thoracic	A	
14F	8		80-90 cm	Lethrinidae	Angular	R	
14F	8		80-90 cm	Lethrinidae	Urohyal	A	