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AT NUKUNONU ATOLL, TOKELAU

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HICKSON FERGUSON¹

ABSTRACT

Tokelau comprises three small atolls in the central Pacific Ocean and is rarely visited by biologists due to its difficult access. Despite occasional visits by fisheries officers and some scientific collections made in the 1960s, very little has been recorded of the diversity of the fish fauna, and no checklist of the fishes of Tokelau has ever been published. In 2012 seven sites around Nukunonu atoll were snorkelled and the fish species recorded. A total of 143 species in 37 families were identified and the majority photographed, including four species with unusual or rare color forms and one hybrid. The species recorded indicate a diverse fish fauna comparable to those of Tokelau's neighbors. Using the results of this study, the specimens held in the scientific collections, and species mentioned in the literature, a provisional checklist of the fishes of Tokelau has been developed.

INTRODUCTION

Tokelau is a non-self-governing territory of New Zealand (McQuarrie, 2007) consisting of three atolls located in the central Pacific between 8°S and 10°S and 171°W and 173°W (van Pel, 1958; Ono and Addison, 2009; OCOG, 2010; Zyllich et al., 2011; Pasilio et al., 2013). The three atolls—Atafu, Nukunonu, and Fakaofu—lie roughly in a straight line with Atafu the northernmost, Nukunonu 90 kilometers to the southeast, and Fakaofu a farther 60 kilometers southeast. Fakaofu is approximately 500 kilometers north of Samoa (Yaldwyn and Wodzicki, 1979; Huntsman and Hooper, 1996; Huntsman and Kalolo, 2007). Other neighbors include Wallis Island (Uvea) of Wallis and Futuna in the southwest, Tuvalu directly westward, and the largely uninhabited Phoenix Islands 400 kilometers north of Atafu (Figure 1).

Each of Tokelau's three atolls consists of a ring-shaped coral reef surrounding a central lagoon (Yaldwyn and Wodzicki, 1979; Ono and Addison, 2009). Scattered along the reef top are many small islets (motu), some with vegetation and others bare. The population of each atoll inhabits only one or two of these islets. The total land area of Tokelau is very small—only 12 km²—with most islets less than 200 meters wide and often not very much longer (although some are a few kilometers in length).

Nukunonu, the largest of the three atolls with a land area of around 4.5 km² and a 109 km² lagoon (Huntsman and Hooper, 1996), is 16 km across at its greatest width (McQuarrie, 2007). It has more than 30 small islets, the largest of which is only 1.5 km² (Yaldwyn and Wodzicki, 1979). The population of around 300 are confined to Nukunonu Village on the islets of Vao and Motuhaga in the southwest of the atoll (Figures 2 and 3).

Because of the small size of the islets, none of the atolls in Tokelau have ever had an airstrip (McQuarrie, 2007; Pasilio et al., 2013). Furthermore, none of the three atolls have a deepwater passage

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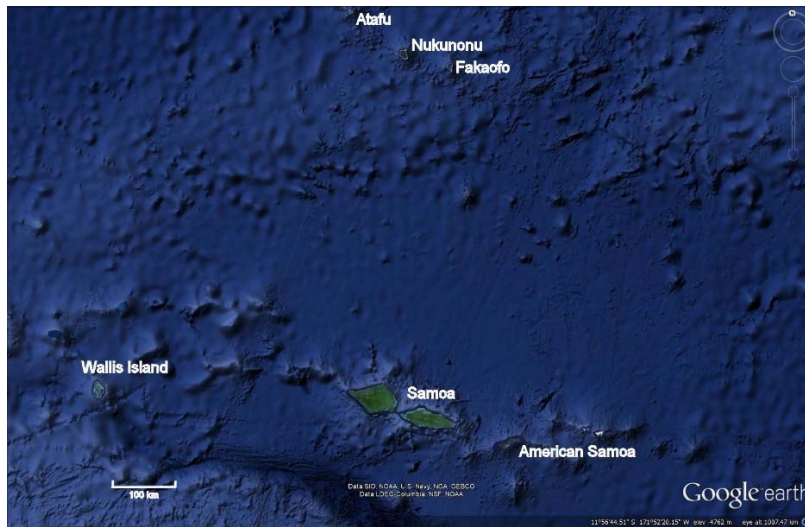


Figure 1. Tokelau in relation to Samoa. Fakaofu is 500 kilometers north of Samoa. The ocean around and between the atolls is 4,000 meters deep (Robertson and Kibblewhite, 1966). Image from Google Earth. Data from SIO, NOAA, U.S. Navy, NGA, GEBCO, LDEO-Columbia, NSF.



Figure 2. Nukunonu Atoll is the largest of the atolls with an area of 109 km². The village is on the southwest islets. Although the population live on only two neighboring islets, they regularly visit the other islets to fish or collect coconuts. Image from Google Earth. Image © 2014 TerraMetrics. Image © 2014 DigitalGlobe. Data from SIO, NOAA, U.S. Navy, NGA, GEBCO, LDEO-Columbia, NSF.



Figure 3. Nukunonu Village, on the islets of Vao and Motuhaga. Image from Google Earth. Image © 2014 DigitalGlobe. Data from SIO, NOAA, U.S. Navy, NGA, GEBCO.

for ships to pass through the reef and into the lagoon (van Pel, 1958; Huntsman and Hooper, 1996; Passfield, 1998; Pasilio et al., 2013) and there is no safe anchorage for ships outside the narrow reef as it drops sharply into the ocean depths (McQuarrie, 2007). This lack of accessibility has resulted in Tokelau remaining largely isolated from the rest of the world: a small, twice-monthly cargo ship from Apia, Samoa, is its only contact. Even this cargo ship is unable to dock or moor to a buoy; a barge (a large, flat-bottomed aluminium boat with outboard motors) from the island pulls alongside the larger ship to allow passengers and goods to be transferred between the two vessels. The barge then returns to the atoll through a shallow channel dynamited in the reef flat for this purpose (McQuarrie, 2007). Presumably as a consequence of this difficult access, very few zoological studies have been conducted in Tokelau.

During the 1960s, scientific collections of fishes were made on all three atolls. The Smithsonian's National Museum of Natural History lists 239 lots (representing 1,657 specimens) in their collection, with all but eight collected in 1965 (NMNH, 2015). Likewise, the Academy of Natural Sciences in Philadelphia has 76 lots collected between 1960 and 1965 (ANS, 2015) and the California Academy of Sciences has two lots (D. Catania, personal communication). The Natural History Museum in England has nine specimens that were registered into the collection in 1930 (J. MacLaine, pers. comm.). No publications or reports have been made about any of these collections.

The few publications of the marine fauna of Tokelau tend to be concerned with fisheries in general (van Pel, 1958; Hinds, 1971; Gillett, 1990; Chapman et al., 2005; Pasilio et al., 2013) and commercially valuable fish species in particular (Tuna Programme, 1983; Gillett, 1985; Passfield, 1998; Zyllich et al., 2011). No comprehensive checklist appears to exist, although Passfield (1998) compiled a list of Tokelauan fish names derived from multiple sources (including the *Tokelau Dictionary* [Simona, 1986] and his own questionnaires). He also conducted surveys of Fakaofu's lagoon and reef; however, it is unclear from the list which species he actually sighted, and many of the fish are not identified to species level. Similarly, Ono and Addison (2009) compiled a list of fish names from the *Tokelau Dictionary* (Simona, 1986) and other sources and by showing Atafu fisherman illustrations of fish in books. However, the two books used were guides to fishes of Southeast Asia and Japan; consequently their list includes at least 30 species of fish not found in this part of the Pacific Ocean.

The goal of this fish survey is therefore to provide a comprehensive inventory of reef fishes inhabiting Nukunonu Atoll.

MATERIALS AND METHODS

This author visited Nukunonu Atoll from 22 August 2012 to 7 September 2012 and took the opportunity to photograph and observe the lagoon and reef fishes in order to produce a record of the species found on this atoll. Accommodation was provided on Motuhaga (Figure 2) and four of the sites were adjacent to this islet. On this islet and the neighboring Vao, the reef has three zones on the ocean side. The first is a conglomerate platform, the remains of the reef that were exposed several thousand years ago when the sea levels in the Pacific dropped (Woodroffe and Biribo, 2011). Projecting out from under the islet like a ledge, it is usually just above the high tide level, but during spring tides the water may break over the edge, and during storm surges the platform may be completely submerged. Seaward of the platform is a reef flat that is shallowly submerged at low tide with some rocks and corals exposed. The seaward edge beyond the low algal crest is characterized by spurs and grooves, and below this is a narrow fore-reef with extensive hard coral cover. The outer edge of the fore-reef is a vertical drop-off. On the lagoon side of the islet the conglomerate platform is covered by a narrow beach composed of coral

rubble and sand; beneath the waterline is a sandy substrate that angles sharply into the lagoon. Patch reefs and pinnacles, none of which were seen to break the water's surface, occur within the lagoon.

There are no dive facilities or scuba equipment in Tokelau so most observations in this study were made by snorkelling from the surface down to about six or seven meters. Other observations were made by walking the reef flats or alongside the channels or by observing fish that had been caught by the locals. Snorkelling was conducted for a total of more than 20 hours at seven sites, including three sites in the lagoon, a shallow channel between the lagoon and the reef flat, the reef flat, a manmade channel in the reef flat, and a single site on the outer reef (Table 1; Figures 4 and 5). Further observations of the individual sites are in Appendix A.

No fish were collected but most species were photographed. While the majority could be identified visually, these identifications are provisional; sampling and analysis of morphometrics, meristics, and DNA are required to confirm identifications. Fish references used for identifications include Allen et al. (2003) and Randall (2005).

Photography was taken with either a Canon D20 compact underwater camera or a Canon 550D camera and a Canon 100mm macro lens in a Nauticam waterproof housing with an Inon Z240 strobe. A GoPro Hero2 on a chest harness recorded movie images of most snorkelling sessions and on a few occasions was removed from the harness, attached to a weight, positioned in front of some coral, and left recording for a short period. These recordings were later used to confirm identifications of species that were not photographed and, in one case, a cryptic species that the author did not see.

Table 1. Site coordinates, depth, visitation details. Depths are estimates and are provided for illustrative purposes only.

	Location	GPS Coordinates	Max Depth (m)	Date(s)	Duration (min)
Site 1	Lagoon	9°12'5.7"S	5	8/23/12	34
		171°50'46.01"W		8/24/12	140
Site 2	Channel	9°12'5.7"S	1	numerous	various
		171°50'46.01"W			
Site 3	Reef flat	to	1		
		9°12'8.23"S			
		171°50'53.42"W			
		9°12'8.23"S		8/23/12	23
		171°50'53.42"W		8/24/12	18
		to		8/30/12	189
Site 4	Channel in reef flat	9°12'0.43"S	4	8/23/12	12
		171°50'58.66"W		8/27/12	89
Site 5	Lagoon	9°7'3.52"S	8	8/25/12	185
		171°51'31.69"W			
Site 6	Lagoon	9°11'56.21"S	6	8/28/12	90
		171°50'56.89"W			
Site 7	Reef	9°12'14.37"S	8	9/02/12	19
		171°50'54.79"W		9/03/12	47
				9/06/12	77



Figure 4. Survey sites around Nukunonu Village. Despite their proximity to each other, the sites varied in substrate, depth, water clarity, water movements, coral cover, shelter, and fish assemblages. See Table 1 and Appendix A for details of the individual sites. Image from Google Earth. Image © 2014 DigitalGlobe.



Figure 5. Survey site adjacent to Te Fakanava motu, five kilometers from the village. Pinnacles were common at this site and most fish species were sheltering in or around the pinnacles. Several species (including *Gymnothorax javanicus*, *Kuhlia mugil*, *Dascyllus aruanus*, *Scarus schlegeli*, *S. frenatus*, *Valenciennaea sexguttata*, *Ptereleotris evides*, and *Arothron meleagris*) were seen at this site only. Image from Google Earth. Image © 2014 DigitalGlobe.

The Coral Fish Diversity Index (CFDI) is a method for predicting the approximate total number of fish species in an area by counting the number of species in six key families of conspicuous fish (Chaetodontids, Pomacanthids, Pomacentrids, Scarids, Labrids, and Acanthurids). The total for these families was counted for Nukunonu Atoll, and the total number of species expected (TSE) was calculated using Allen and Werner's (2002) formula for small reefs:

$$\text{TSE} = 3.39(\text{CFDI}) - 20.595.$$

RESULTS

A total of 143 species were identified, albeit some tentatively, and an additional 11 that could not be positively identified to species level were also sighted (Table 2). One species—*Neocirrhites armatus*—was not actually seen by the author but was recorded when the GoPro camera was left on the reef for a short period. Two positive identifications were made from juveniles only (*Scarus altipinnis* and *S. frenatus*); no adults of these species were seen/identified by the author. Another species—*Chaetodon ephippium*—was not sighted alive by the author, but a dead specimen collected by a fisherman for food was seen.

Table 2. Fish species seen at different sites. The classification of families follows Nelson (2006). Not all unidentified species have been listed; those that might be an already recorded species have not been listed (e.g., scarids, holocentrids) to avoid inflating total numbers. A checkmark (✓) indicates the species was observed at the site. An asterisk (*) indicates tentative identification.

Family Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Carcharhinidae							
<i>Carcharhinus melanopterus</i> (Quoy and Gaimard, 1824)			✓	✓	✓		✓
Myliobatidae							
<i>Aetobatus narinari</i> (Euphrasen, 1790)			✓				
Muraenidae							
<i>Echidna nebulosa</i> (Ahl, 1789)	✓						
<i>Gymnothorax javanicus</i> (Bleeker, 1859)					✓		
<i>Gymnothorax pictus</i> (Ahl, 1789)		✓	✓				
Unidentified muraenid						✓	
Mugilidae							
<i>Crenimugil crenilabris</i> (Forsskål, 1775)			✓				
<i>Neomyxus leuciscus</i> (Günther, 1872)			✓				
Hemiramphidae							
Unidentified hemiramphid							✓
Belonidae							
Unidentified belonid			✓		✓		✓
Holocentridae							
<i>Myripristis violacea</i> Bleeker, 1851	✓					✓	

(Continued)

Table 2. Fish species seen at different sites. (Continued)

Family Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Holocentridae (continued)							
<i>Neoniphon opercularis</i> (Valenciennes, 1831)	✓						
<i>Neoniphon samara</i> (Forsskål, 1775)	✓		✓	✓	✓	✓	
<i>Sargocentron caudimaculatum</i> (Rüppell, 1838)			✓				
<i>Sargocentron microstoma</i> (Günther, 1859)	✓		✓	✓			
<i>Sargocentron spiniferum</i> (Forsskål, 1775)	✓		✓		✓		✓
Aulostomidae							
<i>Aulostomus chinensis</i> (Linnaeus, 1766)							✓
Fistulariidae							
<i>Fistularia commersonii</i> Rüppell, 1838			✓	✓		✓	
Serranidae							
<i>Cephalopholis argus</i> Bloch and Schneider, 1801	✓		✓		✓	✓	✓
<i>Cephalopholis urodeta</i> (Forster, 1801)							✓
<i>Epinephalus fuscoguttatus</i> * (Forsskål, 1775)					✓		
<i>Epinephalus hexagonatus</i> (Forster, 1801)					✓		✓
<i>Epinephalus merra</i> Bloch, 1793	✓		✓	✓	✓	✓	
<i>Epinephalus polyphkadion</i> * (Bleeker, 1849)					✓		
Apogonidae							
Unidentified apogonid					✓		
Echeneidae							
<i>Echeneis naucrates</i> Linnaeus, 1758							✓
Carangidae							
<i>Caranx melampygus</i> Cuvier, 1833	✓				✓		✓
<i>Caranx sexfasciatus</i> Quoy and Gaimard, 1825							✓
<i>Trachinotus baillonii</i> (Lacepède, 1801)							✓
Lutjanidae							
<i>Aphareus furca</i> (Lacepède, 1801)							✓
<i>Aprion virescens</i> * Valenciennes, 1830							✓
<i>Lutjanus bohar</i> (Forsskål, 1775)							✓
<i>Lutjanus fulvus</i> (Forster, 1801)	✓				✓	✓	✓
<i>Lutjanus gibbus</i> (Forsskål, 1775)							✓
<i>Lutjanus monostigma</i> (Cuvier, 1828)			✓		✓		✓
Lethrinidae							
<i>Gnathodentex aurolineatus</i> (Lacepède, 1802)						✓	
<i>Lethrinus xanthochilus</i> Klunzinger, 1870							✓
<i>Monotaxis grandoculis</i> (Forsskål, 1755)	✓		✓		✓	✓	✓
Mullidae							
<i>Mulloidichthys flavolineatus</i> (Lacepède, 1801)	✓		✓		✓	✓	

(Continued)

Table 2. Fish species seen at different sites. (Continued)

Family Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Mullidae (continued)							
<i>Mulloidichthys vanicolensis</i> (Valenciennes, 1831)					✓	✓	
<i>Parupeneus barberinus</i> (Lacepède, 1801)	✓		✓	✓	✓	✓	✓
<i>Parupeneus cyclostomus</i> (Lacepède, 1801)	✓		✓	✓	✓	✓	✓
<i>Parupeneus insularis</i> (Randall and Myers, 2002)	✓		✓	✓	✓	✓	✓
<i>Parupeneus multifasciatus</i> (Quoy and Gaimard, 1825)	✓		✓	✓		✓	✓
Kyphosidae							
<i>Kyphosus vaigiensis</i> * (Quoy and Gaimard, 1825)							✓
Chaetodontidae							
<i>Chaetodon auriga</i> Forsskål, 1775	✓		✓	✓	✓	✓	
<i>Chaetodon citrinellus</i> Cuvier, 1831	✓		✓	✓	✓	✓	
<i>Chaetodon ephippium</i> Cuvier, 1831							
<i>Chaetodon lunula</i> (Lacepède, 1802)	✓		✓	✓	✓		✓
<i>Chaetodon lunulatus</i> Quoy and Gaimard, 1825			✓		✓	✓	✓
<i>Chaetodon ornatissimus</i> Cuvier, 1831							✓
<i>Chaetodon quadrimaculatus</i> Gray, 1831			✓				✓
<i>Chaetodon reticulatus</i> Cuvier, 1831							✓
<i>Chaetodon semeion</i> Bleeker, 1855			✓		✓	✓	
<i>Chaetodon ulietensis</i> Cuvier, 1831	✓		✓		✓	✓	✓
<i>Chaetodon vagabundus</i> Linnaeus, 1758	✓			✓			
<i>Forcipiger flavissimus</i> Jordan and McGregor, 1898							✓
<i>Forcipiger longirostris</i> (Broussonet, 1782)							✓
<i>Heniochus chrysostomus</i> Cuvier, 1831							✓
<i>Heniochus monocerus</i> Cuvier, 1831							✓
Pomacanthidae							
<i>Centropyge flavissima</i> (Cuvier, 1831)			✓	✓	✓	✓	✓
<i>Pygoplites diacanthus</i> (Boddaert, 1772)	✓				✓	✓	✓
Kuhliidae							
<i>Kuhlia mugil</i> (Forster, 1801)					✓		
Cirrhitidae							
<i>Neocirrhites armatus</i> Castelnau, 1873							✓
<i>Paracirrhites arcatus</i> (Cuvier, 1829)							✓
<i>Paracirrhites hemistictus</i> (Günther, 1874)							✓
Pomacentridae							
<i>Abudefduf septemfasciatus</i> (Cuvier, 1830)	✓	✓	✓	✓	✓	✓	
<i>Abudefduf sordidus</i> (Forsskål, 1775)		✓	✓	✓		✓	
<i>Chromis acares</i> Randall and Swerdloff, 1973							✓
<i>Chromis margaritifer</i> Fowler, 1946							✓

(Continued)

Table 2. Fish species seen at different sites. (Continued)

Family Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Pomacentridae (continued)							
<i>Chromis xanthura</i> (Bleeker, 1854)							✓
<i>Chrysiptera glauca</i> (Cuvier, 1830)		✓	✓		✓		
<i>Dascyllus aruanus</i> (Linnaeus, 1758)					✓		
<i>Plectroglyphidodon dickii</i> (Liénard, 1839)							✓
<i>Pomacentrus pavo</i> (Bloch, 1787)	✓				✓	✓	
<i>Pomacentrus vaiuli</i> Jordan and Seale, 1906	✓				✓		
<i>Stegastes albifasciatus</i> (Schlegel and Müller, 1839)	✓						
<i>Stegastes nigricans</i> (Lacepède, 1802)	✓		✓			✓	
<i>Chrysiptera</i> sp. 1			✓				
<i>Chrysiptera</i> sp. 2			✓				
<i>Chromis</i> (?) sp.						✓	
Labridae							
<i>Anampses caeruleopunctatus</i> Rüppell, 1829			✓	✓			
<i>Cheilinus fasciatus</i> (Bloch, 1791)	✓				✓	✓	
<i>Cheilinus trilobatus</i> Lacepède, 1801	✓						
<i>Cheilinus undulatus</i> Rüppell, 1835							✓
<i>Coris aygula</i> Lacepède, 1801							✓
<i>Coris gaimard</i> (Quoy and Gaimard, 1824)							✓
<i>Epibulus insidiator</i> (Pallas, 1770)					✓		✓
<i>Gomphosus varius</i> Lacepède, 1801	✓		✓		✓		✓
<i>Halichoeres hortulanus</i> (Lacepède, 1801)	✓		✓	✓	✓	✓	✓
<i>Halichoeres margaritaceus</i> (Valenciennes, 1839)			✓				
<i>Halichoeres trimaculatus</i> (Quoy and Gaimard, 1834)	✓	✓	✓	✓	✓		
<i>Hemigymnus fasciatus</i> (Bloch, 1792)							✓
<i>Labroides bicolor</i> Fowler and Bean, 1928	✓				✓		
<i>Labroides dimidiatus</i> (Valenciennes, 1839)	✓		✓		✓		✓
<i>Labroides rubrolabiatus</i> Randall, 1958					✓		✓
<i>Oxycheilinus unifasciatus</i> (Streets, 1877)							✓
<i>Stethojulis bandanensis</i> (Bleeker, 1851)	✓		✓				
<i>Thalassoma amblycephalum</i> (Bleeker, 1856)	✓		✓				✓
<i>Thalassoma hardwicke</i> (Bennett, 1830)	✓		✓		✓	✓	
<i>Thalassoma purpureum</i> (Forsskål, 1775)	✓		✓	✓			✓
<i>Thalassoma quinquevittatum</i> (Lay and Bennett, 1839)	✓		✓	✓			✓
Unidentified labrid							✓
Scaridae							
<i>Cetoscarus ocellatus</i> (Valenciennes, 1840)				✓	✓		✓
<i>Chlorurus frontalis</i> (Valenciennes, 1840)			✓	✓	✓		✓

(Continued)

Table 2. Fish species seen at different sites. (Continued)

Family Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Scaridae (continued)							
<i>Chlorurus microrhinos</i> (Bleeker, 1854)					✓		✓
<i>Chlorurus spilurus</i> (Valenciennes, 1840)	✓		✓		✓	✓	
<i>Hipposcarus longiceps</i> (Valenciennes, 1840)			✓	✓	✓	✓	✓
<i>Scarus altipinnis</i> (Steindachner, 1879)						✓	
<i>Scarus frenatus</i> Lacepède, 1802					✓		
<i>Scarus psittacus</i> Forsskål, 1775				✓			✓
<i>Scarus rubroviolaceus</i> Bleeker, 1847							✓
<i>Scarus schlegeli</i> (Bleeker, 1861)					✓		
Pinguipedidae							
<i>Parapercis millepunctata</i> (Günther, 1860)			✓	✓			
Blenniidae							
<i>Blenniella paula</i> (Bryan and Herre, 1903)				✓			
Gobiidae							
<i>Ctenogobiops feroculus</i> * Lubbock and Polunin, 1977					✓		
<i>Valenciennea sexguttata</i> (Valenciennes, 1837)					✓		
Ptereleotridae							
<i>Ptereleotris evides</i> (Jordan and Hubbs, 1925)					✓		
Siganidae							
Unidentified siganid					✓		
Zanclidae							
<i>Zanclus cornutus</i> (Linnaeus, 1758)	✓		✓	✓	✓	✓	✓
Acanthuridae							
<i>Acanthurus achilles</i> Shaw, 1803	✓		✓		✓	✓	✓
<i>Acanthurus achilles</i> X <i>A. nigricans</i>			✓		✓		✓
<i>Acanthurus guttatus</i> Forster, 1801				✓			✓
<i>Acanthurus lineatus</i> (Linnaeus, 1758)	✓		✓	✓			✓
<i>Acanthurus nigricans</i> (Linnaeus, 1758)	✓		✓	✓	✓	✓	✓
<i>Acanthurus nigricauda</i> Dunker and Mohr, 1929			✓				
<i>Acanthurus nigros</i> Günther, 1861			✓	✓	✓		
<i>Acanthurus olivaceus</i> Forster, 1801			✓				
<i>Acanthurus pyroferus</i> Kittlitz, 1834					✓		✓
<i>Acanthurus triostegus</i> (Linnaeus, 1758)	✓	✓	✓	✓	✓	✓	✓
<i>Acanthurus xanthopterus</i> Valenciennes, 1835					✓		
<i>Ctenochaetus striatus</i> (Quoy and Gaimard, 1825)	✓		✓	✓	✓	✓	✓
<i>Naso lituratus</i> (Forster, 1801)	✓		✓	✓	✓		✓
<i>Naso unicornis</i> (Forsskål, 1775)							✓
<i>Zebrasoma scopas</i> (Cuvier, 1829)	✓				✓		

(Continued)

Table 2. Fish species seen at different sites. (Continued)

Family Species	Site 1	Site 2	Site 3	Site 4	Site 5	Site 6	Site 7
Acanthuridae (continued)							
<i>Zebrasoma veliferum</i> (Bloch, 1795)				✓	✓		✓
Unidentified acanthurid				✓	✓		
Sphyraenidae							
<i>Sphyraena</i> spp.							✓
Bothidae							
<i>Bothus mancus</i> (Broussonet, 1782)				✓			
Balistidae							
<i>Balistapus undulatus</i> (Park, 1797)					✓		✓
<i>Balistoides viridescens</i> * (Bloch and Schneider, 1801)				✓			
<i>Melichthys niger</i> (Bloch, 1786)							✓
<i>Melichthys vidua</i> (Solander and Richardson, 1845)				✓	✓		✓
<i>Pseudobalistes flavimarginatus</i> (Rüppell, 1829)					✓		✓
<i>Rhinecanthus aculeatus</i> (Linnaeus, 1758)	✓		✓	✓	✓	✓	
<i>Rhinecanthus retangulus</i> (Bloch and Schneider, 1801)			✓	✓			✓
<i>Sufflamen bursa</i> (Bloch and Schneider, 1801)							✓
Monacanthidae							
<i>Aluterus scriptus</i> (Osbeck, 1765)							✓
<i>Cantherhines dumerilii</i> (Hollard, 1854)			✓				✓
Tetraodontidae							
<i>Arothron hispidus</i> (Linnaeus, 1758)						✓	
<i>Arothron meleagris</i> (Lacepède, 1798)					✓		
<i>Arothron nigropunctatus</i> (Bloch and Schneider, 1801)		✓	✓				
<i>Canthigaster amboinensis</i> (Bleeker, 1865)			✓				
<i>Canthigaster solandri</i> (Richardson, 1845)			✓				
Diodontidae							
<i>Diodon hystrix</i> Linnaeus, 1758			✓				

DISCUSSION

A total of 143 species and one hybrid were identified, six of them tentatively. Two epinephalids—*Epinephalus fuscoguttatus* and *E. polyphkadion*—are similar and may be misidentified (Randall and Ben-Tuvia, 1983; Randall and Heemstra, 1991; Randall, 2005; Craig et al., 2011). Furthermore, the most common serranid sighted—*E. merra*—appeared to have a variable pattern, and some individuals identified as *E. merra* may prove to be another species. A brief glimpse of what was thought to be *Aprion virescens* may have been a misidentification, and the *Kyphosus vaigensis* may have actually been the similar *K. biggibus* or *K. pacificus*. The single *Balistoides viridescens* briefly seen at Site 4 was not viewed clearly due to the amount of sediment in the water but was identified tentatively by the obvious pale area on the body anterior to the caudal peduncle.

A further 11 could not be confidently identified to species. The belonid is most likely *Platybelone argalus*, but neither photographs nor observations could confirm this. Myripristine holocentrids were seen at several sites and may represent more than one species, possibly *Myripristis berndti* or *M. kuntzei* or both. One of the *Chrysiptera* species may be *Chrysiptera brownriggi* or *C. unimaculata*, and the *Chromis* is probably *Chromis virescens*. At most of the sites, one or more scarids defied identification, having variable color patterns that made positive identification difficult. One individual scarid, seen at Site 1, may have been *Chlorurus bleekeri*, although it lacked the distinctive green cheek markings. The acanthurid seen in reasonable numbers (20+) at Site 4 was not seen clearly due to the sediment in the water but appeared to be black (or very dark) with a white ring around the base of the caudal fin. The species may have been *Acanthurus nigricauda*, although the *A. nigricauda* seen at Site 3 had a completely white tail and a more streamlined body shape; alternatively, it may have been *A. blochi*.

The hybrid *Acanthurus achilles* X *nigricans* (Plates 1 and 2) was sighted at three different locations—Site 3 and Site 7, which are contiguous, and Site 5, which is approximately eight kilometers from the other sites—suggesting this may be a rare but not unusual occurrence. Randall (1960; 2001:15) reports this hybrid from the Phoenix Islands, the island of Hawaii, Caroline Atoll, and the Tuamotu Archipelago.

Some unusual coloration was observed in four species of fish. A lone *Aphareus furca* was sighted on the reef at Site 7 on two consecutive days. This species is normally a silvery color, but this individual was dusky with a reddish tinge and a bright yellow irregular splotch on the head just anterior to the first dorsal fin (Plates 3 and 4); this has been described as a rare color form (Randall, 2005:242). Examples of the red version of *Chlorurus microrhinos* were also sighted on the reef at Site 7. This morph is reported as an “occasional color morph” by Randall (2005:450) and as “generally rare” by Allen et al. (2003:177). The specimens of *Abudefduf septemfasciatus* that were seen all had irregular black markings on the posterior edges of the second dorsal, anal, and caudal fins, giving the fins a ragged appearance, as if they had been chewed (Plates 5 and 6). These markings do not appear to have been previously recorded, and both Allen and Randall have not seen it before (G. Allen, West Australian Museum, pers. comm.; J. E. Randall, Bishop Museum, pers. comm.). However, this author has seen this pattern in *A. septemfasciatus* in Niue, about 1,000 kilometers to the south. The tail of *Acanthurus nigricauda* usually is dark with a white ring at the base, but as mentioned above, those seen in Nukunonu have a completely white tail (Plates 7 and 8).

Visual assessments are an easy and effective way to rapidly assess and record common fish species, but pelagic and deepwater species are rarely sighted and small cryptic species are often overlooked (McDermond and Wass, 1986; Williams et al., 2006). However, Allen and Werner (2002) showed that the approximate total number of fish species in an area can be predicted by counting the number of species in six key families. Of the 154 species sighted, a total of 80 species were found in the six key families, and thus, using the formula for small reefs, the predicted total number of species expected for Nukunonu Atoll is 251 species, suggesting another 97 species are still to be recorded. This predicted total of 251 species is low compared to Tokelau’s nearest neighbors: Samoa has 991, Wallis Island has 648, Tuvalu has 607, and the Phoenix Islands have 516 (Wass, 1984; Williams et al., 2006; Job and Ceccarelli, 2012; Allen and Bailey, 2011).

There are two reasons why this predicted total is less than half the known numbers of Tokelau’s neighbors. As mentioned previously, deepwater and pelagic species as well as cryptic species are not recorded during shallow water visual surveys. Second, a limited number of sites were surveyed, and the windward reef was not visited at all. The coral composition on this exposed reef would be different from the single reef site visited in this survey, resulting in a differing assemblage of fish fauna. In contrast, Tokelau’s neighbors have been surveyed more extensively (Schultz, 1943; Wass, 1984; Wantiez and Chauvet, 2003; Williams et al., 2006; Job and Ceccarelli, 2012; Allen and Bailey, 2011).

Despite the relatively low number of species recorded for Nukunonu, the assemblage is similar to those of Tokelau's nearest neighbors. Comparing the species listed in Table 2 to published checklists for the fishes of Samoa (Wass, 1984), Wallis Island (Williams et al., 2006), Tuvalu (Job and Ceccarelli, 2012), and the Phoenix Islands (Allen and Bailey, 2011), reveals that 96% of the species seen in this study in Nukunonu are recorded in Samoa, 90% in the waters around Wallis Island, 92% in Tuvalu, and 95% in the Phoenix Islands. The species seen in Nukunonu but not recorded for Samoa were *Epinephalus polyphekadion*, *Letherinus xanthochilus*, *Parupeneus multifasciatus*, *Ctenogobiops feroculus*, and *Ptereleotris evides*. At Wallis Island *Carcharhinus melanopterus*, *Crenimugil crenilabris*, *Neomyxus leuciscus*, *Epinephalus hexagonatus*, *Caranx sexfasciatus*, *Parupeneus insularis*, *Chaetodon quadrimaculatus*, *Paracirrhites hemistictus*, *Labroides rubrolabiatus*, *Chlorurus frontalis*, *Ctenogobiops feroculus*, *Acanthurus nigros*, *Bothus mancus*, *Melichthys niger*, and *Aluterus scriptus* are not recorded. At Tuvalu *Gymnothorax pictus*, *Neomyxus leuciscus*, *Stegastes albifasciatus*, *Labroides rubrolabiatus*, *Parapercis millepunctata*, *Bleniella paula*, *Valenciennea sexguttata*, and *Canthigaster amboinensis* are not recorded. And absent in the Phoenix Islands are *Parupeneus insularis*, *Pomacentrus vaiuli*, *Cheilinus fasciatus*, *C. trilobatus*, *Scarus schlegeli*, *Ctenogobiops feroculus*, and *Valenciennea sexguttata*.

As would be expected on a small remote island, fishing is an important part of everyday life for the population (Huntsman and Hooper, 1996; Chapman et al., 2005; Elders, 2012), and fish make up a significant part of their diet (Passfield, 1998; Zylich et al., 2011). It was noted by Yaldwyn and Wodzicki (1979:9) that “there is a rich and varied lagoon and offshore fauna of marine fishes still undocumented,” yet since that time there does not appear to have been an attempt to accurately document the species native to these atolls. Furthermore, in the *Tokelau National Strategic Plan: 1 July 2010–30 June 2015* it is noted that coral bleaching is now an annual event and has led to “degradation of coral reefs both inside and outside the lagoon. ... This has greatly affected the quantity and quality of food supply from the in-shore fish population. The life cycle of in-shore fish is also affected by the extreme weather conditions which has seen the decrease in the number and gradual disappearance of some species of fish from the lagoons” (OCOG, 2010:10).

Clearly, further research is needed, especially sampling specimens for collections to confirm identification. Documenting the fish fauna found deeper than 10 meters, surveying more sites, especially on the eastern reefs, and utilizing ichthyocides to sample small and cryptic fishes will give a better indication of the true number of species present in the waters of Nukunonu Atoll.

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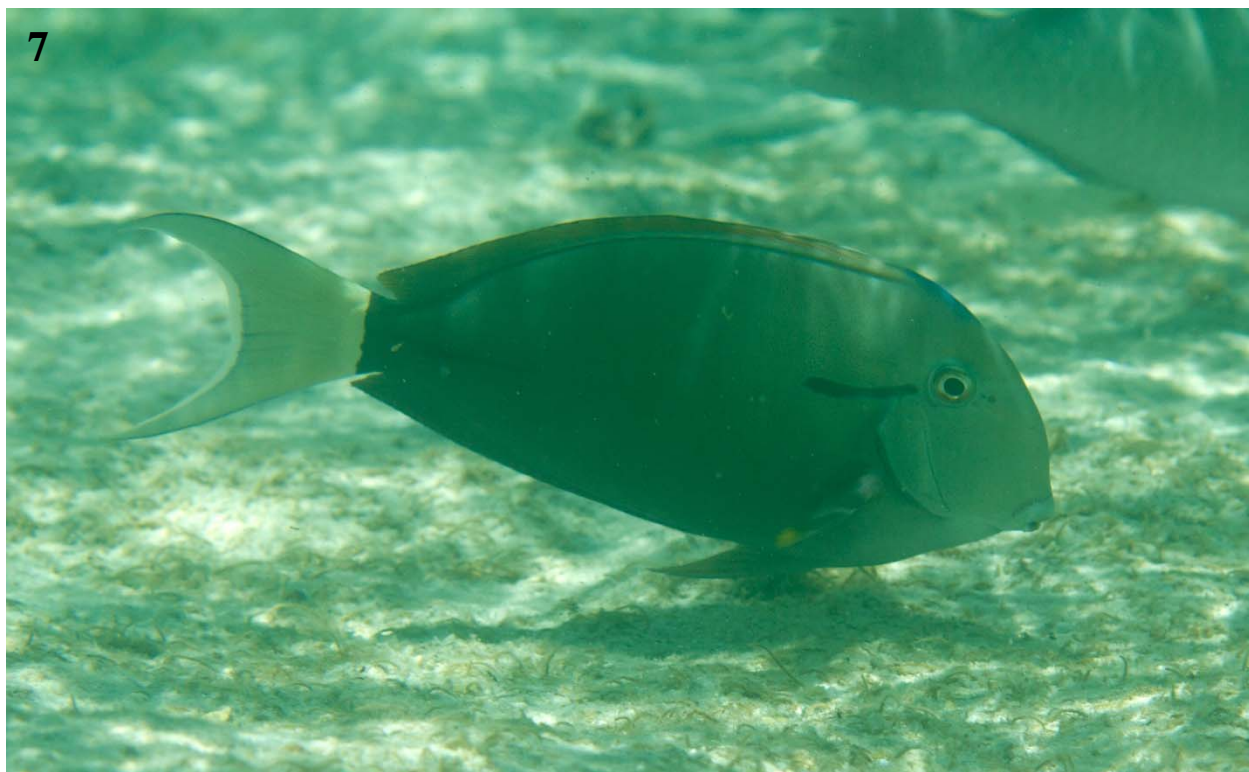
Plates 1 and 2. Hybrid surgeonfish, *Acanthurus achilles* X *nigricans*. Photos copyright of the author.



Plates 3 and 4. A rare color morph of *Aphareus furca*. Photos copyright of the author.



Plates 5 and 6. *Abudedefduf septemfasciatus* with unusual black edging to second dorsal and caudal fins. Photos copyright of the author.



Plates 7 and 8. Unusual tail coloration in *Acanthurus nigricauda*. Photos copyright of the author.

APPENDIX A: THE SITES

Site 1: Lagoon, Motuhaga motu (Figure A1)

After entering the water the author swam southeast 150–200 meters following the beach and reef. Maximum depth here was about five meters. The beach and shoreline were composed of broken coral rubble, but the lagoon bed was sandy away from shore. Some human rubbish (mainly plastic, wood, and metal) in the shallows close to shore. Visibility up to eight meters. Almost no corals seen. Visited twice, on 23 August 2012 and 24 August 2012 for a total of 174 minutes.



Figure A1. Site 1: Lagoon shore of Motuhaga looking southeast. The entry point for the surveys is in the foreground. Common families at this location were Holocentrids, Mullids, Labrids and Acanthurids. Photo copyright of the author.

Site 2: Channel between lagoon (Site 1) and reef flat (Site 3) (Figure A2)

This channel, approximately 300 meters long, separates Vao and Motuhaga islets and is spanned by a concrete bridge. Maximum depth is one meter in a pool at the reef flat end, less than one meter elsewhere. During spring tides and storm surges the channel swells with water from the lagoon and covers a larger area before draining onto the reef flat. This site was frequently visited on foot due to its proximity to the author's accommodation but was rarely snorkelled because of its shallow depth.



Figure A2. Site 2: Channel between Motuhaga (left) and Vao (right), looking towards the ocean. Only seven species were sighted here: *Gymnothorax pictus*; juvenile *Abudefduf septemfasciatus* and *A. sordidus*; *Chrysiptera glauca*; *Halichoeres trimaculatus*; *Acanthurus triostegus*; and a juvenile *Arothron nigropunctatus*. Most of these were seen around the spring tide when the channel and neighboring pools were full. Photo copyright of the author.

Site 3: Reef flat (Figures A3 and A4)

The reef flat on Motuhaga is around 500 meters in length and about 150 meters wide (to the edge of the reef). The reef was walked, and several pools on the reef flat were visited at both high and low tide. At low tide most of the flat is still under water, varying in depth from a few centimeters to ~0.75 meters in the pools. A sandy substrate and lots of corals. Visibility up to seven meters. Visited 23 August 2012, 24 August 2012, 30 August 2012, 4 September 2012, and twice on 5 September 2012 for a total of 531 minutes.



Figure A3. Site 3: Reef flat by Motuhaga at high tide. The Conglomerate Platform is in the immediate foreground. The platform appeared popular with *Gymnothorax pictus*, and in a short walk one afternoon seven were seen, including two juveniles and an adult half out of the water chasing a crab. Photo copyright of the author.



Figure A4. Site 3: Reef flat on Motuhaga at low tide, looking northwards. The island on the right is Vao. Sixty-six species were seen here, plus the hybrid acanthurid. Chaetodontids, Labrids and Acanthurids were the most speciose families. Photo copyright of the author.

Site 4: Wharf and channel (Figure A5)

A manmade channel in the reef flat for the barge to ferry passengers and cargo from the wharf to the cargo ship. GPS coordinates are taken from the wharf. Snorkelled the channel itself and the reef flat either side. The channel acts as a drainage for the reef flat, and water breaking onto the flats runs into the channel and then out to the ocean. As a result, there are very strong outward currents toward the mouth of the channel, particularly within the channel itself. Consequently, that end of the channel was not snorkelled. Substrate was mainly rock with some sand, and corals on the reef flat. Visibility up to seven meters, but variable due to the amount of sand and sediment that is washed into the channel. Probably as a result of all this sediment, this site had the highest density of fishes with large numbers of fistularids, scarids, and acanthurids seen. Maximum depth up to four meters. Visited 23 August 2012 and 27 August 2012 for a total of 101 minutes.



Figure A5. Site 4: The channel in front of the wharf (foreground) at high tide. Photo copyright of the author.

Site 5: Lagoon, Te Fakanava motu (Figure A6)

Swam into lagoon approximately 100 meters from shore. Maximum depth seen was around eight meters. The substrate was sand, but numerous pinnacles reaching from lagoon bottom to less than ~0.5 meters below the surface. Some corals growing close to surface. Visibility around 15–20 meters at surface, 10 meters or less at bottom, and much reduced in shallower waters. Visited once on 25 August 2012 for 185 minutes.



Figure A6. Site 5: Lagoon at Te Fakanava Motu, looking south toward Nukunonu Village (center frame) approximately eight kilometers away. Several large pinnacles occur as close as 30 meters from shore, and are the focal points for most of the 71 species recorded here. The hybrid acanthurid was also seen here. Photo copyright of the author.

Site 6: Lagoon, Vao motu (Figure A7)

Entered the water from a boat launching site on the southeast side of the government building and swam along the reef 50–75 meters into the lagoon, and southeast along the shore for 20 meters. The lagoon bed was sandy, rock around the seawall and shoreline. A reef extends from the shore straight out into the lagoon for several hundred meters. Maximum depth around 5–6 meters in the area surveyed; very few corals on reef. Visited 28 August 2012 for a total of 90 minutes; session finished early after a facial encounter with a stinging jellyfish.



Figure A7. Site 6: Lagoon next to Vao motu, looking north. The structure on the left is a seawall next to the government building, built on a reef that extends out into the lagoon. Forty species were sighted here. Photo copyright of the author.

Site 7: Reef (Figure A8)

From there I swam over the reef approximately 50 meters in each direction. The edge of the reef flat drops around 4.5 meters to the fore-reef, which then slopes down for 50 meters to a depth of about eight meters before ending in a vertical drop-off. The reef crest where the waves break is mostly bare rock with spurs and grooves, but the fore-reef has extensive coral cover, mostly hard corals. Visibility 30+ meters. Visited on 2 September 2012, 3 September 2012, and 6 September 2012, for a total of 143 minutes.



Figure A8. Site 7: The fore-reef next to Motuhaga. A total of 85 species were recorded, including the hybrid acanthurid, and several families were represented at this site only: Aulostomidae, Echeneidae, Kyphosidae, Cirrhitidae, and Sphyraenidae. Photo copyright of the author.

APPENDIX B: CHECKLIST OF THE FISHES OF TOKELAU

The following checklist is compiled from Table 2 of this paper, from 239 lots in the collection of the National Museum of Natural History (NMNH), 76 lots from the Academy of Natural Sciences in Philadelphia (ANS), 9 specimens from the Natural History Museum in London (BNHM), 2 lots from the California Academy of Sciences (CAS), and from selected publications where species have been reliably identified (van Pel, 1959; Tuna Program, 1983; Gillett, 1985; Gillett, 1990; Passfield, 1998). Records from collections identified to genus or family level only may represent multiple lots and more than one species. Records from this paper and other written references that are not identified to species level have been omitted.

A total of 230 species and 53 families are listed, with a further 20 records from collections identified to genus only, and 4 identified to family level only. The families with the most species are Labridae with 25 species, Pomacentridae with 16, Chaetodontidae with 15, Acanthuridae with 15, Carangidae with 11, and the Muraenidae, Serranidae, and Scaridae with 10 each. The most speciose genera are *Chaetodon* with 11 species, *Acanthurus* with 10 species, *Gymnothorax* with 8 species, and *Epinephalus* with 7 species.

Species are listed phylogenetically by family; genus and species are then listed alphabetically. Family classification follows Nelson (2006). Atolls where each species were reported or collected are listed where known. Superscript numbers indicate the reference as follows:

¹ Visual census in this work

² Specimens in the NMNH collection

³ Specimens in the ANS collection

⁴ Specimens in the CAS collection

⁵ Specimens in the BNHM collection

⁶ van Pel (1959)

⁷ Tuna Programme (1983)

⁸ Gillett (1985)

⁹ Gillett (1990)

¹⁰ Passfield (1998)

Carcharhinidae

*Carcharhinus melanopterus*¹ (Quoy and Gaimard, 1824) – Nukunonu

Myliobatidae

*Aetobatus narinari*¹ (Euphrasen, 1790) – Nukunonu

Moringuidae

Moringua sp.³ – Nukunonu, Fakaofu

Chlopsidae

*Kaupichthys brachychirus*³ Schultz in Schultz, Herald, Lachner, Welander and Woods, 1953 – Fakaofu

Muraenidae

*Anarchias allardicei*³ Jordan and Starks in Jordan and Seale, 1906 – Fakaofu

*Echidna nebulosa*¹ (Ahl, 1789) – Nukunonu

Gymnothorax sp.³ – Nukunonu, Fakaofu

*Gymnothorax buroensis*³ (Bleeker, 1857) – Nukunonu, Fakaofu

*Gymnothorax flavimarginatus*³ (Rüppell, 1830) – Atafu, Fakaofu

*Gymnothorax gracilicauda*³ Jenkins, 1903 – Nukunonu

Gymnothorax javanicus^{1,3} (Bleeker, 1859) – Nukunonu, Fakaofu

*Gymnothorax margaritophorus*³ Bleeker, 1865 – Fakaofu
*Gymnothorax meleagris*³ (Shaw in Shaw and Nodder, 1795) – Nukunonu
Gymnothorax pictus^{1,3} (Ahl, 1789) – Atafu, Nukunonu
*Gymnothorax rueppellii*³ (McClelland, 1844) – Fakaofu

Ophichthyidae

*Brachysomophis crocodilinus*³ (Bennett, 1833) – Fakaofu
*Callechelys catostoma*³ (Schneider and Forster in Bloch and Schneider, 1801) – Fakaofu
*Leiuranus semicinctus*³ (Lay and Bennett, 1839) – Atafu, Fakaofu
Muraenichthys sp.³ – Fakaofu

Congridae

*Conger cinereus*³ Rüppell, 1830 – Fakaofu

Engraulidae

*Encrasicholina punctifer*⁸ Fowler, 1938 – Fakaofu

Clupeidae

Spratelloides delicatulus^{7,8} (Bennett, 1832) – Fakaofu

Chanidae

*Chanos chanos*⁶ (Forsskål, 1775) – Atafu, Fakaofu

Synodontidae

*Saurida gracilis*² (Quoy and Gaimard, 1824) – Atafu, Nukunonu, Fakaofu
*Synodus variegatus*² (Lacepède, 1803) – Fakaofu

Bythitidae

Dinematicthys sp.² – Fakaofu

Mugilidae

*Crenimugil crenilabris*¹ (Forsskål, 1775) – Nukunonu
*Liza vaigiensis*⁷ (Quoy and Gaimard, 1825)
Neomyxus leuciscus^{1,3} (Günther, 1872) – Nukunonu
*Valamugil seheli*⁷ (Forsskål, 1775)

Exocoetidae

*Cheilopogon antoncichi*² (Woods and Schultz in Schultz et al., 1953)
*Cheilopogon atrisignis*² (Jenkins, 1903)
*Cheilopogon spilonotopterus*² (Bleeker, 1866)
*Cypselurus angusticeps*² Nichols and Breder, 1935

Hemiramphidae

*Hyporhamphus acutus*² (Günther, 1872) – Atafu, Nukunonu, Fakaofu
*Hyporhamphus affinis*³ (Günther, 1866) – Nukunonu

Belonidae

*Platybelone argalus*² (Lesueur, 1821) – Atafu, Nukunonu, Fakaofu

Holocentridae

*Myripristis amaena*² (Castelnau, 1873) – Fakaofu
Myripristis violacea^{1,2} Bleeker, 1851 – Nukunonu, Fakaofu
Neoniphon opercularis^{1,2} (Valenciennes in Cuvier and Valenciennes, 1831) – Nukunonu
Neoniphon samara^{1,2} (Forsskål, 1775) – Atafu, Nukunonu
*Sargocentron caudimaculatum*¹ (Rüppell, 1838) – Nukunonu
*Sargocentron ittodai*² (Jordan and Fowler, 1902) – Fakaofu
Sargocentron microstoma^{1,2} (Günther, 1859) – Atafu, Nukunonu

Sargocentron punctatissimum^{2,3} (Cuvier in Cuvier and Valenciennes, 1829) – Atafu, Nukunonu
Sargocentron spiniferum^{1,2} (Forsskål, 1775) – Nukunonu

Aulostomidae

*Aulostomus chinensis*¹ (Linnaeus, 1766) – Nukunonu

Fistulariidae

Fistularia commersonii^{1,2} Rüppell, 1838 – Nukunonu, Fakaofu

Scorpaenidae

*Pterois radiata*³ (Cuvier in Cuvier and Valenciennes, 1829) – Nukunonu

*Scorpaenodes scaber*² (Ramsay and Ogilby, 1886) – Atafu, Fakaofu

Scorpaenopsis sp.² – Fakaofu

Serranidae

Cephalopholis argus^{1,2,3} Block and Schneider, 1801 – Atafu, Nukunonu, Fakaofu

Cephalopholis leopardus^{2,3} (Lacepède, 1801) – Atafu, Fakaofu

*Cephalopholis urodeta*¹ (Forster in Bloch and Schneider, 1801) – Nukunonu

Epinephelus sp.³ – Fakaofu

*Epinephelus fuscoguttatus*¹ (Forsskål, 1775) – Nukunonu

Epinephelus hexagonatus^{1,2} (Forster in Bloch and Schneider, 1801) – Nukunonu, Fakaofu

*Epinephelus melanostigma*³ (Schultz in Schultz et al., 1953) – Nukunonu

Epinephelus merra^{1,3} Bloch 1793 – Nukunonu, Fakaofu

Epinephelus polyphkadion^{1,2} (Bleeker 1849) – Nukunonu, Fakaofu

*Epinephelus socialis*³ (Günther, 1873) – Nukunonu

*Epinephelus tauvina*³ (Forsskål, 1775) – Nukunonu

Plesiopidae

Plesiops corallicola^{2,3} Bleeker 1853 – Atafu, Nukunonu

Apogonidae

*Apogon coccineus*² Rüppell, 1838 – Atafu

*Apogonichthys ocellatus*² (Weber, 1913) – Fakaofu

*Cheilodipterus macrodon*² (Lacepède, 1802) – Fakaofu

*Cheilodipterus quinquelineatus*² (Cuvier in Cuvier and Valenciennes, 1828) – Fakaofu

Fowleria sp.² – Atafu, Fakaofu

*Nectamia fusca*² (Quoy and Gaimard, 1825) – Atafu, Fakaofu

*Ostorhinchus novemfasciatus*² (Cuvier in Cuvier and Valenciennes, 1828) – Atafu, Fakaofu

*Ostorhinchus taeniophorus*² (Regan, 1908) – Fakaofu

*Pristiapogon exostigma*² (Jordan and Starks, 1906) – Atafu, Nukunonu, Fakaofu

*Pristiapogon kallopterus*² (Bleeker, 1856) – Nukunonu

Coryphaenidae

*Coryphaena hippurus*⁸ Linnaeus, 1758 – Fakaofu

Echeneidae

*Echeneis naucrates*¹ Linnaeus, 1758 – Nukunonu

Carangidae

*Carangoides ferdau*² (Forsskål, 1775) – Nukunonu

Caranx melampygus^{1,3,5} Cuvier in Cuvier and Valenciennes, 1833 – Atafu, Nukunonu

Caranx sexfasciatus^{1,10} Quoy and Gaimard, 1825 – Nukunonu, Fakaofu

*Decapterus macrosoma*⁸ Bleeker, 1851 – Fakaofu

*Decapterus russelli*⁶ (Rüppell, 1830) – Atafu

Elagatis bipinnulata^{7,8} (Quoy and Gaimard, 1825) – Fakaofo

*Naucrates ductor*⁶ (Linnaeus, 1758) – Atafu

Selar crumenophthalmus^{6,8} (Bloch, 1793) – Atafu, Fakaofo

*Trachinotus baillonii*¹ (Lacepède, 1801) – Nukunonu

*Trachinotus blochii*⁶ (Lacepède, 1801) – Atafu

*Trachinotus botla*⁶ (Shaw, 1803) – Atafu, Fakaofo

Lutjanidae

*Aphareus furca*¹ (Lacepède, 1801) – Nukunonu

*Aprion virescens*¹ Valenciennes in Cuvier and Valenciennes, 1830 – Nukunonu

*Lutjanus bohar*¹ (Forsskål, 1775) – Nukunonu

*Lutjanus ehrenbergii*⁴ (Peters, 1869)

*Lutjanus fulvus*¹ (Forster in Bloch and Schneider, 1801) – Nukunonu

*Lutjanus gibbus*¹ (Forsskål, 1775) – Nukunonu

*Lutjanus monostigma*¹ (Cuvier in Cuvier and Valenciennes, 1828) – Nukunonu

Lethrinidae

*Gnathodentex aureolineatus*¹ (Lacepède, 1802) – Nukunonu

*Lethrinus xanthochilus*¹ Klunzinger 1870 – Nukunonu

*Monotaxis grandoculis*¹ (Forsskål, 1775) – Nukunonu

Mullidae

Mulloidichthys sp.² – Atafu, Fakaofo

Mulloidichthys flavolineatus^{1,2} (Lacepède, 1801) – Atafu, Nukunonu, Fakaofo

Mulloidichthys vanicolensis^{1,4} (Valenciennes in Cuvier and Valenciennes, 1831) – Nukunonu

Parupeneus barberinus^{1,2} (Lacepède, 1801) – Atafu, Nukunonu

*Parupeneus crassilabris*² (Valenciennes in Cuvier and Valenciennes, 1831) – Nukunonu, Fakaofo

Parupeneus cyclostomus^{1,2} (Lacepède, 1801) – Nukunonu, Fakaofo

*Parupeneus insularis*¹ (Randall and Myers, 2002) – Nukunonu

Parupeneus multifasciatus^{1,5} (Quoy and Gaimard, 1825) – Nukunonu

Kyphosidae

*Kyphosus cinerascens*⁸ (Forsskål, 1775) – Fakaofo

*Kyphosus vaigiensis*¹ (Quoy and Gaimard, 1825) – Nukunonu

Chaetodontidae

Chaetodon auriga^{1,2} Forsskål, 1775 – Atafu, Nukunonu, Fakaofo

Chaetodon citrinellus^{1,2} Cuvier in Cuvier and Valenciennes, 1831 – Atafu, Nukunonu

*Chaetodon ephippium*¹ Cuvier in Cuvier and Valenciennes, 1831 – Nukunonu

Chaetodon lunula^{1,3} (Lacepède, 1802) – Nukunonu

Chaetodon lunulatus^{1,2} Quoy and Gaimard, 1825 – Nukunonu, Fakaofo

*Chaetodon ornatissimus*¹ Cuvier in Cuvier and Valenciennes, 1831 – Nukunonu

Chaetodon quadrimaculatus^{1,2} Gray, 1831 – Atafu, Nukunonu

*Chaetodon reticulatus*¹ Cuvier in Cuvier and Valenciennes, 1831 – Nukunonu

Chaetodon semeion^{1,2} Bleeker, 1855 – Atafu, Nukunonu, Fakaofo

Chaetodon ulietensis^{1,2} Cuvier in Cuvier and Valenciennes, 1831 – Atafu, Nukunonu, Fakaofo

*Chaetodon vagabundus*¹ Linnaeus, 1758 – Nukunonu

*Forcipiger flavissimus*¹ Jordan and McGregor in Jordan and Evermann, 1898 – Nukunonu

*Forcipiger longirostris*¹ (Broussonet, 1782) – Nukunonu

*Heniochus chrysostomus*¹ Cuvier in Cuvier and Valenciennes, 1831 – Nukunonu

*Heniochus monoceros*¹ Cuvier in Cuvier and Valenciennes, 1831 – Nukunonu

Pomacanthidae

Centropyge flavissima^{1,10} (Cuvier in Cuvier and Valenciennes, 1831) – Nukunonu, Fakafo

*Pygoplites diacanthus*¹ (Boddaert, 1772) – Nukunonu

Kuhliidae

*Kuhlia mugil*¹ (Forster in Bloch and Schneider, 1801) – Nukunonu

Cirrhitidae

*Neocirrhites armatus*¹ Castelnau, 1873 – Nukunonu

Paracirrhites arcatus^{1,2} (Cuvier in Cuvier and Valenciennes, 1829) – Nukunonu

Paracirrhites hemistictus^{1,2} (Günther, 1874) – Nukunonu

Pomacentridae

Pomacentridae² – Atafu, Nukunonu

Abudefduf septemfasciatus^{1,2,3} (Cuvier in C and V, 1830) – Atafu, Nukunonu, Fakafo

Abudefduf sordidus^{1,2} (Forsskal, 1775) – Atafu, Nukunonu, Fakafo

Chromis sp.² – Nukunonu

*Chromis acare*¹ Randall and Swerdloff, 1973 – Nukunonu

*Chromis margaritifer*¹ Fowler, 1946 – Nukunonu

*Chromis viridis*² (Cuvier in Cuvier and Valenciennes, 1830) – Atafu, Nukunonu, Fakafo

*Chromis xanthura*¹ (Bleeker, 1854) – Nukunonu

Chrysiptera sp.² – Nukunonu

Chrysiptera glauca^{1,2,3} (Cuvier in Cuvier and Valenciennes, 1830) – Atafu, Nukunonu, Fakafo

Dascyllus aruanus^{1,2} (Linnaeus, 1758) – Atafu, Nukunonu, Fakafo

*Lepidozygus tapeinosoma*⁹ (Bleeker, 1856) – Fakafo

*Plectroglyphidodon dickii*¹ (Liénard, 1839) – Nukunonu

*Plectroglyphidodon imparipennis*² (Vaillant and Sauvage, 1875) – Atafu

Pomacentrus coelestis^{2,5} Jordan and Starks, 1901 – Fakafo

Pomacentrus pavo^{1,2} (Bloch, 1787) – Atafu, Nukunonu, Fakafo

Pomacentrus vaiuli^{1,2} Jordan and Seale, 1906 – Atafu, Nukunonu, Fakafo

Stegastes sp.² – Fakafo

Stegastes albifasciatus^{1,2,3} (Schlegel and Müller, 1839) – Nukunonu, Fakafo

Stegastes nigricans^{1,3} (Lacepède, 1802) – Nukunonu

Labridae

*Anampses caeruleopunctatus*¹ Rüppell, 1829 – Nukunonu

Cheilinus fasciatus^{1,2,3} (Bloch, 1791) – Nukunonu, Fakafo

Cheilinus trilobatus^{1,2} Lacepède, 1801 – Atafu, Nukunonu

*Cheilinus undulatus*¹ Rüppell, 1835 – Nukunonu

*Coris aygula*¹ Lacepède, 1801 – Nukunonu

*Coris gaimard*¹ (Quoy and Gaimard, 1824) – Nukunonu

Epibulus insidiator^{1,2,3} (Pallas, 1770) – Atafu, Nukunonu, Fakafo

Gomphosus varius^{1,2,3} Lacepède, 1801 – Nukunonu, Fakafo

Halichoeres sp.² – Fakafo

Halichoeres hortulanus^{1,2} (Lacepède, 1801) – Nukunonu

Halichoeres margaritaceus^{1,2} (Valenciennes in C and V, 1839) – Atafu, Nukunonu, Fakafo

Halichoeres trimaculatus^{1,2,3} (Quoy and Gaimard, 1834) – Atafu, Nukunonu, Fakafo

*Hemigymnus fasciatus*¹ (Bloch, 1792) – Nukunonu

Labroides bicolor^{1,2} Fowler and Bean, 1928 – Nukunonu
Labroides dimidiatus^{1,2} (Valenciennes in Cuvier and Valenciennes, 1839) – Nukunonu, Fakaofu
*Labroides rubrolabiatus*¹ Randall, 1958 – Nukunonu
*Novaculichthys taeniourus*² (Lacepède, 1801) – Atafu
*Oxycheilinus digramma*³ (Lacepède, 1801) – Fakaofu
*Oxycheilinus unifasciatus*¹ (Streets, 1877) – Nukunonu
*Pseudocheilinus hexataenia*² (Bleeker, 1857) – Fakaofu
*Pseudocheilinus tetrataenia*³ – Fakaofu
Stethojulis bandanensis^{1,2} (Bleeker, 1851) – Atafu, Nukunonu, Fakaofu
*Thalassoma amblycephalum*¹ (Bleeker, 1856) – Nukunonu
Thalassoma hardwicke^{1,2} (Bennett, 1830) – Atafu, Nukunonu, Fakaofu
Thalassoma purpureum^{1,2,4} (Forsskal, 1775) – Atafu, Nukunonu, Fakaofu
Thalassoma quinquevittatum^{1,2} (Lay and Bennett, 1839) – Atafu, Nukunonu, Fakaofu

Scaridae

Scaridae² – Fakaofu
*Cetoscarus ocellatus*¹ (Valenciennes in Cuvier and Valenciennes, 1840) – Nukunonu
*Chlorurus frontalis*¹ (Valenciennes in Cuvier and Valenciennes, 1839) – Nukunonu
*Chlorurus microrhinos*¹ (Bleeker, 1854) – Nukunonu
Chlorurus spilurus^{1,4} (Valenciennes in Cuvier and Valenciennes, 1840) – Nukunonu
*Hipposcarus longiceps*¹ (Valenciennes in Cuvier and Valenciennes, 1839) – Nukunonu
*Scarus altipinnis*¹ (Steindachner, 1879) – Nukunonu
*Scarus frenatus*¹ Lacepède, 1802 – Nukunonu
*Scarus psittacus*¹ Forsskal, 1775 – Nukunonu
*Scarus rubroviolaceus*¹ Bleeker, 1847 – Nukunonu
*Scarus schlegelii*¹ (Bleeker, 1861) – Nukunonu

Pinguipedidae

Parapercis millepunctata^{1,2} (Günther, 1860) – Atafu, Nukunonu

Blenniidae

Blenniella paula^{1,2} (Bryan and Herre, 1903) – Atafu, Nukunonu, Fakaofu
*Cirripectes variolosus*² (Valenciennes in Cuvier and Valenciennes, 1836) – Nukunonu
*Entomacrodus striatus*² (Valenciennes in Cuvier and Valenciennes, 1836) – Fakaofu
Istiblennius edentulus^{2,3} (Forster and Schneider in Bloch and Schneider, 1801) – Atafu, Nukunonu, Fakaofu
*Istiblennius lineatus*² (Valenciennes in Cuvier and Valenciennes, 1836) – Atafu, Fakaofu
*Plagiotremus tapeinosoma*² (Bleeker, 1857) – Nukunonu
Rhabdoblennius sp.² – Fakaofu

Eleotridae

Eleotridae² – Atafu, Fakaofu

Gobiidae

Gobiidae² – Atafu
Amblygobius sp.² – Fakaofu
*Amblygobius phalaena*² (Valenciennes in Cuvier and Valenciennes, 1837) – Atafu
Asterropteryx sp.² – Fakaofu
*Asterropteryx semipunctata*² Rüppell, 1830 – Atafu
*Ctenogobius feroculus*¹ Lubbock and Polunin, 1977 – Nukunonu

Gobiodon sp.² – Fakaofu
Paragobiodon sp.² – Fakaofu
Valenciennea sp.² – Fakaofu
*Valenciennea sexguttata*¹ (Valenciennes in Cuvier and Valenciennes, 1837) – Nukunonu
*Valenciennea strigata*² (Broussonet, 1782) – Atafu, Fakaofu

Ptereleotridae

*Ptereleotris evides*¹ (Jordan and Hubbs, 1925) – Nukunonu

Zanclidae

Zanclus cornutus^{1,2,6} (Linnaeus, 1758) – Atafu, Nukunonu, Fakaofu

Acanthuridae

Acanthurus sp.² – Fakaofu
Acanthurus achilles^{1,4} Shaw, 1803 – Nukunonu
*Acanthurus guttatus*¹ Forster in Bloch and Schneider, 1801 – Nukunonu
*Acanthurus lineatus*¹ (Linnaeus, 1758) – Nukunonu
Acanthurus nigricans^{1,4} (Linnaeus, 1758) – Nukunonu
*Acanthurus nigricauda*¹ Dunker and Mohr, 1929 – Nukunonu
Acanthurus nigros^{1,2,4} Günther, 1861 – Atafu, Nukunonu
*Acanthurus olivaceus*¹ Forster in Bloch and Schneider, 1801 – Nukunonu
*Acanthurus pyroferus*¹ Kittlitz, 1834 – Nukunonu
Acanthurus triostegus^{1,2,3} (Linnaeus, 1758) – Atafu, Nukunonu, Fakaofu
*Acanthurus xanthopterus*¹ Valenciennes in Cuvier and Valenciennes, 1835 – Nukunonu
Ctenochaetus striatus^{1,2,3} (Quoy and Gaimard, 1825) – Nukunonu, Fakaofu
Naso lituratus^{1,3} (Forster in Bloch and Schneider, 1801) – Nukunonu
Naso unicornis^{1,2} (Forsskal, 1775) – Nukunonu, Fakaofu
*Zebrasoma scopas*¹ (Cuvier, 1829) – Nukunonu
*Zebrasoma veliferum*¹ (Bloch, 1795) – Nukunonu

Sphyraenidae

*Sphyraena barracuda*⁸ (Edwards in Catesby, 1771) – Fakaofu

Gempylidae

*Ruvettus pretiosus*⁶ Cocco, 1833 – Fakaofu

Scomberidae

Acanthocybium solandri^{6,8} (Cuvier in Cuvier and Valenciennes, 1832) – Atafu, Fakaofu
Euthynnus affinis^{6,8} (Cantor, 1849) – Atafu, Fakaofu
*Grammatorcynus bilineatus*⁸ (Rüppell, 1836) – Fakaofu
*Gymnosarda unicolor*⁸ (Rüppell, 1836) – Fakaofu
Katsuwanis pelamis^{6,7,8} (Linnaeus, 1758) – Atafu, Fakaofu
*Thunnus alalunga*⁸ (Bonnaterre, 1788) – Fakaofu
Thunnus albacares^{2,6,7,8} (Bonnaterre, 1788) – Atafu, Fakaofu
*Thunnus obesus*⁸ (Lowe, 1839) – Fakaofu

Istiophoridae

*Istiophorus platypterus*⁸ (Shaw and Nodder, 1792) – Fakaofu
*Makaira nigricans*⁸ Lacepède, 1802 – Fakaofu

Bothidae

Bothus mancus^{1,2} (Broussonet, 1782) – Atafu, Nukunonu, Fakaofu
*Bothus pantherinus*² (Rüppell, 1830) – Fakaofu

Balistidae

- Balistapus undulatus*^{1,2} (Park, 1797) – Atafu, Nukunonu, Fakaofu
*Balistoides viridescens*¹ (Bloch and Schneider, 1801) – Nukunonu
*Melichthys niger*¹ (Bloch, 1786) – Nukunonu
*Melichthys vidua*¹ (Solander and Richardson, 1845) – Nukunonu
*Pseudobalistes flavimarginatus*¹ (Rüppell, 1829) – Nukunonu
Rhinecanthus sp.² – Atafu
Rhinecanthus aculeatus^{1,2} (Linnaeus, 1758) – Atafu, Nukunonu, Fakaofu
Rhinecanthus rectangulus^{1,4} (Bloch and Schneider, 1801) – Nukunonu
*Sufflamen bursa*¹ (Bloch and Schneider, 1801) – Nukunonu

Monocanthidae

- Aluterus scriptus*^{1,6} (Osbeck, 1765) – Atafu, Nukunonu
*Cantherhines dumerilii*¹ (Hollard, 1854) – Nukunonu

Tetraodontidae

- Arothron hispidus*¹ (Linnaeus, 1758) – Nukunonu
Arothron meleagris^{1,2} (Lacepède, 1798) – Atafu, Nukunonu
*Arothron nigropunctatus*¹ (Bloch and Schneider, 1801) – Nukunonu
*Canthigaster amboinensis*¹ (Bleeker, 1865) – Nukunonu
*Canthigaster janthinoptera*² (Bleeker, 1855) – Nukunonu
*Canthigaster solandri*¹ (Richardson, 1845) – Nukunonu

Diodontidae

- Diodon hystrix*¹ Linnaeus, 1758 – Nukunonu

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