



## The updated checklist of marine fishes in the waters of South Penghu Marine National Park, Taiwan

HAN-YANG LIN<sup>1#</sup>, HSIEN-EN LI<sup>2#</sup> & I-SHIUNG CHEN<sup>2,3\*</sup>

<sup>1</sup>Marine Fisheries Division, Fisheries Research Institute, Ministry of Agriculture, Keelung, 202008, Taiwan, R.O.C.

[bb54jay@gmail.com](mailto:bb54jay@gmail.com); <https://orcid.org/0000-0002-5828-1883>

<sup>2</sup>Institute of Marine Biology, National Taiwan Ocean University, Keelung, 202301, Taiwan, R.O.C.

[seanlee22@hotmail.com](mailto:seanlee22@hotmail.com); <https://orcid.org/0000-0002-5964-3292>

<sup>3</sup>Center of Excellence for the Oceans, National Taiwan Ocean University, Keelung, 202301, Taiwan, R.O.C.

<sup>#</sup>Both authors have equal contribution to this paper

\*Corresponding author: [iscfish@gmail.com](mailto:iscfish@gmail.com); <https://orcid.org/0000-0002-4190-7720>

### Abstract

This study presents a comprehensive survey of marine fish diversity within the South Penghu Marine National Park, Taiwan, conducted from 2017 to 2021. Utilizing visual stripe-transect methods, synthesis of existing literature, and rigorous taxonomic validation, we documented 572 marine fish species from 74 families, including one new and one newly recorded gobiid species, significantly exceeding previous regional surveys. Labridae, Pomacentridae, Gobiidae, and Epinephelidae dominated species richness. Spatial heterogeneity was evident, with Dongjiyu exhibiting the highest diversity (425 species). A substantial proportion of species (31.8%) were site-specific, highlighting habitat variability and the importance of maintaining connectivity. The increased species richness likely reflects the park's establishment in 2014, enhancing ecosystem recovery and protection. The park's role as a buffer against environmental disturbances, such as cold-water events, emphasizes its importance in safeguarding biodiversity. This study provides an updated baseline for ichthyological resources, informing conservation and management strategies for this valuable marine ecosystem.

**Key words:** Checklist, Species Richness, Marine Fish, South Penghu Marine National Park, Taiwan

### Introduction

Penghu County is an archipelago situated in the southwestern sea of Taiwan. The South Penghu Marine National Park located in the southern area of Penghu County, was officially established on 8 June 2014, encompassing Dongyupingyu, Xiyupingyu, Dongjiyu, Xijiyu islands, and other small islets, collectively known as the South Penghu Four Islands. Geographically, the park is situated between longitudes 119°27'51" to 119°43'04" E and latitudes 23°12'05" to 23°19'28" N (i.e. ~ 30 km from the Penghu main island), covering a land area of 370.29 hectares and a marine area of 35,473.33 hectares, totalling 35,843.62 hectares (Marine National Park Headquarters, 2014). This pristine region, largely free from excessive development, retains its natural ecological, geological, and cultural resources. The surrounding waters, characterized by nearly 50% coral reef coverage, are particularly valuable (Chen *et al.*, 2019; Marine National Park Headquarters, 2014). Additionally, the interaction between the seabed topography and the Kuroshio Branch Current in these waters induces upwelling phenomena, resulting in abundant fish resources (Tang *et al.*, 2002; Hsieh *et al.*, 2011). This region serves as a convergence point for northern and southern fish assemblages in Taiwan, hosting a variety of habitats for reef-associated, benthic, demersal, and pelagic fish (Chen *et al.*, 2021; Chen *et al.*, 2023).

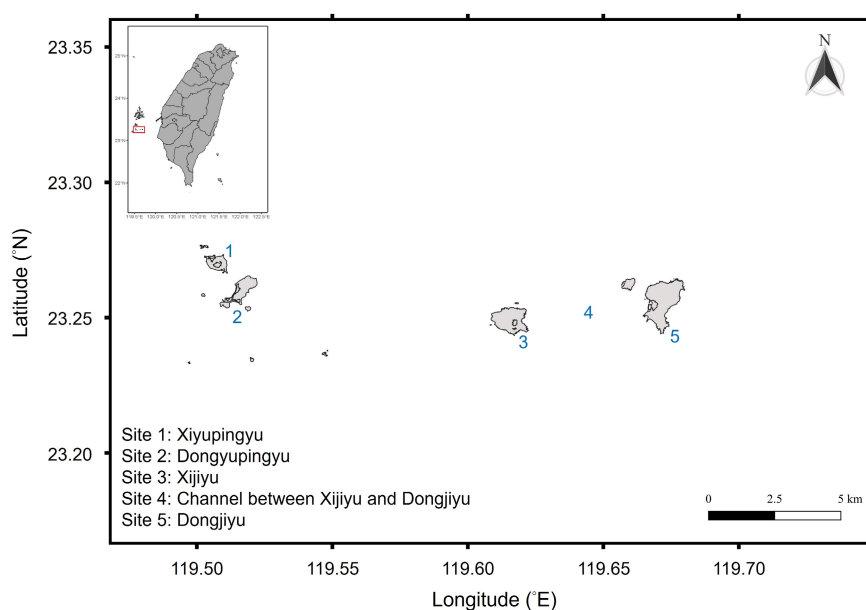
Numerous ecological surveys have been conducted in this sea area, providing preliminary insights into the distribution of marine fishes within the area (Jeng *et al.*, 2009; Tsai *et al.*, 2011; Chang *et al.*, 2013; Chu, 2015; Chen, 2021). Jeng *et al.* (2009) identified 203 species of marine fish from 34 families; Tsai *et al.* (2011) recorded 200 species from 38 families; Chang *et al.* (2013) reported 213 species from 36 families; Chu (2015) documented 302 species from 44 families; and Chen (2021) presented 310 species from 54 families. The increasing number of identified families and species over time indicates an accumulating understanding of the region's ichthyofauna.

The establishment of the South Penghu Marine National Park is anticipated to bring several positive outcomes. These include substantial increases in economically valuable species within the protected area, the recovery of the overall marine ecosystem due to reduced human activities, enhanced protection for native fish species, and improved environmental benefits beyond the protected zone. Additionally, the park aims to better safeguard migratory paths and spawning grounds for commercially important fish species and enhance the effectiveness of fishery resources and management strategies. Therefore, in this study, we report fish species investigated after the foundation of the South Penghu Marine National Park, and increased species richness is expected.

To understand fish resources and fisheries utilization, and to support future planning for fish resource management and marine protected area, this study aims to figure out the latest status of marine fish in this area. Notably, many cryptic species within coral reef areas remain unexplored, necessitating comprehensive investigations. Additionally, in February 2008, a sudden drop in water temperature in Penghu waters resulted in the death of over a hundred fish species, causing around 50%–80% decrease in the fishery (Lee *et al.*, 2013), and it took up to 53 months to recover (Chen *et al.*, 2020). In contrast, the South Penghu Marine National Park waters serve as a buffer against such cold damage, emphasizing its critical role in protecting marine biodiversity. Therefore, this study, conducted between 2017 and 2021, serves as an updated investigation upon the ichthyological resources in the marine waters of the South Penghu Marine National Park, to inform subsequent conservation and management strategies for the marine environment and biological resources.

## Materials and Methods

This study was conducted by the visual stripe-transect method (McCormick & Choat, 1987) in the South Penghu Marine National Park, Taiwan. Studying sites followed previous ecological surveys (Tsai *et al.*, 2011; Chang *et al.*, 2013; Chu *et al.*, 2015). Standardized transects, 50 meters in length, were randomly deployed, and data were collected within a 10-meter swath (5 meters on either side of the transect line). Four SCUBA divers, in collaboration with local dive operators and proficient dive guides, conducted each survey. Underwater documentation was achieved through digital photography, videography, and waterproof field notes. The duration of each survey varied depending on the site depth, generally around 45–50 minutes while all recordings were standardized to 20 minutes for analysis. Other two sampling methods were also conducted to fully capture the fish composition in this area. Cryptic benthic fauna was sampled using handnets. Fish larvae were collected via 20-minute horizontal tows (1-meter depth) using zooplankton nets (330  $\mu\text{m}$  mesh, 0.7 m radius). Larval specimens were immediately preserved in 95% ethanol for subsequent morphological and mitogenomic analyses. To maximize spatial coverage of the five designated sites, at least 24 transects were completed during each seasonal survey (mostly summer and autumn) annually from 2017 to 2021.

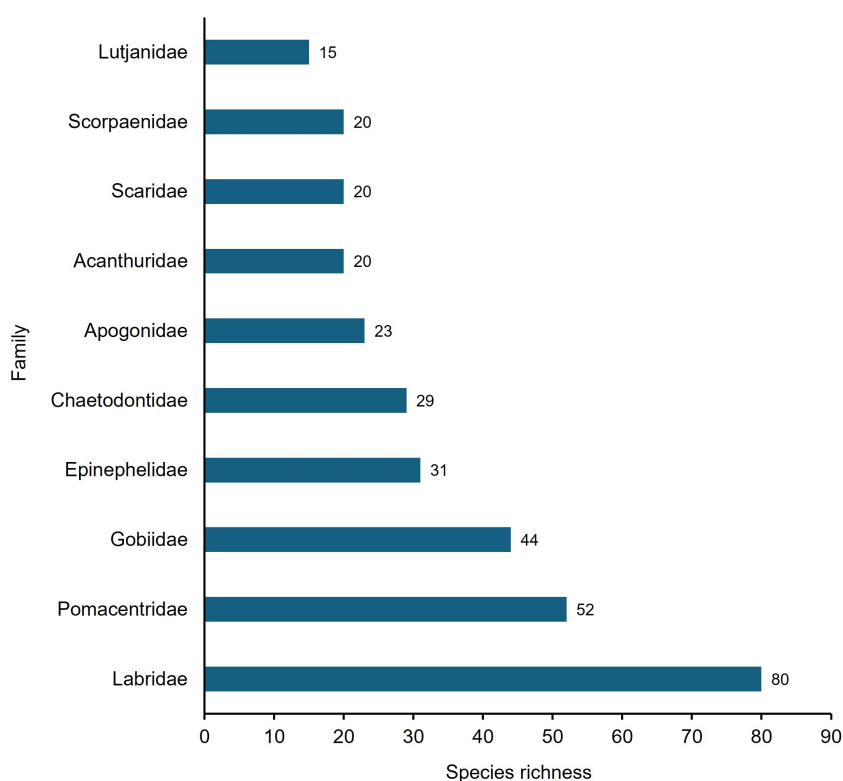


**FIGURE 1.** Survey area of South Penghu Marine National Park, Taiwan.

Taxonomic validity of all recorded species and families was rigorously assessed using WoRMS Taxon Match Tool (Ahyong *et al.*, 2025) and Eschmeyer's Catalogue of Fishes (Fricke *et al.*, 2024). Species and families are presented in alphabetical order. Spatial distribution data are presented by site, they are Site 1: Xiyupingyu; Site 2: Dongyupingyu; Site 3: Xijiyu; Site 4: Channel between Xijiyu and Dongjiyu; and Site 5: Dongjiyu (Table 1, Figure 1).

## Results

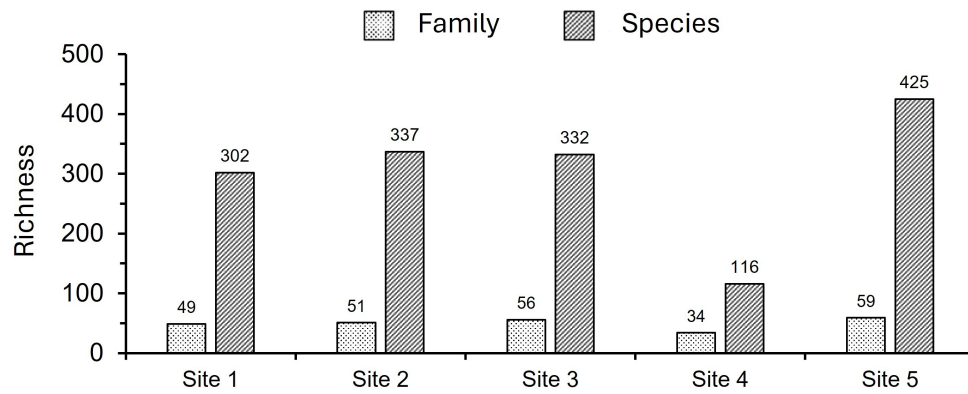
A synthesis of existing literature and the present survey documented a total of 572 marine fish species, distributed across 74 families, within the South Penghu Marine National Park (Table 1). Species richness was dominated by Labridae (80 species, 14.0%), followed by Pomacentridae (52 species, 9.1%), Gobiidae (44 species, 7.7%), and Epinephelidae (31 species, 5.4%). Other than these four families, the top ten families also included Chaetodontidae, Apogonidae, Acanthuridae, Scaridae, Scorpaenidae, and Lutjanidae. The top ten families accounted for 58.4% of total species richness (Table 1, Figure 2). Fourteen families exhibited moderate species richness, ranging from 10 to 29 species. Thirty families were represented by 2 to 9 species, while 26 families only observed 1 species (Table 1).



**FIGURE 2.** Species richness of top 10 families in the South Penghu Marine National Park, Taiwan.

Spatial heterogeneity in species richness was evident across the five survey sites. Dongjiyu (Site 5) exhibited the highest species diversity, with 425 species from 59 families. In addition, a new species of goby, *Priolepis formosa*, was discovered in Dongjiyu water (Chen *et al.*, 2024). Dongyupingyu (Site 2) ranked second, recording 337 species from 51 families, including a newly recorded gobiid species, *Eviota rubriguttata* (Shen *et al.*, 2024). Xijiyu documented 332 species from 56 families. Xiyupingyu recorded 302 species from 49 families. The lowest species richness (116 species) and family representation (34 families) were observed in the Channel between Xijiyu and Dongjiyu (Figure 3).

Species distribution patterns indicated substantial site-specificity. A significant proportion of species (182 species, 31.8%) and families (61 families) were recorded at only one site. 107 species (18.7%) from 39 families were observed at two sites. Ninety species (30 families) were found at three sites, 119 species (32 families) at four sites, and 74 species (25 families) were ubiquitous, occurring at all five sites (Table 1).



**FIGURE 3.** Richness of families and species among five survey sites in the South Penghu Marine National Park, Taiwan. Site 1: Xiyupingyu; Site 2: Dongyupingyu; Site 3: Xijiyu; Site 4: Channel between Xijiyu and Dongjiyu; and Site 5: Dongjiyu.

**TABLE 1.** The checklist of marine fishes in the South Penghu Marine National Park, Taiwan. Site 1: Xiyupingyu; Site 2: Dongyupingyu; Site 3: Xijiyu; Site 4: Channel between Xijiyu and Dongjiyu; and Site 5: Dongjiyu.

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Acanthuridae	<i>Acanthurus dussumieri</i>	Valenciennes, 1835	✓	✓	✓	✓	✓
Acanthuridae	<i>Acanthurus japonicus</i>	(Schmidt, 1931)	✓	✓	✓	✓	✓
Acanthuridae	<i>Acanthurus leucopareius</i>	(Jenkins, 1903)	✓				✓
Acanthuridae	<i>Acanthurus lineatus</i>	(Linnaeus, 1758)	✓	✓	✓		✓
Acanthuridae	<i>Acanthurus maculiceps</i>	(Ahl, 1923)	✓		✓		✓
Acanthuridae	<i>Acanthurus mata</i>	(Cuvier, 1829)		✓	✓		✓
Acanthuridae	<i>Acanthurus nigrofuscus</i>	(Forsskål, 1775)	✓	✓	✓	✓	✓
Acanthuridae	<i>Acanthurus olivaceus</i>	Bloch & Schneider, 1801	✓		✓		✓
Acanthuridae	<i>Acanthurus pyroferus</i>	Kittlitz, 1834		✓			✓
Acanthuridae	<i>Acanthurus thompsoni</i>	(Fowler, 1923)	✓		✓		
Acanthuridae	<i>Acanthurus triostegus</i>	(Linnaeus, 1758)	✓	✓			✓
Acanthuridae	<i>Acanthurus xanthopterus</i>	Valenciennes, 1835	✓	✓	✓		✓
Acanthuridae	<i>Ctenochaetus binotatus</i>	Randall, 1955	✓	✓	✓		✓
Acanthuridae	<i>Ctenochaetus striatus</i>	(Quoy & Gaimard, 1825)	✓	✓	✓	✓	✓
Acanthuridae	<i>Naso annulatus</i>	(Quoy & Gaimard, 1825)			✓		
Acanthuridae	<i>Naso brevirostris</i>	(Cuvier, 1829)			✓		
Acanthuridae	<i>Naso lituratus</i>	(Forster, 1801)		✓			
Acanthuridae	<i>Prionurus scalprum</i>	Valenciennes, 1835	✓	✓	✓	✓	✓
Acanthuridae	<i>Zebrasoma scopas</i>	(Cuvier, 1829)	✓	✓	✓		✓
Acanthuridae	<i>Zebrasoma velifer</i>	(Bloch, 1795)		✓			✓
Aetobatidae	<i>Aetobatus narinari</i>	(Euphrasen, 1790)					✓
Antennariidae	<i>Abantennarius coccineus</i>	(Lesson, 1831)					✓
Antennariidae	<i>Antennarius commerson</i>	(Lacepède, 1798)			✓		
Anthiidae	<i>Nemanthias bicolor</i>	(Randall, 1979)			✓		✓
Anthiidae	<i>Pseudanthias squamipinnis</i>	(Peters, 1855)	✓	✓	✓	✓	✓
Anthiidae	<i>Pseudanthias thompsoni</i>	(Fowler, 1923)	✓	✓	✓		✓
Apogonidae	<i>Apogon coccineus</i>	Rüppell, 1838	✓	✓	✓	✓	
Apogonidae	<i>Apogon crassiceps</i>	Garman, 1903	✓	✓	✓	✓	✓

.....continued on the next page

**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Apogonidae	<i>Apogon doryssa</i>	(Jordan & Seale, 1906)			✓		✓
Apogonidae	<i>Apogon erythrinus</i>	Snyder, 1904			✓		
Apogonidae	<i>Apogonichthyoides melas</i>	(Bleeker, 1848)		✓			
Apogonidae	<i>Apogonichthyoides nigripinnis</i>	(Cuvier, 1828)		✓			
Apogonidae	<i>Apogonichthys perdix</i>	Bleeker, 1854					✓
Apogonidae	<i>Cheilodipterus macrodon</i>	(Lacepède, 1802)	✓	✓	✓		✓
Apogonidae	<i>Cheilodipterus quinquelineatus</i>	Cuvier, 1828		✓	✓		✓
Apogonidae	<i>Fibramia lateralis</i>	(Valenciennes, 1832)					✓
Apogonidae	<i>Gymnapogon urospilotus</i>	Lachner, 1953					✓
Apogonidae	<i>Ostorhinchus angustatus</i>	(Smith & Radcliffe, 1911)	✓				
Apogonidae	<i>Ostorhinchus doederleini</i>	(Jordan & Snyder, 1901)	✓	✓	✓		✓
Apogonidae	<i>Ostorhinchus endekataenia</i>	(Bleeker, 1852)	✓				
Apogonidae	<i>Ostorhinchus holotaenia</i>	(Regan, 1905)	✓	✓	✓		
Apogonidae	<i>Ostorhinchus nigrofasciatus</i>	(Lachner, 1953)	✓				✓
Apogonidae	<i>Ostorhinchus novemfasciatus</i>	(Cuvier, 1828)	✓	✓			✓
Apogonidae	<i>Ostorhinchus properuptus</i>	(Whitley, 1964)		✓	✓		
Apogonidae	<i>Ostorhinchus semilineatus</i>	(Temminck & Schlegel, 1843)	✓				
Apogonidae	<i>Ostorhinchus taeniophorus</i>	(Regan, 1908)		✓			✓
Apogonidae	<i>Pristiapogon exostigma</i>	(Jordan & Starks, 1906)					✓
Apogonidae	<i>Pseudamiops gracilicauda</i>	(Lachner, 1953)			✓		
Apogonidae	<i>Siphamia majimai</i>	Matsubara & Iwai, 1958	✓				
Aulostomidae	<i>Aulostomus chinensis</i>	(Linnaeus, 1766)	✓	✓	✓		✓
Balistidae	<i>Balistapus undulatus</i>	(Park, 1797)	✓	✓	✓		✓
Balistidae	<i>Balistoides conspicillum</i>	(Bloch & Schneider, 1801)		✓			✓
Balistidae	<i>Melichthys vidua</i>	(Richardson, 1845)	✓	✓			✓
Balistidae	<i>Sufflamen bursa</i>	(Bloch & Schneider, 1801)	✓				
Balistidae	<i>Sufflamen chrysopterum</i>	(Bloch & Schneider, 1801)	✓	✓	✓	✓	✓
Belonidae	<i>Strongylura leiura</i>	(Bleeker, 1850)		✓	✓		✓
Blenniidae	<i>Aspidontus taeniatus</i>	Quoy & Gaimard, 1834	✓				✓
Blenniidae	<i>Cirripectes variolosus</i>	(Valenciennes, 1836)	✓	✓			
Blenniidae	<i>Ecsenius bicolor</i>	(Day, 1888)	✓	✓	✓		✓
Blenniidae	<i>Ecsenius lineatus</i>	Klausewitz, 1962	✓	✓			
Blenniidae	<i>Ecsenius namiyei</i>	(Jordan & Evermann, 1902)	✓	✓	✓		✓
Blenniidae	<i>Entomacrodus niuafoouensis</i>	(Fowler, 1932)					✓
Blenniidae	<i>Exallias brevis</i>	(Kner, 1868)			✓		
Blenniidae	<i>Istiblennius dussumieri</i>	(Valenciennes, 1836)		✓			✓
Blenniidae	<i>Meiacanthus grammistes</i>	(Valenciennes, 1836)	✓	✓		✓	✓
Blenniidae	<i>Plagiotremus rhinorhynchus</i>	(Bleeker, 1852)	✓	✓	✓		✓
Blenniidae	<i>Plagiotremus tapeinosoma</i>	(Bleeker, 1857)	✓		✓		
Bregmacerotidae	<i>Bregmaceros</i> sp.						✓
Caesionidae	<i>Caesio caerulea</i>	Lacepède, 1801					✓

.....continued on the next page

**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Caesionidae	<i>Caesio cuning</i>	(Bloch, 1791)			✓		
Caesionidae	<i>Caesio lunaris</i>	Cuvier, 1830					✓
Caesionidae	<i>Caesio teres</i>	Seale, 1906				✓	✓
Caesionidae	<i>Pterocaesio digramma</i>	(Bleeker, 1864)	✓	✓	✓	✓	✓
Caesionidae	<i>Pterocaesio tile</i>	(Cuvier, 1830)	✓			✓	✓
Carangidae	<i>Caranx ignobilis</i>	(Forsskål, 1775)			✓	✓	✓
Carangidae	<i>Caranx sexfasciatus</i>	Quoy & Gaimard, 1825			✓		✓
Carangidae	<i>Elagatis bipinnulata</i>	(Quoy & Gaimard, 1825)	✓	✓			✓
Carangidae	<i>Ferdauia orthogrammus</i>	(Jordan & Gilbert, 1882)		✓			✓
Carangidae	<i>Megalaspis cordyla</i>	(Linnaeus, 1758)			✓		
Carangidae	<i>Seriola dumerili</i>	(Risso, 1810)			✓	✓	✓
Chaetodontidae	<i>Chaetodon argentatus</i>	Smith & Radcliffe, 1911	✓	✓			✓
Chaetodontidae	<i>Chaetodon auriga</i>	Forsskål, 1775	✓	✓	✓	✓	✓
Chaetodontidae	<i>Chaetodon auripes</i>	Jordan & Snyder, 1901	✓	✓	✓	✓	✓
Chaetodontidae	<i>Chaetodon baronessa</i>	Cuvier, 1829	✓	✓	✓		✓
Chaetodontidae	<i>Chaetodon bennetti</i>	Cuvier, 1831	✓	✓	✓		✓
Chaetodontidae	<i>Chaetodon citrinellus</i>	Cuvier, 1831	✓		✓		✓
Chaetodontidae	<i>Chaetodon ephippium</i>	Cuvier, 1831			✓		✓
Chaetodontidae	<i>Chaetodon kleinii</i>	Bloch, 1790	✓	✓	✓	✓	✓
Chaetodontidae	<i>Chaetodon lineolatus</i>	Cuvier, 1831	✓	✓	✓	✓	✓
Chaetodontidae	<i>Chaetodon lunula</i>	(Lacepède, 1802)	✓	✓	✓	✓	✓
Chaetodontidae	<i>Chaetodon lunulatus</i>	Quoy & Gaimard, 1825	✓	✓	✓		✓
Chaetodontidae	<i>Chaetodon melannotus</i>	Bloch & Schneider, 1801	✓	✓	✓		✓
Chaetodontidae	<i>Chaetodon octofasciatus</i>	Bloch, 1787	✓	✓	✓	✓	✓
Chaetodontidae	<i>Chaetodon ornatissimus</i>	Cuvier, 1831		✓	✓	✓	✓
Chaetodontidae	<i>Chaetodon plebeius</i>	Cuvier, 1831	✓	✓	✓	✓	✓
Chaetodontidae	<i>Chaetodon punctatofasciatus</i>	Cuvier, 1831	✓	✓	✓		✓
Chaetodontidae	<i>Chaetodon rafflesii</i>	Anonymous [Bennett], 1830					✓
Chaetodontidae	<i>Chaetodon speculum</i>	Cuvier, 1831	✓	✓	✓	✓	✓
Chaetodontidae	<i>Chaetodon trifascialis</i>	Quoy & Gaimard, 1825	✓	✓	✓	✓	✓
Chaetodontidae	<i>Chaetodon unimaculatus</i>	Bloch, 1787			✓		✓
Chaetodontidae	<i>Chaetodon vagabundus</i>	Linnaeus, 1758	✓	✓	✓		✓
Chaetodontidae	<i>Chaetodon wiebeli</i>	Kaup, 1863			✓	✓	✓
Chaetodontidae	<i>Chaetodon xanthurus</i>	Bleeker, 1857	✓	✓	✓	✓	✓
Chaetodontidae	<i>Coradion altivelis</i>	McCulloch, 1916	✓	✓	✓		✓
Chaetodontidae	<i>Forcipiger flavissimus</i>	Jordan & McGregor, 1898	✓				
Chaetodontidae	<i>Forcipiger longirostris</i>	(Broussonet, 1782)					✓
Chaetodontidae	<i>Heniochus acuminatus</i>	(Linnaeus, 1758)	✓	✓	✓	✓	✓
Chaetodontidae	<i>Heniochus monoceros</i>	Cuvier, 1831				✓	✓
Chaetodontidae	<i>Heniochus varius</i>	(Cuvier, 1829)	✓	✓	✓		✓
Cheilodactylidae	<i>Goniistius zonatus</i>	(Cuvier, 1830)	✓				
Cirrhitidae	<i>Cirrhitichthys aprinus</i>	(Cuvier, 1829)	✓				✓

.....continued on the next page



**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Cirrhitidae	<i>Cirrhitichthys aureus</i>	(Temminck & Schlegel, 1842)	✓			✓	✓
Cirrhitidae	<i>Cirrhitichthys falco</i>	Randall, 1963	✓	✓	✓		✓
Cirrhitidae	<i>Cirrhitichthys oxycephalus</i>	(Bleeker, 1855)	✓			✓	✓
Cirrhitidae	<i>Cirrhites pinnulatus</i>	(Forster, 1801)					✓
Cirrhitidae	<i>Paracirrhites arcatus</i>	(Cuvier, 1829)	✓	✓	✓		✓
Cirrhitidae	<i>Paracirrhites forsteri</i>	(Schneider, 1801)	✓	✓	✓		✓
Congridae	<i>Conger cinereus</i>	Rüppell, 1830		✓			
Coryphaenidae	<i>Coryphaena equiselis</i>	Linnaeus, 1758			✓		
Coryphaenidae	<i>Coryphaena hippurus</i>	Linnaeus, 1758			✓		
Creediidae	<i>Limnichthys nitidus</i>	Smith, 1958					✓
Dasyatidae	<i>Neotrygon kuhlii</i>	(Müller & Henle, 1841)	✓		✓		
Dasyatidae	<i>Taeniurops meyeri</i>	(Müller & Henle, 1841)					✓
Diodontidae	<i>Diodon holocanthus</i>	Linnaeus, 1758	✓	✓	✓	✓	✓
Diodontidae	<i>Diodon hystrix</i>	Linnaeus, 1758					✓
Dorosomatidae	<i>Sardinella zunasi</i>	(Bleeker, 1854)					✓
Dussumieriidae	<i>Etrumeus micropus</i>	(Temminck & Schlegel, 1846)			✓		
Emmelichthyidae	<i>Erythrocles schlegelii</i>	(Richardson, 1846)			✓		
Ephippidae	<i>Platax batavianus</i>	Cuvier, 1831			✓		
Ephippidae	<i>Platax orbicularis</i>	(Forsskål, 1775)	✓	✓			
Ephippidae	<i>Platax teira</i>	(Forsskål, 1775)		✓	✓	✓	
Epinephelidae	<i>Anyperodon leucogrammicus</i>	(Valenciennes, 1828)			✓		
Epinephelidae	<i>Cephalopholis argus</i>	Schneider, 1801	✓	✓	✓		✓
Epinephelidae	<i>Cephalopholis boenak</i>	(Bloch, 1790)	✓	✓	✓	✓	✓
Epinephelidae	<i>Cephalopholis miniata</i>	(Forsskål, 1775)		✓		✓	✓
Epinephelidae	<i>Cephalopholis sexmaculata</i>	(Rüppell, 1830)			✓		
Epinephelidae	<i>Cephalopholis sonnerati</i>	(Valenciennes, 1828)			✓		
Epinephelidae	<i>Cephalopholis spiloparaea</i>	(Valenciennes, 1828)			✓		
Epinephelidae	<i>Cephalopholis urodeta</i>	(Forster, 1801)	✓	✓	✓	✓	✓
Epinephelidae	<i>Cromileptes altivelis</i>	(Valenciennes, 1828)	✓	✓	✓		✓
Epinephelidae	<i>Epinephelus akaara</i>	(Temminck & Schlegel, 1842)					✓
Epinephelidae	<i>Epinephelus areolatus</i>	(Forsskål, 1775)		✓			
Epinephelidae	<i>Epinephelus awoara</i>	(Temminck & Schlegel, 1842)	✓				
Epinephelidae	<i>Epinephelus bleekeri</i>	(Vaillant, 1878)		✓			
Epinephelidae	<i>Epinephelus coeruleopunctatus</i>	(Bloch, 1790)	✓	✓			
Epinephelidae	<i>Epinephelus cyanopodus</i>	(Richardson, 1846)	✓		✓		
Epinephelidae	<i>Epinephelus fasciatomaculosus</i>	(Peters, 1865)					✓
Epinephelidae	<i>Epinephelus fasciatus</i>	(Forsskål, 1775)	✓	✓		✓	✓

.....continued on the next page

**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Epinephelidae	<i>Epinephelus hexagonatus</i>	(Forster, 1801)		✓			✓
Epinephelidae	<i>Epinephelus maculatus</i>	(Bloch, 1790)					✓
Epinephelidae	<i>Epinephelus merra</i>	Bloch, 1793	✓			✓	✓
Epinephelidae	<i>Epinephelus polyphkadion</i>	(Bleeker, 1849)		✓	✓	✓	
Epinephelidae	<i>Epinephelus quoyanus</i>	(Valenciennes, 1830)	✓	✓	✓	✓	✓
Epinephelidae	<i>Epinephelus rivulatus</i>	(Valenciennes, 1830)		✓	✓		
Epinephelidae	<i>Epinephelus sexfasciatus</i>	(Valenciennes, 1828)	✓				
Epinephelidae	<i>Epinephelus spilotoceps</i>	Schultz, 1953	✓				
Epinephelidae	<i>Epinephelus trimaculatus</i>	(Valenciennes, 1828)	✓	✓	✓		✓
Epinephelidae	<i>Liopropoma susumi</i>	(Jordan & Seale, 1906)					✓
Epinephelidae	<i>Plectropomus areolatus</i>	(Rüppell, 1830)	✓	✓			✓
Epinephelidae	<i>Plectropomus laevis</i>	(Lacepède, 1801)	✓		✓		✓
Epinephelidae	<i>Plectropomus leopardus</i>	(Lacepède, 1802)	✓	✓			✓
Epinephelidae	<i>Variola louti</i>	(Forsskål, 1775)					✓
Exocoetidae	<i>Cheilopogon nigricans</i>	(Bennett, 1840)					✓
Fistulariidae	<i>Fistularia commersonii</i>	Rüppell, 1838			✓	✓	✓
Fistulariidae	<i>Fistularia petimba</i>	Lacepède, 1803	✓	✓	✓		✓
Gempylidae	<i>Gempylus serpens</i>	Cuvier, 1829			✓		
Gerreidae	<i>Gerres oyena</i>	(Forsskål, 1775)					✓
Glaucosomatidae	<i>Glaucosoma buergeri</i>	Richardson, 1845					✓
Gobiesocidae	<i>Lepadichthys frenatus</i>	Waite, 1904			✓		✓
Gobiidae	<i>Amblyeleotris guttata</i>	(Fowler, 1938)	✓	✓			✓
Gobiidae	<i>Amblyeleotris periophthalmus</i>	(Bleeker, 1853)	✓				✓
Gobiidae	<i>Amblyeleotris wheeleri</i>	(Polunin & Lubbock, 1977)	✓	✓	✓	✓	✓
Gobiidae	<i>Amblygobius phalaena</i>	(Valenciennes, 1837)		✓	✓		✓
Gobiidae	<i>Asterropteryx semipunctata</i>	Rüppell, 1830		✓			✓
Gobiidae	<i>Barbuligobius boehlkei</i>	Lachner & McKinney, 1974		✓			✓
Gobiidae	<i>Bathygobius fuscus</i>	(Rüppell, 1830)					✓
Gobiidae	<i>Bathygobius laddi</i>	(Fowler, 1931)		✓	✓		✓
Gobiidae	<i>Bryaninops loki</i>	Larson, 1985					✓
Gobiidae	<i>Cabillus</i> sp.						✓
Gobiidae	<i>Cabillus tongarevae</i>	(Fowler, 1927)			✓		✓
Gobiidae	<i>Callogobius flavobrunneus</i>	(Smith, 1958)			✓		
Gobiidae	<i>Callogobius sclateri</i>	(Steindachner, 1879)					✓
Gobiidae	<i>Cryptocentrus nigrocellatus</i>	(Yanagisawa, 1978)	✓	✓			✓
Gobiidae	<i>Eviota abax</i>	(Jordan & Snyder, 1901)			✓		✓
Gobiidae	<i>Eviota albolineata</i>	Jewett & Lachner, 1983	✓	✓	✓		✓
Gobiidae	<i>Eviota flavipinnata</i>	Suzuki, Greenfield & Motomura, 2015		✓			✓
Gobiidae	<i>Eviota masudai</i>	Matsuura & Senou, 2006			✓		✓
Gobiidae	<i>Eviota richardi</i>	Greenfield & Randall, 2016					✓
Gobiidae	<i>Eviota rubriguttata</i>	Greenfield & Suzuki, 2011		✓			
Gobiidae	<i>Eviota sebreei</i>	Jordan & Seale, 1906		✓			

.....continued on the next page



**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Gobiidae	<i>Eviota</i> sp.1			✓	✓		
Gobiidae	<i>Eviota</i> sp.2						✓
Gobiidae	<i>Eviota storthynx</i>	(Rofen, 1959)					✓
Gobiidae	<i>Fusigobius duospilus</i>	Hoese & Reader, 1985		✓			✓
Gobiidae	<i>Fusigobius humeralis</i>	(Randall, 2001)	✓	✓			✓
Gobiidae	<i>Fusigobius inframaculatus</i>	(Randall, 1994)		✓			✓
Gobiidae	<i>Fusigobius neophytus</i>	(Günther, 1877)		✓	✓		✓
Gobiidae	<i>Gnatholepis anjerensis</i>	(Bleeker, 1851)	✓	✓	✓		✓
Gobiidae	<i>Gnatholepis cauerensis</i>	(Bleeker, 1853)	✓	✓			✓
Gobiidae	<i>Gobiodon oculolineatus</i>	Wu, 1979		✓			
Gobiidae	<i>Gobiodon quinquestrigatus</i>	(Valenciennes, 1837)	✓	✓			✓
Gobiidae	<i>Istigobius campbelli</i>	(Jordan & Snyder, 1901)	✓	✓	✓		✓
Gobiidae	<i>Istigobius decoratus</i>	(Herre, 1927)	✓	✓	✓	✓	✓
Gobiidae	<i>Paragobiodon lacunicolus</i>	(Kendall & Goldsborough, 1911)			✓		
Gobiidae	<i>Pleurosicya fringilla</i>	Larson, 1990					✓
Gobiidae	<i>Pleurosicya mossambica</i>	Smith, 1959			✓	✓	✓
Gobiidae	<i>Priolepis cincta</i>	(Regan, 1908)			✓		✓
Gobiidae	<i>Priolepis formosa</i>	Chen, Chen & Harefa, 2024					✓
Gobiidae	<i>Priolepis</i> sp.				✓		
Gobiidae	<i>Trimma annosum</i>	Winterbottom, 2003	✓	✓	✓		✓
Gobiidae	<i>Trimma macrophthalmum</i>	(Tomiya, 1936)		✓	✓		
Gobiidae	<i>Valenciennea immaculata</i>	(Ni, 1981)					✓
Gobiidae	<i>Valenciennea strigata</i>	(Broussonet, 1782)	✓	✓	✓		✓
Grammistidae	<i>Diploprion bifasciatum</i>	Cuvier, 1828	✓	✓	✓	✓	✓
Grammistidae	<i>Grammistes sexlineatus</i>	(Thunberg, 1792)	✓	✓	✓	✓	✓
Grammistidae	<i>Pseudogramma polyacantha</i>	(Bleeker, 1856)					✓
Haemulidae	<i>Diagramma pictum</i>	(Thunberg, 1792)	✓	✓	✓		✓
Haemulidae	<i>Parapristipoma trilineatum</i>	(Thunberg, 1793)		✓	✓	✓	✓
Haemulidae	<i>Plectorhinchus flavomaculatus</i>	(Cuvier, 1830)			✓	✓	
Haemulidae	<i>Plectorhinchus lessonii</i>	(Cuvier, 1830)	✓	✓	✓	✓	✓
Haemulidae	<i>Plectorhinchus lineatus</i>	(Linnaeus, 1758)	✓	✓	✓	✓	✓
Haemulidae	<i>Plectorhinchus picus</i>	(Cuvier, 1828)	✓	✓	✓	✓	✓
Haemulidae	<i>Plectorhinchus vittatus</i>	(Linnaeus, 1758)			✓		✓
Hemiramphidae	<i>Hyporhamphus dussumieri</i>	(Valenciennes, 1847)	✓				✓
Hemiramphidae	<i>Oxyporhamphus micropterus</i>	(Valenciennes, 1847)			✓		
Holocentridae	<i>Myripristis berndti</i>	Jordan & Evermann, 1903		✓			
Holocentridae	<i>Myripristis botche</i>	Cuvier, 1829		✓			
Holocentridae	<i>Myripristis formosa</i>	Randall & Greenfield, 1996		✓			✓
Holocentridae	<i>Myripristis greenfieldi</i>	Randall & Yamakawa, 1996		✓			
Holocentridae	<i>Myripristis kuntee</i>	Valenciennes, 1831		✓	✓		
Holocentridae	<i>Myripristis murdjan</i>	(Forsskål, 1775)	✓		✓		
Holocentridae	<i>Neoniphon sammara</i>	(Forsskål, 1775)		✓			✓

.....continued on the next page

**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Holocentridae	<i>Sargocentron caudimaculatum</i>	(Rüppell, 1838)					✓
Holocentridae	<i>Sargocentron diadema</i>	(Lacepède, 1802)	✓	✓	✓		✓
Holocentridae	<i>Sargocentron melanospilos</i>	(Bleeker, 1858)					✓
Holocentridae	<i>Sargocentron rubrum</i>	(Forsskål, 1775)	✓		✓		✓
Holocentridae	<i>Sargocentron spinosissimum</i>	(Temminck & Schlegel, 1843)	✓	✓			✓
Kyphosidae	<i>Girella leonina</i>	(Richardson, 1846)				✓	✓
Kyphosidae	<i>Girella mezinga</i>	Jordan & Starks, 1907			✓		✓
Kyphosidae	<i>Kyphosus cinerascens</i>	(Forsskål, 1775)	✓	✓	✓	✓	✓
Kyphosidae	<i>Kyphosus vaigiensis</i>	(Quoy & Gaimard, 1825)	✓				
Kyphosidae	<i>Microcanthus strigatus</i>	(Cuvier, 1831)	✓	✓	✓	✓	✓
Labridae	<i>Anampses caeruleopunctatus</i>	Rüppell, 1829	✓	✓	✓	✓	✓
Labridae	<i>Anampses geographicus</i>	Valenciennes, 1840	✓	✓			
Labridae	<i>Anampses melanurus</i>	Bleeker, 1857	✓	✓	✓		✓
Labridae	<i>Anampses meleagrides</i>	Valenciennes, 1840	✓	✓	✓	✓	✓
Labridae	<i>Anampses neoguinaicus</i>	Bleeker, 1878	✓	✓	✓	✓	✓
Labridae	<i>Anampses twistii</i>	Bleeker, 1856	✓	✓	✓	✓	✓
Labridae	<i>Bodianus axillaris</i>	(Bennett, 1832)	✓	✓	✓	✓	✓
Labridae	<i>Bodianus bilunulatus</i>	(Lacepède, 1801)			✓		✓
Labridae	<i>Bodianus diana</i>	(Lacepède, 1801)	✓	✓	✓	✓	✓
Labridae	<i>Bodianus mesothorax</i>	(Bloch & Schneider, 1801)	✓	✓	✓	✓	✓
Labridae	<i>Cheilinus chlorourus</i>	(Bloch, 1791)	✓	✓	✓	✓	✓
Labridae	<i>Cheilinus oxycephalus</i>	Bleeker, 1853	✓	✓	✓		✓
Labridae	<i>Cheilinus trilobatus</i>	Lacepède, 1801	✓	✓	✓		✓
Labridae	<i>Cheilinus undulatus</i>	Rüppell, 1835				✓	
Labridae	<i>Cheilio inermis</i>	(Forsskål, 1775)					✓
Labridae	<i>Choerodon azurio</i>	(Jordan & Snyder, 1901)	✓	✓	✓	✓	✓
Labridae	<i>Choerodon robustus</i>	(Günther, 1862)		✓	✓		✓
Labridae	<i>Choerodon schoenleinii</i>	(Valenciennes, 1839)		✓	✓		✓
Labridae	<i>Cirrhilabrus cyanopleura</i>	(Bleeker, 1851)	✓	✓	✓		✓
Labridae	<i>Cirrhilabrus exquisitus</i>	Smith, 1957	✓		✓		✓
Labridae	<i>Coris aygula</i>	Lacepède, 1801	✓	✓	✓	✓	✓
Labridae	<i>Coris batuensis</i>	(Bleeker, 1856)		✓			
Labridae	<i>Coris dorsomacula</i>	Fowler, 1908	✓	✓	✓	✓	✓
Labridae	<i>Coris gaimard</i>	(Quoy & Gaimard, 1824)	✓	✓	✓	✓	✓
Labridae	<i>Coris musume</i>	(Jordan & Snyder, 1904)					✓
Labridae	<i>Epibulus insidiator</i>	(Pallas, 1770)		✓			✓
Labridae	<i>Gomphosus varius</i>	Lacepède, 1801	✓	✓	✓		✓
Labridae	<i>Halichoeres argus</i>	(Bloch & Schneider, 1801)	✓				
Labridae	<i>Halichoeres biocellatus</i>	Schultz, 1960	✓	✓	✓		✓
Labridae	<i>Halichoeres chrysus</i>	Randall, 1981		✓			✓
Labridae	<i>Halichoeres hartzfeldii</i>	(Bleeker, 1852)			✓		✓
Labridae	<i>Halichoeres hortulanus</i>	(Lacepède, 1801)	✓	✓	✓	✓	✓

.....continued on the next page

**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Labridae	<i>Halichoeres margaritaceus</i>	(Valenciennes, 1839)	✓	✓			✓
Labridae	<i>Halichoeres marginatus</i>	Rüppell, 1835	✓		✓		✓
Labridae	<i>Halichoeres melanochir</i>	Fowler & Bean, 1928	✓	✓	✓	✓	✓
Labridae	<i>Halichoeres melanurus</i>	(Bleeker, 1851)	✓				
Labridae	<i>Halichoeres miniatus</i>	(Valenciennes, 1839)			✓		
Labridae	<i>Halichoeres nebulosus</i>	(Valenciennes, 1839)	✓	✓	✓		✓
Labridae	<i>Halichoeres scapularis</i>	(Bennett, 1832)	✓	✓	✓		✓
Labridae	<i>Halichoeres trimaculatus</i>	(Quoy & Gaimard, 1834)					✓
Labridae	<i>Halichoeres zeylonicus</i>	(Bennett, 1833)			✓		
Labridae	<i>Hemigymnus fasciatus</i>	(Bloch, 1792)	✓	✓	✓		✓
Labridae	<i>Hemigymnus melapterus</i>	(Bloch, 1791)	✓	✓	✓		✓
Labridae	<i>Hologymnosus annulatus</i>	(Lacepède, 1801)	✓	✓	✓		✓
Labridae	<i>Hologymnosus doliatus</i>	(Lacepède, 1801)	✓	✓	✓		✓
Labridae	<i>Iniistius baldwini</i>	(Jordan & Evermann, 1903)			✓		
Labridae	<i>Iniistius dea</i>	(Temminck & Schlegel, 1845)			✓		
Labridae	<i>Iniistius pavo</i>	(Valenciennes, 1840)					✓
Labridae	<i>Iniistius twistii</i>	(Bleeker, 1856)					✓
Labridae	<i>Iniistius verrens</i>	(Jordan & Evermann, 1902)					✓
Labridae	<i>Labrichthys unilineatus</i>	(Guichenot, 1847)	✓	✓	✓		
Labridae	<i>Labroides bicolor</i>	Fowler & Bean, 1928	✓	✓	✓		✓
Labridae	<i>Labroides dimidiatus</i>	(Valenciennes, 1839)	✓	✓	✓	✓	✓
Labridae	<i>Labropsis manabei</i>	Schmidt, 1931	✓	✓			✓
Labridae	<i>Leptojulius lambdastigma</i>	Randall & Ferraris, 1981	✓				✓
Labridae	<i>Macropharyngodon meleagris</i>	(Valenciennes, 1839)	✓	✓	✓		✓
Labridae	<i>Macropharyngodon negrosensis</i>	Herre, 1932	✓	✓	✓		✓
Labridae	<i>Novaculichthys taeniourus</i>	(Lacepède, 1801)	✓	✓			✓
Labridae	<i>Oxycheilinus arenatus</i>	(Valenciennes, 1840)		✓			
Labridae	<i>Oxycheilinus bimaculatus</i>	(Valenciennes, 1840)	✓	✓	✓		✓
Labridae	<i>Oxycheilinus digramma</i>	(Lacepède, 1801)			✓		
Labridae	<i>Oxycheilinus unifasciatus</i>	(Streets, 1877)	✓	✓	✓		✓
Labridae	<i>Parajulis poecilepterus</i>	(Temminck & Schlegel, 1845)	✓	✓	✓		✓
Labridae	<i>Pseudocheilinus evanidus</i>	Jordan & Evermann, 1903	✓	✓	✓		✓
Labridae	<i>Pseudocheilinus hexataenia</i>	(Bleeker, 1857)	✓	✓	✓		✓
Labridae	<i>Pseudojuloides cerasinus</i>	(Snyder, 1904)					✓
Labridae	<i>Pseudolabrus eoethinus</i>	(Richardson, 1846)	✓	✓		✓	
Labridae	<i>Pteragogus aurigarius</i>	(Richardson, 1845)			✓		✓
Labridae	<i>Pteragogus enneacanthus</i>	(Bleeker, 1853)		✓			✓
Labridae	<i>Stethojulis bandanensis</i>	(Bleeker, 1851)	✓	✓	✓		✓
Labridae	<i>Stethojulis strigiventer</i>	(Bennett, 1833)	✓	✓	✓		✓
Labridae	<i>Stethojulis terina</i>	Jordan & Snyder, 1902	✓	✓	✓		✓

.....continued on the next page

**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Labridae	<i>Stethojulis trilineata</i>	(Bloch & Schneider, 1801)	✓	✓	✓		✓
Labridae	<i>Thalassoma amblycephalum</i>	(Bleeker, 1856)	✓	✓	✓	✓	✓
Labridae	<i>Thalassoma hardwicke</i>	(Bennett, 1830)	✓	✓	✓	✓	✓
Labridae	<i>Thalassoma janseni</i>	(Bleeker, 1856)	✓	✓	✓		✓
Labridae	<i>Thalassoma lunare</i>	(Linnaeus, 1758)	✓	✓	✓	✓	✓
Labridae	<i>Thalassoma lutescens</i>	(Lay & Bennett, 1839)	✓	✓	✓	✓	✓
Labridae	<i>Thalassoma purpureum</i>	(Forsskål, 1775)	✓				✓
Labridae	<i>Thalassoma quinquevittatum</i>	(Lay & Bennett, 1839)	✓	✓	✓		✓
Lethrinidae	<i>Gymnocranius elongatus</i>	Senta, 1973		✓			
Lethrinidae	<i>Lethrinus atkinsoni</i>	Seale, 1910	✓	✓			✓
Lethrinidae	<i>Lethrinus haematopterus</i>	Temminck & Schlegel, 1844					✓
Lethrinidae	<i>Lethrinus harak</i>	(Forsskål, 1775)	✓	✓	✓	✓	✓
Lethrinidae	<i>Lethrinus nebulosus</i>	(Forsskål, 1775)		✓			
Lethrinidae	<i>Lethrinus ornatus</i>	Valenciennes, 1830		✓			✓
Lethrinidae	<i>Lethrinus rubrioperculatus</i>	Sato, 1978		✓			
Lethrinidae	<i>Monotaxis grandoculis</i>	(Forsskål, 1775)	✓	✓	✓		✓
Lutjanidae	<i>Lutjanus argentimaculatus</i>	(Forsskål, 1775)			✓	✓	✓
Lutjanidae	<i>Lutjanus bohar</i>	(Forsskål, 1775)	✓	✓	✓		✓
Lutjanidae	<i>Lutjanus decussatus</i>	(Cuvier, 1828)		✓			✓
Lutjanidae	<i>Lutjanus fulviflamma</i>	(Forsskål, 1775)	✓	✓	✓		✓
Lutjanidae	<i>Lutjanus fulvus</i>	(Forster, 1801)				✓	✓
Lutjanidae	<i>Lutjanus gibbus</i>	(Forsskål, 1775)		✓	✓		✓
Lutjanidae	<i>Lutjanus monostigma</i>	(Cuvier, 1828)	✓	✓			✓
Lutjanidae	<i>Lutjanus ophuysenii</i>	(Bleeker, 1860)		✓	✓		
Lutjanidae	<i>Lutjanus russellii</i>	(Bleeker, 1849)			✓		✓
Lutjanidae	<i>Lutjanus stellatus</i>	Akazaki, 1983		✓	✓		✓
Lutjanidae	<i>Lutjanus vitta</i>	(Quoy & Gaimard, 1824)			✓		
Lutjanidae	<i>Macolor niger</i>	(Forsskål, 1775)	✓	✓			✓
Lutjanidae	<i>Paracaesio kusakarii</i>	Abe, 1960		✓			
Lutjanidae	<i>Paracaesio xanthurus</i>	(Bleeker, 1869)					✓
Lutjanidae	<i>Symphorus nematophorus</i>	(Bleeker, 1860)		✓			✓
Microdesmidae	<i>Gunnellichthys curiosus</i>	Dawson, 1968		✓	✓		
Microdesmidae	<i>Nemateleotris magnifica</i>	Fowler, 1938	✓	✓	✓		✓
Microdesmidae	<i>Parioglossus dotui</i>	Tomiyama, 1958					✓
Microdesmidae	<i>Ptereleotris evides</i>	(Jordan & Hubbs, 1925)	✓	✓	✓		✓
Microdesmidae	<i>Ptereleotris heteroptera</i>	(Bleeker, 1855)			✓		
Monacanthidae	<i>Aluterus monoceros</i>	(Linnaeus, 1758)	✓				
Monacanthidae	<i>Aluterus scriptus</i>	(Osbeck, 1765)					✓
Monacanthidae	<i>Cantherhines dumerilii</i>	(Hollard, 1854)					✓
Monacanthidae	<i>Cantherhines fronticinctus</i>	(Günther, 1867)	✓		✓		✓
Monacanthidae	<i>Cantherhines pardalis</i>	(Rüppell, 1837)					✓
Monacanthidae	<i>Paraluteres prionurus</i>	(Bleeker, 1851)	✓	✓	✓		✓

.....continued on the next page

**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Monacanthidae	<i>Pervagor janthinosoma</i>	(Bleeker, 1854)	✓	✓	✓		✓
Monacanthidae	<i>Pervagor melanocephalus</i>	(Bleeker, 1853)	✓				
Monacanthidae	<i>Stephanolepis cirrhifer</i>	(Temminck & Schlegel, 1850)		✓	✓		✓
Monacanthidae	<i>Thamnaconus modestus</i>	(Günther, 1877)			✓		
Mullidae	<i>Mulloidichthys vanicolensis</i>	(Valenciennes, 1831)		✓	✓		✓
Mullidae	<i>Parupeneus barberinus</i>	(Lacepède, 1801)			✓	✓	✓
Mullidae	<i>Parupeneus chrysopleuron</i>	(Temminck & Schlegel, 1843)			✓	✓	✓
Mullidae	<i>Parupeneus ciliatus</i>	(Lacepède, 1802)	✓	✓	✓		✓
Mullidae	<i>Parupeneus cyclostomus</i>	(Lacepède, 1801)		✓	✓		✓
Mullidae	<i>Parupeneus heptacanthus</i>	(Lacepède, 1802)		✓			✓
Mullidae	<i>Parupeneus indicus</i>	(Shaw, 1803)	✓	✓	✓		✓
Mullidae	<i>Parupeneus multifasciatus</i>	(Quoy & Gaimard, 1825)	✓	✓	✓	✓	✓
Mullidae	<i>Parupeneus spilurus</i>	(Bleeker, 1854)			✓	✓	
Mullidae	<i>Upeneus tragula</i>	Richardson, 1846			✓		✓
Muraenidae	<i>Echidna nebulosa</i>	(Ahl, 1789)	✓	✓	✓		
Muraenidae	<i>Echidna polyzona</i>	(Richardson, 1845)	✓				✓
Muraenidae	<i>Enchelycore pardalis</i>	(Temminck & Schlegel, 1846)					✓
Muraenidae	<i>Enchelycore schismatorhynchus</i>	(Bleeker, 1853)		✓			
Muraenidae	<i>Gymnothorax buroensis</i>	(Bleeker, 1857)			✓		✓
Muraenidae	<i>Gymnothorax chilospilus</i>	Bleeker, 1864					✓
Muraenidae	<i>Gymnothorax eurostus</i>	(Abbott, 1860)	✓	✓	✓	✓	✓
Muraenidae	<i>Gymnothorax favagineus</i>	Bloch & Schneider, 1801	✓	✓			
Muraenidae	<i>Gymnothorax fimbriatus</i>	(Bennett, 1832)	✓				
Muraenidae	<i>Gymnothorax flavimarginatus</i>	(Rüppell, 1830)		✓			
Muraenidae	<i>Gymnothorax meleagris</i>	(Shaw, 1795)	✓	✓	✓		✓
Muraenidae	<i>Gymnothorax niphostigmus</i>	Chen, Shao & Chen, 1996		✓			
Muraenidae	<i>Gymnothorax thyrsoideus</i>	(Richardson, 1845)	✓				
Myctophidae	<i>Diaphus richardsoni</i>	Tåning, 1932		✓			
Myctophidae	<i>Diaphus schmidtii</i>	Tåning, 1932			✓		
Nemipteridae	<i>Pentapodus emeryii</i>	(Richardson, 1843)					✓
Nemipteridae	<i>Scolopsis affinis</i>	Peters, 1877			✓		
Nemipteridae	<i>Scolopsis bilineata</i>	(Bloch, 1793)	✓	✓	✓	✓	✓
Nemipteridae	<i>Scolopsis lineata</i>	Quoy & Gaimard, 1824		✓	✓		✓
Nemipteridae	<i>Scolopsis monogramma</i>	(Cuvier, 1830)	✓		✓		✓
Nemipteridae	<i>Scolopsis trilineata</i>	Kner, 1868		✓			✓
Nemipteridae	<i>Scolopsis vosmeri</i>	(Bloch, 1792)	✓	✓	✓		
Nemipteridae	<i>Scolopsis xenochrous</i>	Günther, 1872		✓			
Ophichthidae	<i>Myrichthys colubrinus</i>	(Boddaert, 1781)			✓		✓

.....continued on the next page

**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Oplegnathidae	<i>Oplegnathus fasciatus</i>	(Temminck & Schlegel, 1844)	✓				
Oplegnathidae	<i>Oplegnathus punctatus</i>	(Temminck & Schlegel, 1844)	✓	✓		✓	✓
Ostraciidae	<i>Ostracion cubicum</i>	Linnaeus, 1758	✓	✓		✓	✓
Ostraciidae	<i>Ostracion immaculatum</i>	Temminck & Schlegel, 1850		✓			
Ostraciidae	<i>Ostracion meleagris</i>	Shaw, 1796		✓			✓
Pempheridae	<i>Pempheris oualensis</i>	Cuvier, 1831	✓	✓	✓		✓
Pempheridae	<i>Pempheris vanicolensis</i>	Cuvier, 1831		✓			✓
Phosichthyidae	<i>Vinciguerria nimbaria</i>	(Jordan & Williams, 1895)			✓		
Pinguipedidae	<i>Parapercis clathrata</i>	Ogilby, 1910	✓	✓	✓	✓	✓
Pinguipedidae	<i>Parapercis cylindrica</i>	(Bloch, 1792)			✓		✓
Pinguipedidae	<i>Parapercis kamoharai</i>	Schultz, 1966	✓	✓			✓
Pinguipedidae	<i>Parapercis millepunctata</i>	(Günther, 1860)	✓	✓	✓	✓	✓
Pinguipedidae	<i>Parapercis pacifica</i>	Imamura & Yoshino, 2007	✓	✓	✓		✓
Pinguipedidae	<i>Parapercis snyderi</i>	Jordan & Starks, 1905	✓		✓		✓
Pinguipedidae	<i>Parapercis tetracantha</i>	(Lacepède, 1801)	✓		✓		✓
Pinguipedidae	<i>Parapercis xanthozona</i>	(Bleeker, 1849)	✓				✓
Platycephalidae	<i>Cociella crocodilus</i>	(Cuvier, 1829)		✓			✓
Plesiopidae	<i>Belonepterygion fasciolatum</i>	(Ogilby, 1889)		✓	✓		✓
Plotosidae	<i>Plotosus lineatus</i>	(Thunberg, 1787)		✓			
Pomacanthidae	<i>Apolemichthys trimaculatus</i>	(Cuvier, 1831)			✓	✓	
Pomacanthidae	<i>Centropyge bicolor</i>	(Bloch, 1787)	✓				✓
Pomacanthidae	<i>Centropyge bispinosa</i>	(Günther, 1860)	✓	✓			
Pomacanthidae	<i>Centropyge ferrugata</i>	Randall & Burgess, 1972	✓				✓
Pomacanthidae	<i>Centropyge heraldi</i>	Woods & Schultz, 1953					✓
Pomacanthidae	<i>Centropyge tibicen</i>	(Cuvier, 1831)	✓	✓	✓		✓
Pomacanthidae	<i>Centropyge vrolikii</i>	(Bleeker, 1853)	✓	✓	✓		✓
Pomacanthidae	<i>Chaetodontoplus septentrionalis</i>	(Temminck & Schlegel, 1844)	✓	✓	✓	✓	✓
Pomacanthidae	<i>Pomacanthus annularis</i>	(Bloch, 1787)			✓	✓	
Pomacanthidae	<i>Pomacanthus imperator</i>	(Bloch, 1787)			✓	✓	✓
Pomacanthidae	<i>Pomacanthus semicirculatus</i>	(Cuvier, 1831)	✓	✓	✓	✓	✓
Pomacanthidae	<i>Pygoplites diacanthus</i>	(Boddaert, 1772)				✓	✓
Pomacentridae	<i>Abudefduf bengalensis</i>	(Bloch, 1787)	✓	✓	✓		✓
Pomacentridae	<i>Abudefduf lorenzi</i>	Hensley & Allen, 1977					✓
Pomacentridae	<i>Abudefduf septemfasciatus</i>	(Cuvier, 1830)	✓	✓	✓		✓
Pomacentridae	<i>Abudefduf sexfasciatus</i>	(Lacepède, 1801)	✓	✓	✓	✓	✓
Pomacentridae	<i>Abudefduf sordidus</i>	(Forsskål, 1775)		✓	✓		✓
Pomacentridae	<i>Abudefduf vaigiensis</i>	(Quoy & Gaimard, 1825)	✓	✓	✓		✓
Pomacentridae	<i>Amblyglyphidodon curacao</i>	(Bloch, 1787)	✓	✓			✓
Pomacentridae	<i>Amblypomacentrus breviceps</i>	(Schlegel & Müller, 1839)	✓				
Pomacentridae	<i>Amphiprion clarkii</i>	(Bennett, 1830)	✓	✓	✓		✓

.....continued on the next page



**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Pomacentridae	<i>Azurina lepidolepis</i>	(Bleeker, 1877)	✓	✓	✓		✓
Pomacentridae	<i>Chromis analis</i>	(Cuvier, 1830)	✓	✓			✓
Pomacentridae	<i>Chromis chrysurus</i>	(Bliss, 1883)	✓	✓	✓	✓	✓
Pomacentridae	<i>Chromis cinerascens</i>	(Cuvier, 1830)	✓	✓		✓	✓
Pomacentridae	<i>Chromis fumea</i>	(Tanaka, 1917)	✓	✓	✓	✓	✓
Pomacentridae	<i>Chromis notata</i>	(Temminck & Schlegel, 1843)	✓	✓	✓	✓	✓
Pomacentridae	<i>Chromis ternatensis</i>	(Bleeker, 1856)	✓				✓
Pomacentridae	<i>Chromis viridis</i>	(Cuvier, 1830)	✓	✓	✓		
Pomacentridae	<i>Chromis weberi</i>	Fowler & Bean, 1928	✓	✓	✓		✓
Pomacentridae	<i>Chromis xanthura</i>	(Bleeker, 1854)		✓	✓	✓	✓
Pomacentridae	<i>Chrysiptera biocellata</i>	(Quoy & Gaimard, 1825)	✓				
Pomacentridae	<i>Chrysiptera chrysocephala</i>	Manica, Pilcher & Oakley, 2002		✓	✓		
Pomacentridae	<i>Chrysiptera glauca</i>	(Cuvier, 1830)		✓			
Pomacentridae	<i>Chrysiptera rex</i>	(Snyder, 1909)	✓			✓	
Pomacentridae	<i>Chrysiptera starcki</i>	(Allen, 1973)	✓				
Pomacentridae	<i>Dascyllus aruanus</i>	(Linnaeus, 1758)					✓
Pomacentridae	<i>Dascyllus reticulatus</i>	(Richardson, 1846)	✓	✓	✓		✓
Pomacentridae	<i>Dascyllus trimaculatus</i>	(Rüppell, 1829)	✓	✓	✓	✓	✓
Pomacentridae	<i>Neoglyphidodon melas</i>	(Cuvier, 1830)	✓	✓	✓		✓
Pomacentridae	<i>Neoglyphidodon nigroris</i>	(Cuvier, 1830)		✓			✓
Pomacentridae	<i>Neopomacentrus cyanomos</i>	(Bleeker, 1856)	✓	✓	✓		✓
Pomacentridae	<i>Plectroglyphidodon altus</i>	(Okada & Ikeda, 1937)	✓	✓	✓		✓
Pomacentridae	<i>Plectroglyphidodon dickii</i>	(Liénard, 1839)	✓	✓	✓		✓
Pomacentridae	<i>Plectroglyphidodon fasciolatus</i>	(Ogilby, 1889)	✓	✓	✓	✓	✓
Pomacentridae	<i>Plectroglyphidodon insularis</i>	(Allen & Emery, 1985)		✓			
Pomacentridae	<i>Plectroglyphidodon leucozonus</i>	(Bleeker, 1859)					✓
Pomacentridae	<i>Pomacentrus amboinensis</i>	Bleeker, 1868	✓	✓		✓	✓
Pomacentridae	<i>Pomacentrus bankanensis</i>	Bleeker, 1854	✓	✓	✓		✓
Pomacentridae	<i>Pomacentrus chrysurus</i>	Cuvier, 1830	✓				✓
Pomacentridae	<i>Pomacentrus coelestis</i>	Jordan & Starks, 1901	✓	✓	✓	✓	✓
Pomacentridae	<i>Pomacentrus lepidogenys</i>	Fowler & Bean, 1928	✓	✓	✓		
Pomacentridae	<i>Pomacentrus moluccensis</i>	Bleeker, 1853	✓	✓	✓		✓
Pomacentridae	<i>Pomacentrus nagasakiensis</i>	Tanaka, 1917		✓			
Pomacentridae	<i>Pomacentrus pavo</i>	(Bloch, 1787)			✓		
Pomacentridae	<i>Pomacentrus philippinus</i>	Evermann & Seale, 1907	✓	✓	✓		✓
Pomacentridae	<i>Pomacentrus vaiuli</i>	Jordan & Seale, 1906	✓	✓	✓		✓
Pomacentridae	<i>Pycnochromis delta</i>	(Randall, 1988)			✓		
Pomacentridae	<i>Pycnochromis margaritifer</i>	(Fowler, 1946)	✓	✓	✓	✓	✓
Pomacentridae	<i>Pycnochromis ovatiformis</i>	(Fowler, 1946)	✓	✓			

.....continued on the next page

**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Pomacentridae	<i>Pycnochromis retrofasciatus</i>	(Weber, 1913)					✓
Pomacentridae	<i>Stegastes albifasciatus</i>	(Schlegel & Müller, 1839)	✓		✓		
Pomacentridae	<i>Stegastes lacrymatus</i>	(Quoy & Gaimard, 1825)	✓	✓	✓		✓
Pomacentridae	<i>Stegastes lividus</i>	(Forster, 1801)	✓	✓	✓		
Priacanthidae	<i>Priacanthus hamrur</i>	(Forsskål, 1775)		✓			
Priacanthidae	<i>Priacanthus sagittarius</i>	Starnes, 1988		✓			
Priacanthidae	<i>Pristigenys nipponia</i>	(Cuvier, 1829)			✓		
Pseudochromidae	<i>Labracinus cyclophthalmus</i>	(Müller & Troschel, 1849)	✓	✓	✓	✓	✓
Pseudochromidae	<i>Pseudochromis fuscus</i>	Müller & Troschel, 1849			✓		✓
Pseudochromidae	<i>Pseudochromis tapeinosoma</i>	Bleeker, 1853		✓	✓		✓
Pseudochromidae	<i>Pseudoplesiops immaculatus</i>	Gill & Edwards, 2002					✓
Rachycentridae	<i>Rachycentron canadum</i>	(Linnaeus, 1766)	✓				
Samaridae	<i>Samariscus triocellatus</i>	Woods, 1960					✓
Scaridae	<i>Calotomus carolinus</i>	(Valenciennes, 1840)	✓	✓			✓
Scaridae	<i>Cetoscarus bicolor</i>	(Rüppell, 1829)	✓	✓	✓		✓
Scaridae	<i>Chlorurus japanensis</i>	(Bloch, 1789)	✓	✓			✓
Scaridae	<i>Chlorurus microrhinos</i>	(Bleeker, 1854)					✓
Scaridae	<i>Chlorurus sordidus</i>	(Forsskål, 1775)	✓	✓	✓		✓
Scaridae	<i>Hipposcarus longiceps</i>	(Valenciennes, 1840)			✓		
Scaridae	<i>Scarus chameleon</i>	Choat & Randall, 1986	✓		✓		
Scaridae	<i>Scarus dimidiatus</i>	Bleeker, 1859	✓	✓	✓		✓
Scaridae	<i>Scarus festivus</i>	Valenciennes, 1840	✓	✓			✓
Scaridae	<i>Scarus forsteni</i>	(Bleeker, 1861)	✓	✓	✓	✓	✓
Scaridae	<i>Scarus frenatus</i>	Lacepède, 1802	✓	✓			✓
Scaridae	<i>Scarus ghobban</i>	Forsskål, 1775	✓	✓	✓	✓	✓
Scaridae	<i>Scarus hypselopterus</i>	Bleeker, 1853	✓	✓	✓		✓
Scaridae	<i>Scarus niger</i>	Forsskål, 1775	✓	✓			✓
Scaridae	<i>Scarus oviceps</i>	Valenciennes, 1840					✓
Scaridae	<i>Scarus ovifrons</i>	Temminck & Schlegel, 1846	✓	✓	✓		✓
Scaridae	<i>Scarus prasiognathos</i>	Valenciennes, 1840		✓			✓
Scaridae	<i>Scarus rivulatus</i>	Valenciennes, 1840	✓	✓	✓		✓
Scaridae	<i>Scarus rubroviolaceus</i>	Bleeker, 1847	✓	✓	✓		✓
Scaridae	<i>Scarus schlegeli</i>	(Bleeker, 1861)	✓	✓	✓		✓
Scombridae	<i>Auxis rochei</i>	(Risso, 1810)		✓	✓		
Scombridae	<i>Auxis thazard</i>	(Lacepède, 1800)					✓
Scombridae	<i>Euthynnus affinis</i>	(Cantor, 1849)		✓			
Scombridae	<i>Katsuwonus pelamis</i>	(Linnaeus, 1758)			✓		✓
Scombridae	<i>Sarda orientalis</i>	(Temminck & Schlegel, 1844)		✓			
Scombridae	<i>Scomber australasicus</i>	Cuvier, 1832					✓
Scombridae	<i>Scomber japonicus</i>	Houttuyn, 1782			✓		✓
Scombridae	<i>Scomberomorus commerson</i>	(Lacepède, 1800)		✓			✓
Scombridae	<i>Scomberomorus guttatus</i>	(Bloch & Schneider, 1801)			✓		

.....continued on the next page

**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Scombridae	<i>Thunnus albacares</i>	(Bonnaterre, 1788)			✓		
Scombridae	<i>Thunnus obesus</i>	(Lowe, 1839)	✓	✓	✓	✓	✓
Scorpaenidae	<i>Dendrochirus biocellatus</i>	(Fowler, 1938)			✓		✓
Scorpaenidae	<i>Dendrochirus zebra</i>	(Cuvier, 1829)	✓	✓	✓		✓
Scorpaenidae	<i>Parascorpaena aurita</i>	(Rüppell, 1838)		✓			
Scorpaenidae	<i>Parascorpaena mcadamsi</i>	(Fowler, 1938)	✓	✓			
Scorpaenidae	<i>Parascorpaena mossambica</i>	(Peters, 1855)					✓
Scorpaenidae	<i>Parascorpaena picta</i>	(Cuvier, 1829)	✓				
Scorpaenidae	<i>Pterois antennata</i>	(Bloch, 1787)	✓	✓	✓		✓
Scorpaenidae	<i>Pterois lunulata</i>	Temminck & Schlegel, 1843		✓			✓
Scorpaenidae	<i>Pterois radiata</i>	Cuvier, 1829	✓	✓	✓		✓
Scorpaenidae	<i>Pterois russelii</i>	Bennett, 1831			✓		
Scorpaenidae	<i>Pterois volitans</i>	(Linnaeus, 1758)	✓	✓	✓		✓
Scorpaenidae	<i>Scorpaena miostoma</i>	Günther, 1877		✓			
Scorpaenidae	<i>Scorpaenodes parvipinnis</i>	(Garrett, 1864)					✓
Scorpaenidae	<i>Scorpaenopsis cirrosa</i>	(Thunberg, 1793)	✓	✓	✓		✓
Scorpaenidae	<i>Scorpaenopsis diabolus</i>	(Cuvier, 1829)	✓		✓		✓
Scorpaenidae	<i>Scorpaenopsis neglecta</i>	Heckel, 1837			✓		
Scorpaenidae	<i>Scorpaenopsis oxycephalus</i>	(Bleeker, 1849)					✓
Scorpaenidae	<i>Scorpaenopsis</i> sp.		✓	✓			✓
Scorpaenidae	<i>Sebastapistes cyanostigma</i>	(Bleeker, 1856)		✓	✓		✓
Scorpaenidae	<i>Sebastapistes strongia</i>	(Cuvier, 1829)			✓		
Siganidae	<i>Siganus fuscescens</i>	(Houttuyn, 1782)	✓	✓	✓		✓
Siganidae	<i>Siganus guttatus</i>	(Bloch, 1787)					✓
Soleidae	<i>Pardachirus pavoninus</i>	(Lacepède, 1802)			✓		✓
Soleidae	<i>Soleichthys heterorhinos</i>	(Bleeker, 1856)					✓
Sparidae	<i>Pagrus major</i>	(Temminck & Schlegel, 1843)	✓				
Sphyraenidae	<i>Sphyraena barracuda</i>	(Edwards, 1771)	✓	✓	✓		✓
Sphyraenidae	<i>Sphyraena putnamae</i>	Jordan & Seale, 1905					✓
Synanceiidae	<i>Synanceia verrucosa</i>	Bloch & Schneider, 1801	✓				
Synodontidae	<i>Saurida gracilis</i>	(Quoy & Gaimard, 1824)	✓	✓	✓		✓
Synodontidae	<i>Synodus binotatus</i>	Schultz, 1953		✓			✓
Synodontidae	<i>Synodus dermatogenys</i>	Fowler, 1912	✓	✓	✓		✓
Synodontidae	<i>Synodus fuscus</i>	Tanaka, 1917			✓		✓
Synodontidae	<i>Synodus jaculum</i>	Russell & Cressey, 1979	✓	✓			✓
Synodontidae	<i>Synodus ulae</i>	Schultz, 1953		✓	✓		✓
Synodontidae	<i>Synodus variegatus</i>	(Lacepède, 1803)	✓	✓	✓		✓
Synodontidae	<i>Trachinocephalus myops</i>	(Forster, 1801)	✓		✓		✓
Synodontidae	<i>Trachinocephalus trachinus</i>	(Temminck & Schlegel, 1846)					✓
Tetraodontidae	<i>Arothron hispidus</i>	(Linnaeus, 1758)	✓		✓		✓
Tetraodontidae	<i>Arothron nigropunctatus</i>	(Bloch & Schneider, 1801)					✓

.....continued on the next page

**TABLE 1.** (Continued)

Family	Species	Author	Site 1	Site 2	Site 3	Site 4	Site 5
Tetraodontidae	<i>Canthigaster janthinoptera</i>	(Bleeker, 1855)			✓		
Tetraodontidae	<i>Canthigaster valentini</i>	(Bleeker, 1853)	✓	✓	✓		✓
Tetraodontidae	<i>Lagocephalus sceleratus</i>	(Gmelin, 1789)		✓			
Trichiuridae	<i>Trichiurus japonicus</i>	Temminck & Schlegel, 1844		✓			
Tripterygiidae	<i>Enneapterygius etheostoma</i>	(Jordan & Snyder, 1902)	✓	✓			✓
Tripterygiidae	<i>Enneapterygius flavoccipitis</i>	Shen, 1994					✓
Tripterygiidae	<i>Enneapterygius hsiojenae</i>	Shen, 1994			✓	✓	✓
Tripterygiidae	<i>Enneapterygius leucopunctatus</i>	Shen, 1994					✓
Tripterygiidae	<i>Enneapterygius rubicauda</i>	Shen, 1994			✓	✓	✓
Tripterygiidae	<i>Enneapterygius tutuilae</i>	Jordan & Seale, 1906			✓		✓
Tripterygiidae	<i>Helcogramma fuscipectoris</i>	(Fowler, 1946)					✓
Tripterygiidae	<i>Helcogramma inclinata</i>	(Fowler, 1946)					✓
Tripterygiidae	<i>Helcogramma striata</i>	Hansen, 1986	✓	✓	✓	✓	✓
Tripterygiidae	<i>Norfolkia brachylepis</i>	(Schultz, 1960)			✓	✓	✓
Tripterygiidae	<i>Ucla</i> sp.				✓	✓	
Zanclidae	<i>Zanclus cornutus</i>	(Linnaeus, 1758)	✓	✓	✓	✓	✓

## Discussion

This study presents a comprehensive assessment of marine fish diversity within the South Penghu Marine National Park, revealing a significantly higher species richness (572 species from 74 families) compared to previous surveys conducted in this region. This notable increase supported the potential benefits of the park's establishment in 2014, suggesting enhanced protection and recovery of fish populations. The observed species richness likely reflects the park's unique ecological characteristics, including extensive coral reef habitats and the upwelling phenomena driven by the Kuroshio Branch Current, which contribute to high productivity and diverse ecological niches (Tang *et al.*, 2002; Hsieh *et al.*, 2011). Notably, our survey resulted in the discovery of a new goby species, further emphasizing the park's role as a biodiversity hotspot. We also documented a newly recorded goby species for the region, extending the known distribution of this taxon and highlighting the importance of ongoing surveys for documenting local ichthyofaunal diversity.

The dominance of Labridae, Pomacentridae, Gobiidae, and Epinephelidae families aligns with typical patterns observed in tropical and subtropical reef ecosystems. However, the substantial increase in overall species richness compared to earlier studies (Jeng *et al.*, 2009; Tsai *et al.*, 2011; Chang *et al.*, 2013; Chu, 2015; Chen, 2021) suggests a combination of factors. Firstly, the establishment of the marine park may have fostered ecosystem recovery by reducing anthropogenic pressures, such as fishing and coastal development. Secondly, the adoption of standardized survey methodologies and increased sampling effort in this study may have contributed to a more thorough inventory of the ichthyofauna, including cryptic and less conspicuous species. Thirdly, advancements in taxonomic resources, such as WoRMS Taxa Match Tool and Eschmeyer's Catalogue of Fishes, ensured accurate species identification and validation.

The observed spatial heterogeneity in species richness across the five survey sites highlights the importance of considering habitat variability within the park. Dongjiyu (Site 5) exhibited the highest species diversity, potentially due to its complex reef structures and diverse microhabitats. In contrast, the Channel between Xijiyu and Dongjiyu displayed the lowest species richness, possibly because of its unique environmental conditions (Mostly rock substrate, least coral coverage) or localized disturbances (strong current). However, we observed lots of mature large fish species (e.g., *Lutjanus argentimaculatus*) did the spawning activities here. Also, the endangered species Humphead wrasse (*Cheilinus undulatus*) was observed during our survey on this site. Thus, it still shows that the Channel between Xijiyu and Dongjiyu is important for fish biology and conservation. This site-specific variation

emphasizes the need for targeted conservation and management strategies tailored to the ecological characteristics of each area.

The significant proportion of species and families recorded at only one or two sites underscores the importance of maintaining connectivity among habitats within the park. This pattern suggests that species distributions are influenced by localized environmental factors, such as habitat availability, water depth, and current patterns. The ubiquitous presence of 74 species across all five sites indicates the importance of these species to the overall ecosystem function of the park, they may act as indicator species for monitoring the park's health.

Furthermore, the park's role as a buffer against environmental disturbances, such as the cold-water event of 2008, is critical. The South Penghu Marine National Park's establishment likely contributes to the resilience of local fish populations, mitigating the impacts of such events and facilitating recovery. Future studies should focus on long-term monitoring of fish assemblages to assess the effectiveness of the park's management strategies and to track changes in species composition and abundance in response to environmental fluctuations. In addition, a deeper investigation into the cryptic fish fauna utilizing molecular techniques could reveal even higher species richness. This study provides a valuable baseline for future research and conservation efforts in the South Penghu Marine National Park, emphasizing the importance of marine protected areas in safeguarding biodiversity and promoting ecosystem resilience.

## Acknowledgements

The authors thank the grant support and administrative assistance from Marine National Park Headquarters, Kaohsiung. We also appreciate all the staff who assisted with our field survey of SCUBA diving and fishery survey.

## References

- Ahyong, S., Boyko, C.B., Bernot, J., Brandão, S.N., Daly, M., De Grave, S., de Voogd, N.J., Gofas, S., Hernandez, F., Mees, J., Neubauer, T.A., Paulay, G., van der Meij, S., Boydens, B., Dekeyser, S., Goharimanesh, M., Vandepitte, L., Vanhoorne, B., Agatha, S., Ahn, K.J., Alvarez, B., Alves, K., Amler, M.R.W., Amorim, V., Anderberg, A., Andrés-Sánchez, S., Ang, Y., Antić, D., Antonietto, L.S., Arango, C., Ariño, A.H., Artois, T., Atkinson, S., Auffenberg, K., Bailly, N., Baldwin, B.G., Bank, R., Baquero, E., Barber, A., Barrett, R.L., Bartsch, I., Bergh, N., Bernard, C., Berrios Ortega, F.J., Berta, A., Bezerra, T.N., Bhandari, P., Bieler, R., Blanco, S., Blanco Gavaldà, C., Blasco-Costa, I., Blazewicz, M., Bledzki, L.A., Bock, P., Bonifacino, M., Böttger-Schnack, R., Bouchet, P., Boury-Esnault, N., Bouzan, R., Boxshall, G., Bradshaw, C., Bray, R., Browning, J., Bruhl, J.J., Bruneau, A., Budaeva, N., Bueno-Villegas, J., Burkhardt, U., Calvo Casas, J., Campos-Filho, I.S., Cárdenas, P., Carstens, E., Carvalho, A.B.G.D., Cavalcante Bellini, B., Cedhagen, T., Chan, B.K., Chan, T.Y., Cheng, H.J., Chernyshev, A., Choong, H., Christenhusz, M., Churchill, M., Collins, A.G., Collins, G.E., Collins, K., Consorti, L., Copilaș-Ciocianu, D., Corbari, L., Cordeiro, R., Costa, S.M., Costa, V.M.d.M., Costa Corgosinho, P.H., Coste, M., Cramphorn, B., Crandall, K.A., Cremonte, F., Cribb, T., Cutmore, S., Dahdouh-Guebas, F., Daneliya, M., Dauvin, J.C., Davie, P., De Broyer, C., de Lima Ferreira, P., de Mazancourt, V., de Moura Oliveira, L., Decker, P., Defaye, D., Dekker, H., DeSalle, R., Di Capua, I., Dino dos Santos, T.B., Dippenaar, S., Dohrmann, M., Dolan, J., Domning, D., D'Onofrio, R., Downey, R., Dreyer, N., Duke, N.C., Eisendle, U., Eleaume, M., Elliott, T., Enghoff, H., Epler, J., Esquete Garrote, P., Evenhuis, N.L., Ewers-Saucedo, C., Faber, M., Figueroa, D., Figuerola, B., Fišer, C., Ford, B.A., Ford, K.A., Fordyce, E., Foster, W., Fransen, C., Freire, S., Fujimoto, S., Furuya, H., Galbany-Casals, M., Gale, A., Gao, T., García Rodríguez, R., García-Moro, P., Garic, R., Garnett, S., Gaviria-Melo, S., Gebauer, S., Gerken, S., Gibson, D., Gibson, R., Gil, A., Gil, J., Gittenberger, A., Glasby, C., Glenner, H., Glover, A., Goetghebeur, P., Gómez-Noguera, S.E., Gondim, A.I., Gonzalez, B.C., González-Elizondo, M.d.S., González-Gallego, L., González-Solís, D., Goodwin, C., Gostel, M., Grabowski, M., Grossi, M., Guerra-García, J.M., Guerrero, J.M., Guidetti, R., Guiry, M.D., Gutierrez, D., Hadfield, K.A., Hajdu, E., Halanych, K., Hallermann, J., Hasenhütl, K., Hayward, B.W., Hegna, T.A., Heiden, G., Hendrycks, E., Hennen, D., Herbert, D., Herrera Bachiller, A., Hipp, A.L., Hodda, M., Hoeg, J., Hoeksema, B., Holovachov, O., Hooge, M.D., Hooper, J.N., Horton, T., Hoshino, T., Houart, R., Hroudová, Z., Hughes, L., Hughes, T., Huys, R., Hyžný, M., Iñiesta, L.F.M., Iseto, T., Iwataki, M., Janssen, R., Jaume, D., Jazdzewski, K., Jersabek, C.D., Jiménez-Mejías, P., Jin, X.F., Józwiak, P., Jung, M., Kabat, A., Kajihara, H., Kakui, K., Kantor, Y., Karapınar, B., Karthick, B., Kasai, H., Kathirithamby, J., Katinas, L., Katz, A., Kilian, N., Kim, S., Kim, Y.H., King, R., Kirk, P.M., Klautau, M., Kmentova, N., Kocielek, J.P., Köhler, F., Konowalik, K., Kotov, A., Kovac, L., Kovács, Z., Kremenetskaia, A., Kristensen, R.M., Kroh, A., Kulikovskiy, M., Kullander, S., Kupriyanova, E., Lacroix-Carignan, É., Lamaro, A., Lambert, G., Larridon, I., Lazarus, D., Le Coze, F., Le Roux, M., LeCroy, S., Leduc, D., Lefkowitz, E.J., Lemaitre, R., Lévillé-Bourret, É., Licher, M., Lichter-Marck, I.H., Lim, S.C.,



- Lindsay, D., Liu, Y., Loeuille, B., Lois, R., Lörz, A.N., Lu, Y.F., Luceño Garcés, M., Ludwig, M., Lundholm, N., Maciel Silva, J., Macpherson, E., Mah, C., Mamos, T., Manconi, R., Mańko, M., Mapstone, G., Marco Rosado, N., Marek, P.E., Marhold, K., Markello, K., Marques, L., Márquez-Corro, J.I., Marshall, B., Marshall, D.J., Martin, P., Martín-Bravo, S., Martínez Arbizu, P., Masaki, T., Maslakova, S., Mateos, E., McFadden, C., McInnes, S.J., McKenzie, R., Means, J., Mejía-Madrid, H.H., Meland, K., Merrin, K.L., Mesterházy, A., Míguez, M., Miller, J., Mills, C., Mokievsky, V., Molodtsova, T., Mooi, R., Morales-Alonso, A., Morandini, A.C., Moreira da Rocha, R., Morel, J., Moreyra C., L.D., Moritz, L., Morrow, C., Mortelmans, J., Muasya, M.A., Müller, A., Muñoz Gallego, A.R., Muñoz Schüller, P., Musco, L., Naczi, R.F.C., Nesom, G., Neubert, E., Neuhaus, B., Ng, P., Nguyen, A.D., Nielsen, S., Nishikawa, T., Norenburg, J., Nunes, C., Nunes Godeiro, N., O'Hara, T., Opresko, D., Osawa, M., Osigus, H.J., Ota, Y., Páll-Gergely, B., Panero, J.L., Parra-Gómez, A., Patterson, D., Peart, R., Pedram, M., Pelser, P., Peña Santiago, R., Perbiche-Neves, G., Pereira, J.d.S., Pereira, S.G.G., Pereira-Silva, L., Perez-Losada, M., Petrescu, I., Pflingstl, T., Piasecki, W., Pica, D., Picton, B., Pignatti, J., Pilger, J.F., Pinheiro, U., Pisera, A.B., Poatskievick Pierezan, B., Pohle, A., Poindexter, D., Polhemus, D., Poore, G.C., Potapov, A., Potapova, M., Praxedes, R.A., Půža, V., Rasaminirina, F., Read, G., Reich, M., Reid, J.W., Reimer, J.D., Reip, H., Resende Bueno, V., Reuscher, M., Reynolds, J.W., Reznicek, A.A., Richling, I., Rimet, F., Rink, G., Ríos, P., Rius, M., Rodríguez, E., Rogers, D.C., Rosenberg, G., Ross, G.M., Rützler, K., Sá, H.A.B., Saavedra, M., Sabater, L.M., Sabbe, K., Sabroux, R., Saiz-Salinas, J., Sala, S., Samimi-Namin, K., Sánchez Santos, N., Sánchez-Villegas, R., Santagata, S., Santos, S., Santos Filho, M.A.B.d., Sanz Arnal, M., Sar, E., Saucède, T., Schärer, L., Schierwater, B., Schilling, E., Schmidt-Lebuhn, A., Schneider, C., Schneider, L., Schneider, S., Schönberg, C., Schrével, J., Schweitzer, C., Segers, H., Semple, J.C., Senna, A.R., Sennikov, A., Serejo, C., Shaik, S., Shamsi, S., Sharma, J., Shear, W.A., Shenkar, N., Short, M., Sicinski, J., Sierwald, P., Silva da Silva Filho, P.J., Simmons, E., Simpson, D.A., Sinniger, F., Sinou, C., Sivell, D., Smit, H., Smit, N., Smol, N., Sørensen, M.V., Souza-Filho, J.F., Spalink, D., Spelda, J., Starr, J.R., Sterrer, W., Steyn, H.M., Stoev, P., Stöhr, S., Suárez-Morales, E., Susanna, A., Suttle, C., Swalla, B.J., Takahashi, K.T., Tanaka, M., Tandberg, A.H., Tang, D., Tasker, M., Taylor, J., Taylor, J., Taylor, K., Tchesunov, A., Temereva, E., ten Hove, H., ter Poorten, J.J., Thirouin, K., Thomas, J.D., Thomas, W.W., Thuesen, E.V., Thurston, M., Thuy, B., Timi, J.T., Todaro, A., Todd, J., Trevisan Disaró, S., Tucker, G.C., Turon, X., Tyler, S., Uetz, P., Urbatsch, L., Uribe-Palomino, J., Urtubey, E., Utevsy, S., Uy, M., Vacelet, J., Vader, W., Väinölä, R., Valdés Florido, A., Valls Domedel, G., Van de Vijver, B., van Haaren, T., van Soest, R.W., Vázquez-García, B., Venekey, V., Verhoeff, T., Verloove, F., Vinarski, M., Volkova, P., Vonk, R., Vos, C., Vouilloud, A.A., Walker-Smith, G., Walter, T.C., Watling, L., Wayland, M., Wesener, T., Wetzel, C.E., Whipps, C., White, K., Wieneke, U., Williams, D.M., Williams, G., Williams, N., Wilson, K.L., Wilson, R., Witkowski, J., Xanthos, M., Xavier, J., Xu, K., Yano, O., Yu, D., Zanol, J., Zeidler, W., Zhang, S., Zhao, Z. & Zullini, A. (2025) World Register of Marine Species. VLIZ. Available from: <https://www.marinespecies.org> (accessed 13 March 2025)
- Chang, C.W., Chi, C.J., Chiu, Y.W. & Yang, C.M. (2013) *Ecological hotspot survey and dive site planning in the waters of the southern four islands of Penghu*. Marine National Park Headquarters, Kaohsiung, 187 pp. [in Chinese]
- Chen, I.-S. (2021) *Fishes of South Penghu Marine National Park*. Marine National Park Headquarters, Kaohsiung, 352 pp. [in Chinese]
- Chen, I.-S., Chen, J.T. & Harefa, T. (2024) A new species of the gobiid genus *Priolepis* (Teleostei: Gobiidae) from Taiwan. *Zootaxa*, 5550 (1), 66–77
- Chen, K.S., Chen, C.Y., Chang, Y., Chen, H.S. & Chen, M.H. (2023) A 2°C difference affecting the spatiotemporal distribution of small demersal fish assemblages in shallow tropical and subtropical waters of Western Taiwan. *Scientific Reports*, 13, 20113  
<https://doi.org/10.1038/s41598-023-47300-8>
- Chen, L.S., Liu, W.H. & Yen, H.L. (2019) Applying the System Conservation Planning Method to the South Penghu Marine National Park in Taiwan. *Journal of Coastal Research*, 96, 50–61  
<https://doi.org/10.2112/SI96-008.1>
- Chen, Y.K., Pan, C.Y., Wang, Y.C., Tseng, H.J., Su, B.K. & Lee, M.A. (2021) Interannual variability of larval fish assemblages associated with water masses in winter in the Taiwan Strait during 2007–2013. *Fisheries Science*, 87 (1), 131–144  
<https://doi.org/10.1007/s12562-020-01489-z>
- Chu, Y.W. (2015) *Ecological resource survey in the waters of the southern four islands of Penghu*. Marine National Park Headquarters, Kaohsiung, 201 pp. [in Chinese]
- Fricke, R., Eschmeyer, W.N. & Van der Laan, R. (Eds.) (2024) *Eschmeyer's Catalog of Fishes: Genera, Species, References*. Available from: <http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp> (accessed 13 July 2024)
- Hsieh, H.Y., Lo, W.T., Wu, L.J., Liu, D.C. & Su, W.C. (2011) Comparison of distribution patterns of larval fish assemblages in the Taiwan Strait between the northeasterly and southwesterly monsoons. *Zoological Studies*, 50 (4), 491–505
- Jeng, M.S., Dai, C.F., Chen, J.P., Wang, W.L. & Meng, P.J. (2009) *Ecological resource survey of the surrounding waters of Dongyupingyu, Xiyupingyu, Dongjiyu, and Xijiyu in southern Penghu*. Marine National Park Headquarters, Kaohsiung, 265 pp. [in Chinese]
- Lee, M.A., Yang, Y.C., Shen, Y.L., Chang, Y., Tsai, W.S., Lan, K.W. & Kuo, Y.C. (2013) Effects of an unusual cold-water intrusion in 2008 on the catch of coastal fishing methods around Penghu Islands, Taiwan. *Terrestrial, Atmospheric and Oceanic Sciences*, 24 (6), 1017–1026  
[https://doi.org/10.3319/TAO.2013.08.06.01\(Oc\)](https://doi.org/10.3319/TAO.2013.08.06.01(Oc))



- Marine National Park Headquarters (2014) *South Penghu Marine National Park Project Plan*. Marine National Park Headquarters, Kaohsiung, 215 pp. [in Chinese]
- McCook, L.J., Almany, M.L., Berumen, J.C., Day, A.I., Green, G.P., Jones, J.M., Leis, S., Planes, G.R., Russ, P.F., Sale, G. & Thorrold, S.R. (2009) Management under uncertainty: guide-lines for incorporating connectivity into the protection of coral reefs. *Coral Reefs*, 28, 353–366
- McCormick, M.I. & Choat, J.H. (1987) Estimating total abundance of a large temperate-reef fish using visual strip-transects. *Marine Biology*, 96, 469–478
- Shen, K.N., Hung, T.H. & Chen, I.S. (2024) A new species and two newly recorded species of Eviota (Teleostei: Gobiidae) from Taiwan. *Zootaxa*, 5550 (1), 32–40
- Tang, D.L., Kester, D.R., Ni, I-H., Kawamura, H. & Hong, H. (2002) Upwelling in the Taiwan Strait during the summer monsoon detected by satellite and shipboard measurements. *Remote Sensing of Environment*, 82 (2–3), 262–272  
[https://doi.org/10.1016/S0034-4257\(02\)00062-7](https://doi.org/10.1016/S0034-4257(02)00062-7)
- Tsai, W.S., Chung, C.S., Hsi, Y.L., Chu, Y.W. & Yi, Y.C. (2011) *Fisheries resources and ecologically sensitive area survey in the waters of the southern four islands of Penghu*. Marine National Park Headquarters, Kaohsiung, 236 pp. [in Chinese]