CHAPTER 14

FISHES OF THE COCOS (KEELING) ISLANDS

BY

G.R. ALLEN AND W.F. SMITH-VANIZ

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ABSTRACT

Extensive fish collections were obtained at the Cocos (Keeling) Islands by the Academy of Natural Sciences of Philadelphia in 1973 and the Western Australian Museum in 1989. The combined collections document the occurrence of 533 species. For many Indo-West Pacific fishes (about 85 species), Cocos represents their westernmost limit of distribution. The faunal composition is typical of Indo-West Pacific coral reefs. Only 5 percent of the ichthyofauna consists of exclusively Indian Ocean species. The largest families are as follows (number of species in parentheses): Labridae (54), Gobiidae (51), Pomacentridae (38), Apogonidae (30), Serranidae (30), Acanthuridae (25), Mullidae (24), Chondodontidae (23), Blenniidae (21), Scaridae (20), and Holocentridae (20). Collectively these 11 families comprise 65 percent of the fauna. Little or no endemism is present.

INTRODUCTION

The first fishes collected at the Cocos (Keeling) Islands were taken by the crew of the Beagle and subsequently reported by Jenyns (1842), who listed 10 species. Numerous fish records were recorded in a series of papers by Pieter Bleeker (1854-1859) that were published in Nieuw-Indisch Tijdschrift voor Nederlandisch Indie. Fish specimens were sent to Bleeker from the Cocos Islands by A. J. Anderson and G. Clunies-Ross. The Cocos fauna was summarised by Bleeker (1859) as consisting of approximately 104 species. Most of the fishes reported by Bleeker were eventually deposited in the Rijksmuseum in Leiden.

The only other major ichthyological collection from Cocos was made by C. A. Gibson-Hill, who visited the islands from January to November 1941. The fishes from this expedition were reported by Marshall (1950) and included 119 new records, thus raising the total species known from the island group to approximately 220. The Gibson-Hill collections are presently housed at the British Museum (Natural History).

In 1973 an expedition from the Academy of Natural Sciences of Philadelphia (ANSP) collected marine organisms at Cocos (Keeling) during February and March. Team members, including ichthyologists Patrick L. Colin and William Smith-Vaniz, collected fishes at 68 stations. A variety of collection methods were employed: rotenone

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(35 stations), explosives (17), quinaldine (14), angling (1), and spearing (31), usually as a supplemental means of collection. This effort resulted in a large fish collection consisting of 6,780 specimens in 1,443 lots. Approximately 425 species were obtained.

A team of biologists from the Western Australian Museum and Australian Institute of Marine Sciences conducted a faunal survey at Cocos (Keeling) during February 1989. Fishes were collected mainly with rotenone (24 stations), supplemented by spear and dip nets (1 station each). These efforts yielded a total of 1,814 specimens, including 465 lots and approximately 245 species. In addition, underwater observations were conducted in which the name of each species seen was written on a waterproof sheet. These "spot" identifications were based on the senior author's extensive experience in the Indo-Pacific region. Only fishes whose identity was absolutely certain were recorded. This method provided an additional 203 records, thus a total of 448 species was noted. The combined ANSP-Western Australian Museum collections (and observations) include a total of 533 species.

Many of the species reported by Bleeker (1859) and Marshall (1950) are junior synonyms or were based on misidentifications. It is beyond the scope of the present study to determine the current status of most of the species they listed. However, we estimate that only about 20 of their species represent additions not seen during the 1973 and 1989 visits. Therefore, the total known fish fauna of Cocos (Keeling) is approximately 550 species. The following species listed by Marshall (1950) almost certainly represent additions to the Cocos ichthyofauna: Albulidae - Albula vulpes (Linnaeus); Exocoetidae - Cheilopogon artisignis (Jenkins) and C. cyanopeterus (Valenciennes); Syngnathidae - Hipo-campus trimaculatus Leach; Ostraciidae - Lactoria cornuta (Linnaeus).

Some authors have questioned the provenance of material Bleeker reported as originating from Cocos (Keeling), including several new species he described from there. Dawson (1982) cited the type locality of Micrognathus andersoni (Bleeker) as "Novaselma, Kokos [Cocos] Is. [Indonesia]," and stated (p. 677) that Marshall's (1950) listing of the species (as M. brevirostris) from Cocos-Keeling is based on a "misidentification of the type-locality..." We do not agree with Dawson's assertion that Bleeker's material did not originate from Cocos-Keeling. In the introduction of his first paper Bleeker (1854a) gave the correct coordinates for "Kokos-eilandens" and referred to J. C. Ross. (These islands were originally settled in 1827 by a Scottish sea captain named John Clunies-Ross.) In a later paper Bleeker (1858) thanked both Dr A. J. Anderson "geneesheer" [= physician] and J.G.C. Ross "legevoenoedigen heerder" [= present-day administrator] of Cocos Island.

Through the kindness of Dr. Tyson Roberts we received a copy of a letter signed by A. J. Anderson (original deposited in the RMNH archives), with the heading "Cocos - July -1860," and addressed to Dr. Bleeker, concerning specimens of "treepang fish" [= Carapidae] that had been sent to Batavia. In the same letter Anderson asked to have Bleeker's European address (Bleeker returned to the Netherlands in September 1860) "in the event of my attaining other interesting specimens." No additional correspondence in the RMNH Bleeker files apparently exists concerning Cocos Is. (T. Roberts, in litt.). Presumably much of Bleeker's correspondence while he was in Batavia did not survive. In the absence of any evidence to the contrary, we conclude that all Bleeker's material stated to have come from "Kokos-eilandens" refers to Cocos-Keeling. Although we did not duplicate Bleeker's Cocos record of Micrognathus andersoni, it is a broadly distributed Indo-Pacific species and we have no reason to doubt its occurrence there.
SPECIES COMPOSITION AND ZOOGEOGRAPHY

The ichthyofauna of Cocos (Keeling) consists primarily of species that are associated with coral reefs. The largest families are summarized in Table 1. The families most speciose groups (Labridae, Gobiidae, Pomacentridae, Apogonidae, Serranidae, Acanthuridae, Muronidae, Chaetodontidae, Blenniidae, Scaridae and Holocentridae) account for 63 percent of the total fauna. These families are typically abundant throughout the tropical Indo-Pacific region. Most of these 11 families contain fishes that are diurnally active which either dwell on or near the reef surface, or forage on plankton a short distance above it. Exceptions are the nocturnal apogonids and holocentrids, and the crevice-dwelling mornys (muraenidae).

The fish fauna is similar to that of Christmas Island, the nearest land mass, lying about 850 km to the northeast. Allen and Steene (1987) recorded 573 species from Christmas, of which about 350 species also occur at the Cocos group. The approximately 175 species that are present at Cocos, but lacking at Christmas are primarily inhabitants of the lagoon, a habitat that does not occur at Christmas Island. It is more difficult to explain the occurrence of approximately 210 species of Christmas fishes that are apparently absent from Cocos (Keeling). Two of the most notable disparities are shown by the Serranidae and Blenniidae in which 25 and 14 species, respectively, and 7 genera in each family were found only at Christmas. Perhaps this anomaly can be at least partly be explained by the greater isolation of Cocos (Christmas Island is only about 250 km from Java).

Compared to other oceanic atolls the Cocos Group appears to have a relatively impoverished fish fauna. For example Randall and Randall (1988) and Winterbottom et al. (1989) recorded approximately 800 and 700 species, respectively, for the Marshall Islands in the central Pacific and Chagos Archipelago (incorporating several atolls) in the western Indian Ocean. There are probably several reasons for the diminished Cocos fauna including (1) its small physical size, (2) relative isolation and lack of surrounding “island stepping-stones,” and (3) lesser collecting activity. In addition, the extensive coral die-back at Cocos (Colin, 1977) may be responsible for the exclusion of some species.

Although we believe the ichthyofauna of Cocos has been reasonably well sampled (except for epipelagic fishes), we certainly did not collect all of the species of shorefishes that occur there. That the fauna may not be as well sampled as we would like to believe is suggested by the fact that a number of shallow-water, cryptic species were taken at only one of our combined 59 rotenone stations. Scorpaeodids are cryptic bottom dwellers (except Pterois spp.) yet, inexplicably, only 2 of 16 species we report from Cocos were collected or observed by both museum expeditions.

A zoogeographic analysis of the Cocos fauna is presented in Table 2. The majority of fishes have distributions that cover relatively wide areas in the Indo-Pacific region. There is a much greater affinity to the Western Pacific than to the Indian Ocean region. Indeed, only about 51 percent of the species are Indian Ocean forms. There is no endemism in the Cocos fish fauna, although one angelfish, Centropyge juculator, is known only from Cocos and Christmas Island and an undescribed goby of the genus Tripterygion may have the same distribution. The Indian Ocean coasts of Java and Sumatra are poorly sampled, however, and it is likely that one or both species will be found there eventually. Scorpaeodids keetingensis Marshall which, as the name suggests, Marshall (1950) believed to be endemic to the Cocos group is almost certainly a junior synonym of Scorpaeodids kelloggi (Jenkins) (W. N. Eschmeyer, pers. comm.). Nearly all of the reef
fishes found at Cocos are characterised by a pelagic larval stage of up to several weeks duration. Hence, the widespread nature of the individual species distributions.

ACKNOWLEDGMENTS

We thank the following individuals for assisting us in obtaining the correct scientific names for species in this checklist: Eugenia B. Böhike, Bruce B. Collette, William N. Eschmeyer, Ross W. Feltes, Thomas H. Fraser, Douglass F. Hoese, W. Holleman, Theodore W. Pietsch, John E. Rawlani, Jeffrey T. Williams, Richard W. Wirtztopn, Thosaporn Wongratana, and David J. Woodland. Curatorial assistance at the Academy of Natural Sciences was provided by Eugenia B. Böhike and William G. Saul, and at the Western Australian Museum by Kevin Smith.

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CHECKLIST OF COCOS (KEELING) FISHES

The following list includes fishes that were either collected or observed during 1973 and 1989 surveys. Asterisk or numbers preceding species names indicate the following distributional data: * = also known from Christmas Island; 1 = widespread Indo-Pacific or Indo-west Pacific; 2 = West Pacific species that reach their western distributional limit at Cocos (Keeling); 3 = Indian Ocean species (may include western extremity of west Pacific); 4 = Circumtropical or cosmopolitan; 5 = uncertain extralimital distribution; Square brackets appearing after each species citation indicate that specimens are deposited at the Academy of Natural Sciences, Philadelphia [P], the Western Australian Museum [W], or were observed only [O].

Sphyridae - Hammerhead sharks
4 *Sphyra lewini (Griffith and Smith, 1834) [O]

Carcharhinidae - Requiem sharks
1 *Carcharhinus amblyrhynchos (Bleeker, 1856) [P]
1 *C. melanopterus (Quoy and Gaimard, 1824) [O]
4 *Galeocerdo cuvier (Peten and LeSueur, 1822) [O]
1 *Triakodon obesus (Rippell, 1837) [O]

Mobulidae - Manta rays
4 *Manta birostris (Donndorf, 1798) [O]

Moringuidae - Worm eels
1 Moringua ferruginea Bliss, 1883 [W]
1 *M. javanica (Kaup, 1856) [W]
1 *M. microchir Bleeker, 1855 [P,W]

Chlopsidae - False morays
3 *Kaupichthys n. sp. [K. Tighe, pers. comm., 1993] [P,W]

Muraenidae - Moray eels
2 Anarchias cantonensis (Schultz, 1943) [P]
1 *A. seychellensis Smith, 1962 [P,W]
1 *Echidna nephilosa (Ahl, 1979) [P]
1 *E. polyaena (Richardson, 1844) [P]
2 *Enchelycore bayeri (Schultz, 1953) [W]
1 *E. pardalis (Temminck and Schlegel, 1842) [P,W]
2 *Enchelysassa cantia (Quoy and Guinard, 1824) [P]
1 *Gymnothorax enigmaticus McCosker and Randall, 1982 [W]
1 *G. hurvensis (Bleeker, 1857) [P]
1 G. fimbrinas (Bennett, 1831) [P,W]
1 *G. flavimarginatus (Rippell, 1830) [P,W]
1 *G. javanicus (Bleeker, 1859) [O]
1 *G. margaritophorus Bleeker, 1865 [P,W]
1 *G. melapterus Schultz, 1953 [P]
1 G. monochrous Bleeker, 1864 [P]
1 *G. monostigma (Regan, 1909) [P]
1 *G. rueppellii (McClelland, 1845) [P,W]
1 G. undulatus (Lacepède, 1803) [P,W]
1 *G. zonipectus Seale, 1906 [P,W]
1 *Sidera picta* (Ahl, 1789) [P,W]
1 *S. thysoides* (Richardson, i'845) [P,W]
1 *Uroperygius concolor* (Rüppell, 1838) [W]
1 *U. marmorata* (Lacepède, 1803) [W]
1 *U. xenodactylus* Bleeker, 1859 [P,W]

**Ophiidiidae** - Snake eels
2 *Callichthys carpotomus* (Bloch and Schneider, 1801) [W]
1 *Learurus somicinctus* (Lay and Benner, 1839) [P,W]
2 *Muraenichthys brevis* Günther, 1876 [P]
1 *M. laticeps* Ogilby, 1897 [W]
1 *M. marmoratus* Bleeker, 1857 [W]
2 *Schultziida johnstonensis* (Schultz and Wood, 1949) [W]

**Congidae** - Conger eels
1 *Conger cinereus* Rüppell, 1830 [W]
3 *Gorgasia maculata* Klauswitz and Eibl-Eibesfeldt, 1959 [P,W]
1 *Heteroconger hassi* (Klauswitz and Eibl-Eibesfeldt, 1959) [F,W]

**Clupeidae** - Herrings
1 *Sardinella melanura* (Cuvier, 1829) [P]
1 *Spruzzioides delicatus* (Bennet, 1831) [P,W]

**Synodontidae** - Lizardfishes
1 *Saurida gracilis* (Quoy and Gaimard, 1824) [W,P]
1 *Synodus exigilargus* Schultz, 1953 [P]

**Channidae** - Milkfishes
1 *Chanos chanos* (Forskål, 1775) [O]

**Ophidiidae** - Cusk-eels
1 *Brotula multilineata* Temminck and Schlegel, 1846 [P,W]

**Bythitidae** - Viviparous broolrases
1 *Brotophiophychs paucilae* Schultz, 1960 [P,W]
5 *Ogilibia sp.

**Antennariidae** - Anglerfishes
1 *Anennaria coccinea* (Lesson, 1831) [P,W]
1 *A. dorensis* Bleeker, 1859 [P,W]

**Notocheiridae** [=Sonidae] - Surf spires
3 *Iso natantia* Regan, 1919 [P]

**Hemirhampidae** - Halfbeaks
1 *Hyporhamphus affinis* (Günther, 1866) [P,W]
1 *H. duvaucelii* (Valenciennes, 1847) [P]
2 *Zarnarchgerges dispar* (Valenciennes, 1847) [W]

**Belonidae** - Needlefishes
1 *Platychelus argus* (Bennett, 1831) [W]
1 *Tylopus crocodilus* (Péron and LeSueur, 1821) [P]
Holocentridae - Squirrelfishes
1 *Myripristis adusta* Bleeker, 1853
1 *M. berndti* Jordan and Evermann, 1903
1 *M. chryseres* Jordan and Evermann, 1903
1 *M. kastree* Cuvier, 1831
1 *M. mardjan* (Forsskal, 1775)
1 *M. parvidens* Cuvier, 1829
1 *M. pratinca* Cuvier, 1829
1 *M. vistata* Valenciennes, 1831
1 *M. violaceus* Bleeker, 1851
1 *Neoniophon argenteus* (Valenciennes, 1831)
1 *N. opercularis* (Valenciennes, 1831)
1 *N. sannana* (Forsskal, 1775)
1 *Plectropomus latus* (Valenciennes, 1831)
1 *Sargocentron diadema* (Lacepède, 1801)
1 *S. lepros* (Allen and Cross, 1983)
1 *S. microstoma* (Günther, 1859)
1 *S. caudimaculatum* (Rüppell, 1838)
1 *S. punctatissimum* (Cuvier, 1829)
1 *S. tieare* (Cuvier, 1829)
1 *S. spiniferum* (Forsskal, 1775)

Aulostomidae - Trumpetfishes
1 *Aulostomus chinensis* (Linnaeus, 1766)

Fistulariidae - Cornetfishes
1 *Fistularia commersoni* Rüppell, 1838

Syngnathidae - Pipefishes
1 *Chaenesthes sculpus* (Günther, 1870)
1 *Corythoichthys flavofasciatus* (Rüppell, 1838)
1 *Cosmocampus banneri* (Herald and Randall, 1972)
1 *Doryphorus excisa excisa* Kaup, 1856
1 *Microgymnus brevirostris pygmaeus* Fretzche, 1981
1 *Phoxinus belcheri* (Kaup, 1856)

Scorpaenidae - Scorpionfishes
1 *Parascorpaena mossambica* (Peters, 1855)
1 *Pterois antennata* (Bloch, 1787)
1 *P. radiata* Cuvier, 1829
1 *P. vittata* (Linnaeus, 1758)
[We follow Schultz (1986) in recognizing *Pterois miles* Bennett as an Indian Ocean species distinct from the Pacific *P. vittata*.]
1 *Scorpaenodes albicentris* (Evermann and Seale, 1907)
1 *S. guentheri* (Quoy and Gaimard, 1824)
1 *S. hirsuta* (Smith, 1957)
1 *S. kelloggi* (Jenkins, 1903)
1 *S. littoralis* (Tanaka, 1917)
1 *S. minor* (Smith, 1958)
1 *S. parvipinnis* (Garrett, 1863)
1 *Scorpaenopsis diabolus* (Cuvier, 1829)
1 *Sebastapistes cyanostigma* (Bleeker, 1856)
1 *S. strongia* (Cuvier, 1829)
5 Sebastapistes sp.
1 *Synanceia verrucosa* Bloch and Schneider, 1801

Platycephalidae - Flatheads
1 *Thysanophrys otaiensis* (Cuvier, 1829)

Caracanthidae - Orbicular velvetfishes
2 *Caracanthus maculatus* (Gray, 1831)
1 *C. anipinnis* (Gray, 1831)

Serranidae - Sea basses
[We follow Baldwin and Johnson (1993) in including the Grammistidae and Pseudogrammidae in this family.]
1 *Anoplotheres leucogrammicus* (Valenciennes, 1828)
1 *Cephalopholis argus* Bloch and Schneider, 1801
1 *C. leopardus* (Lacepède, 1801)
1 *C. polleni* (Brecker, 1868)
1 *C. pilipa-papua* (Valenciennes, 1828)
1 *C. luteus* (Valenciennes, 1828)

Randall (1991 p.70) noted that this species consists of two allopatric color forms, the western Indian Ocean *C. nigripinnis* (Valenciennes) and the nominal Pacific form; he regarded them as conspecific because Christmas Is. specimens have somewhat intermediate color patterns. The color pattern of Cocos specimens agrees well with the Pacific form.

3 *Epinephelus javanae* (valenciennes, 1828)
1 *E. fuscoocellaris* (Forsskal, 1775)
1 *E. hexagonatus* (Bloch and Schneider, 1801)
2 *E. maculatus* Bloch, 1790
1 *E. merra* Bloch, 1793
1 *E. macrolepis* (Bloeker, 1855)

Randall (1991 p.187) noted that this species consists of two allopatric color forms, the western Indian Ocean *E. cylindricus* Günther said to differ from the Pacific and eastern Indian Ocean *E. macrolepis* by larger and more closely spaced spots. Because only spot size appeared to distinguish the two forms they were considered to be conspecific.

1 *E. microdon* (Bloeker, 1856)
1 *E. plisothorax* (Forsskal, 1853)
1 *E. karwina* (Forsskal, 1775)
1 *Glicgia albomarginata* (Fowler and Bean, 1930)
1 *Grammistes sexlineatus* (Thunberg, 1792)
5 *Luzonichthys* sp.
2 *Plectranthias nanus* Randall, 1980
1 *Plectranthias areolatus* Rippel, 1828
2 *P. leopardus* (Lacepède, 1802)
2 *P. maculatus* (Bloch, 1790)
1 *Pseudanthias cooperi* (Regan, 1902)
3 *P. evansi* Smith, 1954
2 *P. smithianus* (Randall and I abbock, 1981)
5 *Pseudanthias* sp.

[Winterbottom et al. (1989) give color photographs (plates IVE,F) of this species, which they report as *Anthias* sp. from the Chagos Archipelago.]

2 *Pseudogramma biroleatris* (Schultz, 1943)
1 *P. polyacantha* (Bloeker, 1856)
10

2 *Satureia lineata* Gotline, 1960
1 *Variosa lophi* (Forsskål, 1775) [W]

Pseudochromidae - Dottybacks
1 *Pseudoplecostom n. sp.* [P]
2 P. multiqartatus Allen, 1987 [P]

Plesiopidae - Longfins
1 *Plesiops coerulolineatus* Rüppell, 1835 [P]
2 *P. corallicola* Bleecker, 1853 [P]

Kuhliidae - Flagtails
1 *Kuhlia mugil* (Bloch and Schneider, 1801) [P]

Priacanthidae - Bigeyes
1 *Heteropriacanthus cruentatus* (Lacepède, 1801) [P]

Apogoniidae - Cardinalfishes
1 *Apogon anguineus* (Smith and Radcliffe, 1911) [P]
2 A. bandanensis Bleecker, 1854 [P]
1 A. crassiceps Garman, 1903 [P]
1 A. cyanosoma Bleecker, 1853 [P]
2 A. dispar Fraser and Randall, 1976 [P]
1 *A. evermanni* Jordan and Snyder, 1904 [P]
1 A. exostigma (Jordan and Starks, 1906) [P]
1 A. guarnierii Valenciennes, 1832 [P]
1 *A. kallopterus* Bleecker, 1856 [P]
1 A. leptacanthus Bleecker, 1856 [P]
2 A. melas Bleecker, 1848 [W]
2 *A. novemfasciatus* Cuvier, 1828 [P]
1 A. taeniophorus Regan, 1908 [P]
1 A. taenioporus (Bennett, 1835) [P]
1 *Apteronotus ocellatus* (Weber, 1913) [P]
1 A. peridi Bleecker, 1854 [P]
1 *Ceratotrichon ephippium* Allen, 1987 [P]
1 Chelidodipsis lineatus Cuvier, 1828 [W]
2 C. macrodon (Lacepède, 1802) [P]
1 *C. quinquelineatus* Cuvier, 1828 [P]
1 *Fowleria aurita* (Valenciennes, 1831) [P]
1 F. isostigma (Jordan and Starks, 1906) [P]
1 F. variegata (Valenciennes, 1832) [W]
2 Gymnapogon urospilotus Lachner, 1953 [P]
1 Neamos octospina Smith and Radcliffe, 1912 [P]
1 *Pseudanis gelatinosa* Smith, 1955 [P]
2 *Pseudanis praeflicauda* Lachner, 1953 [P]
1 Rhombamia gracilis (Bleecker, 1856) [O]
2 Sphingamia majimae Matsubara and Iwai, 1959 [F]
2 Sphaeramia nematoptera (Bleecker, 1856) [P]

Malacanthidae - Tilefishes
1 *Malacanthus brevirostris* Guichenot, 1848 [P]
1 *M. latovitmanus* (Lacepède, 1801) [P]
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<tr>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
<th>Year</th>
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<tr>
<td>Carangidae - Trevallies</td>
<td><em>Carangoides fordia</em> (Forskål, 1775)</td>
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<td><em>C. orthogrammus</em> (Jordan and Gilbert, 1882)</td>
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<td><em>Caranx ignobilis</em> (Forskål, 1775)</td>
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<td><em>C. lugubris</em> Poey, 1860</td>
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<td><em>C. melanopus</em> Cuvier, 1833</td>
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<td><em>C. sexfasciatus</em> Quoy and Gaimard, 1825</td>
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<td><em>Decapterus macarellus</em> (Cuvier, 1833)</td>
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<td><em>Elagatis bipinnulatus</em> (Quoy and Gaimard, 1825)</td>
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<td><em>Scomberoides lystus</em> (Forskål, 1775)</td>
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<td><em>Trachinotus balee</em> (Lacepède, 1801)</td>
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<td><em>T. blochii</em> (Lacepède, 1801)</td>
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<td>Lutjanidae - Snappers</td>
<td><em>Aphareus fasciatus</em> (Lacepède, 1802)</td>
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<td><em>Aprius viridescens</em> Valenciennes, 1830</td>
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<td><em>Lutjanus bohar</em> (Forskål, 1775)</td>
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<td><em>L. fulvus</em> (Bloch and Schneider, 1801)</td>
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<td><em>L. gibbus</em> (Forskål, 1775)</td>
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<td><em>L. kasmira</em> (Forskål, 1775)</td>
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<td><em>L. monosigma</em> (Cuvier, 1828)</td>
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<td><em>Macolor niger</em> (Forskål, 1775)</td>
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<td>Caesionidae - Fusiliers</td>
<td><em>Caesio teres</em> Seale, 1906</td>
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<td><em>C. xanthonota</em> Bleeker, 1855</td>
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<td><em>Pterocaesio lativittata</em> Carpenter, 1987</td>
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<td><em>P. tile</em> (Cuvier, 1830)</td>
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<td>Haemulidae - Squirrelfishes</td>
<td><em>Plectorrhinchus chaetodonoides</em> (Lacepède, 1800)</td>
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<td>Lethrinidae - Emperor</td>
<td><em>Gnathodentex aurolineatus</em> (Lacepède, 1802)</td>
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<td><em>Gymnocephalus granulosus</em> (Valenciennes, 1830)</td>
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<td><em>Lebistes atkinsoni</em> Seale, 1909</td>
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<td><em>L. kahak</em> (Forskål, 1775)</td>
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<td><em>L. hyslopeterus</em> Bleeker, 1873</td>
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<td><em>L. lentjan</em> (Lacepède, 1802)</td>
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<td><em>L. microdon</em> Valenciennes, 1830</td>
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<td><em>L. osoleta</em> (Forskål, 1775)</td>
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<td><em>L. xanchochilus</em> Klunzinger, 1870</td>
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<td><em>Monotaxis grandoculis</em> (Forskål, 1775)</td>
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<td>Nemipteridae - Threadfin Breams</td>
<td><em>Scelopristis lineatus</em> (Quoy and Gaimard, 1824)</td>
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<td>Gerreidae - Mojarra</td>
<td><em>Gerres acinaces</em> Bleeker, 1854</td>
<td>[W]</td>
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<td>Mullidae - Goatfishes</td>
<td><em>Mullus flavolineatus</em> (Lacepède, 1801)</td>
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<td><em>M. vanicolensis</em> (Valenciennes, 1831)</td>
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1 Parapeneus barberinus (Lacepède, 1801) [P.W]
1 *P. bifasciatus (Lacepède, 1801) [P.W]
1 *P. cyclostomus (Lacepède, 1801) [P]
1 *P. macronemus (Lacepède, 1801) [O]
2 *P. multifasciatus (Quoy and Gaimard, 1824) [P.W]
1 *P. pleurostigma (Bennett, 1831) [P.W]

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1 *Kyphosus cineraceus (Forskål, 1775) [P]
1 K. vaigiensis (Quoy and Gaimard, 1825) [O]

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1 *Pempheris ovalensis Cuvier, 1831 [P.W]

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1 *Platx orbicularis (Forskål, 1775) [O]
1 *P. teira (Forskål, 1775) [P]

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1 *Chaetodon auriga (Forskål, 1775) [P.W]
1 C. bennetti Cuvier, 1831 [P]
1 C. citrinellus Cuvier, 1831 [P]
1 C. ephippium Cuvier, 1831 [P.W]
3 C. guatamallis Bennett, 1831 [P]
1 C. klenii Bloch, 1790 [P]
1 C. linearis Cuvier, 1830 [P]
1 C. lunula (Lacepède, 1803) [P.W]
3 C. madagaskariensis Ahl, 1923 [P]
1 C. melannota Bloch and Schneider, 1801 [P]
1 C. nigricans Bloch and Schneider, 1801 [P]
3 C. nitrtus Günther, 1860 [P]
1 C. ornatus Cuvier, 1831 [P]
1 C. seminiflor Bleeker, 1855 [P]
1 *C. trifasciatus Quoy and Gaimard, 1824 [P]
1 *C. trifasciatus Park, 1797 [P.W]
2 C. utile Cuvier, 1831 [P.W]
1 C. unimaculatus Bloch, 1787 [P]
1 C. vagabundus Linnaeus, 1758 [P.W]
1 *Forcipiger flavissimus Jordan and McGregor, 1898 [P.W]
2 *Hemipterus polyplepis (Bleeker, 1857) [P]
1 Heniochus chrysostomus Cuvier, 1831 [P]
1 *H. monoceros Cuvier, 1831 [P]

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1 *Apolenichthys trimaculatus (Lacepède, 1831) [P]
2 Centropyge colini Smith-Vaniz and Randall, 1974 [P]
1 *C. flavissimus (Cuvier, 1831) [P.W]
3 C. joculator Smith-Vaniz and Randall, 1974 [P.W]
2 C. multifasciatus (Smith and Radcliffe, 1911) [P]
2 Genicanthus bellus Randall, 1975 [P.W]
1 *Pomacanthus imperator (Bloch, 1787) [P]

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1 *A. budegadis notatus* (Day, 1869)  
1 *A. septemfasciatus* (Cuvier, 1830)  
1 *A. xordidus* (Forskal, 1775)  
1 *A. vaigiensis* (Quoy and Gaimard, 1825)  
2 *Amblyopsis/ophiophodon aureus* (Cuvier, 1830)  
2 *A. caracara* (Bloch, 1787)  
1 *Amphipristis clarkii* (Bennett, 1830)  
2 *Atherina perspicillata* Bleeker, 1855  
2 *Chromis beta* Randall, 1988  
2 *C. amboinensis* (Bleeker, 1873)  
3 *C. ariipes* Fowler and Bean, 1928  
2 *C. caudalii* Randall, 1988  
2 *C. delta* Randall, 1988  
3 *C. dimidiata* (Kunzinger, 1871)  
1 *C. elathea* Fowler and Bean, 1928  
1 *C. epidermis* Bleeker, 1877  
2 *C. margaritifer* Fowler, 1946  
3 *C. nigra* Smith, 1960  
3 *C. opucularis* (Günther, 1867)  
1 *C. terna* Randall, 1988  
1 *C. viridis* (Cuvier, 1830)  
2 *C. xenarcha* (Bleeker, 1854)  
1 *Chrysiptera biocellata* (Quoy and Gaimard, 1824)  
1 *C. glauca* (Cuvier, 1830)  
1 *Dascyllus aruanus* (Linnæus, 1758)  
2 *D. reticulatus* (Richardson, 1846)  
1 *D. trimaculatus* (Rüppell, 1828)  
1 *D. turridus* (Richardson, 1846)  
1 *D. tricirrhatas bimaculata* (Jenkins, 1903)  
2 *C. oxycephalus* (Bleeker, 1855)  
1 *Citharodus spinulatus* (Schneider, 1801)  
1 *Oxyrrhines typus* Bleeker, 1857  
1 *Paracrinites arcaea* (Cuvier, 1829)  
1 *P. forsteri* (Schneider, 1801)  
2 *P. hemistictus* (Günther, 1874)  
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**Cirrhilabidae - Hawkfishes**  
1 *Amblycirrhus bimaculatus* (Jenkins, 1903)  
2 *Cirrhichthys angirus* (Cuvier, 1829)  
1 *C. oxycephalus* (Bleeker, 1855)  
1 *Citharodus spinulatus* (Schneider, 1801)  
1 *Oxyrrhines typus* Bleeker, 1857  
1 *Paracrinites arcaea* (Cuvier, 1829)  
1 *P. forsteri* (Schneider, 1801)  
2 *P. hemistictus* (Günther, 1874)  

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1 *Liza vaigiensis* (Quoy and Gaimard, 1824)
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4 *Sphyraena barracuda* (Walbaum, 1792) [P,W]
1 *S. flavicauda* Rüppell, 1838 [P]

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1 *Polyduetis ocellaris* (Valenciennes, 1831) [P]

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1 *Anampses coeruleopunctatus* Rüppell, 1829 [P]
1 *A. melleagris* Valenciennes, 1840 [P]
1 *A. twistii* Bleeker, 1856 [P]
1 *Bodianus rhiochus* (Bennett, 1830) [P,W]
1 *B. australis* (Valenciennes, 1831) [P]
1 *B. clarius* (Lacepède, 1801) [P]
1 *Chelidonurus bicirrhus* Valenciennes, 1840 [O]
1 *C. chloropus* (Bloch, 1791) [P,W]
1 *C. fasciatus* (Bloch, 1791) [P]
1 *C. triobatus* Lacepède, 1801 [P]
1 *C. undulatus* Rüppell, 1835 [P,W]
2 *C. unifasciatus* Stears, 1877 [O]
1 *Chelito inermis* (Forskål, 1775) [P]
1 *Cirrhilabrus exquissus* Smith, 1957 [P]
2 *Cirrhilabrus rubromarginatus* Randall, 1992 [P]
1 *Coris aygula* Lacepède, 1801 [P]
2 *C. dorosomaculata* (Fowler, 1908) [W]
1 *C. gaimard* (Quoy and Gaimard, 1824) [P,W]
1 *Cymolestes praetextatus* (Quoy and Gaimard, 1834) [P,W]
1 *Ephelis insidiosa* (Pallas, 1770) [P,W]
2 *Gomphosus varius* Lacepède, 1803 [P,W]
2 *Halicoreops choropetermin* (Bloch, 1791) [P]
1 *H. hortulanus* (Lacepède, 1801) [P]
1 *H. marginatus* Rüppell, 1835 [P,W]
2 *H. melapion* Randall, 1980 [P]
2 *H. ornatus* (Garrett, 1863) [P,W]
1 *H. scapularis* (Bennett, 1823) [O]
2 *H. tricuspidatus* (Quoy and Gaimard, 1834) [P,W]
1 *Hemigymnus fasciatus* (Bloch, 1792) [P]
1 *H. melapterus* (Bloch, 1791) [P]
1 *Hologymnus dolatus* (Lacepède, 1801) [P]
1 *Labroides bicolor* Fowler and Bean, 1928 [P]
1 *L. dimidiatus* (Valenciennes, 1839) [P,W]
2 *L. pectoralis* Randall and Springer, 1975 [P]
1 *Labrops samboniana* Randall, 1981 [P]
2 *Macropharyngodon melaeagris* (Valenciennes, 1839) [P,W]
1 *Novaculichthys macrolepidotus* (Bloch, 1791) [W]
1 *N. tenuis* Lacepède, 1801) [P,W]
1 *Pseudochilinus hematochilinus* (Bleeker, 1857) [P,W]
1 *P. occitana* Jenkins, 1900 [P]
2 *Pseudocoris australis* Fourmanoir, 1971 [P]
1 *Pseudodax moluccanus* (Valenciennes, 1839) [P]
2 *Serranochilus bandaneensis* (Bleeker, 1851) [P,W]
1 *S. strigiveni* (Bennett, 1832) [P,W]
1 *Thalassoma amblycephalum* (Bleeker, 1856) [P,W]
1 *T. hardwickei  (Bennett, 1828) [P, W]
2 *T. janusi  (Bleeker, 1856) [W]
3 *T. lunare  (Linneaus, 1758) [P]
4 *T. luteescens  (Lay and Bennett, 1839) [P, W]
5 *T. purpureum  (Forsskål, 1775) [P, W]
6 *T. quinquemittatum  (Lay and Bennett, 1839) [P, W]
7 *T. rutilatum  (Lacepède, 1801) [P]
8 *Xyrichtys annectens  (Günther, 1862) [P]
9 *X. pavo  Valenciennes, 1840 [P]

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1 *Bolbometopon muricatum  (Valenciennes, 1840) [O]
2 Calotomus carolus  (Valenciennes, 1840) [P]
3 C. spinicrenus  (Quoy and Gaimard, 1824) [P]
4 Hippocarassius longiceps  (Valenciennes, 1840) [P]
5 Leposcarus vaginatus  (Quoy and Gaimard, 1824) [P]
6 Scarus auropectoralis  Schultz, 1958 [P]
7 S. enneacanthus  Lacepède, 1802 [P, W]
8 S. forsteri  (Bleeker, 1861) [O]
9 S. frenatus  Lacepède, 1802 [P]
10 S. ghobban  Forsskål, 1775 [P]
11 S. globiceps  Valenciennes, 1840 [P]
12 S. nigripinnis  Forsskål, 1775 [O]
13 S. oviceps  Valenciennes, 1840 [P, W]
14 S. prasigmahos  Valenciennes, 1840 [P]
15 S. pristipinnis  Forsskål, 1775 [P]
16 S. rubrirostrineus  Bleeker, 1847 [O]
17 S. schlegelii  (Bleeker, 1861) [P]
18 S. sordidus  Forsskål, 1775 [P, W]
19 S. strongylocephalus  Bleeker, 1854 [P]
20 S. viridiflanus  (Smith, 1956) [P]

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1 *Parapercis clathrata  Ogilby, 1911 [P, W]
2 P. hexophthalma  (Cuvier, 1829) [P, W]
3 *P. schaunlandi  (Steindachner, 1900) [P]

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2 *Chelidonetus tenuis  Schultz, 1943 [P, W]
3 Limnichthys nitidus  Smith, 1958 [P]

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3 *Enneapterygius elegans  (Peters, 1876) [P]
4 *Enneapterygius intertialus  Jordan & Seale, 1906 [W]
5 *Enneapterygius sp. 1 [W]
6 Helicogramma capitata  Rosenblatt, 1960 [P]

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1 *Aspidontus taeniatus  Quoy and Gaimard, 1834 [P]
2 *A. taeniatus quoyi  (Quoy and Gaimard, 1834) [P]
3 *Cirrhiprion castaneus  (Valenciennes, 1836) [P, W]
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| 3. C. gilberti Williams, 1888 |
| 1. C. polyzona (Bleeker, 1868) |
| 1. C. quagga (Fowler and Ball, 1924) |
| 1. *Ectenia bicolor* (Day, 1888) |
| 1. *E. midas* Starck, 1969 |
| 2. *Entomacrodus caudofasciatus* (Regan, 1909) |
| 1. *E. epirodocheilus* (Bleeker, 1859) |
| 1. *E. striaus* (Quoy and Gaimard, 1836) |
| 1. *Exallius brevis* (Kner, 1868) |
| 1. *Glyptoparctus delicatus* Smith, 1959 |
| 2. *Istiblenis chrysoptilus* (Bleeker, 1857) |
| 1. *I. edentulus* (Schneider, 1801) |
| 1. *I. lineatus* (Valenciennes, 1836) |
| 1. *I. perispilthalis* (Valenciennes, 1836) |
| 1. *Petrocristes sesius* Jordan and Seale, 1906 |
| 1. *Plagiocheilus rhinorhynchos* (Bleeker, 1852) |
| 1. *P. tapelosomus* (Bleeker, 1857) |
| 1. Stanialis seychellenensis Smith, 1959 |

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1. *Diplogrammus goramensis* (Bleeker, 1858)

**Gobiidae - Gobies**

2. *Amblygobius decussatus* (Bleeker, 1855)
3. *A. phalaina* (Valenciennes, 1837)
3. *A. sencincucus* (Bennett, 1833)
3. *A. tekonai* (Smith, 1959)
1. *Asterropteryx semipunctatus* Rüppell, 1830
1. *Bathygobius coenosus* (Bleeker, 1854)
1. *B. cyclopus* (Valenciennes, 1837)
1. *Bryaninops ridens* Smith, 1959
1. *Cábilis tongarevae* (Fowler, 1927)
1. *Cálogobius maculipinnis* (Fowler, 1913)
1. *C. tami* (Steindachner, 1880)
5. *Calogobius sp.*
2. *Eviota lachildebere* Gilib, 1933
2. *E. latifasciata* Jewett and Lachner, 1983
1. *E. praetia* (Kunzinger, 1871)
5. *Eviota sp. 1*
5. *Eviota sp. 2*
5. *Eviota sp. 3*
5. *Eviota sp. 4*
1. *Euxias belissimas* (Smith, 1959)
1. *Fusigobius aoospilus* Hoese and Reader, 1985
1. *F. neophythus* (Günther, 1877)
5. *Fusigobius sp.*
1. *Gnatholepis anjerensis* (Bleeker, 1850)
3. *G. caurifer* (Bleeker, 1853)
5. *Gnatholepis sp.*
2. *Gobiodon inopinatus* Sawada, Arai, and Abe, 1973
1. *G. rivulatus* (Rüppell, 1830)
5 Oplophorus sp. [P,W]
1 Oplophorus oplophorus (Valenciennes, 1837) [P]
1 Palaturus prunatus (Jordan and Seale, 1906) [P]
1 Paragobiodon echinocephalus (Küppel, 1830) [P]
1 *Propterus cinzeta (Regan, 1908) [P]
1 P. inhaca (Smith, 1949) [P]
1 *P. seminudiceps (Valenciennes, 1837) [P,W]
2 Plesioprosopis prolata Watson and Lachner, 1985 [P]
1 Sueviota lacheeri Winterbottom and Hoese, 1988 [W]
1 *Trimma emeriti Winterbottom, 1985 [P,W]
1 T. hoesei Winterbottom, 1984 [W]
1 T. macrophthalmum (Tomiya and, 1936) [P,W]

1 *T. taylori Lobel, 1979 [P]
3 T. undosquamis (Godwin, 1959) [W]
3 T. winchi Winterbottom, 1984 [P]
3 *Trimma sp. [P,W]
2 *Trimma notata Winterbottom, 1989 [P]
1 *Valenciaeotes heldingi Bleecker, 1858 [P]
1 *V. sexguttata (Valenciennes, 1837) [P]
1 *V. stigrata (Broussonet, 1787) [P]
1 Vanderhorstia ornatisima Smith, 1959 [P,W]

 Xenisthiidae - Sandfishes
3 Xenisthias africana Smith, 1958 [P,W]
2 X. clara (Jordan and Seale, 1906) [P,W]

Microdesmidae - Hovegobies
[We follow Randall and Hoese (1985) in including Nemateleotris and Ptereleotris in this family.]

1 *Gunnichthys monostigma Smith, 1958 [W]
1 *Nemateleotris decora Randall and Allen, 1973 [P]
1 N. magnifica Fowler, 1938 [P]
1 *Ptereleotris eidei (Jordan and Hubbs, 1925) [P]
1 *P. heteroptera (Bleecker, 1855) [P]
1 *P. microlepis (Bleecker, 1856) [P,W]
1 *P. zebra (Fowler, 1938) [P]

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1 Kraemeria samoensis Steindachner, 1906 [P]

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1 *Acanthurus biocellatus Valenciennes, 1835 [O]
2 *A. guttatus Bloch and Schneider, 1801 [O]
2 A. leucosternon Bennett, 1832 [P]
1 *A. lineata (Linnaeus, 1758) [O]
2 A. maculicruris (Ahl, 1923) [O]
1 *A. mani (Cuvier, 1829) [P]
2 *A. nigricans (Linnaeus, 1758) [O]
1 *A. nigricauda Duncker and Mohr, 1929 [O]
1 *A. nigrofasciatus (Parson, 1775) [W]
1 A. nigrolineatus Valenciennes, 1835 [P]
2 *A. olivaceus Bloch and Schneider, 1801 [P]
1 *A. pyroferus Kirtlitz, 1834 [O]
1 *A. thompsoni (Fowler, 1923)  [P]
1 *A. triostegus (Linnaeus, 1758)  [P]
1 *A. xanthopterus Valenciennes, 1835  [O]
1 *Clinocheilus striatus (Quoy and Gaimard, 1825)  [P,W]
1 *C. ariegoensis (Bennett, 1828)  [P,W]
1 *Naso brevirostris (Valenciennes, 1835)  [P]
1 *N. hexacanthus (Bleeker, 1855)  [P]
1 *N. fluminensis (Bloch and Schneider, 1801)  [P,W]
1 *N. unicinctus (Forskål, 1775)  [P,W]
1 *N. vlmonghii (Valenciennes, 1835)  [P]
1 *Paracanthorhina hepatus (Linnaeus, 1766)  [P]
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[Most recent authors have recognized this Indian Ocean surgeonfish as a subspecies of the Pacific Z. veliferum. We follow Burgess (1973) in recognizing them both as distinct species, and note that in contrast to Cocos, Christmas Is. fish have the typical veliferum coloration.]

1 *Z. scopas (Cuvier, 1829)  [P,W]

Zanclidae - Moorish Idols
1 *Zanclus cornutus (Linnaeus, 1758)  [P]

Siganidae - Rabbitfishes
1 Siganus argenteus (Quoy and Gaimard, 1825)  [P]
2 S. puellus Schlegel, 1852  [P]
2 S. punctatus (Bloch and Schneider, 1801)  [P]
3 S. stellatus Forsskål, 1775  [O]

Scombridae - Tunas
4 *Acanthocybium solandri (Cuvier, 1831)  [O]
1 *Gnoscia undulata (Lönnberg, 1876)  [O]
4 *Thunnus albacares (Bonnet, 1788)  [O]

Bothidae - Flounders
1 *Bothus ocellatus (Bonnaterre, 1782)  [P,W]
1 *B. pantherinus (Rüppell, 1830)  [W]

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5 *Aeroglossus sp. 1  [P]
5 *Aeroglossus sp. 2  [P]

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1 *Balistapus undulatus (Park, 1797)  [P]
1 *Balistoides viridescens (Bloch and Schneider, 1801)  [G]
1 *Melichthys indicus Randall and Klauswitz, 1973  [P]
4 *M. niger (Bloch, 1786)  [P]
1 *M. vidua (Solander, 1844)  [P]
1 *Odonus niger (Rüppell, 1837)  [P]
1 *Pseudobalistes flavomarginatus (Rüppell, 1829)  [P,W]
1 Rhinecanthus aculeatus (Linnaeus, 1758)  [P,W]
1 *R. rectangulus (Bleeker and Schneider, 1801)  [P]
1 *Saginus bursa (Bloch and Schneider, 1801)  [P]
1 *S. chrysopeus (Bloch and Schneider, 1801)  [P]
1 S. fraenatus (Latreille, 1804)  [P]
1 *Xanthichthys auromarginatus* (Bennett, 1831) [P]
1 *X. caeruleolineatus* Randall, Matsumura and Zama, 1978 [O]

**Monacanthidae** - Leatherjackets
4 *Alaterus scribus* (Osebeck, 1765) [P]
1 *Canthichthys dumerilli* (Hollard, 1854) [P]
1 *C. parazis* (Rüppell, 1837) [O]
1 *Pteragon espiritaus* (Hollard, 1854) [P,W]

**Ostracionidae** - Boxfishes
1 *Ostracion cubicus* Linnaeus, 1758 [P,W]

**Tetraodontidae** - Puffers
1 *Arothron hispidus* (Linnaeus, 1758) [P,W]
1 *A. nigropunctatus* (Bloch and Schneider, 1801) [P]
1 *Carpichthys amboinensis* (Bloeker, 1865) [P]
1 *C. bennetti* (Bloeker, 1854) [P]
1 *C. janthineoptera* (Bloeker, 1855) [P,W]
1 *C. valentinii* (Bloeker, 1855) [P]

**Diodontidae** - Porcupinefishes
4 *Diodon hystrix* Linnaeus, 1758 [P]
<table>
<thead>
<tr>
<th>Family</th>
<th>number of species</th>
<th>shared</th>
<th>CK (%)</th>
<th>CI (%)</th>
<th>CK only</th>
<th>CI only</th>
<th>app. only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labridae</td>
<td>54 (10.2)</td>
<td>43</td>
<td>11</td>
<td>16</td>
<td></td>
<td></td>
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</tr>
<tr>
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<td>18</td>
<td>33</td>
<td>18</td>
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<tr>
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<td>31</td>
<td>7</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>12</td>
<td>20</td>
<td>10</td>
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</tr>
<tr>
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<td>19</td>
<td>11</td>
<td>25</td>
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</tr>
<tr>
<td>Acanthuridae</td>
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<td>24</td>
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<tr>
<td>Murridae</td>
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<td>4</td>
<td>14</td>
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</tr>
<tr>
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<td>15</td>
<td>4</td>
<td>8</td>
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</tr>
<tr>
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<td>21 (4.0)</td>
<td>14</td>
<td>7</td>
<td>14</td>
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<tr>
<td>Scaridae</td>
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<td>11</td>
<td>9</td>
<td>6</td>
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</tr>
<tr>
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<td>8</td>
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<tr>
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<td>5</td>
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<tr>
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<td>2</td>
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<tr>
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<td></td>
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<tr>
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</tr>
<tr>
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<td>4</td>
<td>3</td>
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<tr>
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<td>0</td>
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</tr>
<tr>
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<td>2</td>
<td>3</td>
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</tr>
</tbody>
</table>

The following families of epipelagic fishes were unsampled or undersampled at Cocos (Keeling) Island, and to make the above faunal comparisons more meaningful, species of these families are not included in the total fauna counts (percentages were also calculated using the adjusted totals): Rhincodontidae, Exocoetidae, Coryphaenidae, Gempylidae, Scrombidae and Istigliformes.
<table>
<thead>
<tr>
<th>Distribution</th>
<th>No. species</th>
<th>percent of total fauna</th>
</tr>
</thead>
<tbody>
<tr>
<td>Widespread Indo-Pacific</td>
<td>308</td>
<td>72.8</td>
</tr>
<tr>
<td>or Indo-west Pacific</td>
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<td></td>
</tr>
<tr>
<td>West Pacific &amp; Cocos Is.</td>
<td>85</td>
<td>15.9</td>
</tr>
<tr>
<td>Indian ocean</td>
<td>31</td>
<td>5.8</td>
</tr>
<tr>
<td>Circuatroptical</td>
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<tr>
<td>Uncertain</td>
<td>17</td>
<td>3.2</td>
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<tr>
<td><strong>total</strong></td>
<td><strong>533</strong></td>
<td><strong>100.0</strong></td>
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Also known from Christmas Is. 154 46.4