A contribution to marine life conservation efforts in the South Pacific: The Shark Reef Marine Reserve, Fiji

by

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ABSTRACT. - The first estimate of the fish biodiversity of Shark Reef Marine Reserve (SRMR), Fiji, is provided with special emphasis on elasmobranchs. In 2004, nine elasmobranch species were regularly observed at the site. The most common were the bull shark *Carcharhinus leucas* and the grey reef shark *Carcharhinus amblyrhynchos*. During the fish count made in fall 2004 a total of 267 species of fishes were recorded at SRMR, including members of 37 families, the most diverse being that of the Labridae. SRMR could serve as a model to implement the local marine conservation efforts; this can only be achieved by the creation of an integrated management system taking into consideration all human activities and their impacts.

RÉSUMÉ. - Contribution aux efforts de conservation de la vie marine dans le Pacifique sud : la réserve marine de Shark Reff, Fidji.

La biodiversité ichtyologique de la réserve marine de Shark Reef (SRMR), située aux îles Fidji, est évaluée pour la première fois, avec une attention particulière pour les élasmobranches. En 2004, neuf espèces d'élasmobranches ont été régulièrement observées sur le site. Les requins les plus communs étaient le requin-bouledogue *Carcharhinus leucas* et le requin gris de récif *Carcharhinus amblyrhynchos*. Au cours de l'estimation effectuée à l'automne 2004, un total de 267 espèces a été recensé, comprenant des représentants de 37 familles, la plus diversifiée étant celle des Labridae. La réserve marine de Shark Reef pourrait servir de modèle pour concrétiser les efforts de conservation de la vie marine locale ; ce qui pourrait être réalisé par la création d'un système de gestion intégrée prenant en compte toutes les activités humaines et leurs impacts.

Key words. - Sharks - Elasmobranchii - ISEW - Fiji - Fish Biodiversity - Marine Protected Areas.

Large, long-lived vertebrates such as large fishes and sharks were the first to disappear from coastal ecosystems in response to human activities because of their life history characteristics and attention-attracting size (Jackson, 2001). Early population decline of large animals defines the first major transition in the history of coastal marine ecosystems. In many cases, the near-extirpation of large vertebrates preceded ecological investigations, so that their absence has been uncritically accepted as the natural "baseline" condition (Jackson, 1997). Reduced populations of larger fishes and habitat destruction have an immediate impact upon many economic and social activities because various uses of wildlife provide income, sustenance, or recreation for millions of people. It is therefore not surprising that interest in the conservation of biodiversity is increasing among the general public, as well as among behavioural ecologists who study wild animals and their environment.

One approach to marine conservation for particularly valuable sites involves the creation of small marine protected areas (MPAs), which try to accomplish ecological, economic, and social objectives such as recreation, education, and research (Bonfil, 1999). However, effective conservation of the marine environment can only be achieved by the creation of integrated management regimes, which deal with all human activities and their effects, including both social objectives and fisheries management (Davis *et al.*, 1997; Gell and Roberts, 2003). Biological recovery inside marine reserves appears to develop quickly, which facilitates the management of marine resources (Halpern and Warner, 2002).

Fulfilment of the various objectives of an MPA is difficult to measure. In most cases, baseline data (e.g. species diversity "before" and "after") are missing. Sites that are protected to some degree and used for recreation, education and research can be a promising way to foster non fishery-dependent marine conservation. However, such sites should be monitored closely because they have an immediate economic value (e.g. recreational divers want to know what species they can expect to see). It is therefore important when implementing an MPA that a survey be done collecting baseline data for future comparison and development of the park.

This paper reports a first, non-definitive fish species count for Shark Reef Marine Reserve (SRMR) with special

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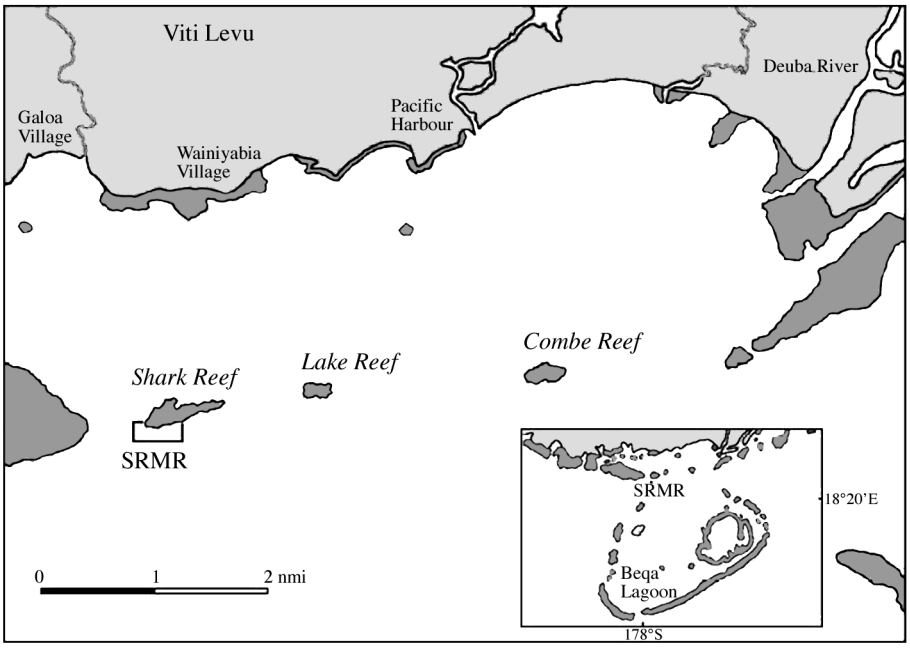

Figure 1. - Location of Shark Reef Marine Reserve (SRMR) between Beqa Lagoon (inset) and the southern coast of Viti Levu. Dark grey areas indicate reef structures. *[Localisation de la réserve marine de Shark Reef (SRMR) entre le lagon Beqa (encart) et la côte sud de Viti Levu. Les zones gris foncé indiquent les structures réci - fales.]*

emphasis on elasmobranchs. Within the elasmobranch fishes, special attention is given to the bull shark, *Carcharhinus leucas* (Valenciennes in Müller and Henle, 1839), which is currently the Reserve's main attraction. SRMR is part of a small patch reef called Shark Reef (SR) on a fringing reef located off the southern coast of Viti Levu, Fiji (Fig. 1). In recent years SR has been used as a shark diving site by a local dive operator who, together with the Minister of Fisheries and Forestry and the local villages, which traditionally own the fishing rights on SR, established SRMR in April 2003.

MATERIAL AND METHODS

The marine reserve SRMR (18°18'S, 178°01'E) is located on Shark Reef and covers approximately 300 m of the reef, encompassing an area that stretches to 300 m beyond the marker buoys. Since the official establishment of the Shark Reef Marine Reserve over the course of the year 2003, the local villagers are not allowed to fish in SRMR, but receive a "shark levy" of F$10 per diver per day in exchange. To attract large shark species, fish scraps are offered on a regular basis.

During 2003 an observer was trained to identify different shark species that visit SRMR. From January to December 2004, during each dive the observer noted the total number of individuals from all shark species present, as well as their sex whenever it could be determined. Dives always took place during the mornings (between 9 a.m. and noon) and to a maximum depth of 30 m. During 7 scuba dives between September 28 and October 1, 2004, a fish species count was conducted at SRMR by the second author to estimate fish diversity at the site. Depth for his census ranged from 3 m to 30 m. The purpose of this fish count was to provide divers visiting SRMR with a list of fishes they can expect to see there.

RESULTS

In 2004, we conduted 282 dives at SRMR. As a result, a total of eight shark species and one ray species were encountered at the site (Fig. 2): *Carcharhinus leucas*, *Negaprion acutidens* (Rüppell, 1837), *Galeocerdo cuvier* (Péron and Lesueur, 1822), *Carcharhinus albimarginatus* (Rüppell, 1837), *Nebrius ferrugineus* (Lesson, 1831), *Carcharhinus amblyrhynchos* (Bleeker, 1856), *Carcharhinus melanopterus* (Quoy and Gaimard, 1824), *Triaenodon obesus* (Rüppell, 1837), and *Aetobatus narinari* (Euphrasen, 1790). With the exception of *G. cuvier*, all species were seen throughout the year, although some of them in low numbers. *G. cuvier* were not seen in the months of January, February, May, June, August, and September. The most abundant species at SRMR was *C. leucas*, followed by *C. amblyrhynchos*. The average number of *C. leucas* seen per month decreased over the course of the year, with the lowest numbers from October to December (Fig. 2). This was also the time of the year when the highest numbers of *C. amblyrhynchos* were recorded.

Annexe I presents the list of the 267 species of fishes that were seen at SRMR during 7 fish survey dives by the second author. We have added *G. cuvier* and *A. narinari* to the list,

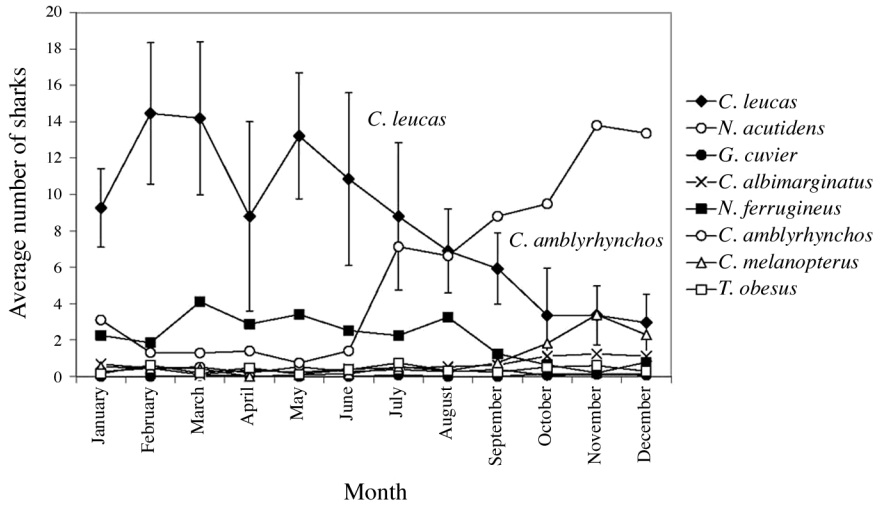

Figure 2. - Average numbers of the different shark species per dive encountered each month at Shark Reef, Beqa Lagoon, Fiji, in 2004. For *Carcharhinus leucas*, standard deviations are shown. *[Nombres moyens des différentes espèces de requins rencontrées en plongée chaque mois à Shark Reef, Lagon Beqa, îles Fidji, en 2004. Pour* Carcharhinus leucas, *l'écart-type est indiqué.*

both of which were observed at the site at other times during 2004. We also added *Manta birostris* (Walbaum, 1792) which has been observed by others at this site, but was not seen during the year 2004. The Labridae is the family represented by the greatest number of species, with a total of 45.

DISCUSSION

Determining where and how protected areas should be implemented is a complex issue that is of primary interest to conservation biologists, as protected areas will play a critical role in helping to protect biodiversity in the future (Deguise and Kerr, 2006). Economic importance is a criterion often used when deciding whether an area is to be designated as a MPA (Kelleher and Kenchington, 1992). In recent years an increasing number of recreational divers have visited SRMR, mainly because of its shark abundance. This is an obvious preliminary indication of the success of SRMR. However, our data provide no evidence as to how the local fish community has responded to the establishment of the marine park. To evaluate the ecosystem within SRMR, fish diversity will have to be quantified through time and habitat surveys will have to be conducted in conjunction with future fish surveys. Furthermore, to ascertain with confidence the influence of establishing and managing a protected area on the welfare of local people, it will be vital that conservation and social scientists conduct rigorous, controlled studies (Wilkie *et al.*, 2006).

Fish species counts and fauna inventories can serve as a baseline for future studies that aim at estimating short- and long-term effects of MPA management decisions. The 267 species of fish (Annexe I) is a high species count for a few dives in a limited area for an island in the South Pacific. The abundance of fishes at SRMR may be the result of both the prohibition of fishing and the shark feeding itself, which provides many food scraps for other species. It is important to note that our approach overlooked inconspicuous species and did not yield quantitative estimates of relative abundance. Accordingly, the list has few species such as gobies (only one of which is listed in annexe I), which would normally be the largest group in a survey for an area (Hawaii excepted) using standard methodology. This makes it difficult to meaningfully compare the SRMR osteichthyes fish list with lists from other areas using different methodology. Despite these constraints, the list can still contribute important information to the increasing marine conservation efforts in the region (Bazilchuk, 2006).

With the exception of *N. acutidens*, all elasmobranch species observed at SRMR in 2004 are confirmed for Fijian waters (Compagno, 1984; Last and Stevens, 1994). They all range at least to French Polynesia, although a single record of *C. leucas* from Rangiroa in the Tuamotu Archipelago reported by Johnson (1978) is undoubtedly a stray. *C. amblyrhynchos, C. melanopterus, G. cuvier, T. obesus*, and *A. narinari* range to the Pitcairn Islands (Randall, 1999). Of the sharks listed in annexe I, only *G. cuvier* occurs at Easter Island.

The number of *C. leucas* seen at SRMR is not constant, but decreases over the course of a calendar year, with most sightings in the first half of the year (Fig. 2). The pattern of a varying number of *C. leucas* present at a particular site can also be seen in other parts of the world, such as the Bahamas where most bull sharks leave the area in spring and early summer each year (Brunnschweiler and Van Buskirk, 2006). A likely explanation for a seasonal departure of *C. leucas* is that sharks move to mating sites and nursery grounds. Brunnschweiler and Van Buskirk (2006) confirmed a female bull shark swimming from Walker's Cay in the Bahamas into a known bull shark nursery (Snelson *et al.*, 1984) on the

Florida east coast within 12 days in spring. Currently, no nurseries or mating sites are known, and no quantitative data is available on the threat bull sharks are facing in Fijian waters and how closed areas would benefit this species. Thus, the ecological case for protection of an area can less often be based on concepts of critical habitat of endangered species or threat of extinction, it may more readily be based on protection of critical or important habitat for commercially or recreationally important species (Kelleher and Kenchington, 1992).

The establishment of SRMR is a first step to protect the fish fauna of a small reef patch off the southern coast of Viti Levu. This MPA, even if relatively small, could boost stocks outside the reserve sufficiently to benefit local fishermen and thus win their support. Under the guidance of a responsible dive operator, visitors to SRMR gain insight into how conditions might have been before human activity perturbated natural systems by removal of top level predators and unsustainable fisheries. The teaching of an ethical basis for respect of natural systems, which evolved over millions of years, but can be extinguished in several fishing seasons, may be the only viable long-term approach. The education to instill a conservation ethic can lead to the preservation of ecosystem values (Caddy and Seijo, 2005). Arrangements that respect local claims and interests while also benefiting conservation goals are imperative.

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Annexe I. - List of fish species observed by diving between September 28 and October 1st 2004, at Shark Reef, Beqa Lagoon, Fiji. Depth range 3 to 30 m. *[Liste des espèces observées en plongée entre le 28 septembre et le 1er octobre 2004 à Shark Reef, Lagon Beqa, îles Fidji. 3 à 30 m de profondeur.]*

Elasmobranchii

Carcharhinidae (requiem sharks)
Carcharhinus albimarginatus (Rüppell, 1837)
Carcharhinus amblyrhynchos (Bleeker, 1856)
Carcharhinus leucas (Val. *in* Müller & Henle, 1839)
Carcharhinus melanopterus (Quoy & Gaimard, 1824)
Galeocerdo cuvier (Péron & Lesueur, 1822)
Negaprion acutidens (Rüppell, 1837)
Triaenodon obesus (Rüppell, 1837)
Ginglymostomatidae (nurse sharks)
Nebrius ferrugineus (Lesson, 1831)
Mobulidae (devilrays)
Manta birostris (Walbaum, 1792)
Myliobatidae (eagle rays)
Aetobatus narinari (Euphrasen, 1790)

Teleostei

Acanthuridae (surgeonfishes)
Acanthurus blochii Valenciennes *in* C & V, 1835
Acanthurus lineatus (Linnaeus, 1758)
Acanthurus mata (Cuvier, 1829)
Acanthurus nigricans (Linnaeus, 1758)
Acanthurus nigricauda Duncker & Mohr, 1929
Acanthurus nigrofuscus (Forsskål, 1775)
Acanthurus nigrorus Valenciennes *in* C & V, 1835
Acanthurus pyroferus Kittlitz, 1834
Acanthurus thompsoni (Fowler, 1923)
Acanthurus xanthopterus Valenciennes *in* C & V, 1835
Ctenochaetus binotatus Randall, 1955
Ctenochaetus cyanocheilus Randall & Clements, 2001
Ctenochaetus striatus (Quoy & Gaimard, 1825)
Naso brevirostris (Cuvier, 1829)
Naso hexacanthus (Bleeker, 1855)
Naso lituratus (Forster, 1801)
Naso unicornis (Forsskål, 1775)
Naso vlamingii (Valenciennes in C & V, 1835)
Zebrasoma scopas (Cuvier, 1829)
Zebrasoma veliferum (Bloch, 1795)
Apogonidae (cardinalfishes)
Ostorhinchus angustatus (Smith & Radcliffe, 1911)
Ostorhinchus cyanosoma (Bleeker, 1883)
Ostorhinchus nigrofasciatus (Lachner, 1953)
Pristiapogon kallopterus (Bleeker, 1856)
Aulostomidae (trumpetfishes)
Aulostomus chinensis (Linnaeus, 1766)
Balistidae (triggerfishes)
Balistapus undulatus (Park, 1797)
Balistoides conspicillum (Bloch & Schneider, 1801)
Balistoides viridescens (Bloch & Schneider, 1801)
Melichthys vidua (Solander *in* Richardson, 1845)
Odonus niger (Rüppell, 1836)
Rhinecanthus rectangulus (Bloch & Schneider, 1801)
Sufflamen bursa (Bloch & Schneider, 1801)
Blenniidae (blennies)
Cirripectes castaneus (Valenciennes in C & V, 1836)
Cirripectes variolosus (Valenciennes in C & V, 1836)
Escenius bicolor (Day, 1888)
Meiacanthus oualanensis (Günther, 1880)
Plagiotremus laudandus (Whitley, 1961)
Plagiotremus rhinorhynchos (Bleeker, 1852)
Caesionidae (fusiliers)
Caesio caerulaurea Lacepède, 1801
Caesio teres Seale, 1906
Pterocaesio marri Schultz *in* Schultz *et al*., 1953
Pterocaesio pisang (Bleeker, 1853)
Pterocaesio trilineata Carpenter, 1987
Caracanthidae (coral crouchers)
Caracanthus maculatus (Gray, 1831)
Carangidae (jacks)
Caranx ignobilis (Forsskål, 1775)
Caranx melampygus Cuvier *in* C & V, 1833
Caranx sexfasciatus Quoy & Gaimard, 1825
Elagatis bipinnulata (Quoy & Gaimard, 1825)
Gnathanodon speciosus (Forsskål, 1775)
Chaetodontidae (butterflyfishes)
Chaetodon auriga Forsskål, 1775
Chaetodon baronessa Cuvier, 1829
Chaetodon bennetti Cuvier *in* C & V, 1831
Chaetodon citrinellus Cuvier *in* C & V, 1831
Chaetodon ephippium Cuvier *in* C & V, 1831
Chaetodon kleinii Bloch, 1790
Chaetodon lunulatus Quoy & Gaimard, 1825
Chaetodon mertensii Cuvier *in* C & V, 1831
Chaetodon pelewensis Kner, 1868
Chaetodon plebeius Cuvier *in* C & V, 1831
Chaetodon rafflesii Bennett, 1830
Chaetodon reticulatus Cuvier *in* C & V, 1831
Chaetodon ulietensis Cuvier *in* C & V, 1831
Chaetodon unimaculatus Bloch, 1787
Chaetodon vagabundus Linnaeus, 1758
Forcipiger flavissimus Jordan & McGregor *in* Jordan & Evermann, 1898
Forcipiger longirostris (Broussonet, 1782)
Hemitaurichthys polylepis (Bleeker, 1857)
Heniochus acuminatus (Linnaeus, 1758)
Heniochus chrysostomus Cuvier *in* C & V, 1831
Heniochus diphreutes Jordan, 1903
Heniochus singularis Smith & Radcliffe, 1911
Heniochus varius (Cuvier, 1829)
Cirrhitidae (hawkfishes)
Cirrhitichthys falco Randall, 1963
Neocirrhites armatus Castelnau, 1873
Paracirrhites arcatus (Cuvier *in* C & V, 1829)
Paracirrhites forsteri (Bloch & Schneider, 1801)
Paracirrhites hemistictus (Günther, 1874)
Echeneidae (remoras)
Echeneis naucrates Linnaeus, 1758
Remora remora (Linnaeus, 1758)
Fistulariidae (cornetfishes)
Fistularia commersonii Rüppell, 1838
Gobiidae (gobies)
Coryphopterus signipinnis (Hoese & Obika, 1988)
Haemulidae (sweetlips and grunts)
Plectorhinchus chaetodonoides Lacepède, 1801
Plectorhinchus picus (Cuvier *in* C & V, 1830)
Plectorhinchus vittatus (Linnaeus, 1758)
Holocentridae (soldierfishes and squirrelfishes)
Myripristis berndti Jordan & Evermann, 1903

Myripristis hexagona (Lacepède, 1802)
Myriprystis kuntee Valenciennes *in* C & V, 1831
Myripristis murdjan (Forsskål, 1775)
Myripristis pralinia Cuvier *in* C & V, 1829
Myripristis violacea Bleeker, 1851
Myripristis vittata Valenciennes *in* C & V, 1831
Neoniphon sammara (Forsskål, 1775)
Sargocentron caudimaculatum (Rüppell, 1838)
Sargocentron diadema (Lacepède, 1802)
Sargocentron microstoma (Günther, 1859)
Sargocentron spiniferum (Forsskål, 1775)
Sargocentron violaceum (Bleeker, 1853)
Kyphosidae (sea chubs)
Kyphosus cinerascens (Forsskål, 1775)
Labridae (wrasses)
Anampses caeruleopunctatus Rüppell, 1829
Anampses geographicus Valenciennes *in* C & V, 1840
Anampses neoguinaicus Bleeker, 1878
Anampses twistii Bleeker, 1856
Bodianus anthioides (Bennett, 1832)
Bodianus axillaris (Bennett, 1832)
Bodianus diana (Lacepède, 1801)
Bodianus loxozonus (Snyder, 1908)
Cheilinus chlorourus (Bloch, 1791)
Cheilinus fasciatus (Bloch, 1791)
Cheilinus trilobatus Lacepède, 1801
Cheilinus undulatus Rüppell, 1835
Cirrhilabrus exquisitus Smith, 1957
Cirrhilabrus punctatus Randall & Kuiter, 1989
Coris dorsomacula Fowler, 1908
Coris gaimard (Quoy & Gaimard, 1824)
Epibulus insidiator (Pallas, 1770)
Gomphosus varius Lacepède, 1801
Halichoeres biocellatus Schultz, 1960
Halichoeres hortulanus (Lacepède, 1801)
Halichoeres marginatus Rüppell, 1835
Halichoeres ornatissimus (Garrett, 1863)
Halichoeres prosopeion (Bleeker, 1853)
Hemigymnus fasciatus (Bloch, 1792)
Hemigymnus melapterus (Bloch, 1791)
Hologymnosus annulatus (Lacepède, 1801)
Hologymnosus doliatus (Lacepède, 1801)
Labroides bicolor Fowler & Bean, 1928
Labroides dimidiatus (Valenciennes *in* C & V, 1839)
Labropsis xanthonota Randall, 1981
Macropharyngodon meleagris (Val. *in* C & V, 1839)
Oxycheilinus digrammus (Lacepède, 1801)
Oxycheilinus orientalis (Günther, 1862)
Pseudocheilinus evanidus Jordan & Evermann, 1903
Pseudocheilinus hexataenia (Bleeker, 1857)
Pseudocheilinus octotaenia Jenkins, 1901
Pseudodax moluccanus (Valenciennes *in* C & V, 1840)
Pteragogus cryptus Randall, 1981
Stethojulis bandanensis (Bleeker, 1851)
Thalassoma amblycephalum (Bleeker, 1856)
Thalassoma hardwicke (Bennett, 1830)
Thalassoma lunare (Linnaeus, 1758)
Thalassoma lutescens (Lay & Bennett, 1839)
Thalassoma nigrofasciatum Randall, 2003
Thalassoma quinquevittatum (Lay & Bennett, 1839)
Lethrinidae (emperors)
Lethrinus atkinsoni Seale, 1910
Lethrinus erythracanthus Valenciennes *in* C & V, 1830
Lethrinus olivaceus Valenciennes *in* C & V, 1830
Lethrinus xanthochilus Klunzinger, 1870
Monotaxis grandoculis (Forsskål, 1775)
Lutjanidae (snappers)
Aphareus furca (Lacepède, 1801)
Lutjanus bohar (Forsskål, 1775)
Lutjanus fulviflamma (Forsskål, 1775)
Lutjanus fulvus (Forster, 1801)
Lutjanus gibbus (Forsskål, 1775)
Lutjanus kasmira (Forsskål, 1775)
Lutjanus monostigma (Cuvier *in* C & V, 1828)
Lutjanus rivulatus (Cuvier *in* C & V, 1828)
Lutjanus semicinctus Quoy & Gaimard, 1824
Macolor niger (Forsskål, 1775)
Monacanthidae (filefishes)
Aluterus scriptus (Osbeck, 1765)
Cantherhines dumerilii (Hollard, 1854)
Mullidae (goatfishes)
Parupeneus barberinus (Lacepède, 1801)
Parupeneus crassilabris (Valenciennes *in* C & V, 1831)
Parupeneus cyclostomus (Lacepède, 1801)
Parupeneus multifasciatus (Quoy & Gaimard, 1825)
Parupeneus pleurostigma (Bennett, 1831)
Muraenidae (moray eels)
Gymnothorax flavimarginatus (Rüppell, 1830)
Gymnothorax javanicus (Bleeker, 1859)
Gymnothorax meleagris (Shaw, 1795)
Nemipteridae (breams and spinecheeks)
Scolopsis bilineatus (Bloch, 1793)
Ostraciidae (trunkfishes)
Ostracion cubicus Linnaeus, 1758
Ostracion meleagris Shaw, 1796
Pempheridae (sweepers)
Pempheris oualensis Cuvier *in* Lesson, 1831
Pempheris schwenkii Bleeker, 1855
Pinguipedidae (sandperches)
Parapercis clathrata Ogilby, 1911
Pomacanthidae (angelfishes)
Centropyge bicolor (Bloch, 1787)
Centropyge bispinosa (Günther, 1860)
Centropyge flavissima (Cuvier *in* C & V, 1831)
Genicanthus melanospilos (Bleeker, 1857)
Pomacanthus imperator (Bloch, 1787)
Pomacanthus semicirculatus (Cuvier *in* C & V, 1831)
Pygoplites diacanthus (Boddaert, 1772)
Pomacentridae (damselfishes)
Abudefduf sexfasciatus (Lacepède, 1801)
Abudefduf vaigiensis (Quoy & Gaimard, 1825)
Amblyglyphidodon aureus (Cuvier in C & V, 1830)
Amblyglyphidodon orbicularis (Hombron & Jacquinot, 1853)
Amphiprion chrysopterus Cuvier *in* C & V, 1830
Amphiprion clarkii (Bennett, 1830)
Amphiprion melanopus Bleeker, 1852
Amphiprion perideraion Bleeker, 1855
Chromis alpha Randall, 1988
Chromis amboinensis (Bleeker, 1873)
Chromis atripes Fowler & Bean, 1928
Chromis chrysura (Bliss, 1883)
Chromis delta Randall, 1988
Chromis iomelas Jordan & Seale, 1906
Chromis lepidolepis Bleeker, 1877
Chromis margaritifer Fowler, 1946
Chromis viridis (Cuvier *in* C & V, 1830)

Chromis weberi Fowler & Bean, 1928
Chromis xanthura (Bleeker, 1854)
Chrysiptera brownriggii (Bennett, 1828)
Chrysiptera rollandi (Whitley, 1961)
Chrysiptera taupou (Jordan & Seale, 1906)
Dascyllus reticulatus (Richardson, 1846)
Dascyllus trimaculatus (Rüppell, 1829)
Neopomacentris metallicus (Jordan & Seale, 1906)
Plectroglyphidodon dickii (Liénard, 1839)
Plectroglyphidodon johnstonianus Fowler & Ball, 1924
Plectroglyphidido lacrymatus (Quoy & Gaimard, 1825)
Pomacentrus brachialis Cuvier *in* C & V, 1830
Pomacentrus callainus Randall, 2002
Pomacentrus coelestis Jordan & Starks, 1901
Pomacentrus imitator (Whitley, 1964)
Pomacentrus nigromarginatus Allen, 1973
Pomacentrus spilotoceps Randall 2002
Pomacentrus vaiuli Jordan & Seale, 1906
Stegastes fasciolatus (Ogilby, 1889)
Ptereleotridae (dartfishes)
Nemateleotris magnifica Fowler, 1938
Ptereleotris evides (Jordan & Hubbs, 1925)
Scaridae (parrotfishes)
Cetoscarus ocellatus (Valenciennes *in* C & V, 1840)
Chlorurus bleekeri (Beaufort *in* Weber & de Beaufort, 1940)
Chlorurus japanensis (Bloch, 1789)
Chlorurus microrhinos (Bleeker, 1854)
Chlorurus sordidus (Forsskål, 1775)
Hipposcarus longiceps (Valenciennes *in* C & V, 1840)
Scarus altipinnis (Steindachner, 1879)
Scarus chameleon Choat & Randall, 1986
Scarus frenatus Lacepède, 1802
Scarus ghobban Forsskål, 1775
Scarus niger Forsskål, 1775
Scarus psittacus Forsskål, 1775
Scarus rivulatus Valenciennes *in* C & V, 1840
Scarus rubroviolaceus Bleeker, 1847
Scarus schlegeli (Bleeker, 1861)
Scarus spinus (Kner, 1868)
Scorpaenidae (scorpionfishes)
Pterois volitans (Linnaeus, 1758)
Pterois radiata Cuvier *in* C & V, 1829
Serranidae (groupers and allies)
Anyperodon leucogrammicus (Val. *in* C & V, 1828)
Belonoperca chabanaudi Fowler & Bean, 1930
Cephalopholis argus Bloch & Schneider, 1801
Cephalopholis leopardus (Lacepède, 1801)
Cephalopholis spiloparaea (Val. *in* C & V, 1828)
Cephalopholis urodeta (Forster, 1801)
Epinephelus fuscoguttatus (Forsskål, 1775)
Epinephelus lanceolatus (Bloch, 1790)
Epinephelus macrospilos (Bleeker, 1855)
Epinephelus maculatus (Bloch, 1790)
Epinephelus polyphekadion (Bleeker, 1849)
Plectropomus leopardus (Lacepède, 1802)
Pseudanthias pascalus (Jordan & Tanaka, 1927)
Pseudanthias squamipinnis (Peters, 1855)
Serranocirrhitus latus Watanabe, 1949
Variola albimarginata Baissac, 1952
Variola louti (Forsskål, 1775)
Siganidae (rabbitfishes)
Siganus doliatus Cuvier, 1830
Siganus punctatus (Forster, 1801)
Siganus uspi Gawel & Woodland, 1974
Tetraodontidae (puffers)
Arothron mappa (Lesson, 1831)
Arothron nigropunctatus (Bloch & Schneider, 1801)
Zanclidae (moorish idols)
Zanclus cornutus (Linnaeus, 1758)