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 Reif, Fidji.

La biodiversité ichthyologique de la réserve marine de Shark Reef (SRMR), située aux îles Fidji, est évaluée pour la première fois, avec une attention particulière pour les elasmobranchs. En 2004, neuf espèces d’elasmobranchs ont été régulièrement observées sur le site. Les requins les plus communs étaient le requin-bouledegué *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...
emphasize 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 SRM with a list of fishes they can expect to see there.

**RESULTS**

In 2004, we conducted 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* (Bleecker, 1856), *Carcharhinus melanopterus* (Quoy and Gaimard, 1824), *Trienodon 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,
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 (Deguis 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 ostechytheys 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 perturbed 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.

Acknowledgements. - This research was supported by funding from Save Our Seas Foundation, Shark Foundation Switzerland, Project Aware Foundation and University of Zurich. We gratefully acknowledge Mike Neumann, Gary J. Adkison and the crew of Beqa Adventure Divers, without whose help this project would never have been possible. We also thank John Randall, Josh Van Buskirk and Jacqueline Earle for comments on the manuscript and the villagers of Wainiyabia and Galoa and the Fijian Ministry of Fisheries and Forestry for their support. The suggestions of one anonymous reviewer for improving the manuscript are greatly appreciated.

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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
- Carccharhinidae (requiem sharks)
  - Carcharhinus albimarginatus (Rüppell, 1837)
  - Carcharhinus amblyrhynchos (Bleeker, 1856)
  - Carcharhinus leucas (Valenciennes in Cuvier, 1835)
  - Carcharhinus melanopterus (Quoy & Gaimard, 1824)
  - Galeocerdo cuvier (Péron & Lesueur, 1822)
  - Negaprion acutidens (Rüppell, 1837)
  - Triakisodon obesus (Rüppell, 1837)
- Ginglymostomiatidae (nurse sharks)
  - Nebrius ferrugineus (Lesson, 1831)
- Apogonidae (cardinalfishes)
- Blenniidae (blennies)
- Balistidae (triggerfishes)
  - Balistapus undulatus (Park, 1797)
  - Balistoides conspicillum (Bloch & Schneider, 1801)
  - Balistoides viridescens (Bloch & Schneider, 1801)
  - Melichthys vidua (Solander in Richardson, 1845)
  - Odous niger (Rüppell, 1836)
  - Rhinecanthus rectangularis (Bloch & Schneider, 1801)
  - Safflumina bursa (Bloch & Schneider, 1801)
  - Blenniidae (blennies)
  - Cirripectes castaneus (Valenciennes in C & V, 1836)
  - Cirripectes variolosus (Valenciennes in C & V, 1836)
  - Ecsenius bicolor (Day, 1888)
  - Meiacanthus oualaniensis (Günther, 1880)
- Plagiostomidae (lancelets)
  - Plagiostomus laudandus (Whiteley, 1961)

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 (Forskal, 1775)
- Acanthurus nigrosus Valenciennes in C & V, 1835
- Acanthurus pyroferus Kittiitz, 1834
- Acanthurus thompsoni (Forowler, 1923)
- Acanthurus xanthonotus Valenciennes in C & V, 1835
- Ctenocharax fimbriatus Randall, 1955
- Ctenocharax cyanopenicilis Randall & Clements, 2001
- Ctenocharax striatus (Quoy & Gaimard, 1825)
- Naso brevirostris (Cuvier, 1829)
- Naso hexacanthus (Bleeker, 1855)
- Naso litoratus (Forster, 1801)
- Naso unicornis (Forskal, 1775)
- Naso vlamingi Valenciennes in C & V, 1835
- Zebrasoma scopas (Cuvier, 1829)
- Zebrasoma veliferum (Bloch, 1795)
- Apogonidae (cardinalfishes)
- Ostrihinus angustatus (Smith & Radcliffe, 1911)
- Ostrihinus cyanosoma (Bleeker, 1883)
- Ostrihinus nigrofasciatus (Lachner, 1953)
- Pteroaesio pisang (Bloch, 1787)
- Paracirrhites arota (Cuvier, 1830)
- Paracirrhites trifasciatus (Forsskål, 1775)
- Chaetodontidae (butterflyfishes)
- Chaetodon auriga (Forsskal, 1775)
- Chaetodon barbatus (Cuvier, 1829)
- Chaetodon bennetti (Cuvier in C & V, 1831)
- Chaetodon cirrhitus (Cuvier in C & V, 1831)
- Chaetodon ephippium Cuvier in C & V, 1831
- Chaetodon kleinii Bloch, 1790
- Chaetodon lunulatus Quoy & Gaimard, 1825
- Chaetodon mertensi Cuvier in C & V, 1831
- Chaetodon plei (Lacepède, 1801)
- Chaetodon plebeius Cuvier, 1830
- Chaetodon reticulatus Cuvier in C & V, 1831
- Chaetodon ulietensis Cuvier in C & V, 1831
- Chaetodon unimaculatus Bloch, 1787

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Myripristis hexagona (Lacepède, 1802)
Myripristis kentoo Valenciennes in C & V, 1831
Myripristis murdjan (Forsskål, 1775)
Myripristis pralina Cuvier in C & V, 1829
Myripristis violacea Bleeker, 1851
Myripristis vittata Valenciennes in C & V, 1831
Neoponypus sumamma (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 neoguineicus Bleeker, 1878
Anampses twistii Bleeker, 1856
Bodianus anthioides (Bennett, 1832)
Bodianus axillaris (Bennett, 1832)
Bodianus diana (Lacepède, 1801)
Bodianus loxozonus (Quoy & Gaimard, 1824)
Bodianus murdjan (Rüppell, 1835)
Bodianus purpureus (Bennett, 1832)
Bodianus twistii Bleeker, 1856
Bodianus axillaris (Bennett, 1832)
Cirrhilabrus aquilus 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 Ogilby, 1911
Halichoeres hortulanus (Lacepède, 1801)
Halichoeres marginatus Rüppell, 1835
Halichoeres ornatusimus Garrett, 1883
Halichoeres prosopeion (Bleeker, 1853)
Hemigymnus fasciatus (Blech, 1792)
Hemigymnus melanurus (Blech, 1791)
Hologymnus annulatus (Lacepède, 1801)
Hologymnus doliatus (Lacepède, 1801)
Labroides bicolor Fowler & Bean, 1928
Labroides dimidiatus (Valenciennes in C & V, 1839)
Labropsis xanthostoma Randall, 1981
Macroscyphusodon meleagris (Val. in C & V, 1839)
Oxycheilinus digrammus (Lacepède, 1801)
Oxycheilinus orientalis (Günther, 1862)
Pseudochelichthys evanius Jordan & Evermann, 1903
Pseudochelichthys hexataenia (Bleeker, 1857)
Pseudochelichthys octotaenia Jenkins, 1901
Pseudoxiphias moluccanus (Valenciennes in C & V, 1840)
Pteragonus cryptus Randall, 1981
Sithojulis bandanensis (Bleeker, 1851)
Thalassoma amblycephalum (Bleeker, 1856)
Thalassoma hardwicke (Bennett, 1830)
Thalassoma lunare (Linnaeus, 1758)
Thalassoma laticeps (Bennett, 1839)
Thalassoma nigrofasciatum Randall, 2003
Thalassoma quinquevittatum (Bleeker, 1853)
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 semincanus Quoy & Gaimard, 1824
Macolor niger (Forsskål, 1775)
Monacanthidae (filefishes)
Aluterus scriptus (Osbeck, 1765)
Cantherhines dumerilii (Holland, 1854)
Mullidae (goatfishes)
Parapeneus barberinus (Lacepède, 1801)
Parapeneus crassilabris (Valenciennes in C & V, 1831)
Parapeneus cyclostomus (Lacepède, 1801)
Parapeneus multifasciatus (Quoy & Gaimard, 1825)
Parapeneus pleurostigma (Bennett, 1831)
Muraenidae (moray eels)
Gymnothorax flavimarginatus (Rüppell, 1830)
Gymnothorax javanicus (Bleeker, 1859)
Gymnothorax meleagris (Shaw, 1796)
Nemipteridae (breams and spinechecks)
Scoplosis bilineatus (Blech, 1793)
Ostraciidae (trunkfishes)
Ostracion cubicus Linnaeus, 1758
Ostracion meleagris Shaw, 1796
Pempheridae (sweepers)
Pempheris ocellata Valenciennes in Lesson, 1831
Pempheris schwenkii Bleeker, 1855
Pinguipedidae (sandperches)
Parapercis clathrata Ogilby, 1911
Pomacanthidae (angelfishes)
Centropyge bicolor (Blech, 1787)
Centropyge bispinosa (Günther, 1860)
Centropyge flavissima (Valenciennes in C & V, 1831)
Genicanthus melanospilos (Bleeker, 1857)
Pomacanthus imperator (Blech, 1787)
Pomacanthus semicirculatus (Cuvier in C & V, 1831)
Pygoplites diacanthus (Blech, 1772)
Pomacentridae (damselfishes)
Abudelfafy sexfasciatus (Lacepède, 1801)
Abudelfafy vaigiensis (Quoy & Gaimard, 1825)
Amblyglyphidodon aureus (Cuvier in C & V, 1830)
Amblyglyphidodon orbitaculis (Hombron & Jacquinot, 1853)
Amphiprion chrysophus Cuvier in C & V, 1830
Amphiprion clarkii (Bennett, 1830)
Amphiprion melanopus Bleeker, 1852
Amphiprion perideraion Bleeker, 1855
Chromis alpha Randall, 1988
Chromis ambienesis (Bleeker, 1873)
Chromis atriopes Fowler & Bean, 1928
Chromis chrysura (Bliss, 1883)
Chromis delta Randall, 1988
Chromis iodelas Jordan & Seale, 1906
Chromis lepidocephalus Bleeker, 1877
Chromis margaritifer Fowler, 1946
Chromis viridis (Cuvier in C & V, 1830)
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Chromis weberi Fowler & Bean, 1928  
Chromis xanthura (Bleeker, 1854)  
Chrysiptera brownriggi (Bennett, 1828)  
Chrysiptera rollandi (Whitley, 1961)  
Chrysiptera taupou (Jordan & Seale, 1906)  
Dascyllus reticulatus (Richardson, 1846)  
Dascyllus trimaculatus (Rüppell, 1829)  
Neopomacentris metallicus (Jordan & Seale, 1906)  
Plectrogyphidodon dickii (Liénard, 1839)  
Plectrogyphidodon johnstonianus Fowler & Ball, 1924  
Plectrogyphidodon lacrymatus (Quoy & Gaimard, 1825)  
Pomacentrus brachialis Cuvier in C & V, 1830  
Pomacentrus callatus Randall, 2002  
Pomacentrus coelestis Jordan & Starks, 1901  
Pomacentrus imitator (Whitley, 1964)  
Pomacentrus nigromarginatus Allen, 1973  
Pomacentrus spilotoceps Randall 2002  
Pomacentrus vauxi Jordan & Seale, 1906  
Steigastes fasciolatus (Ogilby, 1889)  
Ptereleotridae (dartfishes)  
Nemateleotris magnifica Fowler, 1938  
Ptereleotris eides Jordan & Hubbs, 1925  
Scaridae (parrotfishes)  
Cetoscarus ocellatus (Valenciennes in C & V, 1840)  
Chlorurus bleekeri (Beaufort in Weber & de Beaufort, 1940)  
Chlorurus japonensis (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 rivalutus Valenciennes in C & V, 1840  
Scarus rubroviolaceus Bleeker, 1847  
Scarus schlegeli (Bleeker, 1861)  
Scarus spinus (Kner, 1868)  
Scorpinaeidae (scorpionfishes)  
Pterois volitans (Linnaeus, 1758)  
Pterois radiata Cuvier in C & V, 1829  
Serranidae (groupers and allies)  
Ankylorhodon leucogrammicus (Val. in C & V, 1828)  
Belonoperca chabanaudi Fowler & Bean, 1930  
Cephalopholis argus Bloch & Schneider, 1801  
Cephalopholis leopardus (Lacepède, 1801)  
Cephalopholis spilopareua (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  
Vargola albimarginata Baissac, 1952  
Vargola louti (Forsskål, 1775)  
Siganidae (rabbitfishes)  
Siganus dolliatus Cuvier, 1830  
Siganus punctatus (Forster, 1801)  
Siganus uncius Gawel & Woodland, 1974  
Tetraodontidae (puffers)  
Arothron mappa (Lesson, 1831)  
Arothron nigropunctatus (Bloch & Schneider, 1801)  
Zanclidae (moorish idols)  
Zanclus cornutus (Linnaeus, 1758)