

The Reef Ichthyofauna of Bahrain (Arabian Gulf) with Comments on its Zoogeographic Affinities

Gregory Smith,¹ Mostafa Saleh, and Khatoon Sangoor

University College of Bahrain,
P.O. Box 1082, Bahrain, Arabian Gulf.

ABSTRACT. Seventy-one species of fishes are recorded from shallow-water (4-15 m) reefs northeast of Bahrain in the Arabian Gulf. Most (39 spp.) of these range widely throughout the Indo-West Pacific Region; others exhibit more restricted distributions and help clarify zoogeographic relationships of the Arabian Gulf ichthyofauna.

Distributions of reef fishes support the notion of a major zoogeographic discontinuity within the Arabian Gulf. Moreover, levels of endemism for Arabian Gulf reef fishes are higher than hitherto recognized and may approach those of the Red Sea. A strong faunal relationship exists between the Red Sea and Arabian Gulf; seven species reported herein are Arabian endemics, *i.e.* restricted to the Red Sea, Arabian Peninsula, and Arabian Gulf. One species (*Ptereleotris* sp.) constitutes a new addition to the Arabian Gulf ichthyofauna. Additional species confirm dubious or frequently overlooked Arabian Gulf records. Previous checklists of Arabian Gulf reef fishes are emended in light of the most recent systematic literature.

The ichthyofauna of the Arabian Gulf remains poorly known. This is especially true for the coralophilic fishes. In his treatise on marine zoogeography, Briggs (1974:19) commented on the paucity of published information on Gulf biotas stating that the "northwestern boundary of the Western Indian Ocean Province is tentatively considered to occur at the entrance of the Arabian Gulf (Gulf of Oman) until more local distribution data are available." Rather arbitrarily, he concluded that the Arabian Gulf was within the Western Indian Ocean Province rather than the adjacent Indo-Polynesian Province to the east. Referral of the Gulf biota to one of these major biogeographic realms (based upon endemism levels) clearly awaited further studies in the area (Briggs 1974).

¹ Present address: Edison Community College, 8099 College Parkway S.W. Ft. Myers, Florida 33907, USA.

Much of the information on Arabian Gulf fishes has been gleaned from trawl collections (*e.g.*, Blevgad 1944, Kuronuma and Abe 1972 and Al-Baharna 1986) or fish market surveys (Randall *et al.* 1978; Relyea 1981) which include reef fishes only accidentally or incidentally.

ARAMCO biologists (Basson *et al.* 1977) have delineated and described biotopes in the Arabian Gulf and have presented lists of plants and animals, including fishes. However, since an entire biota was considered, reef fishes were considered only superficially.

Until the recent work by Fischer and Bianchi (1984), the taxonomic status of Arabian Gulf fishes was in a state of chaos. Accordingly, most of the earlier regional references are replete with misidentifications. Moreover, even many of the more common Gulf fishes have been reported under a veritable plethora of scientific names which have subsequently been synonymized. Accordingly, the diversity of fishes in the Arabian Gulf is considerably lower than the regional literature would suggest.

The present report considers specifically the reef ichthyofauna of Bahrain. An attempt is made to present an up-to-date checklist based upon the most recent and authoritative systematic literature.

Material and Methods

Divers using SCUBA made observations and collections of reef fishes during April-June 1985 at three stations in 4-15 m depth northeast of Bahrain (Fig. 1). Station descriptions and sampling dates appear in Table 1.

Risk (1972) found a positive correlation between fish species diversity (richness) and reef structural complexity in the Virgin Islands. Accordingly, structurally heterogeneous reefs were selected as stations in the present study. In this way, it was hoped that these stations would best represent the collective fauna of each depth interval sampled.

Our zoogeographic analysis is based only upon reef-fish collections from Bahrain. However, we believe that our collections include the bulk of the shallow reef ichthyofauna reported for the Arabian Gulf, and thus constitute a major faunal component upon which judicious zoogeographic conclusions may be based.

Fishes were collected using a variety of devices including hook-and-line, spearguns, and poisons (quinaldine or 5% sodium hypochlorite). All fishes collected were preserved in 10% Formalin for 24 hr, transferred to 40%

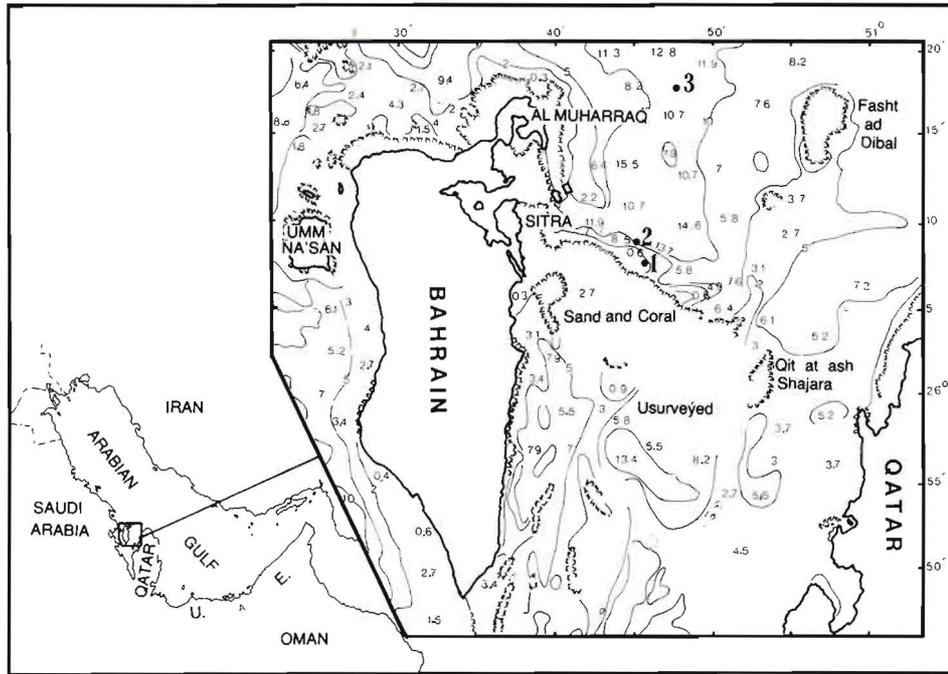


Fig. 1. Locations of reef stations 1, 2 and 3.

Table 1. Locations, descriptions, and sampling dates for reef stations 1, 2 and 3.

Station	Location	Description	Date
1	26°07.5' N 50°45.7' E	Reef configuration due to large buttresses of <i>Porites</i> rising 2-3 m above bottom. In-between, the dominant coral was <i>Acropora</i> which formed dense thickets over 70-80% of the total area. Depth. 4-7 m.	21.4.85 09.5.85 14.6.85
2	26°08.6' N 50°45.0' E	Dominant corals <i>Porites</i> and <i>Acropora</i> ; largest heads rising 2-3 m above the surrounding bottom. Depth 7-10 m.	26.4.85 14.5.85 02.6.85
3	26°17.7' N 50°47.8' E	Rocky ledges and terraces associated with a 1-2 m depth change. Small, scattered stony corals atop rocky substrates. Reef sculpturing due to underlying rocky surfaces which probably represent relict (Pleistocene) shorelines. Depth 13-15 m.	28.4.85 10.5.85

isopropanol, and accessioned into the University College of Bahrain fish collection (UCB). Fish lengths were measured with dial calipers and recorded to the nearest mm standard length (SL).

Results

Seventy-one fish species representing 25 families are reported from shallow-water (< 15 m) reefs off Bahrain (Table 2). Pertinent ecological, distributional, and taxonomic information is presented for each species in the following systematic accounts. The arrangement of families generally follows Nelson (1976) as shown in the following checklist:

Table 2. Inventory of fishes observed and/or collected from shallow-water (< 15 m) reefs in Bahrain.*

	HEMISCYLLIDAE
1.	<i>Chiloscyllium arabicum</i> Gubanov, 1980
	PLOTOSIDAE
2.	<i>Plotosus lineatus</i> (Thunberg), 1787
	SYGNATHIDAE
3.	<i>Doryrhamphus excisus</i> Kaup, 1856
	SERRANIDAE
4.	<i>Cephalopholis hemistiktos</i> (Rüppell), 1830
5.	<i>Epinephelus areolatus</i> (Forsskål), 1775
6.	<i>Epinephelus caeruleopunctatus</i> (Bloch), 1790
7.	<i>Epinephelus chlorostigma</i> (Valenciennes), 1828
8.	<i>Epinephelus latifasciatus</i> (Temminck & Schlegel), 1842
9.	<i>Epinephelus malabaricus</i> (Schneider), 1801
	PSEUDOCROMIDAE
10.	<i>Pseudochromis dutoiti</i> Smith
11.	<i>Pseudochromis persicus</i> Murray

* Denotes a new record for the Arabian Gulf. The sequence of families follows Nelson (1976).

Table 2.—Contd.

APOGONIDAE

12. *Apogon cyanosoma* (Bleeker), 1853
13. *Apogon pharaonis* Bellotti
14. *Apogon taeniatus* Cuvier & Valenciennes, 1828
15. *Cheilodipterus arabicus* Gmelin
16. *Cheilodipterus quinquelineata* Cuvier & Valenciennes, 1828
17. *Fowleria variegata* (Valenciennes), 1828

CARANGIDAE

18. *Carangoides ferdau* (Forsskål), 1775
19. *Gnathanodon speciosus* (Forsskål), 1775
20. *Selaroides leptolepis* (Cuvier), 1833

LUTJANIDAE

21. *Lutjanus argentimaculatus* (Forsskål), 1775
22. *Lutjanus ehrenbergi* (Peters), 1869
23. *Lutjanus fulviflammus* (Forsskål), 1775
24. *Lutjanus lutjanus* Bloch, 1790
25. *Lutjanus russelli* (Bleeker), 1849

NEMIPTERIDAE

26. *Nemipterus peronii* (Valenciennes), 1830
27. *Scolopsis ghanam* (Forsskål), 1775
28. *Scolopsis taeniatus* (Cuvier), 1830

HAEMULIDAE

29. *Diagramma pictum* (Thunberg), 1792
30. *Plectorhinchus gaterinus* (Forsskål), 1775
31. *Plectorhinchus pictus* (Tortonese), 1935
32. *Plectorhinchus schotaf* (Forsskål), 1775
33. *Plectorhinchus sordidus* (Klunzinger), 1870

LETHRINIDAE

34. *Lethrinus elongatus* (Valenciennes), 1830
35. *Lethrinus lentjan* (Lacepède), 1802
36. *Lethrinus nebulosus* (Forsskål), 1775

SPARIDAE

37. *Acanthopagrus berda* (Forsskål), 1775
38. *Acanthopagrus bifasciatus* (Forsskål), 1775
39. *Diplodus sargus kotschy* (Steindachner), 1876
40. *Sparidentex hasta* (Valenciennes), 1830

Table 2.—Contd.

MULLIDAE

41. *Parupeneus margaritatus* Randall and Gueze, 1984
42. *Upeneus tragula* Richardson, 1845

CHAETODONTIDAE

43. *Chaetodon melapterus* Guichenot, 1862
44. *Chaetodon nigropunctatus* Sauvage, 1880
45. *Heniochus acuminatus* (Linnaeus), 1758

POMACANTHIDAE

46. *Pomacanthus maculosus* (Forsskål), 1775

POMACENTRIDAE

47. *Abudefduf vaigensis* (Quoy & Gaimard), 1824
48. *Amphiprion clarkii* (Bennett), 1830
49. *Neopomacentrus sindensis* (Jordan and Evermann), 1902
50. *Pomacentrus aquilus* Allen & Randall, 1980
51. *Pomacentrus trichourus* Günther, 1867
52. *Pristotis jerdoni* (Day), 1873

SPHYRAENIDAE

53. *Sphyraena barracuda* (Walbaum), 1792

LABRIDAE

54. *Cheilinus lunulatus* (Forsskål), 1775
55. *Halichoeres stigmaticus* Randall & Smith, 1980
56. *Thalassoma lunare* (Linnaeus), 1758

SCARIDAE

57. *Scarus ghobban* Forsskål, 1775
58. *Scarus persicus* Randall & Bruce, 1983
59. *Scarus sordidus* Forsskål, 1775

BLENNIIDAE

60. *Escenius pulcher* (Murray), 1887

GOBIIDAE

61. *Amblygobius albimaculatus* (Rüppell), 1828
62. *Cryptocentrus lutheri* Klausewitz, 1960
63. *Istigobius ornatus* (Rüppell), 1830
64. *Ptereleotris* sp.

Table 2.—Contd.

ACANTHURIDAE

65. *Zebrasoma xanthurum* (Blyth), 1852

SIGANIDAE

66. *Siganus canaliculatus* (Park), 1797
 67. *Siganus javus* (Linnaeus), 1766

OSTRACIIDAE

68. *Ostracion cubicus* Linnaeus, 1758
 69. *Ostracion cyanurus* Rüppell, 1832

TETRAODONTIDAE

70. *Arothron stellatus* (Bloch & Schneider), 1801
 71. *Chelonodon patoca* (Buchanan), 1822

HEMISCYLLIDAE

1. *Chiloscyllium arabicum* Gubanov

Sightings. Stations 1, 2 and 3. **Remarks.** Other investigators (Basson *et al.* 1977, Randall *et al.* 1978 and Relyea 1981) have listed *Chiloscyllium griseum* from the Arabian Gulf. Since *C. arabicum* was only recently described, it is likely that *C. griseum* records refer to this species. At least we have not observed *C. griseum* at reefs in Bahrain.

Chiloscyllium arabicum was identified *in situ* by the presence of lateral ridges on the body, dorsal fin shape, and relative size of the dorsal and pelvic fins (Fischer and Bianchi 1984).

PLOTOSIDAE

2. *Plotosus lineatus* (Thunberg)

Sightings. Station 1. **Remarks.** This species has previously been reported as *Plotosus anguillaris* (Basson *et al.* 1977) in the regional literature. Fischer and Bianchi (1984) list *P. anguillaris* as a junior synonym of *P. lineatus*.

The occurrence of *P. lineatus* on the reef is rare; it is more common along open coasts over rocky and vegetated substrates (Basson *et al.* 1977, and Fischer and Bianchi 1984).

SYGNATHIDAE

3. *Doryrhamphus excisus* Kaup

Material Examined. UCB-106-5 (1 specimen, 59 mm SL); UCB-107-11 (1, 59 mm SL). **Remarks.** This species was only collected after poison was applied to the reefs in the vicinity of Stations 1 and 3. Although Dawson (1981) reported *D. excisus* from the Arabian Gulf, its occurrence has not been so noted in the regional checklists (Blevgad 1944, Kuronuma and Abe 1972, Basson *et al.* 1977, Relyea 1981 and Al-Baharna 1986).

SERRANIDAE

4. *Cephalopholis hemistiktos* (Rüppell)

Sightings. Station 3. **Material Examined.** UCB 100-3 (1, 212 mm); UCB-103-4 (1, 264 mm). **Remarks.** Fischer and Bianchi (1984) list both *Cephalopholis hemistiktos* and *C. miniatus* from the Arabian Gulf. However, only *C. hemistiktos* seems to occur off Bahrain. Records of *C. miniatus* from the Gulf may actually refer to the closely-related *C. hemistiktos*. For example, Fig. 119 in Basson *et al.* (1977) listed as *C. miniatus* is clearly *C. hemistiktos*.

5. *Epinephelus areolatus* c (Forsskål)

Sightings. Station 3. Material Examined. UCB-105-2 (1, 247 mm).

6. *Epinephelus caeruleopunctatus* (Bloch)

Sightings. Station 2. **Remarks.** Fischer and Bianchi (1984) did not include the Arabian Gulf within the range of *E. caeruleopunctatus*; however, our record and that of Al-Baharna (1986) establish its presence there. Also, the record of *E. summana* (Basson *et al.* 1977) probably refers to *E. caeruleopunctatus*. *Epinephelus summana* is probably endemic to the Red Sea (Randall and Ben-Tuvia 1983).

7. *Epinephelus chlorostigma* (Valenciennes)

Sightings. Station 2. **Material Examined.** UCB-103-2 (1, 203 mm).

8. *Epinephelus latifasciatus* (Temminck and Schlegel)

Sightings. Station 2. **Material Examined.** UCB-105-7 (1, 289 mm).

9. *Epinephelus malabaricus* (Schneider)

Sightings. Stations 1, 2 and 3. **Remarks.** Other checklists (Basson *et al.* 1977, Randall *et al.* 1978 and Relyea 1981) reported *E. tauvina* rather than *E. malabaricus* from the Arabian Gulf. However, we have examined considerable

material from reefs and fish markets of Bahrain and all are *E. malabaricus*. On this basis we agree with Randall and Ben-Tuvia (1983) that *E. tauvina* does not occur in the Arabian Gulf. Inclusion of the Arabian Gulf within the range of *E. tauvina* by Fischer and Bianchi (1984) is almost certainly based upon earlier misidentifications.

PSEUDOCROMIDAE

10. *Pseudochromis dutoiti* Smith

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-106-2 (2, 55 mm); UCB-107-9 (1, 59 mm); UCB-109-6 (4, 39-51 mm).

11. *Pseudochromis persicus* Murray

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-101-6 (1, 57 mm); UCB-107-8 (1, 49 mm); UCB-107-4 (13, 66-98 mm); UCB-109-7 (3, 62-66 mm).

APOGONIDAE

12. *Apogon cyanosoma* (Bleeker)

Material Examined. UCB-106-4 (1, 54 mm). **Remarks.** A single specimen was poisoned near Station 3. Al-Baharna's (1986) record constitutes first mention of this species from the Arabian Gulf.

13. *Apogon pharaonis* Bellotti

Sightings. Stations 1. **Material Examined.** UCB-1-1-2 (2, 59-64 mm); UCB-107-6 (12, 69-70 mm).

14. *Apogon taeniatus* Cuvier and Valenciennes

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-101-3 (2, 25-29 mm). **Remarks.** This species has been variously reported as *Apogon thurstoni*, *A. uninotatus* and *Apogonichthys nigripinnis* by workers in the Gulf (Relyea 1981).

15. *Cheilodipterus arabicus* Gmelin

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-107-3 (2, 25-29 mm). **Remarks.** Randall *et al.* (1978) reported this species as *C. lachneri* but Al-Baharna (1986) has justified application of the name *C. arabicus*.

16. *Cheilodipterus quinquelineatus* Cuvier & Valenciennes

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-101-1 (2, 34-43 mm); UCB-106-3 (1, 36 mm); UCB-107-1 (10, 30-44 mm); UCB-109-3 (13, 36-50 mm).

17. *Fowleria variegata* (Valenciennes)

Sightings. Station 1. **Material Examined.** UCB-101-10 (1, 32 mm).

CARANGIDAE

18. *Carangoides ferdau* (Forsskål)

Sightings. Stations, 1, 2 and 3.

19. *Gnathanodon speciosus* (Forsskål)

Sightings. Stations 1 and 2. **Material Examined.** UCB-100-4 (1, 112 mm).

Remarks. Previous authors (Relyea 1981) recorded this species as *Caranx speciosus* which has been synonymized under *Gnathanodon speciosus* (Fischer and Bianchi 1984).

20. *Selaroides leptolepis* (Cuvier)

Sightings. Station 3. **Material Examined.** UCB-107-14 (1, 96 mm).

LUTJANIDAE

21. *Lutjanus argentimaculatus* (Forsskål)

Sightings. Station 2.

22. *Lutjanus ehrenbergi* (Peters)

Sightings. Stations 1 and 2. **Material Examined.** UCB-100-5 (1, 142 mm); UCB-103-6 (1, 157 mm). **Remarks.** Reports of *Lutjanus johni* from the Arabian Gulf (Kuronuma and Abe 1972, Basson *et al.* 1977 and Relyea 1981) are undoubtedly misidentifications of *L. ehrenbergi*. Fischer and Bianchi (1984) do not include the Western Indian Ocean within the range of *L. johni*.

23. *Lutjanus fulviflammus* (Forsskål)

Sightings. Stations 1 and 2. **Material Examined.** UCB-100-6 (1, 132 mm); UCB-100-15 (1, 136 mm); UCB-103-13 (1, 170 mm).

24. *Lutjanus lutjanus* Bloch

Sightings. Station 3.

25. *Lutjanus russelli* (Bleeker)

Sightings. Station 2. **Material Examined.** UCB-105-4 (1, 203 mm).

NEMIPTERIDAE

26. *Nemipterus peronii* (Valenciennes)

Sightings. Station 3. **Material Examined.** UCB-108-1 (1, 133 mm). **Remarks.** Relyea (1981) reported *N. tolu* from the Arabian Gulf but this species has since been synonymized under *N. peronii* (Fischer and Bianchi 1984).

27. *Scolopsis ghanam* (Forsskål)

Sightings. Stations, 1, 2 and 3. **Material Examined.** UCB-100-11 (1, 122 mm).

28. *Scolopsis taeniatus* (Cuvier)

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-103-1 (1, 202 mm). **Remarks.** Reports of *S. phaeops* (Randall *et al.* 1978, Relyea 1981) and *S. rüppelli* (Kurunuma and Abe 1972) refer to this species.

HAEMULIDAE

29. *Diagramma pictum* (Thunberg)

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-103-15 (1, 291 mm). **Remarks.** Earlier investigators (Kurunuma and Abe 1972, Basson *et al.* 1977, Randall *et al.* 1978; Relyea 1981) listed this species as *Plectorhynchus pictus*. However, Bauchot *et al.* (1983) have amended the spelling of *Plectorhynchus* to *Plectorhincus*.

30. *Plectorhinchus gaterinus* (Forsskål)

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-100-4 (1, 198 mm); UCB-100-17 (1, 163 mm); UCB-103-11 (1, 198 mm).

31. *Plectorhinchus pictus* (Tortonese)

Sightings. Stations 1, 2. **Material Examined.** UCB-105-1 (1, 200 mm). **Remarks.** Both *Plectorhynchus cinctus* (Basson *et al.* 1977 and Relyea 1981) and *P. fangi* (Randall *et al.* 1978) are considered junior synonyms of *P. pictus* (Fischer and Bianchi 1984).

32. *Plectorhinchus schotaf* (Forsskål)

Sightings. Stations 1 and 2. **Material Examined.** UCB-110-2 (2, 205-210 mm).

33. *Plectorhincus sordidus* (Klunzinger)

Sightings. Station 3. **Material Examined.** UCB-110-1 (2, 195-218 mm). **Remarks.** Apparently overlooking the record of Randall *et al.* (1977), Fischer and

Bianchi (1984) failed to include the Arabian Gulf within the known range of *P. sordidus*. Our own observations indicate, however, that *P. sordidus* may be common; its similarity to *P. schotaf* probably accounts for its absence in other Gulf checklists. Arabian Gulf specimens of *P. sordidus* are easily identified using the meristic and morphometric data presented by Fischer and Bianchi (1984).

LETHRINIDAE

34. *Lethrinus elongatus* (Valenciennes)

Sightings. Stations 1 and 2. **Material Examined.** UCB-100-19 (1, 191 mm). **Remarks.** Earlier references (Kuronuma and Abe 1972, Basson *et al.* 1977, and Relyea 1981) refer to this species as *Lethrinus miniatus* which is now regarded as a junior synonym of *L. elongatus* (Fischer and Bianchi 1984).

35. *Lethrinus lentjan* (Lacepède)

Sightings. Stations 1 and 2. **Material Examined.** UCB-108-2 (1, 221 mm); UCB-100-20 (1, 181 mm).

36. *Lethrinus nebulosus* (Forsskal)

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-100-21 (1, 66 mm).

SPARIDAE

37. *Acanthopagrus berda* (Forsskal)

Sightings. Station 2. **Material Examined.** UCB-100-22 (1, 122 mm).

38. *Acanthopagrus bifasciatus* (Forsskal)

Sightings. Stations 1, 2, and 3. **Material Examined.** UCB-105-8 (1, 120 mm).

39. *Diplodus sargus kotschy* (Steindachner)

Sightings. Stations 1 and 2. **Material Examined.** UCB-105-3 (1, 113 mm). **Remarks.** Earlier references (Kuronuma and Abe 1972, and Relyea 1981) referred to this species as *D. noct* which is now recognized as a junior synonym of *D. sargus kotschy* (Fischer and Bianchi 1984).

40. *Sparidentex hasta* (Valenciennes)

Sightings. Stations 1 and 2. **Material Examined.** UCB-105-5 (1, 165 mm). **Remarks.** This species has previously been recorded (Kuronuma and Abe 1972, Basson *et al.* 1978, and Relyea 1981) as *Acanthopagrus cuvieri*.

MULLIDAE

41. *Parupeneus margaritatus* Randall and Gueze

Sightings. Stations 1 and 2. **Remarks.** Randall and Gueze (1984) described this species from the Arabian Gulf, Gulf of Oman and Pakistan; they consider a single record from the Madras coast of India dubious.

42. *Upeneus tragula* Richardson

Sightings. Stations 1 and 2.

CHAETODONTIDAE

43. *Chaetodon melapterus* Guichenot

Sightings. Stations 1 and 2.

44. *Chaetodon nigropunctatus* Sauvage

Sightings. Stations 1 and 2. **Remarks.** Earlier references (Kuronuma and Abe 1972, Basson *et al.* 1977, and Relyea 1981) listed this species as *C. obscurus*.

45. *Heniochus acuminatus* (Linnaeus)

Sightings. Stations 1 and 2. **Material Examined.** UCB-100-13 (1, 134 mm).

POMACENTRIDAE

46. *Pomacanthus maculosus* (Forsskål)

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-101-4 (4, 24-44 mm); UCB-101-9 (1, 78 mm).

POMACENTRIDAE

47. *Abudefduf vaigensis* (Quoy and Gaimard)

Sightings. Stations 1 and 2. **Material Examined.** UCB-100-16 (1, 78 mm). **Remarks.** Earlier workers (Kuronuma and Abe 1972, Basson *et al.* 1977, and Relyea 1981) listed this species as *A. saxatilis*; following Fischer and Bianchi (1984), however, we apply the name *A. vaigensis*.

48. *Amphiprion clarkii* (Bennett)

Sightings. Station 1.

49. *Neopomacentrus sindensis* Jordan and Evermann

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-106-1 (2, 58-61 mm); UCB-107-5 (3, 60-62 mm); UCB-109-2 (7, 59-65 mm). **Remarks.** Relyea (1981) incorrectly listed this species (as *Pomacentrus sindensis*) as a synonym of *Pristotis jerdoni*. Both are valid species, however, and occur in the Arabian Gulf.

50. *Pomacentrus aquilus* Allen and Randall

Sightings. Stations 1 and 2. **Remarks.** Although only recently described by Allen and Randall (1980), *P. aquilus* is one of the most common damselfishes at shallow-water reefs off Bahrain.

51. *Pomacentrus trichourus* Günther

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-101-5 (1, 54 mm); UCB-107-7 (1, 56 mm).

52. *Pristotis jerdoni* (Day)

Sightings. Station 2. **Remarks.** Relyea (1981) misidentified *Pomacentrus sindensis* as *Pristotis jerdoni*, listing it as the most common damselfish in the Arabian Gulf. Actually, *Pristotis jerdoni* is rare, at least in Bahrain, compared to other pomacentrid species.

SPHYRAENIDAE

53. *Sphyraena barracuda* (Walbaum)

Sightings. Station 3.

LABRIDAE

54. *Cheilinus lunulatus* (Forsskål)

Sightings. Station 3. **Material Examined.** UCB-100-1 (1, 205 mm). **Remarks.** The recent record of Al-Baharna (in press) and our own constitute the first Arabian Gulf records for this species.

55. *Halichoeres stigmaticus* Randall and Smith

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-107-12 (1, 81 mm); UCB-109-5 (1, 101 mm).

56. *Thalassoma lunare* (Linnaeus)

Lightings. Stations 1, 2 and 3.

SCARIDAE

57. *Scarus ghobban* (Forsskål)

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-103-12 (1, 242 mm); UCB-100-9 (1, 172 mm). **Remarks.** Basson *et al.* (1977) listed and figured this species as *Cyallyodon* sp.

58. *Scarus persicus* Randall and Bruce

Sightings. Station 3. **Material Examined.** UCB-103-14 (1, 253 mm); UCB-100-7 (1, 208 mm); UCB-103-9 (1, 259 mm).

59. *Scarus sordidus* Forsskål

Sightings. Station 3. **Material Examined.** UCB-100-18 (1, 222 mm).

BLENNIIDAE

60. *Escenius pulcher* (Murray)

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-107-2 (9, 58-71 mm); UCB-109-4 (12, 52-76 mm).

GOBIIDAE

61. *Amblygobius albimaculatus* (Rüppell)

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-107-10 (1, 84 mm); UCB-109-8 (1, 85 mm). **Remarks.** The record of Al-Baharna (1986) and our own document for the first time occurrence of this species in the Arabian Gulf.

62. *Cryptocentrus lutheri* Klausewitz

Sightings. Stations 1, 2 and 3. **Remarks.** Our record and that of Al-Baharna (1986) constitute the first report of this species from the Arabian Gulf.

63. *Istigobius ornatus* (Rüppell)

Sightings. Station 3.

64. *Ptereleotris* sp.

Sightings. Stations 2 and 3. **Remarks.** Though closely related to *Ptereleotris microlepis* (Bleeker), the Arabian Gulf "form" may constitute an undescribed species and is thus recorded herein merely as *Ptereleotris* sp. In any case, our record is the first reported occurrence of *Ptereleotris* from the Arabian Gulf.

ACANTHURIDAE

65. *Zebrasoma xanthurum* (Blyth)

Sightings. Stations 1 and 2.

SIGANIDAE

66. *Siganus canaliculatus* (Park)

Sightings. Stations 1 and 2. **Material Examined.** UCB-100-14 (1, 109 mm).

Remarks. Earlier references (Relyea 1981) listed this species as *S. oramin* which is now regarded as a junior synonym (Fischer and Bianchi 1984).

67. *Siganus javus* (Linnaeus)

Sightings. Station 1.

OSTRACIIDAE

68. *Ostracion cubicus* Linnaeus

Sightings. Stations 1 and 2.

69. *Ostracion cyanurus* Rüppell

Sightings. Stations 1, 2 and 3. **Material Examined.** UCB-107-13 (1, 81 mm).

Remarks. Our specimen agrees with Randall's (1983) description except for the lower number of pectoral fin rays (9 rather than 11).

TETRAODONTIDAE

70. *Arothron stellatus* (Bloch and Schneider)

Sightings. Station 3.

71. *Chelonodon patoca* (Buchanan)

Sightings. Station 3.

Discussion

Arabian Gulf reef fishes exhibit several distributional patterns (Table 3). Most (39 spp.) range widely throughout the Indo-West Pacific Region (*sensu* Briggs 1974); the others, however, demonstrate more restricted distributions and thus shed light on zoogeographical relationships of the Arabian Gulf ichthyofauna.

Table 3. Distributional patterns exhibited by Arabian Gulf reef fishes.*

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- I. **Cosmopolitan** (East Africa coast to the West Pacific and beyond)
Plotosus lineatus, *Doryrhamphus excisus*, *Epinephelus areolatus*, *E. caeruleopunctatus*, *E. chlorostigma*, *E. latifasciatus*, *E. malabaricus*, *Apogon cyanosoma*, *A. pharaonis*, *A. taeniatus*, *Cheilodipterus quinquelineata*, *Fowleria variegata*, *Carangoides ferdau*, *Gnathanodon speciosus*, *Lutjanus argentimaculatus*, *L. ehrenbergi*, *L. fulviflammus*, *L. lutjanus*, *L. russelli*, *Nemipterus peronii*, *Diagramma pictum*, *Plectorhinchus schotaf*, *Lethrinus elongatus*, *L. lentjan*, *L. nebulosus*, *Acanthopagrus berda*, *A. bifasciatus*, *Upeneus tragula*, *Heniochus acuminatus*, *Abudefduf vaigensis*, *Sphyrnaea barracuda*, *Thalassoma lunare*, *Scarus ghobban*, *S. sordidus*, *Istigobius ornatus*, *Ptereleotris microlepis*, *Ostracion cubicus*, *Arothron stellatus*, *Chelonodon patoca*
- II. **Arabian Gulf to West Pacific or Beyond**
Plectorhinchus pictus, *Amphiprion clarkii*, *Siganus canaliculatus*, *S. javus*, *Pristotis jerdoni*, *Selaroides leptolepis*
- III. **Arabian Endemics** (Red Sea, Arabian peninsula, and Arabian Gulf)
Cephalopholis hemistiktos, *Scolopsis taeniatus*, *Chaetodon melapterus*, *Zebrasoma xanthurum*, *Cryptocentrus lutheri*, *Ostracion cyanurus*, *Cheilinus lunulatus*
- IV. **East Africa to (and including) Arabian Gulf**
Scolopsis ghanam, *Pomacanthus maculosus*, *Plectorhinchus gaterinus*, *P. sordidus*, *Pomacentrus trichourus*
- V. **Arabian Gulf to Northwestern India**
Diplodus sargus kotschy, *Sparidentex hasta*, *Neopomacentrus sindensis*, *Escenius pulcher*, *Parupeneus margaritatus*
- VI. **Arabian Gulf Endemics**
Chiloscyllium arabicum, *Pseudochromis persicus*, *Chaetodon nigropunctatus*, *Cheilodipterus arabicus*, *Halichoeres stigmaticus*, *Scarus persicus*
- VII. **East Africa to Western India**
Pseudochromis dutoiti, *Pomacentrus aquilus*, *Amblygobius albimaculatus*
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* *Ptereleotris* sp. is omitted from the list due to its uncertain taxonomic status.

Briggs (1974) subdivided the Indo-West Pacific Region into several provinces based upon levels of endemism (> 10%). He recognized the Gulf of Oman (Arabian Sea) as a major faunal break separating a Western Indian Ocean Province to the south from the Indo-Polynesian Province to the east. Rather

arbitrarily, Briggs (1974) included the Arabian Gulf within the Western Indian Ocean Province due to a paucity of distributional information on Arabian Gulf biotas.

Our analysis of reef-fish distributions generally supports Briggs' (1974) contention that a major zoogeographic discontinuity exists within the region. Our data clearly indicate that the Arabian Gulf reef-fish fauna cannot be strictly relegated to either the Western Indian Ocean Province or the Indo-Polynesian Province. Rather, it is a transitional fauna with elements belonging to each province; 12 species range from the Arabian Gulf southwards and 11 species range from the Arabian Gulf eastward (Table 3).

The Red Sea and Arabian Gulf exhibit a strong faunal relationship. In fact, seven species reported herein are apparently Arabian endemics, *i.e.* restricted to the Red Sea, Arabian Peninsula, and Arabian Gulf (Table 3).

Reef-fish diversity for Bahrain is low compared to that of Red Sea and Indian Ocean localities (Table 4). Undoubtedly, the depauperate fauna of Bahrain reflects the stressful physicochemical nature and geological recency of the Arabian Gulf. Despite this, about 9% (6 out of 71 spp.) of the shallow-water reef fishes of Bahrain appear to be endemic to the Arabian Gulf (Table 3). An additional five species are restricted to the Arabian Gulf, Gulf of Oman, and northwestern Arabian Sea thereby raising the endemism of the combined area to about 15%. These findings complement the work of Price (1982) who reported 12% endemism for Arabian Gulf echinoderms.

Table 4. Comparative reef-fish, diversity (richness). Red Sea, arabian Gulf, and Indian Ocean localities.

Region	No. of Species	Reference
Seychelles	880	Goldman and Tablot 1976
Red Sea	>325	Randall 1983
Arabian Gulf	71	present study
Arabian Gulf	70	Basson <i>et al.</i> 1977

Briggs (1974) believed that the Red Sea merited provincial distinction based upon fairly high levels of endemism (10-15% for fishes). Based upon our work and that of Price (1982), endemism in the Arabian Gulf may approach that of the Red Sea. Accordingly, the Arabian Gulf may deserve special zoogeographic status. Such action is probably premature at this point, however, and awaits biogeographic analysis of other Arabian Gulf biotas.

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أسماك الشعاب المرجانية في البحرين (الخليج العربي) مع بعض التعليقات على جغرافيتها الحيوانية

جريجورى سميث و مصطفى صالح و خاتون صنقور

كلية البحرين الجامعية - ص. ب (١٠٨٢) - البحرين

تم تسجيل واحد وسبعين (٧١) نوعاً من الأسماك من مناطق الشعاب المرجانية في المياه القليلة الغور (٤ - ١٥م) شمال شرق البحرين في الخليج العربي. تتميز غالبية هذه الأنواع (٣٩ نوعاً) بانتشارها الواسع في مياه المحيط الهندي وغرب المحيط الهادي، بينما تتميز بقية الأنواع بتوزيعها الجغرافي المحدود مما قد يساعد على توضيح العلاقات الجغرافية الحيوانية لأسماك الخليج العربي.

إن ما لوحظ من دراسة التوزيع الجغرافي لأسماك الشعاب المرجانية في هذا البحث يؤيد الفكرة القائلة بأن هناك فاصلاً رئيسياً في التوزيع الجغرافي لهذه الأسماك في الخليج العربي. إضافة إلى ذلك قد لوحظ أن نسبة الاستيطان في أسماك الشعاب في الخليج العربي أعلى مما كان معروفاً من قبل، وربما تقارب هذه النسبة في البحر الأحمر. وكذلك لوحظ وجود تشابه كبير بين فونة أسماك الخليج العربي والبحر الأحمر، فهناك سبعة (٧) أنواع تستوطن المنطقة العربية يقتصر وجودها على البحر الأحمر ومياه جنوب شبه الجزيرة العربية والخليج العربي. وقد أضيف نوعاً واحداً (تيريلوترس ميكروليبس) إلى قائمة أسماك الشعاب للخليج العربي. بالإضافة إلى ذلك فقد تأكد وجود بعض الأنواع النادرة والتي قليلاً ما تشاهد في الخليج العربي.

وقد عدلت قائمة أسماك الشعاب في الخليج العربي في ضوء هذه النتائج وفي ضوء أحدث الاتجاهات في علم تقسيم الأسماك.