Annotated Checklist of the Fishes of Wake Atoll[1]

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Abstract: This study documents a total of 321 fishes in 64 families occurring at Wake Atoll, a coral atoll located at 19° 17′ N, 166° 36′ E. Ten fishes are listed by genus only and one by family; some of these represent undescribed species. The first published account of the fishes of Wake by Fowler and Ball in 1925 listed 107 species in 31 families. This paper updates 54 synonyms and corrects 20 misidentifications listed in the earlier account. The most recent published account by Myers in 1999 listed 122 fishes in 33 families. Our field surveys add 143 additional species records and 22 new family records for the atoll. Zoogeographic analysis indicates that the greatest species overlap of Wake Atoll fishes occurs with the Mariana Islands. Several fish species common at Wake Atoll are on the IUCN Red List or are otherwise of concern for conservation. Fish populations at Wake Atoll are protected by virtue of it being a U.S. military base and off limits to commercial fishing.

WAKE ATOLL IS an isolated atoll in the central Pacific (19° 17′ N, 166° 36′ E). It is approximately 3 km wide by 6.5 km long and consists of three islands with a land area of approximately 6.5 km^2. Wake is separated by 546 km of deep ocean from the nearest reef system on Taongi Atoll in the Marshall Islands to the south. It is 1900 km southwest of Midway Atoll, 1400 km southeast of Minami-tori-shima (Marcus) Island, and 2260 km east of the Mariana Islands. Thus, it is in a unique position with respect to the biogeography of reef fauna. This survey fills a major data gap in the zoogeography of Pacific fishes (see Randall 1998).

Wake Atoll is a U.S. Air Force installation administered by the U.S. Army Space and Strategic Defense Command. Consequentially, access has been limited due to the military mission, and as a result the aquatic fauna of the atoll has not received thorough investigation. Our surveys were sponsored by the Department of Defense Legacy Resource Management Program as part of the program to implement coral reef conservation and protection (Kerr and Lobel 2000).

The first ichthyological collection at Wake resulted in a checklist of 107 species (Fowler and Ball 1925). Specimens were deposited in the Bernice P. Bishop Museum (BPBM), Honolulu, Hawai'i, with duplicates deposited in the Academy of Natural Sciences in Philadelphia (ANSP). The second important collection was by W. Gosline and J. Randall during 1953; most of their specimens are also deposited in the BPBM with a few at the National Museum of Natural History (USNM) and the remaining specimens are held in the University of Hawai'i (Department of Zoology) fish collection. Specimens held in the California Academy of Sciences (CAS) were collected by J. Kauanui and P. Kauanui or J. Oetzel in 1956 and 1957. Specimens held in the Harvard Museum of Comparative Zoology (MCZ) were collected by us in 1999. The collections of the Tanager Expedition and by Gosline and Randall were primarily in shallow water without the benefit of scuba and based largely on the use of ichthyocides and conventional

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fishing techniques. Myers' (1999) listing of fishes from Wake Atoll is based on photographs, or in some cases video, taken by military personnel.

This checklist includes all species reported in previous publications, species not previously verified or published from the B. P. Bishop Museum collection, and new records found during our comprehensive scuba surveys conducted at Wake during July 1997 and May 1999. We have updated species reported in previous publications with current nomenclature and list the synonyms.

The following checklist represents all of the fishes currently known to occur at Wake Atoll. A total of 143 new records is added and includes fishes from the following families: Rhincodontidae, Albulidae, Moringuidae, Chlopsidae, Muraenidae (eight species), Ophichthidae (two species), Congridae (two species), Bythitidae, Mugilidae (three species), Atherinidae, Exocoetidae, Holocentridae (three species), Fistularidae, Scorpaenidae (five species), Caracanthidae, Serranidae (eight species), Cirrhitidae, Pseudochromidae, Priacanthidae, Apogonidae (eight species), Malacanthidae, Echeneidae, Carangidae (six species), Lutjanidae (two species), Lethrinidae, Mullidae (three species), Pempheridae, Chaetodontidae (two species), Pomacanthidae, Oplegnathidae, Pomacentridae (six species), Labridae (18 species), Scaridae (three species), Pinguipedidae, Creedidae, Tripterygidae, Blenniidae (three species), Callionymidae, Gobiidae (14 species), Microdesmidae, Siganidae, Acanthuridae (eight species), Bothidae, Balistidae (three species), Monacanthidae (two species), and Tetraodontidae (four species). Twenty-two of these families represent new family records for Wake Atoll.

MATERIALS AND METHODS

Species are listed in phylogenetic sequence by family with the current valid name first, followed by synonyms if they were cited in other checklists. An asterisk (*) designates those species that are our new records for Wake Atoll. The author and date of description are given for each species followed by the record(s) for Wake Atoll. Museum specimen numbers (i.e., BPBM 1234) are given for those species maintained in ichthyological collections. In addition, the expedition during which the specimens in the Bishop Museum were collected is designated: by (T) for the Tanager Expedition of 1923, (K) for fishes collected by J. Kauanui in 1957, (G&R) for fishes collected by Gosline, Randall et al. during 1953, and (K&L) for fishes collected by us in 1997 and 1999.

Lists of specimens from other scientific collections at Wake Atoll but that have not yet been published were provided by the ANSP, BPBM, and CAS. The list of fishes from the USNM was taken from their Web site (http://www.nmnh.si.edu/vert/fishcat/).

The identification of many of the specimens held in the BPBM was verified by J. Randall and A. Suzumoto. We verified the identity of the specimens held in the University of Hawai'i, Department of Zoology fish collection. J. McCosker verified some of the eel specimens held in the CAS; however, many of the specimens reported in the collections of CAS, USNM, and ANSP were not reexamined. Thus upon further taxonomic evaluation, some of these earlier identifications may be revised.

Our underwater surveys were conducted during two expeditions: 10 to 23 July 1997 and 15 to 29 May 1999. We completed a total of 118 dives during that time at sites located around the atoll (Figure 1). In addition, more than a dozen shallow-water snorkel surveys were also conducted at locations around the atoll. The majority of observations were done by visual and photographic census (using both still and video photography, which are stored in our collection). Several collections of small cryptic fishes were made using quinaldine. These were all located at the dive site directly off the small boat harbor and ranged in depth from 10 to 50 m. Several fishes were speared or collected by nets to confirm species identification.

Overall, our surveys provide a reliable census for the majority of reef fishes but certainly did not adequately sample small cryptic species that remain hidden in crevices and corals. Future surveys should include sampling the cryptic fauna.

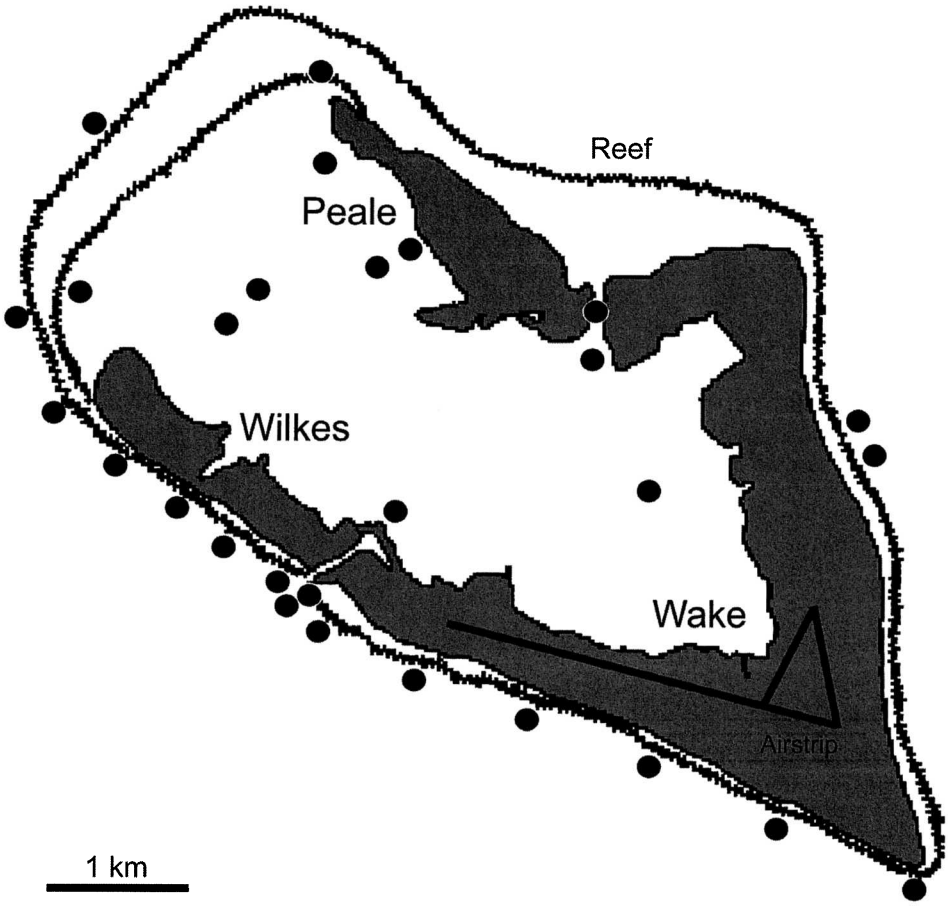

FIGURE 1. Fish survey locations around Wake Atoll. Black dots show survey sites; multiple dives were conducted at many of these locations.

RESULTS

Family RHINCODONTIDAE (Whale Shark)

**Rhincodon typus* (Smith, 1828). Sight record reported by island divers.

Family CARCHARHINIDAE (Requiem Sharks)

Carcharhinus amblyrhynchos (Bleeker, 1856). Myers 1999.

Carcharhinus melanopterus (Quoy & Gaimard, 1824). Myers 1999. No blacktip reef sharks were observed by us.

Eulamia commersoni (Blainville). BPBM 3500 (T). Fowler 1928.

Triaenodon obesus (Rüppell, 1837). Fowler and Ball 1925, Myers 1999.

Family MYLIOBATIDAE (Eagle Rays)

Aetobatus narinari (Euphrasen, 1790). Myers 1999.

Family MOBULIDAE (Manta Rays)

Manta birostris (Donndorff, 1798). Myers 1999.

Family ALBULIDAE (Bonefish)

**Albula glossodonta* (Forsskål, 1775).

Family MORINGUIDAE (Spaghetti Eels)

**Moringua abbreviata* (Bleeker, 1863). BPBM 28145 (G&R).

Family CHLOPSIDAE (False Morays)

**Kaupichthys* sp. CAS 60094.

Family MURAENIDAE (Moray Eels)

**Anarchias* sp. BPBM 12710 (G&R).
**Anarchias cantonensis* (Schultz, 1943). CAS 149959.
**Anarchias seychellensis* Smith, 1962. CAS 51023.
**Echidna leucotaenia* Schultz, 1943. CAS 28698.
**Gymnomuraena zebra* (Shaw in Shaw and Nodder, 1797). Collected by G&R and kept in the University of Hawai'i fish collection, UH 8-IV-53.
Gymnothorax buroensis (Bleeker, 1857). BPBM 12360 (G&R). Böhlke and Randall 2000.
**Gymnothorax enigmaticus* McCosker & Randall, 1982. CAS 51024.
Gymnothorax flavimarginatus (Rüppell, 1828). CAS 37106.
Lycondontis flavomarginata (Rüppell). Fowler and Ball 1925 (BPBM specimen not located).
Gymnothorax javanicus (Bleeker, 1859). BPBM 12358 (G&R). Myers 1999, Böhlke and Randall 2000.
**Gymnothorax meleagris* (Shaw in Shaw and Nodder, 1795). UH Collection.
Gymnothorax pictus (Ahl, 1789). BPBM 3564, 3565 (T), BPBM 12530, 12544 (G&R). Böhlke and Randall 2000.
Lycodontis picta (Ahl). Fowler and Ball 1925.
Gymnothorax ruppelliae (McClelland, 1845). BPBM 3593 (T), BPBM 12371, 12527 (G&R).
Lycodontis petelli (Bleeker). Fowler and Ball 1925.
Gymnothorax undulatus (Lacepède, 1803). BPBM 12380 (G&R). Böhlke and Randall 2000.
Lycodontis undulata (Lacepède). Fowler and Ball 1925.
Uropterygius macrocephalus (Bleeker, 1865). CAS 41192. McCosker et al. 1984, Böhlke and Randall 2000.
**Uropterygius xanthopterus* Bleeker, 1859. CAS 149964.

Family OPHICHTHIDAE (Snake Eels)

**Myrichthys colubrinus* (Boddaert, 1781). BPBM 12518 (G&R).
Myrichthys maculosus (Cuvier, 1817). McCosker and Rosenblatt 1993, Myers 1999.
**Scolecenchelys gymnota* (Bleeker, 1857). CAS 200128.

Family CONGRIDAE (Conger and Garden Eels)

**Conger cinereus* Rüppell, 1830. BPBM 12668 (G&R).
**Heteroconger hassi* (Klausewitz & Eibl Eibesfeldt, 1959). Photographic record.

Family CHANIDAE (Milkfish)

Chanos chanos (Forsskål, 1775). Myers 1999.

Family MYCTOPHIDAE (Lanternfishes)

Myctophum spinosum (Steindachner, 1867). BPBM 3643 (T).
Dasyscopelus spinosus (Schneider). Fowler and Ball 1925.

Family BYTHITIDAE (Livebearing Brotulas)

**Dinematichthys ilucoeteoides* Bleeker, 1855. BPBM 15169 (G&R). This fish is probably not *ilucoeteoides* (J. Randall, pers. comm.), but it has not yet been reclassified.

Family MUGILIDAE (Mullets)

**Crenimugil crenilabis* (Forsskål, 1775). BPBM 3816 (T). Omitted by Fowler and Ball 1925.
**Liza vaigiensis* (Quoy & Gaimard, 1825). A photograph was taken of a juvenile seen in the small boat harbor. This distinctive species has black pectoral fins and yellow pelvic and anal fins.
**Neomyxus leuciscus* (Günther, 1872). CAS 150042.

Family CLUPEIDAE (Herrings)

Spratelloides sp. An unidentified clupeid that may be *Spratelloides* was photographed in the channel between Wake and Peale Islands.

Family EXOCOETIDAE (Flyingfishes)

**Cypselurus poecilopterus* (Valenciennes, 1847). BPBM 10536.
Exocoetus volitans Linnaeus, 1758. BPBM 3668, 3669 (T). Fowler and Ball 1925.

Hirundichthys rondeletii (Valenciennes, 1847). BPBM 3673 (T).
Cypselurus rondelitii (Valenciennes). Fowler and Ball 1925.

Family HEMIRAMPHIDAE (Halfbeaks)

Hyporhamphus acutus acutus (Gunther, 1872). MCZ 158366. Collette 1974.
Oxyporhampus micropterus (Valenciennes, 1846). Myers 1999.

Family HOLOCENTRIDAE (Soldierfishes and Squirrelfishes)

**Myripristis adusta* (Bleeker, 1853). Photographic record.
Myripristis amaena (Castelnau, 1873). BPBM 15173 (G&R). Randall and Greenfield 1996.
Myripristis berndti Jordan & Evermann, 1903. BPBM 3758 (T), BPBM 28241. Randall and Greenfield 1996, Myers 1999. Identified as *Myripristis murdjan* (Forsskål) in Fowler and Ball 1925.
**Myripristis kuntee* Cuvier in C and V, 1831.
Myripristis murdjan (Forsskål, 1775). Myers 1999 tentatively listed this species.
**Myripristis violacea* (Bleeker, 1851). Photographic record.
Neoniphon opercularis (Valenciennes, 1831). BPBM 3752 (T).
Holocentrus opercularis Valenciennes. Fowler and Ball 1925.
Neoniphon sammara (Forsskål, 1775). BPBM 3751 (T), BPBM 15110 (G&R).
Holocentrus sammara Forsskål. Fowler and Ball 1925.
Sargocentron melanospilos (Bleeker, 1858). Myers 1999.
Sargocentron microstoma (Günther, 1859). BPBM 3733 (T). Myers 1999.
Holocentrus microstomus Günther. Fowler and Ball 1925.
Sargocentron punctatissimum (Cuvier, 1829). BPBM 3715 (T). Myers 1999.
Holocentrus lacteoguttatus (Cuvier). Fowler and Ball 1925.
Sargocentron spiniferum (Forsskål, 1775). BPBM 3738 (T), BPBM 15375 (G&R). Myers 1999.
Holocentrus spinifer Forsskål. Fowler and Ball 1925.
Sargocentron tiere (Cuvier in C and V, 1829). ANSP 102854. Randall 1998*a*, Myers 1999.

Family SYGNATHIDAE (Pipefishes and Seahorses)

Corythoichthys flavofasciatus (Rüppell, 1838). BPBM 3775 (T), BPBM 37884 (K&L). Myers 1999.
Corythoichthys conspicillatus (Jenyns). Fowler and Ball 1925.
Doryrhampus excisus Kaup, 1856. Myers 1999.

Family AULOSTOMIDAE (Trumpetfishes)

Aulostomus chinensis (Linnaeus, 1766). Fowler and Ball 1925. Although *A. chinensis* is listed in Fowler and Ball (1925), we did not observe any. Apparently the only Fowler and Ball specimen of *A. chinensis* to survive to the 1960s was from Lisianski Island. This specimen was discarded by BPBM in 1968. Thus this record from Wake Atoll is doubtful.

Family FISTULARIIDAE (Cornetfishes)

**Fistularia commersonii* Rüppell, 1838. Photographic record.

Family SCORPAENIDAE (Scorpionfishes)

Pterois antennata (Bloch, 1787). BPBM 15280 (G&R). Myers 1999.
**Scorpaenodes guamensis* (Quoy & Gaimard, 1824). CAS 150161.
Sebastapistes ballieui (Sauvage in Vaillant and Sauvage, 1875). BPBM 4365. Identified as *Sebastapistes asperella* (Bennett) in Fowler and Ball 1925, a species with inadequate description and no type specimen (Eschmeyer and Randall 1975). The BPBM lot contains two specimens, one *S. ballieui* and one *S. cyanostigma*; however, the locality of this lot was incorrectly listed as Wake (J. Randall, pers. comm.). This species is not included in the species count.
Sebastapistes coniorta Jenkins, 1903. Randall 1996, Myers 1999.
**Sebastapistes fowleri* (Pietschmann, 1934). BPBM 38593 (K&L).
**Sepastapistes mauritiana* (Cuvier, 1829). BPBM 12043 (K), BPBM 13804 (G&R).
**Sebastapistes tinkhami* (Fowler, 1946). MCZ 158370.

Family CARACANTHIDAE
(Orbiculate Velvetfishes)

**Caracanthus maculatus* (Gray, 1831). BPBM 4422 (T), MCZ 158364. This record was omitted from Fowler and Ball 1925.

Caracanthus unipinna (Gray, 1831). BPBM 4425 (T). Fowler and Ball 1925.

Family SERRANIDAE
(Groupers and Sea Basses)

**Aporops bilinearis* Schultz, 1943. CAS 82471.

Cephalopholis argus (Schneider, 1801). BPBM 3951 (T), BPBM 12042 (K), BPBM 15098, 15144 (G&R), SU 500065, ANSP 88339. Fowler and Ball 1925, Randall and Heemstra 1991, Myers 1999.

Cephalopholis spiloparaea (Valenciennes, 1828). BPBM 3950 (T). Randall and Heemstra 1991, Myers 1999. This specimen was misidentified as *Cephalopholis sonnerati* (Valenciennes) by Fowler and Ball 1925.

**Cephalopholis urodeta* (Forster, 1801). Photographic record.

Epinephelus fasciatus (Forsskål, 1775). ANSP 91775, 91783, BPBM 3956 (T), BPBM 15428 (G&R). Randall and Heemstra 1991, Myers 1999.
Holocentrus erythraeus (Bloch & Schneider). Fowler and Ball 1925.
Serranus fasciatus (Forsskål). Fowler and Ball 1925.

Epinephelus hexagonatus (Forster, 1801). ANSP 102856, BPBM 3976 (T) 12040. Randall and Heemstra 1991, Myers 1999. Specimen BPBM 3976 was misidentified as *Serranus merra* by Fowler and Ball 1925.

Epinephelus lanceolatus (Bloch, 1790). Myers 1999.

**Epinephelus merra* Bloch, 1790. BPBM 12040 (G&R).

Epinephelus polyphekadion (Bleeker, 1849). Randall and Heemstra 1991, Myers 1999.

Epinephelus spilotoceps Schultz, 1953. Myers 1999.

Epinephelus tauvina (Forsskål, 1775). ANSP 105506, BPBM 3963 (T). Randall and Heemstra 1991, Myers 1999. This specimen was misidentified as *Serranus corallicola* (Valenciennes) by Fowler and Ball 1925.

**Liopropoma tonstrinum* Randall & Taylor, 1988. BPBM 37889 (K&L).

**Plectranthias longimanus* (Weber, 1913). MCZ 158369.

**Plectranthias nanus* Randall, 1980. MCZ 158368.

**Plectranthias winniensis* (Tyler, 1966). BPBM 37890 (K&L).

Pseudanthias pascalus (Jordan & Tanaka, 1927). BPBM 37891 (K&L). Myers 1999.

**Pseudanthias ventralis* (Randall, 1979). BPBM 37892 (K&L).

**Pseudogramma polyacantha* (Bleeker, 1856). BPBM 37893 (K&L).

Variola louti (Forsskål, 1775). BPBM 3947–3948 (T). Fowler and Ball 1925, Randall and Heemstra 1991, Myers 1999.

Family CIRRHITIDAE (Hawkfishes)

**Amblycirrhitus bimacula* (Jenkins, 1903). CAS 24409.

Cirrhitus pinnulatus (Schneider in Bloch and Schneider, 1801). BPBM 4103 (T), BPBM 15121 (G&R).
Cirrhitus maculatus (Lacepède, 1803). Fowler and Ball 1925.

Neocirrhites armatus Castlenau, 1873. BPBM 4122 (T). Myers 1999.
Paracirrhites melanotus (Günther). Fowler and Ball 1925.

Paracirrhites arcatus (Cuvier in C and V, 1829). Myers 1999.

Paracirrhites forsteri (Schneider in Bloch and Schneider, 1801). BPBM 4126 (T). Myers 1999.

Paracirrhites hemistictus (Günther, 1874). Myers 1999.

Family PSEUDOCHROMIDAE (Dottybacks)

**Pseudochromis* sp. Video taken on the eastern side of Wake Island of a pseudochromid that is likely to be either *P. fuscus* or *P. cyanotaenia*. R. F. Myers (pers. comm.) noted that this is likely to be *P. cyanotaenia*, not *P. fuscus*.

**Pseudoplesiops* sp. Specimen collected in 1997. This is an unidentified species.

Family PRIACANTHIDAE (Bigeyes, Glasseyes)

**Heteropriacanthus cruentatus* (Lacepède, 1801). Photographic record.

Family APOGONIDAE (Cardinalfishes)

**Apogon coccineus* Ruppell, 1838. CAS 150060.
**Apogon cyanosoma* Bleeker, 1853. CAS 85030.
Apogon doryssa (Jordan & Seale, 1906). BPBM 3901 (T).
Amia doryssa (Jordan & Seale). Fowler and Ball 1925. Specimen could not be located.
Apogon exostigma (Jordan & Starks, 1906). Myers 1999.
**Apogon fuscus* Quoy & Gaimard, 1825. Photograph was tentatively identified as *A. fuscus.*
Apogon kallopterus Bleeker, 1856. BPBM 15273 (G&R), BPBM 37876 (K&L). Myers 1999.
**Apogon savayensis* (Günther, 1871). BPBM 3894 (T), BPBM 12041 (K), MCZ 158363. Probably misidentified as *Amia (Apogon) bandanensis* (Bleeker) by Fowler and Ball 1925.
Apogon susanae Greenfield, 2001. CAS 84823. This specimen from Wake was misidentified as *A. coccineus.* The new species *A. susanae* described by Greenfield (2001) included this specimen in the description.
**Apogon taeniophorus* Regan, 1905.
**Cheilodipterus macrodon* (Lacepède, 1802). MCZ 158371.
**Cheilodipterus quinquelineata* (Cuvier, 1828). BPBM 37877 (K&L).
**Fowleria isostigma* (Jordan & Seale, 1906). BPBM 3916 (T). Identified as *Apogonichthys auritus* (Valenciennes) (current name *Fowleria aurita*) by Fowler and Ball 1925.

Family MALACANTHIDAE (Sand Tilefishes)

**Malacanthus brevirostris* Guichenot, 1848.

Family ECHENEIDAE (Remoras)

Remora remora (Linnaeus, 1758). BPBM 4894 (T).
Echeneis remora (Linnaeus). Fowler and Ball 1925.
**Remora osteochir* (Cuvier, 1829). USNM 202330, 202332. Exclusively pelagic species collected from the National Marine Fisheries Service R.V. *Charles H. Gilbert* and placed in the USNM by D. W. Strasburg (U.S. Fish and Wildlife Service).

Family CORYPHAENIDAE (Dolphinfishes)

Coryphaena hippurus Linnaeus, 1758. Myers 1999.

Family CARANGIDAE (Jacks)

Carangoides ferdau (Forsskål, 1775). Fowler and Ball 1925.
**Carangoides orthogrammus* (Jordan & Gilbert, 1881). BPBM 3885 (T). Photographic record.
**Caranx ignobilis* (Forsskål, 1775). Photographic record.
Caranx lugubris Poey, 1861. Myers 1999.
Caranx melampygus Cuvier in C and V, 1833. Myers 1999.
Caranx sexfasciatus Quoy & Gaimard, 1824. Myers 1999.
**Decapturus macarellus* (Cuvier, 1833). Photographic record.
**Elagatis bipinnulatas* (Quoy & Gaimard, 1824). Species identified from a photograph taken by local fishermen.
**Gnathanodon speciosus* (Forsskål, 1775). Photographic record.
Scomberoides lysan (Forsskål, 1775). Myers 1999.
Seriola rivoliana Valenciennes, 1833. Myers 1999.
**Trachinotus baillonii* (Lacepède, 1801). CAS 24035.

Family LUTJANIDAE (Snappers)

**Aphareus furca* (Lacepède, 1801). Photographic record.
**Aprion virescens* Valenciennes, 1830. Photographic record.
Lutjanus fulvus (Schneider, 1801). BPBM 4006, 4007. Myers 1999.
Lutjanus marginatus (Cuvier). Fowler and Ball 1925.
Lutjanus monostigma (Cuvier, 1828). BPBM 4012 (T).
Lutjanus monostigma (Cuvier). Fowler and Ball 1925.

Family LETHRINIDAE (Emperors)

Lethrinus obsoletus (Forsskål, 1775). Myers 1999.
**Lethrinus rubrioperculatus* Sato, 1978. BPBM 4023 (T). Originally identified as *Lethri-*

nus mahsena (Forsskål) by Fowler and Ball 1925.

Monotaxis grandoculis (Forsskål, 1775). BPBM 4032 (T). Fowler and Ball 1925, Myers 1999.

Family MULLIDAE (Goatfishes)

**Mulloidichthys flavolineatus* (Lacepède, 1801). BPBM 4089 (T).

**Mulloidichthys vanicolensis* (Valenciennes in C and V, 1831). Photographic record.

Parupeneus barberinus (Lacepède, 1801). Myers 1999.

Parupeneus cyclostomus (Lacepède, 1801). BPBM 4077 (T). Myers 1999.
Upeneus chryserydros (Lacepède). Fowler and Ball 1925.

Parupeneus insularis Randall & Myers, 2002. BPBM 4070 (T), BPBM 15310, 15442 (G&R). Specimen BPBM 4070 was identified by Fowler and Ball 1925 as *Upeneus indicus* (Shaw). Until recently, this species was classified as *P. bifasciatus* in the central Pacific (Randall and Myers 2002).

Parupeneus multifasciatus (Quoy & Gaimard, 1825). Myers 1999.

**Parupeneus pleurostigma* (Bennett, 1830).

Upeneus arge Jordan & Evermann, 1903. Myers 1999.

Family PEMPHERIDAE (Sweepers)

**Pempheris oualensis* Cuvier, 1831. Photographic record.

Family CHAETODONTIDAE (Butterflyfishes)

Chaetodon auriga Forsskål, 1775. BPBM 4183. Myers 1999.
Chaetodon setifer Bloch. Fowler and Ball 1925.

Chaetodon ephippium Cuvier in C and V, 1831. BPBM 4149 (T), BPBM 15183 (G&R). Fowler and Ball 1925, Myers 1999.

**Chaetodon lineolatus* Cuvier in C and V, 1831. Video was taken of this species.

Chaetodon lunula (Lacepède, 1803). BPBM 4164 (T), BPBM 15193 (G&R). Fowler and Ball 1925, Myers 1999.

Chaetodon ornatissimus Cuvier in C and V, 1831. Fowler and Ball 1925, Myers 1999.

Chaetodon punctatofasciatus Cuvier, 1831. Myers 1999.

Chaetodon quadrimaculatus Gray, 1831. BPBM 15192 (G&R). Fowler and Ball 1925, Myers 1999.

Chaetodon reticulatus Cuvier in C and V, 1831. BPBM 4167 (T). This specimen was misidentified as *Chaetodon collaris* Bloch by Fowler and Ball 1925. Also reported by Myers 1999.

Chaetodon semeion Bleeker, 1855. BPBM 4150 (T). Fowler and Ball 1925.

Chaetodon ulietensis Cuvier, 1831. BPBM 4195, 4196 (T). Myers 1999. Misidentified as *Chaetodon falcula* Bloch in Fowler and Ball 1925.

**Chaetodon unimaculatus* Bloch, 1787. CAS 150086.

**Forcipiger flavissimus* Jordan & McGregor, 1898. Photographic record.

Forcipiger longirostris (Broussonet, 1782). Fowler and Ball 1925, Myers 1999.

Hemitaurichthys thompsoni Fowler, 1923. Myers 1999.

Heniochus acuminatus (Linnaeus, 1758). Myers 1999.

Family POMACANTHIDAE (Angelfishes)

Centropyge flavissima (Cuvier, 1831). BPBM 4221 (T), BPBM 15344 (G&R). Myers 1999.
Holocanthus flavissimus (Cuvier). Fowler and Ball 1925.

Centropyge loricula (Günther, 1873). Myers 1999.

**Centropyge multicolor* Randall & Wass, 1974. Photographic record.

Family KYPHOSIDAE (Rudderfishes, Sea Chubs)

Kyphosus bigibbus Lacepède, 1802. BPBM 4043, 4044 (T). Myers 1999.
Kyphosus fuscus (Quoy & Gaimard). BPBM 4043 (T). Omitted by Fowler and Ball 1925.

Kyphosus cinerascens (Forsskål, 1775). Myers 1999.

Family KUHLIIDAE (Flagtails)

Kuhlia sandvicensis (Steindachner, 1876). BPBM 3929 (T). Fowler and Ball 1925. These specimens were determined as the true *sandvicensis* (which ranges beyond Hawai'i),

although some characters (large eye and some meristic data) do not fit well. The possibility exists that this could be some other species (Randall and Randall 2001).

Family Oplegnathidae (Knifejaws)

**Oplegnathus punctatus* (Temminck & Schlegel, 1844). BPBM 37896 (K&L).

Family Pomacentridae (Damselfishes)

Abudefduf septemfasciatus (Cuvier, 1830). BPBM 4506 (T). Fowler and Ball 1925.

Abudefduf sordidus (Forsskål, 1775). BPBM 4490, 4491 (T). Fowler and Ball 1925.

**Abudefduf vaigiensis* (Linnaeus, 1758). Photographic record.

Chromis acares Randall & Swerdloff, 1973. BPBM 4450 (T), MCZ 158367. Myers 1999. Identified as *Chromis dimidiatus* (Klunzinger) by Fowler and Ball 1925.

Chromis agilis Smith, 1960. BPBM 37888 (K&L). Myers 1999.

**Chromis vanderbilti* (Fowler, 1941). BPBM 12300 (G&R). Photographic record.

Chromis viridis (Cuvier, 1830). Specimens listed as *Chromis caeruleus* (Cuvier) in Fowler and Ball 1925 and as *C. caerulea*, BPBM 4454 (T), BPBM 15319 (G&R). *Chromis caerulea* has been suppressed. *Chromis ternatensis*, which formerly had been synonymized with *C. caerulea* (Allen 1991), was validated as a distinct species and the next available name for what had been called *C. caerulea* was *C. viridis* (Randall et al. 1987).

Chrysiptera biocellata (Quoy & Gaimard, 1824). BPBM 4516 (T). Identified as *Abudefduf brownriggii* (Bennett) by Fowler and Ball 1925.

Chrysiptera brownriggii (Bennett, 1828). BPBM 4528, 4540 (T).
Abudefduf amabilis (De Vis). Fowler and Ball 1925.
Abudefduf leucopomus (Cuvier). Fowler and Ball 1925.

**Chrysiptera glauca* (Cuvier, 1830). BPBM 4542 (T), BPBM 15362 (G&R). Identified as *Abudefduf zonatus* (Cuvier) by Fowler and Ball 1925.

Dascyllus aruanus (Linnaeus, 1758). BPBM 4443 (T), BPBM 15178, 15367 (G&R). Fowler and Ball 1925.

Plectroglyphidodon dickii (Liénard, 1839). Myers 1999.

Plectroglyphidodon imparipennis (Vaillant & Sauvage, 1875). BPBM 4536 (T), BPBM 15341 (G&R).
Abudefduf imparipennis (Vaillant & Sauvage). Fowler and Ball 1925.

Plectroglyphidodon johnstonianus Fowler & Ball, 1924. Myers 1999.

**Plectroglyphidodon lacrymatus* (Quoy & Gaimard, 1825). Photographic record.

**Plectroglyphidodon phoenixensis* (Schultz, 1943). UH collection.

Stegastes albifasciatus (Schlegel & Müller, 1839). No specimens found in the BPBM.
Abudefduf albofasciatus (Schlegel & Müller). Fowler and Ball 1925.

**Stegastes fasciolatus* (Ogilby, 1889). Photographic record.

Stegastes nigricans (Lacepède, 1803). BPBM 4464, 4465 (T), BPBM 15177 (G&R).
Pomacentrus nigricans (Lacepède). Fowler and Ball 1925.

Family Labridae (Wrasses)

**Ammolabrus dicrus* Randall & Carlson, 1997. BPBM 38592 (K&L). This species is currently known only from O'ahu and Wake Atoll. The same species or a close relative was observed in the Ogasawara Islands, Japan, but was not collected (Randall and Carlson 1997).

Anampses caeruleopunctatus Rüppell, 1829. MCZ 158361. Myers 1999.

**Bodianus anthioides* (Bennett, 1831). Photographic record.

**Cheilinus chlorourus* (Bloch, 1791). BPBM 4688 (T), BPBM 12047 (K), BPBM 12723 (G&R) Originally identified as *Cheilinus undulatus* Rüppell by Fowler and Ball 1925.

**Cheilinus fasciatus* (Bloch, 1791).

Cheilinus trilobatus Lacepède, 1801. Myers 1999.

Cheilinus undulatus Rüppell, 1835. Myers 1999.

Coris aygula Lacepède, 1801. BPBM 5116, 12046 (K). Fowler and Ball 1925, Randall 1999.

Epibulis insidiator (Pallas, 1770). BPBM 12044 (K). Myers 1999.

Gomphosus varius Lacepède, 1801. BPBM 12045 (K). Myers 1999.

Halichoeres biocellatus Schultz, 1960. Myers 1999.

**Halichoeres margaritaceus* (Valenciennes in C and V, 1839). CAS 73712.

**Halichoeres ornatissimus* (Garrett, 1863). BPBM 15347 (G&R).

Halichoeres trimaculatus (Quoy & Gaimard, 1824). BPBM 4577 (T), BPBM 12712, 12715, 15172 (G&R). Fowler and Ball 1925.

Hemigymnus fasciatus (Bloch, 1792). Myers 1999.

**Iniistius* sp. An unknown species with an all-white body was observed in the lagoon on several occasions. No specimens were collected.

Labroides bicolor Fowler & Bean, 1928. Myers 1999.

Labroides dimidiatus (Valenciennes, 1839). Myers 1999.

Labroides pectoralis Randall & Springer, 1975. BPBM 37886 (K&L). Myers 1999.

**Labroides rubrolabiatus* Randall, 1958. CAS 73544.

Novaculichthys taeniouris (Lacepède, 1801). BPBM 4696 (T). Fowler and Ball 1925.

Oxycheilinus diagrammus (Lacepède, 1801).
Cheilinus diagrammus (Lacepède). Fowler and Ball 1925.

**Oxycheilinus orientalis* (Günther, 1862).

**Oxycheilinus unifasciatus* (Streets, 1877). BPBM 12722 (G&R).

Pseudodcheilinus hexataenia (Bleeker, 1857). BPBM 4686 (T). Fowler and Ball 1925.

**Pseudocheilinus ocellatus* Randall, 1999. BPBM 37887, paratype (K&L).

**Pseudocheilinus octotaenia* Jenkins, 1900.

**Pseudocheilinus tetrataenia* Schultz, 1960.

**Pseudocoris aurantiofasciata* Fourmanoir, 1971. BPBM 38772. These fish were observed feeding in mixed schools with *Acanthurus thompsoni* in 18 to 20 m near the wreck of the *Stoner*.

Pseudojuloides atavai Randall & Randall, 1981. Myers 1999.

**Pseudojuloides cerasinus* (Snyder, 1904). Photographic record.

Stethojulis bandanensis (Bleeker, 1851). BPBM 12730, 12732, 15205 (G&R). Myers 1999.

**Thalassoma hardwicke* (Bennett, 1820). CAS 75547.

Thalassoma lutescens (Lay & Bennett, 1839). BPBM 4646 (T), BPBM 12680, 12687 (G&R). Myers 1999.

Thalassoma purpureum (Forsskål, 1775). BPBM 4640, 4641 (T). Fowler and Ball 1925.
Thalassoma umbrostigma (Rüppell). Fowler and Ball 1925 also spelled it *umbrostygma*.

Thalassoma quinquevittatum (Lay & Bennett, 1839). BPBM 4637 (T), BPBM 15244 (G&R). Myers 1999. Misidentified as *Thalassoma guntheri* (Bleeker) by Fowler and Ball 1925.

**Thalassoma trilobatum* (Lacepède, 1801). BPBM 15202 (G&R).

**Xyrichtys* undescribed species. BPBM 38591, paratype (K&L). J. Earle and B. Halstead collected one pair of this species from New Guinea in 1993 and it was photographed in Guam by T. Allen. We collected specimens from Wake at 20 m over sand, directly in front of the small boat harbor. For description of this species see Randall and Lobel (in press).

Family SCARIDAE (Parrotfishes)

Bolbometopon muricatum (Valenciennes, 1839). Myers 1999.

Callyodon borborus Jordan & Evermann, 1903 reported by Fowler and Ball 1925 is a synonym of the Hawaiian endemic *Chlorurus perspicillatus* (Steindachner). No specimens were found at BPBM. This species is not included in the species count.

Chlorurus frontalis Valenciennes, 1839. Myers 1999.
Callyodon jonesi (Streets). Fowler and Ball 1925.

Chlorurus microrhinos (Bleeker, 1854). Myers 1999.

Chlorurus sordidus (Forsskål, 1775). BPBM 4739, 4748 (T).
Callyodon sordidus (Forsskål). Fowler and Ball 1925.
Callyodon erythrodon (Valenciennes). Fowler and Ball 1925.

**Hipposcarus longiceps* (Valenciennes, 1839). Photographic record.

Scarus forsteni (Bleeker, 1861). BPBM 4770 (T). Myers 1999. Misidentified as *Callyodon* (*Scarus*) *tricolor* (Bleeker) by Fowler and Ball 1925.

**Scarus ghobban* Forsskål, 1775.

**Scarus globiceps* Valenciennes, 1840.

Scarus oviceps Valenciennes, 1840. BPBM 4766 (T). Myers 1999. *Callyodon pectoralis* (Valenciennes) reported by Fowler and Ball 1925 is a synonym of *Scarus scaber* Valenciennes, an Indian Ocean species. No specimens were found at BPBM. This was probably a misidentification of *S. oviceps.*

Scarus psittacus Forsskål, 1775. BPBM 4749, 4753 (T).
Callyodon brunneus (Jenkins). Fowler and Ball 1925.

Scarus rubroviolaceus Bleeker, 1849. BPBM 4773 (T).
Callyodon rubroviolaceus (Steindachner). Fowler and Ball 1925.

Family PINGUIPEDIDAE (Sandperches)

**Parapercis schauinslandii* (Steindachner, 1900).

Family CREEDIDAE (Sand Burrowers)

**Limnichthys nitidus* Smith, 1958. MCZ 158368. Originally identified as *L. donaldsoni* Schultz, 1960, which has been shown to be a synonym of *nitidus* (Yoshino et al. 1999).

Family TRIPTERYGIDAE (Triplefins)

**Enneapterygius nigricauda* Fricke, 1997. BPBM 4910 (T). This specimen was identified as *Enneapterygius hemimelas* (Kner & Steindachner, 1866) by Fowler and Ball 1925.

**Helcogramma chica* Rosenblatt in Schultz, 1960. BPBM 37885 (K&L).

Family BLENNIIDAE (Blennies)

Blenniella gibbifrons (Quoy & Gaimard, 1824).
Istiblennius gibbifrons (Quoy & Gaimard). BPBM 15364, 15378 (G&R). Springer and Williams 1990.
Rupiscartes gibbifrons (Quoy & Gaimard). Fowler and Ball 1925.

Blenniella paula (Bryan & Herre, 1903). BPBM 4938 (T), BPBM 15368 (G&R). Springer and Williams 1994. A specimen listed in the CAS (150165) as *Blenniella periophthalmus* (Valenciennes, 1836) is probably *B. paula.*

Cirripectes polyzona (Bleeker, 1868). Myers 1999.

Cirripectes quagga (Fowler & Ball, 1924). ANSP 91191, 91013, BPBM 3420 (T), BPBM 30998. Williams 1988.
Rupiscartes quagga Fowler & Ball. BPBM 3420, 10436 (T). Fowler and Ball 1925.

Cirripectes variolosus (Valenciennes, 1836). BPBM 4925 (T), BPBM 15369 (G&R).
Rupiscartes variolosus (Valenciennes). Fowler and Ball 1925.

**Entomacrodus marmoratus* (Bennett, 1828). BPBM 4933 (T). This specimen is listed in the BPBM records as having been collected by the Tanager Expedition at Wake Atoll, but the specimen is missing (A. Suzumoto, pers. comm.). This is a dubious record because *E. marmoratus* is a Hawaiian endemic and needs to be confirmed by additional collections.

Entomacrodus striatus (Quoy & Gaimard, 1836). BPBM 12060, 14210 (G&R). Myers 1999.

Istiblennius edentulus (Bloch & Schneider, 1801). BPBM 4944 (T), BPBM 15209 (G&R), MCZ 158366. Myers 1999.
Salarias edentulus (Schneider). Fowler and Ball 1925.

**Plagiotremus tapienosoma* (Bleeker, 1857). CAS 29079.

Rhabdoblennius ellipes Jordan & Starks, 1906.
Blennius rhabdotrachelus Fowler & Ball. BPBM 3419 (T). Fowler and Ball 1925.

Family CALLIONYMIDAE (Dragonets)

**Synchiropus laddi* Schultz in Schultz et al., 1960. BPBM 38302 (G&R). Specimen originally labeled as *Synchiropus kiyoae* Fricke & Zaiser was reidentified as *S. laddi* by J. Randall.

*Callionymidae unidentified species. MCZ 158373.

Family GOBIIDAE (Gobies)

**Amblygobius phalaena* (Valenciennes, 1837). BPBM 37878 (K&L).

**Asterropteryx semipunctatus* Rüppell, 1830. BPBM 37879 (K&L).

Bathygobius fuscus (Rüppell, 1828). BPBM 4866 (T). Fowler and Ball 1925.

**Cabillus tongarevae* (Fowler, 1927). USNM

166748 (G&R 1953). The identity of this specimen needs to be reexamined because its occurrence at Wake is doubtful (J. Randall, pers. comm.).

**Coryphopterus duospilus* (Hoese & Reader, 1985). BPBM 37881 (K&L).

**Coryphopterus neophytus* (Günther, 1877). BPBM 37880 (K&L).

Coryphopterus sp. BPBM 4844 (T). This specimen collected in salt water was identified as the brackish-water *Glossogobius giuris* (Hamilton) by Fowler and Ball 1925.

**Ctenogobiops aurocingulus* (Herre, 1935). USNM 166766 (G&R).

**Ctenogobiops feroculus* Lubbock & Pulonin, 1977. Photographic record. This species was identified from a photograph; however, it is possible that it is another species (J. Randall, pers. comm.).

Ctenogobiops pomastictus Lubbock & Pulonin, 1977. Tentatively listed in Myers 1999.

Eviota alfelei Jordan & Seale, 1906. BPBM 15343, 15166 (G&R), BPBM 37882 (K&L). Lachner and Karnella 1980.

**Eviota epiphanes* Jenkins, 1903. BPBM 4816 (T). This specimen is listed in the BPBM records as having been collected by the Tanager Expedition at Wake Atoll, but the specimen is missing (A. Suzumoto, pers. comm.). Identified as *E. viridis* (Waite) by Fowler and Ball 1925. The identification of this specimen as *E. epiphanes* is tentative. Lachner and Karnella (1980) remarked that this species is restricted to the North Central Pacific and is found the entire length from Midway to Johnston to Kirimati (Christmas Island); however, Karnella and Lachner (1981) also noted a tentative identification of *E. epiphanes* at Minami-tori-shima (Marcus) Island. Because other Hawaiian endemics are potentially found at Wake, there is a possibility that this species is as well.

**Eviota saipanensis* Fowler, 1945. BPBM 15187 (G&R).

**Favonigobius* sp. Specimen collected by us in 1997 is an undescribed species.

Gnatholepis cauerensis cauerensis (Bleeker, 1853).
Gnatholepis anjerensis (Bleeker). BPBM 4870 (T). Fowler and Ball 1925.

Gobiodon rivulatus (Rüppell, 1830). BPBM 4823 (T). Fowler and Ball 1925.

**Paragobiodon lacunicolus* (Kendall & Goldsborough, 1911). BPBM 4834 (T). Originally identified as *Paragobiodon echinocephalus* (Rüppell) by Fowler and Ball 1925.

**Priolepis kappa* Winterbottom & Burridge, 1993. CAS 60011.

**Priolepis semidoliatus* (Valenciennes, 1837). USNM 166779 (G&R).

**Trimma* sp. Specimen collected in 1997 may be an undescribed species. Specimens in our collection.

Family MICRODESMIDAE
(Dartfishes and Wormfishes)

**Ptereleotris evides* (Jordan & Hubbs, 1925). Photographic record.

**Ptereleotris microlepis* Bleeker, 1856.

Family SIGANIDAE (Rabbitfishes)

**Siganus argenteus* (Quoy & Gaimard, 1825). Photographic record.

Family ZANCLIDAE (Moorish Idol)

Zanclus cornutus (Linnaeus, 1758). Myers 1999.

Family ACANTHURIDAE (Surgeonfishes)

Acanthurus achilles Shaw, 1803. BPBM 4294 (T). Myers 1999.
Hepatus achilles (Shaw). Fowler and Ball 1925.

**Acanthurus blochii* Valenciennes in C and V, 1835. Photographic record.

Acanthurus guttatus Forster, 1801. BPBM 4251 (T). Myers 1999.
Hepatus guttatus (Forster). Fowler and Ball 1925.

Acanthurus leucopareius (Jenkins, 1903). Myers 1999.

Acanthurus nigricans (Linnaeus, 1758).
Hepatus nigricans (Linnaeus). Fowler and Ball 1925.

Acanthurus nigricauda Dunker & Mohr, 1929. BPBM 4285 (T). Myers 1999.

Acanthurus nigrofuscus (Forsskål, 1775). Myers 1999.

Acanthurus nigroris Valenciennes, 1835. BPBM 4276 (T). Myers 1999. Originally identified as *Hepatus elongatus* (Lacepède) by Fowler and Ball 1925.

**Acanthurus nubilus* Fowler & Bean, 1929. BPBM 37895 (K&L).
Acanthurus thompsoni (Fowler, 1923). Myers 1999.
Hepatus thompsoni Fowler. Fowler and Ball 1925.
Acanthurus triostegus (Linnaeus, 1758). BPBM 4239, 4278 (T), BPBM 15255 (G&R). Myers 1999.
Hepatus sandvicensis (Streets). Fowler and Ball 1925.
Ctenochaetus cyanocheilus Randall & Clements, 2001.
**Ctenochaetus hawaiiensis* Randall, 1955. Photographic record.
Ctenochaetus striatus (Quoy & Gaimard, 1825). BPBM 4302, 4304 (T), CAS 150134. Randall and Clements 2001. Misidentified as *C. strigosus* (Bennett) by Fowler and Ball 1925. *Ctenochaetus strigosus* is found only in Hawai'i and Johnston Atoll (Randall and Clements 2001).
**Naso brevirostris* (Valenciennes, 1835). Photographic record.
**Naso hexacanthus* (Bleeker, 1855). Photographic record. This could also be *Naso caesius* Randall & Bell. *Naso hexacanthus* is most common, but *N. caesius* is antitropical and therefore could also occur at Wake (J. Randall, pers. comm.).
Naso lituratus (Bloch & Schneider, 1801). BPBM 4318 (T). Myers 1999.
Acanthurus lituratus (Schneider). Fowler and Ball 1925.
**Naso unicornis* (Forsskål, 1775). Video and photographs were taken of this species.
**Naso vlamingii* (Valenciennes, 1835). Photographic record.
Zebrasoma flavescens (Bennett, 1828). BPBM 4312 (T). Myers 1999.
**Zebrasoma veliferum* (Bloch, 1797). Photographic record.

Family SPHYRAENIDAE (Barracudas)

Sphyraena barracuda (Walbaum, 1792). Myers 1999.

Family SCOMBRIDAE (Tunas and Mackerels)

Acanthocybium solanderi (Cuvier in C and V, 1831). Myers 1999.
Euthynnus affinis (Cantor, 1849). Myers 1999.
Katsuwonus pelamis (Linnaeus, 1758). Myers 1999.
Thunnus alalunga (Bonnaterre, 1788). Myers 1999.
Thunnus albacares (Bonnaterre, 1788). Myers 1999.
Thunnus obesus (Lowe, 1839). Myers 1999.

Family ISTIOPHORIDAE (Billfishes)

Istiophorus platypterus (Shaw & Nodder, 1792). Myers 1999.
Makaira indica (Cuvier, 1831). Myers 1999.
Makaira mazara (Jordan & Synder, 1901). Myers 1999. The specimen mounted in the Wake Atoll airport is labeled as *Makaira nigricans* Lacepède, 1802, the Atlantic counterpart of *M. mazara.*
Tetrapturus angustirostris Tanaka, 1915. Myers 1999.
Tetrapturus audax (Philippi, 1887). Myers 1999.

Family NOMEIDAE (Driftfishes)

Cubiceps pauciradiatus Günther, 1872. Myers 1999.

Family BOTHIDAE (Lefteye Flounders)

Bothus mancus (Broussonet, 1782). BPBM 3687 (T).
Platophrys mancus (Broussonet). Fowler and Ball 1925.
**Bothus pantherinus* (Rüppell, 1830). BPBM 15189 (G&R).

Family BALISTIDAE (Triggerfishes)

**Balistoides viridescens* (Bloch & Schneider, 1801).
Melichthys niger (Bloch, 1786). BPBM 5038 (T). Myers 1999.
Melichthys buniva (Lacepède). Fowler and Ball 1925.
Melichthys vidua (Solander in Richardson, 1844). BPBM 5004 (T). Myers 1999.
Balistes vidua (Richardson). Fowler and Ball 1925.
Rhinecanthus aculeatus (Linnaeus, 1758). BPBM 5022 (T). Myers 1999.
Balistipus aculeatus (Linnaeus). Fowler and Ball 1925.
**Rhinecanthus rectangulus* (Bloch & Schneider, 1801). Photographic record.

**Sufflamen bursa* (Bloch & Schneider, 1801). Photographic record.
Xanthichthys mento (Jordan & Gilbert, 1882). Myers 1999.

Family MONACANTHIDAE (Filefishes)

**Aluterus scriptus* (Osbeck, 1765). Photographic record.
**Cantherhines dumerilii* (Hollard, 1854).

Family OSTRACIIDAE (Trunkfishes, Boxfishes)

Ostracion cubicus Linnaeus, 1758.
Ostracion lentiginosus Bloch & Schneider. Fowler and Ball 1925.
Ostracion meleagris Shaw, 1796. BPBM 12067 (G&R).
Ostracion sebae Bleeker. Fowler and Ball 1925.
Ostracion camurum Jenkins. BPBM 5059, 5064 (T).

Family TETRAODONTIDAE (Puffers)

**Arothron hispidus* (Linnaeus, 1758). Photographic record.
**Arothron meleagris* (Bloch & Schneider, 1801). BPBM 5111, 5117 (T), MCZ 158362. Identified as *Tetrodon regani* Günther by Fowler and Ball 1925.
**Canthigaster amboinensis* (Bleeker, 1865). BPBM 15358 (G&R).
Canthigaster janthinoptera (Bleeker, 1855). BPBM 37894 (K&L). Allen and Randall 1977.
**Canthigaster solandri* (Richardson, 1845). BPBM 15332 (G&R).

Family DIODONTIDAE (Porcupinefishes)

Diodon hystrix Linnaeus, 1758. Fowler and Ball 1925.

DISCUSSION

The fauna of Wake Atoll is largely composed of wide-ranging western and Indo-Pacific fishes, with the notable occurrence of one Hawaiian endemic species (Table 1). The fish fauna of Wake Atoll is much less diverse than those of the Marshall and Mariana Archipelagos. This is probably due to the isolation and low diversity of habitat types found on the atoll. The Mariana Islands are composed of atolls and high islands with diverse habitat types. The Marshall Islands contain atolls with habitats similar to those of Wake but covering a much larger area and therefore benefiting from increased connectivity between reef systems. In comparison, Wake is an isolated single atoll with relatively few habitat types.

TABLE 1
Zoogeography of Wake Atoll Fishes

Zoogeographic Distribution	% of Wake Atoll Fishes
Hawai'i/Japan	0.3
Indo-Pacific	52.2
Indo-pan-Pacific	11.1
West central Pacific	11.1
Indo-West Pacific	3.2
West Pacific	1.3
Pacific Plate	5.7
Pan-Pacific	1.0
Circumtropical	4.1
Circumglobal	1.3

The geomorphology of the atoll is shown in Figures 2 and 3. There are four basic aquatic habitat types within Wake Atoll. The first includes a shallow and turbid lagoon with scattered patch reefs. About one-fourth of the lagoon habitat consists of featureless sand flats that are fully exposed at low tide. A second habitat type is the intertidal, hard-substrate, ocean reef flat, also exposed at low tide. The third is the reef crest, of which the top is also exposed at low tide. The fourth habitat type is the outer reef, which drops in depth rapidly, on both the exposed windward and sheltered leeward sides. We did not find sea grass, algal flats, or mangroves. There are no brackish-water habitats. The island's topography is very low, with a maximum height above sea level of only a few meters.

The lagoon is very murky and shallow (maximum depth of about 5 m). The area of the lagoon along Wake Island is largely exposed at low tide and represents about 25% of the total lagoon area. The lagoon has scattered patch reefs on a sandy bottom (Figure 4). Water circulation in the lagoon was severely reduced when the causeway between

FIGURE 2. Aerial view of Wake Atoll, looking toward the south. The open reef crest is to the right (west). Peale Island is in the foreground separated from Wake Island by a narrow channel. The northwestern margin of the atoll (foreground) has a wide intertidal reef flat.

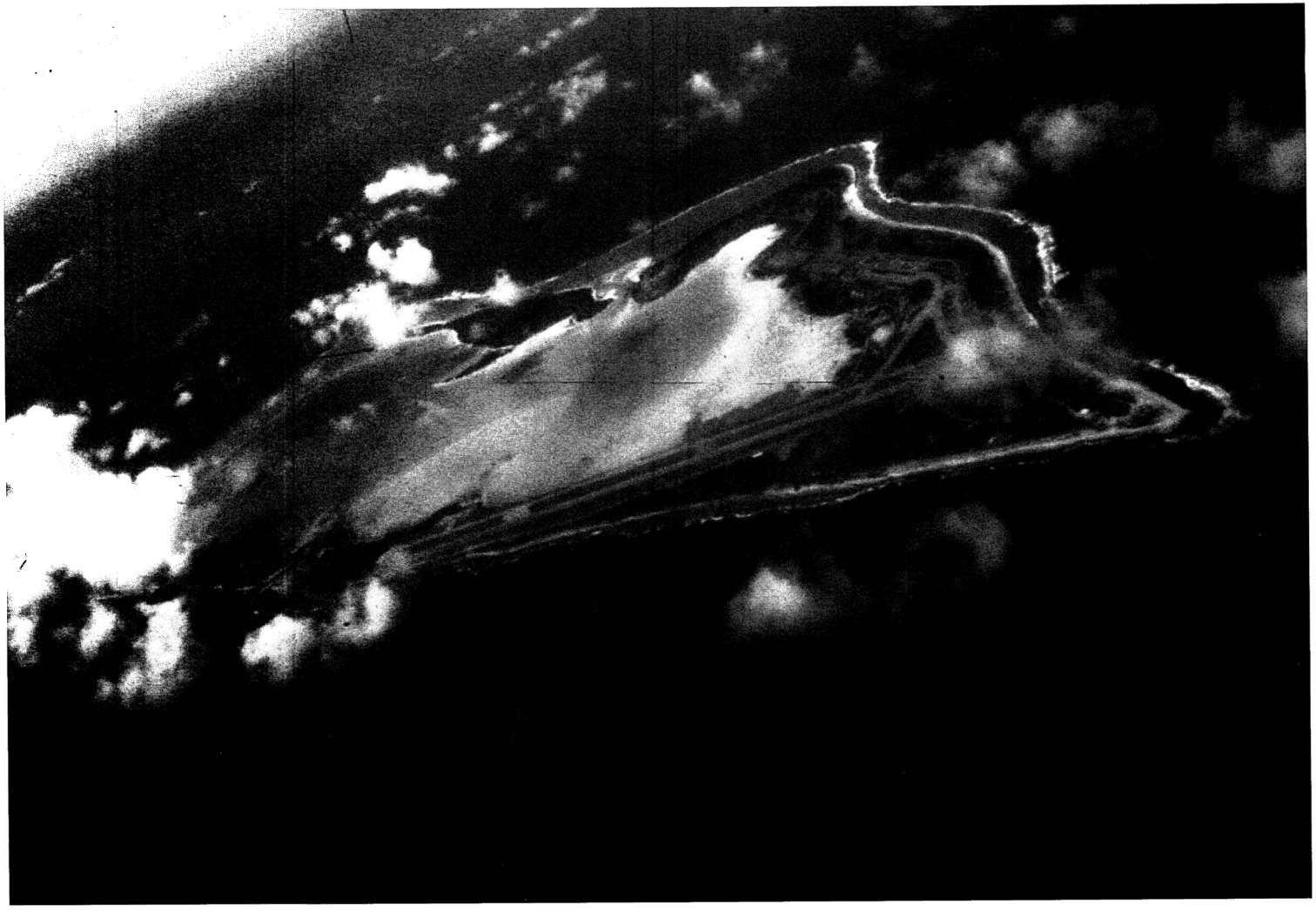

FIGURE 3. Aerial view of Wake Atoll looking north. The eastern tip of Wake Island is on the right (Peacock Point). This view shows the leeward side of the atoll, which has a very narrow intertidal reef flat that rapidly drops off to deeper depths.

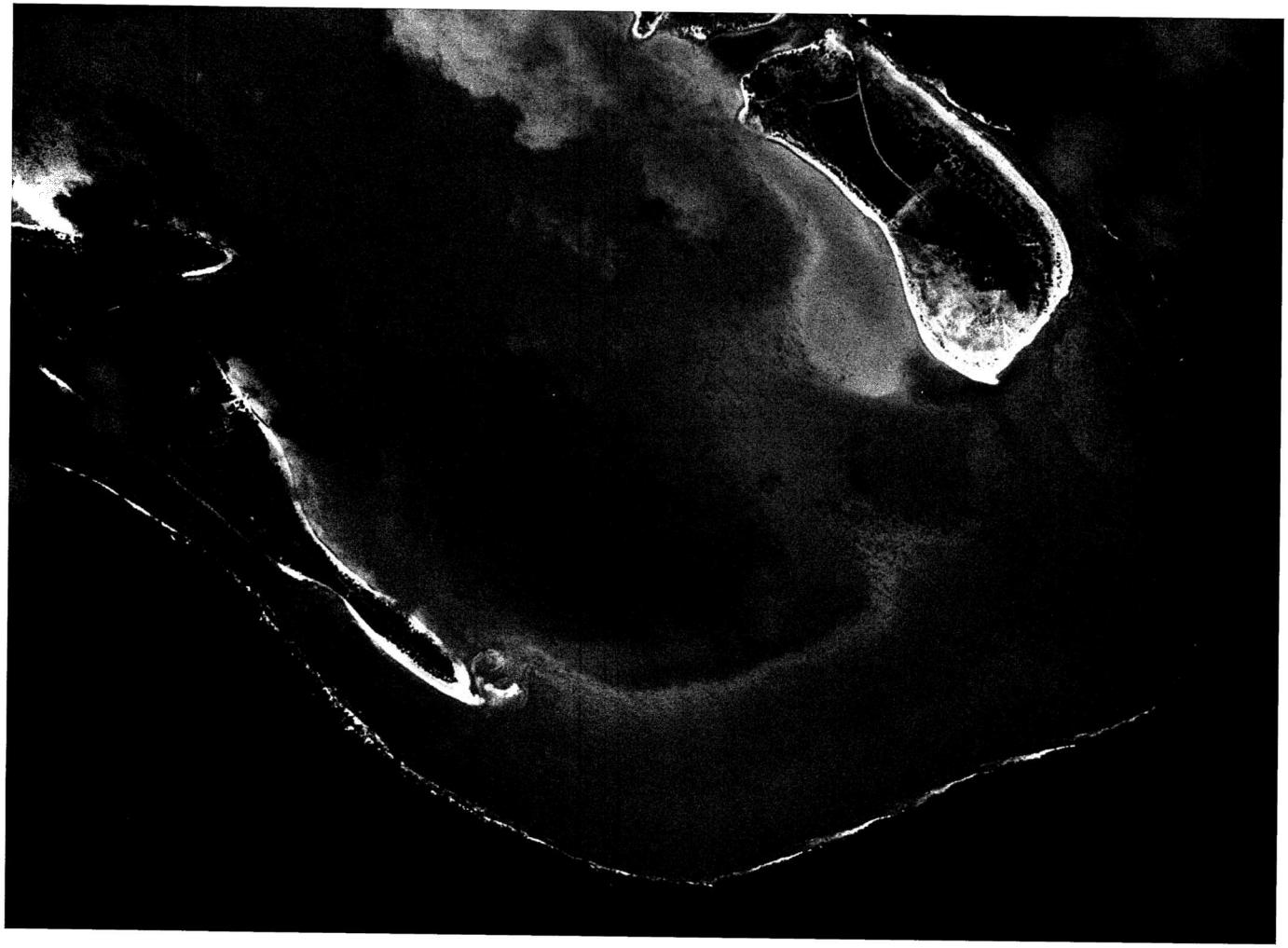

FIGURE 4. Top-down aerial view of the Wake Atoll lagoon showing the western reef, which is only emergent at the lowest tides. The lagoon is mainly sand flats with few patch reefs.

FIGURE 5. Underwater habitat of the outer reef of Wake Atoll showing the dense coral cover.

Wake and Wilkes Islands was built, resulting in the closure of the small boat harbor inlet into the lagoon. There have been reports of large-scale fish die-offs in the lagoon due to high temperatures when tidal flushing is low resulting in low dissolved oxygen (M. Henz, pers. comm.). The outer reef is densely covered in coral and slopes rapidly to abyssal depths (Figure 5).

The total number of fishes identified from Wake Atoll ($n = 321$) is similar to that found on other isolated central Pacific atolls and islands including Johnston Atoll ($n = 301$ [Randall et al. 1985, Kosaki et al. 1991]), Rapa ($n = 268$ [Randall et al. 1990; but many new records recently have been found but not yet reported (J. Randall, pers. comm.)]), and Midway ($n = 258$ [Randall et al. 1993]). It has been suggested that the relatively low number of species occurring at these locations could be explained by their small geographic size and limited habitat diversity, combined with their isolation or relatively large distance separating them from other population sources (Randall 1992, 1998*b*). This comparison is very broad and the islands/atolls vary greatly in their geomorphology. For example, Rapa is a high island, whereas Johnston is an atoll with a large lagoon. Even so the relationship between species diversity and island/atoll isolation and size reveals an interesting and consistent pattern.

The fishes that are found most abundantly at Wake Atoll (Table 2) are typical of those also most abundant on other Pacific Islands (e.g., Kosaki et al. 1991, Randall et al. 1997). The fishes of Wake Atoll can be divided into the following categories: coastal shore fishes (303 species, of which six are elasmobranchs) and offshore pelagic fishes (18 species).

Wake Atoll occupies a unique central location in the northern Pacific and its fauna reflects a mixture of species with different zoogeographic distributions; however, conventional taxonomic classification by species does not always incorporate regional population variation (potential subspecies) that is recognized most readily by color pattern differences (Randall 1998). Thus future research using DNA markers may reveal more regional variation in zoogeography.

TABLE 2

Most Speciose Families of Fishes at Wake Atoll

Family	No. of Genera	No. of Species	% of Total Fish Fauna
Labridae	17	38	11.8
Gobiidae	14	21	6.5
Acanthuridae	4	21	6.5
Pomacentridae	6	20	6.2
Serranidae	8	19	5.9
Chaetodontidae	4	15	4.6
Muraenidae	4	15	4.6
Holocentridae	3	13	4.0
Apogonidae	3	13	4.0
Scaridae	5	13	4.0
Carangidae	8	12	3.7
Blenniidae	7	11	3.4
Mullidae	3	8	2.5
Balistidae	5	7	2.2
Scorpaenidae	3	7	2.2
Cirrhitidae	4	6	1.9
Tetraodontidae	2	6	1.9

It is interesting that a potential ocean current flow pathway seems to exist, at least periodically, between Hawai'i and Wake Atoll. A 90-day oscillation in sea level has been observed intermittently at Wake Atoll based upon two decades of measurements (Mitchum 1995). This oscillation tends to occur about 1.5 yr after an El Niño and appears to be caused by ocean eddies generated off the island of Hawai'i that then move westward and impinge upon Wake Atoll (Mitchum 1995). These ocean eddies are known to contain high concentrations of fish larvae (Lobel and Robinson 1986). We found further evidence of the current flow between Hawai'i and Wake by observing a small sailboat washed ashore with a Hawai'i State registration sticker and from reports of Hawaiian fish aggregation devices (FADS) recovered from Wake by the U.S. Coast Guard (P. Fusco and M. Timmons, pers. comm.).

Based upon this evidence, one would expect an overall close faunal affinity between Wake and Hawai'i; however, this does not seem to be the case. For example, a common species, the convict tang, *Acanthurus triostegus*, is found throughout the Pacific Ocean. The population of *A. triostegus* at Wake Atoll is

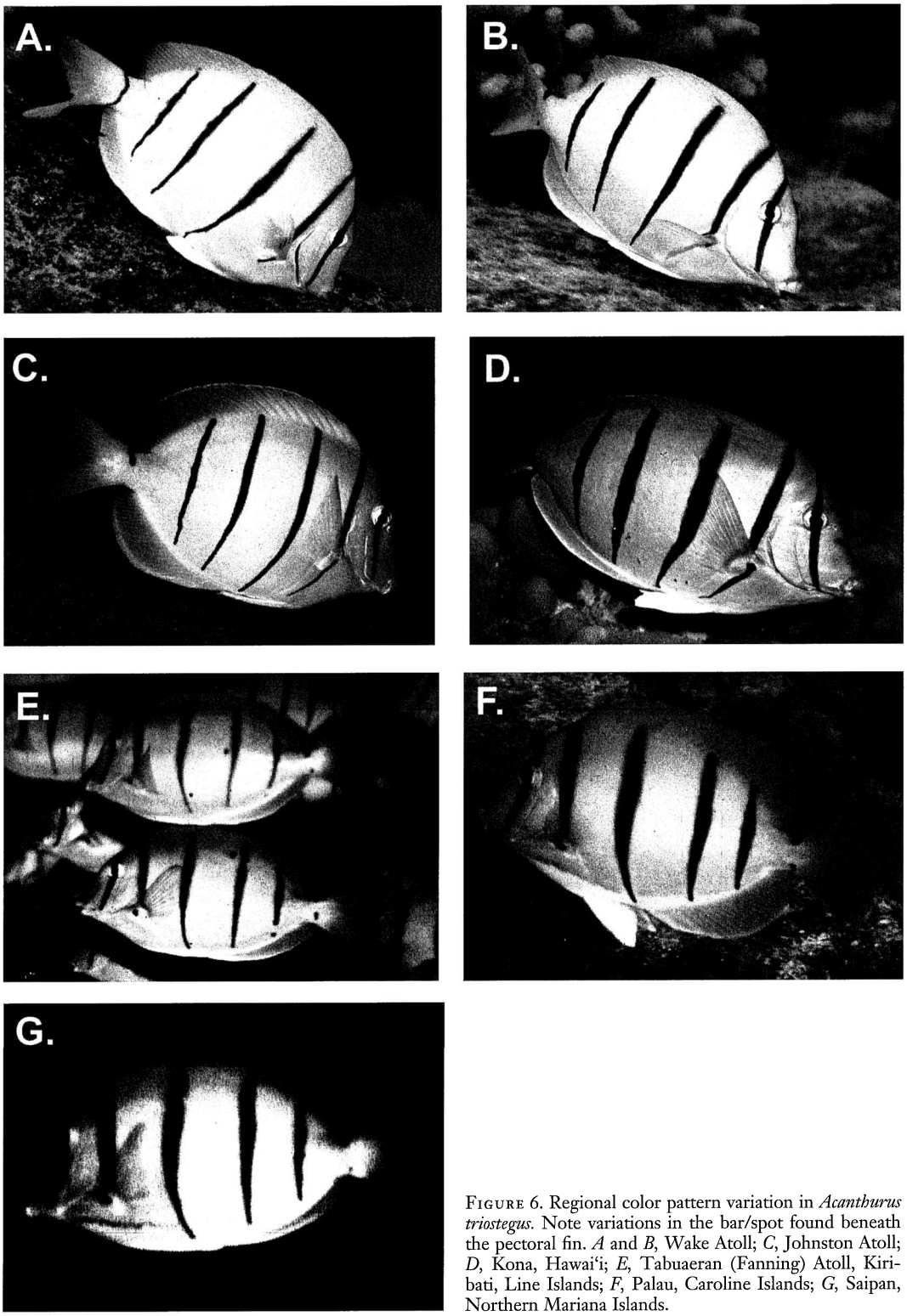

FIGURE 6. Regional color pattern variation in *Acanthurus triostegus*. Note variations in the bar/spot found beneath the pectoral fin. *A* and *B*, Wake Atoll; *C*, Johnston Atoll; *D*, Kona, Hawai'i; *E*, Tabuaeran (Fanning) Atoll, Kiribati, Line Islands; *F*, Palau, Caroline Islands; *G*, Saipan, Northern Mariana Islands.

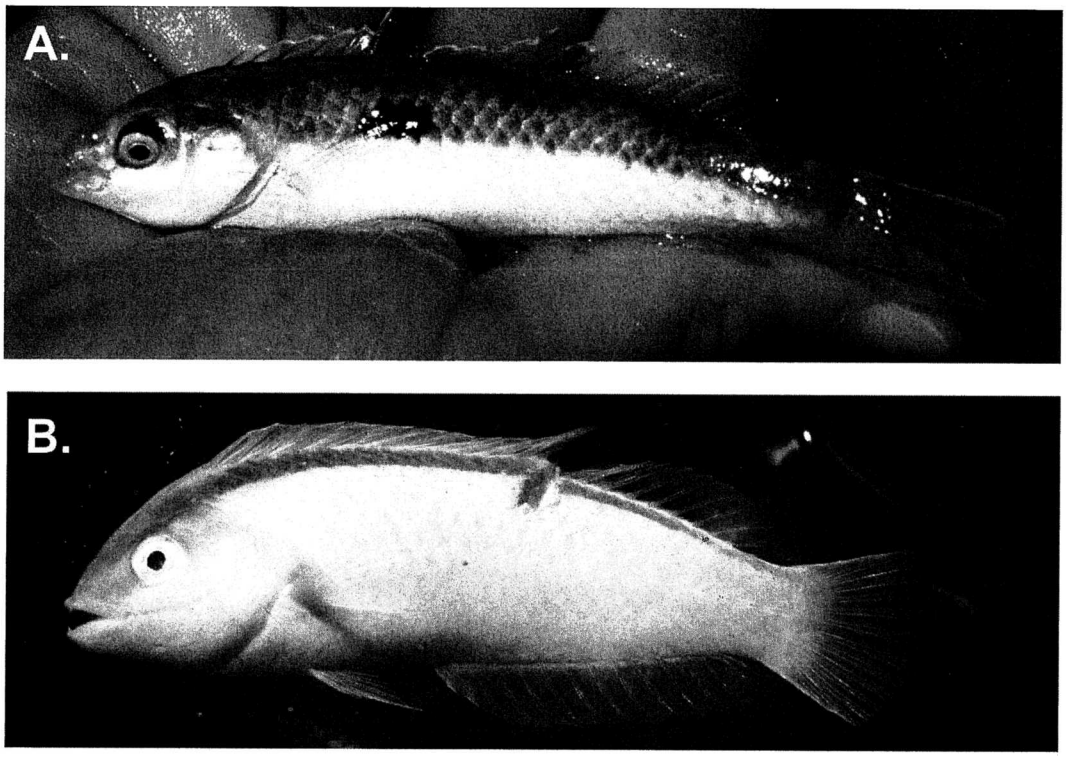

FIGURE 7. *Ammolabrus dicrus* (Labridae), formerly considered a Hawaiian endemic found only from O'ahu, Hawai'i. It is now found at Wake Atoll. Similar fish have been observed in the Marshall Islands but have not been collected (Randall and Carlson 1997). *A*, Female; *B*, male.

not the same as the distinctive Hawaiian form (which Randall [1956] recognized as a subspecies, *A. triostegus sandvicensis*). *Acanthurus triostegus* at Wake Atoll exhibits two color pattern variations: one that is very similar to the populations in the Mariana and Marshall Islands and another that is typical of a variation occurring in Phoenix and Line Island specimens (Figure 6; see also Schultz et al. [1953:625, fig. 90] for illustrations of zoo-

TABLE 3

Zoogeographic Overlap of Wake Atoll Fishes with Those of Nearest Archipelagos

Location	% of Wake Species in Common	Data[a]	% of Wake Species at Location	Data[b]	Reference
Hawaiian Islands	40	129/321	23	129/557	Randall 1996
Johnston Atoll	41	131/321	44	131/301	Randall et al. 1985, Kosaki et al. 1991
Northern Mariana Islands	87	279/321	30	279/933	Myers 1999
Southern Mariana Islands	66	213/321	50	213/427	Myers 1999
Marshall Islands	82	264/321	32	264/817	Myers 1999

[a] Number of Wake Atoll species found at location divided by the total number of species at Wake.
[b] Number of Wake Atoll species found at location divided by the total species at location.

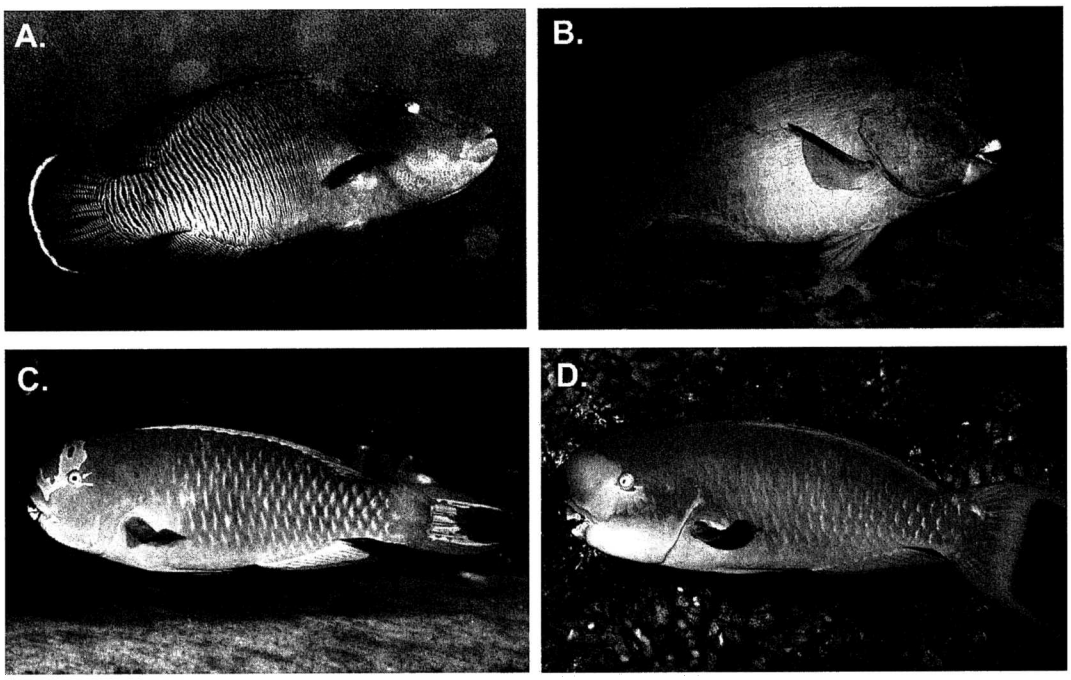

FIGURE 8. Labroid fishes of special concern for conservation found at Wake Atoll. *A*, Maori Wrasse, *Cheilinus undulatus* (Labridae); *B*, Bumphead Parrotfish, *Bolbometopon muricatum* (Scaridae); *C*, Tan-faced Parrotfish, *Chlorurus frontalis* (Scaridae); *D*, Pacific Steephead Parrotfish, *Chlorurus microrhinos* (Scaridae).

geographic color pattern variations in this species).

One species that was previously known only from O'ahu, Hawai'i, is now documented from Wake Atoll: *Ammolabrus dicrus* Randall & Carlson, 1997 (Figure 7). It probably also occurs in the Marshall Islands as well (Randall and Carlson 1997). As noted in the species listing, three other Hawaiian endemics have also been reported from Wake

TABLE 4

Pacific Fishes of Special Concern for Conservation Found at Wake Atoll

Family	Species	IUCN Category	Common Name
Labridae	*Cheilinus undulatus*	VU[a] A1d+2cd	Humphead/Maori Wrasse
Scaridae	*Bolbometopon muricatum*		Giant Bumphead Parrotfish
Scaridae	*Chlorurus frontalis*		
Scaridae	*Chlorurus microrhinus*		
Serranidae	*Epinephalus lanceolatus*	VU A2d	Giant Grouper
Serranidae	*Epinephalus polyphekadion*	Shortlist for assessment	Camouflage Grouper
Serranidae	*Variola louti*	Shortlist for assessment	Yellow-edged Lyretail

[a] Vulnerable based on the following IUCN (2001) criteria: A1d, reduction in population size based on actual or potential levels of exploitation; 2cd, an observed, estimated, inferred, or suspected population size reduction of 30% over the last 10 yr or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on a decline in area of occupancy, extent of occurrence, and/or quality of habitat and actual or potential levels of exploitation; A2d, an observed, estimated, inferred, or suspected population size reduction of 30% over the last 10 yr or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on actual or potential levels of exploitation.

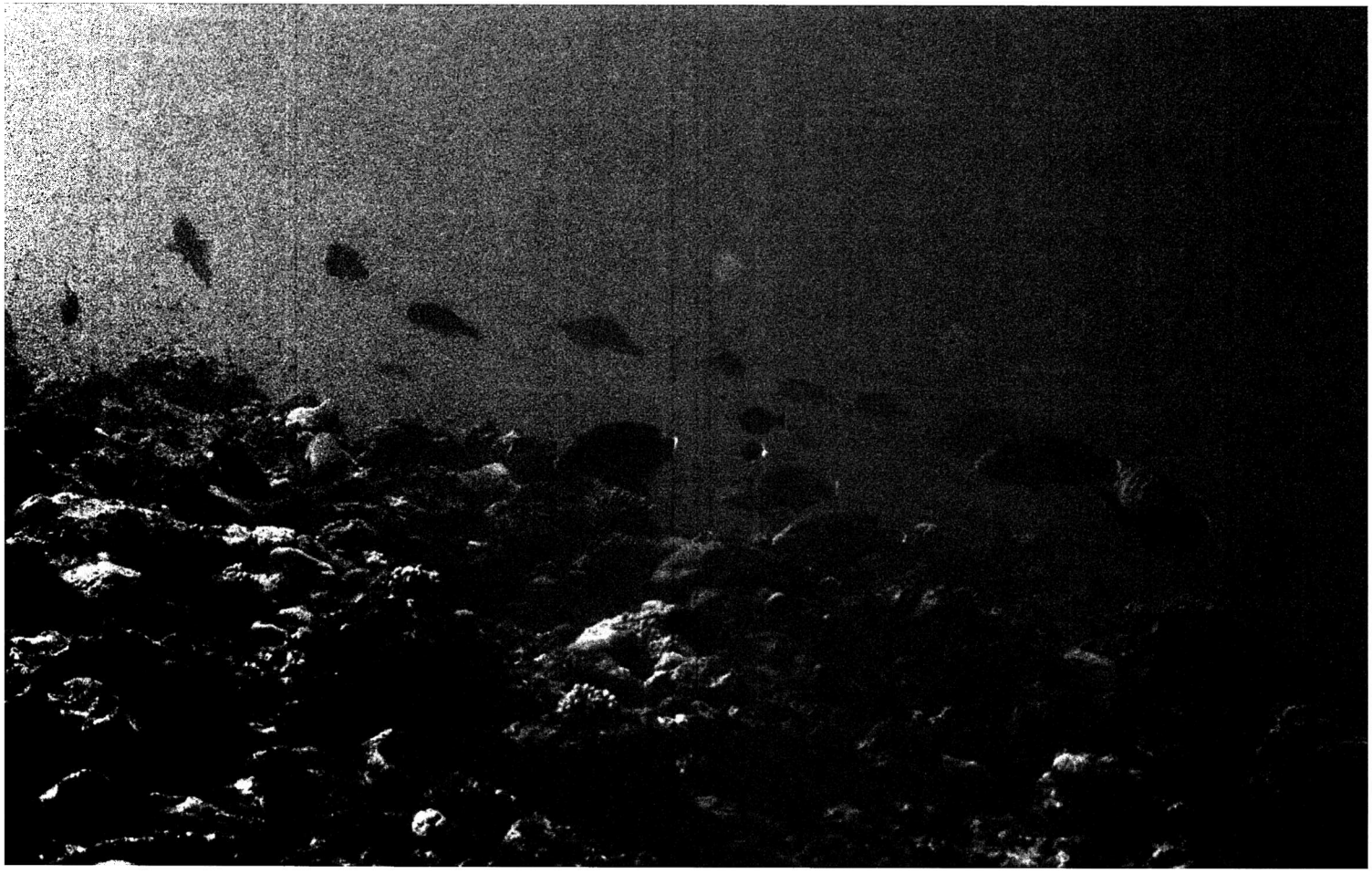

FIGURE 9. This underwater scene shows a school of large parrotfish in the background and at least six large Maori Wrasses (*Cheilinus undulatus*). Such scenes are no longer observed on other Pacific atolls subjected to commercial fishing.

Atoll, but these are probably misidentifications (*Eviota epiphanes*, *Entomacrodus marmoratus*, *Sebastipistes ballieui*).

The Wake Atoll fish fauna has the most species in common with that of the Mariana Islands. A zoogeographic comparison of the Wake Atoll fish fauna with those of the four nearest neighboring archipelagos was made using our checklist and the species distribution data compiled from the literature. This zoogeographic analysis indicates that the greatest species overlap occurs with the northern Mariana Islands (87%) and the Marshall Islands (82%). Although the southern Mariana Islands have a low percentage of species in common with Wake (66%), the southern Mariana Islands had a much greater proportion of their total fish fauna also found at Wake than did the other five locations examined (Table 3). This pattern is corroborated by the *Acanthurus triostegus* example.

Another unique aspect of Wake Atoll is the protection of its natural resources, in particular fisheries, by the U.S. Department of Defense. This is achieved primarily through the exclusion of commercial fishing ventures from Wake and the ban on reef fish spearfishing. Our surveys discovered four labroid fishes (Figure 8) and three groupers on Wake's reefs that are threatened by exploitation elsewhere in the Pacific (Table 4). In particular, the Maori Wrasse (*Cheilinus undulatus*), which is listed on the IUCN Red List (2001) (IUCN Grouper and Wrasse Specialist Group [http://www.hku.hk/ecology/GroupersWrasses/iucnsg/doc/species.html]) as vulnerable to overexploitation, is abundant at Wake (Figure 9). The Maori Wrasse is a prized food fish and is targeted for the live reef fish trade (LRFT) in Hong Kong (Donaldson and Sadovy 2001). These fishes of concern are not fished from Wake waters and therefore population numbers may be considered pristine; however, fishing of other species does occur by the residents and visitors of Wake. For example, very few sharks were observed, which is unusual for a remote Pacific atoll. The local workers reportedly fish occasionally for sharks as well as for other reef species, but whether this has negatively impacted the population was not determined. This emphasizes the need for continued protection of Wake Atoll's coral reef ecosystem.

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