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MARINE INVERTERBRATES OF THE PITCAIRN ISLANDS: SPECIES COMPOSITION AND BIOGEOGRAPHY OF CORALS, MOLLUSCS, AND ECHINODERMS

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ABSTRACT

The marine invertebrate fauna of the Pitcairn Islands consists of a depauparate assemblage of Indo-West Pacific species; 54 corals, 198 molluscs, and 58 echinoderms are recorded. I discuss the physiography and marine communities of each island and the origin and characteristics of the fauna. There is considerably variation in species composition among islands as well as through time, indicating that these peripheral islands have an unstable, dynamic fauna.

INTRODUCTION

The marine fauna of the Pitcairn Group is of particular biogeographic interest because of the group's isolation, peripheral location, and unusual physiography. Located at the southeastern edge of the Indo-West Pacific province, the Pitcairns are 390 km east of their nearest neighbor, Temoe Atoll in the Tuamotu-Gambier Islands, and 1570 km west of Easter Island. They are the easternmost islands on the Pacific plate and indeed within the Indo-West Pacific province, with the exception of faunistically depauperate and unusual Easter Island and Sala y Gomez. Situated between 24-25°S, the Pitcairns are also more austral than most other tropical Pacific islands. Two of the Pitcairn Islands have a physiography that is uncommon for the Central Pacific: Henderson is an uplifted atoll, whereas Pitcairn is a precipitous Pleistocene volcano with very little reef development. The remaining islands, Ducie and Oeno, are small atolls. Of further interest is that except for Pitcairn, the islands in the group are uninhabited and have been so for hundreds of years; they thus provide a rare glimpse of insular marine ecosystems essentially unaltered by human activities.

PAST WORK

Studies on the marine fauna of the Pitcairn Group have been infrequent. Hugh Cuming made the first collections in the archipelago, visiting Ducie, Henderson, and Pitcairn in 1827, and Pitcairn again in 1828 (Dance 1980). Although his stay was brief (11 days total, St. John 1940), several new molluscs were described from specimens he collected in the group. The next significant marine collection, again of molluscs, was made on Henderson by JR Jamieson and DR Tait in 1912; their collections were described by EA Smith (1913). The natural history expeditions that followed in the first half of this century - the Whitney South Sea Expedition in 1922, the Mangarevan Expedition in 1934, and the Templeton Crocker Expedition in 1935 - focused largely on the terrestrial biota.

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Since the 1960's, the marine fauna of the Pitcairns has received more attention. In 1964, HA Rehder collected molluscs on Pitcairn Island. In 1967 the *Pele* with HA Rehder, DM Devaney and BR Wilson on board, spent 5 days on Pitcairn and 2 on Oeno. They made 33 dredge hauls on Pitcairn, collecting in depth zones little studied elsewhere in Polynesia (Rehder 1974). In 1970-1971, the schooner *Westward*, with JE Randall and HA Rehder, spent most of its one-month stay in the group on Pitcairn, but also visited Henderson, Ducie and Oeno briefly (for <3 days each) (Randall 1973, 1978, Devaney & Randall 1973). All 3 above expeditions focused on Pitcairn within the archipelago, and the greatest collecting efforts concentrated on molluscs (Rehder in 1964, 1967, 1970-1; Wilson in 1967), echinoderms (Devaney in 1967) and fish (Randall in 1970-1), although other invertebrates were routinely taken. Results on ophiuroids and asteroids were published by Devaney (1973, 1974), Devaney & Randall (1973) and Marsh (1974). Rehder & Wilson (1975) described 3 new gastropods from Pitcairn, while Rehder & Randall (1975) and Fosberg *et al.* (1983) listed the known malacofauna of Ducie and Henderson respectively. Although most of the large collections of molluscs from Pitcairn have yet to be studied, several systematic revisions on various gastropod taxa include material from the Pitcairn Group (see table 2). Rehder & Randall (1975) provided a brief list and comments on some crustaceans, echinoderms, and corals, and Fosberg *et al.* (1983) mentioned a lobster and an echinoid. A series of papers have also been published discussing the fish fauna, including a species list for Ducie (Rehder & Randall 1975).

PRESENT WORK

The 1987 Smithsonian Expedition visited Ducie on 10 May 1987, Henderson on 12-21 May, Pitcairn on 22-26 May, and Oeno for a brief 2 hours on 28 May. On both Ducie and Henderson we collected most intensely on the fore reef using SCUBA, while reef flat and lagoonal (on Ducie) habitats were sampled less intensely. Collections on Pitcairn were limited to a few specimens brought by divers. On Oeno we landed briefly on the E end of the main islet, and I collected on the adjacent shoreline and lagoon. Accordingly, my most extensive collections are from Henderson and Ducie, while those from Pitcairn and Oeno are very limited.

Corals (Milleporina & Scleractinia), molluscs, and echinoderms were the focus of my collecting efforts, and are the taxa considered here. All species encountered are listed in tables 1-3, with the exception of a few molluscs and corals that remain unidentified. Coral collections made by Devaney in 1967 (USNM portion only) and by the *Westward* crew in 1971 (Bishop Museum, reported on by Rehder & Randall 1975) were also (re-) examined. Other invertebrates collections from the Pitcairns at the USNM and Bishop Museum were not consulted. Literature records are included from papers concentrating on the Pitcairn Group fauna and from several recent taxonomic monographs (see tables 1-3 for citations). All collections from the 1987 expedition are deposited in the National Museum of Natural History (USNM). A list of USNM catalogue numbers for all species here referred to will, once available, be deposited in the USNM Mollusc library.

PHYSIOGRAPHY AND MARINE HABITATS

Ducie: Rehder & Randall (1975) and Devaney & Randall (1973) described the physiography and marine habitats of Ducie in some detail; only a few noteworthy features will be mentioned here. The outer reef slope was investigated only off the western tip of Acadia Islet, where it forms a wide shelf, sloping gently until a break at

25-30 m depth, steepening thereafter. Rehder & Randall (1975) reported similar wide shelves off at least the NW, NE, and SW sides, most extensive (270 m wide to the break at 30 m depth) off the small SW passage. Such wide fore reef terraces appear to be common on the southernmost Polynesian islands: they are found on Rarotonga, Mangaia (Cook Islands), Rimatara, Tubuai, Raivavae, and areas of Rurutu (Austral Islands), and may represent reefs unable to reach the surface due to slower growth rates at these colder latitudes (Paulay & McEdward submitted).

An unusual feature of the fore reef area investigated is the complete absence of sands or finer sediments. Only a few pockets of coral rubble interrupt the undulating reef pavement, which is lightly dissected by a spur and groove topography best developed at depths of <10 m. The fore reef grades imperceptibly into the outer reef flat, a reef crest is entirely lacking. The reef flat investigated at the W end of Acadia Islet has minimal sand deposits, lacks live corals, and has dense populations of the sea cucumber *Holothuria atra* and the giant vermetid *Dendropoma maximum*.

The lack of fine sediments on the fore reef and reef flat is further reflected in the composition of Acadia Islet, composed entirely of storm-tossed coral and mollusc rubble, with shells of the gastropod *Turbo argyrostomus* dominating the latter. On the lagoon side, this rubble mound ends abruptly in a steep bank, ending ca. 10 m from shore at a depth of 8-9 m, uncomformably overlying the flat lagoon bottom of fine, white sand. Many irregular, heavily eroded patch reefs rise from the lagoon floor, reaching within 2-5 m of the surface. Several species of *Montipora* and *Astreopora* cf. *myriophthalma* dominate the sparse coral cover, and the sea urchin *Diadema savignyi* is common. The lagoon floor has an abundance of *Holothuria atra* and occasional *Holothuria nobilis*.

Rehder & Randall (1975) noted a large coral kill on the Ducie fore reef in January 1971, and estimated that it occurred at least a year before their visit:

"Everyone diving at Ducie came up in wonderment at the obvious mass mortality of the corals in all areas investigated. ... At one time in the not-too-distant past, the outer reef of Ducie ... was nearly completely covered with live coral, particularly an *Acropora* with branches of only a few inches in length. The coralline red alga has not grown to the extent of bridging over the tips of the branches of this coral, whereas it completely covers the plate-like or encrusting species." (p. 16)

In contrast, we found prolific live coral cover in some of the same areas as surveyed by the *Westward*. Live coral cover was high throughout the fore reef shelf investigated: at 17 m it was 58%, decreasing abruptly above 8 m to ca. 20-30%. Colonies of several corymbose *Acropora* species, up to 40 cm across, and thin whorled plates of *Montipora aequituberculata*, up to 70 cm in diameter, dominated cover. Other common corals included *Pavona* sp. 1, *Plesiastrea versipora*, and *Cyphastrea* cf. *serailia*. The largest corals seen were ca. 1 m wide colonies of *Favia stelligera*. Unlike on Henderson where they dominate coral cover, *Pocillopora* species were not common on Ducie. In contrast to the great changes that occured in the fore reef coral community between 1971 and 1987, the lagoon fauna appears to have remained stable, in both 1971 and 1987 supporting a low cover of mostly *Montipora* species.

I reexamined all but one (*Pocillopora* sp. cf. *P. modumanensis*, a likely synonym of *P. eydouxi*; see Veron & Pichon 1976) of the 14 coral species collected in 1971 (Rehder & Randall 1975 pp. 37-38) (table 1). All 3 species collected in 1971 but not in 1987 were found solely in the lagoon by the *Westward*, a habitat we sampled very cursorially. All coral species collected on the fore reef in 1971 were well established there in 1987. The 1987 coral community, dominated by *Acropora* species and *Montipora aequituberculata*, appears also to be similar to the pre-kill (pre-1971) fauna. Rehder & Randall (1975) noted *Acropora* to dominate among the recently killed coral species of 1971, and I found the plate coral *M. aequituberculata* to have been a dominant constituent of the reef in the recent past, its colonies clearly visible where eroded surge channels expose the reef framework.

Rehder & Randall (1975) argued that the observed pattern of mass mortality may be due to the intrusion of cold water masses, considering the southern position of the island (Ducie is the southernmost atoll in the world); *Acanthaster*, of which only a single individual was found in the lagoon, was considered a less likely cause. Their hypothesis is supported by the pattern of mortality: very high on the fore reef, while the lagoon retained a considerable, although sparse, cover of mostly *Montipora* species. While *Montipora* is favored by *Acanthaster*, its lagoonal habitat would be isolated from short term intrusions of cold water flowing over the fore reef.

The two most conspicuous invertebrates noted in 1971 on the fore reef (Rehder & Randall 1975), the urchins *Diadema savignyi* and *Heterocentrotus mammillatus*, were also very common during our visit. The maintenance of dense sea urchin populations through this time period is of interest not only because it contrasts with corals, but also because *D. savignyi* abundance varies greatly among islands in Polynesia. On certain islands, e.g. Mangaia, Mauke (Cooks, in 1984), and Henderson (in 1987), these nocturnal animals occur spine-to-spine in dense populations, exposed during the day, due to a lack of sufficient crevices to hide in; in contrast, on some neighboring islands (e.g. Rarotonga in the Cooks), they are not noticeably abundant. The question arises whether the very large populations are stable or the result of occasional outbreaks. The present data from Ducie supports the former hypothesis. The presence of such large densities of diademids in the oligotrophic waters of several uplifted islands (Mangaia, Mauke, Henderson) that lack runoff does not support Birkeland's (1989) hypothesis that dense echinoid populations are due to successful larval recruitment in areas of high nutrient input.

Unexpectedly for an uninhabited atoll, fish are not abundant on the fore reef at Ducie. This was also noted by the *Westward* Expedition (Devaney & Randall 1973, Rehder & Randall 1975). Most conspicuous in 1987 were several larger predators: schools of *Caranx lugubris* and *Seriola lalandi* were ubiquitous, and the grouper *Variola louti* was common. In <0.5 m water on the reef flat, however, large serranids (*Epinephelus* sp.) and scarids were common.

It is tempting to speculate that the great abundance of invertebrate grazers (sea urchins and the gastropod *Turbo argyrostomus*) and the relative paucity of herbivorous fish on Ducie are causally related, and that such a scenario may have been more widespread in Polynesia prior to the advent of man. Human predation is usually intense on large invertebrates, including echinoids and *Turbo*, throughout Polynesia and can render such species uncommon on heavily harvested reefs. Further, predatory fish are especially susceptible to overfishing, as they are often territorial and can be readily taken by angling as well as by spears, nets, and other methods. Thus by decreasing the abundance of both the potential competitors (invertebrate grazers) and principal predators of herbivorous fish, human habitation may result in an ecosystem that is more dominated by fish herbivores, as seen on many densely settled islands today. The balance between invertebrate and vertebrate grazers can also be tipped in the other direction by human occupation, however: in heavily fished reefs in the Caribbean, populations of *Diadema antillarum* are an order of magnitude higher than elsewhere, due to reduced competition from herbivorous fish, reduced predation by balistids (Hay 1984), and presumably little human predation on the urchins themselves.

Henderson: A brief description of the reefs of Henderson Island is given by Spencer & Paulay (1989). In contrast to Ducie, the fore reef on Henderson is relatively narrow, has abundant soft sediments, and supports low coral cover. Spur and groove topography is well developed; the grooves are filled with sands that support an abundant infauna.

An algal turf covers much of the fore reef surface and is dominated by *Microdictyon boergesenii* Setchell, with *Lobophora variegata* (Lamour.) Womersley, and *Stypopodium zonale* (Lamour.) Papenfuss being also common. Coral cover was 6% at 11 m depth off the N Beach. In shallow waters, coral cover is dominated by *Millepora*, which becomes uncommon by 12 m depth; deeper waters are dominated by *Pocillopora* sp. 1, *Pocillopora woodjonesi*, and *Porites* cf. *lobata*. In contrast to Ducie as well as to the uplifted Pleistocene reefs of Henderson, acroporids are uncommon. All corals listed from Henderson (table 1) were collected on the fore reef.

The most conspicuous invertebrates on the fore reef are several sea urchins; *Diadema savignyi* is very abundant (see below), while *Echinostrephus aciculatus* and, in shallow (<10 m) water, *Echinometra oblonga*, are common. The large sea cucumber *Holothuria nobilis* is also common, especially at <15 m depths. Like on Ducie, fish are not abundant on Henderson. The black jack, *Caranx lugubris*, is most conspicuous.

The fringing reef flat that surrounds Henderson on the E, N, and NW sides lacks a reef crest and slopes gently seaward. The flat bordering the North Beach was investigated by snorkeling. Although it is banked by a beach, little loose sediment is found on the hard reef flat pavement, and the little that occurs lies underneath the few loose rocks near the landward margin of the reef.

The reef flat has a rich malacofauna. The bivalves *Arca avellana, Lima vulgaris, Chama asperella,* and especially *Isognomon perna* are common, as are several species of muricids and cones, especially *Drupa morum, Drupa clathrata, Thais armigera,* and *Conus rattus*, but also *Drupa ricinus, Morula uva, Conus miliaris, Conus nanus, Conus lividus,* and *Conus retifer*. Additional common gastropods include *Patella flexuosa, Cypraea schilderorum, Nassarius gaudiosus,* and *Strombus maculatus*. The echinoid *Heterocentrotus trigonarius* is abundant in patches along the outer reef flat, while *Echinometra oblonga* is abundant scattered across the reef. Under rocks are large populations of the irregular echinoid *Echinoneus cyclostomus* as well as occasional *Holothuria arenicola*. The only corals seen were a few colonies of *Favia rotumana*.

Pitcairn: A brief description of the underwater topography and habitats of Pitcairn are given by Devaney & Randall (1973). Coral reefs are small and isolated, most being confined to depths of over 20 m.

Oeno: Devaney & Randall (1973) give a brief description of the Oeno lagoon and fore reef. Our visit was brief and confined to the lagoon. The SE outer reef flat is strongly dissected by spur and groove topography and lacks a reef crest. The lagoon seen is uniformly shallow, ca. 1.5-3 m deep, and has an undulating bottom of rubble and sand, with scattered reefs. In the small area investigated at the eastern tip of the larger islet several species of *Montipora* dominate coral cover, with *Acropora humilis,* *Acropora secale, Pavona varians, Montastrea curta,* and *Cyphastrea* cf. *serailia* being also common. *Tridacna maxima* appears to be abundant throughout the lagoon.

MARINE FAUNA

The recorded coral, mollusc, and echinoderm species of the Pitcairn Islands are listed in tables 1-3. Noteworthy observations on the taxonomy, distribution, or ecology of selected species are presented below.

Corals:

Corals exhibit considerable geographic variation in morphology (Veron 1981), and it may be difficult to determine whether unusual forms at peripheral locations are due to genetic or ecophenotypic differences. Several species in the Pitcairn Group do not fit well into the described species they were assigned to, further collecting in the Pitcairn and Tuamotu Islands is necessary to interpret such differences. The Pitcairn fauna exhibits considerably more such odd geographic variation than the Cook Islands' fauna. Some striking examples are discusses below.

Stylocoeniella guentheri Bassett-Smith 1890

A large clump of arborescent *S. guentheri* was dredged at 37 m off Henderson Island; colonies of similar form were dredged by the *Pele* off Pitcairn from 47-63 m and 72-108 m. The fine branches characteristic of these colonies differ from the encrusting or massively columnar growth form usually exhibited by this species (Veron & Pichon 1976).

Pocillopora sp. 1

This was the most common pocilloporid seen in the Pitcairn group. It is similar to ***P. verrucosa***, but differs in possessing hood-like ramifications over the calices as in ***Stylophora***. I have also seen 2 colonies of this form on Aitutaki in the Cook Islands, where *P. verrucosa* is prevalent.

Pocillopora woodjonesi Vaughan 1918

Colonies of *P. woodjonesi* are fairly common on Henderson. They are reminescent of a thin *P. eydouxi*, a growth form recently also recognized off Australia as being more typical for this species than the irregular form originally described (CC Wallace pers. comm. 1988).

Montipora aequituberculata Bernard 1897

Montipora aequituberculata is one of the most common corals on the Ducie fore reef today. Its large, whorled, thin plates are also conspicuous in exposed reef sections there; it was clearly an important contributor to Holocene reef development on Ducie. While *M. aequituberculata* is uncommon on Henderson today, fossil colonies lacking surface features but exhibiting its classic growth form are locally common on the Pleistocene limestone buttresses above the North Beach (Spencer & Paulay 1989).

Porites sp. aff. *P. annae* Crossland 1952

This unusual *Porites* occurs throughout the Pitcairn Group. It is closest to ***P. annae***, but is much more heavily calcified; septa and walls are very thick, and an incomplete endotheca-like blanket of aragonite often envelops calices near the top of septa such that only the septal denticles project above it. Colonies are small, and subarborescent or massive with large, projecting knobs.

Porites sp. cf. *P. lobata* Dana 1846

Instead of the typical massive growth form of *P. lobata*, most colonies from the Pitcairns have subarborescent or columnar skeletons. All specimens have well-developed pali on all 8 septa, although pali are often at a lower level than septal denticles. *Porites* cf. *lobata* is common on Henderson and occasional on Ducie.

Pavona sp. 1

This columnar *Pavona* is common throughout Southeastern Polynesia, occuring westward at least to the Cook Islands. It is intermediate in form between *P. maldivensis* and *P. clavus* / *P. minuta*. It has a columella, small calices (ca. 2 mm), few (6-9 primary) and markedly unequal septocostae with primary septocostae frequently bearing prominent septal lobes, and either a fine (1-3 cm diameter) digitate or a wide, flat-sided-columnar (cf. *P. minuta*) growth form. Colonies are usually small, but can grow to considerable size, e.g. a 4-5 m diameter colony was found on the Henderson fore reef.

Goniastrea australiensis (Edwards & Haime 1857)

Goniastrea australiensis appears to have a sporadic distribution in the Pacific, and is best represented at high latitudes; it is known from Japan, Philippines, Formosa, Great Barrier Reef, Kermadecs (Veron *et al.* 1977), Niue (Paulay 1988), Rapa (Faure 1985), and the Pitcairns. Within Polynesia it appears to be restricted to a southern, subtropical band.

Plesiastrea versipora (Lamarck 1816)

Although *P. versipora* has been recorded from several localities in the Central Pacific, most literature records are based on misidentified *Montastrea curta* (Dana 1846), a species incorrectly considered a synonym (Veron et al. 1977). Actually *P. versipora* has a sporadic distribution in Polynesia, and is known only from a few Tuamotu atolls (a specimen from Raroia is at the USNM) and from the Pitcairn Group, where it is common both living and as a Pleistocene fossil. This eastern Polynesian population appears to be isolated; the species is not known from the intensively surveyed Niue or Cook Islands (Paulay 1988), nor from other French Polynesian archipelagoes (Chevalier 1981). Its success in the Pitcairn Group is further accentuated by its persistence there since the mid-Pleistocene, despite the tremendous turnover in the coral fauna of the group since then (Paulay & Spencer 1989).

Molluscs:

Modiolus matris Pilsbry 1921

Described from the Hawaiian Islands, this colorful mytilid has a curious distribution; it is also known from the Marquesas, Raivavae (Austral), Pitcairn, Henderson, and Easter Islands (Rehder 1980, USNM collections) and thus appears to be restricted to the easternmost fringe of the Indo-West Pacific. It has a wide depth range; although usually found at 5-8 m in Hawaii (Kay 1979) specimens from the Marquesas (USNM) have been dredged as deep as 128-141 m.

Barbatia parva (Sowerby 1833)

The type locality of this species is Ducie, where it was originally collected by Cuming in 1827 (Rehder & Randall 1975). On Ducie it is abundant in crevices in the lagoonal patch reefs, and is also found attached to the undersides of slabs on the reef flat. In contrast to its habitats on Ducie, *B. parva* is known mostly from outer reef slopes elsewhere in Polynesia (Paulay 1988).

Chama "spinosa" Broderip 1835 *sensu* Lamy 1906

Closely related to *Chama asperella*, or possibly a variant of that species, *C. "spinosa"* differs in having a violet interior. Rehder (in Fosberg *et al.* 1983) listed this species as a possible variety of *C. asperella*, noting its peculiar color. It is widespread in Southeastern Polynesia (Paulay 1987).

Chama sp. 2

An apparently undescribed species with fine, honeycombed sculpture, and a yellow interior. It is also known from the Niue, Cook, Society, and Gambier Islands (Paulay 1987).

Tridacna squamosa Lamarck 1819

Tridacna squamosa was known previously eastward to the Cook Islands (Paulay 1987). We found it to be fairly common between 15-20 m on the fore reef of Ducie and occasional on Henderson. In the Cooks as in the Pitcairns it is known only from fore reef habitats (Paulay 1987). Whether its apparent absence in French Polynesia is real, or due to its somewhat inaccessible habitat is not clear.

Tridacna maxima (Roding 1798)

As *T. maxima* is intensively harvested on inhabited islands, its abundance in undisturbed settings is of interest. While *T. maxima* is abundant in the Oeno lagoon, on Henderson it is uncommon. On Ducie only a single live clam was seen on the reef flat, although the large numbers of shells embedded in the beachrock on Acadia Islet indicate that the species may have been much more common in the past, perhaps prior to the coral mortality noted above.

Cantharidus marmoreus (Pease 1867)

This small, rare trochid is known only from the Tuamotus (Cernohorsky 1980), Austral Islands (Raivavae, USNM 732211) and Henderson.

Turbo argyrostomus Linne 1758

In the Cook Islands *Turbo setosus* is common while *T. argyrostomus* is rare. In the Pitcairns the former is rare, while the abundance of *T. argyrostomus* on Ducie was phenomenal, its shells forming a significant portion of Acadia Islet. Perhaps the rarity of *T. setosus* is in part responsible for the abundance of *T. argyrostomus*.

Pseudovertagus clava (Gmelin 1791)

The abundance of this large cerithiid in the Pitcairn Group and some Tuamotu Atolls has been noted (Rehder & Randall 1975, Houbrick 1978), and is especially interesting considering its sporadic distribution and relative rarity elsewhere. *Pseudovertagus clava* appears to be restricted to a southern subtropical band from ca. 15-35°S in the Indo-Pacific (Houbrick 1978).

Recluzia johni (Holten 1802)

Two specimens found in beach drift on Henderson Island appear to be the first records for this widespread janthinid from Southeastern Polynesia.

Polinices simiae (Deshayes 1838)

Although distributed from East Africa to Easter Island, *P. simiae* is rare in most localities except along the margins of its range, at Easter, the Kermadecs, and Hawaii (Cernohorsky 1972, Rehder 1980). It is similarly common on Henderson Island.

Coralliophila latilirata Rehder 1985

The hosts of this Southeastern Polynesian endemic were previously unrecorded. I collected 2 specimens on the plate coral *Montipora aequituberculata*, and 1 on *Leptastrea* sp..

Engina fuscolineata E.A. Smith 1913

This small buccinid, originally described from Henderson, where it is common in beach drift, is also known from the Society Islands (Richard 1985).

Echinoderms:

Diadema savignyi (Audouin 1826)

Diadema savignyi is abundant on both Ducie and Henderson. I found more than one urchin per m^2 in the crevices that riddle the fore reef on Ducie. They are much less common on the Ducie reef flat, but again common in the lagoon; lagoonal urchins are larger (20-25 cm) than those on the fore reef (<15 cm). On Henderson, *D, savignyi* is so abundant that there are not sufficient crevices for them to occupy, so many remain in the open and aggregate into herds, probably for protection, carpeting large reef areas spine to spine in depths of ca. 8-30 m. I have seen similar aggregations of this species on Mangaia and Mauke in the Cook Islands.

Echinometra species-complex

Recent molecular studies on Indo-Pacific *Echinometra* have shown that at least 4 species are represented in what used to be called *E. mathaei* and *E. mathaei oblonga* (Palumbi & Metz in prep.). In the Pitcairn Group *E. oblonga* is by far the most common species; it was occasional on the reef flat on Ducie, and common on the reef flat and shallow fore reef (0-9 m) on Henderson. Two additional forms that fit 2 of Palumbi & Metz's (in prep.) species were also collected; *E.* sp. 1 with white-tipped spines, and the species tentatively assigned to *E. mathaei* (S.R. Palumbi pers. comm. 1989) with unicolored spines and abundant rod-shaped gonadal spicules packed together in bundles.

Heterocentrotus trigonarius (Lamarck 1816)

This widely distributed urchin is common throughout Polynesia, living in the surf zone on reef fronts and on outer reef flats. Populations in the Pitcairn Group are unusually dense, and consist of very large individuals having a different color pattern and shape than those in Central Polynesia. They are uniformly dark blue violet, have elongate, tapering, sharp spines (if unbroken), and grow up to 25-30 cm in diameter spinetip to spinetip. On Ducie, Henderson, and Oeno, they occur in waters up to 3 m deep on the fore reef, are abundant in the surf zone, and extend onto the outer reef flat, which, lacking a reef crest, receives considerable wave action. On Ducie, in the center of this zone, their density was estimated at up to 1-2 urchins m^{-2}. The population on Oeno is similarly dense, which together with their unusually sharp spines, made this "slate-pencil urchin" an unlikely landing hazard; several people in our landing party had spines driven into their feet through tennis shoes while crossing the reef edge. It is probably to this species and not to *Diadema* that Beechey referred to as "numerous *echini*" on the Henderson reef flat that were capable of inflicting "painful wounds" on landing (Fosberg *et al.* 1983, p. 27). The abundance of this species in the Pitcairns is at least in part the result of lack of human predation, as the species is frequently harvested by Polynesians elsewhere.

Heterocentrotus mammillatus (Linne 1758)

While *Heterocentrotus trigonarius* is ubiquitous in southern Polynesia, the only verified records of *H. mammillatus* in the region are from the Pitcairn Group and Raroia (USNM E8525) in the Tuamotus. Morthensen (1943) records this species east only to Fiji in the South Pacific, albeit it extends to Hawaii in the northern hemisphere. Thus the population in the Pitcairns and Eastern Tuamotus appears to be isolated. Within the Pitcairn Group it is very common on Ducie, rare on Henderson (we did not find any, but Randall (1978) illustrates the species from 1971), and again apparently common on Pitcairn. *H. mammillatus* lives in crevices on the fore reef between 10-20+ m depths and does not overlap with *H. trigonarius*. An excellent illustration of the urchin *in situ* is provided by Randall (1978 fig. 4), depicting the characteristic habitat and hinting at the color pattern of the Pitcairns' populations: primary spines are reddish-orange, while secondary spines are white, often with a slight suffusion of red.

Metalia spatagus (Linne 1758)

A relatively dense population of this spatangoid was found on the fore reef of Henderson Island between 10-18 m depths.

Echinoneus cyclostomus Leske 1778

Although tests of this irregular echinoid are not uncommon in Polynesia, I have rarely seen live animals before. On the north reef flat on Henderson, however, *E. cyclostomus* is common, with 10-15 huddling under occasional, loose, dead coral slabs; the animals being at most partly buried in the little sand found under the rock. They are beige with red tubefeet.

Allostichaster peleensis Marsh 1974

Described from Pitcairn on the basis of a single specimen dregded from 101-119 m, I collected another specimen of this species on the Henderson fore reef at 12-18 m depth. While the type has all arms intact, the present specimen has 4 regenerating arms, indicating, that like other members of the genus (Emson 1977), it may be fissiparous. As noted by Marsh (1974), "*Allostichaster* is a genus of southern temperate waters, Australia, New Zealand and South America so *A. peleensis* may add a temperate element to the otherwise tropical asteroid fauna of Pitcairn Island."

Actinopyga palauensis Panning 1944

Described from Palau, this large, black holothurian has since been recorded only from New Caledonia (Guille *et al.* 1986). I found it to be not uncommon on the fore reef between 10-20 m on Henderson as well as on Niue Island. In the intervening Cook Islands I have never seen it despite an intensive survey of the holothurian fauna there. Pierre Laboute (pers. comm., 1988) recalls collecting what was likely this species on Scilly Atoll (Society Iss.), however. Apparently it has a very patchy distribution.

Holothuria (Halodeima) signata Ludwig 1875

Until recently *H. (H.) signata* was thought to be a synonym of *H. (H.) edulis*, but Frank Rowe (pers. comm. 1987) concluded that the name applies to a distinctive chestnut brown *Halodeima* with cream spots covering the dorsum. I have collected it on Niue, and throughout the Cook as well as Pitcairn Islands.

Holothuria (Lessonothuria?) sp. 3

This small (5 cm), cryptic holothurian is apparently undescribed (Frank Rowe pers. comm. 1986). I have collected it in the Cooks, Niue, and Henderson Island.

DISCUSSION

The distribution of a species reflects, to varying degrees 1) the speciation event that established its original range, 2) its dispersal ability, which sets its potential range, 3) its ecology, which determines the habitats and thus areas in which it is capable of living, and 4) its changing environment, which determines the distribution of suitable habitats. I will first look at the fauna of the Pitcairn Group from the perspective of these 4 factors; then I will briefly investigate variation in species composition and abundance among the four islands that constitute the group.

1) Endemicity: Isolated islands or archipelagoes may produce endemic species by allopatric speciation. Isolation may be at the island (group) level, if the island (group) is physically isolated from its neighbors by wide areas of open ocean. Alternatively, it can be at the habitat level, as uncommon habitats can be isolated even if the islands on which they are situated on are not. At the insular level, the Pitcairn Group is not particularly isolated, its nearest neighbor, Temoe Atoll, is only 390 km distant. On the habitat level however, the terrigenous and largely reefless marine environments of Pitcairn are without parallel in the area except for Easter Island, Rapa, and the Marquesas. Thus while endemics distributed throughout the Pitcairn Group are unlikely, endemics restricted to the unusual habitats of Pitcairn Island may be expected.

A paucity of endemics was noted for the fish fauna by Randall (1978), who judged that about 2% of the fish species are restricted to the group. Among the invertebrates studied 7 of 310 (2.2%) species or subspecies are known only from the Pitcairn Group: the asteroid *Allostichaster peleensis*, the ophiuroids *Amphilimna tanyodes* and *Amphiura bountyia*, the coral *Porites* aff. *annae*, and the gastropods *Engina rosacea*, *Fusinus galatheae bountyi*, and *Ziba cernohorskyi*. Five of the 7 are known only from Pitcairn Island. Although the predominance of potential endemics on Pitcairn fits the expectations outlined above, such a conclusion is weak, as all 5 species were taken only by dredging on Pitcairn, mostly in fairly deep water (40-100 m), a habitat minimally sampled in Polynesia.

2) Dispersal limitations: The Pitcairn Group lies at the eastern edge of the Indo-West Pacific province, yet its fauna recorded herein appears to be entirely derived from the west, lacking East Pacific components. As prevailing surface currents are from the north-east, the islands lie upstream of potential Indo-Pacific source areas, making dispersal to the Pitcairns especially difficult. Similarly, continued survival of established populations may be difficult because there are no upstream islands to contribute propagules; thus populations may be more ephemeral in the Pitcairns than on islands further west (see faunal turnover below).

A direct effect of dispersal limitations is the low diversity of the Pitcairns' marine life, part of the well known trend of eastwardly-decreasing diversity through the Pacific basin (e.g. Wells 1954, Stehli et al. 1967). Although our collections are limited and many species remain to be recorded from the group, species diversity in the Pitcairns is clearly considerably less than in archipelagoes westward. Thus, while 1159 species of molluscs (Richard 1985) and 168 species of scleractinians (Pichon 1985) have been reported from French Polynesia, only 198 molluscs and 54 corals are recorded from the Pitcairns. Similarly diminished diversities were noted for the fish fauna (Randall 1978, Rehder & Randall 1975).

3) Ecological limitations: Some interesting biogeographic trends in the Pitcairn Group result from ecological limitations. Both physical limitations, such as temperature and light intensity, and biotic limitations appear to be important in structuring the marine fauna.

The cooler waters around the Pitcairns likely prevent many Indo-West Pacific species from establishing, contributing to the impoverishment of the fauna discussed above, but may also permit the survival and success of other species on the islands. A widespread faunule restricted to subtropical latitudes, spanning the Pacific from Easter Island and Sala y Gomez, through the Pitcairns, Rapa, Marotiri, Kermadecs, Lord Howe and Norfolk Islands, with some species reappearing in northern subtropical areas (especially Hawaii), has been well documented (Randall 1976, Rehder 1980, Briggs 1987). Among the invertebrates studied, 8 species appear to be restricted to this subtropical faunule (table 4). Species with such a narrowly subtropical yet longitudinally widespread distribution are not as common in the Pitcairn Group as on islands located further south: 2.6% of the Pitcairns' (24-25°S) compared with 42.5% (53 species) of Easter Islands' (27°10'S) malacofauna is so restricted latitudinally.

Such distributions may reflect physical or biotic limitations. If subtropical endemic species are so distributed because of temperature or light limitations, their restriction to so narrow a latitudinal band (24-33°) indicates considerable stenotopy with regards to those physical factors. Biotic limitations for southern endemic and amphitropical taxa has found more support (Briggs 1987, Newman & Foster 1987).

Biotic factors - predators, parasites or competitors - may exclude some species from areas they could otherwise occupy. Species so excluded may survive in other areas unoccupied by their foes. Both the variety and intensity (Vermeij 1978) of biotic interactions increases with increasing diversity, thus species are more likely excluded because of biotic interactions from high than from low diversity areas. Habitats or islands that are physically stressful or isolated and thus have low diversity faunas may serve as refuges for stress tolerant and well dispersing species susceptible to biotic limitations (Diamond 1974, Grime 1977, Briggs 1987). Coral reefs and their associated faunas are limited to a latitudinal band roughly between 30°N and 30°S. Between the tropics of Cancer and Capricorn diversity does not appear to be affected by latitude, but falls abruptly toward higher latitudes due to decreasing temperature and light intensity (Rosen 1984). Thus the southern subtropical faunule discussed coincides with this marginal band of low diversity reefs. The eastern edge of the Indo-West Pacific also has low diversity due to dispersal limitations, and in the Pitcairn fauna, at least one species, the mussel *Modiolus matris*, is restricted to it; it is known only from the Hawaiian, Marquesas, Austral, Pitcairn, and Easter Islands.

In depauparate areas species may also have access to resources unavailable to them in more diverse areas due to biotic interactions. Such ecological release may result in a greater abundance of a species or in an expansion of the resources it uses. Several species that are rarely encountered in more central Indo-West Pacific localities are strikingly common in the Pitcairn Group, including the coral *Plesiastrea versipora,* and the gastropods *Pseudovertagus clava,* and *Polinices simiae*. *Polinices simiae* has also been noted to be unusually common at other marginal Pacific localities: in Hawaii, Easter Island and the Kermadecs (Rehder 1980). Veron (1986) notes that while *Plesiastrea versipora* is common at high latitudes in Australia, it is relatively rare and restricted to shaded environments at low latitudes. While the pelecypod *Barbatia parva* is largely confined to outer reef slopes on most Pacific islands, on Ducie it is abundant in a variety of lagoonal and reef flat habitats. An excellent study of similar ecological release on neighboring Easter Island is given by Kohn (1978).

4) Environmental change and faunal turnover: The uplifted atoll of Henderson provides a well preserved Pleistocene fauna to compare with the living biota of the same area. Paulay & Spencer (1989) showed that since the Pleistocene there has been a greater turnover (extinction and subsequent recolonization of different species) in the coral fauna of Henderson than recorded for any other Pacific island, and that this turnover was not associated with habitat alterations implicit in Henderson's uplift or due to sea level fluctuations. The high faunal turnover is instead likely due to the marginal location of these islands and accompanying physical and dispersal limitations (Paulay & Spencer 1989).

Inter-island variation: There appears to be considerable variation among the Pitcairn Islands in species composition and community structure, reflecting in part the diverse geological history and physiography of the group (Spencer 1989), but also due to the group's peripheral location and attendant instability of its fauna (Paulay & Spencer 1989). The likely unusual marine biota of reef-poor Pitcairn Island cannot yet be compared due to lack of study. The two islands studied in most detail, Henderson and Ducie, show remarkable differences between their faunas. Among the 45 species of corals collected on the two islands, only 16 (36%) are shared. In comparison, Rarotonga and Aitutaki (Cook Islands), separated by about the same distance as Henderson and Ducie, share 78% of their combined fauna of 73 species (Paulay 1988, a study which does not include acroporids) ($G=21.5$, $p<0.001$). Although the large differences between the Ducie and Henderson faunas are certainly due in part to undersampling, considerable qualitative differences are also apparent between them. On Ducie fore reef coral cover is over 50% (although cover has undergone marked fluctuations, see above) and is dominated by *Acropora* and *Montipora* species with *Pocillopora* being occasional. On Henderson, coral cover is <10% and *Millepora* and *Pocillopora* dominate cover, while acroporids are rare. Acroporids are also significantly more diverse on Ducie (16 species, 55% of total) than on Henderson (9 species, 28% of total) ($G=4.7$, $p<0.05$). Further, the echinoid *Heterocentrotus mammillatus* is abundant on Ducie, while it is rare on Henderson.

SUMMARY

Most of the Pitcairns' marine invertebrates are widespread species distributed through several Pacific archipelagoes or the Indo-West Pacific. The location of these islands at the southeastern margin of the Indo-West Pacific province makes both the survival (due to latitudinal, climatic limitations) and continued re-establishment (due to longitudinal, dispersal limitations) of species difficult. Species diversity is therefore relatively low and the fauna appears to be somewhat unstable. Faunal instability is reflected in large short term changes in coral cover on Ducie, large temporal changes in species composition on Henderson, and considerable differences between the faunas of neighboring Ducie and Henderson.

The resulting low species diversity creates a more benign biotic environment than possible in high diversity areas, as many potential predators, parasites, and competitors are absent. This allows the survival of several species restricted to (or most common in) such marginal environments around the Indo-West Pacific fringe. There are few if any endemics restricted to the Pitcairn Group; Pitcairn Island is predicted to be most likely to support possible endemics due to its unusual physiography and habitats.

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Table 1
Pitcairn Group corals

*) 1987 collections; A) Rehder & Randall 1975; B) USNM collections (1967, Devaney coll.); +) species names preceded by a "+" are junior synonyms or misidentifications of the preceding species in the table, their source is given in parantheses; [1]) These species are discussed in more detail in the text. Duc: Ducie, Hen: Henderson, Pit: Pitcairn, Oen: Oeno.

	Duc	Hen	Pit	Oen
MILLEPORINA				
Milleporidae				
Millepora spp.		*		
SCLERACTINIA				
Astrocoeniidae				
Stylocoeniella guentheri Bassett-Smith 1890[1]		*	B	
Pocilloporidae				
Pocillopora damicornis (Linne 1758)			B	
Pocillopora eydouxi Edwards & Haime 1860	*A?	*?		
+?*Pocillopora* sp. cf. *modumanensis* Vaughan 1907 (A)				
Pocillopora sp. 1[1]	*A	*	B	*
+*Pocillopora elegans* Dana 1846 (A)				
Pocillopora woodjonesi Vaughan 1918[1]		*	B	*B
Acroporidae				
Montipora aequituberculata Bernard 1897[1]	*A	*?		
+*Montipora composita* Crossland 1952 (A)				
Montipora aff. *bilaminata* Bernard 1897	A			
Montipora caliculata (Dana 1846)	A	*		
Montipora cf. *capitata* (Dana 1846)		*		
Montipora complanata (Lamarck 1816)	A			
Montipora foveolata (Dana 1846)	*	*		*
Montipora grisea Bernard 1897				*
Montipora incrassata (Dana 1846)	*A			B
+*Montipora* sp. cf. *venosa* (Ehrenberg 1834) (A)				
Montipora tuberculosa (Lamarck 1816)				*
Montipora venosa (Ehrenberg 1834)				*
Montipora cf. *verrucosa* (Lamarck 1816)	*			*?
Acropora acuminata (Verrill 1864)	*		B?	B
Acropora cytherea (Dana 1846)				B
Acropora digitifera (Dana 1846)		*		
Acropora cf. *glauca* (Brook 1893)		*		
Acropora humilis (Dana 1846)	*	*		*
Acropora latistellata (Brook 1892)	*			
Acropora cf. *lutkeni* Crossland 1952	*			
Acropora cf. *microclados* (Ehrenberg 1834)	*			
Acropora nasuta (Dana 1846)	*A	*		
Acropora secale (Studer 1878)			B?	*
Acropora cf. *solitaryensis* Veron & Wallace 1984	*			
Acropora valida (Dana 1846)	*			
Astreopora myriophthalma (Lamarck 1816)	*?A		B	
Astreopora cf. *moretonensis* Veron & Wallace 1984		*		

Poritidae	**Duc**	**Hen**	**Pit**	**Oen**
Porites aff. *annae* Crossland 1952[1]	*	*	B	*
Porites australiensis Vaughan 1918	*A	*		
Porites cf. *lobata* Dana 1846[1]	*	*	B	
Siderastreidae				
Psammocora haimeana Edwards & Haime 1851		*	B	*
Psammocora obtusangula (Lamarck 1816)	*	*		
Agariciidae				
Pavona sp. 1[1]	*A	*		
+*Pavona* sp. cf. *pollicata* (Wells 1954) (A)				
Pavona maldivensis (Gardiner 1905)		*		
Pavona varians Verrill 1864		*		*
Leptoseris hawaiiensis Vaughan 1907			B	
Leptoseris incrustans (Quelch 1886)	*A	*		
Fungiidae				
Cycloseris vaughani (Boschma 1923)			B	
Fungia scutaria Lamarck 1801	*A			
Mussidae				
Scolymia cf. *vitiensis* Bruggemann 1877		*	B	
Faviidae				
Caulastrea cf. *furcata* Dana 1846			B	
Favia mathaii Vaughan 1918		*	B	
Favia rotumana (Gardiner 1899)		*		
Favia stelligera (Dana 1846)	*			
Goniastrea australiensis (Edwards & Haime 1857)[1]		*	B	
Montastrea curta (Dana 1846)	*	*		*
Plesiastrea versipora (Lamarck 1816)[1]	*A	*		*
Leptastrea purpurea (Dana 1846)		*	B?	*
Leptastrea ?transversa Klunzinger 1879		*		*
Cyphastrea cf. *serailia* (Forskal 1775)	*	*		*

Table 2
Pitcairn Group molluscs

*) 1987 collections; A) Rehder in Fosberg et al. 1983, this list includes previous records from Smith 1913; B) Rehder & Randall 1975; C) Rehder 1980; D) Paulay 1988; E) Wilson & Tait 1984; F) Rehder & Wilson 1975; G) USNM collections; H) Powell 1973; I) Emerson & Cernohorsky 1973; J) Cernohorsky 1976; K) Rosewater 1970; L) Houbrick 1986; M) Houbrick 1978; +) species names preceded by a "+" are junior synonyms or misidentifications of the preceding species in the table, their source is given in parantheses; [1]) These species are discussed in more detail in the text. Duc: Ducie, Hen: Henderson, Pit: Pitcairn, Oen: Oeno.

BIVALVIA	**Duc**	**Hen**	**Pit**	**Oen**
Mytilidae				
Modiolus auriculatus Krauss 1848				D
Modiolus matris Pilsbry 1921[1]		*	G	
Botula fusca (Gmelin 1791)			E	
Arcidae				
Arca avellana Lamarck 1819		*A		D
Barbatia parva (Sowerby 1833)[1]	*B	*A		*
Barbatia plicata (Dillwyn 1817)		*A		*
+*Acar divaricata* (Sowerby 1833) (A)				
Pinnidae				
Streptopinna saccata (Linne 1758)		*		
Pteriidae				
Pinctada ?maculata (Gould 1850)	*B			*
Pinctada margaritifera (Linne 1758)	B	*		
Isognomonidae				
Isognomon anomioides (Reeve 1858)		*		
Isognomon perna (Linne 1767)	*B	*		*
Isognomon rupella (Dufo 1840)	*B		D	
+*Isognomon dentifera* (Krauss 1848) (B)				
Pectinidae				
Chlamys coruscans (Hinds 1845)		*	D	
Chlamys sp.			D	
Excellichlamys 'parva' (Sowerby 1835)		*		
Gloripallium pallium (Linne 1758)				*
Mirapecten mirificus (Reeve 1853)		*		
Mirapecten sp.		*		
Semipallium sp.		*		
Spondylidae				
Spondylus hystrix Roding 1798		*		
Spondylus tenebrosus Reeve 1856		*		*
Spondylus sp.	B	A		
Limidae				
Lima bullifera Deshayes 1863		A	D	
Lima vulgaris (Link 1807)		*A		
+*Lima lima* (Linne 1758)				
Ostreacea				
"Ostrea" sp.	B			
Gryphaeidae				
Hyotissa hyotis (Linne 1758)			D	

	Duc	Hen	Pit	Oen
Chamidae				
Chama asperella Lamarck 1819	*	*		
Chama limbula Lamarck 1819	*B	*		*
+*Chama iostoma* Conrad 1837 (B)				
*Chama "spinosa"*Broderip1835 *sensu* Lamy 1906[1]		*A		*
+?*Chama asperella* Lamarck 1819 (A)				
Chama sp. 2[1]		*		
Chama sp.		*		
Lucinidae				
Codakia bella (Conrad 1837)	*B	*A		*
Codakia tigerina (Linne 1758)				*
Anodontia edentula (Linne 1758)		*		*
Cardiidae				
Trachycardium orbitum (Sowerby 1833) - D				
Fragum mundum (Reeve 1845)		*		
Corculum dionaeum (Broderip & Sowerby 1829)	*			
Tridacnidae				
Tridacna maxima (Roding 1798)[1]	*B	*A		*
Tridacna squamosa Lamarck 1819[1]	*	*A?,D		
Mesodesmatidae				
Ervilia cf. *bisculpta* Gould 1861		*		
Tellinidae				
Tellina ?bougei (G.B.Sowerby III 1909)				*
Tellina crucigera Lamarck 1818				*
Tellina scobinata Linne 1758		*A		*
+*Arcopagia scobinata* (Linne 1758) (A)				
Loxoglypta rhomboides (Quoy & Gaimard 1835)				D
Semelidae				
Semele australis (Sowerby 1832)	*B	*A		*
Semelangulus crebrimaculatus (Sowerby 1868)	B			
+*S. nebulosus* Dall, Bartsch & Rehder 1938 (B)				
Trapeziidae				
Trapezium oblongum (Linne 1758)		*A		*
Veneridae				
Venus toreuma Gould 1850			D	
Periglypta reticulata (Linne 1758)		*		
GASTROPODA				
Haliotidae				
Haliotis pulcherrima Gmelin 1791	B	*A		*
Patellidae				
Patella flexuosa Quoy & Gaimard, 1834		*A		*
Cellana taitensis (Roding 1798)			H	
Acmaeidae				
Patelloida conoidalis (Pease 1868)		*A		
Patelloida sp.aff.*chamorrorum* Lindberg&Vermeij 1985		*		
Trochidae				
Cantharidus marmoreus (Pease 1867)[1]		*A		
Stomatellidae				
Broderipia iridescens (Broderip 1834)		A		
Pseudostomatella speciosa (A. Adams 1850)		A		
Turbinidae				
Turbo argyrostomus Linne 1758[1]	*B	*A	G	G

	Duc	Hen	Pit	Oen
Turbo petholatus Linne 1758	B	*A		
Turbo setosus Gmelin 1791	*	*		
Astralium confragosum (Gould 1849)	B			
Neritidae				
Nerita morio (Sowerby 1833)	BC	*AC	C	C
+*Nerita haneti* Recluz 1841 (B)				
Nerita plicata Linne 1758	*B	*A		*
Littorinidae				
Littoraria coccinea (Gmelin 1791)		*AK	K	K
Nodilittorina pyramidalis pascua Rosewater 1970		*AC	C	C
Cerithiidae				
Pseudovertagus clava (Gmelin 1791)[1]	BM		M	*M
Rhinoclavis sinensis (Gmelin 1791)	BM	*A	M	*M
Cerithium ?alveolus Hombron & Jaquinot 1852		*		
Cerith. atromarginatum Dautzenberg&Bouge1933		*A		
Cerithium columna Sowerby 1834		*		
Cerithium echinatum (Lamarck 1822)	*B	*A		*
+*Cerithium rubus* Deshayes 1843 (A)				
+*Cerithium tuberculiferum* Pease 1869 (B)				
Cerithium egenum Gould 1849		A		
Cerithium sandvichense Sowerby 1865	B	*		
Royella sinon (Bayle 1880)		*A	L	
Planaxidae				
Planaxis brasiliana Lamarck 1822			C	
Vermetidae				
Dendropoma maximum (Sowerby 1825)	B	A		
Epitoniidae				
Epitonium torquatum (Fenaux 1943)		A		
Janthinidae				
Janthina janthina (Linne 1758)		*A		*
Recluzia johni (Holten 1802)[1]		*		
Cypraeidae				
Cypraea ?bistrinotata(Schilder&Schilder1937)		*		
Cypraea caputserpentis Linne 1758	*B	A		*
Cypraea childreni Gray 1825		A		
Cypraea cicercula Linne 1758		A		
Cypraea cumingii Sowerby 1832		*A		
Cypraea dillwyni Schilder 1922		*A		
Cypraea fimbriata Gmelin 1791		A		
Cypraea goodalli Sowerby 1832		*A		
Cypraea helvola Linne 1758	B	*A		*
Cypraea irrorata Gray 1828		*A		
Cypraea isabella Linne 1758		*A		*
Cypraea kingae Rehder & Wilson 1975			F	
Cypraea lynx Linne 1758		*		
Cypraea maculifera (Schilder 1932)	*B	*?,A		
Cypraea mappa Linne 1758		A		
Cypraea moneta Linne 1758	*			
Cypraea poraria Linne 1758	*	*A		
Cypraea schilderorum Iredale 1939	*B	*A		*
Cypraea scurra Gmelin 1791		A		

	Duc	Hen	Pit	Oen
Cypraea subteres Weinkauff 1881		A		
Cypraea testudinaria Linne 1758	*B	*		
Cypraea ventriculus Lamarck 1810		*A		
Triviidae				
Trivia edgari Shaw 1909		A		
Vanikoridae				
Vanikoro ?acuta (Recluz 1844)		*		
Vanikoro plicata (Recluz 1844)		A		
Vanikoro sp.		*		
Hipponicidae				
Sabia conica (Schumacher 1817)	*?,B	*		
Calyptraeidae				
Cheilea equestris (Linne 1758)		*		*
Strombidae				
Strombus maculatus Sowerby 1842	*	*		*
Lambis chiragra (Linne 1758)		A		
+*Lambis rugosa* (Sowerby 1842) (A)				
Lambis truncata (Lightfoot 1782)		A		
Naticidae				
Polinices simiae (Deshayes 1838)[1]		*A		
Natica gualteriana Recluz 1844		A		
Natica ochrostigmata Rehder 1980		*	G	
Tonnidae				
Tonna perdix (Linne 1758)		*		*
Malea pomum (Linne 1758)				*
Cassidae				
Casmaria erinaceus (Linne 1758)	B	*A		*
Cymatiidae				
Cymatium nicobaricum (Roding 1798)		*		
Bursidae				
Bursa granularis (Roding 1798)		*A		
Muricidae				
Maculotriton serriale (Deshayes 1834)		*A		
+*Maculotriton serrialis* (Laborde 1838) (A)				
Phyllocoma convoluta (Broderip 1833)		A		
Drupa clathrata (Lamarck 1816)		*A	I	
Drupa elegans (Broderip & Sowerby 1829)	B	A		
Drupa grossularia Roding 1798	*B	*A		
Drupa morum Roding 1798	B	*A	I	
Drupa ricinus (Linne 1758)	*B	*A	I	
Drupa speciosa (Dunker 1867)				I
Drupella cornus (Roding 1798)	B	*		
+*D. elata* (Blainville 1832) (B)				
Morula dealbata (Reeve 1846)		A		
Morula granulata (Duclos 1832)	B	*A		
Morula "parva" (Pease 1868)		*		
Morula uva Roding 1798	*B	*A		
Thais armigera Link 1807		*A		
+*Thais affinis* (Reeve 1846) (A)				
Thais intermedia (Kiener 1835)		A		
Nassa serta (Bruguiere 1789)	*B	*A		
Vexilla vexillum (Gmelin 1791)		A		

	Duc	Hen	Pit	Oen
Coralliophilidae				
Coralliophila latilirata Rehder 1985[1]	*	*		
Coralliophila violacea (Kiener 1836)	*	*		
Quoyula monodonta (Blainville 1832)		*A		
Magilopsis cf. *lamarckii* (Deshayes 1863)		*		
Rapa rapa (Linne 1758)		*		
Buccinidae				
Engina fuscolineata E.A.Smith 1913[1]		*A		
Engina rosacea (E.A. Smith 1913)		A		
Prodotia iostoma (Gray, 1834)		*A		
+*Tritonidea difficilis* E.A. Smith 1913 (A)				
Pisania decollata (Sowerby 1833)		*		
Caducifer decapitata (Recluz 1844)		*A		
Nassariidae				
Nassarius gaudiosus (Hinds 1844)		*A		
Nassarius papillosus (Linne 1758)		A		
+*Alectrion papillosa* (Linne 1758) (A)				
Fasciolariidae				
Fusinus galatheae bountyi Rehder&Wilson 1975			F	
Latirus nodatus (Gmelin 1791)	B	*A		
Peristernia nassatula (Lamarck 1822)		*		
Columbellidae				
Euplica loisae Rehder 1980			C	
Euplica turturina (Lamarck 1822)	B	*A		
+*Euplica palumbina* (Gould 1845) (A,B)				
Euplica varians (Sowerby 1834)		*A		
Pyrene flava (Bruguiere 1789)		*A	G	
+*Pyrene obtusa* (Sowerby 1832) (A)				
Colubrariidae				
Colubraria nitidula (Sowerby 1833)		A		
Colubraria sp.		*		
Vasidae				
Vasum armatum (Broderip 1833)		A		
Harpidae				
Morum ponderosum (Hanley 1858)		A		
Mitridae				
Mitra auriculoides Reeve 1845		A		
Mitra coffea Schubert & Wagner 1829		A		
Mitra colombelliformis Kiener 1838			J	
Mitra coronata Lamarck 1811			J	
Mitra litterata Lamarck 1811	*B	A		
Mitra pele Cernohorsky 1970			J	
Mitra stictica (Link 1807)		A		
Mitra testacea Broderip 1836			J	
Ziba cernohorskyi Rehder & Wilson 1975			F	
Vexillidae				
Vexillum cancellarioides Anton 1838		*		
Turridae				
Daphnella flammea (Hinds 1943)		*		
Conidae				
Conus chaldeus (Roding 1798)	*B	*A		
Conus ebraeus Linne 1758	B	*A		*
Conus flavidus Lamarck 1810	*			

	Duc	Hen	Pit	Oen
Conus geographus Linne 1758	*B	*		
Conus litoglyphus Hwass 1792		*		
Conus lividus Hwass 1792	B	*A		*
Conus magnificus Reeve 1843		*		
Conus miliaris Hwass 1792	*B	*A		
Conus nanus Sowerby 1833	*B	*A		
Conus pennaceus Born 1778		A		
Conus rattus Hwass 1792	B	*A		
Conus retifer Menke 1829	B	*A		
Conus sanguinolentus Quoy & Gaimard 1834		A		
Conus sponsalis Hwass 1792		A		
Conus tenuistriatus Sowerby 1856		A		
Conus tessullatus Born 1778		*A		
Conus textile Linne 1758		*		*
Conus tulipa Linne 1758	B	*A		
Terebridae				
Terebra affinis Gray 1834		*		
Terebra crenulata (Linne 1758)				*
Terebra maculata (Linne 1758)				*
Terebra subulata (Linne 1767)	B			
Hastula penicillata (Hinds 1844)		*		
Elobiidae				
Melampus flavus (Gmelin 1791)		*A		
Bullidae				
Bulla cf. *punctulata* A.Adams 1850		*		
Bulla sp.		A		
Aplysiidae				
Dolabrifera cf. *fusca* Pease 1868	B			
Phyllidiidae				
Phyllidia sp. *?pustulosa* Cuvier 1804				*
Glaucidae				
Glaucus atlanticus Forster 1777		*		

Table 3
Pitcairn Group echinoderms

*) 1987 collections; x) 1987 sight records, not collected; A) Randall & Rehder 1975; B) Marsh 1974; C) Devaney 1974; D) Randall 1978; [1]) These species are discussed in more detail in the text. Duc: Ducie, Hen: Henderson, Pit: Pitcairn, Oen: Oeno.

ECHINOIDEA	**Duc**	**Hen**	**Pit**	**Oen**
Diadematidae				
Diadema savignyi (Audouin 1826)[1]	*A?	*		x
Echinothrix calamaris (Pallas 1774)		*		
Toxopneustidae				
Tripneustes gratilla (Linne 1758)		*		
Echinometridae				
Echinometra mathaei (de Blainville 1825)[1]		*		
Echinometra oblonga (de Blainville 1825)[1]	*	*		
Echinometra sp. 1[1]	*			*
Echinostrephus aciculatus A. Agassiz 1863	*	*		
Heterocentrotus mamillatus (Linne 1758)[1]	*A	D	*	
Heterocentrotus trigonarius (Lamarck 1816)[1]	*A	*		x
Echinoneidae				
Echinoneus cyclostomus Leske 1778[1]		*		*
Clypeasteridae				
Clypeaster sp. ?*reticulatus* (Linne 1758)		*		
Fibulariidae				
Mortonia australis (Desmoulins 1835)		*		*
Brissidae				
Brissus latecarinatus (Leske 1778)	*			
Metalia spatagus (Linne 1758)[1]		*		
ASTEROIDEA				
Astropectinidae				
Astropecten polyacanthus Mueller & Troschel 1842			B	
Oreasteridae				
Culcita novaeguineae Mueller & Troschel 1842			*B	
Ophidiasteridae				
Dactylosaster cylindricus (Lamarck 1816)		*		
Linckia guildingi Gray 1840			*B	
Linckia laevigata (Linne 1758)			B	
Linckia multifora (Lamarck 1816)		*	B	*
Neoferdina cumingi (Gray 1840)		*		
Ophidiaster lorioli Fisher 1906			B	
Acanthasteridae				
Acanthaster planci (Linne 1758)	AB		B	
Asteriidae				
Allostichaster peleensis Marsh 1974[1]		*	B	
OPHIUROIDEA				
Ophiacanthidae				
Amphilimna tanyodes Devaney 1974			C	
Amphiuridae				
Amphiura bountyia Devaney 1974			C	
Ophiactidae				
Ophiactis sp.	*			

Ophiotrichidae	**Duc**	**Hen**	**Pit**	**Oen**
Macrophiothrix demessa (Lyman 1861)			C	C
Macrophiothrix sp.		*		
Ophiothrix purpurea Martens 1867			C	
Ophiocomidae				
Ophiocoma bervipes Peters 1851			C	C
Ophiocoma dentata Mueller & Troschel 1842		*	C	*C
Ophiocoma cf. *doderleini* Loriol 1899		*		
Ophiocoma erinaceus Mueller & Troschel 1842		*	C	C
Ophiocoma longispina HL Clark 1917			C	
Ophiocoma macroplaca (HL Clark 1915)			C	
Ophiocoma pica Mueller & Troschel 1842		*	C	C
Ophiocoma pusilla (Brock 1888)			C	
Ophiocomella sexradia (Duncan 1887)			C	C
Ophionereidae				
Ophionereis aff. *dubia* (Mueller & Troschel 1842)		*		
Ophionereis porrecta Lyman 1860			C	
Ophiodermatidae				
Ophiarachna megacantha erythema Devaney 1974			C	
Ophiopeza kingi Devaney 1974			C	
HOLOTHUROIDEA				
Holothuriidae				
Actinopyga mauritiana (Quoy & Gaimard 1833)		*		
Actinopyga palauensis Panning 1944[1]		*		
Holothuria (Halodeima) atra Jaeger 1833	*	*		x
Holothuria (Halodeima) signata Ludwig 1875[1]		*	*	*
Holothuria (Lessonothuria) sp. 3[1]		*		
Holothuria (Microthele) nobilis (Selenka 1867)	*	*	*	x
Holothuria (Platyperona) difficilis Semper 1868	*			*
Holothuria (Semperothuria) cinerascens (Brandt 1835)	*			
Holothuria (Thymiosycia) arenicola Semper 1868		*		
Holothuria (Thymiosycia) hilla Lesson 1830				*
Holothuria (Thymiosycia) impatiens (Forskal 1775)				*
Labidodemas semperianum Selenka 1867		*		
Synaptidae				
Euapta godeffroyi (Semper 1868)	*	*		
Chiridotidae				
Chiridota hawaiiensis Fisher 1907				*
Chiridota sp.		*		

Table 4
Species in Pitcairn Group that are known only from subtropical areas

Other islands from which species[1] is recorded: Eas: Easter & Sala y Gomez, Rap: Rapa & Marotiri, Aus: Australs, Gam: Gambiers, Ker: Kermadecs, LoH: Lord Howe and Norfolk, Aus: Australian subtropics and N New Zealand, Haw: Hawaiian Islands.

Species	Eas	Rap	Aus	Gam	Ker	LoH	Aus	Haw
Nerita morio	*	*	*	*				
Nodilittorina pyramidalis pascua	*							
Planaxis brasiliana					*	*	*	
Euplica loisae	*	*						
Fusinus galatheae[1]					*			
Mitra pele								*
Allostichaster peleensis[1]							*	
Ophiarachna megacantha erythema		*						

[1] Represented by related subspecies or sister species outside the Pitcairns.