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The non-scleractinian Anthozoa (Cnidaria) of the Mariana Islands

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Abstract—The non-scleractinian Anthozoa of the Marianas are reviewed based on literature records and new surveys. Six zoanthids, 8 corallimorpharians, 26 actiniarians, 3 ceriantharians, 10 antipatharians, and 79 octocorals are recorded. The zoanthid, corallimorpharian, and shallow water gorgonian faunas of Guam are relatively well characterized, although many locally recognized forms remain to be identified to species. Soft corals are relatively well surveyed taxonomically, although information about many species remains limited, due to difficulty of field identification. While large-bodied actiniarians are well known, small species remain little studied. Ceriantharians remain poorly known, while antipatharian records are based on a single deep-water survey in the southern Marianas. A rich deep-water octocoral fauna has been collected, but remains to be studied.

Introduction

The Mariana Islands are a chain of 15 major volcanic and limestone islands bordering the western margin of the Pacific plate between 13 and 21°N latitude (see Paulay 2003 for a more detailed description of the area). The archipelago is a classic island arc, formed by volcanic eruptions initiated by subduction of the Pacific plate under the Philippine plate, on which the islands lie. The island group comprises two geologically distinct chains, the volcanically inactive and older islands of the Southern Mariana back-arc, extending from Guam to Farallon de Medinilla, and the volcanically active, younger islands of the Northern Mariana fore-arc, extending from Anatahan to Uracas (Fig. 1). This geological separation should not be confused with the political division of the archipelago into the U.S. Territory of Guam, and the Commonwealth of the Northern Mariana Islands (CNMI) comprising all islands north of Guam.

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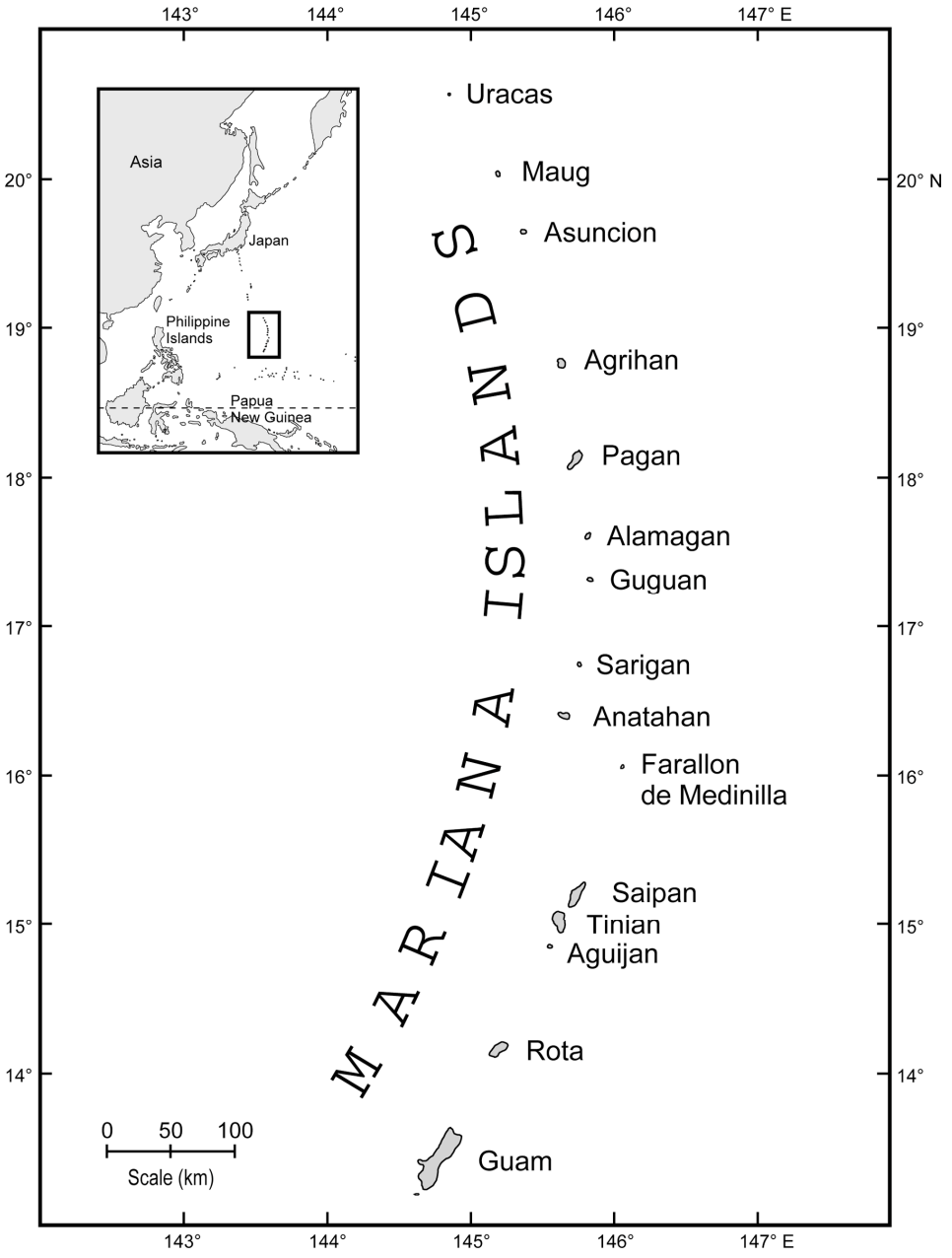

Figure 1. Map of the Mariana Islands

The Southern Marianas were initiated ~43 Ma when the Pacific plate abruptly shifted spreading from NW to WNW; the archipelago has had a complex geological history since. The southern islands are composites of

volcanics and uplifted limestones. Karstic shores predominate, with limestone cliffs lining large tracts of shore, while volcanic shorelines are uncommon. Reefs are generally narrow, and large coastal sections, especially along windward shores, lack reef protection, so that steep fore reefs abut limestone cliffs, often fronted by supratidal, limestone benches. Shores elsewhere are fronted by narrow, largely intertidal reef flats or shallow, moderately wide (100-1000 m) fringing reefs. Lagoonal habitats are uncommon, the only significant ones being Apra Harbor and Cocos lagoon on Guam, and Tanapag-Garapan lagoon on Saipan. Only Apra Harbor has substantial areas >10 m deep.

Subtidal habitats are dominated by oligotrophic reefs. Limestones fronting and underlying recent reefs are riddled with caves and caverns both above and below water, although marine caverns and crevices are generally of limited horizontal extent. Large blocks fallen from cliff faces provide additional wall and crevice habitats. Several anthozoans are known only from these microhabitats.

While the coral fauna of Guam and the Marianas is now relatively well known (Randall 2003), other anthozoan groups have received less attention. Only minimal work considered other anthozoans in the Marianas until the 1970's, the most significant being Cloud's (1959) ecological study of Saipan's reefs, which listed 6 species. Since the establishment of the University of Guam Marine Lab, several studies focused on larger and more conspicuous anthozoans. As a result soft corals, gorgonians, and clownfish anemones have become moderately well documented, although numerous new records are presented here for even these groups. In contrast other actiniarians, corallimorpharians, zoanthids, cerianthids have remained largely unstudied. No sea pens are known to occur on Guam. In addition to listing the identified fauna, we list and document many as yet unidentified species in the hope of stimulating further research.

Methods

This checklist is based on literature records and new collections. Most shallow-water records are from Guam, while deep-water records are from throughout the Marianas. Many of the species recorded in the literature were redocumented with new collections. New records and observations are based on both informal and formal biodiversity surveys. Informal surveys were carried out between 1991 and 2000 around Guam. Four formal biodiversity surveys were run, three for COMNAVMARIANAS (U.S. Department of Defense), at Apra Harbor (Paulay et al. 1997), at the southern Orote – North Agat Bay area (Paulay et al. 2001), and at the Pugua Patchreef – Haputo area (Amesbury et al. 2001); a non-indigenous species survey funded by Sea Grant provided additional coverage (Paulay et al. 2002). Most newly encountered species were photo-documented and collected. Vouchers were deposited in the University of Guam Invertebrate collections (UGI), Florida Museum of Natural History, University of Florida (UF), Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden (RMNH – see Verseveldt 1978), the Northern

Territory Museum of Arts & Sciences, Darwin (NMT), the Zoological Museum, Department of Zoology, Tel Aviv University, Israel (ZMTAU – see Benayahu 1998), and the US National Museum of Natural History (USNM). Photo vouchers are by Gustav Paulay (GP numbers, housed at the Florida Museum of Natural History), Yehuda Benayahu (corresponding to plates in Benayahu 1998) and Robert F. Myers (RFM numbers). Cited photographs (Appendix 1) are on the WWW at: http://www.flmnh.ufl.edu/reefs; they are also available on the Marine Biodiversity of Guam CD-ROM copublication.

Results and Discussion

The zoanthids of Guam have not been previously studied, although Cloud (1959) listed a *Zoanthus* sp. and a *Palythoa* sp. from Saipan. Zoanthids are common and locally dominant on Guam, with three species ecologically important: *Palythoa caesia, Protopalythoa* sp. 1, and *Zoanthus vietnamensis*. Three additional species are uncommon and have localized distribution. Zoanthid taxonomy remains unsettled, but these three common species appear to be widespread in Oceania.

The corallimorpharians of Guam have also not received taxonomic attention, although Cloud (1959) listed *Metarhodactis boninensis* from Saipan (see comment 6 of Appendix), based upon specimens identified by Carlgren, and Gosliner et al. (1996) listed Guam under the range of *Amplexidiscus fenestrafer*. The most common corallimorpharians on Guam are *Rhodactis howesii* and *Ricordea yuma*; both form dense, extensive, clonal stands locally on fringing reefs and moats. The giant corallimorph *Amplexidiscus fenestrafer* is rare and known only from a few locations.

The Marianas has a rich actiniarian fauna, but only six, large, clownfish-associated species and two deep-water anemones have been previously recorded (Dunn et al. 1980, Dunn 1981a, 1981b, Fautin & Hessler 1989). Here we add records of four additional large, zooxanthellate species (*Actinodendron plumosum, Phyllodiscus* sp., *Stichodactyla haddoni,* and *Heterodactyla hemprichii*) as well as 14 smaller species. These include five as-yet-unidentified species, including three that are predominantly on artificial substrata in Apra Harbor and are likely introduced to Guam.

Cerianthids remain unstudied on Guam. Three nocturnal species are listed here based on photographs; they have not been collected. These small cerianthids are not uncommon on Guam, especially in sandy areas of fringing reef moats and in Apra Harbor.

The black corals of the Marianas remain little studied. Ten species recorded by Grigg & Eldredge (1975) in a technical publication are listed below, although their taxonomy requires verification and updating. These records are based on material collected during the Pacific Deep Benthos Surveys around the southern Marianas (see Eldredge 2003). Several black coral species occur at diving depth on Guam, but remain unstudied.

The first octocoral recorded from Guam appears to be the blue coral, *Heliopora coerulea*, collected by Quoy & Gaimard (1824). Soft corals have received more taxonomic attention than any anthozoan group other than the Scleractinia (Gawel 1976, 1977, Verseveldt 1977, 1978, Randall & Gawel 1981, Williams 1992, Benayahu 1998). Most significant are Gawel's (1977) M.S. thesis that reviewed all known local soft corals and Benayahu's (1998) study that focused on the Alcyoniidae. Although Gawel's work remains largely unpublished, Randall & Gawel (1981) published a listing of the species, and Verseveldt (1978), with whom Gawel worked, also listed a number of the species collected by Gawel. Benayahu (1998) recollected and restudied the Alcyoniidae, but did not revisit Gawel's identifications. Specifically, only 7 of the 40 alcyoniids listed here are common to both studies. Eleven *Cladiella* and *Sinularia* species in Gawel were not identified to species, but were treated as numbered taxa. These likely largely correspond to many of Benayahu's taxa, but their identities have not been established. These taxa are not listed here. Five additional alcyoniids listed by Gawel (1977) and Verseveldt (1978) were not listed by Benayahu (1998). Whether some of these are alternative identifications or correspond to taxa not encountered by Benayahu has not been established. Vouchers of these are available in both the University of Guam Invertebrate Collections and the Nationaal Natuurhistorisch Museum, Leiden, for future comparisons (see Appendix 1). The remaining confusion is in part a result of the difficulty in identifying soft coral species, because intra-specific variation is high relative to inter-specific differences in this diverse group, especially in *Sinularia*. Nephtheid and xeniid soft corals on Guam have not been revisited since Gawel (1977) and Verseveldt (1978) and need work. Verseveldt's identifications of nephtheids are generally questionable (L. van Ofwegen pers. comm.). The few nephtheids on Guam are recognizable in the field and tend to be localized; they are often known from only one or two areas, as are the single species each of *Carijoa, Paraminabea,* and *Briareum*.

The gorgonians of the Marianas have received little systematic attention, although they have been actively collected. Gorgonian diversity and abundance increases strikingly with depth. Only a few species are known in <30 m: *Acabaria* and *Subergorgia suberosa* occur in shallow crevices, while *Junceella*, and the zooxanthellate *Rumphella* and *Ifalukella* are locally common at 10-30 m depths. Gorgonian diversity and abundance increase below 30 m, especially in steep, cavernous, and current-swept areas, so that about 20 species are known between 30 and 60 m. Several of the gorgonian species listed have been encountered at diving depths only in caverns along the southern Orote Peninsula of Guam, especially the Blue Hole; these species are otherwise restricted to deeper water. These species encountered at diving depths are relatively well known, even when not identified to species, as they are easy to recognize. In contrast, the much richer deep-water fauna remains poorly known. Gorgonians, the soft coral genera *Siphonogorgia* and *Dendronephthya*, and black corals become much more diverse and abundant below 60 m. Dredging and tangle net

surveys (see Eldredge 2003) have already revealed about 70 species of arborescent octocorals at 60-400 m and many others surely remain to be collected. Other than published records, these deep-water collections are not reported on here. A large collection of deep-water gorgonians has been deposited in the Senckenberg Museum and is under study by Manfred Grasshoff.

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Appendix 1. Anthozoans of the Marianas

Museum: catalogue numbers of vouchers housed at: NMT: Northern Territory Museum of Arts & Sciences, Darwin, Australia; RMNH: Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden; UGI: University of Guam Invertebrate collections; UF: Florida Museum of Natural History, University of Florida; USNM: US National Museum of Natural History; ZMTAU: Zoological Museum, Department of Zoology, Tel Aviv University, Israel. Provenance if other than Guam noted paranthetically; see below for island abbreviations.

Photo: photo vouchers by GP: Gustav Paulay, RFM: Robert F. Myers, YB: Yehuda Benayahu (featured as plates in Benayahu 1998); available at: http://www.flmnh.ufl.edu/reefs, and in the Marine Biodiversity of Guam CD-ROM co-publication. Provenance if other than Guam noted parenthetically.

Refs: numbered references follow at end of Appendix

Is: island: A = Aguijan, G = Guam, M = Marianas with island not specified, R = Rota, T = Tinian, S = Saipan

Notes: numbered notes follow at end of Appendix.

Taxon	Museum	Refs	Photo	Notes	Depth	Is
ZOANTHIDEA: ZOANTHIDAE						
Isaurus tuberculatus Gray, 1828	UF 239	P		1	1	G
Palythoa caesia Dana, 1848	USNM 52364, UF 301	1(S)	GP262-4	2	1	G
Protopalythoa sp. 1	UF 332	P	GP360-13		1	G
Sphenopus sp. 1	UF 255	F	GP812-18	5	1	G
Zoanthus vietnamensis Pax & Mueller, 1957		1(S)	GP615-28	3	1	G
Zoanthid sp. 1 (*Astrosclera*-symbiont)		P	GP417-25 (S)	4	1	G,S
CORALLIMORPHARIA: DISCOSOMATIDAE						
Amplexidiscus fenestrafer Dunn & Hamner, 1980	UF 323	2	GP778-24		1	G
Discosoma nummiforme Leuckart in Rüppell, 1828	UF 307, UGI 6186	C	GP391-21		1	G
Rhodactis bryoides Haddon and Shackleton 1893	UF 328, UGI 6185	C	GP400-4		1	G
Rhodactis cf. *bryoides* Haddon and Shackleton 1893	UF 333	C	GP734-31		1	G
Rhodactis howesii Saville-Kent, 1893	UF 318, UGI 6055	C	GP391-24		1	G
Rhodactis indosinensis Carlgren, 1943		C	GP741-9		1	G
Rhodactis mussoides (Saville Kent 1893)	USNM 50099 (S)?	C, 1(S)?	GP573-4	6	1	G, S?
CORALLIMORPHARIA: RICORDEIDAE						
Ricordea yuma (Carlgren, 1900)	UF 327, UGI 6122	P	GP389-19		1	G
ACTINIARIA: ACTINIIDAE						
Entacmaea quadricolor (Rüppel & Leuckart, 1828)		3,4	GP517-28		1	G

Appendix 1. Anthozoans of the Marianas / *(continued)*

Taxon	Museum	Refs	Photo	Notes	Depth	Is
Stylobates aeneus Dall, 1903		5			3	G
ACTINIARIA: ACTINODENDRONIDAE						
Actinodendron plumosum Haddon, 1898		Ar	GP376-32		1	G
ACTINIARIA: ACTINOSTOLIDAE						
Marianactis bythios Fautin & Hessler, 1989		6			3	M
ACTINIARIA: AIPTASIIDAE						
Aiptasia pulchella Carlgren, 1943		F	GP424-21		1	G
ACTINIARIA: ALICIIDAE						
Phyllodiscus sp. 1		P	GP736-11	7	1	G
Triactis producta Klunzinger, 1877	UF 320, UGI 6634	P	GP528-7	8	1	G
ACTINIARIA: BOLOCEROIDIDAE						
Boloceroides mcmurrichi (Kwietniewski, 1898)	UF 304, UGI 6123	F	GP651-19	9	1	G
ACTINIARIA: EDWARDSIIDAE						
Edwardsianthus gilbertensis (Carlgren, 1931)		D	GP578-33	10	1	G
Edwardsianthus pudica (Klunzinger, 1877)	UF 257	D	GP776-6	11	1	G
ACTINIARIA: HORMATHIIDAE						
Calliactis polypus (Forsskål, 1775)	RMNH, USNM 50481, UF 261	H	GP413-28	12	1	G
ACTINIARIA: ISOPHELLIDAE						
Telmatactis sp. 1	UF 252	P	GP760-3		1	G
ACTINIARIA: NEMANTHIDAE						
Nemanthus annamensis Carlgren, 1943	RMNH Coel. 31255	H		13	1	G
ACTINIARIA: SAGARTIIDAE						
Anthothoe sp. 1 (n. sp.)	UF 262	H	GP356-32	12	1	G
ACTINIARIA: STICHODACTYLIDAE						
Heteractis aurora (Quoy & Gaimard, 1833)		3,4	RFM-51		1	G
Heteractis crispa (Ehrenberg, 1834)		3,4	GP378-34		1	G
Heteractis magnifica (Quoy & Gaimard, 1833)		3,4	RFM-83A		1	G
Stichodactyla haddoni (Saville-Kent, 1893)		P	GP649-33		1	G
Stichodactyla mertensii Brandt, 1835		3,4	GP569-17		1	G
ACTINIARIA: THALASSIANTHIDAE						
Cryptodendrum adhaesivum Klunzinger, 1877		3,4	GP542-8		1	G
Heterodactyla hemprichii Ehrenberg, 1834		P	GP741-34		1	G

Appendix 1. Anthozoans of the Marianas / *(continued)*

Taxon	Museum	Refs	Photo	Notes	Depth	Is
ACTINIARIA: FAMILY INDET.						
Actiniaria sp. 1 (orange-lip)	UF 264, UGI 6637	24	GP522-10	14	1	G
Actiniaria sp. 2 (blue-sheen)		24	GP513-20	15	1	G
Actiniaria sp. 3 (white-striped)	UF 263, UGI 6636	24	GP526-13	16	1	G
Actiniaria sp. 4 (red-lip night)		P	GP830-33	17	1	G
Actiniaria sp. 5 (rough tentacle)		P	GP826-14	18	1	G
CERIANTHARIA						
Ceriantharia sp. 1		P	GP265-2	19	1	G
Ceriantharia sp. 2		P	GP384-27	19	1	G
Ceriantharia sp. 3		P	GP826-13	19	1	G
ANTIPATHARIA: ANTIPATHIDAE						
Cirrhipathes spiralis (Linnaeus, 1758)		7			2	R
Cirrhipathes anguina Dana, 1846		7			1	A
Cirrhipathes sp.		7			2	T
Antipathes dichotoma Pallas, 1766		7			1	G
Antipathes cf. *ulex* Ellis & Solander, 1786		7			2	R,T
Antipathes undulata van Pesch, 1914		7			2	T
Antipathes sp. 1		7			2	R,T,S
Antipathes sp. 2		7			2	R,T,S
Antipathes sp. 3		7			2	R
Tanacetipathes tanacetum (Pourtalès, 1880)		7		20	2	S
COENOTHECALIA: HELIOPORIDAE						
Heliopora coerulea (Pallas, 1766)	USNM 74869, UGI	1(S),8,23, S(A,T)	GP840-7		1	G,S,A, T
ALCYONACEA: CLAVULARIIDAE						
Carijoa sp. 1	UF 320, UGI	P	GP512-3	21	1	G
ALCYONACEA: TUBIPORIDAE						
Tubipora sp. 1	USNM 78690, UGI	1(S),8	GP362-8	22	1	G
ALCYONACEA: ALCYONIIDAE						
Cladiella krempfi (Hickson, 1919)	ZMTAU 29245, UGI	9	YB PI-IA		1	G
Cladiella pachyclados (Klunzinger, 1877)	ZMTAU 29357, RMNH 11890, UGI 2438	8,9,10,11, S(S)	YB PI-IC		1	G,S

Appendix 1. Anthozoans of the Marianas / *(continued)*

Taxon	Museum	Refs	Photo	Notes	Depth	Is
Cladiella tuberculoides (Tixier-Durivault, 1944)	ZMTAU 29403	9			1	G
Eleutherobia sp. 1		25			1	S
Klyxum simplex (Thomson & Dean, 1931)	ZMTAU 29352, UF253, UGI	9	GP838-6		1	G
Klyxum utinomii (Verseveldt, 1971)	RMNH 11901, UGI 2432	8,10,11			1	G
Lobophytum batarum Moser, 1919	ZMTAU 29335, UGI	9	YB PI-ID		1	G
Lobophytum crebriplicatum Von Marenzeller, 1886	RMNH 11911, UGI 2448	8,10,11			1	G
Lobophytum pauciflorum (Ehrenberg, 1834)	RMNH 11903, ZMTAU 29354, USNM 50023, UGI 2460	8,9,10,11, S(R,S,T)	YB PI-IE		1	G,R,S, T
Lobophytum sarcophytoides Moser, 1919	ZMTAU 29405	9	YB PI-IF		1	G
Lobophytum venustum Tixier-Durivault, 1957	ZMTAU 29350, UGI	9			1	G
Paraminabea goslineri (Williams, 1992)	CAS (holotype), UF 254, UGI	12,13	GP736-3	23	1	G
Sarcophyton acutum Tixier-Durivault, 1970	ZMTAU 29406	9			1	G
Sarcophyton glaucum (Quoy & Gaimard, 1833)	RMNH 11896, ZMTAU 29375, UGI 2472	8,9,10,11, S(S)	YB PI-IIA		1	G,S
Sarcophyton trocheliophorum Von Marenzeller, 1886	RMNH 11895, ZMTAU 29391, UGI 2490	8,9,10,11, S(R,S)	YB PI-IIB		1	G,R,S
Sinularia abrupta Tixier-Durivault, 1970	ZMTAU 29277, UGI	9	YB PI-IIC		1	G
Sinularia arborea Verseveldt, 1971	RMNH 11893, ZMTAU 29347, UGI 2568	8,9,10,11	YB PI-IID		1	G
Sinularia brassica May, 1898	ZMTAU 29320	9			1	G
Sinularia compressa Tixier-Durivault, 1945	RMNH 12442, ZMTAU 29398	9,11			1	G
Sinularia crassa Tixier-Durivault, 1945	ZMTAU 29251, UGI	9			1	G
Sinularia cristata Tixier-Durivault, 1970	RMNH 12451	11			1	G
Sinularia densa (Whitelegge, 1897)	UGI 2558	10,11			1	G
Sinularia discrepans Tixier-Durivault, 1970	ZMTAU 29244, UGI	9	YB PI-IIE		1	G
Sinularia erecta Tixier-Durivault, 1945	ZMTAU 29279	9			1	G
Sinularia gardineri (Pratt, 1903)	ZMTAU 29242	9			1	G
Sinularia gaweli Verseveldt, 1978	RMNH 12445 (holotype), ZMTAU 29364, UGI	9,11,S(R,S)	YB PI-IIF		1	G,R,S
Sinularia gibberosa Tixier-Durivault, 1970	ZMTAU 29281	9	YB PI-IIIA		1	G
Sinularia gravis Tixier-Durivault, 1970	ZMTAU 29386, NTM 5520	9			1	G
Sinularia humesi Verseveldt, 1968	ZMTAU 29240	9			1	G

Appendix 1. Anthozoans of the Marianas / *(continued)*

Taxon	Museum	Refs	Photo	Notes	Depth	Is
Sinularia leptoclados (Ehrenberg, 1834)	RMNH 12444, ZMTAU 29390, UGI	9,11			1	G
Sinularia macropodia (Hickson & Hiles, 1900)	RMNH 12449, ZMTAU 29367, UGI	9,11			1	G
Sinularia maxima Verseveldt, 1971	RMNH 11904, ZMTAU 29339, NTM 5445, UGI 2547	8,9,10,11,14, S(R,S),26	YB PI-IIIB		1	G,R,S
Sinularia minima Verseveldt, 1971	ZMTAU 29238	9			1	G
Sinularia notanda Tixier-Durivault, 1966	RMNH 12443	11			1	G
Sinularia numerosa Tixier-Durivault, 1970	RMNH 12448, ZMTAU 29377, UGI	9,11	YB PI-IIIC		1	G
Sinularia paulae Benayahu, 1998	ZMTAU 29241 (holotype), UGI	9			1	G
Sinularia peculiaris Tixier-Durivault, 1970	ZMTAU 29247, UGI	9			1	G
Sinularia polydactyla (Ehrenberg, 1834)	RMNH 11905, ZMTAU 30005, USNM 49642, NTM 5443, UGI 2468	8,9,10,11,14, 15,S(R),26	YB PI-IIID		1	G,R
Sinularia querciformis (Pratt, 1903)	ZMTAU 29401, UGI	9	YB PI-IIIE		1	G
Sinularia variabilis Tixier-Durivault, 1945	ZMTAU 29381	9			1	G
Sinularia vervoorti Verseveldt, 1977	BPBM D243 (holotype), RMNH 11755	11,22			1	G
ALCYONACEA: NEPHTHEIDAE						
Dendronephthya dichotoma Henderson, 1909	RMNH 11900, UGI 2545	8,10,11			2	G
Dendronephthya mirabilis Henderson, 1909	RMNH 11902, UGI 2542 (S)	8,10,11			2	G
Nephthea gracillima Thomson & Dean, 1931	RMNH 11913, UGI 2543	8,10,11			1	G
Stereonephthya cordylophora Verseveldt, 1973	RMNH 12441, USNM 78668, UF246, UGI	10,11	GP736-20	24	1	G
Stereonephthya ulicoides Thomson & Dean, 1931	RMNH 11892, UGI 2540	8,10,11			1	G
Stereonephthya unicolor Gray, 1862	RMNH 11908, UGI 2794	8,10,11	GP815-26		1	G
ALCYONACEA: NIDALIIDAE						
Chironephthya sp. 1	UF 337	P	GP531-29		1	G
ALCYONACEA: SIPHONOGORGIIDAE						
Siphonogorgia variabilis (Hickson, 1903)	RMNH 11894, UGI 2550	8,10,11			1	G
ALCYONACEA: XENIIDAE						
Anthelia glauca Lamarck, 1816	UF 330, UGI 2561	8,10,S(S)	GP815-25		1	G,S
Asterospicularia randalli Gawel, 1976	USNM 54134 (holotype), UGI 2535, RMNH 11891, ZMTAU 29404	8,9,10,16,S(R)	GP362-22	25	1	G,R
Sympodium coeruleum Ehrenberg, 1834	UGI 2570	8,10		26	1	G

Appendix 1. Anthozoans of the Marianas / *(continued)*

Taxon	Museum	Refs	Photo	Notes	Depth	Is
ALCYONACEA: BRIAREIDAE						
Briareum excavatum (Nutting, 1911)	ZMTAU 30008, UF 329	9,17	GP652-7	27	1	G
ALCYONACEA: MELITHAEIDAE						
Acabaria sp. 1A (red)	UF 325, UGI	P	GP251-9	28	1	G
Acabaria sp. 1B (yellow)	UGI	P	GP251-14	28	1	G
Acabaria sp. 2A (yellow w/ red nodes)	UF 331, UGI	P	GP459-23	28	1	G
Acabaria sp. 2B (white w/ yellow nodes)	UGI	P	GP459-22	28	1	G
ALCYONACEA: SUBERGORGIIDAE						
Annella mollis (Nutting, 1910)	NTM 12731, UGI	18,27	GP752-12		1	G
Annella reticulata (Ellis & Solander, 1786)	USNM 93343, UGI	18,27,S(R,S)	GP652-20		1	G,R,S
Subergorgia rubra Thomson, 1905		19		29	?	G
Subergorgia suberosa (Pallas, 1766)	USNM 93340, UF 338, UGI	27,2(M),S(R)	GP653-11		1	G,R
Subergorgia sp. 1	USNM 93341, UF 343	B			1	G
ALCYONACEA: KEROEIDIDIDAE						
Keroeides sp. 1	UGI	A			1	G
ALCYONACEA: GORGONIIDAE						
Rumphella aggregata (Nutting, 1910)	NTM 12054, USNM 93338, UF 335, UGI	27,A,S(R,S)	GP790-27	31	1	G,R,S
ALCYONACEA: ACANTHOGORGIIDAE						
Acanthogorgia sp. 3	UF 341	B			1	G
ALCYONACEA: PLEXAURIDAE						
Astrogorgia sp. 3 (burgundy)	USNM 93345, NTM 5956, UF 339	27,B	GP752-14	31	1	G
Astrogorgia sp. 4 (orange)	UF 346, UGI	B			1	G
Villogorgia cf. *glaesaria* Grasshoff, 1999	UGI	27,A		31	1	G
ALCYONACEA: ELLISELLIDAE						
Junceella fragilis Ridley, 1882	NTM 5955, UF 342	P	GP573-32		1	G
Viminella sp. 1	NTM 5957, UF 336	27,A		31	1	G
Viminella sp. 2	UGI	20	GP652-18		1	G
Ellisella sp. 1	UF 340	A			1	G
Heliania cf. *spinescens* Gray, 1860	UGI	A			1	G
ALCYONACEA: IFALUKELLIDAE						
Ifalukella yanii Bayer, 1955	NTM 12748, UF 155, UGI	20,S(R)	GP815-23	30	1	G,R

Appendix 1. Anthozoans of the Marianas / *(continued)*

Taxon	Museum	Refs	Photo	Notes	Depth	Is
ALCYONACEA: CORALLIIDAE						
Corallium elatius? (Ridley, 1882)		7,21			3	T
Corallium konojoi (Kishinouye, 1903)		21			3	A,S

References: Literature records listed by numeric code, while identifier of species not previously documented from the Marianas listed by alphabetic code as follows. Provenance if other than Guam noted paranthetically; see below for island abbreviations. A) P. Alderslade, Ar) A. Ardelean, B) F.M. Bayer, C) A. Chen, D) M. Daly, F) D.G. Fautin, H) J .C. den Hartog, P) G. Paulay, S) J. Starmer, 1) Cloud 1959, 2) Gosliner et al. 1996, 3) Dunn 1981a, 4) Dunn 1981b, 5) Dunn et al. 1980, 6) Fautin & Hessler 1989, 7) Grigg & Eldredge 1975, 8) Randall & Gawel 1981, 9) Benayahu 1998, 10) Gawel 1977, 11) Verseveldt 1978, 12) Williams 1992, 13) Williams & Alderslade 1999, 14) Slattery et al. 2001, 15) Slattery et al. 1999, 16) Gawel 1976, 17) Stojkovich 1977, 18) Puglisi et al. 2000, 19) Grasshoff 1999, 20) Fabricius & Alderslade 2001, 21) Eldredge 1984, 22) Verseveldt 1977, 23) Quoy & Gaimard 1824, 24) Paulay et al. 2002, 25) Williams 2001, 26) Van Alstyne et al. 1994, 27) Puglisi et al. 2002

Notes:

1) Known from a single collection on the shallow reef front of the Haputo area, in habitat typical for species.
2) The species-level taxonomy of *Palythoa* s.s. remains unresolved. *Palythoa caesia* was the only *Palythoa* species recognized on the Great Barrier Reef in a recent intensive study, and was shown to occur in several genetically indistinguishable forms, previously recognized as distinct species (Burnett et al. 1997). These included the common reef front / reef flat form also known on Guam, with 5-10 cm wide colonies and ~ 8 mm wide polyps (*P. caesia s.s.*), as well as forms with very large (to several m diameter) colonies and polyps less than half that size, that have not been seen on Guam.
3) A potential junior synonym of *Zoanthus natalensis* Carlgren, 1938 (Burnett & Ryland 1997). Common on exposed reef fronts in the low intertidal and shallow subtidal, as typical for species.
4) A small colonial species that lives in the coralline sponge *Astrosclera willeyana*. This species has been seen on Guam by GP, but no specimen or photo records have been taken. The photo voucher is of a colony from Saipan's Grotto, where the species is common.
5) An unusual small, sand-encrusted solitary zoanthid known from a single specimen.
6) Cloud's (1959) record of *Metarhodactis boninensis* Carlgren, 1943 from Saipan (USNM 50099), identified by Carlgren, may correspond to our record of *Rhodactis mussoides* (A. Chen pers. comm. 2003), but this needs verification. We have not examined Cloud's specimen.
7) *Phyllodiscus* is here recorded from Guam on the basis of a single specimen photographed on the fore reef on the south side of the Orote peninsula at 17m.
8) Rare in free-living form (illustrated in photo voucher) on Guam, but common as a juvenile symbiont on the claws of the xanthid crab *Lybia tessellata* and *Lybia* sp. 1. Whether the symbiotic form is conspecific with the free-living form, as has often been assumed, needs to be established.

9) Two forms are attributed to this species, a large solitary and a small gregarious one (J. C. den Hartog pers. comm.), which likely represent distinct species (V. Pearse pers. comm.). Only the solitary form has been found on Guam to date.
10) Locally abundant in dense fields in the inner moat of Tumon.
11) Locally abundant in dense fields in N Agat Bay around 30 m depth.
12) The identity of the two anemone species associated with some species of *Dardanus* hermit crabs (mostly *Dardanus gemmatus* and *D. deformis*, and less commonly *D. megistos* on Guam) are not fully established. The large species that envelops the shell was described as *Calliactis polypus* from the Red Sea, and is likely conspecific across the Indo-West Pacific. This would make other names applied to this associate, such as *C. miriam* Haddon & Shackleton, 1893, junior synonyms (J. C. den Hartog pers. comm.). The smaller anemone that occupies the umbilical area of the shell can be referred to as *Verrillactis paguri* sensu England, 1971 (non Verrill, 1869) (J. C. den Hartog 1997, pers. comm.); however, as this is not a valid name, we prefer to follow Cutress (1977) in recognizing it as an undescribed *Anthothoe*.
13) *Nemanthus annamensis* is likely a junior synonym of *Nemanthus nitidus* (Wassilieff, 1908) (Lavaleye & den Hartog 1995).
14) Forms large clonal aggregations on some shipping buoys in Apra Harbor. This species is azooxanthellate, albeit brownish.
15) Widespread on shipping buoys and mooring chains in Apra Harbor, occurs both in large aggregations carpeting an area, but also as isolated individuals. This species is zooxanthellate.
16) Occasional on shipping buoys in Apra Harbor.
17) A small solitary anemone common at 10-20 m on the fore reef, where it expands only at night.
18) A ca. 10 cm solitary anemone common on the shallow (3-8m) fore reef, where it extends from small crevices at night.
19) Three cerianthids are recognized based on field appearance. They occur in sand and rubble, and emerge only at night.
20) Grigg & Eldredge's (1975) record of this Atlantic species (as *Antipathes tanacetum*, now transferred to *Tanacetipathes* Opresko, 2001) is likely a misidentification.
21) *Carijoa* is here recorded from two sites on Guam: attached in abundance to navigational buoys in Apra Harbor, and from a cavern at Shark's Pit, Orote.
22) Varied polyp morphology suggests that *Tubipora* includes several species. Only one of these is known on Guam, but until the genus is revised, it cannot be reliably identified to species. Recorded as *T. musica* by Cloud (1959) and Randall & Gawel (1981).
23) *Paraminabea goslineri* occurs in both yellow (as originally described) and orange-red color forms (as illustrated in the voucher photo). The species is usually found in clonal aggregates of the same color. Described from Guam as *Minabea* (Williams 1992), transferred to *Paraminabea* by Williams & Alderslade (1999).
24) Gawel's (1977) *Stereonephthya* sp. 1.
25) Described from Guam. Distinction from the type species of the genus, *Asterospicularia laurae* Utinomi, 1951 from Taiwan, needs to be confirmed. *Asterospicularia* was recently transferred to the Xeniidae (Alderslade 2001).
26) Not seen since Gawel (1977).
27) Recorded as *Pachyclavularia violacea* by Stojkovich (1977), who noted restriction of species to the edge of the dropoff (25+m) along the outer southern margin of the Orote Peninsula. The species remains moderately common there and has not been seen anywhere else on Guam.

28) At least two species of *Acabaria* occur on Guam. One occurs in shallow water as well (5 m+), lives in crevices, and grows as contorted branchs; it occurs as red (*A.* sp. 1A) and yellow (*A*. sp. 1B) colonies. The second is a deep-water species that is common in the Blue Hole, has an open, dichotomous form, and occurs in two colors: yellow with red nodes (*A.* sp. 2A) and white with yellow nodes (*A*. sp. 2B).
29) Based solely on the literature record; all other gorgonians were collected.
30) Previously known only from Ifaluk Atoll in the Carolines (Federated States of Micronesia). This small, zooxanthellate gorgonian appears to be restricted to, but common on, current swept reef slopes near the northern and southern tips of Guam and on the SW point of Rota (Putan Taipingot).
31) Recorded under generic name only in Puglisi et al. 2002.