

Marine Bivalvia (Mollusca) of Guam

GUSTAV PAULAY¹

*Marine Laboratory
University of Guam
Mangilao, Guam 96923 USA*

Abstract—The marine bivalves of Guam are documented from new collections and 339 species recorded. Nevertheless Guam's fauna remains imperfectly known and is estimated to be considerably more diverse. Such high diversity on a local scale in the west-central Pacific suggests that bivalve diversity in the Indo-west Pacific is much higher than previously recorded. Pteriomorphs and heterodonts dominate Guam's fauna, while protobranchs and anomalodesmatans comprise only four species. Galeommatids represent the most species rich family, even though they are uncommon in samples.

Introduction

REGIONAL SETTING

Guam (13°N, 144°W), the southernmost of the Mariana Islands, is the largest, most populous, and developed island in Micronesia. As part of the island arc bordering the northwestern margin of the Pacific plate, Guam has had a complex geological history since initiation around 42 Ma. Submarine and subaerial volcanic episodes interspersed with periods of sedimentation and reef formation, together with alternating subsidence and uplift have led to complex physiography both above and below water. Northern Guam is a relatively flat, uplifted limestone plateau, bordered by karstic cliffs and limited reef development. In contrast southern Guam is dominated by volcanic hills, locally with limestone veneers, with same valleys terminating in small bays. Barrier reefs are limited to shallow Cocos lagoon at the southern tip of the island, and Apra Harbor at the junction of the volcanic south and karstic north (Fig. 1). Other than these two small lagoons, Guam's shore is fronted by fringing reefs or lacks reef protection.

Guam has a diversity of marine habitats, even if it lacks the large and complex lagoons that characterize many Micronesian islands to the south. Major habitats include exposed limestone shores without reef protection, supratidal benches, narrow, intertidal reef flats, fringing reefs with well developed (1-3 m deep) moats, and shallow (<12 m) Cocos and deep (60 m) Apra Harbor lagoons. A gradient of southwardly increasing fringing reef development appears to be partly the result of greater tectonic uplift toward the north. Reef development is

¹Current address: Florida Museum of Natural History, Gainesville FL 32611-7800 USA, email: paulay@flmnh.ufl.edu

under further local geological control, with large embayments, created by faulting and groundwater discharge in Tumon, Hagåtña (Agaña) and Pago bays, having developed the widest fringing reefs, and with a barrier reef (Apra Harbor) developed north of the projecting Orote peninsula. Additional variation in reef habitats result from differences in wind, wave, and current exposure, with eastern reefs considerably more exposed than western reefs to both tradewinds and typhoons. Finally, terrigenous sediments are limited to the south, most prevalent along the southwest coast, and this is reflected in the localization of several infaunal bivalve species. Fore reefs exhibit moderate variation around the island in width, terracing, and in the abundance and nature of mobile sediments. Mangroves are limited to very small stands in stream estuaries, and to larger, but still narrow bands in inner Apra Harbor and at the southeast end of the island in Merizo. Seagrass beds are developed along the larger fringing reef systems as well as in Cocos lagoon.

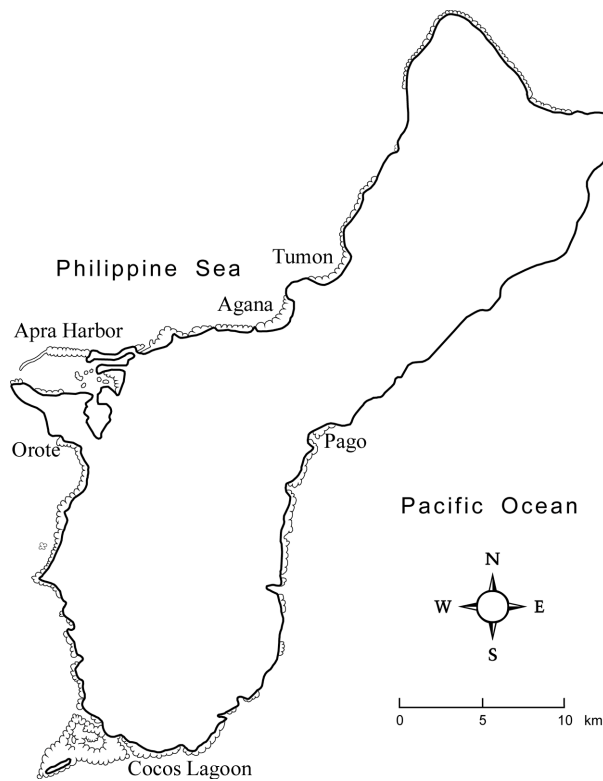


Figure 1. Map of Guam.

Apra Harbor, the largest and busiest port in Micronesia, is the only deep lagoon in the Marianas. Its unique habitats host many species not found

elsewhere on Guam or in the Marianas. The harbor is also the main entry point for species introduced by shipping traffic (Paulay et al. 2002). Apra Harbor has been substantially altered following World War II, as a large breakwater built over the barrier reef and bank that previously bounded the lagoon along the north has substantially reduced circulation with the surrounding ocean. Despite such major alterations, Apra Harbor has a vibrant and thriving marine biota, with well-developed reefs, some of the highest coral cover (albeit dominated by *Porites rus*) on Guam, and a diverse biota. Physical, chemical, and biotic conditions all show pronounced east to west gradients in the harbor, related to the unidirectional exchange of water through the western entrance. Benthic habitats range from fairly exposed and oceanic reefs along the northwestern end of the Orote Peninsula, to silt-choked, lagoonal patch reefs, mud and silty sand bottoms, and mangroves in Sasa Bay and the Inner Harbor, with corresponding variation in the biota.

BIVALVES

Mollusks are among the taxonomically better known phyla, partly because shells have long fascinated naturalists, are often sufficient in themselves for species level identification, and persist and accumulate after the animal's death. Shells provide more abundant material for study, and a better cross section of what lives in an area, than is available for most organisms, which can only be studied alive. The study of Indo-West Pacific bivalves is nevertheless hampered by the diversity of the fauna and paucity of revisionary studies. The publication of several regional faunistic monographs (Oliver 1992, 1995, Lamprell & Whitehead 1992, Lamprell & Healy 1998, Okutani 2000) and taxonomic revisions (e.g., Willan 1993, Vidal 1999, Glover & Taylor 2001), have greatly facilitated taxonomic work on Indo-West Pacific bivalves in the past decade. Nevertheless this diverse class remains poorly known. Although many, especially smaller bivalves remain undescribed, a perhaps greater limitation for faunistic studies is the profusion of inadequately described taxa and consequent abundance of junior synonyms that have resulted from the ready availability and attraction of shells. Revisionary studies are badly needed for most families to stabilize both species level nomenclature and generic and higher classification.

The bivalves of Guam have received little attention in the past. Species from the island have been included in some revisions (e.g., Stenzel 1971, Rosewater 1961, 1965, Waller 1972, Willan 1993, Vidal 1993, 1997, 1999), and one species was described from Guam (Raines 1996). Several M.S. theses at the University of Guam focused on bivalves (Jameson 1975, Day 1977, Braley 1981, Persselin 1998, Peshut 2000). The mollusks of the Northern Mariana Islands, but not Guam, were checklisted by Vermeij et al. (1983), while Cloud (1959) recorded 48 species from Saipan. Checklist attempts for Guam began with Smith (1986), who listed 65 species, while Paulay (1996a) recorded 201 species, and Peshut (2000) encountered 223 taxa in a quantitative survey. I have been incidentally collecting and identifying bivalves on Guam since 1991, but attention paid to the

comprehensive marine biodiversity survey featured in this volume has limited effort spent specifically on bivalves. The present checklist is thus more a report of progress to date than an authoritative list of the fauna. Nevertheless it already demonstrates the substantial local diversity of the group. Other than the 20 sediment samples (500+ specimens each) picked by Peshut (2000) and ca. 20 dredge hauls from 50-150 m depths fully sorted for bivalves, bivalve collecting has been incidental to other work. Taxonomic determinations remain preliminary, with many species identified to generic level only. Accurate species level identifications in bivalves often require mini revisions of relevant taxa.

Methods

Bivalves were collected from beaches, reef flats, moats, lagoons, fore reefs, and the lower reef talus to ca. 200m by walking, snorkeling, SCUBA, and dredging. Dredging was largely confined to 50-150m depths, focused on a well-developed terrace at that depth around the island. Epifaunal and endolithic species were collected from reef substrata, while dead shells and infaunal bivalves were taken by fanning sand during dives and from sediment samples retained on 0.8mm mesh sieves (see Peshut 2000). I have examined ~15,000 specimens, although over 80% of these came from fewer than 40 sediment and dredge samples.

The extent of coverage varies with macrohabitat as well as microhabitat. Coverage is relatively good on the leeward deep slope and on fringing reefs. It is moderate on the fore reef at diving depths, in Apra Harbor, and on the windward deep slope. Endolithic taxa have received little attention, as have cemented, epibenthic species. Unidentified taxa are given consecutive numbers in my notes, these are used here as they apply to Guamanian taxa. Literature records are included where available. Records from other Mariana Islands were not systematically searched, although are included when they are based on specimens seen or from reliable literature.

Results & Discussion

At present 339 species of bivalves are known from Guam (Appendix 1). Because considerable effort was placed on picking shells from sediment retained on a 0.8mm mesh, microbivalves are at least as well documented as larger species. Nevertheless new records are still commonly encountered: almost every sediment sample processed included species previously unrecorded from Guam. Given that sampling was virtually confined to <200m and remains modest there, the entire bivalve fauna of the island is likely considerably greater than 500 species.

Such richness underscores Bouchet et al.'s (2002) observation that the Indo-West Pacific mollusk fauna is considerably more diverse than previously recognized. The highest currently documented regional bivalve diversity in the

world is around 1200 species (Crame 2000), in the Southeast Asian – Indo-Malayan region. Species richness rapidly decreases eastward from this diversity center in most marine organisms (Paulay 1997). In comparison to these regional diversities, the local species richness of bivalves on Guam is remarkable, considering the location and small size of the island, limited habitat diversity, and limited extent of coverage, especially with regard to depth. Bouchet et al. (2002) documented very high mollusk diversity in a 5 X 5 km area in Koumac, New Caledonia, with 519 species of bivalves recorded. Their results were based on a sample size ($N = 45,480$) ca. three times greater than in the present study, from an island with substantially greater habitat diversity than Guam. An interesting comparison can be made between the opisthobranch fauna of Koumac (271 species) and Guam (485 species; Carlson & Hoff 2003). Opisthobranchs have been more exhaustively sampled on Guam than any other mollusk group. As a group they are also more difficult to sample in rapid biodiversity surveys than shelled taxa like bivalves, because most species can only be collected alive. These comparisons suggest that Guam's bivalve biota remains substantially undersampled. It further implies that the species richness of bivalves in the still poorly-explored Indo-Malayan diversity center is likely much higher than heretofore documented. Preliminary samples from the area indeed suggest very high species richness, especially when microbivalves are considered.

Pteriomorphs and heterodonts dominate Guam's fauna (Table 1), while protobranchs and anomalodesmatans are represented by just 4 species. Dominance of these two subclasses is typical for shallow-water, tropical Pacific island bivalve faunas (Paulay 1990). 46 families were encountered, 9 with >10 species, while 23 families were represented by 1 or 2 species each (Table 2). In comparison, Bouchet et al. (2002) encountered 62 families at Koumac, New Caledonia, 14 with >10 species, and 27 with 1 or 2 species. The rankings of families in terms of species diversity are similar between Guam and New Caledonia (Tables 2). The main overall difference is that infaunal taxa are proportionately more diverse than epifaunal taxa in New Caledonia relative to Guam. Thus the ratio between the predominantly infaunal heterodonts and predominantly epifaunal pteriomorphs is 1.99 for New Caledonia and 1.56 for Guam. This difference reflects the different nature of reef habitats at these locations, with a very wide, soft-bottom-dominated lagoon enclosed by the barrier reef at Koumac compared with limited fringing reef development giving way to a hard-bottom-dominated fore reef environment on Guam.

The Galeommatidae *sensu lato* (cf. Ponder 1998) stand out in both samples as a megadiverse group. Their actual diversity must be substantially higher than indicated in Table 3, and could be several times higher than that of any other family. Galeommatid shells are relatively uncommon in samples, and many species are currently known from one or a few valves on Guam. Similarly, at Koumac galeommatids accounted for only 1.6% of the shells, but 12% of the species diversity (Bouchet et al. 2002). Their rarity is likely in part a preservational artifact, as shells are often exceptionally fragile, and in part an

ecological / collecting issue, as many species live in specialized microhabitats, often in commensal association with varied invertebrate hosts. Such a combination of rarity and diversity implies that the known diversity of this group will grow rapidly and substantially when larger samples become available. Galeommatids are poorly known taxonomically, with generic and even higher taxonomic limits poorly understood, and much if not most of their indicated diversity may be in undescribed species (Morton & Scott 1989).

Table 1. Species richness of bivalve subclasses on Guam and New Caledonia

Clade	Guam	Koumac, NC
Protobranchia	1	2
Pteriomorpha	131	165
Heterodonta	204	329
Anomalodesmata	3	21

Data for Koumac, New Caledonia from Bouchet et al. (2002)

At least 10 of the bivalve species documented appear no longer to survive on Guam. Locally extirpated taxa include 3 intentionally (*Crassostrea gigas*, *Saccostrea tuberculata*, *Tridacna gigas*) and 3 accidentally introduced species (*Anomia nobilis*, *Chama fibula*, *Chama macerophylla*), 3 indigenous species from Apra Harbor (*Lopha cristagalli*, *Timoclea* sp. 9, *Spondylus varius*) and the previously widespread *Hippopus hippopus*. The last two species were probably collected to death, *S. varius* for curios following WWII, while *Hippopus* prehistorically, presumably for food. The other two indigenous species may have succumbed to environmental change in Apra Harbor.

Table 2. Most species rich bivalve families on Guam and New Caledonia

Family	Guam	Guam	Koumac, NC	Koumac, NC
	# of species	% of fauna	# of species	% of fauna
Galeommatidae s. l.	39	11%	61	12%
Tellinidae	38	11%	51	10%
Cardiidae ¹	29	9%	37	7%
Veneridae	28	8%	53	10%
Limidae	21	6%	15	3%
Pectinidae	21	6%	27	5%
Arcidae	19	6%	24	5%
Mytilidae	18	5%	27	5%
Lucinidae	17	4%	20	4%

Species richness of families with >10 species on Guam compared with Koumac, New Caledonia (Bouchet et al. 2002). The other families in the New Caledonian sample that had >10 species are: Semelidae (19), Spondylidae (16), Psammobiidae (13), Pteriidae (12), and Mactridae (11).

¹includes Tridacnidae of Bouchet et al. 2002.

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Appendix 1. Bivalves of Guam

Museum: vouchers specimens at ANSP: Academy of Natural Sciences, Philadelphia; DMNH: Delaware Museum of Natural History; SBMNH: Santa Barbara Museum of Natural History; UF: Florida Museum of Natural History, University of Florida, Gainesville; UGI: University of Guam Invertebrate Collections; USNM: US National Museum of Natural History, Washington DC. Vouchers are from Guam unless an island abbreviation (see below) is added parenthetically.

Depth: 1: 0-60m, 2: 60-200m, 3: >200m

Is: Island: G: Guam, Gu: Guguan, M: Maug, MS: Mariana Islands island unspecified, P: Pagan, R: Rota, S: Saipan, T: Tinian.

Ref: numbered references follow at end of Appendix

Photo: vouchers by GP: Gustav Paulay (housed at UF), and RFM: Robert F. Myers; available online at: <http://www.flmnh.ufl.edu/reefs> and in the Marine Biodiversity of Guam CD-ROM co-publication. Comprehensive photographic coverage is planned in future; check website.

Note: numbered notes follow at end of Appendix

Taxon	Museum	Ref	Photo	Note	Depth	Is
PROTOBRANCHIA: NUCULIDAE						
<i>Pronucula</i> sp. 1	UF 287969	P			1	
PTERIOMORPHIA: MYTILIDAE						
<i>Adula</i> sp. 1	UF 289102	P			1	
<i>Brachidontes</i> cf. <i>striatulus</i> (Hanley, 1844)	UF 288859, UGI 6251	1,22		55	1	
<i>Brachidontes</i> sp. 1	UF 287848	P		2	2	
<i>Dacrydium</i> sp. 1	UF 287966	P			1,2	
<i>Gregariella coarctata</i> (Carpenter, 1856)	UF 297069	P			1,2	
<i>Gregariella coralliphaga</i> (Gmelin, 1791)	UF 287345, USNM 595519(S)	P			1,2	
<i>Lithophaga laevigata</i> (Quoy & Gaimard, 1835)	UF 287430, UGI 6246	P			1	
<i>Lithophaga lessepsiana</i> (Vaillant, 1865)	UF 297206	P			1	
<i>Lithophaga nigra</i> (Orbigny, 1842)	UF 297239, UGI 6248	P			1	
<i>Modiolus auriculatus</i> Krauss, 1848	UF 289021, UGI 3470	P			1	
<i>Modiolus</i> sp. 2	UF 297252	P			2	
<i>Musculus</i> sp. 2	UF 287441	P			1	
<i>Musculus</i> sp. 3	UF 297079	P			2	
<i>Rhomboidella malaccana</i> Ockelmann, 1983	UF 287994	P			1	
<i>Septifer bilocularis</i> (Linnaeus, 1758)	UF 287437, UGI 1916	22			1	
<i>Septifer</i> cf. <i>cumingii</i> Récluz, 1849	UF 287330, UGI 4659(P)	P			1	P

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Septifer excisus</i> (Wiegmann, 1837)	UF 297192, UGI 6255USNM 487060, USNM 617675 (P), USNM 620116 (R)	P	GP785-7		1	P,R
<i>Septifer</i> cf. <i>furcillata</i> Gould, 1861	UF 286758	P			1	
PTERIOMORPHIA: ARCIDAE	UF 284805	P			1	
<i>Acar plicata</i> (Dillwyn, 1817)	UF 287431, UGI 6259	2		1	1	
<i>Acar</i> sp. 2 (<i>congenita</i> of Habe, not Smith, 1885)	UF 287376	22		56	1	
<i>Anadara antiquata</i> (Linnaeus, 1758)	UF 296972, UF 296944(M), UGI 997	P			1	M
<i>Arca avellana</i> Lamarck, 1819	UF 296949	P			2	
<i>Arca</i> sp. 2 (cave)	UF 287843, UGI 6529	P			2	
<i>Arca</i> sp. 3 (aff. <i>acuminata</i>)	UF 287457, UGI 6261	P			1	
<i>Barbatia amygdalumstomum</i> (Röding, 1798)	UF 284794, UGI 6375	P			1	
<i>Barbatia foliata</i> (Forsskål, 1775)	UF 284967, UGI 6537	P			1	
<i>Barbatia lima</i> (Reeve, 1844)	UF 296967, UGI 6263	P			1	
<i>Barbatia parva</i> (Sowerby, 1833)	UF 284920, UGI 6271	P			1	
<i>Barbatia tenella</i> (Reeve, 1844)	UF 284837, UGI 6344	P		2	2	
<i>Barbatia</i> s. l. sp. 10 (<i>Arcopsis</i> -like)	UF 287824	P		2	2	
<i>Barbatia</i> sp. 11	UF 296945	P		2	2	
<i>Bathyarca</i> sp. 1	UF 296946	P		2,3	1	
<i>Bentharca</i> sp. 1 (cave)	UF 296947, UGI 6290	3		2	2	
<i>Bentharca</i> sp. 2 (aff. <i>xenophorica</i> (Kuroda, 1930))	UF 296984	P		2,4	2	
<i>Bentharca</i> sp. 3 (deep cave)	UF 287325, UGI 6269	3?			1,2	
<i>Hawaiarca rectangularis</i> Dall, Bartsch & Rehder, 1938	UF 296976, UGI 6526	P			1,2	
PTERIOMORPHIA: NOETIIDAE	UF 287824	P			2	
<i>Arcopsis ornata</i> (Viader, 1951)	UF 287563	P			2	
<i>Arcopsis</i> sp. 1	UF 287557	P			2	
<i>Arcopsis</i> sp. 2	UF 296977, USNM 594151, UGI 6282	P			1	
<i>Arcopsis</i> sp. 3	UF 287746, UGI 5358	P			1,2	
<i>Striarca</i> sp. 1						
PTERIOMORPHIA: GLYCYMERIDAE						
<i>Glycymeris reevei</i> (Mayer, 1868)						

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Tucetona pectunculus</i> (Linnaeus, 1758)	UF 287635, UGI 6539	P			2	
PTERIOMORPHIA: PHILOBRYIDAE						
<i>Cratis</i> cf. <i>kaneko</i> Hayami & Kase, 1993	UF 296966, UGI 6308	3			1,2	
PTERIOMORPHIA: ARCOIDA INCERTAE SEDIS						
<i>Limopsis</i> sp. 1	UF 296951	3		5	1,2	
PTERIOMORPHIA: PINNIDAE						
<i>Pinna muricata</i> Linnaeus, 1758	UF 298503, UGI 6208	4	GP654-1		1	
<i>Streptopinna saccata</i> (Linnaeus, 1758)	UF 284812, UGI 6212	P	GP581-11		1	
PTERIOMORPHIA: PTERIIDAE						
<i>Electroma</i> sp. 1	UF 284809	P			1	
<i>Pinctada anomioides?</i> (Reeve, 1857)	UF 284792, UGI 1923	P			1	
<i>Pinctada maculata</i> (Gould, 1850)	UF 289027, UGI 2264	P			1	
<i>Pinctada margaritifera</i> (Linnaeus, 1758)	UF 24078, UGI 1342	P	GP762-2		1	
<i>Pteria chinensis</i> (Leach, 1814)	UF 284972	P			1	
<i>Pteria</i> cf. <i>howensis</i> Lamprell & Healy, 1997	UF 283534, UF 287515(M), UF 282409(S)	P			1,2	M,S
PTERIOMORPHIA: ISOGNOMONIDAE						
<i>Isognomon ephippium</i> (Linnaeus, 1758)	UF 288860, UGI 6559	P			1	
<i>Isognomon isognomum</i> (Linnaeus, 1758)	UF 287324	5			1	
<i>Isognomon legumen?</i> (Gmelin, 1791)	UF 282415	22?		53	1	
<i>Isognomon nucleus</i> (Lamarck, 1819)		P		6	1	
<i>Isognomon perna</i> (Linnaeus, 1767)	UF 292278, UGI 1695	P	GP785-6		1	
PTERIOMORPHIA: MALLEIDAE						
<i>Malleus decurtatus</i> Lamarck, 1819	UF 284790, UGI 6215	P	GP525-3		1	
<i>Malleus</i> cf. <i>nuttalli</i> (Conrad, 1837)	UF 284789, UGI 6311	P		7	1	
PTERIOMORPHIA: VULSELLIDAE						
<i>Vulsella</i> sp. 1	UF 284857, UGI 5449	P			1	
PTERIOMORPHIA: ENTOLIIDAE						
<i>Pectinella aequoris</i> Dijkstra, 1991	UF 287556, UGI 6312	H			2	
PTERIOMORPHIA: PROPEAMUSSIIDAE						
<i>Chlamydelta</i> sp. 1 (aff. <i>incubata</i> Hayami & Kase, 1993)	UF 297253, UGI 6297	3			1,2	

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Parvamussium crypticum</i> Hayami & Kase, 1993	UF 297255	P			2	
<i>Parvamussium</i> sp. 1	UF 287583, UGI 6349	W			2	
PTERIDIOMORPHIA: PECTINIDAE						
<i>Anguipecten picturatus</i> Dijkstra, 1998	UF 288930, UGI 5880	W			2	
" <i>Chlamys</i> " <i>perfecta</i> (Melvill, 1909)	UF 298535, UGI 5878	W		2	1,2	
<i>Cryptopecten nux nux</i> (Reeve, 1853)	UF 286762	H			2	
<i>Decatopecten radula</i> (Linné, 1758)	USNM 763576	W			1	
<i>Excellichlamys spectabilis</i> (Reeve, 1853)	UF 282399, UGI 1449(S)	W			1	S
<i>Glorichlamys elegantissima</i> (Deshayes, 1863)	UF 298518, UGI 5885	W			1,2	
<i>Gloripallium pallium</i> (Linnaeus, 1758)	USNM 604293	6,22		54	1	
<i>Gloripallium spectosum</i> (Sowerby, 1842)	UF 298529, UGI 5895	W			2	
<i>Hemipecten forbesianus</i> Adams & Reeve, 1850	UF 298789	W			1	
<i>Juxtamussium coudeini</i> (Bavay, 1902)	UF 298520	W			1	
<i>Juxtamussium</i> sp. 1	UF 298538, UGI 5886	W			2	
<i>Laevichlamys irregularis</i> (Sowerby, 1842)	UF 298525, USNM 763919, UGI 1235	W			1	
<i>Laevichlamys lemniscata</i> (Reeve, 1853)	UF 298528, UGI 2265, UGI 525 (Gu)	W			1	Gu
<i>Laevichlamys squamosa</i> (Gmelin, 1791)	UF 298521, USNM 604297, UGI 5377	6			1	
<i>Mimachlamys</i> sp. 1 (aff. <i>kauaiensis</i> (Dall, Bartsch & Rehder, 1938))	UF 298548	W			2	
<i>Mirapecten mirificus</i> (Reeve, 1853)	UF 298522, UGI 5451, UGI 5882	W			2	
<i>Mirapecten spiceri</i> (Rehder, 1944)	UF 282407, UGI 4474	W	GP781-32		1,2	
<i>Paschaminites coruscans coruscans</i> (Hinds, 1845)	UF 284891, USNM 620342	6		39	1	
<i>Pedum spondyloideum</i> (Gmelin, 1791)		6			1	
<i>Semipallium diana</i> (Crandall, 1979)	UF 298524, UGI 5885	W			2	
<i>Semipallium marybellae</i> Raimes, 1996	SBMNH 143017 (holotype), UF 287522, UGI 5363	7,8		58	1	
PTERIDIOMORPHIA: SPONDYLIDAE						
<i>Spondylus imbutus</i> Reeve, 1856	UF 287863	P			2	
<i>Spondylus linguafelis</i> Sowerby, 1847	UF 287528	P			2	
<i>Spondylus multimuricatus</i> Reeve, 1856	UGI 5379	P			1	
<i>Spondylus nicobaricus</i> Schreibers, 1793	UF 292124, UGI 1723	P			1	

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Spondylus occidens?</i> Sowerby, 1903	UF 287979	P			2	
<i>Spondylus squamosus</i> Schreibers, 1793	UF 284970, UGI 5378	P			1	
<i>Spondylus varius</i> Sowerby, 1827		P		8	1	
<i>Spondylus violascens</i> Lamarck, 1819	UF 297195	P	GP831-7		1	
<i>Spondylus</i> sp. 4 (orange, deep)	UF 286474	P			2	
PTERIOMORPHIA: ANOMIIDAE						
<i>Anomia nobilis</i> Reeve 1856	UF 296979	5		9	1	
Anomiidae spp.	UF 282422, UGI 6557	P		10	1,2	
PTERIOMORPHIA: PLICATULIDAE						
<i>Plicatula</i> sp. 1	UF 287918, UGI 6258	P			1	
PTERIOMORPHIA: DIMYIDAE						
<i>Dimyella</i> sp. 1 (n. sp. cave)	UF 288844	3		2,11, 12	1	
<i>Dimyella</i> sp. 2 (n. sp. deep)	UF 288013	P		2,11	2	
PTERIOMORPHIA: LIMIDAE						
<i>Ctenoides ales</i> (Finlay, 1927)	UF 298507, UGI 5674	P			1	
<i>Ctenoides annulata</i> (Lamarck, 1819)	UF 292762, UGI 6241	P			1,2	
<i>Ctenoides oshimensis</i> (Sowerby, 1914)	UF 288139	P		13	1,2	
<i>Ctenoides</i> sp. 2	UF 297238	P			2	
<i>Divarilima</i> sp. 1 (corrugated)	UF 287574	P			2	
<i>Divarilima</i> sp. 2 (aff. <i>elegans</i> Hayami & Kase, 1993)	UF 288096	P			2	
<i>Divarilima</i> sp. 3 (coarse)	UF 287544	P			2	
<i>Isolimea limopsis</i> (Nomura & Zinbo, 1934)	UF 297241	P			2	
<i>Lima ogasawaraensis</i> Habe, 1993	UF 287648	P			2	
<i>Lima vulgaris</i> (Link, 1807)	UF 296288, UF 295778(S), UGI 6236	P			1	
<i>Limea</i> sp. 1	UF 287597	P			2	
<i>Limaria basilanica</i> (A. Adams & Reeve, 1850)	UF 297245, UGI 6224	P			2	
<i>Limaria fragilis</i> (Gmelin, 1791)	UF 282396, UGI 6226	P	GP588-10		1	
<i>Limaria</i> sp. 2	UF 297248	P			2	
<i>Limaria</i> sp. 3	UF 288116	P			2	
<i>Limaria</i> sp. 4	UF 287337	P			2	

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Limaria</i> sp. 5	UF 287179	P			2	
<i>Limaria</i> sp. 6	UF 297244	P			1	
<i>Limatula strangei</i> (Sowerby, 1872)	UF 287274, UGI 6351	P			2	
<i>Limatula</i> sp. 1	UF 297244	P			2	
<i>Limatula</i> sp. 2	UF 297235	P			1	
PTEROMORPHIA: OSTREIDAE						
<i>Crassostrea gigas</i> (Thunberg, 1793)		5,9		14	1	
<i>Dendostrea sandwicensis</i> (Sowerby in Reeve, 1871)		1		15	1	
<i>Lopha cristagalli</i> (Linnaeus, 1758)	USNM 608084	10		16	1	
<i>Planostrea pestigris</i> (Hanley, 1846)	USNM 301779b	P			1	
<i>Saccostrea cucullata</i> (Born, 1778)	UF 298651, USNM 254513, UGI 1902	1,5,12			1	
<i>Saccostrea echinata</i> (Quoy & Gaimard, 1835)	UF 298513	1,5,9		17	1	
<i>Saccostrea tuberculata</i> (Lamarck, 1804)		1		18	1	
PTEROMORPHIA: GRYPHAEDAE						
<i>Hyotissa hyotis</i> (Linnaeus, 1758)	UF 298650, UGI 5480	P			1	
<i>Parahyotissa numisma</i> (Lamarck, 1819)	UF 289046	P			1	
HETERODONTA: LUCINIDAE						
<i>Anodontia ovum</i> (Reeve, 1850)		T			1	
<i>Anodontia vesicula</i> (Gould, 1850)		T			2	
<i>Anodontia</i> sp. 1 (n. sp.?)	UF 300527	T			2	
<i>Anodontia</i> sp. 2 (n. sp.?)	UF 287725	T			2	
" <i>Anodontia</i> " sp. 3 (n. sp.?)	UF 296756	T			2	
<i>Codakia paytenorum</i> (Iredale, 1937)	UF 287703, UGI 6428	P			1	
<i>Codakia punctata</i> (Linnaeus, 1758)	UF 296839, UGI 3484	22		52	1	
<i>Codakia tigrina</i> (Linnaeus, 1758)	USNM 851147, UGI 6422	P			1	
" <i>Epicodakia</i> " <i>bella</i> (Conrad, 1837)	UF 287414, UGI 1442	22		2,51	1	
<i>Epicodakia sweeti</i> (Hedley, 1899)	UF 284887, UGI 6425	P			1	
<i>Funafutia levukana</i> (Smith, 1885)	UF 288026, UGI 6483	P			1,2	
<i>Myrtea</i> sp. 1	UF 287694, UGI 6431	T			1,2	
<i>Parvilucina</i> s.l. sp. 4	UF 287737, UGI 6472	P			1,2	
<i>Parvilucina</i> s.l. sp. 5	UF 287183, UGI 6480	P			2	

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Parvilucina</i> s.l. sp. 6	UF 287650, UGI 6470	P			2	
<i>Wallucina fijjensis</i> (Smith, 1885)	UF 288440, UGI 6484	13			1	
<i>Wallucina</i> sp. 3	UF 297203, UGI 5899	P			2	
HETERODONTA: FIMBRIIDAE						
<i>Fimbria fimbriata</i> (Linnaeus, 1758)	UF 282434, UGI 1724	14(MS),22		50	1	
HETERODONTA: THYASIRIDAE						
Thyasiridae sp. 1	UF 288400	S			2	
HETERODONTA: UNGULINIDAE						
<i>Diplodonta</i> sp. 1	UF 287784	P			2	
<i>Diplodonta</i> sp. 2	UF 287752	P			2	
HETERODONTA: CHAMIDAE						
<i>Amphichama</i> sp. 1 (n. sp.?)	UF 300741	M			2	
<i>Chama asperella</i> Lamarck, 1819	UF 282420, UGI 5739	P	GP778-27		1	
<i>Chama brassica</i> Reeve, 1847	UF 298506 USNM 248485a	5			1	
<i>Chama fibula</i> Reeve, 1846	UF 298753	5		19	1	
<i>Chama iostoma</i> Conrad, 1837	DMNH 84404, UGI 5443	P		20	1	
<i>Chama lazarus</i> (Linnaeus, 1758)	UF 298505, UGI 5444, USNM 248485, USNM 607895(S), DMNH 85947,	P	GP525-7		1	S
<i>Chama macerophylla</i> (Gmelin, 1791)	UF 298754	5		21	1	
<i>Chama pacifica</i> Broderip, 1835	UGI 5744	5			1	
<i>Chama</i> sp. 4	UF 300742	P			1	
<i>Chama spinosa</i> Reeve, 1847 <i>sensu</i> Lamy, 1906	UF 282406	P		57	1	
HETERODONTA: CARDITIDAE						
<i>Cardita variegata</i> Bruguière, 1792	UF 284886, USNM 849671, UGI 6404	P			1	
<i>Carditella</i> cf. <i>iejimensis</i> Hayami & Kase, 1993	UF 288460, UGI 6331	3			1,2	
<i>Carditella</i> sp. 2	UF 288817	P			2	
<i>Glans</i> sp. 1	UF 287241, UGI 6502	P			2	
HETERODONTA: GALEOMMATIDAE S. L.						
<i>Barrinysia cumingi</i> (A. Adams, 1856)	UF 287322, UGI 6287	P			1	
<i>Ephippodonta</i> sp. 1	UF 288394	P			1	
<i>Galeomma</i> sp. 1 (orange)	UF 298631	S			1	

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Galeomma</i> sp. 2 (burgundy)	UF 288266	S			1	
<i>Galeomma</i> s. l. sp. 3 (pitted)	UF 288260	S		2	1	
<i>Galeomma</i> s. l. sp. 4	UF 288219	S	?GFP852-8	2	1	
<i>Galeomma</i> s. l. sp. 5	UF 288258	S		2	1	
<i>Galeomma</i> s. l. sp. 6	UF 298784	S		2	1	
<i>Galeomma</i> s. l. sp. 7	UF 288368	S		2	1	
<i>Galeomma</i> sp. 8	UF 288257	S			1	
<i>Galeomma</i> s. l. sp. 9	UF 287683	P		2	1	
<i>Galeomma</i> sp. 10	UF 287347	P			1	
Galeommatidae sp. 1	UF 288391	S			1	
Galeommatidae sp. 2	UF 298787	S			1	
Galeommatidae sp. 3	UF 288220	S		2	1,2	
<i>Kellia</i> sp. 1	UF 288376	S			1,2	
<i>Kellia</i> sp. 2	UF 298785	S			1	
<i>Kellia</i> sp. 3	UF 298783	S			1	
Lasaeidae? sp. 1	UF 288243	S			1	
Lasaeidae sp. 2	UF 287447	P			1	
Lasaeidae sp. 3	UF 288367	S		2	1	
<i>Mysella</i> sp. 1	UF 288229	S			1	
<i>Mysella</i> sp. 2	UF 288382	S			1,2	
<i>Planktonya</i> sp. 1	UF 287593	P			1,2	
<i>Rochefortia</i> sp. 1	UF 288242	S			2	
<i>Rochefortia</i> sp. 2	UF 288212, UGI 6447	S			1	
<i>Rochefortia</i> sp. 3	UF 288265	S			1	
<i>Rochefortia</i> sp. 4	UF 288402	S			1	
<i>Rochefortia</i> s. l. sp. 5	UF 287927	P		2	2	
<i>Rochefortia</i> sp. 6	UF 288383	S			1	
<i>Scintilla cuvieri?</i> Deshayes, 1856	UF 298629, UGI 6455	S			1	
<i>Scintilla</i> s. l. sp. 1 (white)	UF 284926	S	GP534-19		1	
<i>Scintilla</i> s. l. sp. 2	UF 287525	S	GP582-20	2	1	
<i>Scintilla</i> s. l. sp. 3	UF 293839	S		2	1	

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Scintilla</i> s. l. sp. 4	UF 288369	S		2	1	
<i>Scintilla</i> s. l. sp. 5	UF 284847	P		2	1	
<i>Scintilla?</i> s. l. sp. 6	UF 288247	S		2	1	
<i>Scintillona bryani</i> (Pilsbry, 1921)	UF 293837, UGI 6448	P			1	
<i>Scintillona</i> sp. 1	UF 296933, UGI 6452	S	GP541-1		1	
HETERODONTA: SPORTELLIDAE						
<i>Anisodonta caledonica</i> (Fischer, 1886)	UF 287323, UGI 6280	P			1	
HETERODONTA: CARDIIDAE						
<i>Acrosterigma biradiatum</i> (Bruguère, 1789)	UF 287869	V			2	
<i>Acrosterigma hobbsae</i> Vidal, 1999	UF 287986 (paratype), UGI 6353	I,S			1	
<i>Acrosterigma profundum</i> Vidal, 1999	UF 287917	V			2	
<i>Afrocardium exochum</i> (Melvill & Standen, 1906)	UF 287754, UGI 6278	V			1	
<i>Afrocardium richardi</i> (Audouin, 1827)	UF 288924, UGI 5333	P			1	
<i>Corculum dionaeum</i> (Broderip & Sowerby, 1829)	UF 287242, UGI 5890	P			2	
<i>Ctenocardia fornicata</i> (Sowerby, 1841)	UF 288936, UGI 6460	P	GP771-19		2	
<i>Ctenocardia victor</i> (Angas, 1872)	UF 288938, UGI 6469	P			1,2	
<i>Ctenocardia</i> sp. 1 (n. sp.)	UF 288922, USNM 846285, UGI 4218	22	GP534-33 48		1	
<i>Fragum fragum</i> (Linnaeus, 1758)	UF 288949, UGI 6549	P			1	
<i>Fragum loochooanum</i> Kira, 1959	UF 288955, UGI 6463	P			1	
<i>Fragum mundum</i> (Reeve, 1845)	UF 288802, UGI 6465	P			1	
<i>Fragum suenziense</i> (Issel, 1869)	UF 287512	V			2	
<i>Frigidocardium kirana</i> Sakurai & Habe, 1966	UF 287314	V			2	
<i>Frigidocardium torresi</i> (Smith, 1885)	UF 295375, UGI 6458	P	GP517-33		1	
<i>Fuhvia australis</i> (Sowerby, 1834)	UF 287151, UGI 6366	V			1,2	
<i>Fuhvia undatopicta</i> (Pilsbry, 1904)	UGI 1892	P		22	1	
<i>Hippopus hippopus</i> (Linnaeus, 1758)	UF 287253	P		23	2	
<i>Lunulicardia</i> cf. <i>retusa</i> (Linnaeus, 1767)	UF 287733	P			2	
<i>Microfragum festivum</i> (Deshayes, 1855)	UF 298509, USNM 851267	P			1	
<i>Nemocardium lyratum</i> (Sowerby, 1834)	UF 288946	P			1,2	
<i>Nemocardium?</i> sp. 1						

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Tridacna deversa</i> (Röding, 1798)		5,9	RFM-213A	24	1	
<i>Tridacna gigas</i> (Linnaeus, 1758)		5,9		25	1	
<i>Tridacna maxima</i> (Röding, 1798)	UF 297124, USNM 487053, UGI 1317	16(G,M,S), 22	GP742-12	49	1	M,S
<i>Tridacna squamosa</i> Lamarck, 1819	UGI 3062	16(S,T)	GP644-22		1	S,T
<i>Vasticardium elongatum enode</i> (Sowerby, 1840)	UF 288838, UGI 5678	17			1	
<i>Vasticardium orbata philippinense</i> (Hedley, 1899)	UF 288837, USNM 851098, UGI 6371	18			1	
<i>Vasticardium sewelli</i> (Prashad, 1932)	UF 287527, USNM 849694	15			1	
HETERODONTA: TELLINIDAE						
<i>Aenigmatellina</i> sp. 1	UF 287671	P			2	
<i>Arcopella isseli</i> (H. Adams, 1870)	UF 287186, UGI 6475	P			2	
<i>Cadella semen</i> (Hanley, 1845)	UF 288544, UGI 6534	P			1,2	
<i>Clathrotellina tenuistriata</i> (Sowerby, 1867)	UF 288104, UGI 5893	P			1,2	
<i>Cyclotellina remies</i> (Linnaeus, 1758)	UF 300524, UGI 6374	P			1	
<i>Elliptotellina euglypta</i> (Gould, 1861)	UF 287353, UGI 6397	P			1,2	
<i>Elliptotellina</i> sp. 1	UF 287508	P			2	
<i>Elliptotellina</i> sp. 2	UF 287567	P			2	
<i>Exotica fijiensis</i> (Sowerby, 1868)	UF 288534, UGI 6522	P		26	1	
<i>Exotica</i> sp. 1	UF 287745, UGI 6505	P		27	1,2	
<i>Exotica</i> sp. 2 (aff. <i>nebulosus</i> (Dall, Bartsch & Rehder, 1938))	UF 288506, UGI 6508	P		28	1,2	
<i>Exotica</i> sp. 3	UF 288491	P			2	
<i>Hemimetus angulata</i> (Linnaeus, 1767)	USNM 851056	P			1	
<i>Jactellina obliquaria</i> (Deshayes, 1855)	UF 284012, UGI 6379	P			1	
<i>Loxoglypta clathrata</i> (Deshayes, 1835)	UF 295687, UGI 5737	22		42	1	
<i>Loxoglypta</i> sp. 1	UF 297230, UGI 1711	P			1	
“Macominæ” sp. 1 (pink)	UF 289101, UGI 6403	P			1	
“Macominæ” sp. 2 (transparent)	UF 287218	P			1	
<i>Obtellina bougei</i> (Sowerby, 1909)	UF 284843, UGI 6384	P			1	
<i>Pharaonella</i> cf. <i>astula</i> (Hedley, 1917)	UF 287743	P			2	

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Pinguitellina robusta</i> (Hanley, 1844)	UF 295693, UGI 3588	22		44	1,2	
<i>Pinguitellina</i> sp. 1	UF 287427	P			1	
<i>Quadrans gargadia</i> of authors, not Linnaeus, 1758	UF 298512	P		29	1	
<i>Quadrans parvitas</i> Iredale, 1931	UF 287729, UGI 6532	P			1,2	
<i>Quidnipagus palatam</i> Iredale, 1929	UF 300526, UGI 1422	19,22		43	1	
<i>Scissulina dispar</i> (Conrad, 1837)	UF 288811	22		41	1	
<i>Scutarcopagia linguafelis</i> (Linnaeus, 1758)	UF 296943, UGI 5738	P			1	
<i>Scutarcopagia scobinata</i> (Linnaeus, 1758)	UF 296446, USNM 849703, UGI 1538	P			1	
<i>Tellina chariessa</i> Salisbury, 1934	UF 296942	P		30	1	
<i>Tellina</i> s.l. <i>patagiata</i> Prashad, 1932	UF 287177, UGI 6394	P		2	2	
<i>Tellina</i> s.l. sp. 2	UF 297251	P		2	1	
<i>Tellina</i> s.l. sp. 3	UF 288523	P		2	1	
<i>Tellina</i> s.l. sp. 4	UF 288499	P		2	1	
<i>Tellinella crucigera</i> (Lamarck, 1818)	UF 285615, UGI 5735	22		41	1	
<i>Tellinella</i> sp. 2 (aff. <i>verrucosa</i> (Hanley, 1844))	UF 288150, UGI 6381	P			1,2	
<i>Tellinella staurella</i> (Lamarck, 1818)	UF 298508, UGI 6383	22		41	1	
<i>Tellinella virgata</i> (Linnaeus, 1758)	USNM 607844(S), UGI 2212, UGI 1447(S)	22		41	1	S
<i>Tellinides ovalis</i> (Sowerby, 1825)	UF 288136, UGI 6399	P			1	
HETERODONTA: SEMELIDAE						
<i>Abra seurati</i> Lamy, 1906	UF 288519, UGI 6479	P			1,2	
<i>Abra</i> sp. 1	UF 287700	P			2	
<i>Ervilia biscalpta</i> Gould, 1861	UF 288064	P			1,2	
<i>Leptomya psittacus</i> Hanley, 1882	UF 288850, UGI 6391	P			1	
<i>Lonoa hawaiiensis</i> Dall, Bartsch & Rehder, 1938	UF 288525, UGI 6528	P			1	
<i>Rochefortina sandwicensis</i> (Smith, 1885)	UF 288449, UGI 6294	P			1,2	
<i>Semele australis</i> (Sowerby, 1832)	UF 284022, UGI 6490	P			1	
Semelidae sp. 1	UF 288493	P			2	
HETERODONTA: PSAMMOBIIDAE						
<i>Asaphis violascens</i> (Forskål, 1775)	UF 300525, UGI 6377	22		40	1	
<i>Gari pusilla</i> Bertin, 1880	UF 288496, USNM 851298, UGI 6400	P			1	

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Gari sibogai</i> Prashad, 1932	UF 288113, UGI 6389	20			2	
HETERODONTA: SOLECURTIDAE						
<i>Solecurtus</i> sp. 1	UF 287303	P			2	
HETERODONTA: MACTRIDAE						
Macridae sp. 1	UF 287759, UGI 6492	P			1	
HETERODONTA: MESODESMATIDAE						
<i>Atactodea sirriata</i> (Gmelin, 1791)	UF 298511, UGI 1705	P		31	1	
HETERODONTA: TRAPEZIDAE						
<i>Coralliophaga coralliophaga?</i> (Gmelin, 1791)	UF 288475, UGI 6500	3		32	1	
<i>Glossocardia obesa</i> (Reeve, 1843)	UF 288076, USNM 851284, UF 288075(S), UGI 6207	3			1	
<i>Trapezium oblongum</i> (Linnaeus, 1758)	UF 288063, UGI 6200	P			1	
<i>Trapezium sublaevigatum</i> (Lamarck, 1819)	UF 283530, UGI 6199	5			1	
HETERODONTA: GLOSSIDAE						
<i>Meiocardia moltkiana</i> (Spengler, 1783)	UF 286783	P			2	
HETERODONTA: KELLIELLIDAE						
<i>Atheinus</i> sp. 1	UF 288410	P			2	
<i>Atheinus</i> s.l. sp. 2	UF 298781	P			2	
HETERODONTA: VENERIDAE						
<i>Callista accincta</i> (Römer, 1864)	UF 287233	P			2	
<i>Doriscia</i> cf. <i>cookei</i> Dall, Bartsch & Rehder, 1938	UF 287248, UGI 6546	P			2	
<i>Dosinia</i> sp. 7	UF 287469, UGI 6495	P			1	
<i>Dosinia</i> sp. 8	UF 287313	P			2	
<i>Gafrarium pectinatum</i> (Linnaeus, 1758)	UF 287472, USNM 247415, UGI 1452, USNM 607852(S)	22		46	1	S
<i>Gafrarium tumidum</i> Röding, 1798	UF 287465, USNM 774709, UGI 1919	2		1	1	
<i>Globovenerus toreuma</i> (Gould, 1851)	UF 282405, UGI 5373	P			1,2	
<i>Gouldia</i> s. l. sp. 1	UF 288169	P			1	
<i>Gouldia</i> s. l. sp. 2 (aff. <i>kilburni</i> Drivas & Jay, 1990)	UF 288170	P			2	
<i>Lioconcha castrensis</i> (Linnaeus, 1758)	UF 282447, UGI 4518	P			1	
<i>Lioconcha ornata</i> (Lamarck, 1817)	UF 287473, UGI 5357	P			1	

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Lioconcha philippinarum</i> (Hanley, 1844)	UF 287714, UGI 5733	P			1,2	
<i>Lioconcha melhartae</i> Lamprell & Stanistic, 1996	UF 287304, UGI 6498	P			2	
<i>Irus</i> sp. 1	UF 288176	P			1,2	
<i>Periglypta puerpera</i> (Linnaeus, 1771)	UF 285618, USNM 247745, UGI 1726, USNM 608009(S)	P			1	S
<i>Periglypta reticulata</i> (Linnaeus, 1758)	UF 288715, USNM 847262, UGI 4745	22		47	1	
<i>Periglypta crispata</i> (Deshayes, 1853)	UF 282413, ANSP 197714, UGI 6420, USNM 607980(S)	P			1	S
<i>Pitar festoui</i> Harte, 1993	UF 287664, UGI 5889	P			2	
<i>Pitar intricata</i> (Dautzenberg, 1907)	UF 283535, UGI 6414	P			1	
<i>Pitar prora</i> (Conrad, 1837)	UF 287451, UGI 1704, UGI 1459(S)	22		45	1	
<i>Pitar spoori</i> Lamprell & Whitehead, 1990	UF 293836, UGI 6409	P			1	
<i>Pitar</i> sp. 6 (deep)	UF 287238, UGI 6417	P			2	
<i>Samarangia quadrangularis</i> (Adams & Reeve, 1850)	UF 287623, UGI 5884	P			2	
<i>Timoclea marica</i> (Linnaeus, 1758)	UF 284845, USNM 851223, UGI 4284	P			1	
<i>Timoclea</i> sp. 9	UGI 6516	P		33	1	
<i>Timoclea</i> sp. 10	UF 287942, UGI 6510	P			2	
<i>Timoclea</i> sp. 11	UF 287349, UGI 6524	P			1,2	
<i>Timoclea</i> sp. 12	UF 288040, UGI 6518	P			2	
HETERODONTA: MYOIDA: CORBULIDAE						
<i>Corbula tahitensis</i> Lamarck, 1818	UF 287343	P			1,2	
<i>Varicorbula rotalis</i> (Hinds, 1843)	UF 287541	P			1,2	
HETERODONTA: MYOIDA: GASTROCHAENIDAE						
<i>Rocellaria gigantea</i> (Deshayes, 1830)	UF 296963, UGI 6545	C			1	
<i>Dufoichaena denifera?</i> (Dufo, 1840)	UF 287507	C			1	
<i>Dufoichaena pexiphora?</i> (Sturany, 1899)	UF 289551	C			1	
<i>Gastrochaena cuneiformis</i> Spengler, 1783	UF 296974	C			1	
<i>Spengleria plicatilis</i> (Deshayes, 1855)	UF 284769	C		GP826-12	1	
HETERODONTA: MYOIDA: TEREDINIDAE						
<i>Lyrodus pedicillatus</i> (Quatrefages, 1849)		11(G,S),21		34	1	S
<i>Nototerredo edax</i> (Hedley, 1895)		11		35		

Appendix 1. Bivalves of Guam / (continued)

Taxon	Museum	Ref	Photo	Note	Depth	Is
<i>Teredo clappi</i> Bartsch, 1923		11,21		36	1	
<i>Teredo fulleri</i> Clapp, 1923		21			1	
<i>Teredo furcifera</i> Martens, 1894		11,21		37	1	
<i>Teredothyra matocotana</i> Bartsch, 1927		11		38		
ANOMALODESMATA: POROMYIDAE						
<i>Poromya</i> sp. 1	UF 284883	P			2	
ANOMALODESMATA: VERTICORDIIDAE						
<i>Spinospella ericia</i> (Hedley, 1911)	UF 287249, UGI 6285	P			2	
ANOMALODESMATA: CUSPIDARIIDAE						
<i>Cuspidaria</i> sp. 1	UF 287919, UGI 6343	P			2	

References: Literature records listed by number, identifier of species not previously documented from the Marianas listed letter as follows. C) J. Carter, H) J. Hayami, M) A. Matsukuma, P) G. Paulay, S) P. Valentitch Scott, T) J. Taylor, V) J. Vidal, W) T.R. Waller, 1) Braley 1984, 2) Amesbury 1999, 3) Hayami & Kase 1996, 4) Rosewater 1961, 5) Paulay et al. 2002, 6) Waller 1972, 7) Raines 1996, 8) Hutsell 1999, 9) Eldredge 1994, 10) Stenzel 1971, 11) Roch 1976, 12) Braley 1982, 13) Glover & Taylor 2001, 14) Nicol 1950, 15) Vidal 1999, 16) Rosewater 1965, 17) Vidal 1993, 18) Vidal 1997, 19) Day 1977, 20) Willan 1993, 21) Edmondson 1946, 22) Hirdalgo 1904-1905

Notes:

- 1) Subfossil remains of Holocene age of these species are widespread on Guam, however extant populations are largely restricted to inner Apra Harbor. This restriction may correspond to reduction of mangrove habitats during the Holocene (Amesbury 1999).
- 2) Generic assignments tentative, needs revision.
- 3) May correspond to Hayami & Kase's (1996) record of *Bentharca* sp. B from Guam.
- 4) May correspond to Hayami & Kase's (1996) record of *Bentharca tenuis?* from Guam.
- 5) A minute, undescribed, arcoid bivalve tentatively assigned to the Limosoidea by Hayami & Kase (1993).
- 6) Based on sight record by GP, no voucher currently available for this abundant species.
- 7) Indo-West Pacific *Malleus (Mahifundus)* species have been over-synonymized. The Guam species is closest to the Hawaiian *M. nuttalli*, which, contrary to current usage, is not a synonym of *M. regula*.
- 8) Known only from Apra Harbor, where this species inhabited steep reef faces. Although dead shells are still encountered, no live animals have been seen in years, and this giant spondylid appears to have been extirpated, probably by overcollecting. Based on sight record by GP.
- 9) This species was described from Hawaii, where it is common in Pearl Harbor and potentially introduced. It was brought to Guam on the dry dock Machinist in July, 1999. Most animals died within a month of arrival, so the species is unlikely to become established on Guam.
- 10) Anomids remain unstudied on Guam due to limited well-preserved material on hand.

- 11) These species are undescribed members of a clade of minute dimyids, with well developed hinge teeth, that occur in reef caves throughout the Indo-West Pacific.
- 12) *Dimyella* sp. B of Hayami & Kase (1996).
- 13) Often incorrectly identified as *C. concentricus* (e.g., Okutani 2000).
- 14) Introduced to Apra Harbor Guam (see Eldredge 1994), but appears not to have become established.
- 15) As *Ostrea nomades* in Braley (1984); synonymy after Lamprell & Healy (1998).
- 16) Known only from dead shells in Apra Harbor dredgings, never seen alive on Guam.
- 17) Introduced to Apra Harbor, Guam (see Braley 1984 and Eldredge 1994).
- 18) As *Saccostrea cucullata tuberculata* in Braley (1984); introduced to Guam.
- 19) Brought to Guam from Hawaii on the dry dock Machinist in July, 1999. Most animals died within a month of arrival, so the species is unlikely to establish on Guam.
- 20) Kilburn & Rippey (1982) and Paulay (1987, 1989) have previously referred to this species as *Chama limbula* Lamarck, 1819. I have since seen Lamarck's types and they do not match this common Indo-West Pacific species well. *Chama tostoma* is the oldest clearly valid name.
- 21) This West Atlantic species was brought to Guam from Hawaii on the dry dock Machinist in July, 1999 in great abundance. Most animals died within a month of arrival, so the species is unlikely to become established on Guam.
- 22) This species is extirpated on Guam, although Holocene shells are occasionally found. The only living individual recorded (UGI 1892) was taken in Apra Harbor near the docks and is suspected to have been dropped off a boat after being brought from another island.
- 23) Known only from worn, mostly small (<1cm) shells from deep (~100m) water. Whether these represent an extant deep-water population or a now extirpated population from the glacial low stand is not known. Similar small *Lunulicardia* are commonly dredged deep from the lagoons of the Marshall Islands (USNM collections).
- 24) Introduced from Palau. The introduced animals are still alive (see photo cited), but no recruitment has been observed.
- 25) An attempt to introduce *T. gigas* to Guam (Eldredge 1994) was apparently not successful. This species has a Pleistocene fossil record on Guam, but the population appears to have died out before the arrival of people, perhaps during a glacial low stand, as no Holocene shells are known (Paulay 1996b).
- 26) *Semelangulus* sp. 3 of Paulay (1996b); A. Matsukuma (in prep.) considers *Semelangulus* to be a junior synonym of *Exotica*.
- 27) *Semelangulus* sp. 1 of Paulay (1990); not 26.
- 28) *Semelangulus* sp. 2 of Paulay (1990) and *Semelangulus crebrimaculatus* of Paulay (1996b), not Sowerby, 1868; see not 26.
- 29) Known from a single, dead sample of worn shells only, from the Piti reef flat. This species is common in atoll lagoons through much of the western Pacific.
- 30) Known from a single, fresh valve on Guam collected on the leeward fore reef.
- 31) Although this surf clam is abundant on most islands where it occurs, it is rare on Guam and has not been seen alive in the past decade.
- 32) As *C. hyalina* in Hayami & Kase (1996), which may be a valid name for some specimens. The considerable morphological variation in *Coralliophaga* has been attributed to their endolithic lifestyle, and only two Indo-West Pacific species were recognized in the last revision (Solem 1954). The possibility that additional cryptic diversity may underlie this variation is worth investigating.

- 33) A small species that must have been extremely abundant in inner Apra Harbor some time in the past, but I have never seen it alive. When the Inner Harbor was excavated after WWII, dredge spoils were deposited around Rizal Beach in northern Agat Bay. *Timoclea* sp. 1 shells washed out of these spoils now form a shell hash on large beach areas here and we have even been collected offshore in the area as well. Numerous other mollusks (e.g., *Spondylus multimuricatus*, *Lopha cristagalli*, *Chama brassica*) as well as fossil crabs have also washed out of harbor dredge spoils in this area. See Kesling (1958) for a review of the origin of these deposits.
- 34) As *Teredo diegensis* in Edmondson (1946); as *Teredo yatsui* in Roch (1976); synonymy after Turner (1966).
- 35) As *Teredo juttingae* in Roch (1976); synonymy after Turner (1966).
- 36) As *Teredo trulliformis* in Edmondson (1946); synonymy after Turner (1966).
- 37) As *Teredo bensoni* in Edmondson (1946) and Roch (1976); synonymy after Turner (1966).
- 38) As *Teredo matocotana* in Roch (1976); generic assignment after Turner (1966).
- 39) *Pecten coruscans* Hinds, 1845, currently assigned to *Semipallium*, differs from other members of the genus in developing directly from the prodissoconch to the radially plicate stage, without depositing an intervening prismatic shell layer in the early dissoconch of the right valve (Waller 1972). *Pascalimnites* is an available generic name for this lineage, erected for *Pecten pasca* Dall, 1908, an Easter Island endemic offshoot from *coruscans* stock. Although *Pascalimnites* was erected because of the cemented lifestyle of *pasca* (Dijkstra & Raines 1999), the lack of an external prismatic layer in the early right dissoconch is the diagnostic character of the genus (T.R. Waller pers. comm. 2002).
- 40) Misidentified as *Asaphis deflorata* in Hidalgo (1904-1905), an Atlantic congener.
- 41) All classified as *Tellina* in Hidalgo (1904-1905).
- 42) As *Tellina rhomboides* in Hidalgo (1904-1905), synonymy after Lamprell & Whitehead (1992).
- 43) As *Tellina rugosa* in Hidalgo (1904-1905), synonymy after Kay (1979).
- 44) Classified as *Arcopagia* in Hidalgo (1904-1905).
- 45) As *Caryatis obliquata* in Hidalgo (1904-1905), synonymy after Lamprell & Whitehead (1992).
- 46) Classified as *Crista pectinata* in Hidalgo (1904-1905).
- 47) Classified as *Venus* in Hidalgo (1904-1905).
- 48) Classified as *Hemicardium* in Hidalgo (1904-1905).
- 49) As *Tridacna mutica* in Hidalgo (1904-1905), synonymy after Rosewater (1965).
- 50) Classified as *Corbis* in Hidalgo (1904-1905).
- 51) As *Lucina fibula* in Hidalgo (1904-1905), synonymy after Lamprell & Whitehead (1992).
- 52) Classified as *Lucina* in Hidalgo (1904-1905).
- 53) Hidalgo's (1904-1905) record of *Perna anomiooides* may pertain to this species, or to *Isognomon perna*.
- 54) Classified as *Chlamys* in Hidalgo (1904-1905).
- 55) Classified as *Modiola striatula* in Hidalgo (1904-1905).
- 56) As *Arca volucris* in Hidalgo (1904-1905), synonymy after Lamprell & Healy (1998).
- 57) Hidalgo's (1904-1905) record of *Venericardia canaliculata* Reeve needs to be verified and is not included.
- 58) Raines (1996) also records *Semipallium tigris* from Guam, but I have never seen any specimens of that species on the island.