

Marine biodiversity of Guam: the Ascidiacea

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Abstract—Between 1998 and 2000 the first comprehensive collections ever made of ascidians in Guam were carried out, mainly by snorkeling and SCUBA; a few deeper samples were collected by dredging. Artificial substrates in harbors, such as buoys, wharf pilings and marina floats, were sampled in addition to numerous natural coral reef sites. Approximately 117 species in 32 genera have been catalogued, though some of the species are not yet fully identified. The collection includes 87 colonial species and 30 solitary species. Eighty-six species are considered indigenous or probably indigenous. Thirty-one species, 16 colonial and 15 solitary, are considered introduced or cryptogenic; all were collected from artificial substrates and a few of these were also collected from natural substrates. Seventy-eight species were collected only from natural sites; this group was predominantly colonial (69 species). The collection includes at least 4 new, undescribed species. Manuscripts are in preparation that will include descriptions of all the species.

Introduction

Beginning a century ago, central and western Pacific tropical ascidians have been the focus of a large number of taxonomic investigations (see bibliography in Kott 1985). Since the 1960's there have been a number of major studies including those by Eldredge (1967), Tokioka (1967), Millar (1975), Kott (1980, 1982, 1985, 1990, 1992), Nishikawa (1984, 1986, 1994), and C. & F. Monniot (numerous publications; see Monniot et al. 1991 for review, also Monniot C. 1992, Monniot F. 1992-1995, Monniot F. & C. 1996, 2001). However, only Kott (1982) included the island of Guam; she identified six species of algal-bearing didemnids that had been collected by C. Birkeland. These six species are in the Queensland Museum in Brisbane. Thus, prior to the current study, nearly nothing was known of the ascidians of Guam. In 1999 an extensive study was undertaken of the marine invertebrates of Apra Harbor (Paulay et al. 2002), with a comparison of artificial and natural substrates; this study was expanded to a number of other reef areas of Guam in 2000. All but one of the 117 species of ascidians recorded here were collected either during these surveys or in 1997-98 when a small number of species were collected by G. Paulay, L. Kirkendale and

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J. Starmer and identified by C. and F. Monniot in Paris or by the author; a few of the latter are deposited at the National Museum of Natural History (NMNH) in Washington DC. The ascidians listed in this paper are therefore, with the exception of the 6 listed in Kott (1982) and the 17 listed in Monniot & Monniot (2001), all new records and range extensions.

Materials and Methods

The specimens were collected primarily by snorkeling, SCUBA and in a few cases by dredging. Marina floats were sampled by pulling the specimens off the docks, ropes and tires manually. All samples were maintained in fresh seawater and examined live in the laboratory immediately after collection. They were then relaxed for several hours in tightly covered bowls of seawater containing a few drops of menthol in 95% ethanol before being preserved in 10% seawater formalin buffered with a small amount of sodium borate. Most of the specimens are currently in the possession of the author. These will be donated to a museum (not yet chosen) after publication of the descriptive monographs. A few are in the Museum national d'Histoire naturelle (MNHN) in Paris or the Queensland Museum in Brisbane, Australia (QM); a few duplicates are housed in the University of Guam Marine Laboratory Invertebrate collection (UGI) and others are at the U.S. National Museum of Natural History, Smithsonian Institution, in Washington DC (USNM). 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

The 1998-2000 collections have thus far yielded 117 species (Appendix 1) belonging to 32 genera in 11 families. Unidentified *Ascidia*, *Diplosoma* and *Botryllus* species in the NMNH, though listed separately in Appendix 1, are considered probable duplicates of others in the list at this time and are not included in the total of 117 species; arrangements have been made for a loan of these specimens for further examination.

The collection includes 87 colonial species and 30 solitary species. Thirty-one species, 16 colonial and 15 solitary, are considered introduced or cryptogenic; all were collected from artificial substrates and a few of these were also collected from natural substrates. If a species was found primarily in natural areas and only sporadically occurred on artificial substrates, it was considered indigenous; if its predominant locale was artificial substrates and only a few isolated small specimens were collected from natural areas, it was considered introduced or cryptogenic. (*Ascidia* sp. A was collected in approximately equal numbers from artificial and natural substrates.) Seventy-eight species were collected only from natural sites; this group was predominantly colonial (69

species). A number of the species are not yet fully identified, including at least 4 new, undescribed species.

While a number of subtidal sites were sampled fairly completely, there are still many reef areas that were not sampled during this study due to a lack of time and inclement weather, in particular the north end of the island, even though this region is known to be rich in species. It is usually windy on Guam, and the often high waves and surf make collecting by SCUBA from a small boat quite dangerous. Thus I estimate that the 117 species listed here probably represent no more than 75% of the ascidians of Guam.

Although many references were used for these identifications, the most useful and relevant were the monographs of C. and F. Monniot on the ascidians of French Polynesia and New Caledonia, and their newest monograph (F. & C. Monniot 2001) that includes primarily species from Palau and the Philippines. Kott's three large monographs on the ascidians of Australia (1985, 1990, 1992) were also useful. The latest volume of that series (2001) was not available during this study. The classification scheme of Saito et al. (2001) was followed for the botryllids, in which the two genera *Botrylloides* and *Botryllus* are separated on the basis of gonadal position.

For many of the species listed here, especially the colonial species, the Guam record is only the second or third known occurrence, the first being from one of the above-mentioned monographs from areas many thousands of kilometers distant. This is a clear indication of our lack of knowledge of the biodiversity and biogeography of tropical Pacific ascidians.

Acknowledgments

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References

- Eldredge, L. G. 1967. A taxonomic review of Indo-Pacific didemnid ascidians and descriptions of twenty-three central Pacific species. *Micronesica* 2: 161-261.

- Kott, P. 1980. Algal-bearing didemnid ascidians in the Indo-west-Pacific. *Memoirs of the Queensland Museum* 20: 1-47.
- Kott, P. 1982. Didemnid-algal symbioses: host species in the western Pacific with notes on the symbiosis. *Micronesica* 18: 95-127.
- Kott, P. 1985. The Australian Ascidiacea part 1, Phlebobranchia and Stolidobranchia. *Memoirs of the Queensland Museum* 23: 1-440.
- Kott, P. 1990. The Australian Ascidiacea part 2, Aplousobranchia (1) and Supplement: Phlebobranchia and Stolidobranchia. *Memoirs of the Queensland Museum* 29: 1-266.
- Kott, P. 1992. The Australian Ascidiacea part 3, Aplousobranchia (2) and Supplement 2. *Memoirs of the Queensland Museum* 32: 375-655.
- Kott, P. 2001. The Australian Ascidiacea part 4, Aplousobranchia (3), Didemnidae. *Mem. Queensland Mus.* 47: 1-407.
- Millar, R. H. 1975. Ascidians from the Indo-West-Pacific region in the Zoological Museum, Copenhagen (Tunicata, Ascidiacea). *Steenstrupia* 3: 205-336.
- Monniot, C. 1992. Ascidies de Nouvelle-Calédonie XI. Phlébobranches et stolidobranches du plateau des Chesterfield. *Bulletin Museum national d'Histoire naturelle, Paris* 14: 3-22.
- Monniot, C., F. Monniot & P. Laboute. 1991. Coral Reef Ascidians of New Caledonia. *Orstom, Paris.* 247.
- Monniot, F. 1992. Ascidies de Nouvelle-Calédonie XII. Le genre *Lissoclinum* (Didemnidae) dans le lagon sud. *Bulletin Museum national d'Histoire naturelle, Paris* 14: 565-589.
- Monniot, F. 1993. Ascidies de Nouvelle-Calédonie XIII. Le genre *Polysyncraton* (Didemnidae). *Bulletin Museum national d'Histoire naturelle, Paris* 15: 3-17.
- Monniot, F. 1994. Ascidies de Nouvelle-Calédonie XIV. Le genre *Diplosoma* (Didemnidae). *Bulletin Museum national d'Histoire naturelle, Paris* 16: 3-11.
- Monniot, F. 1995. Ascidies de Nouvelle-Caledonie XV. Le genre *Didemnum*. *Bulletin Museum national d'Histoire naturelle, Paris* 16: 299-344.
- Monniot, F. & C. Monniot. 1996. New collections of ascidians from the western Pacific and southeastern Asia. *Micronesica* 29: 133-279.
- Monniot, F. & C. Monniot. 2001. Ascidians from the tropical western Pacific. *Zoosystema* 23: 201-383.
- Nishikawa, T. 1984. Ascidians from the Truk Islands, Ponape Island and Majuro Atoll (Tunicata, Ascidiacea). *Proceedings of the Japanese Society of Systematic Zoology* 27: 107-140.
- Nishikawa, T. 1986. Ascidians from the Gilbert and Solomon Islands and Nauru I. Perophoridae, Ascidiidae and Corellidae. *Proceedings of the Japanese Society of Systematic Zoology* 32: 30-78.
- Nishikawa, T. 1994. Some didemnid ascidians from the northern Mariana Islands, Micronesia. *Natural History Research Special Issue, no. 1*: 299-302.
- Paulay, G., L. Kirkendale, G. Lambert, & J. Starmer. 2002. The marine invertebrate biodiversity of Apra Harbor: significant areas and introduced species,

- with focus on sponges, echinoderms and ascidians. Prepared for Naval Activities Guam, under Cooperative Agreement N68711-97-LT-70001.
- Saito, Y., Shirae, M., Okuyama, M. & Cohen, S. 2001. Phylogeny of botryllid ascidians. In *The Biology of Ascidians*. Sawada, H., Yokosawa, H. and Lambert, C. C. Springer-Verlag, Tokyo. 315-320.
- Tokioka, T. 1967. Pacific Tunicata of the United States National Museum. U. S. National Museum Bulletin 251: 1-247.

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Appendix 1. Ascidians of Guam

Voucher: GL: author's collection, MNHN: Museum national d'Histoire naturelle Paris, USNM: U.S. National Museum of Natural History, Smithsonian Institution, Washington DC, QM: Queensland Museum

Lit: Literature: 1) F&C Monniot 2001; 2) Kott 1982

Photo: photo vouchers; see methods. Cited photographs are on the WWW at: <http://www.flmnh.ufl.edu/reefs/>; they are also available on the Marine Biodiversity of Guam CD-ROM copublication.

Notes: see end of appendix

ID: identification by: GL: author, CM: Claude Monniot, FM: Francoise Monniot, PK: Patricia Kott

D: depth: 1) 0-60m, 2) 60-200m

Status: C: cryptogenic, I: indigenous, N: non-indigenous, 1: colonial, S: solitary

Taxon	Voucher	Ref	Photo	Notes	ID	D	Status
APLOUSOBANCHIA							
Aplousobranch sp. A (gold & green)	no sample		GP526: 2			1	C 1
APLOUSOBANCHIA: CLAVELINIDAE							
<i>Clavelina moluccensis</i> (Sluiter, 1904)	GL, MNHN A3 CLA 121	1	GP355:19	1	FM, GL	1	I 1
<i>Clavelina</i> sp. A (n. sp.?)	GL		GP587:22		GL	1	I 1
APLOUSOBANCHIA: DIDEMNIDAE							
<i>Didemnum cuculliferum</i> (Sluiter, 1909)	GL		GP581:9?		GL	1	I 1
<i>Didemnum digestum</i> Sluiter, 1909	GL				GL	1	I 1
<i>Didemnum edmondsoni</i> Eldredge, 1967	GL				GL	1	I 1
<i>Didemnum granulatum</i> Tokioka, 1954	GL		GP756:24		GL	1	I 1
<i>Didemnum ligulum</i> -A F. Monniot, 1983	GL		GP570:9		GL	1	I 1
<i>Didemnum ligulum</i> -B F. Monniot, 1983	GL		GP740:28		GL	1	I 1
<i>Didemnum molle</i> (Herdman, 1886)	GL, QM GH695	2	GP252:11	2, 3	GL, PK	1	I 1
<i>Didemnum moseleyi</i> (Herdman, 1886)	GL		GP736:2	4	GL	1, 2	I 1
<i>Didemnum nigrum</i> Monniot & Monniot, 1996	GL		GP570:32?		GL	1	I 1
<i>Didemnum perlucidum</i> F. Monniot, 1983	GL, MNHN A2 DID.C 464, USNM 25064	1	GP568:20	5	GL, FM	1	N 1
<i>Didemnum psammathodes</i> (Sluiter, 1895)	GL		GP747:20	6	GL	1	C 1
<i>Didemnum rubeum</i> F. and C. Monniot, 1996	GL, MNHN A2 DID.C 487	1	GP649:14	7	FM, GL	1, 2	I 1
<i>Didemnum uturoa</i> C & F Monniot, 1987	GL		GP757:27		GL	1	I 1

Appendix 1: Ascidians of Guam / (continued)

Taxon	Voucher	Lit.	Photo	Notes	ID	D	Status
<i>Didemnum</i> sp. A	GL				GL	1	I 1
<i>Didemnum</i> sp. B	GL		GP756:4		GL	1	I 1
<i>Didemnum</i> sp. C	GL				GL	1	I 1
<i>Didemnum</i> sp. D	GL				GL	1	I 1
<i>Didemnum</i> sp. E	GL		GP740:14		GL	1	I 1
<i>Didemnum</i> sp. F	GL				GL	1	I 1
<i>Didemnum</i> sp. G	GL				GL	1	I 1
<i>Didemnum</i> sp. H	GL		GP740:35		GL	1	I 1
<i>Diplosoma listerianum</i> (Milne Edwards, 1841)	GL, MNHN A2 DIP.A 156, USNM 25066	1	GP568:22		GL, FM	1	N 1
<i>Diplosoma similis</i> (Sluiter, 1909)	GL, QM GH825	2	GP508:34	8	GL, PK	1	I 1
<i>Diplosoma virens</i> (Hartmeyer, 1909)	GL				GL	1	I 1
<i>Diplosoma</i> sp. A	GL		GP568:23	9	GL	1	C 1
<i>Leptoclinides</i> sp. A	GL		GP740:30	10	GL	1	I 1
<i>Lissoclinium calycis</i> F. Monniot, 1992	GL		GP571:32	11, 12	GL	1	I 1
<i>Lissoclinium fragile</i> (Van Name, 1902)	GL, MNHN A2 LIS 161, USNM 25065	1	GP568:31		GL, FM	1	N 1
<i>Lissoclinium patella</i> (Gottschaldt, 1898)	GL, QM GH826	2	GP541:18	2	GL, PK	1	I 1
<i>Lissoclinium timorense</i> (Sluiter, 1885)	GL, QM GH827	2	GP569:4	2	GL, PK	1	I 1
<i>Lissoclinium</i> cf. <i>vareau</i> C. and F. Monniot, 1987	GL				GL	1	I 1
<i>Polysyncrator aspiculatum</i> (Tokioaka, 1949)	GL				GL	1	I 1
<i>Polysyncrator</i> sp. A	GL		GP747:17	13	GL	1	I 1
<i>Polysyncrator</i> sp. B	GL				GL	1	I 1
<i>Polysyncrator</i> sp. C (aff. <i>poro</i>)	GL		GP570:5		GL	1	I 1
<i>Polysyncrator</i> sp. D	GL		GP747:18		GL	1	I 1
<i>Trididemnum banneri</i> Eldredge, 1967	GL				GL	1	I 1
<i>Trididemnum</i> cf. <i>cerebriforme</i> Hartmeyer, 1913	GL		GP570:23		GL	1, 2	I 1
<i>Trididemnum clinoides</i> Kott, 1977	GL, QM GH696	2	GP569:8	2	GL, PK	1	I 1
<i>Trididemnum cyclops</i> Michaelsen, 1921	GL		GP542:13?		GL	1	I 1
<i>Trididemnum fetia</i> C & F Monniot, 1987	GL				GL	1	I 1
<i>Trididemnum paracyclops</i> Kott, 1980	QM GH824	2		2	GL, PK	1	I 1
<i>Trididemnum profundum</i> (Sluiter, 1909)	GL		GP569:5		GL	1	I 1

Appendix 1: Ascidians of Guam / (continued)

Taxon	Voucher	Lit.	Photo	Notes	ID	D	Status
<i>Triidemnum</i> sp. A	GL				GL	2	I 1
APLOUSOBANCHIA: HOLOZOIDAE							
<i>Distaplia cuscina</i> Kott, 1990	GL				GL	1	I 1
APLOUSOBANCHIA: POLYCITORIDAE							
<i>Cystodites dellechiaiei</i> (Della Valle, 1877)	GL		GP590:8	14	GL	1	I 1
<i>Cystodites violatinctus</i> F. Monniot, 1988	GL		GP405:34	14, 15	FM	1	I 1
<i>Eudistoma album</i> F. Monniot, 1988	MNHN A3 EUD 218	1	GP569:15		FM	1	I 1
<i>Eudistoma ovatum</i> (Herdman, 1886)	GL		GP646:20	15	GL	1	I 1
<i>Eudistoma reginum</i> Kott, 1990	GL, MNHN A3 EUD 233	1	GP570:31?	16	FM	1	I 1
<i>Eudistoma</i> sp. A	GL		GP747-19		GL	1	I 1
<i>Eudistoma</i> sp. B	GL				GL	1	I 1
<i>Eudistoma</i> sp. C	GL				GL	1	I 1
<i>Aplidiopsis</i> sp. A (n. sp.?)	GL				GL	1	I 1
<i>Aplidium lobatum</i> Savigny, 1816	GL		GP756:2		GL	1	I 1
<i>Aplidium</i> sp. A	GL		GP755:21		GL	1	I 1
<i>Aplidium</i> sp. B	GL		GP570:17	12	GL	1	I 1
<i>Aplidium</i> sp. C	GL				GL	1	I 1
<i>Polyclinum constellatum</i> Savigny, 1816	GL, MNHN A1 POL.B 70, USNM 25065	1	GP512:28		GL, FM	1	N 1
<i>Polyclinum pute</i> Monniot & Monniot, 1987	GL		GP570:12		GL	1	I 1
<i>Polyclinum sundaicum</i> (Sluiter, 1909)	GL		GP569:13	17	GL	1	I 1
<i>Polyclinum</i> sp. A	GL		GP528:33	18	GL	1	I 1
<i>Pseudodistoma aureum</i> (Brewin, 1957)	GL				GL	1	I 1
<i>Synoiicum intercedens</i> (Sluiter, 1909)	GL		GP756:15		GL	1	I 1
PHLEBOBRANCHIA: ASCIDIIDAE							
<i>Ascidia capillata</i> Sluiter, 1887	GL				GL	1	I 2
<i>Ascidia gemmata</i> Sluiter, 1895	GL, UGI, MNHN P5 ASC 328, USNM 25065		GP458:30	19	GL	1	I 2
<i>Ascidia ornata</i> F&C Monniot, 2001	GL, USNM 25070	1	GP525:23	12, 20,	FM, GL	1	I 2
<i>Ascidia sydneyensis</i> Stimpson, 1855	GL, UGI, USNM 25065, 25075				GL	1	N 2
<i>Ascidia</i> sp. A	GL, USNM 25068		GP568:18	21	GL	1	? 2
<i>Ascidia</i> sp. B	GL		GP568:19	22	GL	1	C 2

Appendix 1: Ascidians of Guam / (continued)

Taxon	Voucher	Lit.	Photo	Notes	ID	D	Status
<i>Ascidia</i> sp. C	GL		GP746:32	13	GL	1	I 2
<i>Phallusia julinea</i> Sluiter, 1919	GL, MNHN P5 PHA 94	1	GP531:30		GL, FM, CM	1	I 2
<i>Phallusia nigra</i> Savigny 1816	GL, UGI, USNM 25072		GP525:14		GL	1	N 2
PHLEBOBRANCHIA: CORELLIDAE							
<i>Corella minuta</i> Traustedt, 1882	GL		GP745:2		GL	1	I 2
<i>Rhodosoma turcicum</i> (Savigny, 1816)	GL				GL	1	I 2
PHLEBOBRANCHIA: DIAZONIDAE							
<i>Rhopalaea circuta</i> F&C Monniot, 2001	GL, MNHN P1 RHO.A 30	1	GP358:18		FM, CM, GL	1	I 1
<i>Rhopalaea crassa</i> (Herdman, 1880)	GL, MNHN P1 RHO.A 29	1	GP532:6		GL, FM, CM	1	I 1
<i>Rhopalaea</i> sp. A (n. sp.?)	GL, USNM 25065		GP525:24	23	GL	1	I 1
PHLEBOBRANCHIA: PEROPHORIDAE							
<i>Ecteinascidia imperfecta</i> Tokioka, 1950	GL		GP756:11		GL	1	I 1
<i>Perophora faoapa</i> (C. & F. Monniot, 1987)	GL		GP570:30		GL	1	I 1
<i>Perophora multilathrata</i> (Sluiter, 1904)	GL		GP756:19		GL	1	C 1
<i>Perophora sagamiensis</i> Tokioka, 1953	GL				GL	1	C 1
STOLIDOBRANCHIA: PYURIDAE							
<i>Herdmania insolita</i> F&C Monniot, 2001	GL	1	GP525:26?		CM, GL	1	C 2
<i>Herdmania pallida</i> (Heller, 1878)	GL, MNHN S2 HER 26	1			CM, GL	1	C 2
<i>Microcosmus exasperatus</i> Heller, 1878	GL				GL	1	N 2
<i>Microcosmus helleri</i> Herdman, 1881	GL				GL	1	C 2
<i>Microcosmus pupa</i> (Savigny, 1816)	GL				GL	1	C 2
<i>Pyura confragosa</i> Kott, 1985	GL				GL	1	C 2
<i>Pyura curviflora</i> Tokioka, 1950	GL				GL	1	C 2
<i>Pyura elongata</i> Tokioka, 1952	GL		GP756:35		GL	1	I 2
<i>Pyura honu</i> C & F Monniot, 1987	GL				GL	1	C 2
<i>Pyura</i> cf. <i>robusta</i> Hartmeyer, 1922	GL				GL	1	C 2
<i>Pyura</i> sp. A (n. sp.?)	GL			24	GL	1	I 2

Appendix 1: Ascidians of Guam / (continued)

Taxon	Voucher	Lit.	Photo	Notes	ID	D	Status
STOLIDORANCHIA: STYELIDAE							
<i>Botrylloides niger</i> Herdman, 1886	GL, MNHN S1 SYM 73	1	GP512:25		CM, FM, GL	1	C 1
<i>Botrylloides perspicuum</i> Herdman, 1886	GL				GL	1	I 1
<i>Botrylloides simodensis</i> (?) Saito and Watanabe, 1981	GL				GL	1	C 1
<i>Botryllus tuberculatus</i> Ritter & Forsyth, 1917	GL				GL	1	I 1
<i>Botryllus</i> sp. A	MNHN (not catalogued)		GP424:24		GL	1	C 1
<i>Botrylloides</i> sp. A	GL, USNM 25074				GL	1	C 1
<i>Cnemidocarpa irene</i> (Hartmeyer, 1906)	GL		GP568:18		GL	1	C 2
<i>Cnemidocarpa</i> sp. A	GL				GL	1	I 2
<i>Eusynstyela latericius</i> (Sluiter, 1904)	MNHN S1 EUS 26	1	GP402:22		GL, FM, CM	1	I 1
<i>Eusynstyela misakiensis</i> ? (Watanabe & Tokioka, 1972)	GL		GP570:13		GL	1	I 1
<i>Eusynstyela phiala</i> C. Monniot, 1991	GL		GP745:7		GL	1	I 1
<i>Eusynstyela</i> sp. A	GL				GL	1	I 1
<i>Polyandrocarpa sagamiensis</i> Tokioka, 1953	GL				GL	1	C 1
<i>Polycarpa argentata</i> (Sluiter, 1890)	GL		GP568:11		GL	1	I 2
<i>Polycarpa aurita</i> (Sluiter, 1890)	GL				GL	1	C 2
<i>Polycarpa cryptocarpa</i> (Sluiter, 1885)	GL, MNHN S1 POL B 462-464		GP522:4		GL	1	I 2
<i>Polycarpa papillata</i> (Sluiter, 1885)	GL, UGI, USNM 25069		GP570:7		GL	1	I 2
<i>Polycarpa pigmentata</i> (Herdman, 1906)	GL, UGI		GP360:33		GL	1	I 2
<i>Styela canopus</i> (Savigny, 1816)	GL, UGI				GL	1	N 2
<i>Symplegma brakenhielmi</i> (Michaelsen, 1904)	GL, MNHN S1 SYM 73, USNM 25063	1	GP526:7		GL, FM, CM	1	N 1
<i>Symplegma</i> sp. A	GL		GP512:34		GL	1	C 1

Notes: 1) blue, 2) algal, urn-shaped, 3) urn shaped, 4) flat, pink, and white, 5) white with black lines, 6) tunic filled with sand and fecal pellets, 7) flat, red, abundant, 8) algal, 9) "fluffy" thick gelatinous tunic, 10) brown spotted, 11) tetrahedral spicules around zooids, 12) clear tunic, 13) yellow, 14) disc-shaped spicules, 15) purple, 16) dark shiny, 17) flat sand-filled but not encrusted, 18) thin sandy lobes, 19) red striped siphons, distended gut, 20) thick, unusual tunic vasc. pattern, 21) white marble, 22) long, dark gray, 23) gold spot, 24) white, black siphons