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| Title | Hydromedusan fauna of the Nansei Islands |
| Author(s) | Kubota, Shin |
| Citation | Proceedings of the 10th International Coral Reef Symposium (2006): 197-201 |
| Issue Date | 2006 |
| URL | http://hdl.handle.net/2433/193681 |
| Right | © Japanese Coral Reef Society |
| Type | Journal Article |
| Textversion | publisher |

Hydromedusan fauna of the Nansei Islands

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Abstract A total of 57 species of hydromedusae belonging to Antho-, Lepto-, Limno-, Trachy-, Narco-, and Laingiomedusae were collected at 32 stations, 1-7 stations on each of 12 islands from Tanegashima Island to Yonaguni-jima Island, in the Nansei Islands, by surface tows of a plankton net at a port, sometimes by vertical tows from 0-40 m depth at a station several km off a port, during 1991-2004. *Euphysomma brevia*, *Koellikerina* sp., *Podocoryne apicula*, *Teissiera* spp., *Zanlea costata*, *Agastra* sp., *Eirene* spp., *Eucheilota multicirris*, *Eutima* spp., are new to the Japanese fauna, and all but *Podocoryne apicula*, *Eirene* sp. 2, and *Eucheilota multicirris*, are recorded in only this region within Japan. Other, previously recorded, rare species that are known only from the Nansei Islands, are *Dicnida* sp., *Euphysilla* sp., *Thecocodium quadratum*, *Timoides agassizii*, and *Kantiella enigmatica*.

Keywords geographical distribution, fauna, hydromedusae, Nansei Islands, new record, rare species

Introduction

The Japanese hydromedusan fauna is known to include at least 185 species in 113 genera and 51 families, excluding the

Siphonophora (Kubota 1998b, 2003a, c). The hydromedusa fauna of the Nansei Islands has not been reviewed, although several reports concerning the fauna have been published (Kubota 1987, 1993, 1995, 1997, 1998a, 2003b, 2005; Kubota and Iwao 2002; Kubota et al. 2003; Iwanaga et al. 2003). This paper presents a review of the hydromedusan fauna of these islands, based on observations over 13 years.

Materials and Methods

Hydromedusae were sampled every year during 1991-2004, usually in the spring (March or May) and autumn (October or November), rarely in summer (June). Animals were sampled with a small plankton net (30 cm diameter, 55 cm long, 0.34 mm mesh size) by surface towing and vertical towing up to 40 m in depth, up to several times a year at one island. Sampling was carried out at 32 stations, distributed among 12 islands of the Nansei Islands, with up to 7 stations per island (Fig. 1). Multiple tows were made at many stations at different times and dates. Hydromedusae were identified and photographed alive under a microscope within a few hours of collection. Drawings were made with a drawing apparatus after the specimens were anesthetized in a 7% MgCl₂ solution.

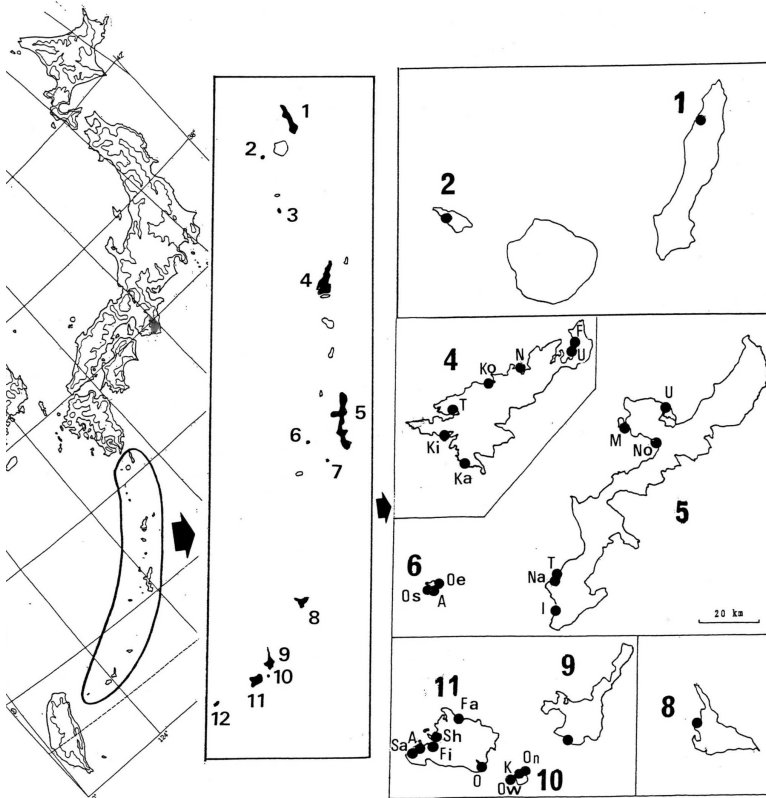
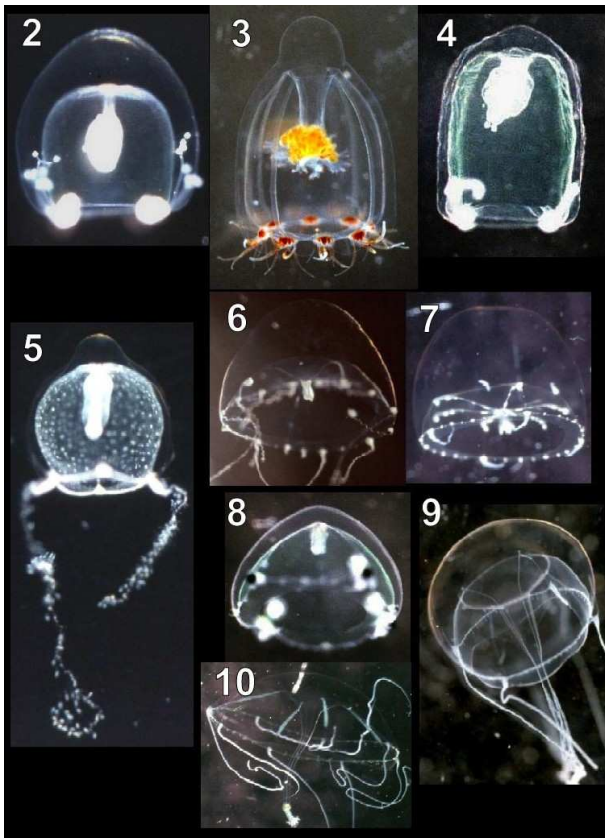


Fig. 1. Collecting stations in the Nansei Islands. 1. Tanegashima I. (Nishinoomote). 2. Kuchinoerabu-jima I. (Honmura). 3. Suwanose-jima I. (Motoura). 4. Amami-oshima I. (F: Funakura, U: Uttabara, N: Naze, Ko: Kuninao, T: Taken, Ki: Kuji, Ka: Koniya). 5. Okinawa-jima I. (U: Unten, M: Motobu, No: Nago, T: Tomari, Na: Naha, I: Itoman). 6. Aka-jima I. (Oe: off southeastern shore, 0-25m depth, A: Aka, Os: off Sakubaru, 0-30 m depth). 7. Aguni-jima I. (Aguni port). 8. Miyako-jima I. (Hirara). 9. Ishigaki-jima I. (Ishigaki port). 10. Kuroshima I. (On: off north coast, 0-30m depth, K: Kuroshima port, Ow: off west coast, 0-40 m depth). 11. Iriomote-jima I. (Fa: Funaura, Sh: Shirahama, Fi: Funauki, 0-40 m depth, A: Amitori, Sa: Sakiyama, O: Ohara). 12. Yonaguni-jima I. (Kubura).

Results and Discussion

All species collected from the 12 islands are enumerated in Tables 1-3. Of the Anthomedusae 27 species in 24 genera were collected (Table 1). *Euphysomma brevia* (Fig. 2), two indeterminate *Teissiera* species (Fig. 5, 11), one *Koellikerina* species (Fig. 3), and *Zanclaea costata* (Fig. 12), are new to the Japanese fauna. In addition, the record of *Podocoryne apicula* (Fig. 4) is noteworthy, as this species was only recently reported from Japanese waters, as a medusa from Tsushima I., Nagasaki Pref. (Kubota 2004). *Koellikerina* sp. and two *Teissiera* species, together with several previously reported species - *Dicnida* sp. and *Euphysilla* sp. reported by Kubota and Iwao (2002), *Thecocardium quadratum*, redescribed by Kubota (1993), and *Timoides agassizii*, described by Iwanaga et al. (2003), *Pandeopsis ikarii* recently reported from Tsushima I. by Kubota (2004) - were encountered at only one station. All of these species that were encountered at single stations, except *Timoides agassizii*, were rare, with only one or a few individuals collected.

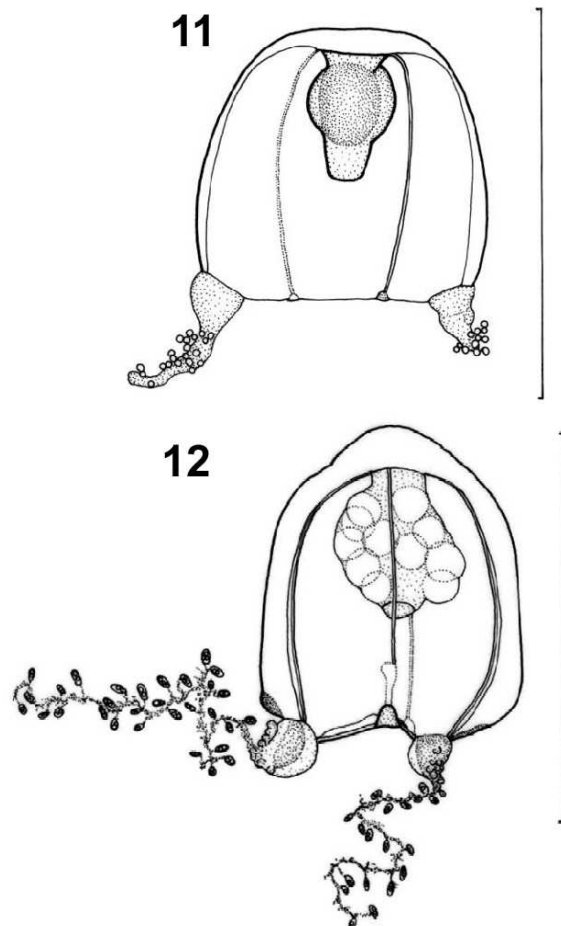


Figs. 2-10. Photographs of some hydromedusae new to Japan, all collected in the Nansei Islands, showing side view of live animals. 2: *Euphysomma brevia* collected from Miyako-jima I. in May, 1993. 3: *Koellikerina* sp. collected from Kuchinoerabu-jima I. in May, 1991. 4: *Podocoryne apicula* collected from Miyako-jima I. in May, 1993. 5: *Teissiera* sp. 1 collected from Miyako-jima I. in May, 1993. 6: *Eirene* sp. 1 collected from Miyako-jima I. in May, 1993. 7: *Eirene* sp. 2 collected from Iriomote-jima I. in June, 1997. 8: *Eucheilota multicirris* collected from Miyako-jima I. in May, 1993. 9: *Eutima* sp. 1 collected from Sesoko-jima I. near Okinawa-jima I. in November, 1992. 10: *Eutima* sp. 2 collected from Iriomote-jima I. in June, 1997.

Of the Leptomedusae, 19 species in 11 genera were found, including six species new to Japan: *Agastra* species, two indeterminate *Eirene* species (Fig. 6-7), *Eucheilota multicirris* (Fig. 8), and two indeterminate *Eutima* species (Fig. 9-10) (Table 2). Four of these newly recorded species, *Agastra* sp., *Eirene* sp. 1, *Eutima* sp. 1, *Eutima* sp. 2, the intermedia form of *Eutima japonica* described by Kubota (2003b) based on specimens from Okinawa-jima I., and the previously recorded *Aequorea macrodactyla* and *Clytia* species, were found at only one station. Only one to a few individuals were collected of each of these species. The rare *Agastra* species is recorded on the basis of a single individual that has already spawned its gametes and the umbrella was nearly degenerated when collected.

Two species in two genera of Limnomedusae were collected, and these were mostly found at the Yaeyama Islands, the most southernly site in the Nansei Islands (Table 3). *Proboscoidactyla ornata* usually produced medusa buds. *Scolionema* species, which is not usually encountered in the plankton due to its sessile habit of attaching to algae with its tentacles, is represented by a juvenile and cannot be identified to species.

All the other species in Anthomedusae, Leptomedusae, and



Figs. 11-12. Drawings of two hydromedusan species new to Japan, both collected in the Nansei Islands, showing side view of live animals. Scale bar, 1mm. 11: *Teissiera* sp. 2 collected from Aka-jima I. in March, 1994. 12: *Zanclaea costata* collected from Miyako-jima I. in May, 1993.

Table 1. Anthomedusae of the Nansei Islands (# new to Japan).

| Species/Islands | Tanega-shima I. | Kuchi-noerabu-jima I. | Suwa-nose-jima I. | Amami-oshima I. | Okinawa-jima I. | Aguni-jima I. | Aka-jima I. | Miyako-jima I. | Ishigaki-jima I. | Kuroshima I. | Iriomote-jima I. | Yonaguni-jima I. |
|--|-----------------|-----------------------|-------------------|-----------------|-----------------|---------------|-------------|----------------|------------------|--------------|------------------|------------------|
| <i>Amphinema</i> sp. | * | * | | * | | | * | | | | * | |
| <i>Bougainvillia fulva</i> Agassiz and Mayer, 1899 | | | | * | | | * | * | * | | * | |
| <i>Cladonema</i> sp. | | | | * | | | * | * | * | | * | |
| <i>Cytaeis uchidae</i> Rees, 1962 | | | * | * | | * | * | * | * | * | * | |
| <i>Dicnida</i> sp. | | | | * | | | * | | | | * | |
| <i>Dipurena ophiogater</i> Haeckel, 1879 | * | | | * | | | * | * | * | * | * | |
| <i>Ectopleura minerva</i> Mayer, 1900 | | | | * | | | * | * | * | * | * | |
| <i>Euphysa aurata</i> Forbes, 1848 | | | | * | | | * | * | * | * | * | |
| <i>Euphysilla</i> sp. | | | | * | | | * | | | | * | |
| <i>Euphysomma brevia</i> Uchida, 1947# | | | | * | | | * | * | | | * | |
| <i>Euphysora bigelowi</i> Maas, 1905 | * | * | * | * | | | * | * | * | * | * | |
| <i>Halitiara formosa</i> Fewkes, 1882 | * | * | * | * | | | * | * | * | * | * | |
| <i>Koellikerina</i> sp.# | | * | * | | | | * | | | | * | |
| <i>Pandopsis ikarii</i> Kramp, 1959 | | | * | * | | | * | | | | * | |
| <i>Podocoryne apicula</i> Kramp, 1959# | | | | * | | | * | * | * | * | * | |
| <i>Podocoryne minima</i> (Trinci, 1903) | * | | | * | | * | * | * | * | * | * | |
| <i>Rathkea octopunctata</i> (M. Sars, 1835) | * | * | | * | | | * | * | * | * | * | |
| <i>Sarsia nipponica</i> Uchida, 1927 | | | | * | | | * | * | * | * | * | |
| <i>Staurocladia</i> sp. | | | | * | | | * | * | * | * | * | |
| <i>Teissiera</i> sp. 1# | | | | * | | | * | * | * | * | * | |
| <i>Teissiera</i> sp. 2# | | | | * | | | * | * | * | * | * | |
| <i>Thecocardium quadratum</i> (Werner, 1965) | | * | | * | | | * | * | * | * | * | |
| <i>Timoides agassizii</i> Bigelow, 1904 | | * | | * | | | * | * | * | * | * | |
| <i>Turritopsis nutricula</i> McCrady, 1857 | | * | | * | | | * | * | * | * | * | |
| <i>Vannuccia forbesii</i> (Mayer, 1894) | | * | | * | | | * | * | * | * | * | |
| <i>Zanlea costata</i> Gegenbaur, 1857# | | * | | * | | | * | * | * | * | * | |
| <i>Zanlea prolifera</i> Uchida and Sugiura, 1976 | | * | | * | | | * | * | * | * | * | |

Table 2. Leptomedusae of the Nansei Islands (# new to Japan).

| Species/Islands | Tanega-shima I. | Kuchi-noerabu-jima I. | Suwa-nose-jima I. | Amami-oshima I. | Okina-wa-jima I. | Aguni-jima I. | Aka-jima I. | Miyako-jima I. | Ishigaki-jima I. | Kuroshima I. | Iriomote-jima I. | Yonaguni-jima I. |
|---|-----------------|-----------------------|-------------------|-----------------|------------------|---------------|-------------|----------------|------------------|--------------|------------------|------------------|
| <i>Aequorea macrodactyla</i> (Brandt, 1834) | | | | * | | | | | * | | | |
| <i>Agastria</i> sp. # | | | | | | | | * | | | | |
| <i>Cirrholovenia tetranema</i> Kramp, 1959 | | | | * | * | | * | | | | | |
| <i>Clytia gardineri</i> (Browne, 1905) | * | | | | * | | * | | | | * | * |
| <i>Clytia languida</i> (L. Agassiz, 1862) | * | | | | | | * | | | | | * |
| <i>Clytia macradayi</i> (Brooks, 1888) | | | | | * | | * | | | | | * |
| <i>Clytia</i> sp. | | | | | | | * | | | | | |
| <i>Eirene</i> sp. 1# | | | | | | | | * | | | | |
| <i>Eirene</i> sp. 2# | | | | | * | | | | | | * | |
| <i>Eucheilota multicirris</i> Xu and Huang, 1990# | | | | | * | | | * | | | | |
| <i>Eucheilota paradoxica</i> Mayer, 1900 | | | | | * | | * | | | | | |
| <i>Eugymnanthea japonica</i> Kubota, 1979 | | | | * | * | | * | | * | | | |
| <i>Eutima japonica</i> Uchida, 1925 (intermedia form) | | | | | * | | * | | | | * | |
| <i>Eutima</i> sp. 1# | | | | | * | | * | | | | | * |
| <i>Eutima</i> sp. 2# | | | | | * | | * | | * | | * | * |
| <i>Laodicea undulata</i> (Forbes and Goodsir, 1851) | | * | | | * | | * | | * | | * | * |
| <i>Obelia</i> spp. | * | | | | * | | * | | * | | * | * |
| <i>Tiaropsidium roseum</i> (Maas, 1905) | | | | | * | | * | | * | | * | * |

Table 3. Limno-, Trachy-, Narco-, and Langiomedusae of the Nansei Islands.

| Species/Islands | Tanega-shima I. | Kuchi-noerabu-jima I. | Suwa-nose-jima I. | Amami-oshima I. | Okina-wa-jima I. | Aguni-jima I. | Aka-jima I. | Miyako-jima I. | Ishigaki-jima I. | Kuroshima I. | Iriomote-jima I. | Yonaguni-jima I. |
|--|-----------------|-----------------------|-------------------|-----------------|------------------|---------------|-------------|----------------|------------------|--------------|------------------|------------------|
| Limnomedusae | | | | | | | | | | | | |
| <i>Proboscoidactyla ornata</i> (McCrady, 1859) | | | | | * | | | * | * | | * | * |
| <i>Scolinomema</i> sp. | | | | | | | | * | * | | * | * |
| Trachymedusae | | | | | | | | | | | | |
| <i>Aglaura hemistoma</i> Péron and Lesueur, 1810 | * | * | * | * | * | * | * | * | * | * | * | * |
| <i>Liriope tetraphylla</i> (Chamisso and Eysenhardt, 1821) | * | * | * | * | * | * | * | * | * | * | * | * |
| <i>Petasiella asymmetrica</i> Uchida, 1947 | | * | * | * | * | * | * | * | * | * | * | * |
| <i>Rhopalonema velatum</i> Gegenbaur, 1857 | | * | * | * | * | * | * | * | * | * | * | * |
| Narcomedusae | | | | | | | | | | | | |
| <i>Aegina rosea</i> Eschsholtz, 1829 | | | * | * | | | * | | * | * | * | * |
| <i>Cunina</i> sp. | | | | * | | | * | | * | * | * | * |
| <i>Solmaris rhodoloma</i> (Brandt, 1838) | | * | | * | | | * | | * | * | * | * |
| <i>Solmundella bitentaculata</i> (Quoy and Gaimard, 1833) | | * | * | * | | | * | | * | * | * | * |
| Laingiomedusae | | | | | | | | | | | | |
| <i>Kantiella enigmatica</i> Bouillon, 1978 | | | | * | | | * | | * | * | * | * |

Limnomedusae enumerated in Tables 1-3 are known north of the Nansei Islands, in areas such as Tanabe Bay, Wakayama Prefecture and Asou Bay, Tsushima I., Nagasaki Prefecture (Kubota 1995, 1997, 1998b, 2003a, c, 2004).

Four Trachymedusae, *Aglaura hemistoma*, *Liriope tetraphylla*, *Rhopalonema velatum*, and *Petasiella asymmetrica*, were found (Table 3). All are common, holoplanktonic species, distributed widely in the Nansei Islands. Abundance and ubiquity are common characteristics of holoplanktonic hydromedusa from Kyushu to Honshu as well (Kubota 2003c, 2004).

Four Narcomedusae, *Aegina rosea*, *Cunina* species, *Solmaris rhodoloma*, *Solmundella bitentaculata*, were found (Table 3). These species are also quite widely distributed in the Nansei Islands.

Kantiella enigmatica was the only Laingiomedusae encountered; it is widely distributed in the Nansei Islands. This species was first described and illustrated from Japanese waters by Kubota (1997); it is not yet known from seas around Kyushu to Honshu. The life cycle of Laingiomedusae remain unknown.

The accurate identification of undetermined species can be pursued via laboratory culture, to connect the medusa with the hydroid stage. This method has been demonstrated for *Eugymnanthea japonica* (Kubota 1987; Kubota et al. 2003). The hydroids of this area have been reported by Yamada (1955) from Tokara Islands, Yamada and Kubota (1987) from Okinawa-jima Island, while the author has unpublished data on the hydroids of all the Nansei Islands.

Acknowledgments

I would like to express my gratitude to Dr. Susumu Otsuka (Hiroshima University), the crew of Hiroshima University's research vessel, "Toyoshio Maru", particularly Mr. Akio Go and Mr. Kazumitsu Nakaguchi, and also the staff of Okinawa Regional Research Center, Tokai University, particularly Dr. Hiroyuki Yokochi, the staff of Yaeyama Marine Park Research Station (Kuroshima Island), the staff of the Akajima Marine Science Laboratory, and the staff of Sesoko Station, Tropical Biosphere Research Center, University of the Ryukyus, for their kind help with collecting hydromedusae. I would like to express my sincere gratitude to anonymous reviewers for improving the manuscript. This study was supported in part by the Grant-in-Aid for Biological Research Nos. C: 04640683 and C2: 06839015 from the Japanese Ministry of Education, Science and Culture, by the Research Institute of Marine Invertebrates, Japan, and by the Showa Seitoku Memorial Foundation, Japan.

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