CHAPTER 9

Feather stars (Crinoidea, Comatulida) of Nhatrang Bay, Vietnam: fauna, habitat and symbionts

E.S. Mekhova[1], T.A. Britayev[1]

ABSTRACT. As a result of extensive sampling performed during short field trips in 2004–2008, 31 comatulid crinoid species from 5 families were found in the Bay of Nhatrang, southern Vietnam. Comasteridae is the most species rich family in Nhatrang Bay, with 18 species from 4 subfamilies. The other families are Mariametridae with 6 species, Himerometridae with 3, and Zygometridae and Colobometridae with 2 each. The most numerous species in our samples were *Himerometra robustipinna* (Carpenter, 1881) (Himerometridae) (32 individuals) and *Cenometra bella* (Hartlaub, 1890) (Colobometridae) (27 individuals). *Cenometra bella* and *Colobometra perspinosa* were associated with gorgonians; one species was found on sediment, while others inhabit hard substrates. Twenty-three species (74%) were diurnal and 5 (16%) were nocturnal (cryptic during the day and crawling to exposed feeding perches at night. The diel activity of 3 species was not established. All crinoids were inhabited by symbionts, polychaetes (including myzostomids), gastropods, crabs, shrimps and ophiuroids. *Comaster nobilis* and *Lampometra palmata* harbored the richest symbiontic assemblages (19 and 13 species, respectively). A key for field identification of comatulids in Nhatrang Bay is provided.

Unstalked crinoids, also known as feather stars or comatulids, are relatively large, bottom-dwelling animals. They inhabit a wide range of depths, from the intertidal zone to deep ocean trenches [Belyaev 1966; Oji *et al*. 2009]. In some habitats they are very common and may reach densities up to 115 individuals per square meter [Fabricius 1994; Messing 1994]. More than a half of known comatulid species are found at shelf depths (<200 m) in the tropical Indo-West Pacific. The East Indian Archipelago, which coincides with the center of the Coral Triangle, is usually considered to be the center of comatulid biodiversity. Approximately 100 species of shallow-water crinoids (≤50 m) have been recorded there. No more than 50% of this number can be found in the fauna of local areas studied within the Archipelago. The Sulu (Jolo) Archipelago has been reported to include a maximum of 54 species [Messing 1998]. Variations in species number within this region may derive from: habitat diversity, limited geographic ranges of species and sampling efforts. Species richness declines in all directions from the hot spot described above, although local comatulid diversity may reach similar or even higher levels elsewhere, e.g., 57 species in the vicinity of the Lizard Island, Northern Great Barrier Reef [Messing 1998].

The South China Sea comatulid fauna consists of 102 species, with 90 known from shallow water [Lane *et al*. 2000]. The Vietnamese coast was never considered as a hot spot of marine biodiversity [e.g. Hoeksema 2007], with 45 comatulid species known so

[1] A.N. Severtsov Institute of Ecology and Evolution, 33 Leninskij prospect, Moscow, Russia, 119071, elena.mehova@gmail.com

Graff, 1883, *M. ambiguum* Graff, 1887; Decapoda *Allogalathea elegans, Harrovia* sp., *Periclimenes commensalis.*

Distribution in Nhatrang Bay. Mot Island.

General distribution. Red Sea, East Africa, South Africa, Madagascar, Seychelles, South-China Sea, Vietnam, Japan, north Australia, Great Barrier Reef, New Caledonia, New Zealand, at depths 1–103 m.

Comaster nobilis (Carpenter, 1884)
(Pl. 68 A)

Actinometra nobilis Carpenter 1888: 336, pl. 65.
Comanthina nobilis: Rowe *et al*. 1986: 243, fig. 8 B; Kogo 1998: 31, fig. 25.
Comaster nobilis: Messing 1998: 206.

Material examined. South China Sea, Nhatrang Bay, Mun Island, 03.10.2003 – 1 spm; 24.05.2005 – 2 spms; Mot Island, 7–12 m, 02.10.2005 – 2 spms; 7–12 m, 08.05.2006 – 1 spm; Nok Island, 4–5 m, 12.05.2006 – 1 spm; Mun Island, 12 m, 24.04.2007 – 1 spm; Nok Island, 5 m, 25.04.2007 – 1 spm; 12 m – 1 spm; Mun Island, 8–10 m, 27.04.2007 – 1 spm; Nok Island, 12–15 m, 02.05.2007 – 1 spm; Mun Island, 6 m, 04.05.2007 – 1 spm; 5 m, 11.05.2007 – 1 spm; 12–15 m, Nok Island – 1 spm; Do Island, 5–6 m, 27.05. 2007 – 1 spm; Mun Island, 28.05.2007 – 1 spm; 5–7 m, 31.05.2008 – 1 spm; Mot Island, 30.05.2007 – 1 spm; Tam Island, 5 m, 01.06.2007 – 1 spm; Nok Island, 10 m, 16.06.2007 – 1 spm.

Measurements. Arm number ranges from 58 (juvenile) to 130 with 90–110 on average. The arms are arranged in different planes; filtering arms of a given specimen are longer than those which are used to attach to the bottom.

Coloration. Variable: white, lemon-yellow and black or dark brown in different combinations also black-orange, purely white and brown specimens.

Ecological notes. Common, diurnal, fully exposed. Numerous in the outer part of the Bay. Feeding specimens are located on top of rocks. Inactive specimens look like loose balls. During filtration, some arms extended in multidirectional posture. Pinnules of feeding arms are arranged in 4 planes, with each pinnule perpendicular to the arm axis, and are often observed to flex. Pinnules of arms used to attach to the bottom are arranged in one plane and are pressed against the arm axis. Found at 5–15 m.

Symbionts. Polychaeta *Paradyte crinoidicola*; Myzostomida *Hypomyzostoma* sp., *Myzostoma vastum* Graff, 1883, *Myzostoma coronatum* Graff, 1884, *Myzostoma* sp.1, *Myzostoma* sp. 13; Decapoda *Allogalathea elegans, Periclimenes commensalis, Synalpheus* sp., *Harrovia* sp., *Synalpheus tropidodactilus, Periclimenes affinis* (Zehntner, 1894), *Pontoniopsis comanthi, Palaemonella pottsi, Synalpheus stimpsoni* (De Man, 1888), *Laomenes* sp.; Ophiuroidea *Gymnolophus obscura*; Gastropoda *Annulobalcis wareni* Dgebuadze, Fedosov et Kantor, 2012, *Curveulima* sp.1.

Distribution in Nhatrang Bay. Do, Tam, Mot, Mun, Nok Islands.

General distribution. Sri-Lanka, Indonesia, Malaysia, South China Sea, Vietnam, Philippines, Vakayama (Japan), Coral Sea, Great Barrier Reef, New Caledonia.

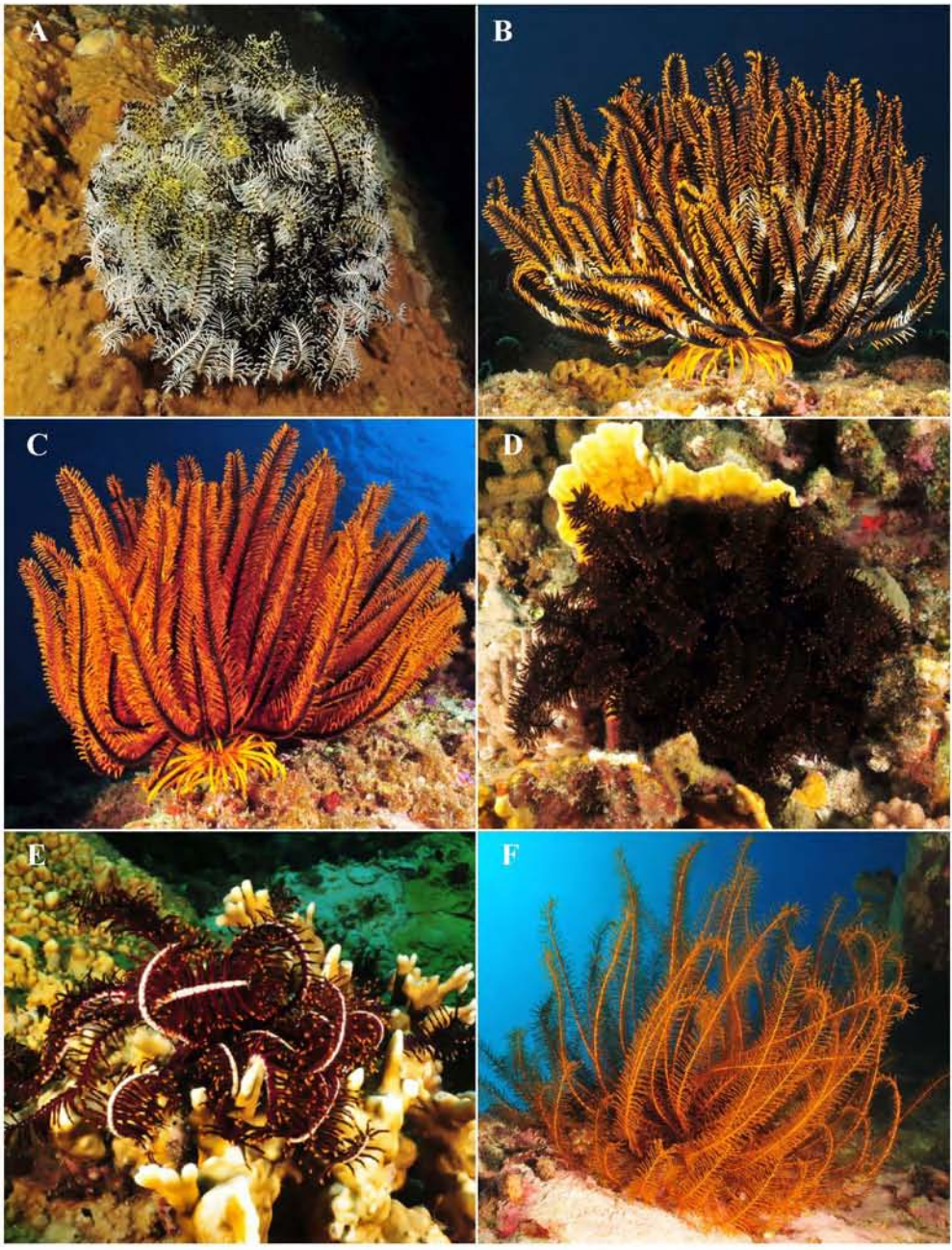

Plate 68. **A** – *Comaster nobilis*, **B** – *Oxycomanthus bennetti*, **C** – *Oxycomanthus* cf. *pinguis*, **D** – *Comatella nigra*, **E** – *Comatella stelligera*, **F** – *Phanogenia gracilis*.

activity, crown shape and feeding posture of crinoids. Symbionts associated with diurnal crinoids may be more susceptible to predation pressure. Thus diurnal crinoids should harbor less diverse assemblages than nocturnal species. Among diurnal crinoids, we may expect more diverse assemblages in cryptic and semi-cryptic species than in species fully exposed to view. Further studies are necessary to verify this hypothesis.

Acknowledgements

Our work in Vietnam was made possible through the logistics of the Coastal Branch of the Russian-Vietnamese Tropical Centre, and we would like to thank its directors, Mr. N.L. Filichev and Mr. Chan Than Kuang. We are grateful to O.V. Savinkin for the photos of crinoids and assistance in the field, and to Dr. I. Marin for identification of decapods. We are indebted to Ms. A. Zalota for her help with linguistic corrections. Comments and changes made by Dr. C. Messing significantly improved the manuscript. Field work was accomplished with permission from the Hon Mun Marine Protected Area granted to the Coastal Branch of the Russian-Vietnamese Tropical Centre. The study was partly supported by the Russian Foundation for Basic Research, under grants numbers 12–05–00239-a and 12–04–31017 mol_a 2012.

References

Bell F.J. 1882. An attempt to apply a method of formulation to the species of the Comatulidae; with the description of a new species. *Proceedings of the Zoological Society of London*: 530–536.

Belyaev G.M. 1966. *Bottom fauna of the ultraabyssal depths of the world ocean*. [In Russian]. Akademy Nauk. SSSR, Institute Okeanologii, 247 pp.

Britayev T.A., Mekhova E.S. 2011. Assessment of hidden diversity of crinoids and their symbionts in the Bay of Nhatrang, Vietnam. *Organisms Diversity & Evolution*, 11(4): 275–285.

Carpenter P.H. 1880. On the genus Solanocrinus Goldfuss and its relations to recent Comatulae. *Linnean Society (Zoology)*, 15: 187–217.

Carpenter P.H. 1881. The Comatulae of the Leyden Museum. *Notes Leyden Museum*, 3: 173–217.

Carpenter P.H. 1888. Crinoidea. 2. The unstalked crinoids. *Rep. Scientific Results Voyage "Challenger" (Zoology)*, 26(60): 1–339.

Chen J.C., Chang K.H., Chen C.P. 1988. Shallow-water crinoids of Kenting National Park, Taiwan. *Bulletin of the Institute Zoology Academy Sinica*, 27(2): 73–99.

Clark A.H. 1907. Description of new species of recent unstalked crinoids from the coast of northeastern Asia. *Proceeding U.S. National Museum*, 33: 127–156.

Clark A.H. 1908. New genera of unstalked crinoids. *Proceedings Biology Society of Washington*, 21: 125–136.

Clark A.H. 1909. Descriptions of seventeen new species of recent crinoids. *Bulletin U.S. National Museum*, 22: 633–651.

Clark A.H. 1911. On a collection of unstalked crinoids made by the United States Fisheries steamer "Albatross" in the vicinity of the Philippine Islands. *Proceedings U.S. National Museum,* 39: 529–563.
Clark A.H. 1912. The crinoids of the Indian Ocean. *Echinodermata of the Indian Museum.* Calcutta, 1–325.
Clark A.H. 1913. Notes on the recent crinoids in the British Museum. *Smithsonian Miscellaneous Collections*, 61(15): 1–89.
Clark A.H. 1915. A monograph of the existing crinoids. *Bulletin U.S. National Museum,* 82(1): 1–406.
Clark A.H. 1918. The unstalked crinoids of the Siboga expedition. *Siboga Expedition,* 42b: 1–300.
Clark A.H. 1921. Monograph of the existing Crinoids: Part 2. *Bulletin United States National Museum*, 82(1) xxvi + 795, 57 pls.
Clark A.H. 1931. A monograph of the existing crinoids. *Bulletin U.S. National Museum,* 82(3): viii + 816 pp., 82 pls.
Clark A.H. 1941. A monograph of the existing crinoids. *Bulletin U.S. National Museum,* 82(4a): 1–603, 61 pls.
Clark A.M. 1972. Some crinoids from the Indian Ocean. *Bulletin British Museum Natural History*, 24(2): 73–156.
Clark A.M., Rowe F.W.E. 1971. *Monograph of shallow-water Indo-West Pacific echinoderms*. London, Trustees of the British Museum Natural History, 509 pp.
Clark H.L. 1921. The echinoderm fauna of Torres Strait: its composition and its origin. *Carnegie Institute Washington,* 10: 11–25.
Clark H.L. 1946. The echinoderm fauna of Australia, its composition and its origin. *Carnegie Institution of Washington Publication*, 566: 1–567.
Dao T.H. 1994. *Check list of echinoderms in Vietnam, Vol.1: Crinoidea and Echinoidea*. Hanoi, Science and Technics Publishing House, 111 pp.
Dawydoff C. 1952. Contribution à l'étude des invertébrés de la fauna marine benthique de l'Indochine. *Bulletin biologique de France et de Belgique*, suppl.: 106–113.
Deheyn D, Lyskin S.A, Eeckahaut I. 2006. Assemblages of symbionts in tropical shallow-water crinoids and assessment of symbionts' host-specificity. *Symbiosis,* 42: 161–168.
Fabricius K.E., Dale M.B. 1993. Multispecies associations of symbionts on shallow water crinoids of the central Great Barrier Reef. *Coenoses,* 8: 41–52.
Fabricius K.E. 1994. Spatial patterns in shallow-water crinoid communities on the central Great Barrier Reef. *Australian Journal of Marine and Freshwater Research,* 45: 1225–1236.
Gislen T. 1922. The crinoids from Dr. S. Block's expedition to Japan 1914. *Nova Acta Regiae Societatis Scientarium Upsaliensis*, 4–5: 1–183.
Gislen T. 1938. Crinoids of South Africa. *Kungliga Svenska Vetenskapsakademiens Handlingar*, 3(17): 1–22.
Hartlaub C. 1890. Beitrag zur Kenntnis der Comatuliden-Fauna des Indishen Archipels. *Nachrichten von der Gesellschaft der Wissenschaften zu Göttingen,* 5: 168–189.
Hartlaub C. 1891. Bitrag zur Kenntnis der Comatuliden-Fauna des Indishen Archipels. *Nova Acta Academic Caesar Leopold Carol,* 58: 5–120.

Hoeksema B.W. 2007. Delineation of the Indo-Malayan centre of maximum marine biodiversity: the Coral Triangle. In Renema W. (ed.) *Biogeography, time and place: distributions, barriers and islands*. Dordrecht, Springer, 117–178.

Kirkendale L., Messing Ch.G. 2003. An annotated checklist and key to the Crinoidea of Guam and the Commonwealth of the Northern Marianas Islands. *Micronesica*, 35–36: 523–546.

Kogo I. 1998. Crinoids from Japan and adjacent waters. *Special publications from Osaka Museum of Natural History,* 30: 1–148.

Kogo I. 2002. Comatulid fauna (Echinodermata: Crinoidea: Comatulida) of the Sagami Sea and a part of Izu Islands, Central Japan. *Memoirs of the National Science Museum*, Tokyo, 41: 223–246.

Kogo I., Fujita Y. 2000. Three species of the shallow-water comatulids from Okinawa Island, new records in Japan. *Bulletin Osaka Museum Natural History,* 54: 1–12.

Lane D.J.W., Marsh L.M., VandenShpiegel D., Rowe F.W.E. 2000. Echinoderm fauna of the South China Sea: an inventory and analysis of distribution patterns. *The Raffles Bulletin of Zoology,* 8: 459–493.

Leonard A.B., Strickler J.R., Holland N.D. 1988. Effects of current speed on filtration during suspension feeding in *Oligometra serripinna* (Echinodermata: Crinoidea). *Marine Biology,* 97: 111–125.

Liao Y., Clark A.M. 1995. *The echinoderms of southern China*. Science Press. Beijing, 614 pp.

Linnaeus C. 1758. *Systema naturae*. Holmiae, 10 Ed.: 824 pp.

Mekhova E.S., Britayev T.A. 2012. Fauna of feather stars (Crinoidea: Comatulida) of the Bay of Nhatrang (South Vietnam). *Paleontological Journal*, 45 (in press).

Messing C.G. 1994. Comatulid crinoids (Echinodermata) of Madang, Papua New Guinea, and environs: diversity and ecology. pp. 237–243 In: David, B., Guille, A., Feral, J.-P., Roux M (eds.) *Echinoderms Through Time,* Rotterdam, Balkema, 385 pp.

Messing C.G. 1997. Living Comatulids. *Paleontological Society Papers*, 3: 3–30.

Messing C.G. 1998. Revision of recent Indo-West Pacific comatulid genus *Comaster* Agassiz. Part 1. The type species of *Comaster* and *Phanogenia* Leven. *Invertebrate Taxonomy,* 12: 191–209.

Messing C.G., Meyer D.L., Siebeck U.E., Jermiin L.S., Vaney D.I., Rouse G.W. 2006. A modern soft-bottom, shallow-water crinoid fauna (Echinodermata) from the Great Barrier Reef, Australia. *Coral Reefs,* 25: 164–168.

Meyer D.L., Macurda Jr.D. 1980. Ecology and distribution of the shallow-water crinoids of Palau and Guam. *Micronesica,* 16(1): 59–99.

Müller J. 1841. Űber die Gattungen und Arten der Comatulen. *Archiv fur Naturgeschichte*, 7(1): 139–148.

Müller J. 1843. IV. Neue Beitrage zur Kenntniss der Arten von Comatulen. *Archiv fur Naturgeschichte,* 9(1): 131–136.

Oji T., Ogawa, Y., Hunter A.W., Kitazawa K. 2009. Discovery of dense aggregations of stalked crinoids in Izu-Ogasawara Trench, Japan. *Zoological Sciens*, 26, 406–408.

Pavlov D.S., Smurov A.V., Il'yash L.V., Matorin D.N., Kluyev N.A., Kotelevtsev S.V., Rumak V.S., Smurova T.G. 2004. Present-Day State of Coral Reefs of Nha Trang Bay (Southern Vietnam) and Possible Reasons for the Disturbance of Habitats of Scleractinian Corals. *Russian Journal of Marine Biology*, 30(1): 43–50.

Pilcher N.J., Messing C.G. 2001. A preliminary checklist of the shallow-water crinoids of the Kerama Island, Okinawa, Japan. *Report of Akajima Marine Science Laboratory,* 12: 15–17.

Putchakam S., Sonchaeng P. 2004. Echinoderm fauna of Thailand: history and inventory reviews. *Science Asia,* 30: 417–428.

Rowe F.W.E., Hoggett A.K., Birtles R.A., Vail L.L. 1986. Revision of some comasterid genera from Australia, with descriptions of two new genera and nine new species. *Zoological Journal of the Linnaean Society,* 86: 197–277.

Smith E.A. 1876. Diagnoses of new species of Echinodermata from the Island of Rodriguez. *Annals and magazine of natural history*, 17(4): 406.

Zmarzly D.L. 1984. Distribution and Ecology of Shallow-Water Crinoids at Enewetak Atoll, Marshall Islands, with an Annotated Checklist of Their Symbionts. *Pacific Science,* 38: 105–122.

Zmarzly D.L. 1985. The Shallow-water crinoids fauna of Kwajalein Atoll, Marshall Islands: ecological observations, interatoll comparisons, and zoogeographic affinities. *Pacific Science,* 39: 340–358.

Бесстебельчатые морские лилии залива Нячанг: фауна, местообитания и симбионты

Е.С. Мехова[1], Т.А. Бритаев[1]

РЕЗЮМЕ. В заливе Нячанг отмечено 31 вид бесстебельчатых морских лилий из 5 семейств. Наиболее богатое видами семейство Comasteridae представлено в заливе Нячанг 18 видами (4 подсемейства), семейство Mariametridae – 6 видами, семейство Himerometridae – 3 видами, семейства Colobometridae и *Zygometridae* – 2 видами. По числу особей в наших сборах доминировали виды *Himerometra robustipinna* (Carpenter, 1881) (32 экземпляра) и *Cenometra bella* (Hartlaub, 1890) (27 экземпляров) из семейств Himerometridae и Colobometridae соответственно. Большинство обнаруженных видов (23 вида, 74% всей фауны) являются дневными, и лишь 5 видов (16%) – ночными, которые в течение дня прячутся в убежищах, а ночью выбираются на более открытые участки для фильтрации. Для 3 видов время активности в заливе не установлено. Все морские лилии были заселены симбионтами: полихетами, гастроподами, крабами, креветками и офиурами. Наиболее богатые видами симбиотические ассоциации найдены на лилиях *Comaster nobilis* и *Lamprometra palmata* (19 и 13 видов соответственно). Дан упрощенный дихотомический ключ для определения морских лилий залива Нячанг.

---

[1] Институт проблем экологии и эволюции им. Северцова РАН. Москва, Ленинский пр–т, д 33, 119071, elena.mehova@gmail.com