Joint Vietnamese-Russian Tropical Research
and Technological Centre
A.N. Severtsov Institute of Ecology and Evolution RAS

BENTHIC FAUNA OF THE BAY OF NHATRANG, SOUTHERN VIETNAM

Volume 2

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The book contains 9 chapters describing different groups of marine invertebrates: symbiotic polychaetes; mollusks – chitons, gastropods of the family Eulimidae, nudibranchs; pontoniin schrimps; commercial and mangrove species of crabs; sea stars and crinoids. In the result of the processing of the samples, collected in the Bay of Nhatrang, 474 species of invertebrates are described, nearly half of them (218 species) were found in Vietnam for the first time. Eight new for science species are described. For each species the localities and general distribution data, synonymy and for many species diagnoses and descriptions are provided. The book is illustrated by 470 original color photographs of live specimens taken in nature or in aquaria immediately after collecting. This volume significantly increases the knowledge not only about the fauna of the Bay, but of Vietnam in general.

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ДОННАЯ ФАУНА ЗАЛИВА НЯЧАНГ, ЮЖНЫЙ ВЬЕТНАМ

Том 2

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Донная фауна залива Нячанг, Южный Вьетнам. Том 2. М.: Т-во научных изданий КМК. 2012. 491 с.

Книга состоит из 9 глав, посвященных различным группам морских беспозвоночных: симбиотическим полихетам, моллюскам – хитонам, эулимидам, голожаберным, мангровым и промысловым крабам, креветкам – понтониинам, морским звездам и морским лилиям. В результате обработки коллекций, собранных, преимущественно на акватории залива Нячанг, выявлено 474 видов беспозвоночных животных, около половины которых (218 видов) впервые отмечены у побережья Вьетнама. Кроме того, приводятся описания 8 новых для науки видов. Для каждого вида приводятся данные о местонахождении, распространении, синонимия, а для многих видов – диагнозы или описания. Книга иллюстрирована 470 оригинальными цветными фотографиями живых объектов, выполненных в естественных условиях, в аквариуме, или в контейнерах сразу после сбора материала. Этот выпуск существенно расширяет наши представления не только о фауне залива, но и о фауне Вьетнама в целом.

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ОГЛАВЛЕНИЕ

FOREWORD

Five years ago the first volume of the series "Benthic Fauna of the Bay of Nhatrang" dedicated to biodiversity studies of the fauna of the Bay has been published. The general goals of the series were mentioned in the Introduction to the first volume [Britayev, Pavlov 2007]. Over the years the urgency of the fauna studies increased. From one hand the anthropogenic press on the benthic communities of the Bay keeps rising, from the other it became obvious that the Bay of Nhatrang is the biodiversity hotspot of the coastal fauna of Vietnam. The high diversity of the fauna may be related to the peculiarities of the water circulation of the South China Sea as well as to the history of fauna formation and proximity of the continental slope to the shores. The latter allowed conservation of the rich fauna during transgressions and regressions of the World Ocean.

The book is based on the material collected in the Bay of Nhatrang mostly in 2002–2010 basing on the Coastal Branch of Tropical Center. In some chapters samples were included, that were collected before creation of the Tropical Center in 1985 and 1987 by the joint expeditions of the A.N. Severtzov Institute of Ecology and Evolution and Institute of Oceanography of Vietnam, as well as the expedition of the Tropical Center and Research Institute for Marine Fisheries of Haiphon (2006–2010). The map of Vietnam and studied areas of the Bay is provided in Fig. 1, 2.

The current volume includes 9 chapters dedicated to different groups of marine invertebrates: symbiotic polychaetes, parasitic gastropods of the famiy Eulimidae, chitons, nudibranchs, pontoniin schrimps, commercial species of crabs, mangrove crabs, sea stars and crinoids. 474 species of invertebrates are described, nearly half of them (218 species) were found in Vietnam for the first time. Eight new for science species are described. Thus the volume significantly increases our knowledge not only about the fauna of Nhatrang Bay, but of Vietnam in general.

Specialists from leading research institutions of Russia participated in preparation of this volume: A.N. Severtzov Institute of Ecology and Evolution of Russian Academy of Sciences (RAS), Zoological Institute of RAS, P.P. Shirshov Institute of Oceanology of RAS, and Zoological Museum of Moscow State University. In most cases they participated in collecting material themselves, that increases creditability of results. The leading researchers in corresponding taxonomic groups were invited to review the publication.

This publication was prepared with the organizing support of the administration of the Tropical Center: general directors V.S. Rumak, Chin Khuok Khan, and A.N. Kuznetsov, directors of the Coastal Branch of the Tropical Center Y.N. Sbikin, V.K. Nezdolyi, N.L. Filichev, Nguen Van Doan, Chan Kong Khuan, Nguen Van Kuang. We are very grateful to our Russian and Vietnamese colleagues participating in collection of material, to the reviewers, whose efforts improved the quality of the publication, interpreter and English editor A. Zalota. Nearly half of photographs in several chapters (polychaetes, nudibranchs, sea stars and crinoids) were taken by the devoted participant of the expeditions to Vietnam, underwater photographer O.V. Savinkin.

Editors of the volume T.A. Britayev, D.S. Pavlov

ВВЕДЕНИЕ

Пять лет назад вышел первый том серии “Benthic Fauna of the Bay of Nhatrang”, посвященный исследованию разнообразия фауны залива. Общие задачи серии были упомянуты в предисловии к первому выпуску [Британев, Павлов 2007]. За прошедшие годы актуальность исследований фауны залива только увеличилась. С одной стороны, выросла антропогенная нагрузка на сообщества залива, с другой – по мере исследования, стало очевидно особое значение залива Нячанг, как центра разнообразия прибрежной фауны Вьетнама. Высокое разнообразие фауны залива вероятно связано с особенностями циркуляции вод Южно-Китайского моря, а также с историей ее формирования и близостью к берегу материкового склона, что позволило сохраниться богатой фауне в периоды трансгрессий и регрессий Мирового Океана.

В основу этой книги лег материал, собранный на акватории залива Нячанг преимущественно в период с 2002 по 2010 годы на базе Приморского отделения Тропцентра. Однако в ряде работ использованы пробы, собранные до создания Тропцентра в 1985 и 1987 гг. совместными экспедициями Института проблем экологии и эволюции им. А.Н. Северцова АН СССР и Института океанографии Вьетнама, а также Тропцентра и Исследовательского института морских продуктов и ресурсов г. Хайфон (2006–2010 гг.). Картосхема вод Вьетнама и акватории залива, охваченных сборами представлена на Рис. 1, 2.

В данный выпуск вошло 9 глав, посвященных разным группам морских беспозвоночных животных: симбиотическим полихетам, паразитическим брюхоногим моллюскам Eulimidae, хитонам, голожаберным моллюскам, креветкам-понтониинам, промысловым крабам, крабам мангровых сообществ, морским звездам и морским лилиям. Приводятся данные по 474 видам беспозвоночных, около половины которых (218 видов) впервые отмечены у побережья Вьетнама. Кроме того, приводятся описания 8 новых для науки видов. Таким образом, этот выпуск существенно расширяет наши представления не только о фауне залива, но и о фауне Вьетнама в целом.

В подготовке издания участвовали специалисты из ведущих научных центров России: Института проблем экологии и эволюции РАН, Зоологического Института РАН, Института Океанологии, Зоологического музея МГУ. В большинстве случаев, они не только обрабатывали уже собранные коллекции, но и сами участвовали в сборе материала, что положительно сказалось на качестве полученных результатов. Для рецензирования издания были привлечены ведущие специалисты по каждой конкретной группе животных.

Данная работа была выполнена благодаря организационной поддержке руководства Тропцентра: его гендиректоров В.С. Румака, Чинь Куок Кханя, А.Н. Кузнецова, директоров Приморского отделения Тропцентра Ю.Н. Сбикина, В.К. Нездолия, Н.Л. Филичева, Нгуен Ван Доана, Чан Конг Хуана, Нгуен Ван Куанга. Мы признательны нашим российским и вьетнамским коллегам, участвовавшим в сборе материала, рецензентам, чей нелегкий труд способствовал улучшению качества статей, переводчику и редактору английского текста А. Залота. Около половины фотографий для ряда разделов (полихеты, голожаберные моллюски, морские звезды, морские лилии) выполнены неизменным участником экспедиций во Вьетнам, подводным фотографом О.В. Савинкиным.

Редакторы выпуска Т.А. Британев и Д.С. Павлов

CHAPTER 1

Symbiotic polychaetes from Nhatrang Bay, Vietnam

T.A. Britayev[1], T.I. Antokhina[1]

ABSTRACT. Shallow-water polychaete fauna associated with benthic invertebrates in Nhatrang Bay, Vietnam was studied based on extensive sampling surveys performed from 1985 to 2012. As a result, 24 polychaete species belonging to four families were found. A check list of all these species including synonymies, list of material examined, extended diagnosis, taxonomic and ecological notes, and distribution is here presented. Most reports include *in situ* colour photos of representative specimens. The vast majority of symbionts belong to Polynoidae (13 species), followed by Syllidae (5 species), Hesionidae (5 species), and Spionidae (1 species), which were associated with echinoderms (53.8%), cnidarians (23.0%), sponges (11.5%), crustaceans (7.7%), and other polychaetes (3.8%). The number of symbiotic polychaetes occurring in Vietnamese coastal waters is here increased from 10 up to 26 species. The Vietnamese fauna of symbiotic polychaetes differs considerably from the Australian one. However, further studies on poorly investigated or even overlooked hosts (e.g. sponges, octocorals, tube dwelling polychaetes, echinoids and ophiuroids) will certainly lead to an increase in our knowledge on the diversity of symbiotic polychaetes of Vietnam.

The establishment of specialized symbiotic associations involving polychaetes is a rather common phenomenon in the World Oceans. According to the most recent review [Martin, Britayev 1998] there are ca. 370 symbiotic species of polychaetes, either obligate or facultative. Although their world distribution patterns have not been formally analyzed, it seems likely that there may be a latitudinal gradient, with a relatively low diversity in cold and temperate waters that tends to increase towards tropical areas. Conversely, the symbiotic polychaete fauna is relatively well known in the cold and temperate European waters, as well as along both coasts of North America [Barel, Kramers 1977; Pettibone 1993], while tropical areas are still poorly investigated. There are no publications focusing on these organisms from any particular tropical area, with a few exceptions [e.g. Gibbs 1969; Britayev *et al*. 1999]. In turn, most data on symbiotic species are usually scattered in faunistic, taxonomic, or, more rarely, in ecological papers [e.g. Devaney 1967; Hanley 1989; Britayev, Zamyschliak 1996; Barnich *et al*. 2004], and the Vietnamese fauna is not an exception.

Various polychaete families have been previously studied in Vietnam [e.g. Fauvel 1939; Uschakov 1972; Fauchald 1968; Gallardo 1967; Strelzov 1968, 1972]. However, only ten symbiotic species are known to date. Most of them belong to the Polynoidae (8 species), while the Syllidae and the Spionidae were represented by only one species, respectively [Fauvel 1939; Gallardo 1967; Radashevsky 1996; Britayev, Zamyschliak 1996; Britayev, Fauchald 2005; Britayev, Martin 2005; Martin *et al*. 2009; Antokhina,

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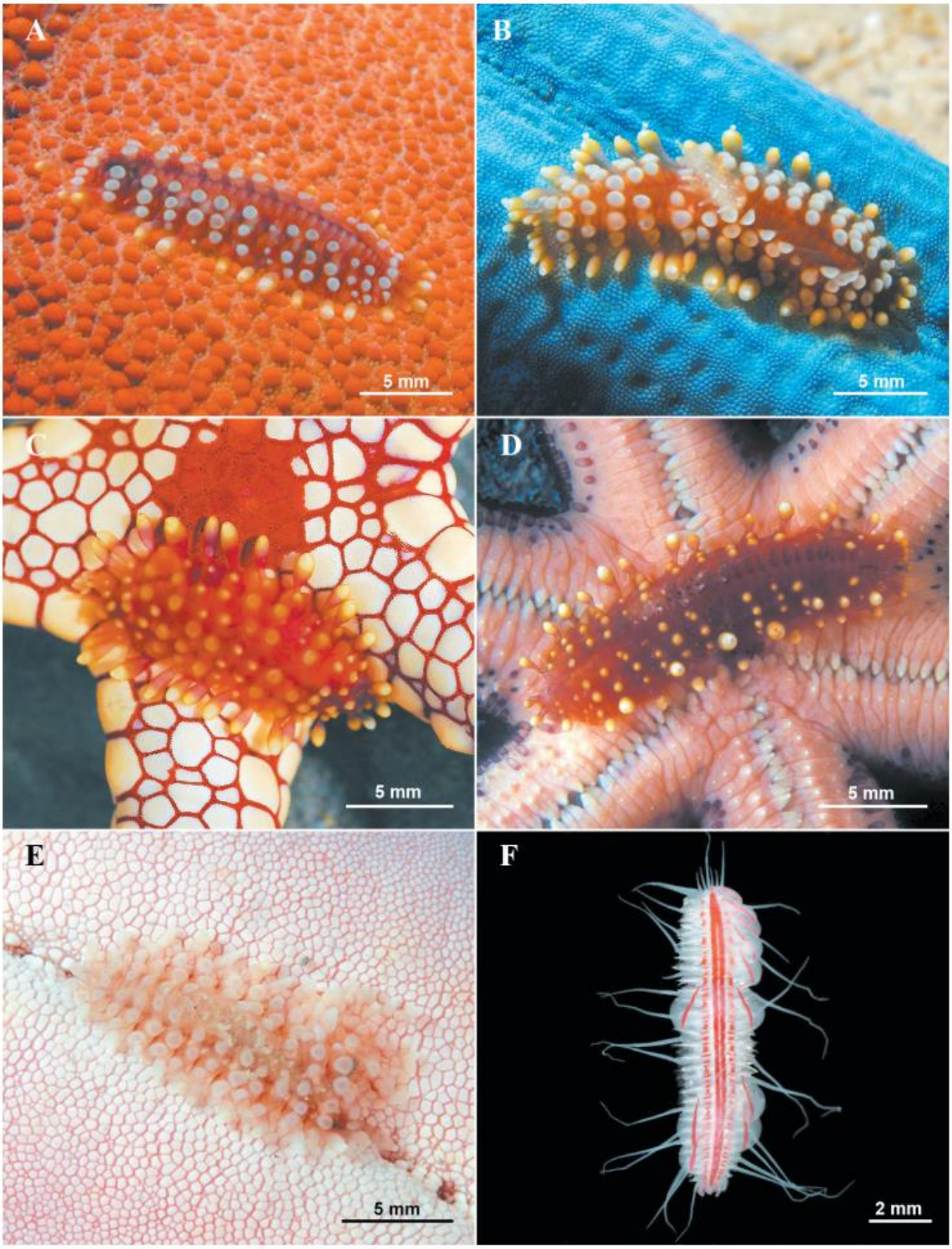

Plate 1. **A** – *Asterophilia culcitae* on the oral surface of starfish *Culcita novaeguineae* (*in situ*), **B** – *A. culcitae* on the arm of starfish *Linckia laevigata* (*in situ*), **C** – *A. culcitae* on the aboral surface of starfish *Fromia monilis* (in lab), **D** – *A. culcitae* on the oral surface of starfish *Echinaster luzonicus* (in lab), **E** – *A. culcitae* on the oral surface of starfish *Choriaster granulatus* (*in situ*), **F** – *Australaugeneria rutilans* (in lab).

CHAPTER 2

Chitons (Mollusca, Polyplacophora) of Nhatrang Bay, South Vietnam

B.I. Sirenko[1]

ABSTRACT. The chiton fauna of Nhatrang Bay consists of 28 species. Twenty one species were found for the first time in Vietnam, and seven of them were described as new. Oyster beds are the most interesting and poorly studied biotopes widely distributed in the Southern Vietnam, and most of new species of chitons were found there. Abundance of chitons in oyster beds is probably linked with low predator pressure of crabs and fishes. The influence of predators on chitons evolution is discussed. Data on chitons fauna in Vietnam are summarized. Currently, it includese 49 species, 25 of them are new for Vietnam.

The literature about Vietnamese chitons is very scarce. It merely consists of descriptions of several species collected in the South China Sea near the Vietnamese coast. Leloup [1937, 1940, 1952] described three new species, Strack [1991] and Sirenko [1998] described two new species. Several more articles have added few new species to the fauna of Vietnam: Sirenko [1988, 1992] and Strack [2003]. First list of Vietnamese chitons, compiled by Leloup [1952], included 13 species, Dawydoff [1952] listed 17 species, but most of these records need verification. Strack [2003] compiled a final list of Vietnamese chitons that included 40 species, but almost half of them require verification. This article is a result of two years of field investigations of chitons fauna in Nhatrang Bay.

Materials and methods

Specimens were collected during two expeditions in spring (March-May) of 2009 and 2010, near Nhatrang city and neighboring islands: Tre, Mun, Mot and Nok (Fig. 2). The majority of material was collected using SCUBA diving, up to 22 m depths. Chitons were collected traditionally, from underneath stones and by a new method which allowed us to overcome some difficulty with the collection of small specimens with cryptic coloration. This new procedure involved collection of: substrata of dead bivalve and gastropod shells, dead branches of corals and pieces of coralline algae that covered dead corals and rocks. They were placed in a bucket of fresh water after which a small amount of formol has been added. One to two hours later these shells and other debris have been washed in the bucket and large pieces of shells, corals and algae have been removed. The remains were then sieved on a set of sieves with 5×5 and 1×1 mm mesh size. This sieved material has been sorted under a stereomicroscope. Additionally, I collected bottom sand near rocks that has been dried and examined under a microscope. This procedure allowed valves of several chitons species to be collected which have not otherwise been collected alive.

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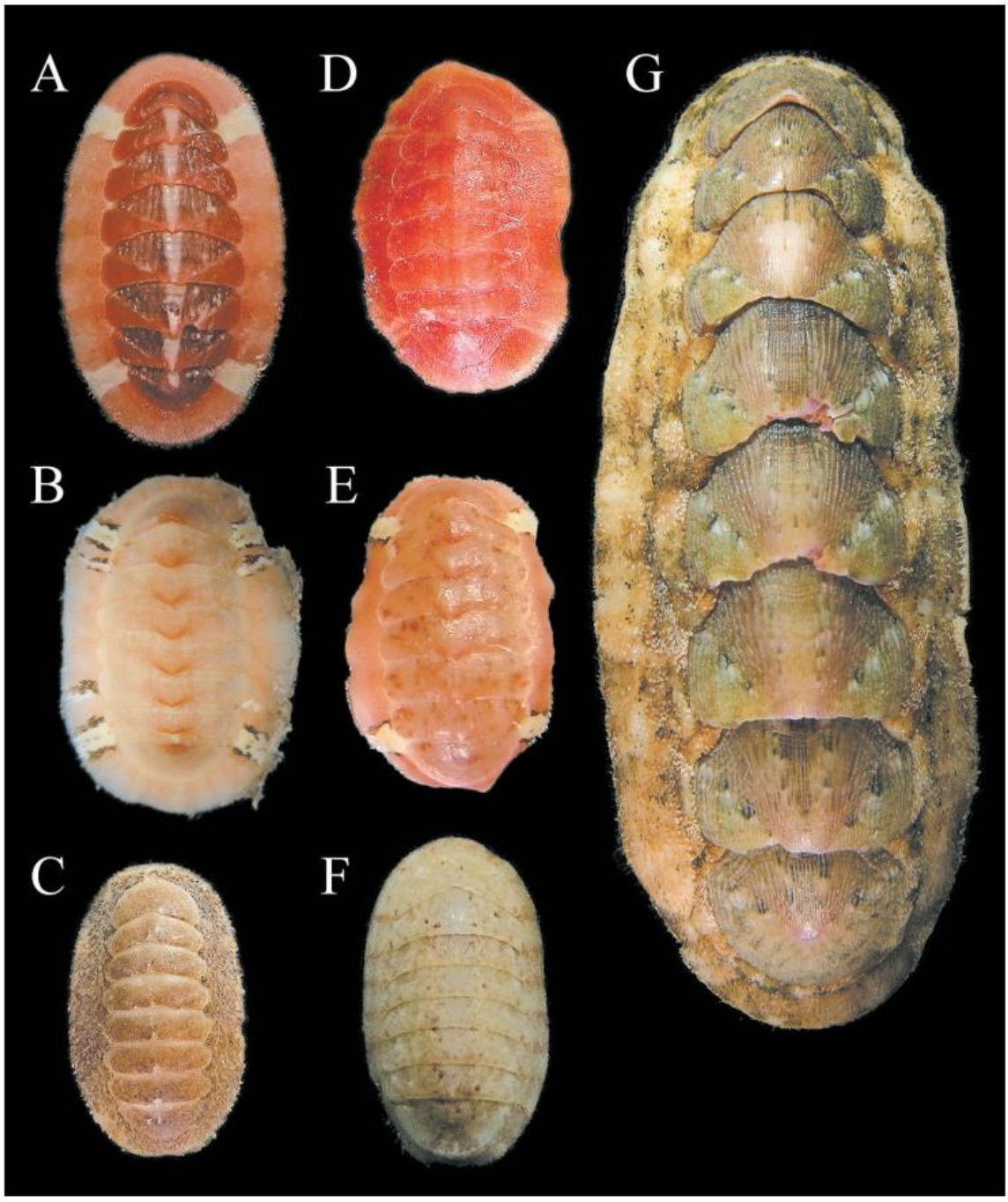

Plate 11. Images of fixed mollusks. **A** – ***Callochiton dawydoffi*** sp. nov., BL – 8.4 mm; **B** – *Callochiton multidentatus*, BL – 5.4 mm; **C** – *Ischnochiton albinus*, BL – 5.2 mm; **D** – *Callochiton subsulcatus*, BL – 6.5; **E** – *Callochiton multidentatus*, BL – 5.5 mm; **F** – *Ischnochiton bouryi*, BL – 5.6 mm; **G** – *Stenoplax alata*, BL – 37.2 mm.

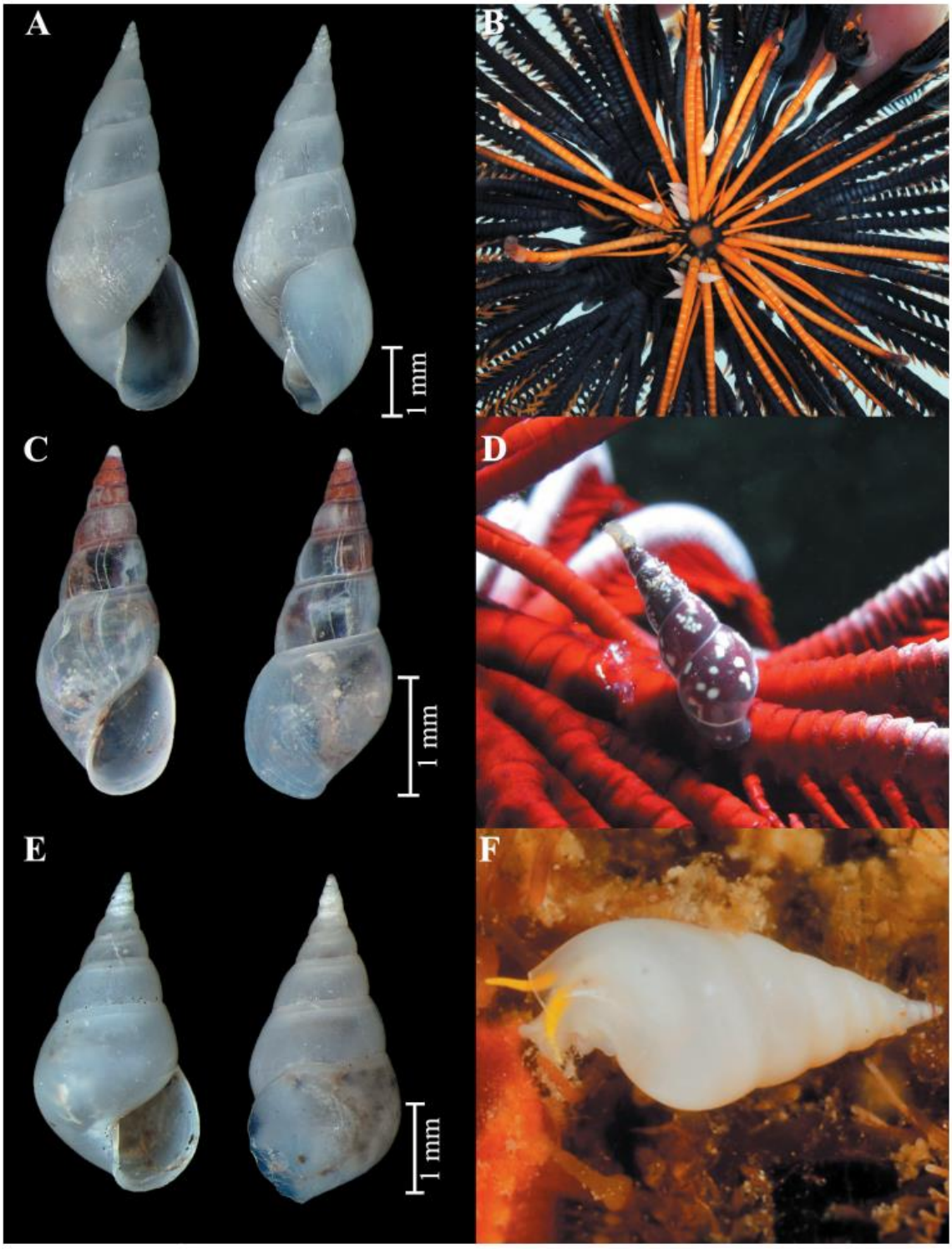

Plate 17. **A** – *Annulobalcis albus*, holotype, 6.0 mm; **B** – *Annulobalcis albus* on the host – feather star *Oxycomanthus bennetti;* **C** – *Annulobalcis vinarius*, holotype, 2.9 mm; **D** – *Annulobalcis vinarius* on the arm of feather star *Himerometra robustipinna;* **E** – *Annulobalcis wareni,* holotype, 3.8 mm; **F** – *Annulobalcis wareni*, live specimen.

CHAPTER 4

Opisthobranch molluscs of Vietnam (Gastropoda: Opisthobranchia)

A.V. Martynov[1], T.A. Korshunova[2]

ABSTRACT. Currently, study of opisthobranch molluscs (including well-known nudibranchs) are among the most dynamically developed fields of marine biology. Great diversity, intricate evolutionary history and numerous biological peculiarities are features of this remarkable group of the phylum Mollusca. Despite general advancements, currently there is a great deficiency in works on taxonomy of regional opisthobranch faunas. Opisthobranchs of Vietnam are among world's least studied faunas. Prior to present study, there has been a single review that dealt only with the nudibranch molluscs [Risbec, 1956], and now it is much outdated. Therefore, the review of Vietnam opisthobranch molluscs' fauna in this study is presented for the first time. For each species short synonymy, diagnostic features and data on its biology and distribution are provided. Every species in this review is illustrated with an original color photograph. In total, 150 species of opisthobranch molluscs have been recorded. This includes most orders: Cephalaspidea, Anaspidea, Umbraculida, Sacoglossa, Notaspidea, Doridacea and Nudibranchia. One of the most important results of this study is 116 new species of opisthobranch molluscs that have been recorded for the first time for Vietnamese fauna. A new colorful species, ***Janolus savinkini*** sp. nov. is described.

Tropical, Indo-West Pacific Nudibranch molluscs make up the core of this group's diversity and hold a leading place in the world's fauna species number. Apart from dramatically different morphology in comparison to other gastropods, nudibranchs processes numerous unique biological novelties. For instance, species of one of the most common tropical dorid nudibranch family, Phyllidiidae, acquired a set of unusual digestive and protective adaptations. Among various aberrant features of this family, most remarkable are: secondary respiratory leaves under the notum (primary gills are completely reduced), absence of a radula (one of the most typical molluscan character), transformation of pharynx into a strong sucking organ, and finally, an elaborate system of chemical protection that uses sponge metabolites [e.g. Cimino *et al*. 1999; Cimino, Ghiselin 2009; and many others]. Some species from another large nudibranch group (Aeolidacea), for instance *Pteraeolidia janthina* poses even more unusual features such as: a symbiosis with microalgae Zooxanthellae in the dorsal papillae; thus it has a possibility to use algae's photosynthetic products for its benefit [e.g. Wägele, Johnsen 2001]. Various other symbionts (e.g. copepod crustaceans) have also been noted with tropical Nudibranchia. These few remarkable examples are only the top of an iceberg of the nudibranch features which can be central themes of numerous other long-term studies in different fields of biology.

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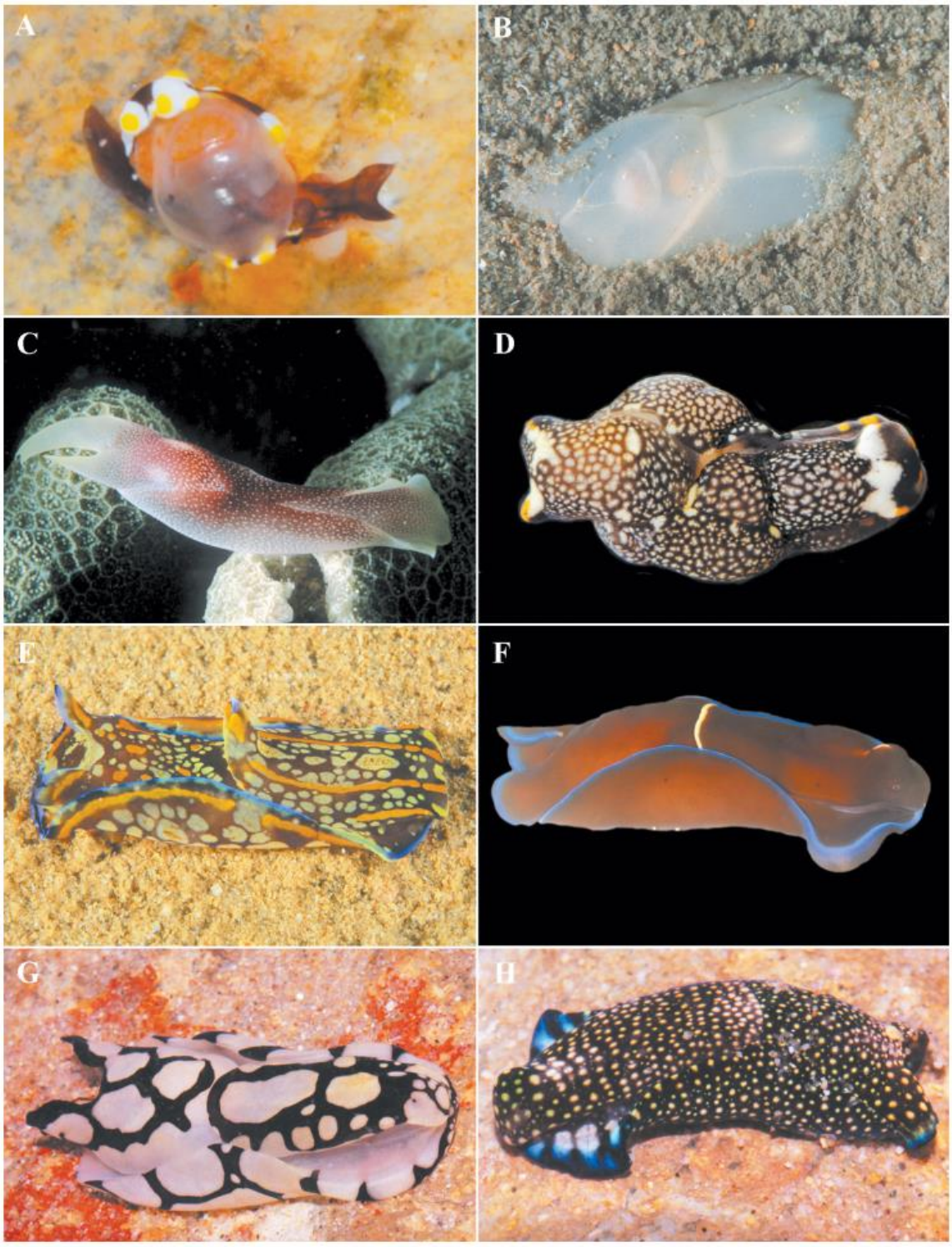

Plate 21. **A** – *Colpodaspis thompsoni*; **B** – *Philine orientalis*; **C** – *Chelidonura amoena*; **D** – *Chelidonura fulvipunctata*; **E** – *Philinopsis cyanea*; **F** – *Philinopsis gardineri*; **G** – *Philinopsis pilsbryi*; **H** – *Philinopsis reticulata*. **A–C**, **E–H** – photos of O. Savinkin; **D** – photo of T. Korshunova.

CHAPTER 5

Brachyuran crabs (Crustacea Decapoda Brachyura) of the mangrove intertidal zone of southern Vietnam

E.S. Chertoprud[1], V.A. Spiridonov[2], I.N. Marin[3], V.O. Mokievsky[2]

ABSTRACT. An assessment of taxonomic composition and functional structure of brachyuran crab assemblages was conducted in southern Vietnam mangroves. 26 species of 10 families were found in Dam Bay (Nhatrang Bay, Tre Island), Nha Phu Lagoon (both in Khán Hoa Province) and in the Can Gio National Park (Dong Nai River). 15 species are recorded for the first time from the coast of Vietnam. These are *Episesarma palawanense* (Rathbun, 1914), *Ilyoplax punctata* (Tweedie, 1935), *Macrophthalmus milloti* (Crosnier, 1965), *Metaplax longipes* (Stimpson, 1858), *Metopograpsus latifrons* (White, 1847), *Mictyris brevidactylus* (Stimpson, 1858), *Nanosesarma batavicum* (Moreira, 1903), *Parasesarma* cf. *affine* (De Haan, 1837), *P. ungulatum* (H. Milne Edwards, 1853), *Sphaerozius scaber* (Fabricius, 1798), *Uca borealis* (Crane, 1975), *U. paradussumieri* (Bott, 1973), *U. crassipes* (White, 1847), *U. flammula* (Crane, 1975) and *U. vocans* (Linnaeus, 1758). Using literature data and on site observations of crabs' trophic specialization and morphology, we distinguished four principal life forms of mangrove brachyuran crabs: high tide active predators, low tide polyphagous forms, high tide polyphagous forms and low tide detritus feeders. Distribution of these life forms within main horizons of mangrove intertidal zone is described. A non-fragmented mangrove forest (Can Gio National Park) is characterized by high species diversity and a complex composition of life forms. On the other hand impoverished crab assemblages are associated with mangrove biotopes that are transformed into a pond system for mud crab and fish cultivation (Nha Phu Lagoon). Mangrove plantation, in Dam Bay, has already accommodated a relatively rich and diverse assemblage of intertidal brachyuran crabs.

The mangrove ecosystems of Vietnam are experiencing significant anthropogenic pressure. Mangroves are replaced by shrimp, fish and crab aquaculture farms. Maritime forests were initially threatened by the defoliant treatment, during the Vietnamese – American war (1965–1975). Although they are partly restored, their total coverage still gradually decreases [Graaf, Xuan 1998; Tong *et al*. 2004].

As a response to this, Vietnamese government established several national parks with an aim of conserving and restoring large mangrove massifs. National Park Can Gio encompasses the Dong Nai River and Long Tau River Delta and it is one of the largest among protected areas (about 75 000 ha). Besides this, mangrove forests are re-planted

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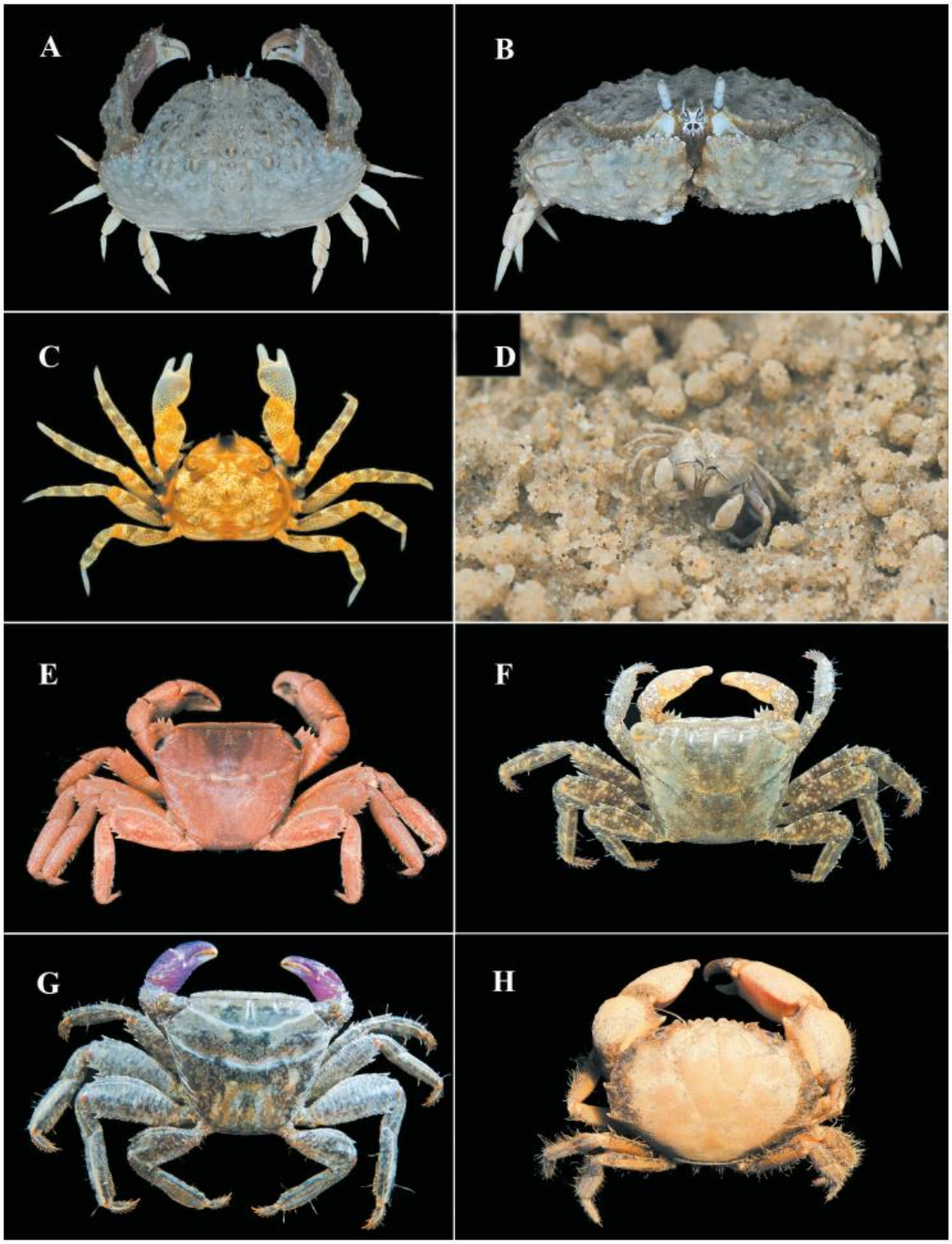

Plate 43. **A** – *Calappa hepatica*, ♂, CW 75.2 mm; **B** – *C. hepatica*, same specimen, frontal view; **C** – *Scopimera globosa*: ♀, CW 4,3 mm; **D** – same species, female in the Dam Bay mangrove; **E** – *Metopograpsus latifrons*, ♂, CW 26,2 mm (coloration after fixation with formalin); **F** – *M. latifrons*, ♂, CW 30,4 mm (form with orange hands of helipeds); **G** – *M. latifrons*, ♂, CW 23,4 mm (form with violet hands of helipeds); **H** – *Sphaerozius scaber*, ♂, CW 25,6 mm.

CHAPTER 6

Commercial crabs (Crustacea Decapoda Brachyura) from Nhatrang Bay (Vietnam)

E.S. Chertoprud[1], V.A. Spiridonov[2], S.A. Ponomarev[3], V.O. Mokievsky[2]

ABSTRACT. A preliminary assessment of taxonomic diversity of brachyuran crabs caught and traded by local population in the Nhatrang Bay area (southern Vietnam, Khánh Hoa Province) revealed 31 species of 11 families. Among them, 6 species, though common in the neighboring areas, were recorded for the first time in Vietnam waters: *Dromia dormia* (Linnaeus, 1763); *Ranina ranina* (Linnaeus, 1758); *Dorippe sinica* Chen, 1980 (southward extension of the known range); *Calappa quadrimaculata* Takeda et Shikatani, 1990; *Eucrate solaris* Yang et Sun, 1979 and *Varuna yui* Hwang et Takeda 1986. Nomenclature of *Monomia haanii* (Stimpson, 1858) (= *Portunus gladiator* Fabricius, 1798), which is a common commercial in the Nhatrang area, is discussed. Contrary to the opinion of Ng *et al*. [2008], the name *M. haanii* should be retained as a valid name under the International Code of Zoological Nomenclature, since *P. gladiator* Fabricius, 1798 became a secondary homonym of *P. gladiator* (Fabricius, 1793) after the neotype designation of the latter species performed by Stephenson and Cook [1973]. Coloration characteristics making it possible to distinguish between morphologically very similar species *M. haanii* (Stimpson, 1858), *M. argentata* (A. Milne Edwards, 1861) and *M. pseudoargentata* Stephenson, 1961 (all constantly present in commercial catches) are provided. Based on the frequency of occurrence and abundance on the markets we distinguished several groups of caught and sold species of brachyuran crabs. A – commonly and broadly sold species that include: several species of Portunidae and most of box crabs (Calappidae, 5 species). B – valuable, but sporadically sold species that include: 1 species of Varunidae, 1 species of Carpiliidae and 1 species of Raninidae that is from time to time sold on the Nhatrang markets. C – occasional bycatch which includes species of: Dromiidae, Dorippidae, Matutidae, Galenidae, Goneplacidae and Xanthidae (8 common species). These have been never recorded at the city market but they are sold in limited number at landing places wholesale markets. Taxonomic composition of commercial crabs in the Nhatrang area and in the Western Central Pacific in general shows only partial resemblance. Portuniudae are represented by the greatest number of species in both cases. Number of commercial species of Calappidae and Matitidae in southern Vietnam even exceeds figures reported by Ng [1998] and FAO [2011] for the entire Western Central Pacific. Xanthidae taxa, which includes a number of commercial species in Indo-Pacific is poorly represented in the collections from the Nhatrang market. This is probably due insufficient availability (or accessibility) of the reef associated habitats in the Nhatrang Bay, where crabs of this family are commonly caught. Absence of deep-living Geryonidae on the Nhatrang market may be explained by the fact that most of local fishery is done in shallow water.

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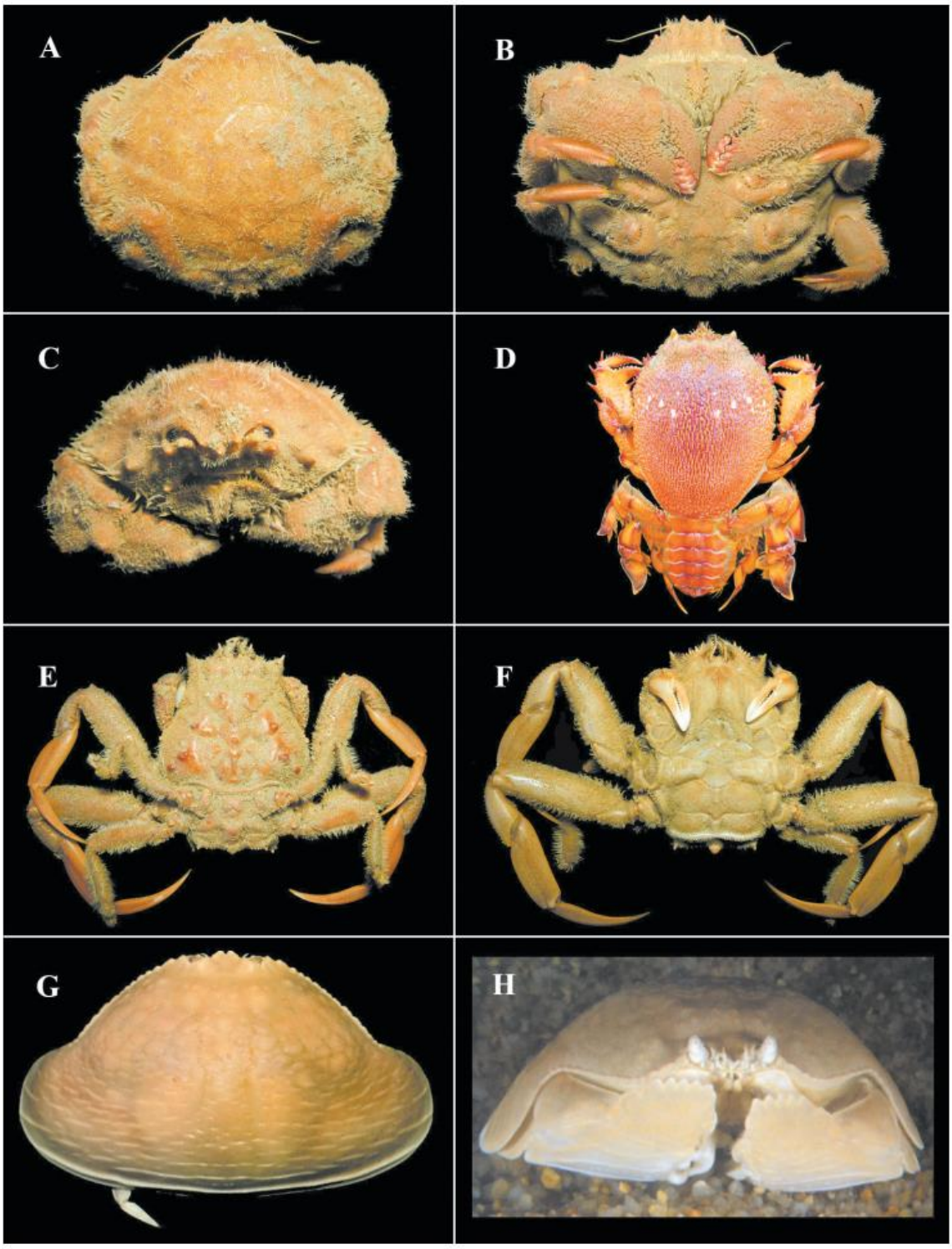

Plate 48. **A** – *Dromia dormia*, ♂, CW 92 mm (preserved specimen); **B** – *Dromia dormia*, same specimen, ventral view; **C** – *Dromia dormia*, same specimen, frontal view; **D** – *Ranina ranina*, ♂, CW 146 mm (colour in live); **E** – *Dorippe sinica*, ♀, CW 36 mm (preserved specimen); **F** – *Dorippe sinica*, same specimen, ventral view; **G** – *Calappa calappa*, ♂, CW 88 mm, from Marin, Nguen, [2007]; **H** – *Calappa calappa*, from Marin, Nguen [2007] frontal view.

CHAPTER 7

New records and associations of pontoniine shrimps (Crustacea: Decapoda: Caridea: Palaemonidae:Pontoniinae) from the Nhatrang Bay, Vietnam; with taxonomic remarks on some species from the Indo-West Pacific region

I.N. Marin[1]

ABSTRACT. A review of recently collected pontoniine shrimps in the Nhatrang Bay, Vietnam is provided. This paper contains 11 records of new species for the pontoniine fauna of the region, namely *Conchodytes pteriae* Fransen, 1994, *Fennera chacei* Holthuis, 1952, *Hamopontonia corallicola* Bruce, 1970, *Hamopontonia fungicola* Marin, 2012, *Harpiliopsis depressa* (Stimpson, 1860), *Laomenes holthuisi* Marin et Okuno, 2010, *Periclimenes gonioporae* Bruce, 1989, *Periclimenes toloensis* Bruce, 1969, *Philarius condi* Marin, 2012, *Platypontonia hyotis* Hipeau-Jacquotte, 1971 and *Vir smiti* Fransen et Holthuis, 2007. These records and a review of recently published papers increased the pontoniine shrimps list reported for Vietnam up to 120 species. This paper also describes newly discovered associations between pontoniine shrimps and other marine invertebrates recorded in Nhatrang Bay, Vietnam. So, *Phycomeness sulcatus* (Ďuriš, Horká et Marin, 2008) and *Periclimenes toloensis* Bruce, 1969 were recorded for the first time in association with shallow-water hydroids of the genus *Macrorhynchia* Kirchenpauer, 1872 (Hydrozoa: Leptothecata: Plumulariidae); *Rapipontonia paragalene* Marin, 2007 was firstly collected from shallow-water hydroid of the genus *Sertularia* Linnaeus, 1758 (Hydrozoa: Leptothecata: Sertulariidae); *Neoanchistus cardiodytes* Bruce, 1975 was found for the first time in association with burrowing cardiid shell *Vasticardium flavum subrugosum* (G.B. Sowerby II, 1839) (Mollusca: Bivalvia: Cardiidae); *Zenopontonia rex* (Kemp, 1922) comb. nov. was recorded for the first time from a sea star *Euretaster insignis* (Sladen, 1882) (Echinodermata: Asteroidea: Pterastridae). Additionally, firstly mentioned an unusual association of *Zenopontonia soror* (Nobili, 1904) comb. nov. with large nudibranch of the genus *Ceratosom*a Gray, 1850 (Molluska: Gastropoda: Nudibranchia: Chromodorididae) from Philippines based on photomaterials from internet. Besides, based on morphological features of collected specimens, *Periclimenes imperator* Bruce, 1967 is synonymized with *P. rex* Kemp, 1922 as a junior synonym and is transferred to the genus *Zenopontonia* Bruce, 1975 together with *Periclimenes soror* Nobili, 1904. A new genus, *Isopericlimenaeus* gen. nov., has been suggested for *Periclimenaeus gorgonidarum* (Balss, 1913). Remarks on taxonomic status of *Periclimenes delagoae* Barnard, 1958, *Periclimenes granulimanus* Bruce, 1878, *Periclimenes tonga* Bruce, 1988, *Periclimenes ischiospinosus* Bruce, 1991, *Cuapetes lacertae* (Bruce, 1992) and *Periclimenes nomadophila* Berggren, 1994 are also provided in this paper.

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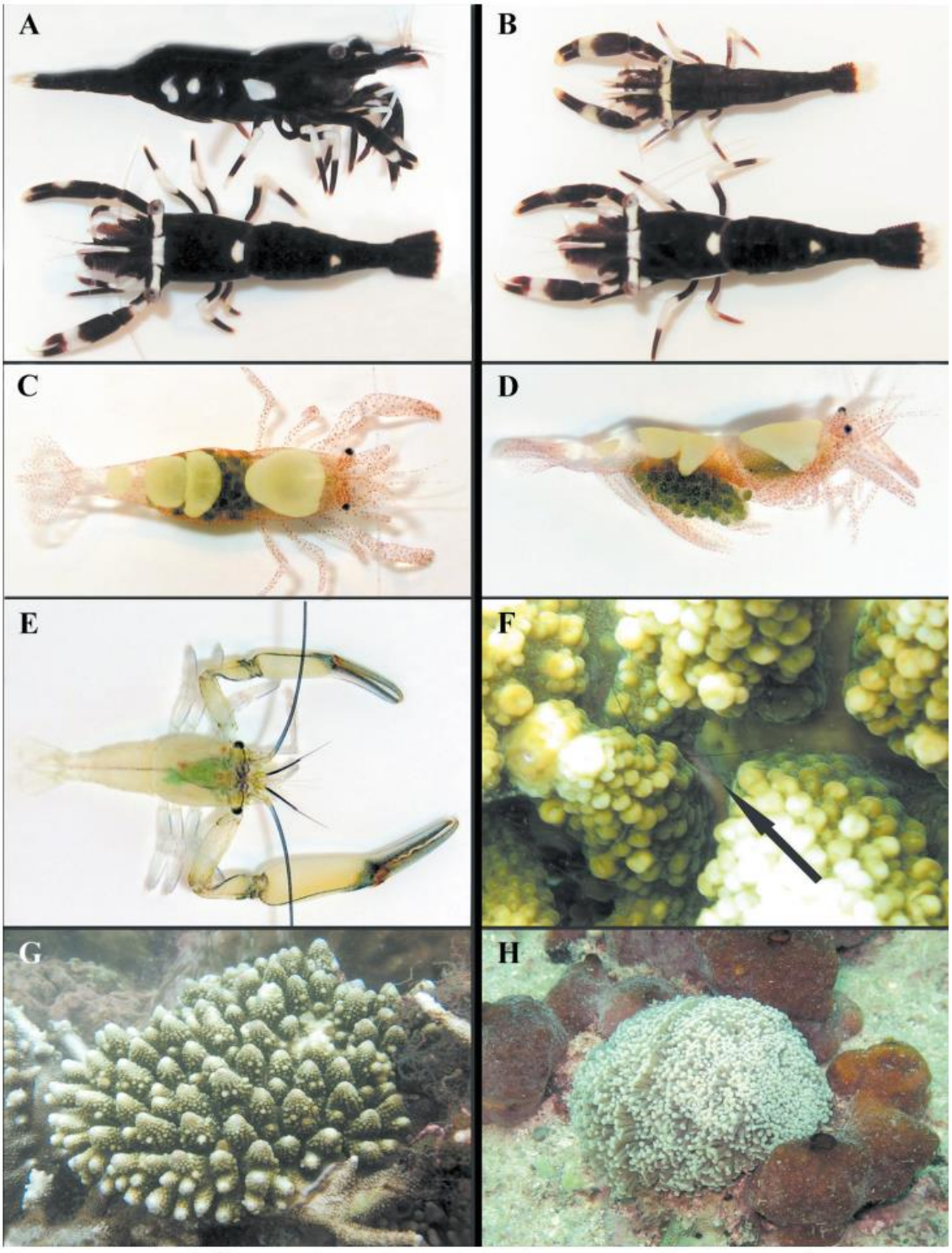

Plate 53. *Laomenes holthuisi* Marin et Okuno, 2010, Nhatrang Bay, Vietnam: **A** – ovigerous female, dorsal and lateral views, **B** – ovigerous female (below) and male (above); *Hamopontonia fungicola* Marin, 2012, Nhatrang Bay, Vietnam, ovigerous female: **C** – dorsal view, **D** – lateral view; *Philarius condi* Marin, 2012, Nhatrang Bay, Vietnam, male: **E** – dorsal view, **F** – same specimen on coral host (arrow); **G** – *Acropora* cf. *gemmifera* (Brook, 1892), Nhatrang Bay, Vietnam – host of *Philarius condi* Marin, 2012; **H** – *Euphyllia glabrescens* (Chamisso et Eysenhardt, 1821) – host for *Hamopontonia fungicola* Marin, 2012, Nhatrang Bay, Vietnam.

CHAPTER 8

Asteroidea of Vietnam with some notes on their symbionts

T.I. Antokhina[1], O.V. Savinkin[1], T.A. Britayev[1]

ABSTRACT. Asteroidea and their symbionts represent an important and diverse, but poorly explored component of the biodiversity of coastal ecosystems of Vietnam. We studied data from 8 years of collecting sea stars and their symbionts by schnorkelling, scuba-diving and trawling in the Bay of Nhatrang and other coastal areas of Vietnam. A total 47 species of asteroids and 24 species of their symbionts have been found. These species of asteroids belong to 13 families, with the most diverse families Ophidiasteridae and Oreasteridae, comprising 15 and 10 species respectively. Two species of asteroids, *Nardoa novaecaledoniae* and *Stellasteropsis colubrinus* are new for the coastal waters of Vietnam. The most diverse groups of symbionts of asteroid were copepods with 8 species (33.3% of all symbiotic species found), polychaetes with 7 species (29.2%) and gastropods with 5 species (20.8%). The other groups – decapods, fishes and ctenophorans, were substantially less diverse and included 1 or 2 species only. Our study revealed a rather rich fauna of asteroids and their symbionts in the coastal waters of Vietnam in comparison to some other areas of the Indo-West Pacific. We suggest that a further increase in the asteroid and their symbionts diversity might be expected from trawling on soft grounds, especially in deeper areas of Vietnamese coast.

The South China Sea (SCS) is located in the Indo-Malayan region and partially belongs to the Coral Triangle, the area recognized as a centre of maximum biodiversity of marine species, especially corals, mollusks and marine fishes [Veron 1994, 1995; Roberts *et al*. 2002; Mora *et al*. 2003; Allen 2002, 2003; Hoeksema 2007]. SCS has a rich echinoderm fauna with close to thousand species known, of which about 12% are endemic [Lane *et al*. 2000]. However echinoderm diversity in the South China Sea probably underestimated since much of this large marine ecosystem remains unexplored. For comparison, in the better studied Australian waters 1154 echinoderm species have been recorded [Rowe, Gates 1995]. Due to the fact that the SCS borders the Coral Triangle and is a partially enclosed basin its fauna is of a special interest for biodiversity research [Lane *et al*. 2000; Ng, Tan 2000].

The recorded number of Asteroidea species in the SCS is 236 of which ~ 24% are endemic [Lane *et al*. 2000; Ho 2002; Chao 2000; Purwati, Lane 2004; Liu *et al*. 2006]. The regional faunas included in the SCS are significantly less diverse. For example, in the coastal waters of Vietnam only 56 species of asteroids have been recorded [Lane *et al*. 2000; Ho 2002]. Our previous paper [Antokhina, Britayev 2012] provided a checklist of 39 asteroids for the Bay of Nhatrang revealed new records for this area and underlined the gaps in our knowledge.

In this extended paper we provided a checklist of Asteroidea of Vietnam based on the material collected in the coastal waters of Vietnam (excluding the Bay of Tonkin) in the

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Plate 61. **A** – *Archaster typicus*, **B** – *Stellaster equestris*, **C** – *Stellasteropsis colubrinus*, **D** – *Asterodiscides elegans*, **E** – *Anthenea aspera*, **F** – *Bothriaster primigenius*, **G** – *Choriaster granulatus*, **H** – *Culcita novaeguineae*.

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

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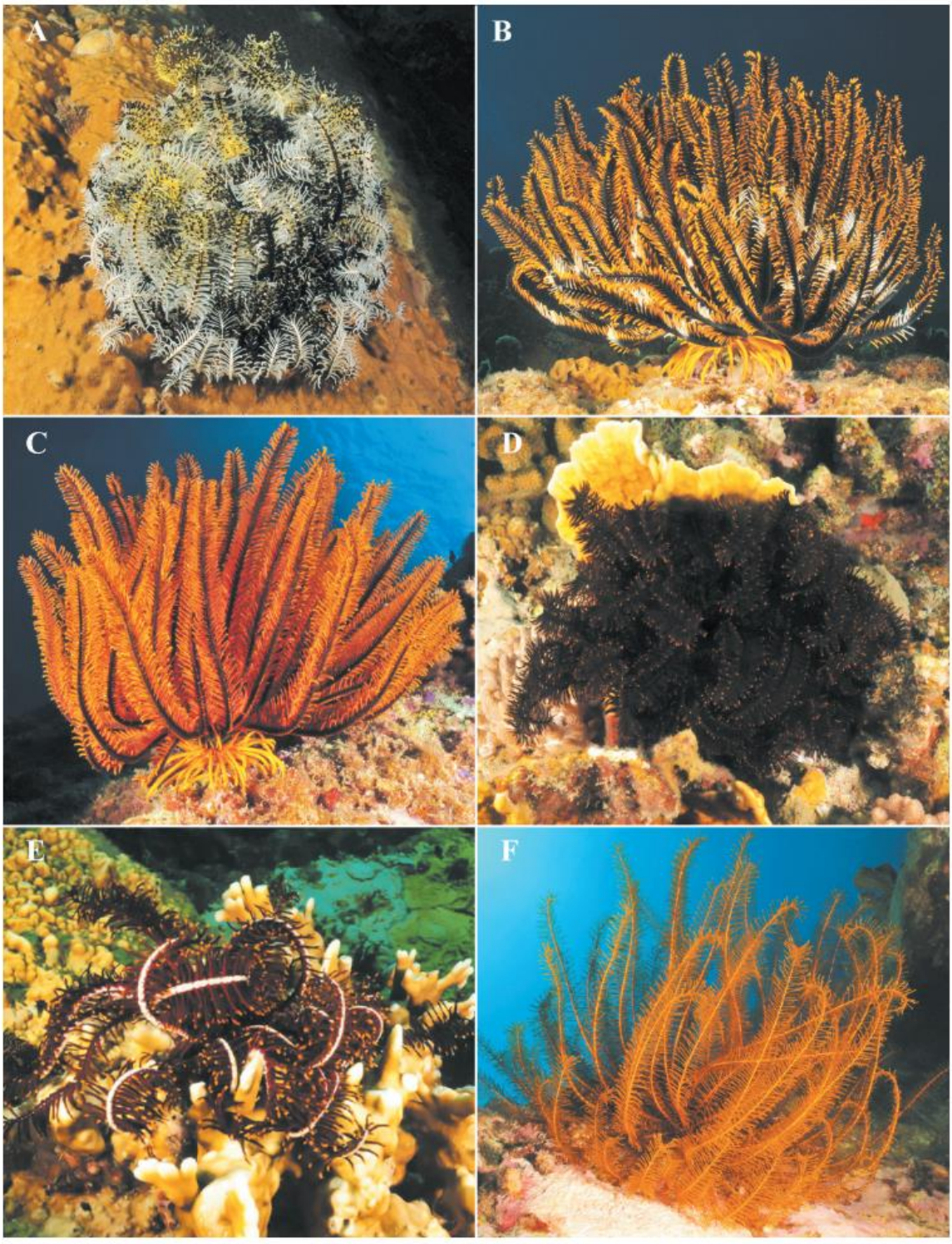

Plate 68. **A** – *Comaster nobilis*, **B** – *Oxycomanthus bennetti*, **C** – *Oxycomanthus* cf. *pinguis*, **D** – *Comatella nigra*, **E** – *Comatella stelligera*, **F** – *Phanogenia gracilis*.