

**THE FAMILY Xenidae (Octocorallia: Malacalcyonacea)  
OF VIETNAM WITH TWO NEW RECORDS**

**Hoang Xuan Ben**

Institute of Oceanography, Vietnam Academy of Science and Technology,  
01 Cau Da, Nha Trang City, Khanh Hoa, Vietnam

Received 19 October 2023; accepted 30 August 2024

**ABSTRACT**

Xenidae is a soft coral family that has contributed to the diversity of tropical coral reef communities, including those found in Southeast Asia. From 50 soft coral samples of the family Xenidae collected from coastal fringing reefs along the coast of central Vietnam, five species have been recorded belonging to two genera, *Xenia* (two species) and *Heteroxenia* (three species). Of five species, two were recorded for the first time in Vietnam are *Xenia novaebritaniae* Ashworth, 1900 and *Heteroxenia elisabethae* K lliker, 1874. An identification key was provided based on colony forms and morphological characters of sclerites for five xeniid corals in Vietnam.

**Keywords:** Xenidae, *Xenia novaebritaniae*, *Heteroxenia elisabethae*, new record, Vietnam.

---

*Citation:* Hoang Xuan Ben, 2024. The family Xenidae (Octocorallia: Malacalcyonacea) of Vietnam with two new records. *Academia Journal of Biology*, 46(3): 103–111. <https://doi.org/10.15625/2615-9023/19149>

\*Corresponding author email: [hxuanben@yahoo.com](mailto:hxuanben@yahoo.com); <https://orcid.org/0000-0003-1487-2208>

## INTRODUCTION

Soft coral (Octocorallia) is one of the main groups contributing to the diversity of tropical coral reef communities. Among 1,200 species belonging to 200 soft coral genera recorded from tropical reefs, about 90 genera belonging to 23 families are found in the Central-West Pacific, Indian Ocean, and the Red Sea (Fabricius & Alderslade, 2001). The Indo-West Pacific is known as the world's center of biodiversity for coral reef ecosystems and the most diverse region for soft coral variety (Dinesen, 1983; Hoeksema & Putra, 2000).

Vietnam is located in the Indo-Pacific region with more than 3,260 km of coastal line and 3,000 islands. The coral reefs in Vietnam are typical fringing reefs distributed along the coast and around the islands. To date, 200 species from 45 genera in 15 families are known in Vietnam (Hoang & Dautova, 2010), of which 94 species in 15 genera and five families were recorded in Nha Trang Bay (Tixier-Durivault, 1970). Of these, *Sclerophytum* is the most diverse genus, with 38 species, followed by *Lobophytum* (15 species) and *Sarcophyton* (9 species). Malyutin (1990) reported two soft coral species *Sclerophytum mammifera* and *Sclerophytum laminilobata* collected at Con Dao Islands were also added to the list of coral in Vietnam. However, recent studies suggest that the number of soft coral genera and species in Vietnam can be much higher, there were 15 soft coral species belonging to two genera *Sclerophytum* and *Sarcophyton* collected at Nha Trang Bay were new records for the South China Sea (Dautova & Savinkin, 2009, 2013; Dautova et al., 2010). Recently, Hoang et al. (2023) reported the occurrence of *Sarcophyton cherbonnieri* from Vietnam and extended the distributional region of this species in the South China Sea. In this paper, we want to contribute knowledge on the diversity and distribution of xeniid corals in Vietnam based on samples collected in the central part of the country.

## MATERIALS AND METHODS

### Sample collection

A total of 50 samples of the family Xenidae were collected by using SCUBA at 1 m to 15 m deep on the reefs at Quang Ngai, Binh Dinh, Phu Yen, Nha Trang, Cam Ranh, and Ninh Thuan provinces were located in central Vietnam (Fig. 1). Samples were *in situ* photographed, measured the colony size, checking the presence of pulsation and siphonozooid, the color of the colony, substrata and recorded water depth. The samples were fixed in formalin 4%, rinsed with fresh water after 24 h, and transferred into ethanol 70% for further study.

### Identification

In the laboratory, morphological characteristics were measured or counted by using a dissecting microscope (Accu-scope EXC-350; USA) including colony size; length and width of stalk, polyp, tentacle, and pinnule; number of rows of pinnules along tentacles, number of pinnules in the outermost row.

To measure sclerites, the tissue of the polyps and colony base was inspected separately after dissolving the organic matter in 10% sodium hypochlorite, 20–30 sclerites were chosen and measured to the nearest 0.001 mm under a microscope at magnifications of  $\times 40$ ,  $\times 100$  and  $\times 400$  (the range values of sclerites diameters: length  $\times$  width in mm), maximal diameter and shape of sclerites were measured if present. The sclerites were rinsed with distilled water and dried at room temperature for the Scanning Electron Microscope (SEM) with setting S-4800, accelerating Voltage at 10 kV, and magnification for each sclerite type. The identification of samples refers following Roxas (1933), Reinicke (1997), Alderslade (2000), Halász et al. (2013, 2019).

All samples were kept at the Museum of Oceanography (Nha Trang, Vietnam) with taxonomic vouchers and reference materials (collector name, depth, substrata,...). Additionally, Xeniid species samples collected in 1954 and identified by Tixier-

Durivault (1970) were checked to verify her collection of the Vietnam Museum of Oceanography in Nha Trang. Identification of xeniid species in the

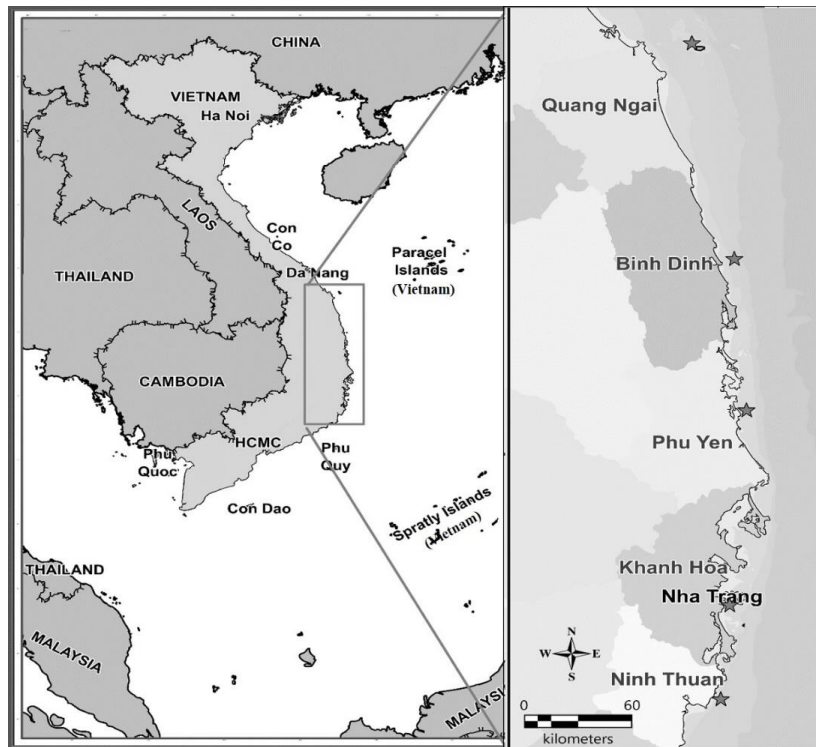


Figure 1. The sampling areas (indicated by stars) of the family Xeniidae in central Vietnam

## RESULTS

### Diversity and distribution

The present results recorded five species belonging to two genera of Xeniidae (Table 1). The *Xenia* genus has two species, three species of *Heteroxenia* were found in central Vietnam. Two species, *Heteroxenia elisabethae* and *Xenia lilliae* were common found in Quang

Ngai, Binh Dinh, Phu Yen, Nha Trang, Cam Ranh, and Ninh Thuan provinces while *Heteroxenia mindorensis* was only recorded in Nha Trang Bay. Three species *Xenia lilliae*, *Heteroxenia medioensis* and *Heteroxenia mindorensis* previously identified in Nha Trang were also found in our survey (Tixier-Durivault, 1970).

Table 1. List of xeniid species in Central Vietnam

Genus	Species	Location					
		1	2	3	4	5	6
<i>Xenia</i> Lamarck, 1816	<i>Xenia lilliae</i> Roxas, 1933	+	+	+	+	+	+
	<i>Xenia novaebritaniae</i> * Ashworth, 1900	+			+		
<i>Heteroxenia</i> K�lliker, 1874	<i>Heteroxenia elisabethae</i> * K�lliker, 1874	+	+	+	+	+	+
	<i>Heteroxenia medioensis</i> Roxas, 1933				+		+
	<i>Heteroxenia mindorensis</i> Roxas, 1933				+		
Total	2	3	2	2	5	2	3

Notes: 1: Quang Ngai; 2: Binh Dinh; 3: Phu Yen; 4: Nha Trang; 5: Cam Ranh; 6: Ninh Thuan; \*: New record for Vietnam.

**Systematic part****Order Malacalcyonacea McFadden, van Ofwegen & Quattrini, 2022****Family Xeniidae Ehrenberg, 1828**

The xeniids are mostly small, soft and often slimy, stoloniferous to membranous, lobate, or upright with a cylindrical stalk, sometimes sparsely branched and delicate colonies. Siphonozooids, if present, developed

in mature colonies at least during some periods of their life, some species have pulsating polyps. Polyps were usually non-retractile and only slightly contractile, but occasionally highly contractile or (rarely) retractile. Tentacles with pinnules in multiple rows along each side; sclerites, if present, minute roundish or oval disc or corpuscles or flattened rod; Zooxanthellate (McFadden et al., 2022).

**Key to the species of *Xenia* and *Heteroxenia* in Vietnam**

1. Lobes capitate, polyps concentrated in well-defined capitulum. The sclerites are ellipsoid platelets, mostly up to 0.025 mm in maximal diameter. The capitulum is not covered with siphonozooids between the autozooids.....*Xenia*
  - 1.1. Two rows of pinnules on each side of the tentacles, 10–12 pinnules in the outermost row.....*X. lillieae*
  - 1.2. Three rows of pinnules on each side of the tentacles, 10–12 pinnules in the outermost row.....*X. novaebritanniae*
2. Lobes capitate, polyps concentrated in well-defined capitulum. The capitulum covered with siphonozooids between the autozooids at least during breeding season.....*Heteroxenia*
  - 2.1. Two rows of pinnules on each side of the tentacles, 14–18 pinnules in the outermost row.....*H. medioensis*
  - 2.2. Three rows of pinnules on each side of the tentacles, 20–24 pinnules in the outermost row.....*H. mindorensis*
  - 2.3. Three or four rows of pinnules on each side of the tentacles, 16–24 pinnules in the outermost row.....*H. elisabethae*

**Genus *Xenia* Lamarck, 1816**

**Diagnosis:** Colonies are small and soft with cylindrical stalks, lobes capitate, polyps concentrated in well-defined capitulum, not retractile and always monomorphic. The sclerites are ellipsoid platelets, mostly up to 0.025 mm in maximal diameter and abundant in all parts of the colony. The capitulum is not covered with siphonozooids between the autozooids (Halász et al., 2019).

***Xenia novaebritanniae* Ashworth, 1900**

**Material examined:** The samples were collected at Tro Hon (15°22'12.0"N, 109°8'30.9"E), Tam Toa (15°22'8.8"N, 109°7'32.1"E) in Quang Ngai; Hon Noi (12°2'09.5"N, 109°19'13.9"E) in Nha Trang.

**Description:** small to medium size, about 20–30 mm in total height and 30

diameters (Fig. 2B). The polyp short up to 5–7 mm (including the tentacles). The pinnules short and stout with three rows each side tentacle, 10–12 (sometimes 13) number of pinnules in the outer row. The sclerite small, 0.01–0.022 × 0.01–0.016 mm (Fig. 3B).

**Distribution:** El-Tûr, Ras Tanaka (Gulf of Suez), Ras Atantur, Dahab (Gulf of Aqaba), New Caledonia, Great Barrier Reef, Talili bay, New Britain, Loyalty Islands (Papua New Guinea), Malay Archipelago, Mindoro (Philippines) (Reinicke, 1997), and Vietnam (Quang Ngai, Nha Trang). This species is the first record for Vietnam.

**Genus *Heteroxenia* Kölliker, 1874**

**Diagnosis:** Lobes capitate, polyps concentrated in the well-defined capitulum.

The capitulum is covered with siphonozooids least during some periods of their life (Roxas, 1933; Gohar, 1940).  
between the autozooids in mature colonies at

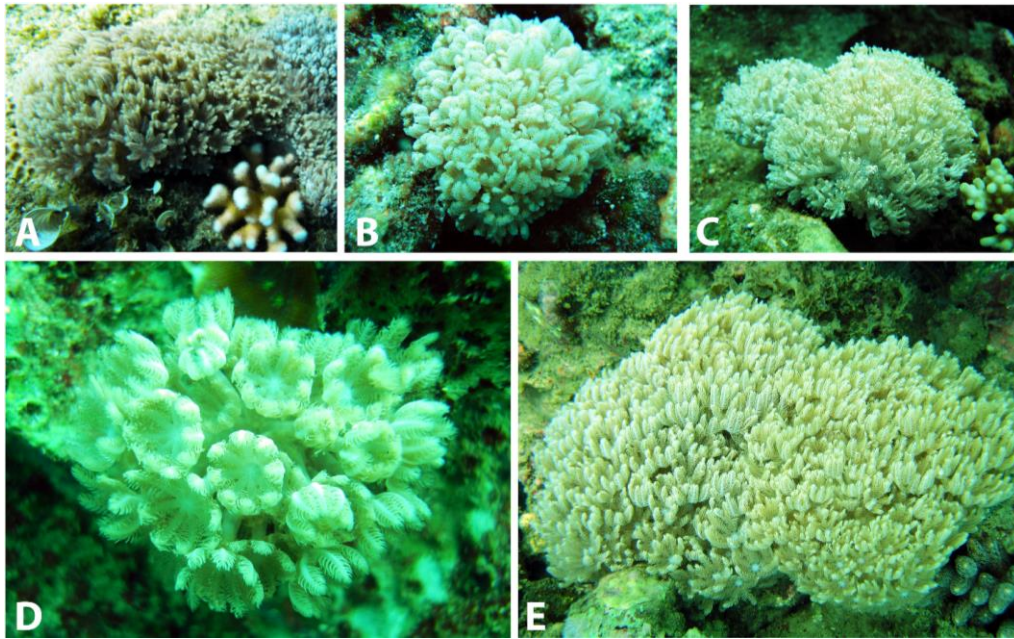


Figure 2. Underwater photographs of Xeniid soft coral: (A) *Xenia lillieae*; (B) *Xenia novaebritaniae*; (C) *Heteroxenia medioensis*; (D) *Heteroxenia mindorensis*; (E) *Heteroxenia elisabethae*

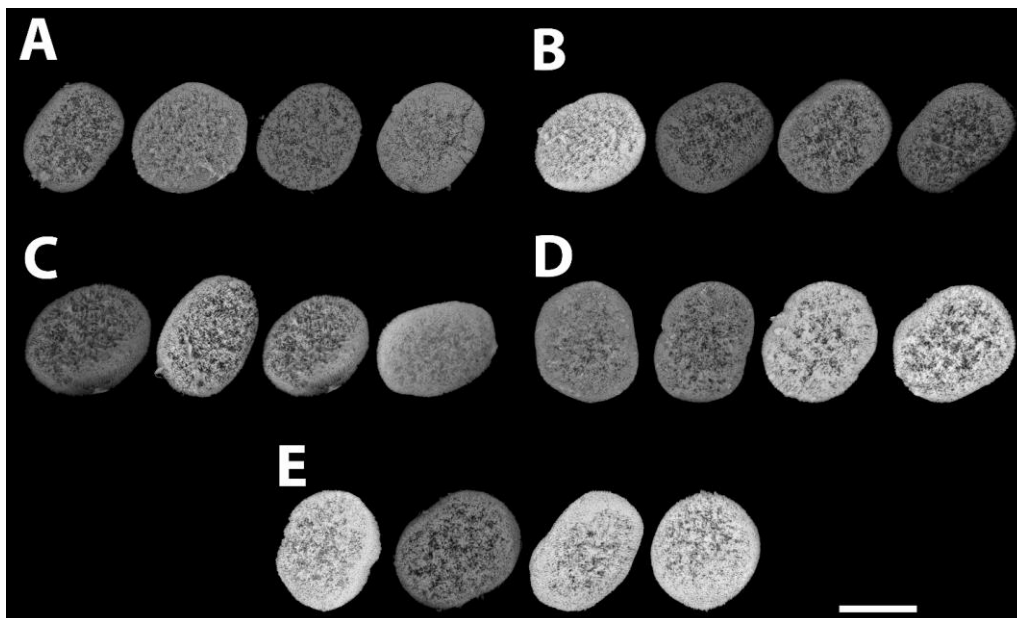


Figure 3. Scanning electron micrographs of sclerites: (A) *Xenia lillieae*; (B) *Xenia novaebritaniae*; (C) *Heteroxenia medioensis*; (D) *Heteroxenia mindorensis*; (E) *Heteroxenia elisabethae*. Scale bar: 10 µm

***Heteroxenia elisabethae* Kölliker, 1874**

**Material examined:** the samples were collected at Tam Toa (15°22'8.8"N, 109°7'32.1"E) in Quang Ngai; Hon Kho (13°45'47.5"N, 109°17'52.8"E) in Binh Dinh; Hon Dua (13°10'04.8"N, 109°19'09.4"E) and Vung La (13°24'43.4"N, 109°18'12.2"E) in Phu Yen; Hon Noi (12°2'09.5"N, 109°19'13.9"E) in Nha Trang; Bai Chuong (11°49'59.5"N, 109°10'53.6"E) in Cam Ranh; Mui Do (11°33'45.9"N, 109°07'43.9"E) and Bo Doi (11°48'34.2"N, 109°11'32.7"E) in Ninh Thuan.

**Description:** small to medium size, reaching 10–30 mm in total height and pulsation (Fig. 2E), light brown to cream in color; the capitulum covered with siphonozooids between which the autozooids rise; the tentacles short 0.2–0.3 mm wide and 4–5 mm long, each side tentacle with 3 or 4 rows with 16–24 pinnules in the outer row. The sclerites small platelet-shaped, 0.018–0.024 × 0.012–0.016 mm diameter (Fig. 3E).

**Distribution:** This species is found in Port Denison (Queensland, Australia), Nosy Bé (Madagascar), Formosa (Taiwan), Mindoro (Philippines), Lembah Strait (Indonesia), Miyazaki (Japan) Palao (Caroline islands), Red Sea (Gulf of Suez and Gulf of Aqaba), Seychelles Island (Western Indian Ocean), East Africa (Indian Ocean) (Reinicke, 1997), and Vietnam (Quang Ngai, Binh Dinh, Phu Yen, Nha Trang, Cam Ranh, Ninh Thuan provinces). This species was a new record for Vietnam.

**DISCUSSION**

A review of published works on Xenidiids found that the Philippines has the most diversity, with 41 species, followed by the Red Sea (34 species), Lembah (Indonesia) (29 species) and Japan (17 species) (Roxas, 1933; Janes, 2008; Catherine et al., 2014). In this study, we identified five species from two genera of the family Xenidiidae in central Vietnam, our findings revealed 2 new record species from a total of 50 soft coral samples, more than doubling the number of species previously identified in Vietnam. It was

suggested that collecting more specimens and expanding investigations could result in more new record xenidiids species from coastal fringing reefs along the coast of central Vietnam, including the combination of morphological taxonomy and molecular biology.

Phylogenetic analysis of 28S rDNA supported that *Xenia lilliae* grouped in a clade with *Heteroxenia mindorensis*, *Heteroxenia fuscescens*, *Heteroxenia elisabethae* and *Xenia puertogalerae* (Catherine et al., 2014). However, the key to *Heteroxenia* and *Xenia* is considerably different due to the present or absent siphonozooids between the autozooids. *Xenia puertogalerae* distinguishes from *Xenia lilliae* in having variations of fifteen to seventeen pinnules in a row (Roxas, 1933). Our collecting samples found all areas in central Vietnam, which indicated that *Xenia lilliae* species is commonly found in central Vietnam.

*Xenia garciae*, *Xenia novaebritanniae*, *Xenia miniata*, and *Xenia crassa* have tentacles with three rows of pinnules and six to twelve pinnules in the outer row. However, four species can be recognized by the size of colonies and sclerites. *Xenia garciae* has tiny colonies about 10 mm in height and diameter, the sclerites of *Xenia miniata* range in size from 0.033 to 0.055 mm, and *Xenia crassa* sclerites have crests on their surface (Reinicke, 1995, 1997; Halász et al., 2019). In this study, the colonies of *Xenia novaebritanniae* are medium size up to 30 mm, and sclerites reach up to only 0.022 mm with missing crests and the studying samples are not much different from Reinicke's description (Table 2). Moreover, *Xenia novaebritanniae* also found in the Philippines (Roxas, 1933) verified the presence of this species in Vietnam.

*Heteroxenia medioensis* and *Heteroxenia mindorensis* species were first described in the Philippines by Roxas, referring to *H. medioensis* specimens collected from Mindoro with characters as two or three rows of pinnules (Roxas, 1933) while our samples have only two rows. However, the number of pinnules in studying samples of *Heteroxenia medioensis* matches well with 20–24 pinnules

in the outer row found in Roxas's samples (Roxas, 1933). The distinction of *Heteroxenia mindorensis* and *Heteroxenia medioensis* by the maximum size of sclerites and the number of pinnules in the outer row ( $0.024 \times 0.014$  vs.  $0.027 \times 0.018$  and 14–18 vs. 20–24, respectively).

*Heteroxenia elisabethae* has a variation of rows per side tentacle and pinnules in the outer row. In our specimens, we counted 6/8 samples with three rows and the rest with four rows per side tentacle. Moreover, the number of pinnules varies not only along with polyps but also between colonies, the majority of our samples were 16–18 pinnules, followed by 18–20 and finally 20–24 on the outside row (Table 2). A variation of rows per side tentacle and pinnules in the outer row of this species was also observed in some areas, from 16 to 23 pinnules found in the Rea Sea (Reinicke, 1997), 18–23 pinnules in Western Indian Ocean, Philippines and Indonesia with the pinnules in the outer row up to 26 (Roxas,

1933; Janes, 2008; McFadden et al., 2014) (Table 2). The colony reaches from small to medium size about 35–50 mm in total height (Fig. 2G). The color of the colony is brown; pulsation was regularly observed. The materials collected in the present study are 10–15 mm wide at the base of the stalk and split into two or three branches (Fig. 2E). The tentacle of polyp is up to 4–5 mm long with three rows along each side tentacle, 14–18 number of pinnules in the outer row. The sclerites are round or oval and measure from  $0.025\text{--}0.043 \times 0.016\text{--}0.025$  mm (Fig. 3E). Moreover, McFadden et al. (2014) revealed that the phylogenetic tree of the family Xeniidæ based on analysis of 28S rDNA only supported the monophyly of three *Heteroxenia* species but not that of *Heteroxenia elisabethae* species. However, more materials for morphological taxonomy and molecular analyses could be useful to confirm the *Heteroxenia elisabethae* species present in Vietnam.

Table 2. Comparison of morphological characteristics variations of *Xenia novaebritanniae* Ashworth, 1900 and *Heteroxenia elisabethae* K lliker, 1874

Main characters	<i>Heteroxenia elisabethae</i> K�lliker, 1874	<i>Xenia novaebritanniae</i> Ashworth, 1900
Colonies size (mm)	Up to 33 (Roxas, 1933) 25–45 (Reinicke, 1997) Up to 30 (Janes, 2008) 10–30 (This study)	20–30 (Reinicke, 1997) 20–30 (This study)
Pinnules of row	3 (Roxas, 1933) 3–4 (Reinicke, 1997) 3–4 (Janes, 2008) 3–4 (McFadden et al., 2014) 3–4 (This study)	3 (Reinicke, 1997) 3 (This study)
Pinnules in outer row	16–18 (Roxas, 1933) 16–24 (Reinicke, 1997) 18–23 (Janes, 2008) 18–26 (McFadden et al., 2014) 16–24 (This study)	10–12 (Reinicke, 1997) 10–13 (This study)
The sclerites size (mm)	$0.019\text{--}0.024 \times 0.01\text{--}0.015$ (Reinicke, 1997) $0.014\text{--}0.019 \times 0.016\text{--}0.022$ (Janes, 2008) $0.015\text{--}0.022 \times 0.018\text{--}0.025$ (McFadden et al., 2014) $0.018\text{--}0.024 \times 0.012\text{--}0.016$ (This study)	$0.020\text{--}0.022 \times 0.015\text{--}0.018$ (Reinicke, 1997) $0.018\text{--}0.022 \times 0.01\text{--}0.016$ (This study)



## CONCLUSION

The current research found five Xeniid species from two genera *Xenia* and *Heteroxenia* with two new Vietnam records. This present study not only contributed to our knowledge of Xeniid soft coral diversity in Vietnam but also revealed their valuable biodiversity, distribution and relationship of Octocorallia fauna at Indo-Pacific reefs.

**Acknowledgements:** The authors thank Mr. Mai Xuan Dat, Tran Van Binh and Mr. Phan Minh Thu for their assistance with SEM sclerites imaging and figures; Dr. Götz Reinicke for checking the Xeniid specimens and his helpful suggestions that improved the quality of the manuscript. This research was funded by the project of the Vietnam Academy of Science and Technology, grant no. TDDTMT.01/24–26.

## REFERENCES

- Alderslade P., 2000. Four new genera of soft corals (Coelenterata: Octocorallia) with notes on the classification of some established taxa. *Zoo Med Leiden*, 74(16): 237–249.
- Dautova T. N & Savinkin O. V., 2009. New data on soft coral from Nha Trang Bay. *Zootaxa*, 2027: 1–27.
- Dautova T. N., Savinkin O. V., 2013. Octocorallia: Alcyoniidae. Benthic fauna of the bay of Nha Trang, Southern Vietnam, (Moscow KMK), pp. 271.
- Dautova T. N., Van Ofwegen L. P., Savinkin O. V., 2010. New species of the genus *Sinularia* (Octocorallia: Alcyonacea) from Nha Trang Bay, South China Sea, Vietnam. *Zool Med Leiden*, 84(5): 47–91.
- Dinesen Z. D., 1983. Patterns in the distribution of soft corals across the central Great Barrier Reef. *Coral Reefs*, 1(4): 29–36.
- Fabricius K. F., Alderslade P., 2001. Soft corals and sea fans: A comprehensive guide to the tropical shallow water genera of the central-west Pacific, the Indian Ocean and the Red Sea. *Australian Institute of Marine Science, Townsville*, pp. 264.
- Gohar H. A., 1940. Studies on the Xeniiidae of the Red Sea. Their ecology, physiology, taxonomy and phylogeny. *Pub Mar Biol Station Ghardaqa, Egypt*, 2: 27–118.
- Halász A., McFadden C. S., Aharonovich D., Toonen R., Benayahu Y., 2013. A revision of the octocoral genus *Ovabunda* (Alderslade, 2001) (Anthozoa, Octocorallia, Xeniiidae). *ZooKeys*, 373: 1–41. <http://doi.org/10.3897/zookeys.373.6511>
- Halász A., McFadden C. S., Toonen R., Benayahu Y., 2019. Re-description of type material of *Xenia* Lamarck, 1816 (Octocorallia: Xeniiidae). *Zootaxa*, 4652(2): 201–239. <https://doi.org/10.11646/zootaxa.4652.2.1>
- Hoang X. B., Dautova T. N., 2010. Diversity of soft corals (Alcyonacea) in Vietnam. International Conference Marine Biodiversity of East Asian Sea: Status, Challenges and Sustainable Development: 82–87.
- Hoang X. B., Dautova T. N., 2010. Soft corals (Otocorallia: Alcyonacea) in Ly Son Island, the central of Vietnam. *Vietnam Journal of Marine Science and Technology*, 10(4): 39–49.
- Hoang X. B., Thai M. Q., Nguyen X. V., Dao V. H., 2023. Morphological Observations Reveal New Record of *Sarcophyton cherbonnieri* Tixier-Durivault, 1958 (Octocorallia: Alcyonacea: Alcyoniidae) in Vietnam. *Natl. Acad. Sci. Lett.*, <https://doi.org/10.1007/s40009-023-01302-2>
- Hoeksema B. W., Putra K. S., 2000. The reef coral fauna of Bali in the center of marine diversity. *Proceedings 9<sup>th</sup> International Coral Reef Symposium Bali Indonesia*, 1: 173–178.
- Janes M. P., 2008. A study of the Xeniiidae (Octocorallia, Alcyonacea) collected on the “Tyro” expedition to the Seychelles with a description of a new genus and species. *Zool. Med. Leiden*, 82(49): 599–626.



- Janes M. P., McFadden C. S., Chanmethakul T., 2014. A new species of *Ovabunda* (Octocorallia, XenIIDae) from the Andaman Sea, Thailand with notes on the biogeography of this genus. *ZooKeys*, 431: 1–17. <http://doi.org/10.3897/zookeys.431.7751>
- Malyutin A. N., 1990. Two new species of *Sinularia* (Octocorallia: Alcyonacea) from South Vietnam. *Asian Mar Bio*, 7: 9–14.
- McFadden C. S., Reynolds, A. M., Janes M. P., 2014. DNA barcoding of xeniid soft corals (Octocorallia: Alcyonacea: XenIIDae) from Indonesia: Species richness and phylogenetic relationships. *Syst Bio.*: 1–11. <http://dx.doi.org/10.1080/14772000.2014.902866>
- McFadden S. C., Gonzalez A., Imada R., Shi S.S., Prudence Hong P., Merrick Ekins M., Benayahu Y., 2019. Molecular operational taxonomic units reveal restricted geographic ranges and regional endemism in the Indo-Pacific octocoral family XenIIDae. *Journal of Biogeography*: 1–15.
- McFadden C. S., van Ofwegen L. P., & Quattrini A. M., 2022. Revisionary systematics of Octocorallia (Cnidaria: Anthozoa) guided by phylogenomics. *Bull Soci Syst Bio*, 1(3). <https://doi.org/10.18061/bssb.v1i3.8735>
- Reinicke G. B., 1995. XenIIDae des Roten Meeres (Octocorallia, Alcyonacea). *Beiträge zur Systematik und Ökologie, Essener Ökologische Schriften Germany*, 6: 1–168.
- Reinicke G.B., 1997. XenIIDae (Coelenterate: Octocorallia) of the Red Sea, with descriptions of six new species of *Xenia*. *Fauna Saudi Arab*, 16: 5–62.
- Roxas H. A., 1933. Philippine Alcyonacea: Families Cornularia and XenIIDae. *The Philippine J Sci.*, 50 (1): 49–110.
- Tixier-Durivault A., 1970. Les Octocoralliaires de Nha Trang (Vietnam). *Cahiers du Pacifique*, 14: 115–236.
- Verseveldt J., 1971. Octocorallia from the north-western Madagascars (Part 2), *Zool Verhand*, 117: 1–73.