



Research article

Hebridae, Gelastocoridae, and Mesoveliidae (Hemiptera: Heteroptera) from mangrove areas in Thailand

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Abstract

Importance of the work: This is the first report of the family Gelastocoridae from a mangrove area in Thailand, providing a new country record for species and the family.

Objectives: Providing a taxonomic list and distributions of Hebridae, Gelastocoridae, and Mesoveliidae in Thai mangroves.

Materials and Methods: In total, 150 specimens were collected of the Hebridae, Gelastocoridae and Mesoveliidae from 24 localities during 2013–2024 in coastal mangrove areas of the Gulf of Thailand and the Andaman Sea using sweeping and hand-picking methods.

Results: Specimens of *Hebrus nereis* (Polhemus and Polhemus, 1989) were collected from muddy margins of small streams and emergent rocks in mangrove forests in South Thailand. Three species of Mesoveliidae (*Mesovelis vittigera* Horvath, 1895, *Mesovelis* sp. and *Nerevelia murphyi* Polhemus and Polhemus, 1989) were collected. Female specimens of *Mesovelis* were reported from several mangroves in Central Thailand. One of these females was probably *Mesovelis horvathi* Lundblad, 1933; however, a male specimen is needed to confirm the identification. Specimens of the Mesoveliidae were collected from muddy margins with vegetation or dead logs. *Nerthra macrothorax* (Montrouzier, 1855) was a single species of Gelastocoridae collected among organic matter on a beach in mangroves in South Thailand.

Main finding: A single species of the Hebridae was found restricted to South Thailand, whereas three species of the Mesoveliidae were collected throughout mangrove areas in Thailand. Furthermore, a species of the Gelastocoridae was reported from a single locality.

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Introduction

The Hebridae, Gelastocoridae, and Mesoveliidae are considered as semiaquatic true bugs since most species in these families are found generally along the margins of aquatic systems (Nakthong and Vitheepradit, 2022). Members of the Hebridae are small insects ($\approx 1\text{--}4$ mm) with dark brown coloration, consisting of two subfamilies, nine genera and approximately 200 species (Andersen and Weir, 2021; Chen et al., 2021). In Thailand, 17 species representing 5 genera and 2 subfamilies have been recorded (Vitheepradit, 2008). Most species are found commonly on floating vegetations or soils of marginal mesohabitats, both lentic and lotic, except members of *Nieserius subaquatica* Zettl that were collected from the gravel in streams located in northern and central regions (Vitheepradit, 2008). The Gelastocoridae are large nepomorphans ($\approx 4\text{--}15$ mm) that occur generally in the margins of streams and ponds (Andersen and Weir, 2021; Chen et al., 2021). Biological information is scarce for this family since they are cryptic. Two subfamilies and 100 species are recognized in this family (Andersen and Weir, 2021), however only eight species representing one genus have been reported from Southeast Asia (Kment and Jindra, 2008). Specifically, there is no official report of this family from Thailand. The Mesoveliidae are tiny insects with yellowish-brownish coloration ($\approx 1\text{--}4$ mm), consisting of 2 subfamilies, 11 genera and approximately 40 species (Andersen and Weir, 2021; Chen et al., 2021). Members of this family occur generally in the margins of freshwater and brackish systems (Andersen and Weir, 2021). Four species of the Mesoveliidae have been reported from Thailand (Vitheepradit, 2008; Nakthong and Vitheepradit, 2022).

There are four families of semiaquatic true bugs known to occur in mangrove forests throughout the world: the Gerridae, Hebridae, Mesoveliidae and Veliidae (Cheng, 1976). However, there is only scattered published information on semiaquatic insects in mangrove areas in Southeast Asia scattered, with most taxonomic knowledge based on reviews or new species descriptions of certain taxa (Polhemus and Polhemus, 1989; Yang and Murphy, 2011). In the last several decades, several new species have been described from mangrove areas in Southeast Asia (Polhemus and Polhemus, 1989; Yang and Murphy, 2011). Sole research on semiaquatic true bugs in Thai mangrove areas was conducted by Nakthong and Vitheepradit (2022), which focused on the mangrove areas on the Gulf of Thailand located in eastern and central Thailand, whereas the semiaquatic true bug fauna from coastal mangrove areas on the Andaman Sea remained unexplored. Therefore, the main objective of the

current research was to determine the species assemblages of the semiaquatic true bugs (the Hebridae, Mesoveliidae, Gelastocoridae) in the mangrove fauna of Thailand.

Materials and Methods

The semiaquatic bug specimens were part of an intensive faunistic survey on aquatic and semiaquatic true bugs in Thai coastal mangrove areas located on both the Gulf of Thailand and the Andaman Sea during 2013–2024 (Fig. 1; Table 1). The specimens were obtained using an aquatic D-net and soft forceps. In the margins of mesohabitat, specimens associated with vegetation and dead organic matter were collected based on sweeping an aquatic D-net back and forth across the margin. In each collecting regime, when an aquatic D-net was about one-third full, the organic material was transferred to a white pan where specimens were removed using soft forceps, placed into containers with 80% ethyl alcohol and labelled. Any semiaquatic true bugs found hiding in the crevices of emergent rocks or walking on the ground were collected using soft forceps. Subsequently, specimens were relocated to containers with 80% ethyl alcohol and labelled.

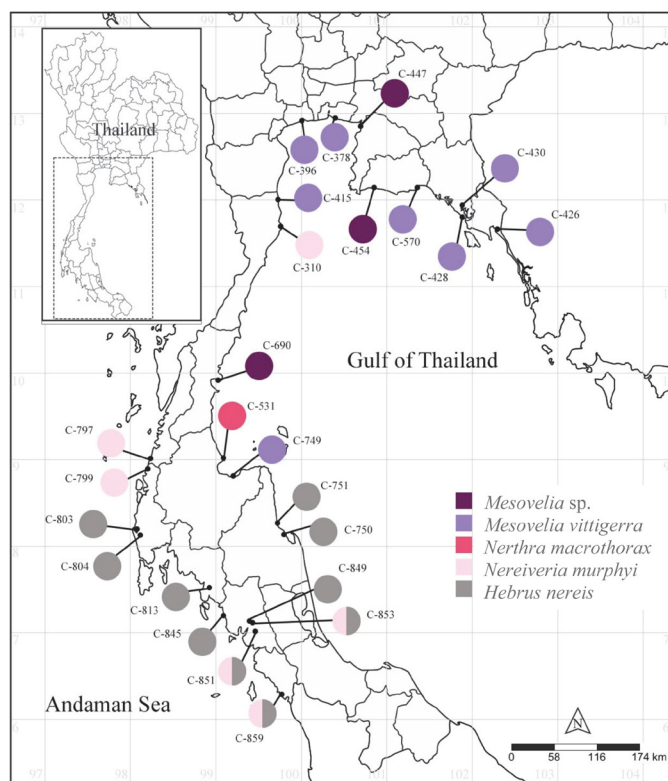


Fig. 1 Map showing sampling sites and species composition of Hebridae, Gelastocoridae and Mesoveliidae in mangrove areas of Thailand. Species are color-coded and C-numbers indicate collection site numbers (see Table 1).

Table 1 Collection site numbers (C-numbers) and locality information for the sampled sites, including collection date, province, location, GPS coordinates, and elevation.

Locality number	Date	Province	Location	GPS coordinates	Elevation (m)
C-310	31 May 2013	Prachuap Khiri Khan	Klong Khao Dang	12°08.317'N 99°57.110'E	no data
C-378	18 February 2016	Samut Prakan	Chulachomklao Fort	13°32.323'N 100°34.885'E	no data
C-396	6 July 2016	Samut Sakhon	Bang Yaphraek	13°29.990'N 100°16.172'E	3
C-415	11 May 2017	Prachuap Khiri Khan	Khao Krai Rat	12°31.209'N 99°58.510'E	3
C-426	7 December 2017	Trat	Ban Tha Ranae	12°11.287'N 102°33.410'E	5
C-428	8 December 2017	Chanthaburi	Leam Ngun	12°25.101'N 102°14.104'E	1
C-430	8 December 2017	Chanthaburi	Ban Tha Sorn	12°22.097'N 102°20.524'E	5
C-447	24 April 2018	Chonburi	Klong Tumru	13°26.370'N 100°58.068'E	no data
C-454	17 October 2018	Rayong	Phra Chedi Klang Nam	12°41.584'N 101°40.500'E	no data
C-531	28 January 2020	Surat Thani	Ban Laem Pho – Laem Krai	09°22.655'N 99°16.447'E	1
C-570	14 October 2020	Rayong	Saphan Rak Samea	12°46.031'N 101°39.237'E	no data
C-690	16 August 2022	Chumphon	Mu Ko Chumphon National Park	10°21.480'N 99°13.750'E	1
C-749	5 February 2023	Surat Thani	Ban Huay Sup	09°14.198'N 99°14.506'E	1
C-750	6 February 2023	Nakhon Si Thammarat	Mangrove Forest Resource Development Station	08°28.044'N 100°03.033'E	1
C-751	6 February 2023	Nakhon Si Thammarat	Hard Thong Khum	07°09.416'N 99°57.668'E	1
C-797	31 October 2023	Ranong	Yan'n wild beach camping	09°25.507'N 98°25.591'E	no data
C-799	1 November 2023	Phang Nga	Kura Buri	09°14.726'N 98°22.987'E	16
C-803	16 December 2023	Phang Nga	Tai Mhuang	08°34.433'N 98°14.843'E	3
C-804	16 December 2023	Phang Nga	Klong Khang Khaw	09°29.621'N 98°16.165'E	3
C-813	20 December 2023	Krabi	Klong Nam Ron	07°53.826'N 99°06.083'E	3
C-849	6 February 2024	Trang	Urban Forest	07°26.595'N 99°37.117'E;	2
C-851	5 May 2024	Trang	Had Sam Ran	07°15.701'N 99°37.910'E	10
C-853	5 May 2024	Trang	Urban Forest	07°26.595'N 99°37.117'E	2
C-859	7 May 2024	Satun	Muang Satun	06°37.442'N 99°59.203'E	17

In total, 61 male specimens and 84 female specimens of semiaquatic true bugs were examined. The specimens were identified to the species level and counted under a stereo microscope using various taxonomic keys (such as Polhemus and Polhemus, 1989; Kment and Jindra, 2008; Yang and Murphy, 2011; Nakthong and Vitheepradit, 2022). Images of representatives from each collected species were made using an Olympus SZX10 microscope attached with a Wireless Digital Imaging Olympus EP50 camera and an Olympus LG-LSLED light source (Olympus; Tokyo, Japan). Then, the images were processed using the Photoshop CS5 software (Adobe Systems Inc.; San Jose, CA USA). Specimens were preserved in 80% ethyl alcohol and deposited in the Entomology Museum (EMKU), Department of Entomology, Kasetsart University, Bangkok, Thailand. All collection data were from locations in Thailand and C-numbers were used in the data collection system in the Systematic and Ecological Entomology Laboratory at Kasetsart University (SEEK Lab), Bangkok, Thailand. The collection co-ordinates were obtained using a global positioning system (GPSmap 62S; Garmin; Olathe, KS, USA) based on the WGS 84 map datum.

Results

Family Hebridae Amyot and Serville, 1843
 Subfamily Hebrinae Amyot and Serville, 1843
 Genus *Hebrus* Curtis, 1833

Hebrus nereis Polhemus and Polhemus, 1989 (Figs. 1, 2A and 3A)

Diagnosis: This species can be recognized by the posterior margin of the pronotum with a median notch and parameres with a median hook in males.

Discussion: This species has been collected from a mud surface and underneath a log in the intertidal zone of mangrove areas in Singapore and Thailand (Polhemus and Polhemus, 1989). More specifically, the specimens were observed running on mud in a mangrove area located in Ranong Province, Thailand (Polhemus and Polhemus, 1989). In the current study, this species was hiding in crevices of emergent rocks in the intertidal zone of mangrove areas in Trang province, Thailand. In addition, specimens were collected from margins near the roots of mangrove trees on small streams inside mangrove forests.

All specimens collected in the current study were submacropterous. Another possible species that may occur in mangrove areas in South Thailand is *Hebrus mangrovensis* Polhemus and Polhemus, 1989 because records of *H. mangrovensis* have been reported from Singapore (Polhemus and Polhemus, 1989).

Material examined: THAILAND—Nakhon Si Thammarat Province: 1 male, Amphur Muang, Mangrove Forest Resource Development Station 44, 6 February 2023, 08°28.044'N 100°03.033'E, 1 m, SEEK team, C-750; 1 male, Amphur Tha Sala, Hard Thong Khum, 6 February 2023, 07°09.416'N 99°57.668'E, 1 m, KU team; C-751; Phang Nga Province: 1 female, Amphur Tai Mhuang, 16 December 2023, 08°34.433'N 98°14.843'E, 3 m, SEEK team, C-803; 1 female,

Amphur Tai Mhuang, Klong Khang Khaw, 16 December 2023, 09°29.621'N 98°16.165'E, 3 m, SEEK team, C-804; Krabi Province: 4 males, Amphur Klong Thom, Klong Nham Ron, 20 December 2023, 07°53.826'N 99°06.083'E, 3 m, SEEK team; C-813; Trang Province: 16 males, 15 females, Amphur Yan Ta Khao, Urban Forest, 6 February 2024, 07°26.595'N 99°37.117'E, 2 m, SEEK team, C-849; 1 male, 1 female, Amphur Had Sam Ran, 5 May 2024, 07°15.701'N 99°37.910'E, 10 m, KU team, C-851; 4 males, 26 females, Amphur Yan Ta Khao, Urban Forest, 5 May 2024, 07°26.595'N 99°37.117'E, 2 m, SEEK team, C-853; Satun Province: 2 males, 1 female, Amphur Muang Satun; 7 May 2024; 06°37.442'N 99°59.203'E; 17 m; SEEK team; C-859.

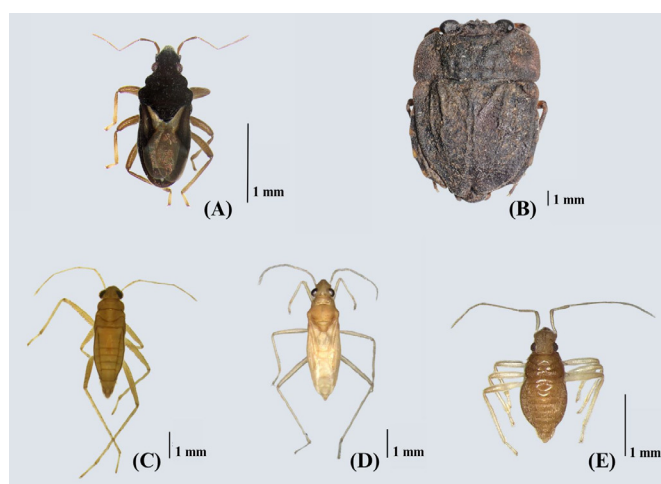


Fig. 2 Habitus of species from mangrove areas in Thailand: (A) *Hebrus nereis*; (B) *Nerthra macrothorax*; (C) *Mesovelvia vittigera*; (D) *Mesovelvia* sp.; (E) *Nereivelia murphyi*.

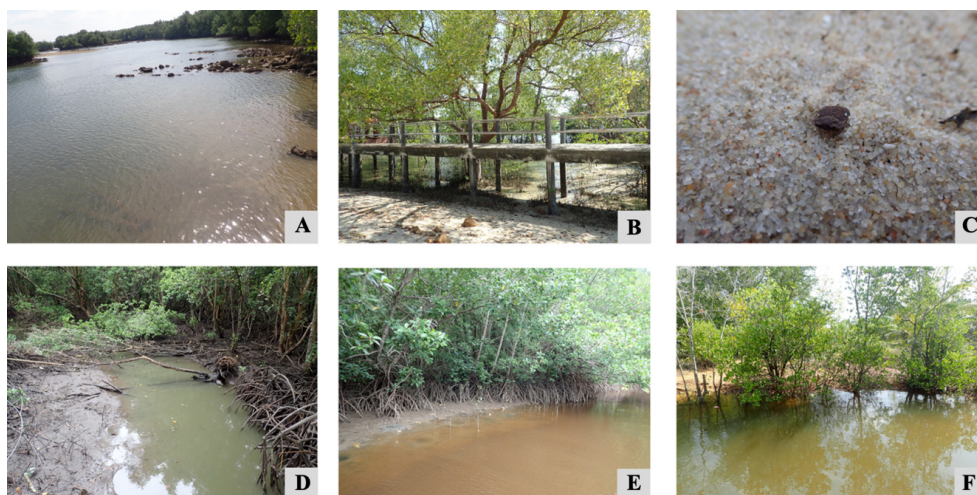


Fig. 3 Representative collection sites/species associations in Thailand: A) Trang Province: Had Sam Ran (C-849)/*Hebrus nereis*; (B and C) Surat Thani Province: Ban Laem Pho-Laem Krai (C-531)/*Nerthra macrothorax*; D) Rayong Province: Saphan Rak Same (C-570)/*Mesovelvia vittigera*; E) Mo Kho Chumphon National Park (C-690)/*Mesovelvia* sp.; F) Satun Province: Muang Satun (C-859)/*Nereivelia murphyi*.

Family Gelastocoridae Kirkaldy, 1897
 Subfamily Nerthrinae Kirkaldy, 1906
 Genus *Nerthra* Say, 18323

Nerthra macrothorax (Montrouzier), 1855 (Figs. 1, 2B, 3B–3C)

Diagnosis: This species can be recognized by the head having median trilobe tubercles and the pronotum with rounded lateral margins.

Discussion: This species is distributed widely from Africa through Australia (Polhemus and Polhemus, 2012). More specifically, records of this species have been reported across the Indian and Pacific oceans (Kment and Jindra, 2008). In Southeast Asia, this species was collected from islands in Indonesia, Malaysia and the Philippines (Kment and Jindra, 2008; Polhemus and Polhemus, 2012; Xie and Liu, 2018). The record of *N. macrothorax* in the current study is not only the first record in Thailand but also the first record on the coast of continental Southeast Asia. In addition, this record represents the first official report of the family Gelastocoridae in Thailand. The specimens in the current study were found under organic debris on a sandy beach in a small mangrove area on the Gulf of Thailand. Similarly, specimens of this species have been found under plant debris or inside logs in other Southeast Asian countries (Kment and Jindra, 2008). Notably, storms and sea currents may play a role of transportation of this species with plant materials from one beach to another (Kment and Jindra, 2008).

Material examined: THAILAND—Surat Thani Province: 2 males, 1 female, Amphur Chaiya, 28 January 2020, 09°22.655'N 99°16.447'E, 1 m, SEEK team, C-531.

Family Mesoveliidae Douglas & Scott, 1867
 Subfamily Mesoveliinae Douglas & Scott, 1867
 Genus *Mesovelia* Douglas & Scott, 1867

Mesovelia vittigera Horvath, 1895 (Figs. 1, 2C and 3D)

Diagnosis: Males of this species can be recognized by the sternite VIII with the single median tuft of dark setae.

Discussion: This species is common and is distributed in the Oriental and Australian regions (Andersen and Weir, 2004; Yang and Murphy, 2011). In Thailand, this species is also common, occurring in a wide range of freshwater habitats (Vitheepradit, 2008). Furthermore, this species has been collected from peat swamps in South Thailand (Sites and Vitheepradit, 2010) and reported from mangrove areas in central and eastern Thailand (Nakthong and

Vitheepradit, 2022). The current study added a record from a mangrove area in South Thailand, indicating that the current known distribution of this species is restricted to the Gulf of Thailand. In Thai mangrove areas, these insects were observed walking on mud and vegetation at the margins in mangrove forests.

Material examined: THAILAND—Samut Prakan Province: 10 males, 11 females, Chulachomklao Fort, 18 February 2016, 13°32.323'N 100°34.885'E, SEEK team, C-378; Samut Sakhon Province: 2 males, 2 females, Amphur Muang, Tumbon Bang Yaphraek, 6 July 2016, 13°29.990'N 100°16.172'E, SEEK team, C-396; Prachuap Khiri Khan Province: 1 male, Amphur Hua Hin, Khao Krai Rat, 11 May 2017, 12°31.209'N 99°58.510'E, 3 m, SEEK team; C-415; Trat Province: 4 males, 3 females, Amphur Muang, Ban Tha Ranae, 7 December 2017, 12°11.287'N 102°33.410'E, 5 m; SEEK team; C-426; Chanthaburi Province: 1 male, Amphur Leam Sing, Tumbon Leam Ngun, 8 December 2017, 12°25.101'N 102°14.104'E, 1 m, SEEK team, C-428; 2 males, 15 females, Amphur Klung, Ban Tha Sorn, 8 December 2017, 12°22.097'N 102°20.524'E, 5 m, SEEK team, C-430; Rayong Province: 1 male, Amphur Klaeng, Saphan Rak Samea, 14 October 2020, 12°46.031'N 101°39.237'E, 1 m, SEEK team, C-570; Surat Thani Province: 1 male, Amphur Phunphin, Ban Huay Sup, 5 February 2023, 09°14.198'N 99°14.506'E, 1 m, SEEK team, C-749.

Mesovelia sp. (Figs. 1, 2D and 3E)

Diagnosis: Females of this genus can be recognized by the elongate body and the head length clearly less than the pronotum length.

Discussion: Male specimens are required for a reliable identification of the *Mesovelia* species that occur in Thailand. In the current study, several female specimens of *Mesovelia* were collected from mangrove areas located in the eastern and southern regions. The records of these specimens have been presented separately from the records of *M. vittigera* due to two important dimensions. First, the record from Chumphon Province extends the southern range of this genus in the mangrove systems in Thailand. Second, there is a possibility of *Mesovelia horvathi* Lundblad occurring in Thai mangrove areas because a female from Chumphon province was keyed to *M. horvathi* based on the dichotomous key of Yang and Murphy (2011). Specimens of *M. horvathi* have been reported from brackish habitats in Malaysia and Singapore (Yang and Murphy, 2011).

Material examined: THAILAND—Chonburi Province: 1 female, Amphur Muang, Klong Tumru, 24 April 2018, 13°26.370'N 100°58.068'E, SEEK team, C-447; Rayong Province:

1 female, Amphur Muang Rayong; Phra Chedi Klang Nam; 17 October 2020; 12°41.584'N 101°40.500'E; SEEK team; C-454; Chumphon Province: 1 female; Amphur Muang Chumphon; Mu Ko Chumphon National Park; 16 August 2022; 10°21.480'N 99°13.750'E; 1 m; KU team; C-690.

Genus *Nereivelia* Polhemus and Polhemus, 1989

Nereivelia murphyi Polhemus and Polhemus, 1989 (Fig. 1, 2E and 3F)

Diagnosis: This species can be recognized by the stout body and the head length longer than the pronotum length.

Discussion: This species has been reported from Singapore and Thailand (Polhemus and Polhemus, 1989; Yang and Murphy, 2011; Nakthong and Vitheepadit, 2022). In Thailand, this species was collected from dead logs in Phetchaburi and Ranong Provinces (Polhemus and Polhemus, 1989; Nakthong and Vitheepadit, 2022). The current study added five records from mangrove areas in the Andaman Sea. Based on the current distribution, this species is more abundant along the Andaman Sea coastline than in the Gulf of Thailand. Specimens in the current study were collected from the muddy margins of small streams in mangrove forests.

Material examined: THAILAND—Prachuap Khiri Khan Province: 1 male, 1 female, Khao Sam Roi Yod NP, Klong Khao Dang, 31 May 2013, 12°08.317'N 99°57.110'E, SEEK team, C-310; Ranong Province: 1 female, Amphur Suk Samran, Yan'n Wild Beach Camping, 31 October 2023, 09°25.507'N 98°25.591'E, SEEK team, C-797; Phang Nga Province: 1 male, Amphur Khura Buri, 1 November 2023, 09°14.726'N 98°22.987'E, 16 m, SEEK team, C-799; 1 female, Amphur Had Sam Ran; 5 May 2024; 07°15.701'N 99°37.910'E; 10 m; KU team; c-851; 1 male; Amphur Yan Ta Khao; Urban Forest; 5 May 2024; 07°26.595'N 99°37.117'E; 2 m; KU team; c-853; Satun Province: 5 males, 1 female; Amphur Muang Satun; 7 May 2024; 06°37.442'N 99°59.203'E; 17 m; KU team; c-859.

Conflict of Interest

The authors declare that there are no conflicts of interest.

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