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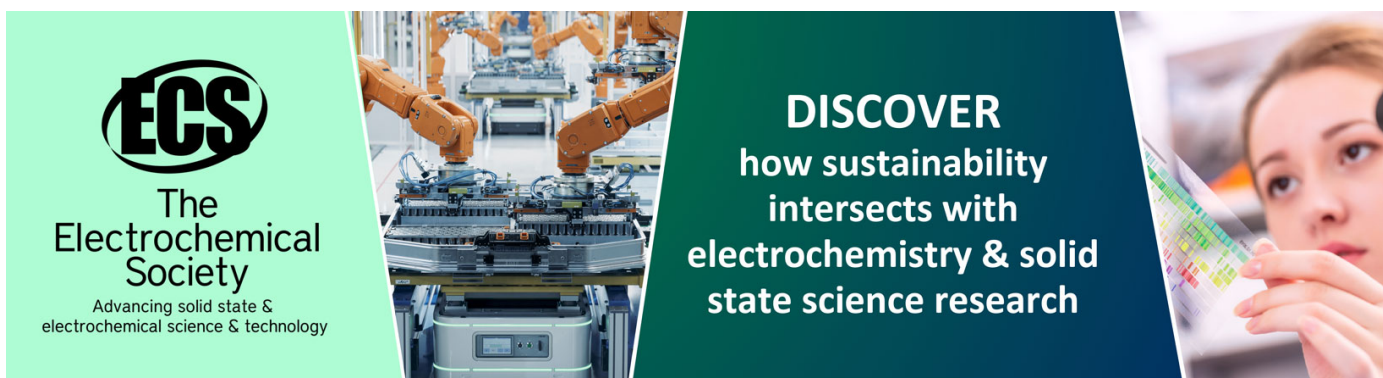
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Diversity of brachyuran crab (Crustacea: Decapoda) in West Coast of North Sumatra, Indonesia

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Abstract. The west coast of Sumatra is a water area with a high potential for fishery products. One of the areas, (i.e., Sibolga City) is a national fishery center in Indonesia. The high productivity of these waters is supported by the presence of keystone species in nature, one of which is the crab (infraorder Brachyura). This study aims to record brachyuran species on the west coast of Sumatra that are still unknown. Sampling was conducted in Central Tapanuli Regency and Sibolga City using convenience sampling. The samples obtained were 50 individuals. Based on the identification, the sample consisted of 22 species belong to 6 families. Fourteen species is first recorded in this region, and five species are new records in Indonesia. **Keywords:** benthos, biodiversity information, Crustacea, intertidal, marine

1. Introduction

The infraorder Brachyura (crab) in Indonesia that has been reported consists of 1400 species [1]. One of these brachyurans was from the western coast of northern Sumatra (24 species) belong to the families Ocypodidae, Matutidae, Grapsidae, Sesarmidae, Varunidae, and Portunidae [2-5]. The species that have been reported, some of which have undergone revision at the genus level; five species of the genus *Uca* was revised into three different genera, namely *Austruca*, *Paraleptuca*, and *Tabuca* [3], while the other species, namely *Portunus minutus* Shen, 1937, also underwent revision to *Lupocycloporus minutus* (Shen, 1937) [2].

Sibolga City located in the west coast of North Sumatra is a national fishery centre. This region and its surroundings have complex marine and coastal ecosystems, as estuaries, bays, and the open sea. In addition, in this area, there was pressured by sedimentation due to land conversion [6, 7]. In the watershed, the rivers flow affects the sedimentation process, that affect the species life. Some crabs move to other places or come in new ones.

This study recorded the brachyuran species on the west coast of North Sumatra. This species list is useful as database of the current condition of the species composition of the Brachyura in this region and also provided for conservation.



2. Materials and methods

Sampling was carried out from 25 September to 05 October 2020 at several locations on the west coast of North Sumatra (figure 1). This study used the convenience sampling method. Sampling was conducted in the intertidal area. Crabs were collected using a hand net and handpicking. The samples were put into a sample bottle and cleaned and preserved. Initially, the sample was preserved in 70% alcohol for 2 - 24 hours and then replaced with 96% alcohol for storage. Documentation is done using the DSLR camera. Crabs were identified at the species level, based on morphological characters [8-17]. In addition, identification also used, namely the Marine Species Identification Portal (speciesidentification.org) and the World Register of Marine Species (www.marinespecies.org).

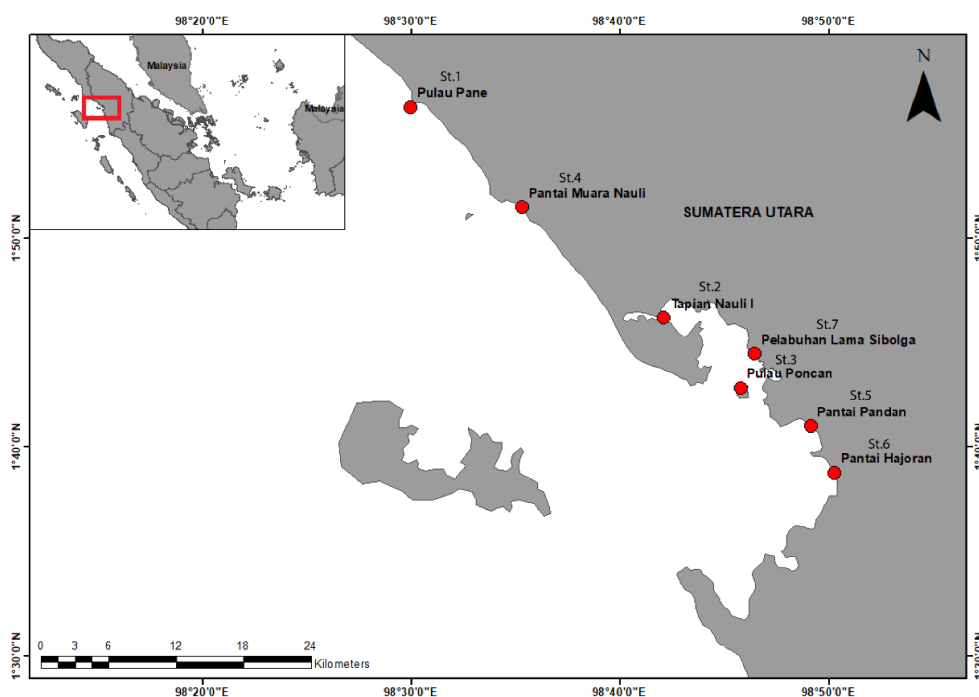


Figure 1. Sampling locations of crabs on the west coast of North Sumatra (Central Tapanuli Regency and Sibolga City). The red dot showed the location site of crabs

3. Results

The results recorded 22 species of Brachyura on the west coast of North Sumatra. The most commonly found species belong to the family Portunidae (table 1, figure 2).

3.1. Genus *Charybdis*

Ordo Decapoda Latreille, 1802

Subordo Pleocyemata Burkenroad, 1963

Superfamili Portunoidea Rafinesque, 1815

Famili Portunidae Rafinesque, 1815

Subfamili Thalamitinae Paulson, 1875

Genus *Charybdis* De Haan, 1833

3.1.1. *Charybdis feriata* (Linnaeus, 1758). Distribution: 1) World: China, Kamboja, Filipina, India, Thailand, Taiwan, Madagascar, Japan, Australia, Spanyol, East Afrika, Madagascar, Hongkong, Malay peninsular, Singapore, Pakistan; 2) Indonesia: Mahakam, Bontang- East Kalimantan, Jambi, Java Island, Langkat Regency, Sibolga City.

Table 1. Species of Brachyura in Central Tapanuli Regency and Sibolga City

Family/Species	n	♂	♀	Location							Distribution	
				St.1	St.2	St.3	St.4	St.5	St.6	St.7	WPP	WPP
											571	572
Portunidae												
<i>Charybdis feriata</i>	2	1	1	1	-	1	-	-	-	-	✓	✓
<i>Charybdis annulata</i> *	2	1	1	-	-	1	-	-	1	-	-	-
<i>Charybdis hellerii</i>	5	4	1	1	-	-	2	1	-	1	✓	✓
<i>Portunus sanguinolentus</i>	3	2	1	1	-	-	-	-	2	-	✓	✓
<i>Portunus trituberculatus</i>	1	1	-	-	-	-	1	-	-	-	✓	-
<i>Portunus pelagicus</i>	4	3	1	-	-	1	-	1	2	-	✓	✓
<i>Thranita prymna</i>	5	3	2	-	-	3	-	-	2	-	✓	-
<i>Thranita crenata</i>	6	4	2	-	-	3	-	1	-	2	✓	✓
<i>Thranita danae</i>	3	2	1	-	-	1	-	-	1	-	-	-
<i>Thalamita quadrilobata</i>	1	1	-	-	-	1	-	-	-	-	✓	-
<i>Thalamita sexlobata</i> *	1	1	-	-	-	-	-	-	-	1	-	-
Xanthidae												
<i>Atergatis dilatatus</i> **	1	1	-	-	-	1	-	-	-	-	-	-
<i>Atergatis integerrimus</i>	1	-	1	-	-	-	1	-	-	-	✓	-
<i>Xanthidae incerta cedis</i>	1	1	-	-	-	-	-	-	-	1	-	-
<i>Epixanthus dentatus</i>	1	1	-	-	-	-	-	-	1	-	-	-
<i>Macromedaeus voeltzkowi</i> **	1	1	-	-	-	1	-	-	-	-	-	-
Grapsidae												
<i>Metopograpsus messor</i>	5	3	2	-	4	1	-	-	-	-	-	✓
<i>Metopograpsus thukuhar</i>	2	1	1	-	2	-	-	-	-	-	✓	✓
<i>Grapsus albolineatus</i>	1	1	-	-	-	1	-	-	-	-	-	✓
Sesarmidae												
<i>Parasesarma plicatum</i>	1	1	-	-	1	-	-	-	-	-	✓	-
Plagusiidae												
<i>Plagusia immaculata</i>	1	1	-	-	-	1	-	-	-	-	-	-
Menippidae												
<i>Menippe rumphii</i> *	2	2	-	2	-	-	-	-	-	-	-	-

n: Total Individuals

St: Station

St. 1, 4, 5: Sandy and muddy substrates

St. 2: Mangroves, muddy substrate

St. 3: Sandy, muddy and rocky substrates

St. 6, 7: Rocky substrate and coral reefs

WPP: Fisheries Management Area

*: reported in Indonesia, but the specific location is unknown

**: new record in Indonesia

The (-) sign on WPP 572 indicates that this species is a new distribution record on the west coast of North Sumatra

3.1.2. *Charybdis annulata* (J. C. Fabricius, 1798). Distribution: 1) World: Madagascar, Mozambik, South Pasifik Ocean, Tanzania, Indo-West-Pasifik: South Africa, East Africa, Pakistan, India, Sri Lanka, Vietnam, China, Indonesia, Singapore, Australia, Japan and Tahiti; 2) Indonesia: the specific location in Indonesia still unknown.

3.1.3. *Charybdis hellerii* (A. Milne-Edwards, 1867). Distribution: 1) World: Mediterranean, East Africa, Red Sea, Persian Gulf, Pakistan, India, Andaman, China, Japan, Malaysia, Singapore, Australia and New Caledonia, Madagascar, Singapore, Vietnam, Palestine, New Caledonia, South Africa, Gulf of Aden, Socotra, South Oman, Persian Gulf, Gulf of Oman, Sri Lanka, Mergui Islands, Andaman Sea, Thailand, Philippines, Mediterranean, Caribbean Coast, Colombia, Florida Atlantic Coast, Brazil; 2) Indonesia: Java Sea, Ambon, Sibolga City, Mimika Papua waters.

3.2. Genus *Portunus*

Subfamily Portuninae Rafinesque, 1815

Genus *Portunus* Weber, 1795

3.2.1. *Portunus sanguinolentus* (Herbst, 1783). Distribution: 1) World: East Africa, Red Sea, Persian Gulf, Gulf of Oman, Arabian Sea, Pakistan, India, Sri Lanka, Andaman Sea, Thailand, Philippines, China, Japan, Australia, New Zealand, Polynesia, France, Hawaii, Thailand, China, Philippines; 2) Indonesia: Indonesian waters.

3.2.2. *Portunus trituberculatus* (Miers, 1876). Distribution: 1) World: Red Sea, Malaysia, China, Korea, Japan, Shanghai; 2) Indonesia: east coast of Sumatra.

3.2.3. *Portunus pelagicus* (Linnaeus, 1758). Distribution: 1) World: Australia, New Caledonia, China, Cambodia, Philippines, India, Malaysia, Singapore, Thailand, Taiwan; 2) Indonesia: Lombok, Ambon, Anambas, Southeast Sulawesi, Lampung, South Sulawesi, Banten Bay, Bontang East Kalimantan, Jepara, Madura Strait, Matasiri, Sibolga City, Langkat Regency, Indonesian waters.

3.3. Genus *Thranita*

Subfamily Thalamitinae Paulson, 1875

Genus *Thranita* Evans, 2018

3.3.1. *Thranita prymna* (Herbst, 1803). Distribution: 1) World: Australia, New Caledonia, China, India, South Africa, Red Sea, Japan, Madagascar, Hong Kong, Malaysia, Singapore, Thailand, Taiwan, New Caledonia, Sudan; 2) Indonesia: Ambon, Wakatobi, Yogyakarta, Central Java, northern Maluku, Sulawesi, Kupang, West Java, Klah-Sabang Island.

3.3.2. *Thranita crenata* (Rüppell, 1830). Distribution: 1) World: New Caledonia, China, Cambodia, Philippines, India, Kenya, South Africa, Madagascar, Red Sea, Persian Gulf, Malaysia, Singapore, Korea, Japan, Australia, Hawaii, Thailand, Taiwan, Vietnam; 2) Indonesia: Ambon, Riau, South Sulawesi, Maluku, Anambas, Banten Bay, Kuta Bay Lombok, South Lombok, Bontang East Kalimantan, Lampung, Central Java, Matasiri, Aru Islands, Flores Sea, Sumbawa, Klah-Sabang Island, Tikus Island- Seribu Islands, Indonesian waters.

3.3.3. *Thranita danae* (Stimpson, 1858). Distribution: 1) World: Mozambique west to the Red Sea, Japan, Marshall Islands, Gilbert Islands, Fiji, New Zealand, New Caledonia, Madagascar, Mauritius, South Pacific; 2) Indonesia: Ambon, Ternate.

3.4. Genus *Thalamita* Latreille, 1829

3.4.1. *Thalamita quadrilobata* Miers, 1884. Distribution: 1) World: Seychelles, Andaman Islands, Gilbert Islands, Madagascar, Mauritius, East Africa, Red Sea, Gulf of Aden, Persian Gulf, Japan, Gulf of Oman, Maldives, Philippines, Palau, Australia, Polynesia, France; 2) Indonesia: east coast of Sumatra

3.4.2. *Thalamita sexlobata* Miers, 1886. Distribution: 1) World: Tongataba, Tuticorin, Andaman Islands, Persian Gulf, Manar Gulf, Madagascar, Gulf of Aden, Red Sea, Gulf of Oman, Burma, Indonesia, Japan, Australia, Hawaii; 2) Indonesia: The specific location in Indonesia is unknown.

3.5. *Genus Atergatis*

Superfamily Xanthoidea MacLeay, 1838

Family Xanthidae MacLeay, 1838

Subfamily Zosiminae Alcock, 1898

Genus *Atergatis* De Haan, 1833

3.5.1. *Atergatis dilatatus* De Haan, 1835. Distribution: 1) World: Japan, Kenya, Sri Lanka, Andaman Islands, China, Taiwan, Samoa New Caledonia; 2) Indonesia: This study (new record).

3.5.2. *Atergatis integerrimus* (Lamarck, 1818). Distribution: 1) World: New Caledonia, China, India, Thailand, Taiwan; 2) Indonesia: Pulau Tikus-Seribu Islands, east coast of Sumatra.

3.6. *Xanthidae MacLeay, 1838 incerta cedis*

Remarks. This species has a close resemblance to *Paraxanthus barbiger*. *Paraxanthus barbiger* is found only in Chile, which borders the South Pacific Ocean. Currently, the sample cannot be identified at the species level. More specimens and in-depth studies are needed to determine the species.

3.7. *Genus Epixanthus*

Genus *Epixanthus* Heller, 1860

3.7.1. *Epixanthus dentatus* (White, 1848). Distribution: 1) World: North and South Atlantic Ocean; 2) Indonesia: Timika waters, Papua.

3.8. *Genus Macromedaeus*

Genus *Macromedaeus* Ward, 1942

3.8.1. *Macromedaeus voeltzkowii* (Lenz, 1905). Distribution: 1) World: South Africa, East Africa, Red Sea, Somalia, Persian Gulf, Gulf of Oman; 2) Indonesia: this study (new record).

3.9. *Genus Metopograpsus*

Superfamily Grapsoidea MacLeay, 1838

Family Grapsidae MacLeay, 1838

Genus *Metopograpsus* H. Milne Edwards, 1853

3.9.1. *Metopograpsus messor* (Forskål, 1775). Distribution: 1) World: Western Indian Ocean, East Africa, Madagascar, Red Sea, Southern Oman, Persian Gulf, Gulf of Oman, Pakistan, India and Andaman Islands; 2) Indonesia: Noordwachter Island.

3.9.2. *Metopograpsus thukuhar* (Owen, 1839). Distribution: 1) World: South Africa, East Africa, Madagascar, Seychelles, Red Sea, Gulf of Aden, Persian Gulf, Gulf of Oman, Pakistan, India, Vietnam, China, Japan, Cocos Islands, Australia, Tahiti and Hawaii; 2) Indonesia: Sumatra, Aceh, West Coast of Flores, Obi Islands, Ambon, and Bawean Islands, Java Sea; Edam Island/Damar Besar Island, Noordwachter Island/Sabira Island (Seribu Islands), Indonesian waters.

3.10. *Genus Grapsus*

Genus *Grapsus* Lamarck, 1801

3.10.1. Grapsus albolineatus Latreille in Milbert, 1812. Distribution: 1) World: East Africa, Mauritius, Somalia, Socotra, Red Sea, Gulf of Aden, South Oman, Persian Gulf, Gulf of Oman, Pakistan, India, Bay of Bengal, Sri Lanka, Nicobar Islands, Andaman Sea, Mergui Islands, China, Japan, Indonesia, Singapore, Cocos Islands, Australia, Hawaii; 2) Indonesia: Aru Islands, Edam Island, Noordwachter Island (Sabira Island-Seribu Islands), Ambon, Java Sea, Pontianak, Lombok, Madura Bay, Semau Island, Adonara Island, Ambon.

3.11. Genus Parasesarma

Family Sesarmidae Dana, 1851

Genus *Parasesarma* De Man, 1895

3.11.1. Parasesarma plicatum (Latreille, 1803). Distribution: 1) World: East Africa, South Africa, Madagascar, Mauritius, Seychelles, India, New Caledonia, Japan, North Arabian Gulf, Thailand; 2) Indonesia: Lombok.

3.12. Genus Plagusia

Family Plagusiidae Dana, 1851

Genus *Plagusia* Latreille, 1804

3.12.1. Plagusia immaculata Lamarck, 1818. Distribution: 1) World: North Pacific Ocean, Indian Ocean, Madagascar; 2) Indonesia: Java Sea.

3.13. Genus Menippe

Superfamily Eriphioidea MacLeay, 1838

Family Menippidae Ortmann, 1893

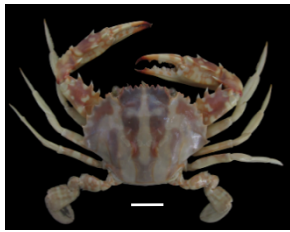
Genus *Menippe* De Haan, 1833

3.13.1. Menippe rumphii (J. C. Fabricius, 1798). Distribution: 1) World: Madagascar, Sri Lanka, Bay of Bengal, Indian Ocean, Malaysia, Singapore, Thailand, southern China, Taiwan; 2) Indonesia: Indonesian waters.

4. Discussion

The location with the most varied species among the seven sampling was station three, with sandy, muddy and rocky substrates. The Portunidae was the most dominant group (seven species), followed by the Xanthidae and Grapsidae, each with two species (table 1). The results showed that the Portunidae generally occupies in the intertidal area when submerged in water to the subtidal area, with a sandy substrate and rocks. The Xanthidae family usually hides under small stones in the intertidal zone, while the Grapsidae group occupies large rocks on the beach. This result is consistent with the previous studies; in the intertidal region, it is common to find members of the families Portunidae and Xanthidae as the dominant group [18-20].

The third sampling point is a small island, i.e., Poncan Island (figure 1) as a tourist spot. However, this sampling was carried out when no tourism activity due to the pandemic. The area has a variety of habitats. One of the preferred habitats for most groups of crabs is a beach with a substrate dominated by mud [21]. Portunidae and Grapsidae prefer rocky shores [19]. However, this habitat is influenced by activities such as feeding and mating activities that use different habitats [22]. In addition, the Brachyura crab group also active in the zoning system [23].



a



b



c



d



e



f



g



h



i



j



k



l



m



n



o

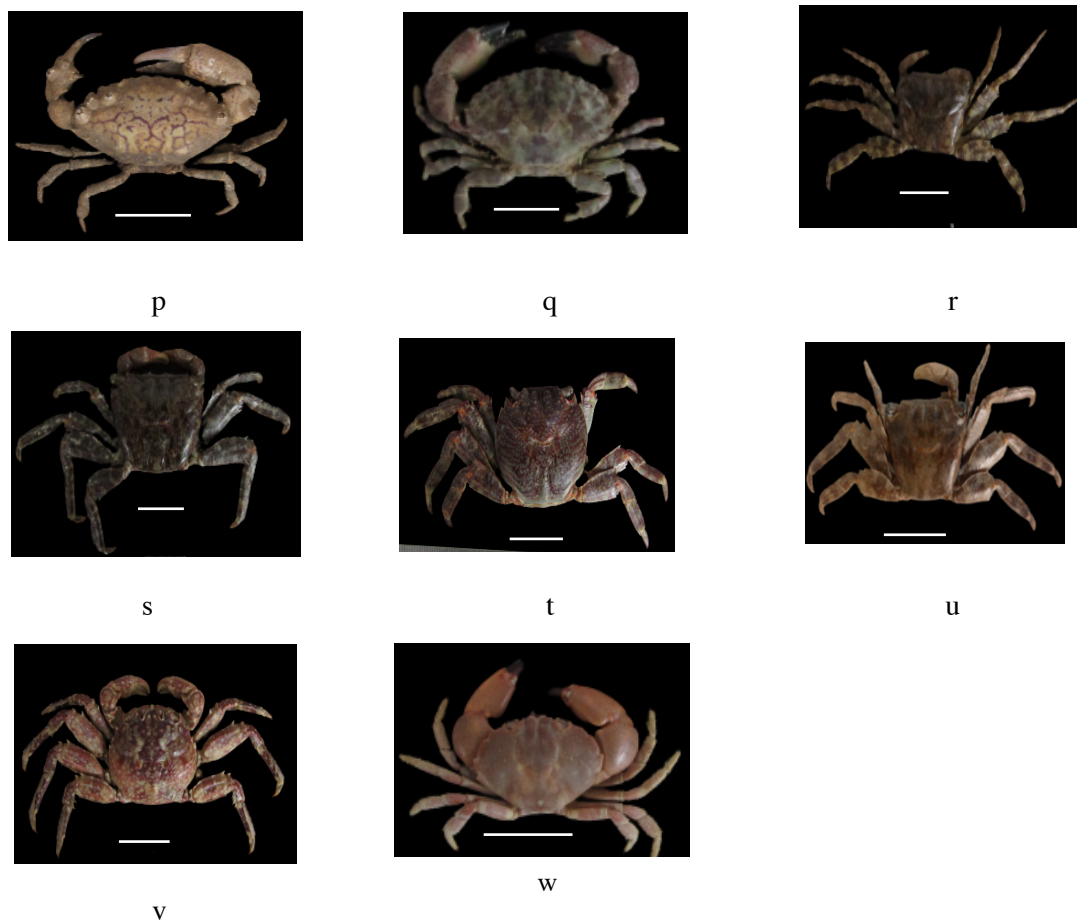


Figure 2. Brachyuran crab found in West coast Sumatra: a: *Charybdis feriatus*, b: *Charybdis annulate*, c: *Charybdis helleri*, d: *Portunus sanguinolentus*, e: *Portunus trituberculatus*, f: *Portunus pelagicus*, g: *Thalamita prymna*, h: *Thalamita crenata*, i: *Thalamita danae*, j: *Thalamita stimpsoni*, k: *Thalamita quadrilobate*, l: *Thalamita sexlobata*, m: *Atergatis dilatatus*, n: *Atergatis integerrimus*, o: *Xanthidae incerta cedis*, p: *Epixanthus dentatus*, q: *Macromedaeus voeltzkowi*, r: *Metopograpsus messor*, s: *Metopograpsus thukuhar*, t: *Grapsus albolineatus*, u: *Plagusia immaculata*, w: *Menippe rumphii*. Scale bars: 1 mm.

The species with the widest distribution was *Charybdis helleri*, which was found at stations 1, 4, 5 and 7 (table 1). The previous studies indicate that this species is a native originating from the Indo-Pacific, but the species has spread to the western Atlantic Ocean [24, 25]. *Epixanthus dentatus*, *Thranita danae*, and *Parasesarma plicatum* were initially only known distributed in eastern Indonesia. This study showed that these species are also distributed in western Indonesia. One of the species found commonly spread in the Indian Ocean, along the east coast of Africa and Madagascar was *Macromedaeus voeltzkowi* as a new record. The species widely distributed in the Indian Ocean is *Atergatis dilatatus* as a new record [26]. The new record species spread on the west coast of North Sumatra, presumably because it is mediated by ocean currents when larval stage through global ocean currents.

5. Conclusion

This study recorded 14 species of brachyuran crabs which were new distribution records in the west coast region of North Sumatra, and two of which were new records in Indonesia.

Acknowledgments

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