Journal of Natural Resources and Environmental Management
13(1): 147–155. http://dx.doi.org/10.29244/jpsl.13.1.147–155
E-ISSN: 2460-5824
http://journal.ipb.ac.id/index.php/jpsl

The diversity of the Genus Panulirus trafficked through the Fish Quarantine Station Controlling the Quality and Safety of Fishery Products, Aceh Province

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Article Info:
Received: 04 - 09 - 2022
Accepted: 05 - 10 - 2022

Keywords:
SKIPM-Aceh, Quarantine Station, Spiny lobster, *P. homarus*, Bamboo lobster

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Abstract. *The genus Panulirus is one of the important fishery commodities for Aceh Province. In the context of the sustainability of these resources, it is necessary to apply regulations properly. The purpose of the research is to determine the species and the number of spiny lobster and origin of the lobster catching area that is trafficked through the Fish Quarantine Station for Quality Control and Safety of Fishery Products in Aceh. The activity is carried out from February to April 2022. The method used is by observing activities, and collecting data on the species of lobsters that are trafficked. There are 6 species lobster that are trafficked at the Fish Quarantine Station for Quality Control and Safety of Fishery Products in Aceh Province, including; Panulirus homarus, Panulirus ornatus, Panulirus penicillatus, Panulirus polyphagus, Panulirus longipes and Panulirus versicolor. The quarantine stations carry out inspections before shipping an average of 1929 individuals per month. The species of Panulirus versicolor is the species of spiny lobster with the highest percentage (34%) sent through, the quarantine station The origin of lobster catching consists of 8 areas, namely Banyak Island (Aceh Singkil), Simeulue Island, Labuan Haji (South Aceh), Meulaboh (West Aceh), Calang and Lamno (Aceh Jaya), Banda Aceh and Sabang Island.*

How to cite (CSE Style 8th Edition):
Lastria L, Darmarini AS, Aly M, Heriansyah, Wardiatno Y. 2023. The diversity of the Genus Panulirus trafficked through the Fish Quarantine Station Controlling the Quality and Safety of Fishery Products, Aceh Province. JPSL **13**(1): 147–155. http://dx.doi.org/10.29244/jpsl.13.1.147–155.

INTRODUCTION

Lobster is one of the important fishery commodities in Indonesia (Aisyah and Triharyuni 2010; Setyanto et al. 2018; Taridala et al. 2019), especially those from the Genus Panulirus (Pratiwi 2013). The existence of this genus is widespread in Indonesian waters (Setyanto et al. 2018; Setyanto et al. 2019; Waluyo and Arifin, 2021). There are 6 species of Panulirus or spiny lobster in Indonesia, namely *Panulirus ornatus, Panulirus versicolor, Panulirus penicillatus, Panulirus homarus, Panulirus longipes*, and *Panulirus polyphagus* in Kebumen Waters (Kadafi et al. 2006); Palabuhanratu (Wahyudin et al. 2017a); Badung, Bali (Asvin et al. 2019) and 5 species were found in Lombok (Yonvitner et al. 2019). The diversity of the spiny lobster also has been reported from the island of Sumatra, one of which is in Aceh, there are 6 species (Irfanur et al. 2017), and 7 species including *Panulirus longipes* femoristriga (Damora et al. 2021).

The potential of lobster as an export commodity has a high price (Khikmawati et al. 2017; Maskun et al. 2020), and it is also marketed for local consumption (Suhermat et al. 2020). This is evident from the increasing domestic market demand for lobster (Kadafi et al. 2006), resulting in an increase in fishing targets (Setyono 2006; Furqan et al. 2017) and intensive fishing even using explosive devices (Junaidi et al. 2010). The high demand for lobster in local and international markets has resulted in quite high exploitation. For the sustainability of lobster fisheries, the government makes management efforts in the form of regulations, namely *Peraturan Menteri Kelautan dan Perikanan Republik Indonesia* (PERMEN-KP) No. 12 of 2020, which is corrected to PERMEN-KP No. 17 of 2021 concerning lobster catching, namely the prohibition of catching lobsters in a state of laying eggs and the size traded must have a size carapace length 8.0 cm with a minimum weight of 200 grams. This supervision is carried out by the Fish Quarantine Station for Quality and Safety Control of Fishery Products.

Every lobster that is trafficked through the Fish Quarantine Station for Quality Control and Safety of Fishery Products must comply with PERMEN-KP No. 11 of 2019 concerning the issuance of carrier media and/or fishery products. As well as a system of quality assurance and security of fishery products as regulated in the regulation of the minister of marine affairs and fisheries, especially in PERMEN-KP No. 19 of 2010 concerning control of quality assurance and security of fishery products. Lobsters will be able to be shipped if they have a health certificate signed by an official at the local Quarantine Station. Based on the description above, it is necessary to conduct research on the diversity, number, and origin of lobsters transported through *Stasiun Karantina Ikan, Pengendalian Mutu dan Keamanan Hasil Perikanan* (SKIPM) of Aceh Province, through an internship program as part of *Program Merdeka Belajar Kampus Merdeka* (MBKM).

METHOD

Location and Time

This research was conducted at the Fish Quarantine Center for Quality Control and Safety of Fishery Products, Aceh Province, Blang Bintang District, Aceh Besar District, Aceh. This activity has been carried out from January to April 2022. During the full activity, researchers participate in activities according to the time schedule for sending lobsters through Aceh's Iskandar Muda Airport.

Data Collection

The data collection method was carried out by identifying and recording the type, length, weight, number, origin, and destination of the lobsters to be transported. Data collection is carried out during the inspection process before delivery. After data collection is carried out, documentation is taken as needed. The tools used are rulers, digital scales, and documentation of lobster samples using an Android cellphone with Vivo Y12.

Data Analysis

Data was collected for three months, then recapitulation was carried out using the excel windows 10 application. Data analysis was carried out by calculating the number, average, and percentage of lobster species for 3 months. Morphological identification activities were carried out in the laboratory of the Fish Quarantine Station for Quality Control and Safety of Fishery Products in Aceh. Morphological identification refers to Holthuis (1991), Chan (1998), Kadafi et al. (2006), Wahyudin et al. (2017a), Ahmed et al. (2022).

RESULT AND DISCUSSION

There were 6 species of spiny lobster that were trafficked during the internship program. The results of the identification during the training were carried out showed that there were 6 types of lobsters that were trafficked, namely; sand lobster (*Panulirus homarus*), rock lobster (*Panulirus penicillatus*), Pakistani lobster (*Panulirus polyphagus*), pearl lobster (*Panulirus ornatus*), batik lobster (*Panulirus longipes*), bamboo lobster

(*Panulirus versicolor*). The species of lobsters trafficked at the Fish Quarantine Station Quality Control and Safety Fishery Products Aceh Province, are presented in Figure 1. All species of lobsters transported have a carapace length of at least 8.0 cm and a weight of 200 g according to PERMEN-KP No. 17 year 2021.

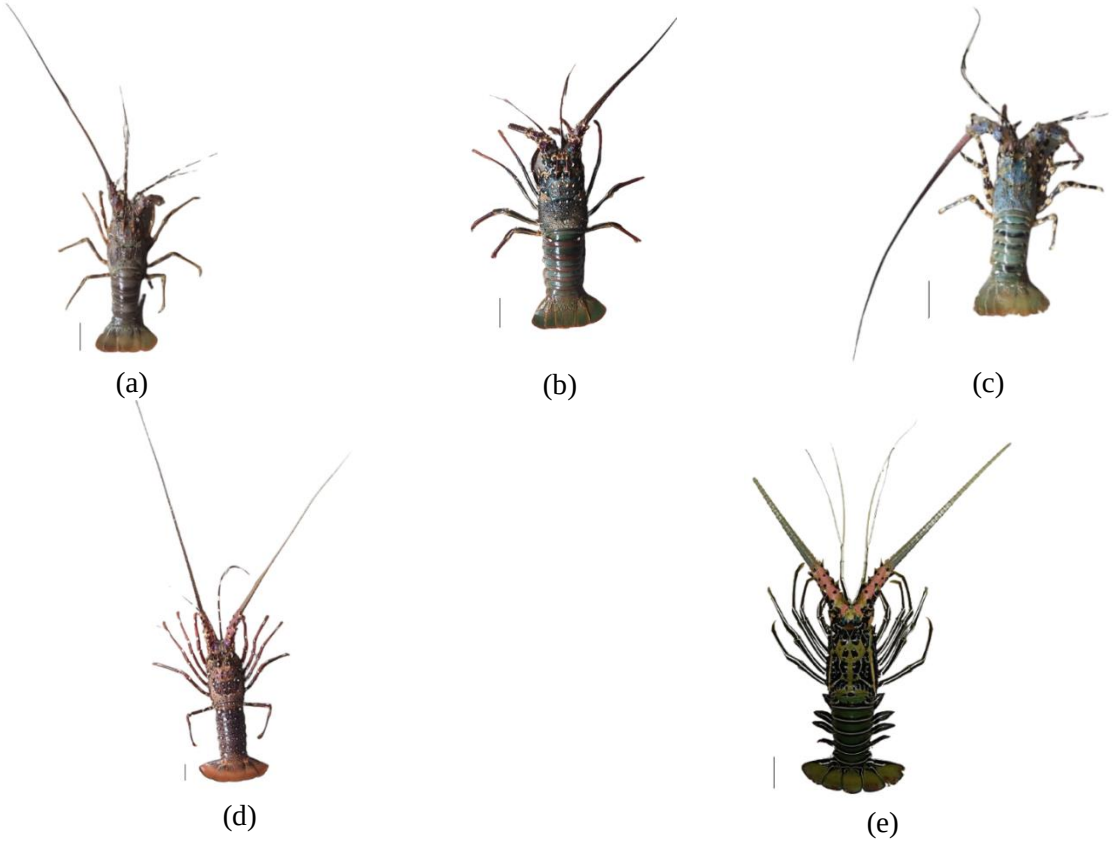

Figure 1 Species of spiny lobster that were trafficked through the Fish Quarantine Station Quality Control and Safety Fishery Products, Aceh Province (scale 3 cm) (a. *Panulirus homarus,* b. *Panulirus penicillatus,* c. *Panulirus ornatus,* d. *Panulirus longipes,* e. *Panulirus versicolor*)

Species Diversity

The sample *Panulirus homarus* (Linnaeus 1758) (Figure 1a) had a total length of 21.5 cm, carapace length 9.2 cm, weight 300.0 g. The total number of lobsters trafficked during the 3 months of the internship was 329 individuals. The number measured was 14 individuals with an average total length, carapace length, and weight of 21.3 cm, 9.1 cm, and 279.2 g, respectively. *P. homarus* has a brownish green base color. In line with the opinion of Ahmed et al. (2022) that this species has a dark green to reddish brown color. This species has white spots on the abdomen. *P. homarus* has a frontal plate, a pair of equally big spines (Motoh 1980), between the frontal horns, there are no small spines, in accordance with the opinion of Ahmed et al. (2022).

Panulirus penicillatus (Olivier 1791) in (Figure 1b) has a total length of 20.2 cm, carapace length 8.6 cm, and weight 299.0 g. During the internship, 328 individuals of this species were trafficked. The number of *P. penicillatus* measured was 11 individuals with an average total length of 21.2 cm, an average carapace length of 9.1 cm, and an average weight of 259.5 g respectively. *P. penicillatus* in this observation during the internship is blue-black in color. Irwani et al. (2020) say this species is yellowish-green to black-blue depending on environmental conditions. Male individuals tend to be darker in color than females (Damora et al. 2021).

The samples of *Panulirus polyphagus* (Herbst 1793) that were trafficked were 14 ind. The sample measured during the activity was only 1 ind with a total length of 21.9 cm, carapace length of 10.0 cm, and weight of 301.0 g. This species is not accompanied by documentation due to a technical error during the

shooting. *Panulirus polyphagus* has a light bluish-green base color, consistent with Ahmed et al. (2022). Kadafi et al. (2006) this species is light green-bluish with yellowish-white transverse stripes in each segment. This species has a pair of spines located on the antennular plate and a pair of brownish-black eyes. Each segment on the abdomen is yellowish-white with brown margins near the posterior (Ahmed et al. 2022).

Figure 1c, *Panulirus ornatus* (Fabricius 1798) has a total length of 21.6 cm, carapace length 9.2 cm, and weight 310.0 g. The total sample was 80 individuals, while those measured were 9 ind with an average length of 21.1 cm, an average carapace length of 9.2 cm, and a weight of 268.6 g. *P. ornatus* has a basic body color of greenish and slightly bluish in the carapace. As mentioned by Kizhakuda (2017), this species has a bluish-green carapace and reddish-yellow spines. The antennae plate has 4 spines with no small spines between them.

The sample of *Panulirus longipes* (Milne-Edwards 1868) in (Figure 1d) has a total length of 20.2 cm, carapace length 8.7 cm, and weight 291.0 g. The total sample was 209 individuals, and 11 individuals were measured. The measurement results showed an average length of 21.4 cm, an average carapace length of 9.0 cm, and a weight of 263.0 g. The batik lobster has a dark brown base color with a pink carapace. In their report according to Pillai and Thirumilu (2007) the carapace area behind the front horn is pink. The anterior edge has spines of irregular size and a pair of orbital spines, the antennular plate has a pair of separate spines (Kadafi et al. 2006).

Panulirus versicolor (Latreille 1802) in (Figure 1e) has a total length of 21.2 cm, carapace length of 9.0 cm, and weight 270.0 g. The total sample that was transported for 3 months was 234 ind, while the sample measured was 7 ind. The measurement results showed an average total length of 21.6 cm, an average carapace length of 8.7 cm, and a weight of 268.2 g. *P. versicolor* has a bright green base body color, greenish abdomen, and a white line flanked by blue lines in each segment; this is in line with Ahmed et al. (2022). *P. versicolor* has a pink antenna stalk. This was also conveyed by Page (2013). On the antennular plate, there are spines of a fairly large size (Holthuis 1991).

Number of Lobsters Trafficked

The number of lobsters traded for 3 months was 5,786 individuals consisting of 6 types of lobster (Table 1). The average number per month is 1,929 individuals. In carrying out their duties, the quarantine station checks on average 64 individuals/day for lobsters to be sent out of the region. As long as the observation takes place from February - April 2022, the destination of the shipment is Central Jakarta. For three months, the most traded lobster occurred in March 2022, with as many as 2,036 individuals. The lowest number of individuals sent was in April 2022, which was 1,728 individuals. Based on the species of lobster, there are three species that are trafficked in high numbers, namely *P. versicolor, P. penicillatus,* and *P. homarus. P. versicolor* is an important export commodity species (Ernawati et al. 2014) as well as *P. penicillatus* (Irwani et al. 2019), and *P. homarus* (Wibowo et al. 2020).

Table 1 Total of Genus *Panulirus* trafficked through the Fish Quarantine Center for Quality Control and Fishery Product Safety Aceh (based on number per species)

No	Species	Total of the month (ind) in year 2022		
		February	March	April
1	*Panulirus homarus*	521	481	264
2	*Panulirus ornatus*	92	47	61
3	*Panulirus versicolor*	621	733	593
4	*Panulirus penicillatus*	544	644	637
5	*Panulirus longipes*	171	119	161
6	*Panulirus polyphagus*	73	12	12

The percentage of the number of lobsters transported at the quarantine station for three months is presented in Figure 2. The highest percentage (30%) based on the species of lobster trafficked at the Fish Quarantine Station for Quality Control and Safety of Fishery Products was *P. versicolor* with a total of 1,947 individuals, then *P. penicillatus* (31%) with a total of 1,825 individuals and *P. homarus* (22%) with a total of 1,266 individuals. Based on Figure 2, it is noted that the *P. polyphagus* species have the lowest trafficked percentage compared to other species.

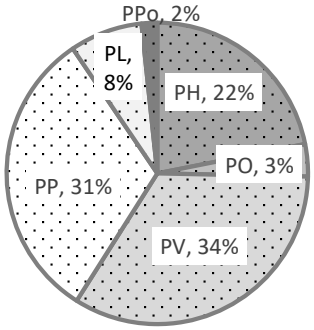

Figure 2 Percentage of composition by species trafficked in Fish Quarantine Center for Quality Control and Fishery Product Safety, Aceh Province (PH: *Panulirus homarus*, PO: *Panulirus ornatus*, PV: *Panulirus versicolor* PP: *Panulirus penicillatus*, PL: *Panulirus longipes*, PPo: *Panulirus polyphagus*)

This is presumably because this species has a limited presence in the Aceh region. This assumption is reinforced by a report which states that only 1% of this species is recorded in Aceh (Damora et al. 2021). In addition to these three species, there are three other species recorded in less less numbers, namely the *Panulirus ornatus* species, which also has a low percentage of around 3%. While *P. longipes* and *P. polyphagus* were 8% and 2% respectively.

The Provenance of Fishing Ground

Observations showed that there were eight lobster fishing areas in Aceh Province (Table 2). During the research, the capture area of *P. homarus* (Figure 1a) came from the waters of Sabang Island, Lamno, Banda Aceh, Meulaboh, Banyak Island, and Labuan Haji. Sand lobsters are often found in Indonesian waters such as in the waters of Tabanan, Bali (Kembaren et al. 2015), Teluk Palabuhanratu (Khikmawati et al. 2017; Wahyudin et al. 2017a; Rombe et al. 2018), Labangka, Sumbawa Island (Asrial et al. 2020). The fishing grounds for *P. penicillatus* (Figure 1b) originate from the waters of Sabang Island, Lamno, Banda Aceh, Meulaboh, and Simeulue Island. The distribution of rock lobsters in Indonesia is found in Simeulue (Yusuf et al. 2019), Yeh Gangga Beach, Tabanan, Bali (Asvin et al. 2019), Southern Coast of Java, and Lombok (Irwani et al. 2020); Labangka, Sumbawa Island (Asrial et al. 2020), and Wonogiri Center of Java (Zaenuddin and Putri 2017; Wardiatno et al. 2020).

Panulirus polyphagus comes from Lamno waters. The distribution of Pakistani lobster is found in the Indonesian Pacific waters, Pakistan, India, Vietnam, Taiwan Province in China, the Philippines, Papua New Guinea, and northern Australia (Chan 1998); Mayalibit Bay, West Papua (Wahyudin 2017b); North Kalimantan Sebatik Waters (Chodrijah et al. 2018); Sebatik Waters (Tirtadanu et al. 2021). *P. longipes* (Figure 1d) originates from the waters of Lamno, Banda Aceh, Sabang Island, Meulaboh, Calang and Labuan Haji. Its distribution in Indonesia includes Sorong, West Papua (Sururi et al. 2016), Teluk Sepi, West Lombok (Nurfiarini and Purnamaningtyas 2017); besides that, this species is also found in Haifa Israel (Spanier and Friedmann 2019).

The fishing grounds for *Panulirus versicolor* (Figure 1e) that are trafficked at the quarantine station come from the waters of Sabang, Labuan Haji, Simeulue Island, Banda Aceh, Melaboh, and Lamno. Bamboo lobsters are found in the Red Sea and the East coast of Africa to southern Japan and Polynesia (Holthuis 1991). In

addition, in Indonesia, bamboo lobsters are scattered in the waters of Latuhalat, Ambon Island (Ongkers et al. 2014), Sumatra Island, Java, East Nusa Tenggara, Timor Leste, Sulawesi, Halmahera, Ambon and Key Islands (Pratiwi 2013), Sikka Nusa Southeastern East (Ernawati et al. 2014), Simeulue (Yusuf et al. 2017).

Table 2 The origin of the lobster fishing area

No	Area	Diversity of lobster					
		PH	**PO**	**PP**	**PPo**	**PL**	**PV**
1	Banda Aceh	✓				✓	✓
2	Calang	✓	✓	✓			✓
3	Labuan Haji	✓	✓	✓		✓	✓
4	Lamno	✓	✓	✓	✓	✓	✓
5	Meulaboh	✓				✓	✓
4	Pulau Banyak	✓					
5	Sabang	✓	✓	✓			✓
6	Simeulue		✓	✓		✓	

Note: PH: *Panulirus homarus,* PO: *Panulirus ornatus,* PV: *Panulirus versicolor* PP: *Panulirus penicillatus,* PL: *Panulirus longipes,* PPo: *Panulirus polyphagus*

CONCLUSION

The spiny lobster species are transported through the Fish Quarantine Station for Quality and Safety Control of Fishery Products, Aceh province, namely *Panulirus. homarus, P. ornatus, P. longipes, P. pennicillatus, P. polyphagus,* and *Panulirus versicolor*. The most dominant type of lobster found was *P. versicolor*. The origin of lobster catch is from the waters of Sabang, Lamno, Banyak Island, Simeulue, Calang, Banda Aceh, Labuan Haji, and Meulaboh. Lamno is the catchment area of all identified lobster species trafficked through the Fish Quarantine Station for Quality Control and Safety of Fishery Products.

ACKNOWLEDGMENT

The authors would like to thank the Aquatic Resources Study Program, Faculty of Fisheries and Marine Sciences, Teuku Umar University, for providing the opportunity to conduct independent learning internships at the Merdeka Belajar Kampus Merdeka and the Fish Quarantine Station, Quality Control and Safety of Fishery Products in Aceh, which has provided opportunities to study and work.

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