Morphological differentiation of mantis shrimp (*Oratosquillina* sp.) from the East coastal water of North Sumatera, Indonesia

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Abstract. In quantitative morphological analysis, measuring morphometric and meristic characters is one of the most critical ways to confirm that cryptic species do show morphological variation. Mantis shrimp, known as cryptic species, have high variation and a wide distribution area that cause differences in morphometric characteristics and population mixing. *Oratosquillin*a sp. was the dominant mantis shrimp observed on four sites in the North Sumatera coastal water of Indonesia. This species was selected to identify the variation and comparison of morphometric characters between populations. The data collected were analyzed using a two-way analysis of variance to recognize the significance of the differences in morphometric characteristics among four populations, the cluster analysis using the unweighted pair group with arithmetic mean method, and the principal component analysis to determine the populations' distribution based on the morphological character differences. The Kruskal-Wallis test found that 35.29% of characters differed significantly; the variation was seen in 10 morphometric and 2 meristic characters. The differences in morphological intrapopulation characteristics were found in the carapace, telson, and motion organs. The Mann-Whitney U test compared inter-population characters, determining the highest morphological differences between Berombang and Belawan's populations. The morphological variation of the *Oratosquillina* sp. population in Belawan is an adaptation response to the environmental conditions.
Key Words: cluster analysis, mantis shrimp, morphometric, meristic.

Introduction. Mantis shrimp, *Oratosquillina* sp., has economic potential as a marine fishery resource. Ramdhani et al (2023) stated that it has become a necessary economic driving force for coastal communities since it provides a livelihood with a direct income for most local people. This potential is good for becoming an export commodity from Indonesia. Unfortunately, management has not been optimal, especially in the coastal areas of North Sumatra province. Although this shrimp is highly consumed in Indonesia, especially by local residents of North Sumatera, Hasibuan & Dimenta (2022) reported on its popularity in foreign countries, such as Malaysia and Hong Kong. Thus, mantis shrimps caught by local fishermen are usually exported to other countries.

This shrimp can be found in the coastal waters of Sumatera and is primarily found in ecosystems with muddy sand substrates (Dimenta et al 2020; Hasibuan & Dimenta 2022; Situmeang et al 2017) and at the bottom of the waters, at a maximum depth of several meters (Tuaputty et al 2023). The wide distribution, its behavior and skills of burrowing in the substrate, and a low migration ability could be factors determining variations in the morphometric characters of mantis shrimp (Hanson et al 2023). According to the literature, mantis shrimp is generally known as a bioindicator for the marine ecosystem (Syarul et al 2023; Situmeang et al 2017; Barber et al 2002). Syarul et al (2023) suggested that the behavior of the mantis shrimp, burrowing cavities in its habitat, can create opportunities for oxygen circulation in the substrate of coastal waters, especially in ecosystems with poor condition, assigning an important role to this organism in marine ecosystems.

Mantis shrimp is classified as a cryptic species (Cheng & Sha 2017). According to Triandiza & Maddupa (2018), cryptic species have similar morphological characteristics, making the morphological identification process more difficult. This shrimp has seven superfamilies that live in tropical and subtropical water, i.e., gonodactyloids, parasquilloids, squilloids, bathysquilloids, lysiosquilloids, erythrosquilloids, and eurysquilloids (Schram et al 2013). In addition, Arifin & Sugihartono (2017) mentioned that the mantis shrimp is generally identified by the thorax characters, which are called the carapace, the six segments of abdomen, the form of the tail (called the telson) and the claw, as a special characteristic. Ahyong & Kumar (2018) presented the essential parts of morphology observed in the identification process, such as the characters on the shape of the cornea, antenna, rostral plate, dorsal carapace, maxilliped propodus, raptorial claw, periopod, thoracic somites, abdomen, telson, and uropods. All stomatopods have the same fundamental body plan, but the body shape in terms of cross-section differs among superfamilies, such as *Squillidae*, *Pseudosculdidae*, and *Bathysquilloidae*, which have dorsoventrally depressed bodies.

Morphometrics and meristics were quantitative morphological analysis techniques that could be applied to marine species such as fish and shrimp (Syaifullah et al 2015). Mantis shrimp are taxonomically classified as marine crustaceans from the Malocostraca class with a high species variation and diversity (Ariyama et al 2021). As a cryptic species, mantis shrimps require the selection of accurate methods for morphological identification. Several studies have been conducted on the morphometric analysis of the Sumatera mantis shrimp species, as reported by Wardiatno & Mashar (2013) on *Harpiosquilla raphidea* and *Oratosquillina gravieri* in Jambi, by Supiana & Dimenta (2022) on *H. raphidea* in Labuhanbatu, by Sihombing (2018) on *O. gravieri* in Percut, by Tumanggor (2022) on *Oratosquilla oratoria* in Langkat, by Syarul et al (2023) on *O. gravieri* and *H. indica* in Bengkulu, and by Pane et al (2023) on *H. raphidea* populations in Karang gading. An applicable strategy for managing and conserving the over-exploited mantis species is urgently needed, and precise knowledge on the morphology, taxonomy, and impact of the *Oratosquillina* sp. population structure is the fundamental prerequisite for further fisheries management. The aim of the research was to conduct a morphometric and meristic study during the identification procedures, to clarify aspects related to the diversity and intraspecies morphological variations within several populations of *Oratosquillina* sp. found around the east coastal water of North Sumatera.

Material and Method

Description of the study sites. The research site along the coast of North Sumatra province was determined by applying the purposeful random sampling method based on the information from local fishermen. Sampling was conducted twice a month from May to August 2023. The samples of mantis shrimp were collected randomly from 4 observation stations, i.e., Station 1 (located in Berombang), Station 2 (located in Asahan), Station 3 (located in Pantai Labu), and Station 4 (located in Belawan). The research location is found in Figure 1.

***Identification and morphometric-meristic measurement of Oratosquillina sp*.** Several references were used in the identification process of mantis shrimp sample, i.e., Santhoshkumar et al (2021), Zairion et al (2021), Ahyong & Kumar (2018), Ahyong et al (2008), and Carpenter & Niem (1998). The morphological variation analysis of *Oratosquillina* sp. was conducted through the measurement of morphometric and meristic characters. The morphological characters of mantis shrimp were measured according to a modified method of Supiana & Dimenta (2022) and Zairion et al (2021). The morphometric characters of *Oratosquillina* sp*.* measured in this research were determined by using the standard method for 34 characters (i.e., 29 morphometric characters and 5 meristic characters), as described in Table 1 and Figure 2.

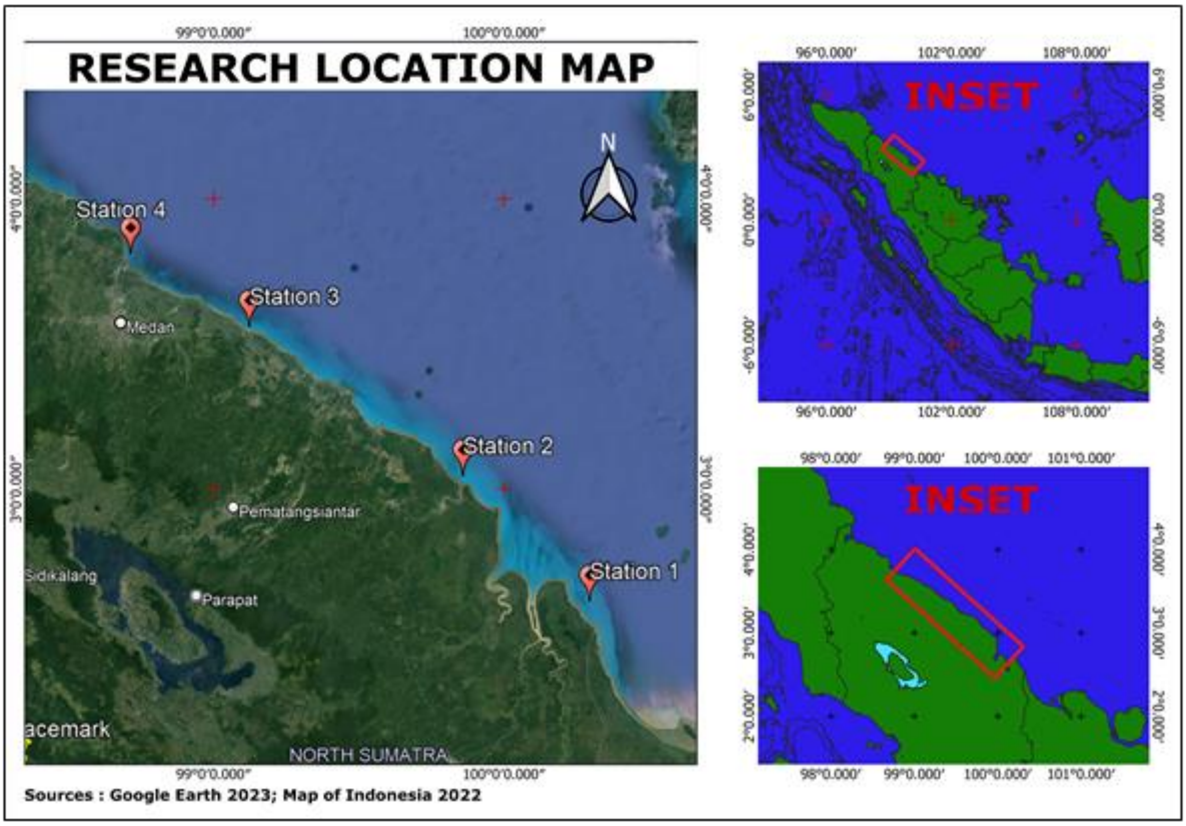

Figure 1. Sampling site of research.

Table 1

Morphometric characters and meristic characters measurement

No	*Code*	*Morphometric characters*
1	SL	Standard length
2	CL	Carapace length (from the tip of rostral plate to the tip of head)
3	CW	Carapace width (width between the widest head sections)
4	ATL	Length the anterior TS to the tip of the telson
5	TSL	Thorax somite length (from the anterior to the tip of thorax)
6	WTS	Width of the 8th thorax somite
7	WAS1	Width of the 1st somite abdominal segment
8	WAS2	Width of the 2nd somite abdominal segment
9	WAS3	Width of the 3rd somite abdominal segment
10	WAS4	Width of the 4th somite abdominal segment
11	WAS5	Width of the 5th somite abdominal segment
12	WAS6	Width of the 6th somite abdominal segment
13	LAS1	Length of the 1st somite abdominal segment
14	LAS2	Length of the 2nd somite abdominal segment
15	LAS3	Length of the 3rd somite abdominal segment
16	LAS4	Length of the 4th somite abdominal segment
17	LAS5	Length of 5th somite abdominal segment
18	LAS6	Length of 6th somite abdominal segment
19	LT	Length of Telson
20	WT	Width of Telson
21	LEU	Length of Uropod
22	LRM	Length of right Merus
23	WRM	Width of right Merus
24	LRP	Length of right Propodus
25	WRP	Width of right Propodus
26	LLM	Length of left Merus

No	Code	Morphometric characters
27	WLM	Width of left Merus
28	LLP	Length of left Propodus
29	WLP	Width of left Propodus
	Code	Meristic characters
30	TP	Count of the teeth propodus
31	TD	Count of the teeth dactylus
32	TT	Count of the teeth telson
33	IDT	Count teeth of the intermediate denticle telson
34	SDT	Count teeth of the submedian denticle telson

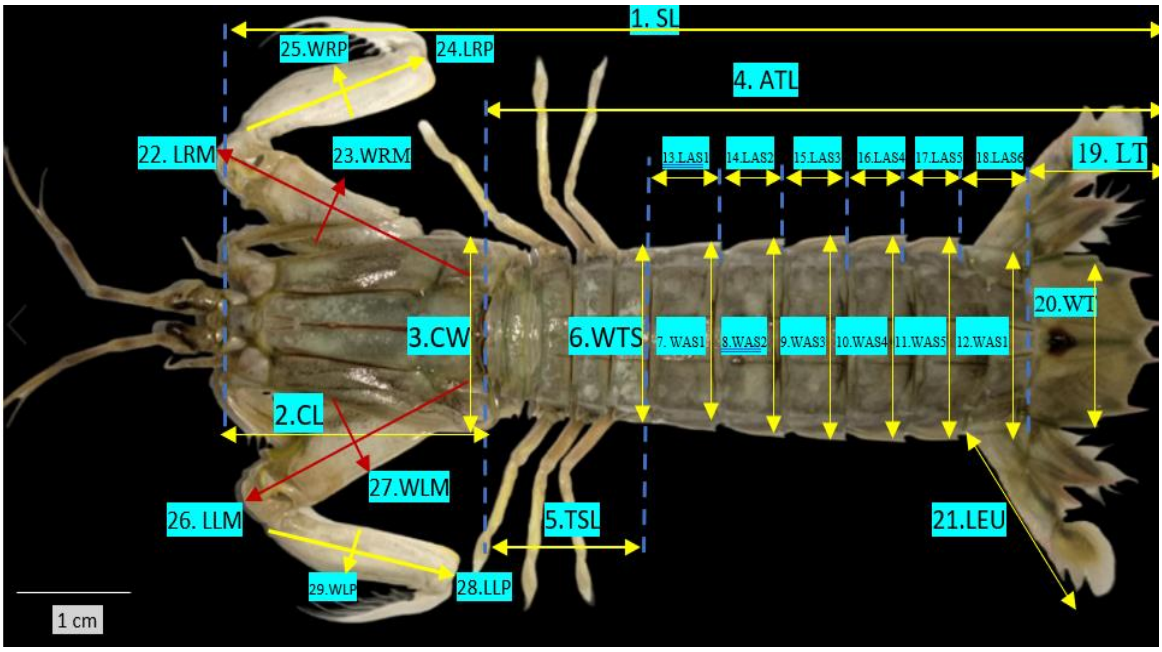

Figure 2. Morphometric characters of *Oratosquillina* sp.

Statistical analysis. The morphometric and meristic character differences from the *Oratosquillina* sp. population were analyzed by applying non-parametric statistics using the SPSS software version 22. In order to identify any morphological differentiation between the observed populations, these were compared using one-way ANOVA, Kruskal-Wallis, and Mann-Whitney-U tests (at $p<0.05$). A cluster analysis was applied to classify the mantis shrimp samples based on the similarity of morphological characteristics between populations. Clustering interpopulations' morphological characters with principal component analysis (PCA), using the multi-variate statistical package (MVSP 3.22) software, also provides information on the Euclidean distance and dendrogram matrix of intrapopulation morphological character variations. The Euclidean distance and the unweighted pair group method with arithmetic mean (UPGMA) cluster analysis were performed using the SPSS software version 22.

Results and Discussion

Morphological characters measurement of Oratosquillina sp. During this study, a total of 231 *Oratosquillina* sp. were collected. In data acquired by morphometric and meristic character measurements, the standard Kruskall-Wallis test showed that 12 characters (10 morphometric characters and 2 meristic characters), meaning 35.29% of the studied characters, were significantly different (Table 2). The results indicated that morphological differences between populations of mantis shrimp, *Oratosquillina* sp., were found in the following main characters: carapace (thorax), claw, and telson. Based on the Mean-Wheatney U-test result, several characters of the mantis sample from the Belawan population were more accentuated compared to the samples from other locations (Table 3). The significant differences (P<0.05) in the morphometric characters among populations were found at codes SL, HL, WH, ATL, WTS, WAS5, LT, WT, LEU, LRM, WRM, LLM, and WLM, and in the meristic characters at codes TT and SDT. This result confirms that most differences in characters occurred in motion organs that are frequently used, i.e., claw, uropod, and telson. The motion organs significantly influence the behavior and survival of mantis shrimp (i.e., anti-predator protection, or prey devouring). Dingle & Caldwell (1978) mentioned that the morphological structure co-evolves with the behavior and ecology of organisms. Lee et al (2022) affirmed that the behavior of mantis shrimps (burrowing or feeding patterns) defines them as opportunistic predators.

The convergent evolution of the feeding methods and foraging strategies influenced the morphology. According to Patek et al (2004), mantis shrimps are well known for using their raptorial appendages in their feeding strategy, for smashing shells and impale fish. Anderson et al (2016) described the morphological covariation of the raptorial appendage of Squillidae species (stomatopod shrimp) as depending on their feeding mechanisms. Patek et al (2013) defined the raptorial appendages (second thoracic segment) as an engine, amplifier and tool which creates a mechanical system. DeVries et al (2012) and Claverie et al (2011) mentioned that the mechanism delivers extremely rapid and powerful strikes to the preys. Anderson et al (2016) reported that the *Squillidae* population from the Gulf of Mexico showed an intriguing handedness pattern in right-propodus appendages, which had a variable number of spines, whereas the left one had a constant number of spines.

The squillidae family known as mantis shrimp has a burrowing behavior and creates perforations in the substrate. Thus, the type of substrate in mantis shrimp's habitat determines the morphological characteristics of a digging tool to the maxilliped 2 (MXP 2) of the raptorial claw. According to Reaka & Manning (1987) and Dingle & Caldwell (1978), the raptorial maxilliped is used to spear or smash prey or other stomatopods, and to communicate with competitors or predators. Burrowing behavior is an essential preventive activity carried out by the stomatopod family Squillidae to protect during the molt cycle phase. Reaka (1975) mentioned the burrowing behavior as a defensive pattern used to survive intruding predators.

According to the Mann-Whitney U-test result, the percentage comparison of inter-population character variation showed the highest variation between the Berombang and Belawan's populations, with 13 characters (38.2%) among both populations found at the morphometric characters SL, CW, ATL, TSL, WTS, WAS5, LT, WT, LEU, LRM, WRM, LLM, WLM, and at the meristic character SDT (Table 2). The lowest variation was found between the Pantai Labu and Belawan populations, in 3 characters (8.8%). According to Koga & Rouse (2021) and Hatta (2016), the significance of the character variation is due to different factors (including the amount and type of prey) and also to the genetic variability.

Reaka (1980) stated that the phenotypic variation of morphometric stomatopod characters can occur due to the dispersal ability or migration due to ecological conditions, such as geographic isolation and habitat's environmental factors. Anastasiadou et al (2022) reported that sexual dimorphism and reproductive maturation are also related to intermediate forms or morphotypes such as carapace and rostral structure variability. Zhang et al (2016) highlighted that the dispersal range of mantis shrimp depends on the habitat preferences. Supiana & Dimenta (2022) stated that the preferred habitats of stomatopods (Squillidae family) are on muddy substrate around estuary areas, especially on the mangrove roots. According to Mashar & Wardiatno (2011), mantis shrimp (*O. gravieri*) have a habitat distributed on the bottom water, with a sandy loam texture substrate, and perfectly live in a grouping distribution. This habitat preference pattern implies that it contributes to allopatric speciation, which occurs through limited genetic exchange. Cheng & Sha (2017) investigated the cryptic diversity and potential hybridization of *O. oratoria* in the Northwestern (NW) Pacific water, which described the preference pattern as barrier factors to gene flow and promoted allopatric diversification. Mashar & Wardiatno (2011) reported that the spatial distribution of *O. gravieri* population on Jambi form a clustered pattern, in accordance with their habitat preferences.

Table 2

Kruskal Wallis-test for morphometric and meristic differences of *Oratosquillina* sp.

CHR	*Mean ± SD Max-Min (mm)*	*Kruskal-Wallis Test*	*P-Value*	*CHR*	*Mean ± SD Max-Min (mm)*	*Kruskal-Wallis Test*	*P-Value*
Morphometric (N=231)							
SL	128.55±27.91 (60.87-190.85)	37.816	0.000*	LAS3	9.45±2.46 (4.45-13.50)	8.866	0.061^{ns}
CL	32.78±7.26 (15.16-47.71)	21.811	0.000*	LAS4	9.62±2.40 (4.45-13.80)	6.687	0.083^{ns}
CW	24.19±5.98 (10.96-40.51)	30.601	0.000*	LAS5	10.32±2.40 (5.09-14.40)	5.967	0.102^{ns}
ATL	70.45±15.17 (34.45-108.71)	38.813	0.000*	LAS6	7.91±2.40 (2.84-12.50)	7.320	0.073^{ns}
TSL	21.04±5.12 (9.01-33.11)	2.869	0.412^{ns}	LT	21.82±5.23 (8.76-32.69)	18.780	0.000*
WTS	23.35±5.26 (10.10-35.19)	17.875	0.000*	WT	24.26±5.26 (11.00-34.00)	25.601	0.000*
WAS1	24.75±5.50 (11.26-35.86)	8.517	0.060^{ns}	LEU	27.70±5.36 (14.22-39.61)	24.855	0.000*
WAS2	25.21±5.48 (11.50-36.31)	7.282	0.077^{ns}	LRM	26.61±3.76 (17.77-37.33)	27.407	0.000*
WAS3	25.99±5.68 (12.11-36.69)	7.072	0.083^{ns}	WRM	8.87±1.53 (6.15-13.10)	7.616	0.069^{ns}
WAS4	26.68±5.85 (12.60-37.21)	7.862	0.061^{ns}	LRP	44.15±6.37 (30.50-68.39)	4.152	0.197^{ns}
WAS5	27.02±5.84 (12.66-37.80)	4.914	0.192^{ns}	WRP	9.90±1.58 (6.86-14.30)	6.144	0.105^{ns}
WAS6	25.12±5.63 (11.87-35.81)	5.781	0.135^{ns}	LLM	26.60±3.90 (18.26-37.19)	23.480	0.000*
LAS1	9.16±2.46 (4.09-13.20)	8.894	0.061^{ns}	WLM	9.02±1.37 (6.44-12.34)	10.520	0.065^{ns}
LAS2	9.33±2.47 (4.43-13.40)	10.151	0.067^{ns}	LLP	44.89±5.72 (31.55-68.22)	5.580	0.114^{ns}
				WLP	10.06±1.61 (6.71-13.76)	7.100	0.061^{ns}
Meristic (N=231)							
TP	2.97±0.171 (2-3)	3.908	0.272^{ns}				
TD	5.97±0.171 (5-6)	7.590	0.055^{ns}				
TT	5.09±1.021 (4-7)	16.937	0.001*				
IDT	7.91±0.286 (7-8)	12.668	0.005*				
SDT	5.88±0.325 (5-6)	2.218	0.529^{ns}				

CHR-character morphology; N-population; ns-non significant; *significant.

Table 3

Mann Whitney U-test for morphometric and meristic characters of *Oratosquillina* sp.

CHR	*BR vs BA*		*BR vs PL*		*BR vs BL*		*BA vs PL*		*BA vs BL*		*PL vs BL*	
	U value	*P-value*	*U value*	*P-value*	*U value*	*P-value*	*U value*	*P-value*	*U value*	*P-value*	*U value*	*P-value*
Morphometric												
SL	137.00	0.74	47.00	0.00*	34.00	0.01*	124.00	0.02*	78.00	0.05*	100.00	0.44
CL	139.00	0.79	70.00	0.01*	48.00	0.06	145.00	0.09	61.00	0.02*	93.00	0.29
CW	122.00	0.40	52.50	0.00*	35.00	0.01*	152.00	0.03*	92.00	0.20	92.00	0.28
ATL	116.00	0.30	38.00	0.00*	29.00	0.00*	146.00	0.10	95.00	0.25	94.00	0.31
TSL	139.00	0.79	110.00	0.29	82.00	0.92	202.00	0.83	113.00	0.63	101.00	0.46
WTS	119.00	0.03*	68.00	0.01*	46.00	0.04*	176.00	0.38	111.00	0.57	104.00	0.53
WAS1	139.00	0.79	65.50	0.01*	46.00	0.06	157.00	0.17	94.00	0.23	108.00	0.64
WAS2	140.00	0.81	81.00	0.06	45.00	0.14	162.00	0.21	96.00	0.26	111.50	0.74
WAS3	124.50	0.45	78.00	0.07	46.00	0.23	155.00	0.15	92.00	0.20	115.50	0.86
WAS4	117.00	0.31	79.00	0.08	50.00	0.08	149.00	0.11	90.00	0.18	111.00	0.73
WAS5	118.00	0.33	39.00	0.00*	45.00	0.04*	155.00	0.15	72.00	0.04*	118.00	0.94
WAS6	117.00	0.31	84.00	0.06	54.00	0.12	152.00	0.13	90.00	0.18	113.50	0.80
LAS1	145.50	0.96	99.00	0.15	62.50	0.27	163.00	0.22	105.00	0.43	101.00	0.46
LAS2	141.00	0.84	98.00	0.14	63.00	0.28	157.00	0.17	100.50	0.34	103.00	0.51
LAS3	140.00	0.81	103.00	0.20	64.00	0.30	160.00	0.19	101.00	0.35	102.00	0.48
LAS4	140.00	0.81	106.00	0.23	67.00	0.38	169.50	0.29	103.00	0.39	103.00	0.51
LAS5	141.00	0.84	108.00	0.26	66.00	0.35	172.00	0.32	104.50	0.42	106.50	0.60
LAS6	109.00	0.20	126.50	0.64	78.50	0.78	165.50	0.25	107.50	0.49	94.00	0.31
LT	108.00	0.19	94.00	0.11	21.00	0.00*	191.00	0.62	79.00	0.05*	88.00	0.21
WT	107.00	0.18	84.00	0.07	11.00	0.00*	196.00	0.72	119.00	0.79	77.00	0.05*
LEU	109.50	0.21	79.00	0.03*	12.00	0.00*	196.50	0.02*	75.00	0.04*	82.00	0.04*
LRM	81.00	0.03*	77.00	0.07	27.50	0.00*	197.00	0.73	111.00	0.57	97.00	0.37
WRM	81.00	0.06	78.00	0.08	83.00	0.04*	198.50	0.76	71.00	0.04*	89.50	0.24
LRP	41.00	0.00*	78.00	0.03*	57.00	0.16	157.00	0.01*	58.00	0.01*	75.00	0.02*
WRP	141.50	0.85	119.00	0.46	70.50	0.49	157.00	0.17	114.00	0.03*	97.00	0.37
LLM	89.50	0.05*	95.00	0.12	28.00	0.00*	180.00	0.43	114.00	0.65	86.50	0.19
WLM	97.00	0.06	87.00	0.08	24.00	0.00*	201.50	0.82	98.00	0.29	101.50	0.47
LLP	47.00	0.00*	79.00	0.03*	28.00	0.09	155.50	0.04*	52.00	0.01*	101.50	0.47
WLP	139.00	0.79	126.00	0.62	46.00	0.07	164.00	0.23	64.00	0.02*	95.00	0.33
Meristic												
TP	140.00	0.41	133.00	0.40	84.00	1.00	209.50	0.97	120.00	0.45	114.00	0.44
TD	147.00	1.00	133.00	0.40	77.00	0.28	199.50	0.31	115.50	0.19	116.00	0.71
TT	112.00	0.17	125.00	0.54	76.00	0.63	140.00	0.04*	84.00	0.05*	118.00	0.93
IDT	147.00	1.00	140.00	1.00	84.00	1.00	210.00	1.00	126.00	1.00	120.00	1.00
SDT	129.50	0.33	137.00	0.80	78.00	0.03*	180.50	0.01*	102.00	0.21	114.00	0.44
VCHR (%)	14.7% (5 character different)		29.4% (10 character different)		38.2% (13 character different)		20.6% (7 character different)		32.35% (11 character different)		8.8% (3 character different)	

CHR-character; BR-Berombang; BA-Bagan Asahan; PL–Pantai Labu; BL-Belawan; VCHR-variation of character.

Distribution of Oratosquillina sp. population. The clustering distribution using the Principal Component Analysis (PCA) supports the morphological variation test results (Table 1 and Table 2), which describe that these species form two groups on the East Coast of North Sumatera, where the Belawan population is a separate group, while the Pantai Labu, Asahan, and Berombang populations overlap, forming another group (Figure 3). The similarity of morphological character measurements in this population is probably what caused the overlap to form. In addition, the limited migration distances are also contributing factors to the clustering of *Oratosquillina* sp. distribution. Morphological variation between populations is also possible as a response to this limitation. The migration ability and distribution of mantis shrimp are also influenced by the life cycle. During the planktonic larva stage, the movement of these shrimp follows the flow of water current, and towards the mature stage, they already begin to burrow and settle in the substrate cavity. Pei (2013) described shrimps species usually spawning their eggs in the deep offshore water areas, in addition Tang et al (2010) and Shin & Ellingsen (2004) mentioned that the post-larvae of mantis shrimp advect into shallower nursery grounds (mangrove estuary) where they settle as benthic lifestyle. After a period of growth, the planktonic larvae and juveniles migrate to offshore water to complete their life cycle.

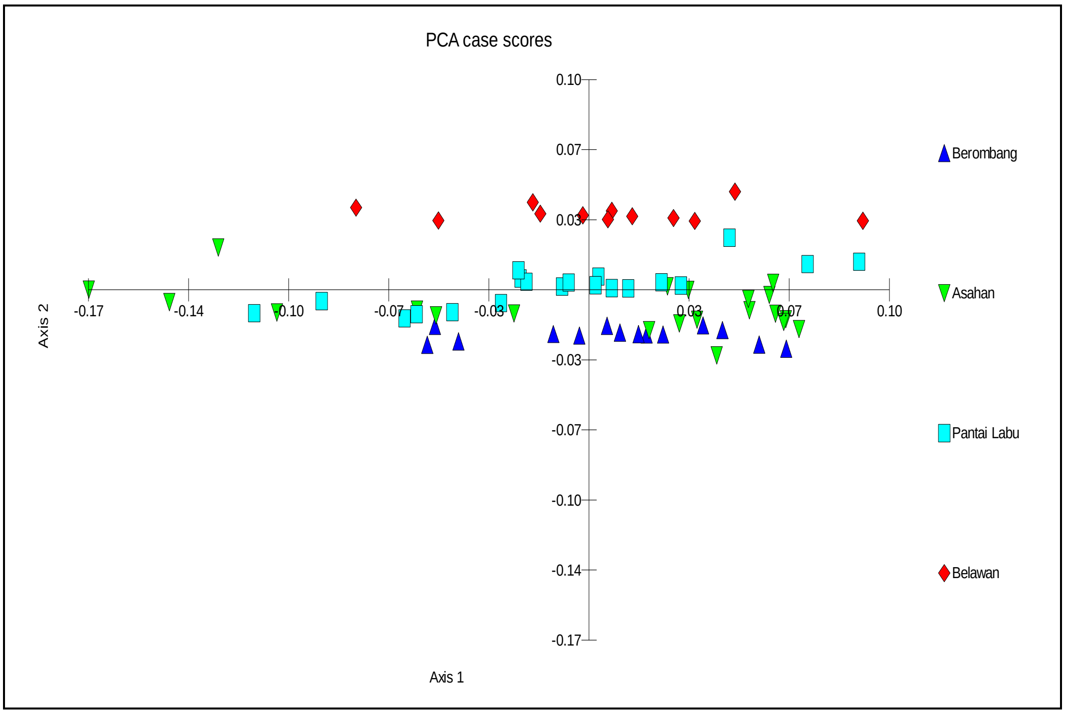

Figure 3. Plot of principal component analysis (PCA) of *Oratosquillina* sp.

The current flow contributes to the dispersal of mantis shrimp larvae. According to Cheng & Sha (2017), the coastal interface currents affect the dispersal of *O. oratoria* larvae, and Cheng et al (2022) mentioned their strong influence on the species local adaptation and adaptive radiation. In addition, Coscia et al (2020) and Sandoval-Castillo et al (2018) explained that the oceanographic heterogeneity manifestations in coastal waters, such as the current of interfaces, habitat transition zones, and ecological gradients, strongly influence the adaptive divergence and impose a spatial variability of selective pressures on populations or marine species distributed along the gradients.

The distance matrix was determined by cluster analysis using the morphometric character of the *Oratosquillina* sp. population. Based on the distance matrix, the result shows that populations of Pantai Labu and Belawan have the highest Euclidean distances of 10.51 and 10.07, respectively, closer than the Asahan population, and the lowest distance found on Pantai Labu vs. Belawan was 5.95 (Table 4).

Table 4
Euclidean distance of the *Oratosquillina* sp. morphometric characters (cluster analysis)

	Sampling location			
	Berombang	*Asahan*	*Pantai Labu*	*Belawan*
Berombang	.000	7.306	10.516	10.078
Asahan	7.306	.000	8.177	8.013
Pantai Labu	10.516	8.177	.000	5.950
Belawan	10.078	8.013	5.950	.000

This result showed that the Pantai Labu and Belawan populations have high similarity in morphometric characters. The clustering of groups based on morphological characteristics describes the kind of interpopulation and their response pattern to habitat conditions. Zairion et al (2021) mentioned that the kinship of mantis shrimp depends on the similarity of their body shape, morphological characters, and behavior. Similar results reported by Hatta (2016) for mantis shrimp *Squilla* sp. from 3 locations in Malaysia show that the Kuala Selangor population had the highest morphological differentiation, with the most dependable character being the abdominal length.

Conclusions. Morphological variations of mantis shrimp *Oratosquillina* sp. populations occurred in several populations from the east coastal water of North Sumatera. Belawan population has the highest morphological variations. Differences in the morphological intrapopulation characters were found in the main body and motion organs, such as the carapace, claw, uropod, and telson. The cluster of morphologically characterized dissimilarity indicated that the dispersed interpopulation characters form two groups, with Pantai Labu, Asahan, and Berombang's populations overlapping in one group, and Belawans population forming another group. Euclidean distance describes the highest similarity in morphological variations found in the Pantai Labu and Belawan's populations. These results suggest that the morphological variation is an adaptation response to the environmental conditions.

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