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Morphological Variations of *Meretrix* sp. from Bancaran, Madura, Indonesia

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ABSTRACT
Meretrix sp. or well known as asiatic hard clam has a significant ecological role in the estuary ecosystem. Besides, they are also traded and consumed by people. Further studies are needed to analyze their morphological and ecological aspects to support the potency analysis of this clam. This study aimed to analyze the variation of *Meretrix* sp. found in Bancaran Estuary located in Madura Indonesia. The samples were collected randomly by handpicking during the low tide. Identification was carried out based on morphological characters. Morphometry parameters were measured by using a. caliper. Data was analyzed descriptive-quantitatively. The results of this study revealed that there were five morphological variations of *Meretrix* sp, which is found in Bancaran Madura. Therefore, further study on the potency or *Meretrix* sp. from this region as well as the molecular studies regarding the variations are needed.

Keywords: *Bivalvia, Meretrix aurora, Meretrix meretrix, Veneridae.*

1. INTRODUCTION

Veneridae is one of the bivalves family, which is very diverse and most of the members are edible bivalves. One of the genus that belongs to Veneridae is *Meretrix*, which is commonly known as asiatic hard clam. In the worldwide record, there are 15 species of *Meretrix* [1][2], namely *M. astricta, M. attenuate, M. aurora, M. casta, M. lamarckii, M. lusoria, M. lyrata, M. meretrix, M. morphine, M. petechialis, M. planisulcata, M. subtrigona, M. vestita* [1][2], *M. tigris*, and *M. marisarabicum*[2].

Meretrix is usually found in the mangrove ecosystem and estuary [3][4][5][6][7]. As consequence of the living mode and the habitat, this clam has ability to accumulate heavy metal [8][9][10][11], hence they act as bio-indicator. In addition to playing an important ecological role, these shells also have economic value. Most of the members of this genus can be consumed, for instance, *M. meretrix* and *M. lyrata* [12][13][14], hence they are actively fished and traded.

These clams are also distributed in Indonesia coastal waters. The most frequently reported species is *Meretrix meretrix* [7][8][11][13][15][16]. Other members of the genus *Meretrix* are reported exist in Indonesia are *M. lusoria* [15], *M. lyrata* [11], *M. zonaria* [13]. Indonesia has long coastal lines, which are also composed of mangrove and estuarine ecosystems that are potential as the habitat of *Meretrix* clams. One of these ecosystems is Bancaran Estuarine, which is located at Madura Strait. Recent study reported the population of *Meretrix meretrix* in this area [7], however the information on the variation of *M. meretrix* and the presence of other members of this genus remains un-disclosed. Therefore, this study purposed to analyze the variation of *Meretrix* sp. found in Bancaran Estuary located in Madura Indonesia. This morphological study is expected to be useful to complete the data on the potential of this clam.

2. METHODS

2.1. Sampling and Collection

Samples were collected from the Estuary of Bancaran River, Madura Indonesia (Figure 1). The clams were collected by handpicking during the low tide in March 2021. A total samples 462 individuals of *Meretrix* sp were collected. The samples were preserved in 70% of alcohol for identification and morphometric measurement.

2.2. Identification and Measurement

Identification was conducted by observing the exterior and interior of the shells referred to Dharma [13] and Huber [1]. The observed characters included shape and outline of the shell, sculpture of the shell, exterior colour, umbo, hinge ligament, interior colour, pallial line, pallial sinus, adductor muscle scars, as well as the dentition. Morphometric of the shell was measured by using a caliper. The parameters

measured were shell length, shell height, and shell width. SL= Shell length was the perpendicular distance between the anterior and posterior ends of the shells. SH= Shell height was defined as the distance from the highest part of the dorsal side to the lowest part of the ventral side of the shells [17].

2.3. Data Analysis

The data of morphological characters and the identification results were descriptively analyzed. Meanwhile, the morphometric data were analyzed descriptive-quantitatively.

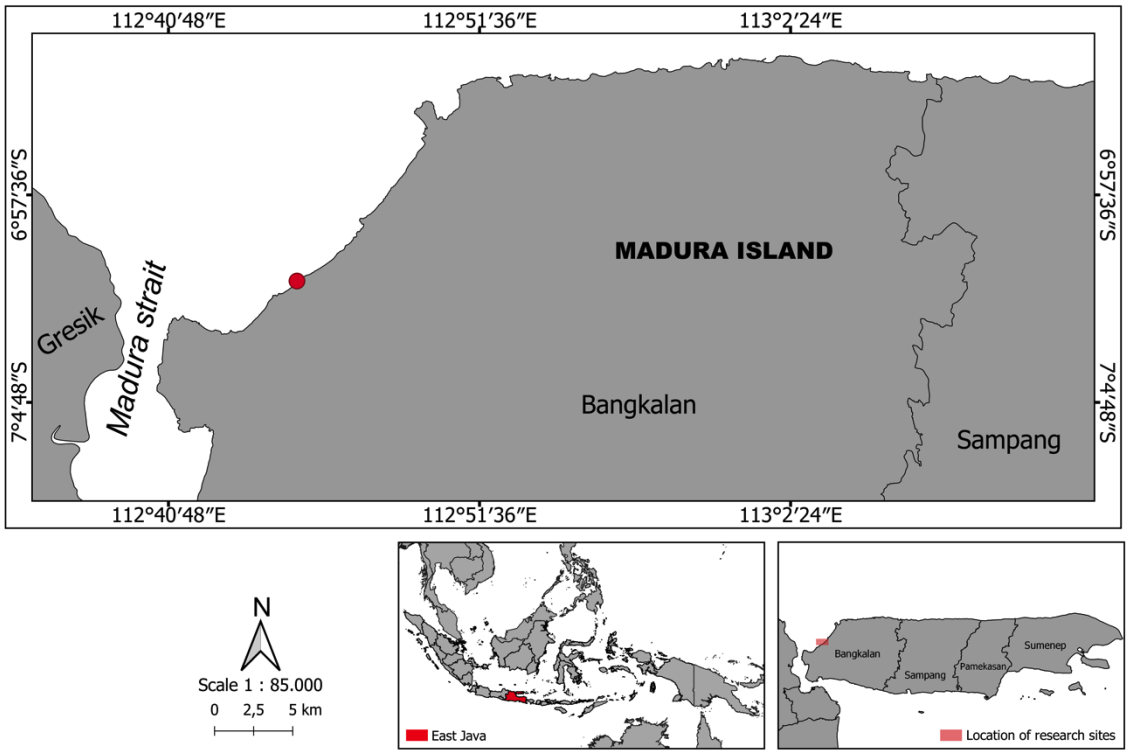

Figure 1 Sampling sites: Estuary of Bancaran, Madura Indonesia.

3. RESULTS AND DISCUSSION

The identification revealed that there was one species of *Meretrix* in Bancaran Estuary, Madura, namely *Meretrix* cf. *aurora*. There were five variations of this species based on the exterior of the shells, namely whitish with black band at dorsoposterior region, purplish with radial band, purplish, brownish, and whitetish with radial band (Figure 2).

Description. Shell: equivalve, trigonal shell, hard, tick; shell exterior smooth, colour varies: whitish, whitish with radial band; purplish, brownish. Umbo: prominent, prosogyrate. Adductor muscle scars and pallial line: obvious. Pallial sinus: narrow, rounded at the bottom end. Shell length range: 6-45 mm (Table 1).

Previous study stated that *Meretrix* found in Bancaran Estuarine is *Meretrix meretrix*. However, based on our observation, the character of palial sinus of all specimens are different from the one pictured in Huber [1]. Based on Huber [1], the base of pallial sinus of *Meretrix meretrix* was pointed at anterior part, however the base of pallial sinus of specimens from Bancaran was rounded (Figure 2). This character was more closed to *M. aurora*. The finding of variations on *Meretrix* cf. *aurora* was in line with the previous study regarding the variation of *M. meretrix* [15].

Poutier [12] and Dharma [13] have already reported this species and the use for consumption. Local people around Bancaran Estuarine also actively collected this clam for consumption and local trading. Hence, the sizes of *Meretrix's* members found in this area were smaller than the sizes reported by literatures [12][13].

Figure 2 *Meretrix* from Bancaran, Madura. a: Variation A; b: Variation B; c: Variation C; d: Variation D; c: Variation E.

Table 1. Morphometric parameters of *Meretrix* sp. From Bancaran, Madura

Para-meter	Variation A	Variation B	Variation C	Variation D	Variation E
Number (n)	280	51	93	13	25
Relative frequen-cy (%)	60.6	11	20.1	2.8	5.4
Shell length (mm)	16-42	25-45	6-42	19-39	17-42
Shell height (mm)	18-38	20-39	18-35	24-37	21-35

There were five variations of *Meretrix* cf. *aurora* in Bancaran Estuarine. These results are consistent with the results of previous studies, which reported the variations of *M. meretrix* in Indonesia [15]. Based on the relative frequency, motif A, namely the whitish colour white black band on the dorsoposterior region is the most common variation (Figure 2a). Meanwhile, variation d of *M. meretrix* (brownish colour) (Figure 2d) has the lowest relative frequency. So far, identification is based on morphological characteristics. This method needs to be strengthened by using a molecular tool because of the morphological variations within this species. Morphological identification of molluscs can be confirmed using molecular techniques, as was done in *Clithon oualaniensis* which has a high morphological variation [18].

Hard clams found in Bancaran were *Meretrix* cf. *aurora* (Table 1) and they were abundant. This is in accordance with previous research, which showed that the population of hard clam in this area was relatively high [7]. Thus, its potential can be developed for other benefits, not only for consumption. Several studies have shown that this clams can be used for medical purposes [19][20][21][22]. On the other hand, there are differences in the identification of the clams found in this region.

4. CONCLUSION

It can be concluded that there were five morphological variations of *Meretrix cf. aurora*, which is found in Bancaran Estuary Madura. Therefore, it is necessary to conduct further studies on the potency of *Meretrix* sp. from this region as well as molecular studies to confirm morphological identification.

AUTHORS CONTRIBUTION

All authors conceived and designed this study. All authors contributed to the process of revising the manuscript, and at the end all authors have approved the final version of this manuscript.

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