

STUDIES ON THE DISTRIBUTION OF THREE SPECIES OF
LANCELETS IN THE SHALLOW WATERS ALONG THE INDIAN
OCEAN COAST OF THAILAND*

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ABSTRACT

The samples were collected during the 5th Thai-Danish Expedition along the Indian Ocean coast of Thailand during January-February 1966. The main aim of this expedition was to study the benthos communities along the continental shelf of the Indian Ocean bordering Thailand coast. Bottom samples were collected at one hundred and eighty-two stations by Smith-McIntyre Bottom Sampler with 0.1 m³ capacity. In some locations, Mouse Trap was also used in order to collect meiofauna.

Three species of lancelets, *Branchiostoma belcheri* Gray, *B. malayana* Webb and *Epigonichthys cultellus* Peters were found at only fourteen stations. Various ecological factors, such as, temperature, salinity, oxygen content, water current and the composition of the bottom sediments were brought into consideration in order to determine the cause of their distributions. It seems probable that the compositions of the bottom sediments and the water current along the coast are the main factors that limited the distribution of these three species. It was also found that these three species selected different types of sediments. *B. belcheri* prefers medium coarse brown sand with shell fragments and very small proportion of mud to very fine sand with large proportion of mud. On the contrary, *Epigonichthys cultellus* and *B. malayana* were found in muddy sand with or without shell gravels.

The evidences also show that the interspecific competition among these three species are high. *B. belcheri* usually occurred alone while *E. cultellus* and *B. malayana* were found together in the same type of sediment. However, in such a case, *B. malayana* were found more numerous than *E. cultellus*.

INTRODUCTION

DURING January to February 1966, there was a joint scientific expedition between Thai and Danish Scientists in order to investigate the benthos communities along the continental shelf of the Indian Ocean coast of Thailand. It was called the 5th Thai-Danish Expedition. The Thai government provided a fishery research vessel Number 2, 'Dhanarajata' with 388 tons gross. The Danish government provided, besides a group of three scientists, some of the equipments and facilities for the expedition.

The samples of lancelets were provided to us by Dr. Gunnar Thorson, former Director of the Marine Biological Station at Elsinor, Denmark. We acknowledge his kindness and his technical assistance to the junior author.

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METHOD AND MATERIALS

The bottom samples were collected by Smith-McIntyre Grab of 0.1 m² at various stations (Fig. 1) along the Indian Ocean coast of Thailand from Ranong to the Thai-Malaysian Border. It was decided to collect a group of about 10 samples at each station. The samples were weighed, their volumes measured and then separated by using a set of sorting pans of different mesh sizes. The remains in each pan were sorted by hand. The lancelet samples were separated from the other benthic organisms. They were later identified in the laboratory and their numbers of each species were recorded.

At some stations, a Mouse Trap bottom sampler was used in order to collect meiofauna. With this instrument smaller lancelets were captured.

The compositions of the sediment were classified qualitatively such as light muddy sand with shell gravel or light clayey sand and so on (Fig. 3).

The temperature, salinity and also oxygen contents in the water were measured by using the well-known standard methods.

In this study, there was no current measurement. The general pattern of the circulation in the Andaman Sea at this time of the year (February-March) is based on Sverdrup *et al.* (1957). It is shown that the waters from the northern section move in a clockwise direction contrary to that in the southern portion which moves anti-clockwise. These two gyres after meeting somewhere south of Phuket Island, move to the west (Fig. 4).

RESULTS

Of the total one hundred and eighty-two collecting stations only eighty-nine of them were collected by Smith-McIntyre bottom grab sampler and Mouse Trap. The others were shore collections on some islands and also bottom dredges. There are only eighteen stations in which three species of lancelets were found. The results are already shown in Figs. 1, 2 and 4. The types of the bottom sediments along the study areas are shown in Fig. 3.

The three species of lancelets which were identified by us are *Branchiostoma belcheri* Gray, *B. malayana* Webb and *Epigonichthys cultellus* Peters. Their distributions together with their abundances are shown in Table 1. It is interesting to note here the first record of *B. malayana* in the Indian Ocean fauna.

Among the three species, *B. belcheri* (Fig. 2) shows a wider range of distribution than the others. They were found at depths varying from 22 to 68 metres. The number per square meter of this species varied according to the types of sand, being greater in the grey medium sand than in the other types (Table 1). The temperature and salinity at the bottom of some stations in which *B. belcheri* occurred varied from 25.6°C to 28.1°C and 31.82‰ to 32.75‰ respectively. The oxygen content of the bottom water at these stations ranged from 2.38 ml/l to 3.90 ml/l.

Branchiostoma malayana occurred in only two stations on the south-eastern site of Phuket Island (Fig. 2). They were collected from the muddy sand type sediments. This species was caught together with *Epigonichthys cultellus* at one station.

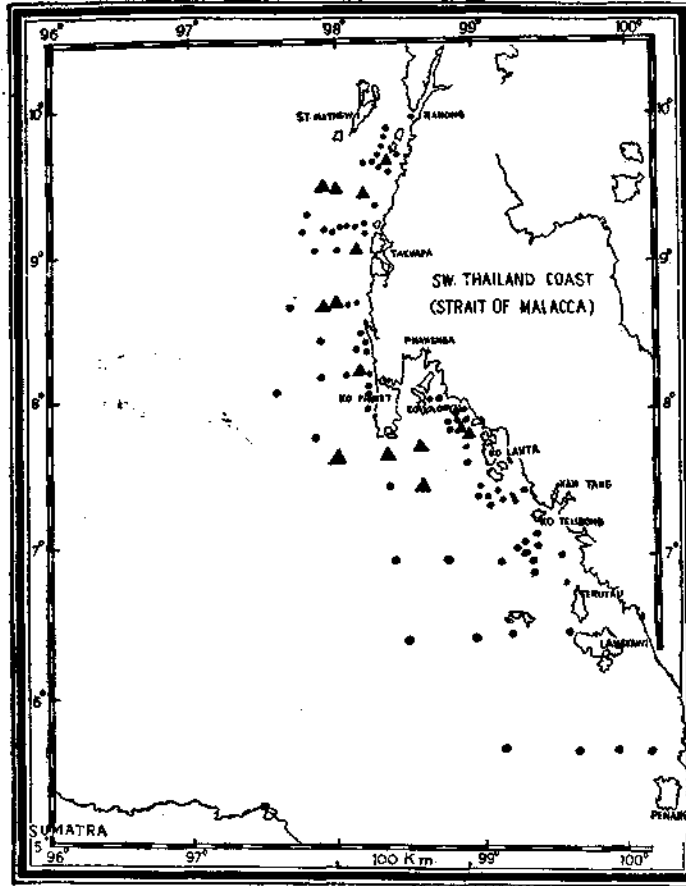


Fig. 1. Sampling stations (●) which were taken by Smith-McIntyre Grab. ▲ indicates the station in which lancelets were found.

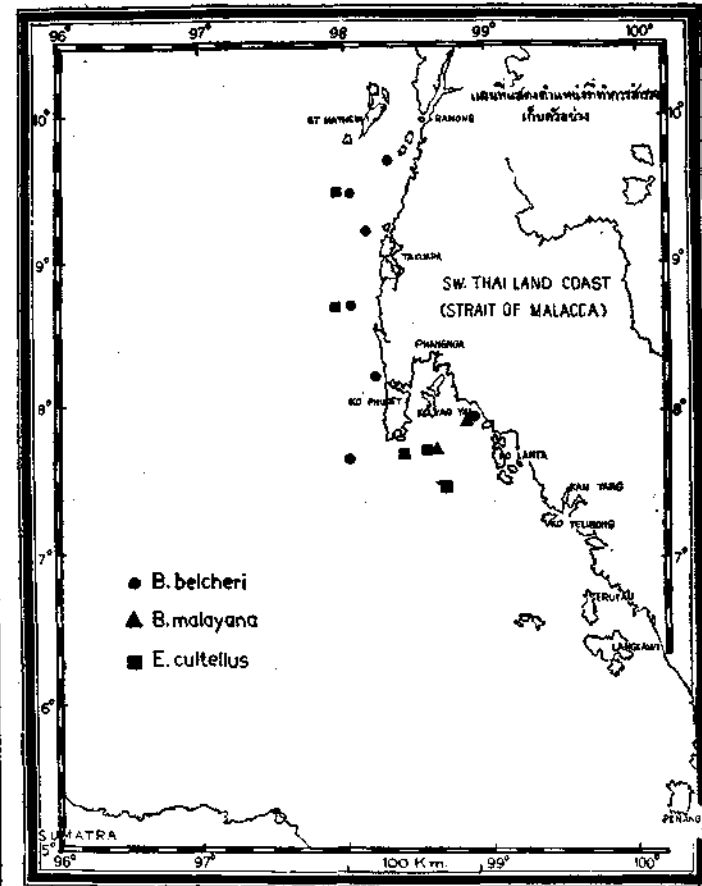


Fig. 2. Occurrence of species of lancelets along the SW Thailand coast.

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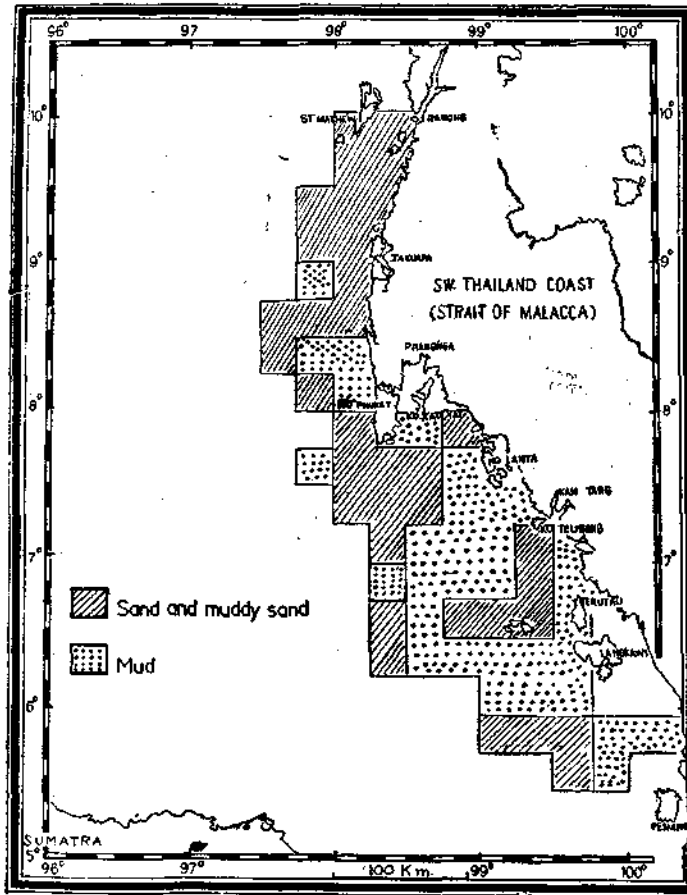


Fig. 3. Nature of Bottom sediments along the SW Thailand coast.

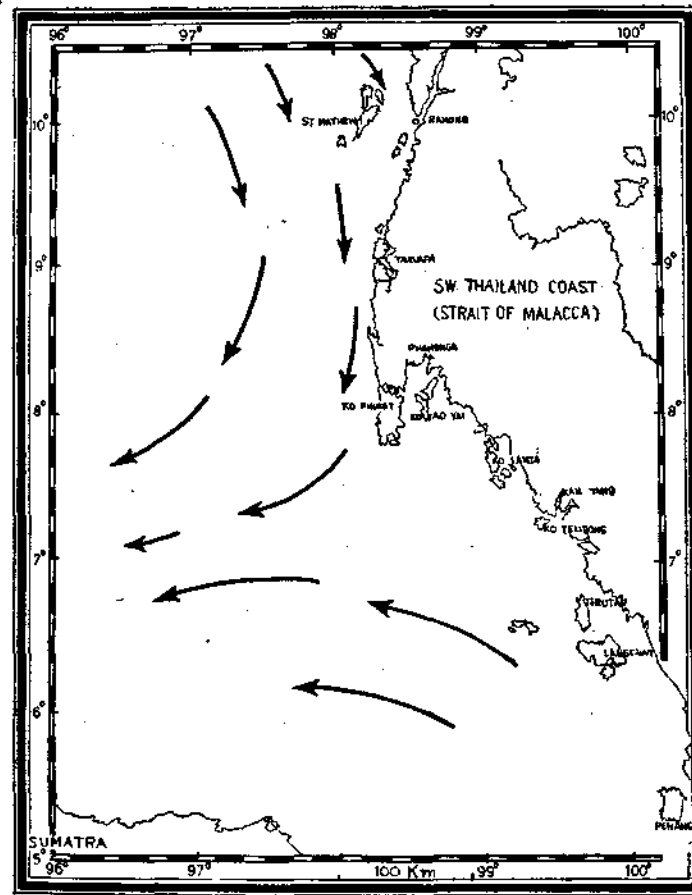


Fig. 4. Current pattern along Thailand coast during February-March (After Sverdrup *et al.* 1957).

The temperature in which *B. malayana* were captured was 28.1°C and the salinity 31.4‰ and 31.83‰. The oxygen content was measured at only one station and it was 3.90 ml/l.

TABLE 1. Types of bottom and the abundance of lancelets

Sampling Station	Dhanarajata Station	Type of bottom sediments	Smith-Mc Intyre No./1 m ²	Mouse Trap	Species of lancelets
1000	399	Muddy sand with shell gravel	10	1	<i>E. cultellus</i>
1006	398	Clayer coarse sand to gravel	10	—	<i>B. belcheri</i>
1007	378	Mud with very fine sand and gravel	10	—	<i>B. belcheri</i>
1008	361	Medium coarse brown sand	39	—	<i>B. belcheri</i>
1011	360	Not identified	—	1	<i>E. cultellus</i>
1014	344	Grey medium sand	47	—	<i>B. belcheri</i>
1018	341	Loose brown sand	19	—	<i>B. belcheri</i>
1019	341	Fine grey sand	10	1	<i>B. belcheri</i>
1020	340	Medium sand with clay	—	1	<i>E. cultellus</i>
1024	325	Light muddy sand	20	1	<i>B. belcheri</i>
1025	400	Light muddy sand	27	3	<i>B. malayana</i>
			10	2	<i>E. cultellus</i>
1031	417	Light clay and muddy sand	—	1	<i>E. cultellus</i>
1090	395	Muddy sand	10	—	<i>B. malayana</i>
1091	395	Brown sand	10	—	<i>B. belcheri</i>

TABLE 2. Bottom Temperature, Salinity and Oxygen at some of the stations

Dhanarajata Station	Temperature °C	Salinity ‰	Oxygen ml/l	Species of lancelets found
325	27.68	32.47	3.53	<i>B. belcheri</i>
340	26.45	33.40	1.42	<i>E. cultellus</i>
378	27.41	32.75	3.09	<i>B. belcheri</i>
395	28.05	31.82	3.90	<i>B. malayana</i>
398	25.58	34.13	2.38	<i>B. belcheri</i>
399	26.39	33.49	2.70	<i>E. cultellus</i>
417	26.53	33.68	2.56	<i>E. cultellus</i>

Epigonichthys cultellus (Fig. 2) showed no variation in their numbers in all samples. They were caught in the muddy sand type with or without gravel. It is generally recognized that *E. cultellus* were frequently caught in the Mouse Trap with very fine nylon meshes. The temperature and the salinity at *E. cultellus* stations were in the ranges of 26.4°C to 26.5°C and 31.46‰ to 33.68‰. In some stations, *E. cultellus* occurred in comparatively low oxygenated waters, the values varying from 1.41 ml/l to 2.67 ml/l.

DISCUSSION AND CONCLUSION

The distribution of the three species of lancelets along the Indian Ocean coast of Thailand brings to light many points for discussion. The first record of *Branchiostoma malayana* in the Indian Ocean fauna seems to be the most interesting

one. Webb (1956) described this species from the south-east shore of Singapore Island. He also stated that it showed some relationship with the lancelets of the Indian Ocean and the Bay of Bengal. Wickstead (1964) had some doubts whether the Acraniate larvae in his plankton collections belonged to the adult of *B. malayana*. However, until the present study no adult of this species had been collected in the Zanzibar water or elsewhere in the Indian Ocean. *Branchiostoma malayana* has been reported mainly from the Pacific region (Webb 1956, Piyakarnchana & Vajropala 1961, Piyakarnchana 1962).

Unlike the former species, *B. belcheri* and *E. cultellus* have been reported by many authors from the Indian Ocean (Franz, 1922; Prenant, 1928; Prashad, 1934; Webb, 1957). Hubbs (1922) classified *B. belcheri* as an Indo-asiatic species and also *Epigonichthys* and *Asymmetron* as the Indo-Australasian group. Webb (1956) also called *B. belcheri* a predominant species of the China Sea.

The presence of *B. malayana* in the faunal list of the Indian Ocean coast of Thailand might indicate the penetration of the Pacific lancelet fauna into the Indian Ocean by way of the shallow water along the coast line. This finding will also support the proposal by Ekman (1967) that the Malayan Archipelago is the faunistic center of the Indo-Malayan Region. However, the picture is not clear when we consider the origin of the other two species of lancelets in the northern part of the study areas. By judging from the peculiar current patterns of the Andaman Sea and also of the Strait of Malacca (Sverdrup *et al.* 1957) the gyre of clockwise direction in the northern part of the Andaman Sea and the current anti-clockwise direction in the Malacca strait probably prevent the penetration of the southern lancelet fauna to the north.

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