



Catch Per Unit Effort of Estuarine Push Net with Emphasis on Occurrence and Abundance of *Acetes* Shrimps in the Coastal Waters of Malacca, Peninsular Malaysia

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ABSTRACT

Catch per unit effort (CPUE) of estuarine push net (EPN) and abundance of *Acetes* shrimps in the coastal waters of Klebang Besar, Malacca were investigated based on the catch data from April 2006 to March 2007. The average monthly CPUE of the EPN observed was 3.53 (\pm 3.99) kg/fisherman/hour. The total catch comprised of three major categories namely: *Acetes* shrimps (90%), fish juveniles (9%) and other shrimps (1%). Amongst the *Acetes* shrimps, three species (*A. indicus*, 87%, *A. japonicus*, 12% and *A. intermedius*, 1%) were recorded from the investigated area. The peak catches were observed during the months of September, November and December. There was no significant correlation ($p > 0.05$) between monthly catches and environmental parameters (temperature, dissolved oxygen, salinity and pH).

Keywords: CPUE, estuarine push net, *Acetes* shrimps, Peninsular Malaysia

INTRODUCTION

The Estuarine Push Net (EPN) is locally known as Suongkor (*Fig. 1*) in the coastal region of Malacca, Peninsular Malaysia. It is a triangular shape and the mesh size decreases from 3.2 cm at anterior section to 0.5 cm at the cod end. It is used intensively all along the coast and estuaries of Malacca to collect *Acetes* shrimps (Udang geragau). Fishing is done normally during day time by pushing the net against the flow of tide (Omori, 1975). The EPN catches the species of shrimps that drift with current or do not swim fast enough. There is a large population which is depending on the income from this fishery in the coastal region of Malacca. However, little is known about the fishery of *Acetes*. The fishery statistics are particularly inadequate, because the shrimps are mainly consumed locally. Observation on the commercial fishing, sampling and examination of specimens landed was made in various localities in Japan, Taiwan, Hong Kong, South Vietnam, Thailand, Malaysia, Singapore, Indonesia and India (Omori, 1975). The EPN has been used for decades but the catch per unit effort (CPUE) and temporal variation of catches are unknown. It is assumed that the small mesh size net used may lead to an overexploitation of the shrimps living in the estuarine area. Therefore, an attempt was made to study the CPUE of estuarine push net fishery and the temporal distribution of *Acetes* shrimps in the coastal waters of Malacca, Peninsular Malaysia.

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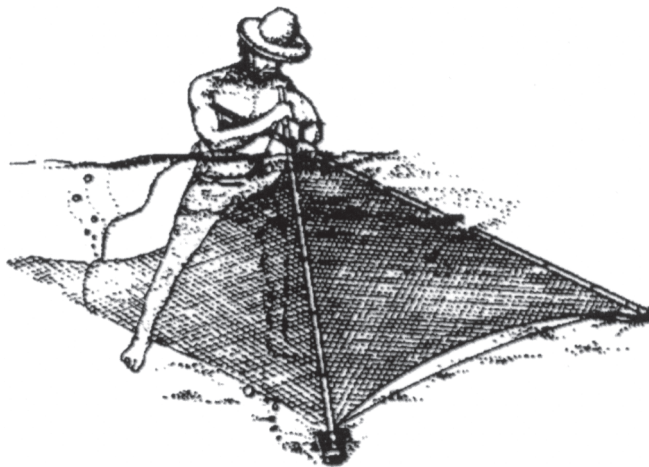


Fig. 1: Estuarine push net (EPN) which is used to catch *Acetes* shrimps along the coast of Malacca, Malaysia

(Source: www.fao.org)

MATERIALS AND METHODS

Samplings were done fortnightly between April 2006 and March 2007 from Klebang Besar (N 02°13.009' & E 102° 11.921') in the Malacca coastal waters, Straits of Malacca (Fig. 2). The estuarine push net was operated between the depth of 1 m and 1.5 m. The fishing effort was one man per hour and the towing length was approximately 1000 m along the coast of Klebang Besar, Malacca. After collection, samples of total catches were immediately preserved in 10% formalin in the field and transported to the laboratory for further analysis. The specimens were identified in the laboratory using a Nikon dissecting microscope (Nikon-122764, Japan). For species composition, 20 gm sub-sample of *Acetes* was taken randomly from the total catch after separation of fish juveniles and other shrimps. Annual percent composition and temporal distribution of *Acetes* shrimps were calculated from monthly sub-sample data. The identification of *Acetes* shrimps was based on the work of Hansen (1919) and Omori (1975). Physico-chemical parameters such as water temperature, salinity, dissolved oxygen and pH were measured fortnightly (April 2006 to March 2007) using a calibrated Hydro Lab (Model: Surveyor 4A, Hydrolab Corporation, USA).

RESULTS AND DISCUSSION

Environmental Variables

The average subsurface water temperature recorded from the Klebang Besar during the study period was $30.13 \pm 1.23^{\circ}\text{C}$ (mean \pm SD). The lowest temperature (28.09°C) was found in February, while the highest temperature (32.95°C) was recorded during September (Fig. 3). The mean value of salinity recorded was 26.23 ± 4.82 ppt. The lowest value of salinity recorded was 19.50 ppt in October, while the highest was 33.82 ppt in March (Fig. 3). The mean value of dissolved oxygen recorded was 5.10 ± 1.12 mg L⁻¹. The

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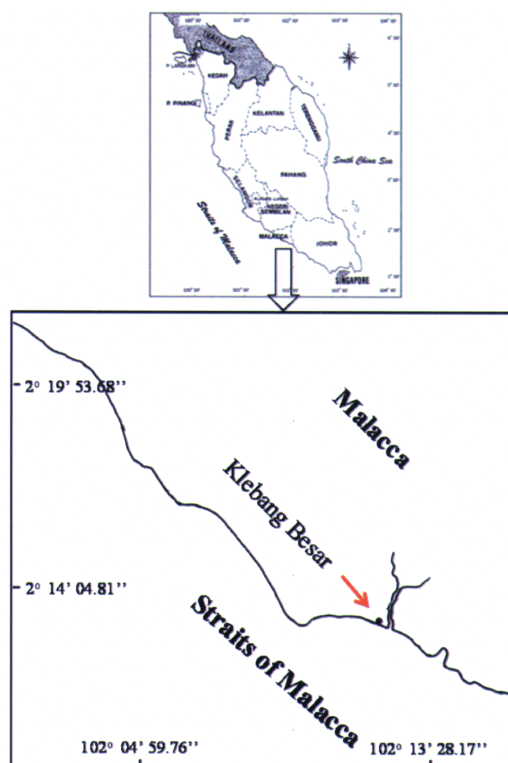


Fig. 2. Geographical location of the sampling area in the coastal waters of Malacca

lowest dissolved oxygen recorded was 3.24 mg L^{-1} in October, while the highest value was 6.97 mg L^{-1} in May (Fig. 4). The fluctuation of pH during the study period was low between 7.37 and 8.37 (Fig. 4) with a mean of 7.91 ± 0.30 .

Estuarine Push Net Fishery

There were three (3) major groups of the species observed from the catches of EPN in the coastal waters of Malacca (Fig. 5). The dominant group was *Acetes* shrimps (90%), followed by fish juveniles (9%), and other shrimps (1%). The monthly average total CPUE of EPN was found to be $3.53 (\pm 3.99) \text{ kg/fisherman/hr}$. The highest catch ($15.10 \text{ kg/fisherman/hr}$) was observed in December and the lowest ($0.3 \text{ kg/fisherman/hr}$) was observed in the month of January (Fig. 6). It is noted that in the inshore coastal areas of Malacca, estuarine push net is commonly used to catch the *Acetes* shrimps. The catching capabilities of the EPN depend on the strength of the operator, his experience on the ground and the season (Tham, 1954). There is no published report regarding the CPUE of EPN fishery except the report by Tham (1954) which stated that the highest catches are observed during the north-east monsoon in Singapore. The present study revealed that the highest catches observed in the coastal waters of Malacca are in the months of November and December, the beginning of the north-east monsoon season. In the study area, *Acetes* are caught two times each month during the neap tide, between new moon and full moon. The average fishing days per month were 6 ± 3.52 . Fishermen

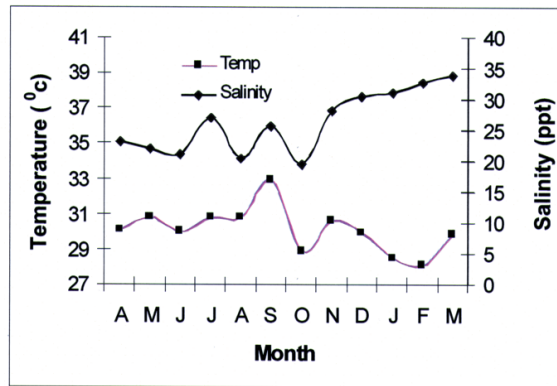


Fig. 3: Monthly variation of temperature and salinity in the coastal waters of Malacca, Malaysia

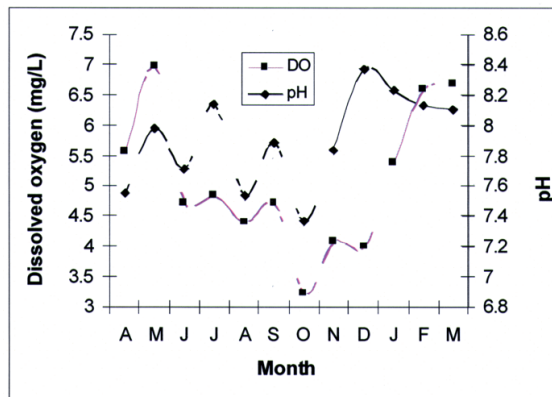


Fig. 4: Monthly variation of dissolved oxygen and pH in the coastal waters of Malacca

sell *Acetes* shrimps near the beach or road side directly to the consumer or to middlemen. Most of *Acetes* shrimps are sold in wet condition (95%) and the rest (5%) in dry condition. The average price of wet *Acetes* was at RM 3.00 in the coastal region of Malacca. The mean monthly CPUE showed a moderate positive correlation with temperature ($r = 0.29$, $p > 0.05$), salinity ($r = 0.22$, $p > 0.05$) (Fig. 7) and pH ($r = 0.37$, $p > 0.05$). However, the mean monthly CPUE showed negative correlation with dissolved oxygen ($r = -0.47$, $p > 0.05$) (Fig. 8).

Occurrence and Abundance of *Acetes* Shrimps

The planktonic shrimps of the genus *Acetes* were observed in the area throughout the study period. There were three species of *Acetes* (*Acetes indicus*, *Acetes japonicus* and *A. intermedius*) found in the coastal waters of Malacca. The annual percent compositions of *A. indicus*, *A. japonicus* and *A. intermedius* were 87%, 12% and 1%, respectively (Fig. 9).

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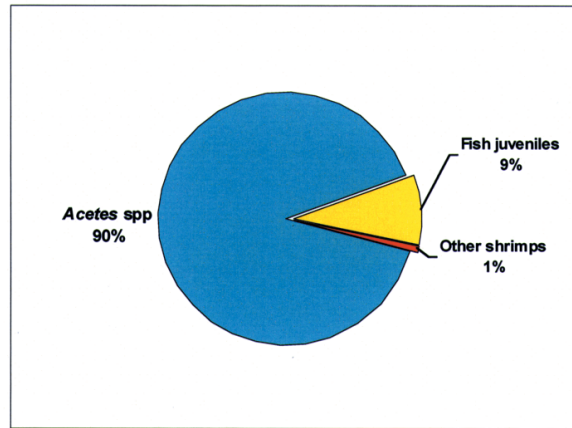


Fig. 5: Annual major catches categories of EPN along the coast of Malacca, Malaysia

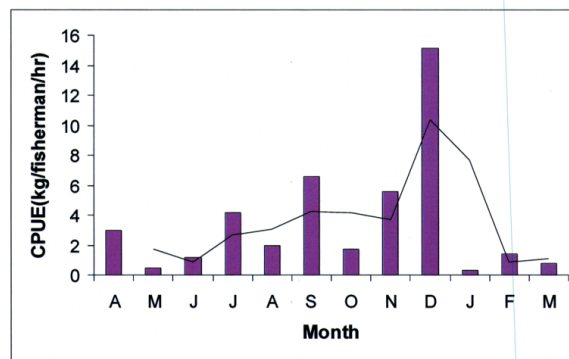


Fig. 6: Monthly average catches (Kg/fisherman/hr) of EPN along the coast of Malacca, Malaysia

Acetes indicus

Highest densities (more than 70%) of *A. indicus* were recorded almost every month (Fig. 10) in the study area. Bhattacharya (1988) reported that the temperature for *A. indicus* ranged from 13°C to 35°C. In the coastal waters of Klebang Besar, temperature varied from 28.09°C to 32.95°C and *A. indicus* was found in comparatively lower density from January to May and peak in June – December months (Fig. 10). Bhattacharya (1988) also mentioned that a large number of *A. indicus* occurred when salinity varied from 26.50 ppt to 35.00 ppt. In the coastal waters of Malacca, this species was recorded with the salinity from 19.50 ppt to 33.82 ppt. But there was no significant correlation ($p > 0.05$) between the abundance of *A. indicus* and the salinity in the study area. *Acetes indicus* occurs in the central part of the Indo-West Pacific, from South China Sea through the Gulf of Thailand (Omori, 1975; Chaitiamvong, 1980; Chaitiamvongse and Yoodde, 1982) and the Bay of Bengal, Bangladesh (Mahmood *et al.*, 1978, Zafar and Alam, 1997), Straits of Malacca (Pathansali, 1966) and Andaman Sea to the entire east and west coasts of India

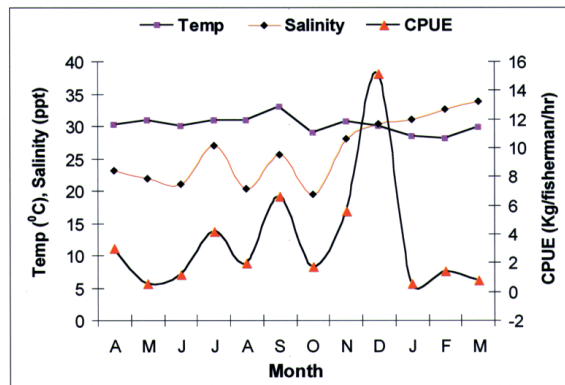


Fig. 7: Monthly variation of CPEU with temperature and salinity in the coastal waters of Malacca, Malaysia

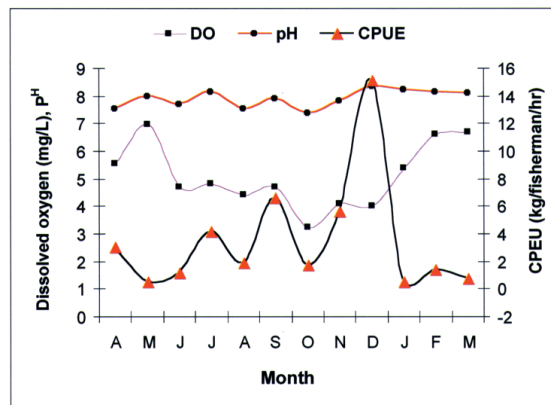


Fig. 8: Monthly variation of CPEU with dissolved oxygen and pH in the coastal waters of Malacca, Malaysia

(Ravindranath, 1980). This species is the most common shrimp along the Maharashtra coast in northwestern India, especially at Bombay (Aravindakshan *et. al.*, 1985) and in Galle Harbour of Sri Lanka and Manora Channel near Karachi, Pakistan (Tirmizi and Ghani, 1982).

Acetes japonicus

The occurrence of *A. japonicus* was observed all year round but the number was negligible from June to December (Fig. 10). The maximum density (35.35%) of *A. japonicus* was in March and the minimum (1.23%) in September (Fig. 10). The monthly percent of abundance of *A. japonicus* showed positive correlation with dissolved oxygen ($r = 0.83$; $p < 0.05$) and salinity ($r = 0.43$; $p > 0.05$). No significant correlation ($p > 0.05$) was found between the monthly abundance of *A. japonicus* and the two variables (Temperature and pH). *Acetes japonicus* is distributed along the coastal areas of the Yellow Sea, South China Sea (Wang, 1987; Lei, 1988), Gulf of Thailand (Omori, 1975), Java Sea and Straits of Malacca (Pathansali, 1966; Omori, 1975). It has also been reported from the southwest coast of India (Achuthankutty *et al.*, 1973), Bangladesh (Mahmood *et al.*, 1978) and

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Manora channel near Karachi of Pakistan (Tirmizi and Ghani, 1982). In Japan, the species is found in neritic waters around the Islands of Kyushu and the western part of Honshu (Harada, 1968) and is commercially fished in the Ariake Sea (Omori, 1975). Great swarms of this species can occur in Suruga Bay usually in July and August (Omori, 1975). The species is also recorded in Vietnam (Omori, 1975) and along the coast of Pakistan and in Kuwait Bay of the Gulf of Arabia (Enomoto, 1971).

Acetes intermedius

The occurrence of *A. intermedius* was observed in February and March during the investigation (Fig. 10). The occurrence of *A. intermedius* was absent in the 20 gm sub sample in the other months during the study period. The abundance of *A. intermedius* showed positive significant correlation with salinity ($r = 0.91, p < 0.05$). Higher degree positive correlation was also found with conductivity ($r = 0.87, p > 0.05$) and moderately correlated with TSS ($r = 0.62$). The occurrence of *A. intermedius* was in February and March during the investigation. It is well known that *A. intermedius* is a highly migratory species. It migrates from estuaries to offshore waters and performs a diel vertical



Fig. 9: Annual species composition of *Acetes* shrimps in the coastal waters of Malacca, Malaysia

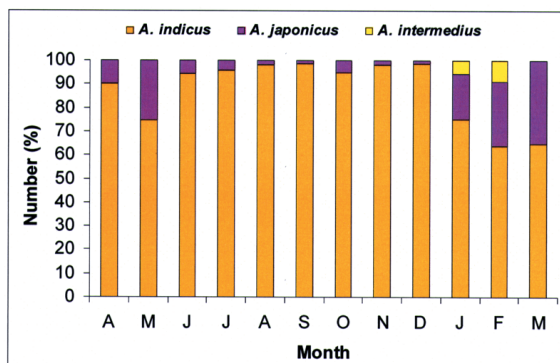


Fig. 10: Monthly abundance of three *Acetes* shrimps in the coastal waters of Malacca, Malaysia

migration in the coastal waters of south-western Taiwan during the period from June to October (Chiou *et al.*, 2000). May be due to its migratory character, the species could not be found in other months except February and March in the study area. It is one of the most important commercial shrimp resources and is also an important component of the marine ecosystem in the coastal waters of south-west Taiwan (Chiou *et al.*, 2000). The species *A. intermedius* is previously reported from Bangladesh (Zafar, 2000); Taiwan, Philippines and south coast of Java, Indonesia (Omori, 1975) and now in the coast of the Straits of Malacca, Peninsular Malaysia.

CONCLUSIONS

The major component in the EPN catches were *Acetes* shrimps (90%). The percentage compositions of *A. indicus*, *A. japonicus* and *A. intermedius* were 87%, 12% and 1%, respectively. The average catch was 3.54 kg/fisherman/hr and the highest catch was observed in the months of November and December. There was no significant correlation ($p > 0.05$) between monthly CPUE of total catch and environmental parameters (temperature, salinity, dissolved oxygen and pH). It could be concluded from the study that estuarine push net is the effective fishing gear for *Acetes* fishery since the dominant component in the EPN catches are *Acetes* shrimps (90%). However, further studies are needed to find out the composition of juvenile fishes and their commercial value to evaluate the effectiveness of the estuarine push net.

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