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Catch per unit effort of coastal prawn trammel net fishery in Izmir Bay, Aegean Sea**O. AKYOL and T. CEYHAN**

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Abstract

Catch per unit effort (CPUE) data from the coastal trammel prawn net fishery was estimated from fishery-dependent surveys in Izmir Bay (Aegean Sea) during the 2004-2005 fishing season. Catches were sampled from 18 boats for a total of 170 landings, 60 landings from April to July (first period) and 110 landings from August to November (second period). The mean CPUEs were 2.56 ± 0.39 kg. 10 net unit⁻¹ in the first period and 2.29 ± 0.20 kg. 10 net unit⁻¹ in the second period, and not significantly different between periods ($P>0.05$).

Keywords: CPUE; Caramote prawn; *Melicertus kerathurus*; Trammel net; Coastal fishery; Aegean Sea.

Introduction

Catch and effort data are typically analyzed in the form of catch-per-unit-effort (CPUE), which expresses the quantity of fish caught (in numbers or weight) by a given amount of fishing effort. In general, CPUE is used as an index of abundance, meaning that a proportional change in CPUE is expected to represent the same proportional change in stock size (FAO, 1999).

Shrimp fisheries are carried out by beam-trawlers (only in the Sea of Marmara), otter trawlers (Aegean Sea and the Mediterranean) and traditional tram-

mel netters in all Turkish seas (except the Black Sea).

The shallow water prawn fishery is the most important fishing activity in the Turkish Aegean Sea. Artisanal trammel prawn net fisheries are especially concentrated in Izmir Bay in the Aegean Sea. Historically, commercially important stocks of caramote prawn, *Melicertus kerathurus* (Forskål, 1775) have been exploited in and around Izmir Bay since 1967 (C. Küntay, pers.comm.). There are only a few studies (TÜRKMEN & YILMAZYERLİ, 2006; GÖKÇE & METİN, 2007; AKYOL, 2008) on the fishery and biology of this species

in the Bay of Izmir.

The Bay of Izmir has been closed to trawlers since the early 1980's and to purse-seiners for seven years. As a consequence, fleets of small scale fisheries have increased yearly. Recently, more than a hundred fishing boats participated in the prawn fishery over two seasons, late April to early July (the first period) and late August to early November (the second period). This paper reports the CPUE estimated for two fishing periods from eighteen prawn netters in Izmir Bay, which is located in the central Aegean Sea.

Material and Methods

Sampling data were obtained from 170 observations of which 60 were landings in the 1st period (from April to July) and 110 were landings in the 2nd period (from August to November), from 18 fishing boats in the 2004 - 2005 fishing season. During the rest of the year (i.e. from December to beginning of April) due to the colder water, many prawns, *M. kerathurus* included, are buried in the muddy bottom. Hence, this period is an inactive period for prawns.

For each fishing boat the following data were recorded: (i) the type and technical characteristics of the boat and gears; (ii) total prawn weight (g) of landings; and (iii) soak time of the nets. Technical characteristics of the net were drawn according to FAO (1975).

Fishing effort (f) and CPUE were calculated using the following formula, modified from DE METRIO and MEGALOFONO (1988): $f = (a'/10) \times g$. Where $(a'/10)$ represents the average length of the nets, placed daily in the sea divided by the 10 net units (200 m total length of stretched net is called one unit

and the length of trammel net is 100 m after it is mounted on to the upper and lower ropes, i.e. hanging ratio is 0.5). Therefore, 10 net units is equal to $10 \times 100 = 1000$ m. 'g' is the number of fishing days. The CPUE was computed in biomass with the formula, $CPUE = \text{kg}/f$. Means were given with standard error (\pm SE). A *t*-test was used to compare CPUEs between both periods.

Results

The target prawn species of the trammel net fishery in Izmir Bay is the caramote prawn, *Melicerus kerathurus*. The length of the fishing boats varied from 6.3 to 9.7 m (mean: 7.5 ± 0.25) and their engine power between 6.5 and 85 hp (mean: 36.1 ± 6.83). All the boats were made of wood. The sampling boats represented about 20% of the active segment of the coastal fleet.

The fishing gear, a trammel net in all of the boats, is composed of two layers, one lower and one upper (Fig. 1). The stretched mesh sizes of the inner and outer nets were 40 mm and 220 mm respectively and the length of the each net varied from 800 to 3500 m (mean: 1544 ± 165 m). The cumulative length of the nets used by the 18 boats which were sampled was 28000 m with an average 1544 ± 165 m per vessel. Soak time of the nets was estimated at about 12 hours, from sunset to sunrise. The nets are usually set at a depth of 10-35 m on muddy bottoms.

Fishing effort (f) and CPUE relative to boats and fishing periods are shown in Table 1. Mean CPUE was 2.56 ± 0.39 kg for the first period and 2.29 ± 0.20 kg for the second period. No significant differences in mean CPUE between both periods were detected ($P > 0.05$).

| | | | | | |
|-------------|--------|----------------|------|---------------|-----|
| 208 PL Ø 2 | | E= 0.50 | | 100.00 PP Ø 4 | |
| 5.5 | 220 mm | PA | 909 | 75 Rtex | 5.5 |
| | | | | 5000 | |
| 50 | 40 mm | PA | 5000 | 25 Rtex | 50 |
| | | | | 5000 | |
| 5.5 | 220 mm | PA | 909 | 75 Rtex | 5.5 |
| | | | | 909 E~0.54 | |
| 5.5 | 220 mm | PA | 682 | 75 Rtex | 5.5 |
| | | | | 682 | |
| | | | | 5000 | |
| 50 | 40 mm | PA | 5000 | 25 Rtex | 50 |
| | | | | 5000 | |
| 5.5 | 220 mm | PA | 909 | 75 Rtex | 5.5 |
| | | | | 909 | |
| 277 Pb 30 g | | 103.3 PP Ø 3-4 | | E= 0.51 | |
| | | | | 0 1 2 5 m | |

Fig. 1: Technical characteristics of the prawn trammel net, used in Izmir Bay (PA, polyamide; PP, polypropylene; PL, plastic; Pb, lead; E, hanging ratio).

Discussion

The only two previous studies of the trammel net fishery for prawn in Izmir Bay were based on by-catch and discards (GÖKÇE and METİN, 2007; AKYOL, 2008). This paper provides the first quantification of CPUE for 2004-2005 fishing season from this type fishery in the Bay of Izmir (Aegean Sea).

Post-larval and juvenile stages of Penaeid shrimp are found in swamps or lagoons (WILLMAN & GARCIA 1985). TÜRKMEN & YILMAZYERLİ (2006) reported that the spawning season and minimum size at first sexual maturity of *M. kerathurus* in Izmir Bay was between May and August, (4.6 cm CL and 16.5 cm TL, respectively). Izmir Bay (the bay is 'L' shaped; 20 x 40 km in the upper part and 5-7 x 24 km in the lower part), which includes the Gediz estuary (40000 hectares) and three lagoons (2949 hectares in total) is probably one of the

most important nursery and recruitment areas in the Turkish Aegean Sea. For this reason, the area has been closed to trawlers for the last two decades and to purse-seiners since 2000. Thus, artisanal small scale fisheries with the use of gillnets and trammel nets are the principal fisheries in the area.

The total amount of prawn catch in the bay is unknown. Our results show that fishing effort and CPUE in biomass of prawns were relatively low (average 2.29-2.56 kg per 1000 m net). It is not unusual for many boats to come back to port without covering expenses. Due to the low CPUEs, fishermen spend most fishing time on by-catch and are moving towards increasing the size of their nets. However, we cannot compare to these values because absence of any literature from the area. NAESJE, *et al.* (2007) stated that when a standard fishing gear is used, the CPUE may be used as a rough indicator of the relative density of fish in the areas

Table 1
Fishing effort and CPUE (kg 1000 m⁻¹net) from 18 fishing boats in Izmir Bay.

| Boats | Length of nets (m) | 1 st Period | | | | 2 nd Period | | | |
|-------|--------------------|------------------------|------------------------------|--------------------------|-------------|------------------------|------------------------------|--------------------------|-------------|
| | | Number of trips | Total weight of catches (kg) | f (length of nets* days) | CPUE (kg/f) | Number of trips | Total weight of catches (kg) | f (length of nets* days) | CPUE (kg/f) |
| 1 | 2000 | 10 | 77.0 | 20.0 | 3.85 | 9 | 57.5 | 18.0 | 3.19 |
| 2 | 2500 | 6 | 41.5 | 15.0 | 2.77 | 11 | 69.6 | 27.5 | 2.53 |
| 3 | 2000 | 9 | 30.0 | 18.0 | 1.67 | 9 | 32.8 | 18.0 | 1.82 |
| 4 | 2000 | 2 | 4.0 | 4.0 | 1.00 | 7 | 28.5 | 14.0 | 2.04 |
| 5 | 1300 | 4 | 17.5 | 5.2 | 3.37 | 2 | 4.5 | 2.6 | 1.73 |
| 6 | 1800 | 2 | 7.5 | 3.6 | 2.08 | 7 | 45.5 | 12.6 | 3.61 |
| 7 | 1800 | 4 | 6.3 | 7.2 | 0.88 | 4 | 13.0 | 7.2 | 1.81 |
| 8 | 1800 | 5 | 28.0 | 9.0 | 3.11 | 11 | 44.5 | 19.8 | 2.25 |
| 9 | 900 | - | - | - | - | 8 | 18.0 | 7.2 | 2.50 |
| 10 | 800 | - | - | - | - | 5 | 11.5 | 4.0 | 2.88 |
| 11 | 2000 | - | - | - | - | 10 | 46.3 | 20.0 | 2.32 |
| 12 | 3500 | 3 | 13.0 | 10.5 | 1.24 | 4 | 12.5 | 14.0 | 0.89 |
| 13 | 1000 | - | - | - | - | 2 | 4.6 | 2.0 | 2.30 |
| 14 | 1600 | 7 | 18.0 | 11.2 | 1.61 | 3 | 5.5 | 4.8 | 1.15 |
| 15 | 800 | - | - | - | - | 6 | 18.0 | 4.8 | 3.75 |
| 16 | 1600 | 6 | 48.5 | 9.6 | 5.05 | 10 | 50.0 | 16.0 | 3.13 |
| 17 | 1400 | - | - | - | - | 2 | 3.0 | 2.8 | 1.07 |
| 18 | 1200 | 2 | 10.0 | 2.4 | 4.17 | - | - | - | - |
| Total | 28000 | 60 | 301.3 | 115.7 | 2.56± 0.39 | 110 | 465.3 | 195.3 | 2.29±0.20 |

sampled. In this study, the low CPUE may be an indication of low abundance and/or over-fishing of caramote prawns.

In this study, CPUE analysis was based on samples taken from 20% of the total active prawn fleet for the first time. So, we recommend that monitoring programs on all coastal trammel netters should be established to estimate the effect of fishing power (i.e. tonnage, engine power, vessel size, time, gear, etc.) and to estimate the biomass of the species for sustainability in the area.

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