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Research article

Discard composition of the bottom trawl fishery in Babadıllimanı Bight, Mersin, Turkey (northeastern Mediterranean)

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Abstract: This research aimed to estimate the composition of discards from the bottom trawl fishery in Babadillimani Bight (Cilician Basin, Northern Mediterranean). During May 1999 to April 2000, a deep trawl net was used with a one-hour haul duration in each depth zone per month. A total of 89 fish, seven cephalopods, and 24 crustacean species were captured. The proportion of the total harvest that was discarded varied each month, ranging from 30.97% to 71.68%, with an average of 58.2%. The mean discard proportion of the total yield decreased with increasing depth, being 30.5%, 22.0%, and 5.5% in the 0–50 m, 50–100 m, and deeper than 100 m zones respectively. Crustaceans made up the largest proportion of the total discards (53.3%), followed by fish (42.3%), and cephalopods (4.4%).

Keywords: Bottom trawling, Northeastern Mediterranean, Discard, Fish, Crustacea, Cephalopoda.

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Introduction

In terms of species and fishing equipment, the fisheries of the Mediterranean are highly diverse. Some of these species have commercial value, while others do not. Bottom trawl net fisheries enable the collection of many species that inhabit the soft bottom. Therefore, Caddy (1993) referred to the Mediterranean's fisheries as multispecific. Additionally, coastal fisheries in the Cilician Basin (northeast Mediterranean) typically employ deep trawl nets on the continental margin, in depths ranging from 0 to 100 m, reaching a maximum of 200 m (Bingel 1987). Furthermore, trawl operations conducted in this region do not have a specific target species, and fishermen generally aim to capture species with high commercial value. Due to legal requirements, the discard fraction consists of unmarketable species or species and size groups with minimal commercial value. In fact, this is the case for the majority of the world's regions: Alverson et al. (1994) reported that commercial fishing generates an estimated 27 million tonnes of discards annually worldwide.

Despite the abundance of information on the fishing grounds (Aasen & Akyuz 1956, Akyuz 1957), trawl fisheries and catch composition (Bingel 1984, 1987, Bingel et al. 1993, Anonymous 1993), plastic materials retained in deep trawl net (Bingel et al. 1987), fish stocks and fisheries fleets (Gucu & Bingel 1994), multispecies fisheries modelling (Gucu 1995), stock composition (Avsar et al. 1988a, 1988b, 1990, Avsar 1995) fish and fishery biology (Bingel 1982, Avsar 1994, Gucu et al. 1994, Kumlu et al. 1999, Yeldan & Avsar 1999, Ozutok & Avsar 2003), data on the bottom trawl discard from the fisheries carried out in Cilician Basin (northeastern Mediterranean) has not been reported in detail. The

primary objective of the present study is to analyse the species composition of the bottom trawl by-catch and refuse in a small bight along the coast of the Cilician Basin (northeast Mediterranean).

Materials and Methods

Samples were collected from three sampling stations, one representative of each depth range (0–50 m, 50–100 m, and deeper than 100 m), in Babadillimani Bight, located in the western entrance of Mersin Bay in the Cilician Basin (Figure 1). These stations were sampled at monthly intervals, with each haul lasting one hour, using a commercial deep trawl net with a 22mm cod-end mesh size in stretched form, between May 1999 and April 2000.

Trawl operations were conducted during the day, and all caught materials on board were swept away by the seawater, which contained mud and other organic and inorganic particles. Identification of species was accomplished by weighing the references provided by Whitehead et al. (1984, 1986a, 1986b) and Fischer et al. (1987a, 1987b). The species collected during the study period were classified as belonging to two groups: 1) commercial species- those that were always marketable (although only young individuals were discarded); and 2) discard species- those that were always discarded. To statistically test the percentage discard values obtained among the depth range, a two-tailed analysis of variance was applied.

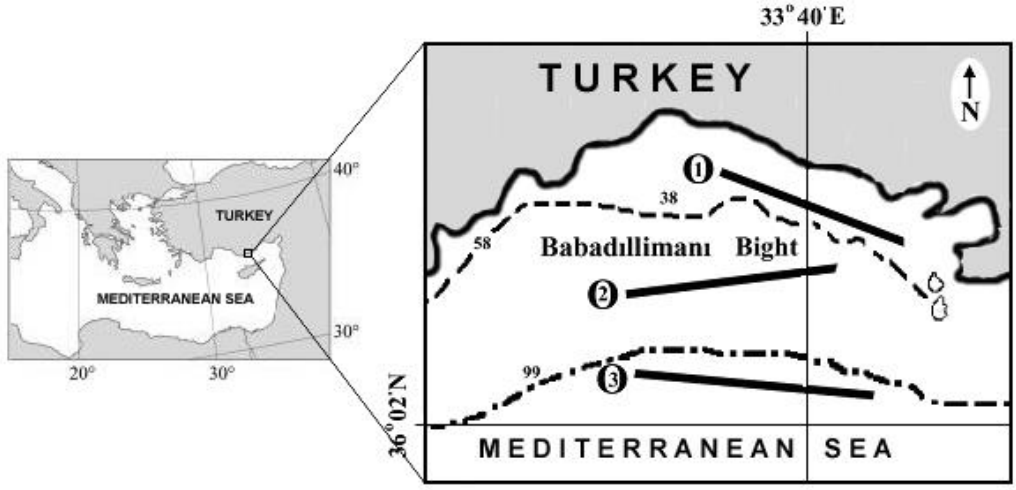

Figure 1. Study area and trawled depth ranges (①: 0-50m depth range station; ②: 50-100m depth range station, and ③: deeper than 100m depth range station).

Results

During the research period, 96 fish species, 26 crustacean species, and 7 cephalopod species were identified in the total catch. Of these, 50 fish species, 5 crustacean species, and 4 cephalopod species were classified as commercial or consistently marketable species, while the remaining 46 fish species, 22 crustacean species, and 3 cephalopod species were classified as refuse species (Table).

In the course of 36 hours of fishing, 36 hauls yielded a total of 2,617.2 kg of biomass. Fish made up 55.3% of the total catch, followed by crustaceans (36.6%) and cephalopods (7.7%). Figure 2 illustrates the monthly variations of the total capture and discard biomass as well as their respective fractions. The minimum and maximum discard values were 12.4 kg and 400.6 kg in March and August, respectively, with an average value of 135.2 kg (131.6 kg). As evident from Figure 2, the monthly fluctuations of the total catch, total discard, and amount of fish discarded follow a similar pattern.

During the study period, the greatest total catch (707.4 kg) was obtained in August, the commencement of the fishing season. From August until the end of the fishing season, this value decreased month-by-month. March yielded the least amount of total biomass at 39.5 kg, after which it began to rise month-by-month until August, the start of the next fishing season. The discard fraction of the total catch followed the same trend, with the maximum discard value in August (400.6kg) and the least discard value in March (12.4kg).

Table. List of totally discarded species (n: number of species).

Fishes (n=46)	*Gnathophis mystax*	*Sygnathus typhle*	*Crangon crangon*
Anthias anthias	*Gobius niger Gymnura altavela*	*Symphurus nigrescens*	*Dorippe lanata*
Aphia minuta	*Hippocampus hippocampus*	*Torpedo marmorata Trachinus*	*Eupagurus bernhardus*
Apogon nigripinnis	*Hippocampus ramulosus*	*araneus*	*Homola barbato*
Arnoglossu kessleri	*Lagocephalus lagocephalus*	*Trachinus draco*	*Ilia nucleus*
Arnoglossus laterna	*Lagocephalus spadiceus*	*Trichiurus lepturus*	*Lepas anatifera*
Arnoglossus thori	*Lagocephalus suezensis*	*Trigla lyra*	*Liocarcinus depurator*
Blennius ocellaris	*Leiognathus klunzingeri*	*Uranoscopus scaber*	*Macropipus tuberculatus*
Bothus podas	*Macroromphosus scolopax*		*Macropodia longirostris*
Callionymus flamentosus	*Mustelus mustelus*	**Cephalopods (n=3)**	*Macropodia tenuirastris*
Cepola rubescens	*Myliobatis aquila*	*Octopus aegina*	*Maja squinado*
Citharus linguatula	*Raja clavata*	*Octopus defilippi*	*Nebalia bibes*
Conger conger	*Raja miraletus*	*Sepia elegans*	*Pagurus variabilis*
Cynoglossus sinusarabici	*Raja radula*		*Paramola cuvieri*
Dactylopterus volitans	*Serranus hepatus*	**Crustaceans (n=22)**	*Pisa nodipes*
Dasyatis pastinaca	*Serranus scriba*	*Aegeon cataphractus*	*Squilla desmaresti*
Deltentosteus quadrimaculatus	*Solea lascaris*	*Alpheus glaber*	*Squilla mantis*
Echelus myrus	*Stephanolepis diaspros*	*Calappa granulata*	*Upogebia deltaura*
Echeneis naucrates	*Sygnathus acus*	*Charybdis longicollis*	

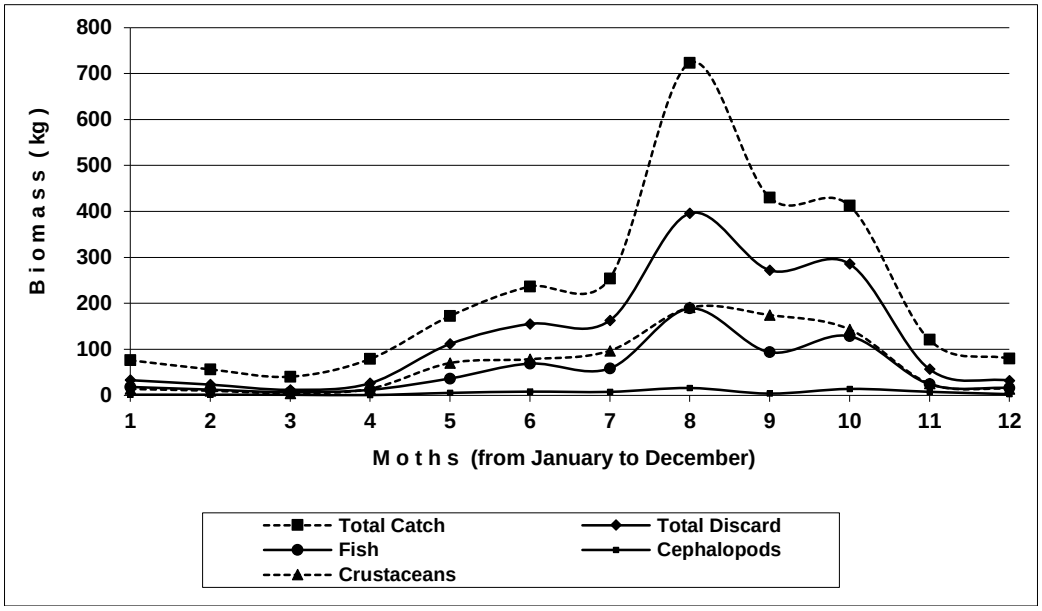

Figure 2. Monthly chances of total catch and the discard biomass together with its discard fractions.

Figure 3 depicts the monthly fluctuations of discard fractions as a percentage of total capture. It shows that the minimal and maximum discard proportions were 31.0% and 71.7%, respectively, during the months of march and october. Crustaceans comprised the majority of the discards at 53.3%, followed by fish (42.3%) and cephalopods (4.4%).

Figure 4 depicts the discard fractions as a percentage of total capture for each depth range. As shown in Figure 4, more than half of the total refuse was collected between 0 and 50 m (52.2%), followed by 50 to 100 m (37.7%) and deeper than 100 m (10.1%). The two-tailed analysis of variance revealed a significant difference ($P<0.05$) between the percentage discard values across the depth ranges. Fish constituted the majority of discards in the 0–50 m depth range (52.8%), while crustaceans dominated the 50–100 m (65.3%) and deeper than 100 m (49.6%) depth ranges. The majority of discarded cephalopods came from the deepest depth range, and the proportion of discarded cephalopods increased

from the shallow area (0–50 m; 21.2%) to the deep area (deeper than 100 m; 43.9%). On the other hand, the percentage of discarded fish decreased with increasing depth ranges. This result suggests that the shallow water capture contained a greater proportion of discarded fish than the deep water catch. The majority of the discarded crustaceans were collected from the depth ranges 0–50 m and 50–100 m.

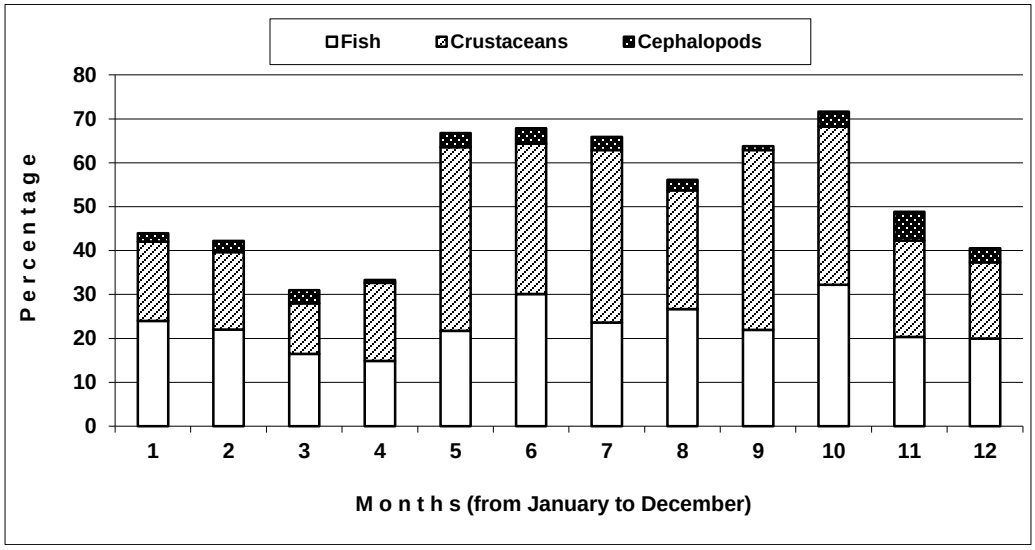

Figure 3. Monthly changes of the discard fractions as percentage in total catch.

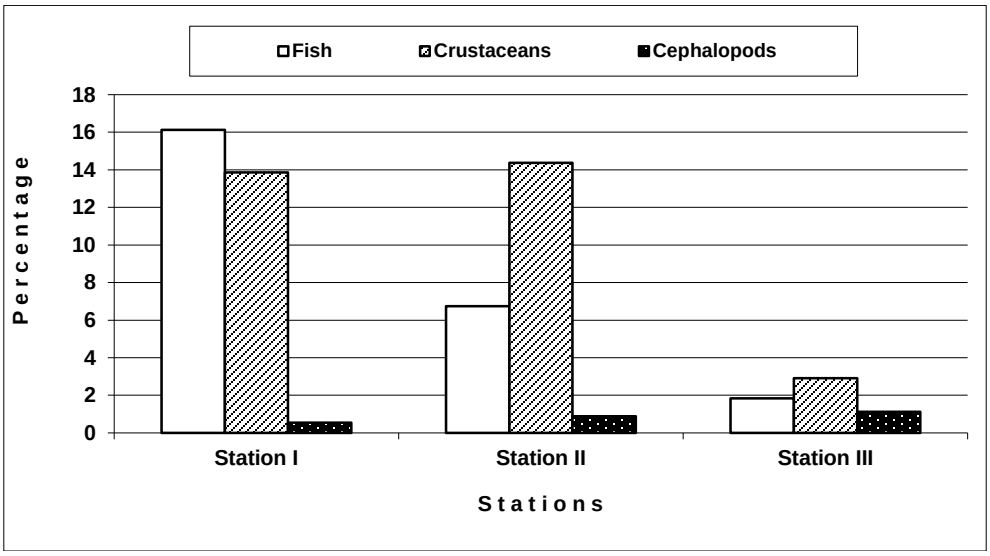

Figure 4. Discard fractions as percentage in total catch for each station.

Discussion

During the research period, an average of 58.4% of the total catch was discarded. However, the proportion of total capture that was discarded varied by month, depth range, and species. Monthly variations in the proportion of discards ranged from 31.0% to 71.7% of the total harvest, and the discard fraction values for the depth ranges of 0–50 m, 50–100 m, and greater than 100 m were 30.5%, 22.0%, and 5.9%, respectively. Furthermore, there were substantial disparities between the discard fraction values of each taxon, with crustaceans comprising the majority of discards (53.3%), followed by fish (26.0%) and cephalopods (4.4%).

In this study, it was observed that, with the exception of a few octopuses and crabs, virtually all organisms perished when discarded. Bozzano & Sarda (2002) reported that Hill & Wassenberg (1990) found that nearly all discarded fish, roughly half of non-commercial crustaceans, and 98% of non-commercial cephalopods were deceased.

After sorting, unwanted organisms by fishermans are discarded onboard, which attracts ship-following seabirds.

It is likely that only a small portion of the refuse is returned to the ecosystem as organic material, though the seabirds consumed vast quantities of waste. According to Bozzano and Sarda (2002), Camphuysen et al. (1995) found that seabirds ingested over 70% of fishery discards.

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Ethical Approval

The authors dont declare ethical approval.

Conflicts of Interest

The authors declare that no conflict of interest.

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