ISSN: 0001-5113
AADRAY

ACTA ADRIAT.
35 (1/2): 83 - 100, 1994

UDC: 639.2 (262)
Original scientific paper

Trawlable species assemblages on the continental shelf of the Northeastern Levant Sea (Mediterranean) with an emphasis on Lesseptian migration

Ali Cemal GÜCÜ and Ferit BINGEL

Middle East Technical University, Institute of Marine Sciences
Erdemli, İçel, Turkiye

A check list for the Northeastern Levant Sea fishes is presented based on samples collected between 1980-1984. A total of 165 species were identified. The species community, which is vulnerable to trawl fishery, is examined. The numerical analysis of the trawl data showed that the infralittoral area from eastern half of the Mersin Bay to the easternmost tip of Gulf of Iskenderun, which is confined to the wider part of the continental shelf, form a specific community structure dissimilar to that of Posidonia oceanica *associated with western part. This part is favored by Lessepsian immigrants, which sometimes made up to 70% of the total demersal fish biomass.*

INTRODUCTION

Although Mediterranean Sea is, in general, located in temperate climate band, the Northeastern Levant basin (36°-37°N) shows subtropical characteristics, with a 23.9 °C mean annual surface temperature. In addition to high temperature, the region is characterized by high salinity and extreme oligotrophy. The subtropic climate prevailing in the region has adverse influence on the species richness of the basin. As the consequence of its historical evolution, the Mediterranean was disconnected from Indo-Pacific in Pliocene, which was the tropical entrance for the biota. For the modern Mediterranean Sea the main source of the inhabiting species is the Atlantic Ocean (TORTONESE, 1964), in which tropical species are very rare. Many species present today in the Levant Sea are compulsive inhabitants and they are at the limit of their ecological tolerance as GALIL (1993) presumed.

The faunal composition of the Levant Sea has been drastically altered after two man-made events; construction of Suez Channel and Aswan reservoir, after which region has been subjected to invasion of new species from Indo-Pacific. The immigration of the Indo-Pacific species through Suez Channel has been studied by several authors (BEN-TUVIA, 1983; SPANIER *et al.*, 1989; GALIL, 1993). Today, this new component of the ecosystem attained very high levels of importance in fish community and fishery (OREN, 1957; BEN-TUVIA, 1972, 1973; BEN-YAMI and GLASER, 1974; GOLANI, 1992; GUCU *et al.*, in press).

The fishes inhabiting the Mediterranean Sea, especially coastal area, are quite perfectly known on global basis (RIEDL, 1970; TORTONESE, 1975; WHITEHEAD *et al.*, 1984, 1986 a, 1986 b; FISCHER, 1987). The community structure of western and eastern parts are well documented (TORTONESE, 1964; BEN-TUVIA, 1971;

PERES, 1985; ROS *et al.*, 1985; GORENSHTAIN, GALIL and LEWINSOHN, 1979; SPANIER *et al.*, 1989). However on regional scale, there are discontinuities in the knowledge. The shallow continental shelf area of the Northeastern Levant Sea is one of the places the fauna and flora of which are very little known about. There were only few attempts to describe the faunal structure of this region (AKYUZ, 1957). In the present study, soft bottom demersal species composition along the continental shelf area, which is of high commercial importance in terms of fishery, were studied.

MATERIAL AND METHODS

The samples used for this study were collected during a fishery project supported by Turkish State Planning Office. The sampling program spreaded over a five year period which can be divided into three parts. In the first part (May 1980 - November 1982), samples were collected on monthly basis (28 cruises) and the total study area was represented by seven regions (namely Goksu, Tirtar, Seyllan, Tuzla, Hurma, Yumurtalik and Botas, see Fig. 1). In each cruise, to minimize sampling error and to obtain representative data, four trawl hauls from different depths (0-10; 10-20; 20-50; 50-100 meters) were taken from each region, as weather conditions and other facilities permitted. Since the area coverage of this part of the data is not comparable with the second part described below, it is used only to complete species list given in Tables 1 and 2.

During the second sampling program (1983-1984), samples were collected on seasonal basis. For this purpose three surveys were carried out; dates and duration of each survey are as in Table 3.

Table 3. Data collection scheme of the seasonal surveys

Survey Code	First day	Last day	# of hauls
Fall 1983	26.09.1993	04.11.1983	53
Spring 1984	15.05.1984	02.05.1984	63
Fall 1984	11.10.1984	31.10.1994	61

In order to increase the area coverage and to improve the reliability of the sampling, which is designed to cover the whole of the shelf area, number of hauls in each level and subregions were increased and 177 stations were sampled within this period (Fig. 1). Since legal trawling season is from September to May, autumn and spring surveys are considered as "pre-fishing" and "post-fishing" seasons, respectively.

The R/V Lamas, by which the trawling was carried out, is 16.5 m long, 120 HP wooden-hull boat. The trawl net used in the study is a standard Mediterranean type with 19 m head rope and a cod-end of 28 mm in streched form. The samples were collected day time with 2.5 n.m./h average trawling speed. Positions of the trawl stations are depicted in Fig. 1. The total catch from each haul was identified to species, counted, weighed and standardized to unit trawling hour (CPUE).

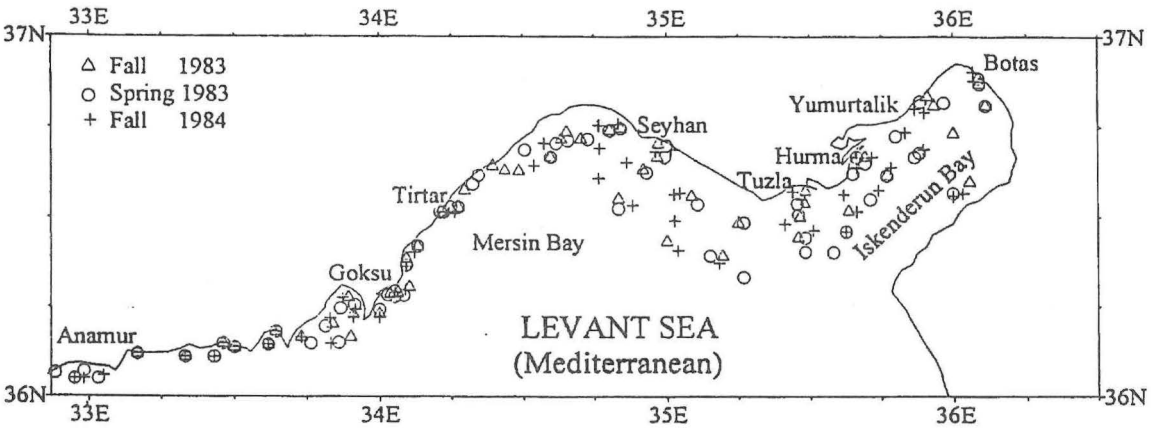

Fig. 1. Sampling sites and the position of the stations

In addition to the above listed surveys, more or less continuous sampling was conducted on rocky bottoms by visual observations, long line and gill net throughout the study period. This third program was used to extend area coverage of the study and to access different habitats, rather than soft bottoms.

In the study, numerical analysis was performed by taking only second sampling (1983-1984) into account, while the samples from the first program were used to visualize temporal changes in the faunal composition.

The faunal analysis was based primarily on the groups assumed to be well-sampled by the trawls. The others, which occurred in the catch just sporadically, for example gastropods and polychaets, were excluded for analytical purposes. For the analysis, the biomass data were formed in a matrix in which n hauls are described by s species. To avoid masking effects of large organisms, which may swamp the other data, logarithmic transformation was applied. The similarity between stations pairs were computed by by Bray-Curtis measure, which are then placed in a triangular matrix. Finally data were classified in dendrograms by applying group averaging method (FIELD *et al.*, 1982).

RESULTS

The list of species caught along the Northeastem Levant Sea are given in Table 1. In this table there are 10 families belonging to class Chondrichthyes, which consists of 13 species and 62 families of class Osteichthyes consisting of 152 species. Among them, 9 families of Chondrichthyes having 12 species and 50 families of Osteichtyes with 99 species were encountered in trawl catches. The list of fish species observed in the trawl catch, and hence assumed to be the inhabitants of the soft bottom continental shelf area of the Northeastern Levant Sea are indicated by "T" in Table 1. Among the other inhabitants of the soft bottoms, rather than teleostean fish are given in Table 2.

The Red Sea immigrants are indicated by "R" in Table 1. This table shows that total of 21 species of Red Sea immigrant could reach Northeastern Levant coast, however only 15 of them could be captured by trawl net, and hence treated quantitatively in this study. Beside Red Sea teleosteans, four species of Indo-Pacific crustaceans attained very high level of importance in the total catch. The percentage of the Red Sea species in the total catch are computed for the pre- and postfishing seasons and presented in Table 4.

Table 4. Percentages of Red Sea immigrants in among teleosteans and in total catch of the Northeastern Levant Sea (ns = not sampled).

Date	Red Sea Teleost / Σ Teleost	Σ Red Sea / Total catch
May-Jun 1980	37.28	32.89
Sep-Oct 1980	52.11	49.12
May-Jun 1981	43.51	32.81
Sep-Oct 1981	74.52	69.13
May-Jun 1982	31.82	55.16
Sep-Oct 1982	42.69	46.71
May-Jun 1983	ns	ns
October 1983	36.81	26.18
May 1984	26.80	13.51
October 1984	53.41	32.52

Proportion of the Indo-Pacific teleosteans exhibit similar fluctuation pattern in the post and pre fishing season, while in post fishing seasons the ratio is always lower than in the pre fishing season. The overall averages in post fishing season are 34.85% and 33.59% of the total counts for Red Sea teleosteans and total Red Sea species, respectively. For prefishing season the average percentages are 51.91% for the teleosteans and 44.73% for the total Erythrean immigrants.

Biogeography of the Northeastern Levant Basin

The results of the numerical analysis, which exhibits biogeographic distribution of the species assemblages, are presented by the dendrograms in Fig. 2 for three different periods.

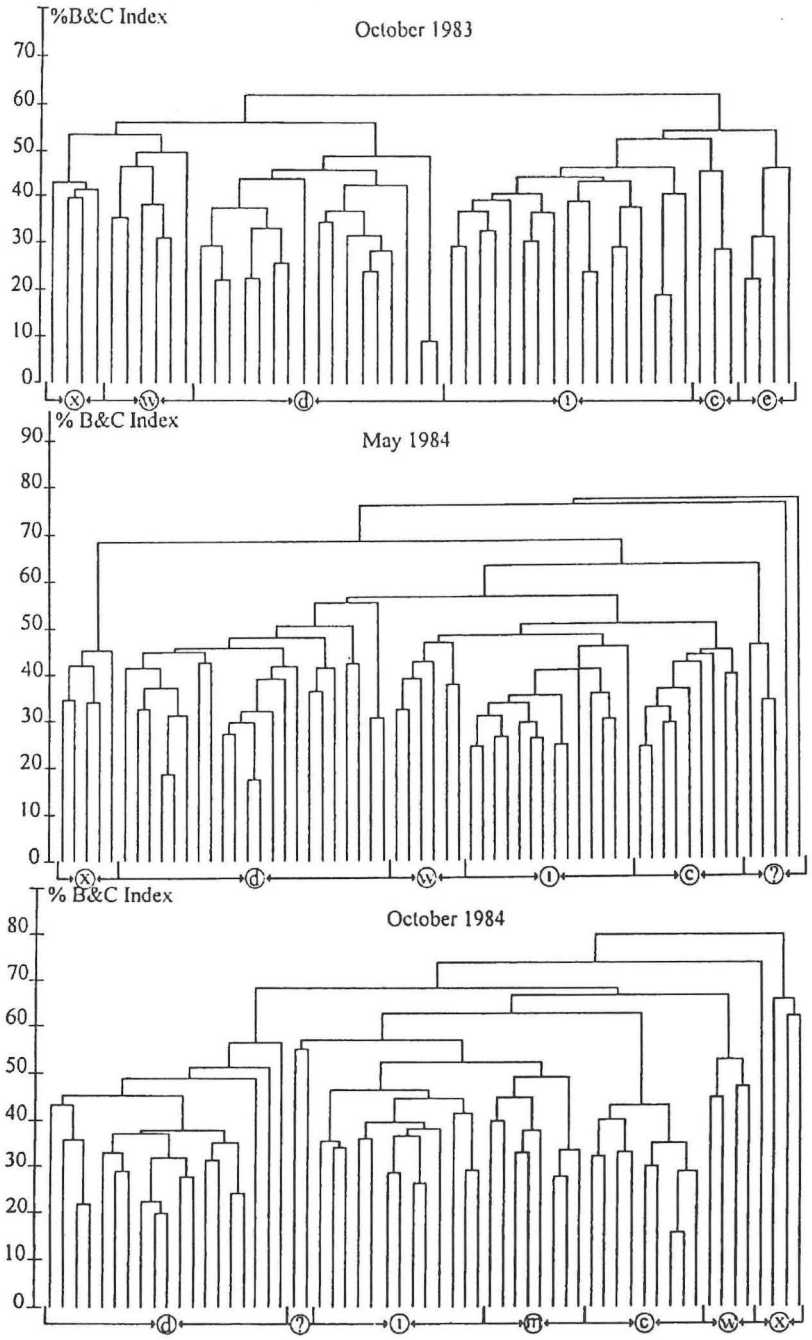

Fig. 2. Dendrograms showing the similar groups of the cluster analysis for October 1983 (upper), May 1984 (middle) and October 1984 (lower); d= offshore; m=offshore - Iskenderun Bay; i=intermediate; c=near coastal; w=western coast of Mersin Bay; e=easternmost tip of the Iskenderun Bay; x= narrow continental shelf; ?=no common feature

AUTUMN 1983

The upper part of Fig. 3 shows the resultant group averaging dendrogram for the autumn 1983 cruise. In general, two distinct groups can be recognized. The first includes stations confined to wider part of tile shelf area (East of Mersin Bay and the Gulf of Iskenderun) and the second represents narrower part along the western extension of the study area. More closer examination of the dendrogram provides 6 groups at 50% similarity level. These groups were extracted and coded. On a geographic map group code of each station is plot-

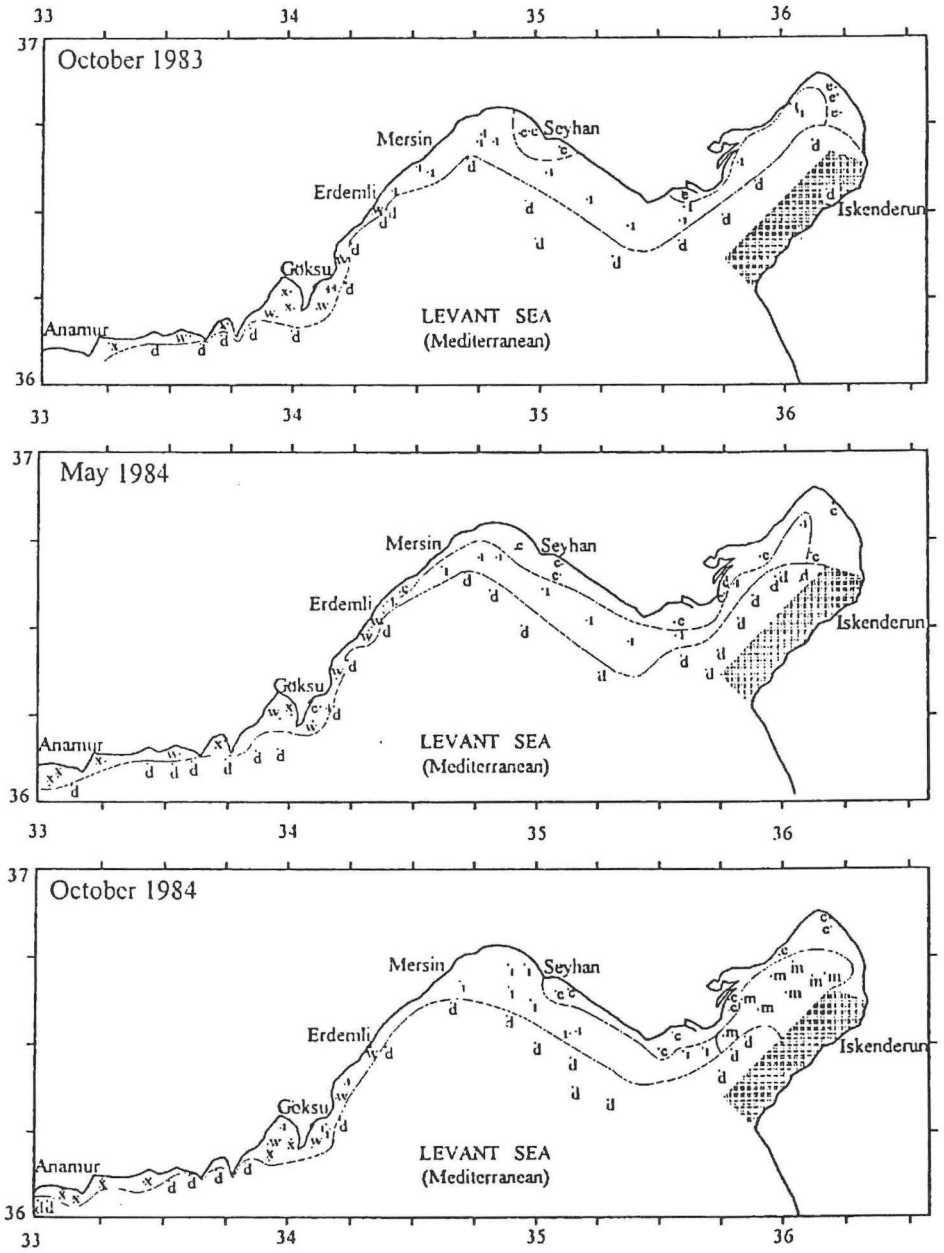

Fig. 3. Biogeographic map of the species assemblages of the northeastern Levant Sea. October 1983 (upper), May 1984 (middle) and October 1984 (lower); d=offshore; m=offshore - Iskenderun Bay; i=intermediate; c=near coastal; w=western coast of Mersin bay; e=easternmost tip of the Iskenderun Bay; x= narrow continental shelf; ?=no common feature

ted on its coresponding location (Fig. 3). These subregions are named as: d (= offshore), i (= intermediate), c (= near coastal), w (= western coast of Mersin Bay), e (= easternmost tip of the Iskenderun Bay) and x (= narrow continental shelf). The depth of the shallowest and deepest stations of the corresponding group are given in the parenthesis right after the group titles of the following section.

I - Offshore (55-78 m)

This subregion has a large extent over the entire area. The stations grouped under this heading have a depth extent from 55 to 78 meters. Table 5 shows main taxonomic groups of this subregion, in which total of 65 species were identified. The main characteristic of this region is the high proportion of teleosteans, followed by cephalopods, echinoderms, sponges

and decapods. The first 20 species, which contribute the highest percentages in the total catch are given in Table 5. The red mullet, *Mullus barbatus* is the most common species. This species is one of the most important commercial species and the catch per unit trawling effort (CPUE) for this species is about 11 kg for this subregion, which is a very high value compared to the rest of the region. The second species, *Boops boops* is a school forming bentho-pelagic fish. The *Saurida undosquamis*, which is the third species in biomass, is an Indo-Pacific immigrant. The Red-Sea immigrants are very low in quantity as compared to overall picture of 30-40% of this season (Table 6).

Seyhan river mouth. As it can be seen from dendrogram, this group is closely related with the 'intermediate' layer described above. A total of 40 species were identified for this group. The teleosteans are the main contributors to the biota of the region. Decapods are another important inhabitant of the layer, forming 27% of the total trawlable biomass. The most recognizable feature of the species composition of this layer is that *Saurida undosquamis* of the intermediate layer is replaced by blue crab, *Callinectes sapidus* and by a penaeid, *Parapenaeus longirostris*. Indo-Pacific species of this region form 25% of the total biomass and Red-Sea teleosts make up 33% of the total teleosteans.

Table 6. Percentages of Indo-Pacific teleosteans and total species in the subregions (Σ = Total Biomass).

	October 1983		May 1984		October 1994	
Sub region	**Teleost**	**Σ**	**Teleost**	**Σ**	**Teleost**	**Σ**
Offshore	14.4	11.15	23.52	12.36	14.55	7.63
Offshore - Iskenderun	-	-	-	-	44.57	51.27
Intermediate	53.37	51.87	24.70	32.54	67.87	67.65
Near coastal	32.76	24.79	20.43	22.11	67.08	65.91
West coast of Mersin Bay	36.30	33.44	20.58	25.16	51.99	27.77
East coast of Iskenderun Bay	70.33	65.78	-	-	-	-
Narrow continental shelf	31.80	12.91	11.87	2.76	7.60	2.62

II - Intermediate (14-59 m)

This zone is situated between the offshore and near coastal region. The whole area along the east of Erdemli within the 14-59 m isobath is included in this part and additional isolated patch of this group exists near Goksu river mouth. A total of 66 species were identified from this region, teleosteans being the dominant group. Decapods and stomatopods are the next groups in importance (Table 5). Three teleostean species form more than 50% of the biomass. These are *Leiognathus klunzingeri*, *Saurida undosquamis* and *Mullus barbatus*. The former two species originate from the Red Sea. It is seen from Table 6 that Indo-Pacific immigrants account for more than 50% of both, total biomass and teleostean biomass.

III - Near coastal (8-15 m)

This region, in fact, covers very shallow part of the Mersin Bay, and in this period, possibly due to sampling insufficiency, confined to

IV - West coast of Mersin Bay (13-36 m)

This group may be considered as the westward extension of the intermediate layer, which is represented by 43 species of teleosts, cephalopods, decapods and stomatopods. The species assemblage is dominated by an Indo-Pacific species, *Saurida undosquamis*. Percentages of Red Sea species are at a moderate level compared to the entire composition.

V - East coast of Iskenderun Bay (7-33 m)

This group is modified from 'intermediate and 'near coastal' zones by the influence of higher temperature and salinity and showed slightly dissimilar characteristics from that of the remaining parts. Since peculiar hydrographic properties favor Red Sea immigrant species, the first three species, which form more than 50% of the total biomass, are Indo-Pacific. The overall contribution of the immigrants attain up to 70% of all teleosteans and 66% of the total biomass.

VI - Narrow continental shelf (15-35 m)

This group is located within the narrow continental shelf along the west of Goksu (Fig. 3). The main characteristic of this area is the *Posidonia oceanica* and therefore species assemblages of this area are dominated by the species associated with this plant. Although percentage of teleosteans is very low due to very high biomass of sea grasses and sponges in this region, CPUE is quite high. Among the Red Sea species, teleosteans form some 30%, whereas other groups are very few.

SPRING 1984

The results of the cluster analysis are depicted in Fig. 2. There are 5 main groups, which are coded as d (= offshore), i (= intermediate), c (= near coastal), w (= western coast of Mersin bay), x (= narrow continental shelf). An additional cluster, which is indicated by '?', is recognized. This group has no common feature to the rest of the fauna and they are the results of unexpected encounters of patch forming species.

I - Offshore (60-78 m)

This group has again a large extent on the continental shelf including all stations deeper than 60 m. The highest number of species was observed in this region (Table 7). The contribution of the teleosteans to the total biomass was very low as compared to the species inhabiting the same zone in the previous period, while the occurrence of sponges and echinoderms increased (Table 7). The ranked species list was slightly changed and the CPUE of the *Mullus barbatus* decreased remarkably, while *Saurida undosquamis* remained constant. The CPUE for cephalopods also decreased.

II - Intermediate (27-60 m)

In this season, distinction between near coastal and intermediate regions are more apparent. Total of 64 species were identified in this region, the teleostean fishes being the dominant group. The biomass of decapods was still high, due solely to non-commercial Indo-Pacific crab, *Carybdis longicollis*. The *Leiognathus klunzingeri* which was the most abundant fish of this region in autumn 1983, disappeared. The decrease in *L. klunzingeri* biomass was accompanied with the decline in the contribution of the Red Sea species in the region.

III - Near coastal (7-30m)

Compared to the previous period, the extent of this region was enlarged and covered very shallow parts of the region, under river influence. The species composition was severely changed and the number of species recorded increased to 48. The biomass was dominated by the members of cartilaginous fishes, such as *Raja miraletus* and *Dasyatis pastinaca*.

IV - West coast of Mersin Bay (22-37 m)

The extent of this region was exactly the same as in 1983, from 'Erdemli' westward (Fig. 3). The CPUE was again very high and mostly represented by the teleosteans. Decapods were the second important group, dominated by non-commercial crab, *Carybdis longicollis*. The cephalopods remained important, however *Sepia officinalis*, which was the main constituent of the previous season, was replaced by the *Octopus vulgaris*.

V - Narrow continental shelf (13-56 m)

This group of stations were confined to small bays along the western part of the Goksu Delta, characterized by *Posidonia* meadows and its associated fauna. The results given in Table 6 were distorted by a bryozoan species, which sporadically occurred in very high numbers. The proportion of the teleosteans to the total biomass was therefore very low (Table 7). On the other hand, two highly commercial fish species, *Sparus aurata* and *Pagrus pagrus*, increased the CPUE of the teleosteans of this region. The cephalopods of this subregion remained as high as in autumn 1983. The percentages of Red Sea immigrants were very low and accounted for about 10% of the teleosteans and only 2% of the total biomass (Table 6).

AUTUMN 1984

The lowest part of the Fig. 2 is the resulting dendrogram of the cluster analysis performed for autumn 1984. Similar to the previous two periods six groups may be isolated; d (= Offshore), m (= Offshore - Iskenderun Bay), i (= Intermediate), c (= Near Coastal), w (= West coast of Mersin Bay) and x (= Narrow continental shelf). The only difference is that under the subregion named 'offshore', two different biogeographic areas may be recognized.

1 - Offshore (60-82 m)

The deeper section of the study area foamed an isolated subregion, like in the previous two periods, however eastward extension has been shortened and the stations, which remain within the Iskenderun Bay and formerly grouped under 'offshore', are rather similar to intermediate region in this period. The number of species found in this area was still vely high (Table 8). The biomass of *Mullus barbatus*, which is one of the commercial species of this layer, slightly increased. Indo-Pacific species of the region formed 15% of the teleosteans and 8% of the total biomass.

II - Offshore - Gulf of Iskenderun (40-75 m)

This part of Gulf of Iskenderun was formerly occupied by the extension of offshore group, however in this period it was dominated by the Lessepsian immigrants and formed a distinct cluster, rather similar to intermediate layer. The number of species was very low, compared to the offshore stations (Table 8), whereas Indo-Pacific constituents were higher than the previous layer and accounted for 45% of the teleosteans and 51% of the total biomass.

III - Intermediate (7-46 m)

This group was again dominated by the Red-Sea species (Table 6). The teleosteans were the dominant group followed by the decapods. The first three species having the highest CPUE were Indo-Pacific and the rest of species were quite similar to those of the intermediate layer of autumn 1983.

IV - Near Coastal (7-17 m)

A total of 54 species were found in the near coastal zone. The teleosteans made the bulk of the biomass and compared to the other subregions of the same period CPUE of the teleosteans was very high. Indo-Pacific immigrants were main constituents of both the teleostean and total biomass. The *Leiognathus klunzingeri*, which was the most abundant species in autumn 1983 and then disappeared in spring 1984, became very abundant again in this period. The abundance of the members of the Chondrichthyes remained considerably high, as it was in the previous periods.

V - West coast of Mersin Bay (25-45 m)

The largest contributor of the layer was *Euspongia officinalis*. *Saurida undosquamis*, which is an Indo-Pacific species, was the other important species. The overall contribution of the immigrants ammounted to 52% of the teleosteans and 28% of the whole biomass.

VI - Narrow continental shelf (15-66 m)

The part of the continental shelf, which is close to off Anamur, forms absolutely dissimilar group within the dendrogram (Fig. 2). The *Posidonia* meadows were again the main property of the region. Since this group was confined to a smaller area, the number of inhabitants was slightly reduced (Table 8). The teleosteans, sponges and macrophytes had an almost equal contribution to the total biomass. Among the teleosteans, two highly commercial sparids, *Diplodus sargus* and *Sparus aurata* were very important. The occurrence of the Red Sea fishes was very low, and dropped to the lowest values recorded throughout the study (Table 5).

DISCUSSION

The species list given in Table 1 shows primarily demersal soft bottom species of the continental shelf of the Northeastern Levant basin. Although this list was improved for the teleosteans by including some rocky shore species and pelagics, it is not yet complete and the 165 species found in this study is far below

the total number of fish species given by BEN-TUVIA (1983) for the whole Levant Basin. On the other hand, it is still useful for the validation and completion of the species list of the region, especially if the lack of recent and relevant literature from this particular region in the northeast corner of the Mediterranean, is concerned.

The numerical analysis of faunal composition in successive periods shows 5 to 6 different zones having peculiar species composition. The most striking point is the evident distinction between east and west of the coastal zones and the existence of a specific faunal structure in the eastern half of the Mersin Bay and Gulf of Iskenderun. In the text, this zone is analyzed as 'near coastal' and 'intermediate' zones, which respectively cover increasing depth ranges. Recalling the Por's notation, this part may be considered as the 'Lessepsian Province' within the Northeastern Levant Sea (GALIL, 1993). West of Erdemli, there is a transition zone around Goksu Delta, which is coded as 'west of Mersin Bay'. It is called transition because the western tip of the former class may stretch in to this area and it is also due to its indecisive behavior between two groups. Inhabitants of this region, show more similar organization to that occupying off Anamur in autumn 1983, whereas in spring 1984, it is a part of Lessepsian Province. Deeper yet, at depths between 50 to 90 m, there is a group of organisms, called 'off shore' inhabitants. This deeper band is relatively constant and has always the same extent over the northeastern shelf area.

Infralittoral community

The classification according to littoral zonation, 'east of Iskenderun Bay', 'near coastal', 'intermediate' and 'west of Mersin Bay' remain as well within infralittoral. They all bear the basic characters of this zone, notably existence of macrophytes. *Posidonia oceanica* is typical macrophyte, however on the locations under Levantine influence (particularly high salinity and high temperature), this species is replaced by a Chlorophycean, *Caulerpa prolifera*. Number of species is reduced as compared to the circalittoral zone, possibly due to dynamic hydrography and fluctuating nature of the substrate. Community inhabiting this zone is therefore unstable but rather dynamic. Thus associated species have fast turnover rate, high reproductive rate and high production (r-selected; PIANKA, 1970). Typical examples are *Leiognathus klunzingeri* and *Stephanolepis diaspros*. The former species shows typical 'boom and bust' strategy, as it is seen in Tables 5, 6 and 7, where the high abundance and rapid decline follow each other. However, the community on the 'narrow continental shellf' is less unstable and teleost fauna is dominated by the sparids and mugilids, typical in the western sector of the Turkish Mediterranean coasts and along the Aegean Sea (KORKMAZ, 1973; ARTUZ and KORKMAZ, 1976).

Circalittoral community

Finally, the part coded as 'offshore' is circalittoral and colonized by sponges, anthozoans, bryozoans and tunicates like elsewhere in the Mediterranean (PERES, 1985). The community is more stable and the fluctuations in the species distribution seem to be altered by the fishery and offshore-inshore spawning migrations rather than hydrographic complexity. For example, the CPUE of *Mullus barbatus*, which is the most important commercial fish of the region, is always higher during pre fishing season (autumn) than in post fishing season (spring). The spawning migration of Cephalopods, which takes place in spring in the infralittoral zone (GÜCÜ and SALMAN, 1993), is also visible from Table 5, 7 and 8.

There are several geographic, hydrographic and biologic peculiarities of the northeastern Levant basin, which may play distinctive role in the biogeography of the inhabiting community. The area from southern tip of Iskenderun Bay near Syria border to Erdemli is dominated by a relatively broad shelf built up by sediments mainly deposited by the Seyhan, Goksu and Ceyhan rivers, then narrows gradually along the western coast. Between the Goksu delta and Anamur the mountains plunge into the Mediterranean and form a steep coastline

(EVANS, 1970). The coastal plain along the east of Mersin is broad enough to facilitate establishment of recognizably large specific biota. One of the side effects of smooth and large shelf area is its suitability for the trawl fishery. The resources of the region have therefore being severely exploited for decades (AASEN and AKYUZ, 1956; BINGEL *et al.*, 1993; GÜCÜ and BINGEL, 1994). The Levant Sea as a whole, was considered 'depleted, impoverished, and unbalanced' by POR (1978) and BEN-TUVIA (1983), which is absolutely valid for the northeastern corner as well. On the other hand, the area is climatically much warmer and saltier than the other basins of the Mediterranean (LATIF *et al.*, 1989), which enables the colonization of the Erythrean immigrants in such an unbalanced biota.

Finally, a sea grass, *Posidonia oceanica* seems to be a biological key factor affecting biogeographic distribution. This plant is an endemic species for the Mediterranean and covers almost entire coastal band within 0-40 m depth range, which can be exceeded in non-turbid, clear waters. However, it is an euryhaline species and due to high salinity and turbidity, it does not exist in the Levant Sea (VERDAGUER, 1993). In the northeastern Levant Sea its usual distribution area is replaced by the 'intermediate' and 'near coastal' communities described above. This plant is known to accommodate mature communities, which maintains its identity on the infralittoral zone, contrary to other Mediterranean counterparts (ROS *et al.*, 1985). On the other hand, if the outstanding success of the invasion of the Red Sea species in the Levant Basin is, in very generalized sense, attributed to the instability of the eastern Mediterranean biota, the *Posidonia oceanica*, as a host of the stable community, plays a patriotic role by confronting further westward expansion of the Lesseptian Province along the Turkish coast.

Lesseptian immigrants

The role of the Indo-Pacific species in the northeastern Levant Sea was known since 1950's (AKYUZ, 1957; LEWINSOHN and HOLTHUIS, 1964; GÜCÜ *et al.*, in press). The most comprehensive catch analysis has been done for the Israeli fishery and the catch of the Erythrean species has been almost a third of the total landings since 1954 (GALIL, 1993). Concerning the Turkish fishery, there is no specific catch statistics to evaluate the contribution of Red Sea species in the total landing. However, GÜCÜ *et al.* (in press) summarized their importance in the total demersal fish biomass as 62 % in the Gulf of Iskenderun, 34% in Mersin Bay and 27% in the coastal strip between Incekum and Anamur. In the present study, time series of Erythrean to indigenous species ratio, though is a short one, displays remarkable fluctuation on seasonal basis. In autumn, contribution of the Red Sea immigrants are always higher than in spring (Table 4, Fig 2). The key species responsible for this fluctuation is the *Leiognathus klunzingeri*. The destructive fishing intensity on the region is well-known (BINGEL *et al.*, 1993; GÜCÜ and BINGEL, 1994) and this species having very high girth factor (max. girth/total length), is highly vulnerable to the trawl fishery. In addition to fishery influence, this species is the most desirable prey for the demersal piscivorus species (BINGEL, 19XX; GÜCÜ, 1991). It is, therefore, depleted during the fishing season and the biomass of this species is reduced to a very low level. On the other hand, *L. klunzingeri* shows typical characteristics of a 'r-selected' species, having very high turnover rate. Following the spawning period in summer, its biomass is immediately recovered until next fishing season.

As the infra- and circalittoral parts of the same location are compared, immigrants are more successful at shallower parts. BEN-TUVIA (1983) and POR (1978) consider temperature to be the most important and single factor responsible for the colonization success of the Lesseptian migrants and their success in the intermediate layers at about 20-40 m, is attributed again to relatively higher and stable temperature at this isobath. The hydrographic observations for the study area (Latif *et al.*, 1989), show that the layer preferred by the immigrants is more haline than the near coastal zone, which is influenced by Goksu, Seyhan and Ceyhan rivers and other

small streams flowing to the Northeastern Levant Sea. Hence, it may be worth to add two more factors, which may be equally important for the colonization success and seasonal fluctuation of the Red Sea contribution to the fauna; that are fishing pressure and salinity.

ACKNOWLEDGEMENTS

The major part of the data has been collected during trawl surveys financed by the State Planning Organization of Prime Ministry of Turkey via Turkish Scientific and Technical Research Council (TUBITAK). It is our pleasant duty to thank Mrs. Nilgun Akkiran Uysal, for her efforts in preparation of fish collection in the METU-IMS. We would like to thank all the participants of the fishery surveys.

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Accepted: July 4, 1995

Koćarske vrste na području kontinentalnog šelfa sjeveroistočnog dijela Levantskog mora (Sredozemlje) sa specijalnim naglaskom na Lesepske migracije

Ali Cemal GÜCÜ i Ferit BINGEL

Tehničko sveučilište Srednjeg Istoka, Institut za istraživanje mora
Erdemli, Içel, Turska

KRATKI SADRŽAJ

Donosi se popis riba sjeveroistočnog dijela Levantskog mora na osnovu uzoraka sakupljenih u razdoblju 1980-1984. Identificirano je ukupno 165 vrsta. Ispitana je zajednica vrsta dostupna koćarskom ribolovu. Numerička analiza podataka koćarenja pokazala je da je u području infralitorala, od sredine istočnog dijela zaljeva Mersin do najistočnijeg vrha zaljeva Iskenderun, koji obuhvaća veći dio kontinentalnog šelfa, stvorena zajednica sa posebnim strukturnim obilježjima koja se razlikuje od zajednice vrste *Posidonia oceanica* vezane za zapadni dio.

Lesepski migranti, koji ponekad tvore do 70% ukupne biomase demersalne ribe, pokazuju preferencu prema ovom dijelu.

Table 1. The list of fish species captured along the continental shelf area of the northeastern Levant Sea. (T = caught by trawling, R = Lesseptian immigrant)

CHONDRICHTHYES

Alopiidae
Alopias vulpinus
Scyliorhinidae
Scyliorhinus canicula (T)
Triakidae
Mustelus asterias (T)
Mustelus mustelus (T)
Squatinidae
Squatina squatina (T)
Rhinobatidae
Rhinobatos rhinobatos (T)
Torpedinidae
Torpedo marmorata (T)
Rajidae
Raja clavata (T)
Raja miraletus (T)
Raja radula (T)
Dasyatidae
Dasyatis pastinaca (T)
Gymnuridae
Gymnura altavela (T)
Myliobatidae
Myliobatis aquila (T)

OSTEICHTHYES

Clupeidae
Alosa fallax (T)
Dussumieria acuta (R)
Sardina pilchardus
Sardinella aurita (T)
Sardinella maderensis (T)
Engraulidae
Engraulis encrasicolus (T)
Argentinidae
Argentina sphyraena
Synodontidae
Saurida undosquamis (T,R)
Synodus saurus (T)
Anguillidae
Anguilla anguilla
Murnenidae
Muraena helena (T)
Congridae
Conger conger (T)
Ophichthidae
Echelus myrus (T)
Belonidae
Belone belone
Exocoetidae
Hirundichthys rondeletii (T)
Hemiramphidae
Hemirampushus far
Hyporhampus picarti (R)
Macroramphosidae
Macrorhamphosus scolopax (T)
Syngnathidae
Hippocampus hippocampus (T)
Syngnathus typhle (T)
Merlucciidae
Merluccius merluccius (T)
Gadidae
Phycis phycis
Holocentridae
Sargocentron rubrum (R)
Zeidae
Zeus faber (T)
Caproidae
Capros aper
Serranidae
Anthias anthias
Epinephelus aeneus (T)
Epinephelus alexandrinus (T)
Epinephelus guaza (T)
Mycteroperca rubra (T)
Serranus cabrilla (T)
Serranus hepatus (T)
Serranus scriba
Moronidae
Dicentrarchus labrax
Teraponidae
Pelates quadrilineatus (T,R)
Apogonidae
Apogon imberbis (T)
Apogon nigripinnis (T,R)
Cepolidae
Cepola rubescens (T)
Pomatomidae
Pomatomus saltator (T)
Carangidae
Alectis alexandrinus (T)
Alepes djedaba (T,R)
Caranx crysos
Caranx rhonchus (T)
Lichia amia
Naucrates ductor
Pseudocaranx dentex
Seriola dumerili (T)
Trachinotus ovatus
Trachurus mediterraneus
Trachurus trachurus (T)
Coryphaenidae
Coryphaena hippurus

Table 1. Continued

Lobotidae
Lobotes surinamensis (T)
Leiognathidae
Leiognathus klunzingeri (T,R)
Haemulidae
Pomadasys incisus (T)
Sciaenidae
Argyrosomus regius (T)
Sciaena umbra
Umbrina cirrosa (T)
Sillaginidae
Sillago sihama (T,R)
Mullidae
Mullus barbatus (T)
Mullus surmuletus (T)
Upeneus asymmetricus (T,R)
Upeneus moluccensis (T,R)
Sparidae
Boops boops (T)
Dentex dentex (T)
Dentex gibbosus
Dentex macrophthalmus (T)
Diplodus annularis (T)
Diplodus cervinus (T)
Diplodus puntazzo (T)
Diplodus sargus (T)
Diplodus vulgaris (T)
Lithognathus mormyrus (T)
Oblada melanura (T)
Pagellus acarne (T)
Pagellus erythrinus (T)
Pagrus auriga (T)
Pagrus coeruleostictus (T)
Pagrus pagrus (T)
Sarpa salpa
Sparus aurata (T)
Spondyliosoma cantharus
Centracanthidae
Spicara flexuosa (T)
Spicara maena (T)
Spicara smaris (T)
Pomacentridae
Chromis chromis
Labridae
Coris julis
Symphodus doderleini
Symphodus mediterraneus
Symphodus roissali (T)
Thallossoma pavo
Xyrichthys novacula (T)
Scaridae
Sparisoma cretense
Trachinidae
Echiichthys vipera
Trachinus araneus (T)
Trachinus draco (T)
Trachinus radiatus
Uranoscopidae
Uranoscopus scaber (T)
Siganidae
Siganus luridus (T,R)
Siganus rivulatus (T,R)
Trichiuridae
Trichiurus lepturus (T)
Scombridae
Auxis rochei
Euthynnus alletteratus
Orcynopsis unicolor
Sarda sarda
Scomber japonicus (T)
Scomberomorus commerson (R)
Xiphiidae
Xiphias gladius
Gobiidae
Gobius niger jazo (T)
Callionymidae
Callionymus filamentosus (T,R)
Synchiropus phaeton
Blenniidae
Blennius ocellaris (T)
Lipophrys dalmatinus (T)
Lipophrys pavo
Lipophrys trigloides
Parablennius gattorugine
Parablennius sanguinolentus
Parablennius tentacularis
Carapidae
Carapus acus (T)
Sphyraenidae
Sphyraena chrysotaenia (T,R)
Sphyraena sphyraena (T)
Mugilidae
Chelon labrosus
Liza aurata (T)
Liza saliens
Mugil cephalus (T)
Atherinidae
Atherina boyeri (T)
Atherinomorus lacunosus (R)
Scorpaenidae
Helioclenus dactylopterus
Scorpaena notata (T)
Scorpaena porcus (T)
Scorpaena scrofa (T)
Triglidae
Lepidotrigla cavillone (T)
Trigla lucerna (T)
Trigla lyra (T)
Trigloporus lastoviza (T)
Dactylopteridae
Dactylopterus volitans (T)
Citharidae
Citharus linguatula (T)

Table 1. continued

Bothidae
Arnoglossus imperialis
Arnoglossus kesleri
Arnoglossus laterna (T)
Arnoglussus rueppelli
Arnoglussus thori
Bothus podas (T)
Soleidae
Buglossidium luteum (T)
Microchirus ocellatus (T)
Monochirus hispidus (T)
Solea vulgaris (T)
Cynoglossidae
Cynoglossus sinusarabici (T,R)
Echeneidae
Echeneis naucrates (T)
Balistidae
Balistes carolinensis (T)
Monacanthidae
Stephanolepis diaspros (T,R)
Tetraodontidae
Lagocephalus spadiceus (T,R)
Pempheridae
Pempheris vanicolensis (R)

Table 2. The components other than teleosts of the soft bottoms of the continental shelf area of the northeastern Levant Sea.

THALLOPHYTA
Caulerpa prolifera
Codium spp.
ANGIOSPERMAE
Posidonia oceanica
PORIFERA
Suberites domuncula
Euspongia officinalis
ANTHOZOA
Pennatula rubra
MOLLUSCA
Gastropoda
Aporhais pespelicani
Murex sp.
Natica sp.
Opisthobranchia
Philine aperta
Cephalopoda
Eledone moschata
Loligo vulgaris
Octopus vulgaris
Sepia officinalis
CRUSTACEA
Stomatopoda
Oratosquilla massavensis (R)
Squilla mantis
Decapoda
Callinectes sapidus
Charybdis longicollis (R)
Portunus pelagicus (R)
Penaeus japonicus (R)
Penaeus kerathurus
Penaeus semisulcatus
Parapenaeus longirostris
Eupagurus sp.
ECHINODERMATA
Crinoidae
Antedon mediterranean
Asteroidae
Astropecten sp.
Echinaster sepositus
Ophiuroidae
Ophiura texturata
Echinoidae
Centrostephanus longispinus
Cidaris cidaris
Sphaerechinus granularis
Stylocidaris affinis
Holothuroidae
Stichopus regalis
CHORDATA
Ascidiacea
Ascidia sp.

Table 5. The top 20 species of highest biomass in October 1983 (CPUE = Catch per unit trawling effort, in grams; % = percentage biomass; (n) = number of species)

Subregion	CPUE (%)		CPUE (%)		CPUE (%)
Offshore (65)		**Intermediate (66)**		**Near coastal (40)**	
Mullus barbatus	10912 (14.40)	*Leiognathus klunzingeri*	9084 (21.24)	*Leiognathus klunzingeri*	10019(18.66)
Boops boops	8816 (11.64)	*Saurida undosquamis*	7906(18.48)	*Callinectes sapidus*	8347 (15.55)
Saurida undosquamis	6642 (8.77)	*Mullus barbatus*	5998 (14.02)	*Mullus barbatus*	6962 (12.97)
Citharus linguatula	4862 (6.42)	*Oratosquilla massavensis*	2348 (5.49)	*Parapenaeus longirostris*	6153 (11.46)
Sepia officinalis	4629 (6.11)	*Charybdis longicollis Echi-*	2158 (5.05)	*Dasyatis pastinaca*	3900 (7.26)
Ophiura texturata	4439 (5.86)	*naster sepositus Dasyatis*	1659 (3.88)	*Rhinobatos rhinobatos*	3800 (7.08)
Pagellus erythrinus	3473 (4.58)	*pastinaca*	1606 (3.75)	*Solea vulgaris*	2501 (4.66)
Euspongia officinalis	2762 (3.65)	*Sepia officinalis*	1490(3 48)	*Caulerpa prolifera*	2499 (4.66)
Octopus vulgaris	2681 (3.54)	*Trigla lucerna*	1188 (2.78)	*Mustelus mustelus*	2233 (4.16)
Lepidotrigla cavillone	2605 (3 44)	*Rhinobatos rhinobatos*	1130 (2.64)	*Oratosquilla massavensis*	1781 (3.32)
Pagellus acarne	2517 (3.32)	*Agrosomus regius*	977 (2.28)	*Trigla lucerna*	1232 (2.30)
Parapenaeus longirostris	2334 (3.08)	*Pagellus erythrinus*	704 (1.65)	*Stephanolepis diaspros*	891 (1.66)
Trigla lucerna	2299 (3.03)	*Parapenaeus longirostris*	665 (1.56)	*Gobius niger*	380 (0.71)
Arnoglossus laterna	1943 (2.56)	*Pomadasys incisus*	622 (1.45)	*Oblada melanura*	351 (0.65)
Spicara flexuosa	1760 (2.32)	*Euspongia officinalis*	582 (1.36)	*Sparus aurata*	320 (0.65)
Pennatula rubra	1224 (1.61)	*Arnoglosus laterna*	523 (1.22)	*Pagellus erythrinus*	307 (0.57)
Raja miraletus	1148 (1.52)	*Callinectes sapidus*	521 (1.22)	*Diplodus vulgaris*	262 (0.49)
Uranoscopus scaber	1122 (1.48)	*Myliobatis aquila*	498 (1.16)	*Siganus rivulatus*	246 (0.46)
Upeneus moluccensis	783 (1.03)	*Diplodus annularis*	467 (1.09)	*Lithognathus mormyrus*	230 (0.43)
Dasyatis pastinaca	762 (1.01)	*Upeneus moluccensis*	330 (0.77)	*Argyrosomus regius*	203 (0.38)
Teleost	53697(74.31)		33128(77.44)		34763(64.76)
Cephalopoda	7492(9.89)		1598(3.74)		- -
Decapoda	2681 (3.54)		3345(7.82)		14640(27.27)
Stomatopoda	156(0.21)		2348(5.49)		1781(3.32)
West coast of Mersin Bay (43)		**East coast of Iskenderun (38)**		**Narrow continental shelf (54)**	
Saurida undosquamis	14318 (28.19)	*Saurida undosquamis*	10971(26.79)	*Posidonia oceanica*	23600(19.25)
Sepia offcinalis	5254 (]0.34)	*Stephanolepis diaspros*	5966(14.57)	*Octopus vulgaris*	17764(14.49)
Rhinobatos rhinobatos	4683 (9.22)	*Leiognathus klunzingeri*	4479(10.94)	*Euspongia officinalis*	16574(13.52
Mullus barbatus	3420 (6.73)	*Caulerpa prolifera*	2732(6.67)	*Codium spp.*	9900(8.07)
Bothus podas	3083 (6.07)	*Siganus rivulatus*	2514(6.] 4)	*Stephanolepis diaspros*	8406(6.85)
Dasyatis pastinaca	2867 (5.64)	*Dasyatis pastinaca*	2353(5.74)	*Dasyatis pastinaca*	8224(6.71)
Pagellus erythrinus	2674 (5.26)	*Pagellus erythrinus*	2350(5.74)	*Saurida undosquamis*	7100(5.79)
Mustelus mustelus	1824 (3.59)	*Mullus barbatus*	]480(3.61)	*Sepia officinalis*	4825(3.93)
Citharus linguatula	1777 (3.50)	*Mullus surmuletus*	1343(3.28)	*Ephinephelus aeneus*	4150(3.38)
Uranoscopus scaber Trigla	1646 (3.24)	*Diplodus annularis*	1054(2.57)	*Pagrus pagrus*	4120(3.36)
lucerna	13()3 (2.56)	*Callionymus flamentosus*	866(2.11)	*Myliobatis aquila*	2275(1.86)
Arnoglossus laterna	1031 (2.03)	*Charybdis longicollis*	705(1.72)	*Dentex dentex*	1869(1.52)
Charybdis longicollis	1017 (2.00)	*Rhinobatos rhinobatos*	620(1.51)	*Lepidotrigla cavillone*	1602(1.31
Myliobatis aquila	803 (1.58)	*Pelates quadrilineatus*	511(1.25)	*Mullus barbatus*	1542(1.26
Leiognathus klunzingeri	742 (1.46)	*Oratosquilla massavensis*	465(1.14)	*Raja miraletus*	1534(1.25
Sparus aurata	609 (1.20)	*Upeneus moluccensis*	397(0.97)	*Symphodus roissali*	1449(1.18
Solea vulgaris	500 (0.98)	*Trigla lucerna*	371(0.91)	*Diplodus vulgaris*	1008(0.82
Stephanolepis diaspros	448 (0.88)	*Seriola dumerili*	315(0.77)	*Bothus podas*	950(0.77
Octopus vulgaris	430 (0.85)	*Parapenaeus longirostris*	308(0.75)	*Scorpaena porcus*	872(0.71
Raja miraletus	418 (0.82)	*Bothus podas*	199(0.48)	*Mullus surmuletus*	871(0.71
Teleost	43750(86.14)		36643(89.47)		49692(40.5)
Cephalopoda	5685(11.19)		- -		22589(18.4)
Decapoda	1268(2.50)		1106(2.70)		15(0.01)
Stomatopoda	89(0.18)		465(1.14)		25(0.02)

Table 7. The top 20 species of highest biomass in May 1984 (CPUE = Catch per unit trawling effort, in grams; % = percentage biomass; (n) = number of species)

Subregion	CPUE (%)		CPUE (%)		CPUE (%)
Offshore (73)		**Intermediate (64)**		**Near coastal (48)**	
Euspongia offcinalis	12632(18.11)	*Saurida undosquamis*	5259(15.81)	Raja miraletus	7906(22.65)
Saurida undosquamis	6481 (9.29)	*Dasyatis pastinaca*	4836(14.53)	Dasyatis pastinaca	4463(12.79)
Antedon mediterranea	6324(9.07)	*Charybdis longicollis*	2977(8.95)	Trigla lucerna	3567(10.22)
Mullus barbatus	5131(7.36)	*Mullus barbatus*	2466(7.41)	Saurida undosquamis	2893(8.29)
Lepidotrigla cavillone	4577(6.56)	*Arnoglossus laterna*	1879(5.65)	Leiognathus klunzingeri	2289(6.56)
Pagellus erythrinus	3957(5.67)	*Spicara flexuosa*	1491(4.48)	Caulerpa prolifera	2238(6.41)
Pennatula rubra	3416(4.90)	*Raja miraletus*	1274(3.83)	Arnoglossus laterna	2031(5.82)
Citharus linguatula	1955(2.80)	*Trigla lucerna*	1248(3.75)	Spicara flexuosa	1461(4.19)
Sepia officinalis	1776(2.55)	*Oratosquilla massavensis*	1183(3.55)	Mullus barbatus	1147(3.29)
Spicara flexuosa	1740(2.49)	*Citharus linguatula*	1126(3.38)	Solea vulgaris	952(2.73)
Cidaris cidaris	1730(2.48)	*Pagellus erythrinus*	1040(3.12)	Oratosquilla massavensis	951(2.73)
Upeneus moluccensis	1669(2.39)	*Rhinobatos rhinobatos*	857(2.58)	Upeneus asymmetricus	818(2.34)
Octopus vulgaris	1667(2.39)	*Leiognathus klunzingeri*	733(2.20)	Pagellus erythrinus	802(2.30)
Squatina squatina	1343(1.93)	*Merluccius merluccius*	542(1.63)	Lithognathus mormyrus	464(1.33)
Parapenaeus longirostris	1180(1.69)	*Parapenaeus longirostris*	499(1.50)	Diplodus annularis	345(0.99)
Bryozoa	1165(1.67)	*Lepidotrigla cavillone*	491(1.48)	Sepia officinalis	326(0.94)
Merluccius merluccius	112(1.59)	*Solea vulgaris*	434(1.31)	Charybdis longicollis	278(0.80)
Ophiura texturata	785(1.13)	*Upeneus moluccensis*	423(1.27)	Gobius niger	225(0.65)
Uranoscopus scaber	784(1.12)	*Uranoscopus scaber*	371(1.11)	Penacus japonicus	222(0.64)
Scyphozoa	773(1.11)	*Gobius niger*	364(1.10)	Bothus podas	200(0.57)
Teleost	35432(50.80)		26997(81.14)		10667(87.87)
Cephalopoda	3504(5.02)		665 (2.00)		334(0.96)
Decapoda	2160(3.10)		3778(11.36)		631(1.81)
Stomatopoda	92(0.13)		1183(3.55)		951(2.73)
West coast of Mersin Bay (42)		**Narrow continental shelf (49)**			
Dasyatis pastinaca	38402(31.57)	*Bryozoa*	114664(33.54)		
Mullus barbatus	16057(13.20)	*Euspongia officinalis*	49834(14.58)		
Saurida undosquamis	15988(13.14)	*Codium spp.*	46909(13.72)		
Charybdis longicollis	9383(7.71)	*Posidonia oceanica*	43003(12.58)		
Bothus podas	6137(5.04)	*Mullus barbatus*	18451 (5.40)		
Octopus vulgaris	3915(3.22)	*Pagrus pagrus*	13320(3.90)		
Raja miraletus	3624(2.98)	*Stephanolepis diaspros*	6499(1.90)		
Leiognathus klunzingeri	3382(2.78)	*Octopus vulgaris*	4840(1.42)		
Euspongia officinalis	2384(1.96)	*Diplodus vulgaris*	4473(1.31)		
Trigla lucerna	2291 (1.88)	*Dentex dentex*	4320(1.26)		
Arnoglossus laterna	2201(1.81)	*Pagellus erythrinus*	4164(1.22)		
Citharus linguatula	1956(1.61)	*Serranus cabrilla*	2824(0.83)		
Sepia officinalis	1682(1.38)	*Scorpaena notata*	2798(0.82)		
Uranoscopus scaber	1254(1.03)	*Bothus podas*	2449(0.72)		
Lepidotrigla cavillone	1208(0.99)	*Mullus surmuletus*	2393(0.70)		
Pagellus erythrinus	1055(0.87)	*Saurida undosquamis*	2193(0.64)		
Synodus saurus	975(0.80)	*Raja miraletus*	2127(0.62)		
Solea vulgaris	945(0.78)	*Diplodus annularis*	2009(0.59)		
Zeus faber	745 (0.61)	*Trigloporus lastoviza*	1995(0.58)		
Stephanolepis diaspros	634(0.61)	*Sepia officinalis*	1816(0.53)		
Teleost	101692(83.59)		79587(23.28)		
Cephalopoda	5597(4.60)		6656(1.95)		
Decapoda	9624(7.91)		- -		
Stomatopoda	269(0.22)		- -		

Table 8. The top 20 species of highest biomass in October 1984 (CPUE = Catch per unit trawling effort, in grams; % = percentage biomass; (n) = number of species)

Subregion	CPUE (%)		CPUE (%)		CPUE (%)
Offshore (73)		**Offshore - Iskenderun (46)**		**Intermediate - Mersin (58)**	
Euspongia officinalis	25447(32.44)	*Saurida undosquamis*	16080(41.85)	*Leiognathus klunzingeri*	17219(28.52)
Mullus barbatus	8688(11.08)	*Citharus linguatula*	3513(9.14)	*Saurida undosquamis*	11609(19.23)
Saurida undosquamis	4289(5.47)	*Mullus barbatus*	3307(8.61)	*Upeneus moluccensis*	4013(6.65)
Citharus linguatula	3823(4.87)	*Charybdis longicollis*	1901(4.95)	*Oratosquilla massavensis*	3332(5.52)
Raja miraletus	3380(4.31)	*Merluccius merluccius*	1546(4.02)	*Myliobatis aquila*	3270(5.42)
Pagellus erythrinus	3303(4.21)	*Parapenaeus longirostris*	1454(3.78)	*Parapenaeus longirostris*	3202(5.30)
Merluccius merluccius	3049(3.89)	*Squatina squatina*	1238(3.22)	*Mullus barbatus*	2947(4.88)
Lepidotrigla cavillone	3031(3.86)	*Arnoglossus laterna*	1221(3.18)	*Argyrosomus regius*	2899(4.80)
Antedon mediterranea	2759(3.52)	*Myliobatis aquila*	925(2.41)	*Charybdis longicollis*	2359(3.91)
Cidaris cidaris	2250(2.87)	*Sepia officinalis*	800(2.08)	*Arnoglossus laterna*	1136(1.88)
Parapenaeus longirostris	1796(2.29)	*Pagellus erythrinus*	774(2.01)	*Gobius niger*	837(1.39)
Upeneus moluccensis	1510(1.93)	*Oratosquilla massavensis*	676(1.76)	*Mustelus mustelus*	800(1.32)
Uranoscopus scaber	1500(1.91)	*Trigla lucerna*	586(1.52)	*Citharus linguatula*	676(1.12)
Mustelus mustelus	1424(1 81)	*Leiognathus klunzingeri*	463(1.20)	*Sepia officinalis*	603(1.00)
Octopus vulgaris	1215(1.55)	*Upeneus moluccensis*	393(1.02)	*Trigla lucerna*	529(0.88)
Spicara flexuosa	1191(1.52)	*Uranoscopus scaber*	376(0.98)	*Ephinephelus aeneus*	435(0 72)
Arnoglossus laterna	855(1.09)	*Pennatula rubra*	347(0.90)	*Dasyatis pastinaca*	338(0.56)
Trigloporus lastoviza	550(0.70)	*Solea vulgaris*	263(0.68)	*Pomadasys incisus*	293(0.48)
Trigla lucerna	474(0.60)	*Raja miraletus*	244(0.63)	*Sparus aurata*	142(0.24)
Teleost	40585(51.74)		32887(85.59)		26997(80.75)
Cephalopoda	3793(4.84)		1094(2.85)		665(1.00)
Decapoda	2243(2.86)		3354(8.73)		3778(12.64)
Stomatopoda	52(0.07)		676(1.76)		1183(5.52)
Near Coastal (54)		**West coast of Mersin Bay (41)**		**Narrow continental shelf (44)**	
Leiognathus klunzingeri	38951 (41.29)	*Euspongia officinalis*	23850(41.39)	*Euspongia officinalis*	56257(33.12)
Saurida undosquamis	9060(9.60)	*Saurida undosquamis*	12435(21.58)	*Posidonia oceanica*	34477(20.29)
Myliobatis aquila	7044 (7.47)	*Myliobatis aquila*	5250(9.11)	*Diplodus sargus*	19100(11.24)
Pagellus erythrinus	5641 (5.98)	*Bothus podas*	3420(5.94)	*Sparus aurata*	18800(11.07)
Mullus barbatus	4477(4.75)	*Rhinobatos rhinobatos*	1850(3.21)	*Codium spp.*	17493(10.30)
Stephanolepis diaspros	4421 (4.69)	*Stephanolepis diaspros*	1530(2.66)	*Myliobatis aquila*	4200(2.47)
Upeneus asymmetricus	2522(2.67)	*Leiognathus klunzingeri*	1065(1.85)	*Stephanolepis diaspros*	3803(2.24)
Pelates quadrilineatus	2427(2.57)	*Caulerpa prolifera*	900(1.56)	*Cidaris cidaris*	1693(1.00)
Diplodus annularis	1795(1.90)	*Dasyalis pastinaca*	875(1.52)	*Rhinobatos rhinobatos*	1533(0.90)
Caulerpa prolifera	1747(1.85)	*Pagellus erythrinus*	635(1.10)	*Bothus podas*	1367(0.80)
Dasyatis pastinaca	1489(1.58)	*Serranus cabrilla*	600(1.04)	*Raja radula*	1333(0.78)
Umbrina cirrhosa	1283(1.36)	*Antedon mediterranea*	600(1.04)	*Dentex macrophthalmus*	1308(0.77)
Sparus aurata	1202(1.27)	*Callinectes sapidus*	570(0.99)	*Dentex dentex*	1110(0.65)
Ephinephelus aeneus	1192(1.26)	*Upeneus moluccensis*	520(0.90)	*Pagrus pagrus*	1050(0.62)
Portunus pelagicus	1044(1.11)	*Echeneis naucrates*	500(0.87)	*Caulerpa prolifera*	733(0.43)
Lithognathus mormyrus	924(0.98)	*Octopus vulgaris*	470(0.82)	*Trachinus draco*	720(0.42)
Callionymus filamentosus	850(0.90)	*Ephinephelus aeneus*	418(0.72)	*Xyrichthys novacula*	600(0.35)
Siganus rivulatus	830(0.88)	*Arnoglossus laterna*	375(0.65)	*Sepia officinalis*	530(0.31)
Upeneus moluccensis	665(0.70)	*Lagocephalus spadiceus*	290(0.50)	*Synodus saurus*	470(0.28)
Balistes carolinensis	652(0.69)	*Echinaster sepositus*	280(0.48)	*Trigloporus lastoviza*	440(0.26)
Teleost	90216(95.64)		30740(53.35)		58565(34.47)
Cephalopoda	89(0.09)		553(0.96)		530(0.31)
Decapoda	1807(1.92)		590(1.02)		- -
Stomatopoda	466(0.49)		- -		- -