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# DEMERSAL FISHERIES RESOURCES OF THE BAY OF MAGOSA, THE TURKISH REPUBLIC OF NORTHERN CYPRUS

Bülent Cihangir*, Hüseyin A. Benli*, E. Mümtaz Tıraşın*,
Murat Kaya** & Aydın Ünlüoğlu*

*Dokuz Eylül University, Institute of Marine Sciences and Technology, 35340 İnciraltı, İzmir-Turkey
**Ege University, Faculty of Fisheries, Bornova, İzmir-Turkey

## ABSTRACT

*Two ecological surveys were carried out in the territorial waters of the Turkish Republic of Northern Cyprus in May 1997 and July 1998 with R/V. K.Piri Reis. Demersal and some semi-pelagic fisheries resources were sampled by bottom trawl. Some other small pelagic species also caught by the trawl were included in the list. In this study, 9 cartilaginous fish species, 84 bony fish species, 4 shrimp species and 16 cephalopod species were obtained. About 40 of the bony fish species are commercially important. 44 bony fish species were sampled in depths shallower than 100 m (Stratum A). The number of bony fish species decreased with depth, and while 27 species were found in depths between 101-200 m (Stratum B), 24 species were encountered in between 201-500 m (Stratum C). Cartilaginous fish were absent in Stratum A, and commercially important shrimp species were distributed mostly in Stratum C. Of the bony fishes only longspine snipefish and boarfish, which have no economical value, were found in all depth strata. The distribution of the remaining bony fish species was restricted with depth. The most frequently observed fishes (over 80%) in various strata were comber in Stratum A, large-scaled gurnard in Stratum B and rockfish in Stratum C. With 75% occurrence frequency starry ray was the most common cartilaginous fish. Elegant cuttlefish and shortfin squid were the most common cephalopods, and were observed more than 80% in the trawl hauls. Overall total biomass estimates for the fisheries resources in the Bay of Magosa were low. Bony fish comprised the major part of the fish biomass in the Bay of Magosa in each stratum and season except for in Stratum C in summer 1998, where a cartilaginous fish, stingray, was the most abundant species.*

## 1. INTRODUCTION

Lack of knowledge on the diversity, abundance and distribution of the living resources of a region seriously impedes the sound management and protection of these resources. Information on the marine living resources along the coasts of the Turkish Republic of Northern Cyprus (TRNC) is limited due to the scarce studies carried out on the region. The troubled political and economical situation in the TRNC has and continues to limit the funds available for marine research.

In order to increase the knowledge on the marine living resources of the TRNC, two research surveys were recently conducted with R/V *K. Piri Reis* in spring 1997 and summer 1998 [1]. These surveys aimed to determine mainly the diversity, abundance, and distribution of the marine plants and animals in the territorial waters of the TRNC, and also to monitor the basic oceanographic parameters influencing the living organisms in the region. The data collected will become the basis for a comprehensive inventory of the demersal fish fauna of the TRNC. Hence, the lessepsian species, which migrated to the waters of the northern Cyprus after the opening of the Suez Channel, will also be determined.

This paper is a preliminary contribution to the knowledge on the diversity and biomass of the demersal and some semi-pelagic fisheries resources of the TRNC, and it is based on the data gathered during these two recent surveys.

## 2. MATERIALS AND METHODS

Fishery data for this study were collected with a Mediterranean type high opening bottom trawl during two research surveys conducted in the territorial waters of the TRNC with R/V *K. Piri Reis* operated by the Institute of Marine Sciences and Technology of Dokuz Eylül University. The first survey was carried out in spring 1997 (8-20 May 1997) and a total of 22 hauls were towed. The second survey was in summer 1998 (10-22 July 1998) and altogether 16 hauls were taken. However, since the bottom topography in the northern coast of the TNRC between Koruçam and Karpaz is not suitable for bottom trawling, majority of the hauls, a total of 24, was taken in the Bay of Magosa. The trawl was equipped with a 22 mm mesh size net (knot-to-knot) at the cod-end. All trawling operations were carried out during daytime. Locations, sampling dates and hauling depths of trawl stations are presented in Table 1.

In order to estimate the standing biomass of various fisheries resources the survey areas were divided into sub-

areas of 9 square nautical miles and were stratified according to depth as A (20-100 m), B (101-200 m) and C (201-600 m). However, again due to the bottom topography, the sampling effort could not be distributed proportionally between these strata. Because more samples were taken in the Bay of Magosa, the biomass estimates were only carried out for this bay.

For a more accurate calculation of the area swept by the gear the Net Sounder was used to determine the width between wing nets during the operation. The state of the gear on the bottom during trawling was also monitored on board using the same device. The total biomass estimates ( $\hat{B}$ ) were obtained from the equation below [2,3]:

$$\sum_{i=1}^{n} \hat{B}_i = \frac{A_i \cdot \overline{C}_i}{a_i \cdot q}.$$

Where $\overline{C}_i$ is the mean weight of catch taken in area $i$, $A_i$ is the total area of sea bottom in area $i$, and $a_i$ is the area swept by the trawl in area $i$. The catchability coefficient is denoted by $q$ and is assumed to be equal to 1 in all areas. The variance of this estimator was calculated with the following equation:

$$\mathrm{var}(\hat{B}) = \sum_{i=1}^{n} \left(\frac{A_i}{a_i}\right)^2 \cdot \frac{\mathrm{var}(C_i)}{h_i}$$

where $h_i$ is the number of hauls taken in area $i$.

Frequencies of occurrence of species in different strata were calculated as the proportion of number of trawls in a stratum that contained the particular species to the total number of trawls hauled in that stratum (irrespective of amount of species).

## 3. RESULTS

A total of 113 species have been determined in the trawl samples collected along the coasts of the TRNC. Of these species, 9 were cartilaginous (sharks and rays) fish, 84 were bony fish species, 4 were shrimp species and 16 were cephalopod species. The species list and their frequencies of occurrence in each stratum in different seasons are presented in Table 2. The list includes also some other small pelagic species, which were caught by the trawl.

Among the bony fish, 40 species are commercially important; such as sardine, round sardine, anchovy, lizardfish, hake, blue whiting, greater fork-beard, john-dory, groupers, comber, horse mackerels, red mullet, striped red mullet, bogue, annular sea bream, two-banded sea bream, sharpsnout sea bream, axillary sea bream, common pandora, common sea bream, black sea bream, picarels, marbled spinefoot, scorpionfish, gurnards, flounder, sole and anglerfish. 44 bony fish species were sampled in the depths shallower than 100 m (Stratum A). The number of bony fish species decreased with depth, while 27 species were found in depths between 101-200 m (Stratum B), 24 species were encountered in between 201-600 m (Stratum C). Cartilaginous fish were absent in Stratum A, and commercially important shrimp species were distributed mostly in Stratum C. Of the bony fishes only longspine snipefish and boarfish were found in all depth strata. These species have no economical value. The distribution of the remaining bony fish species was restricted with depth. The most frequently observed fishes (over 80%) in various strata were comber in Stratum A, large-scaled gurnard in Stratum B and rockfish in Stratum C. With 75% occurrence frequency starry ray was the most common cartilaginous fish. Elegant cuttlefish and shortfin squid were the most common cephalopods, and were observed in more than 80% of the trawl hauls.

The percentage composition by biomass of main groups of fishery resources in the Bay of Magosa, together with biomass estimates, catch rates and catch per unit effort for each sampling period are presented in Tables 3 and 4.

Bony fish comprised the major part of the fisheries resources in the Bay of Magosa in each stratum and season except for in Stratum C in summer 1998 (Tables 3 and 4). In spring 1997, in Stratum A, picarel was the most abundant bony fish by weight (23%) and was followed by comber (17%). In stratum B in the same season, anglerfish was the most dominant (35%) species by weight. The same species was also abundant in Stratum C together with a semipelagic species, jack mackerel. In summer 1998, in Strata A and B, the most dominant fishes in the total catch by weight were longspine snipefish (28%) and picarel (29%), respectively. In Stratum C, however, a cartilaginous fish, stingray, was the most abundant species and accounted for 69% of the total biomass.

## 4. DISCUSSION

The overall diversity of fisheries resources in the waters of the TRNC is low compared with the coasts of Turkey, especially with the Aegean coast. Yet, the number of species is expected to increase with additional surveys, which will cover the other seasons.

According to the literature, more than 300 species, also called lessepsian migrants, are known to have entered the Mediterranean Sea especially after the opening of the Suez

**Table 1.** Locations, sampling dates and hauling depths of the trawl stations in the waters of TRNC

| Spring 1997 | | | | | Summer 1998 | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | Coordinates | | Depth (m) | | Sampling Date | Coordinates | | Depth (m) | |
| | | | Start | Finish | | | | Start | Finish |
| 10.5.97 | Start | 35°24'7"N-33°07'5"E | 560 | 576 | 14.07.98 | Start | 35°10'6"N-32°46'5"E | 84 | 97 |
| | Finish | 35°23'9"N-33°09'0"E | | | | Finish | 35°10'4"N-32°48'1"E | | |
| 10.5.97 | Start | 35°22'7"N-33°02'6"E | 33 | 35 | 14.07.98 | Start | 35°17'5"N-32°51'7"E | 122 | 106 |
| | Finish | 35°22'7"N-33°04'2"E | | | | Finish | 35°16'7"N-32°52'8"E | | |
| 11.5.97 | Start | 35°20'58"N-33°23'4"E | 40 | 46 | 14.07.98 | Start | 35°19'1"N-32°49'0"E | 233 | 227 |
| | Finish | 35°20'7"N-33°22'5"E | | | | Finish | 35°18'6"N-32°49'9"E | | |
| 12.5.97 | Start | 35°20'7"N-33°28'6"E | 28 | 38 | 14.07.98 | Start | 35°21'5"N-32°54'0"E | 30 | 17 |
| | Finish | 35°20'6"N-33°27'5"E | | | | Finish | 35°21'1"N-32°54'6"E | | |
| 12.5.97 | Start | 35°22'9"N-33°41'0"E | 38 | 45 | 17.07.98 | Start | 35°47'7"N-34°43'8"E | 114 | 113 |
| | Finish | 35°22'4"N-33°39'3"E | | | | Finish | 35°47'9"N-34°44'1"E | | |
| 13.5.97 | Start | 35°17'6"N-32°54'2"E | 50 | 92 | 18.07.98 | Start | 35°10'3"N-33°57'8"E | 77 | 47 |
| | Finish | 35°17'0"N-32°52'6"E | | | | Finish | 35°09'0"N-33°57'2"E | | |
| 13.5.97 | Start | 35°19'2"N-32°54'6"E | 28 | 45 | 18.07.98 | Start | 35°11'2"N-33°56'8"E | 70 | 36 |
| | Finish | 35°17'7"N-32°54'4"E | | | | Finish | 35°10'0"N-33°56'1"E | | |
| 13.5.97 | Start | 35°19'8"N-32°55'1"E | 11 | 13 | 18.07.98 | Start | 35°08'7"N-34°00'1"E | 145 | 134 |
| | Finish | 35°18'3"N-32°55'1"E | | | | Finish | 35°09'5"N-33°59'3"E | | |
| 13.5.97 | Start | 35°12'5"N-32°52'3"E | 75 | 85 | 19.07.98 | Start | 35°08'5"N-33°57'4"E | 33 | 33 |
| | Finish | 35°11'2"N-32°51'8"E | | | | Finish | 35°09'5"N-33°56'7"E | | |
| 16.5.97 | Start | 35°40'3"N-34°39'1"E | 275 | 337 | 19.07.98 | Start | 35°08'3"N-34°00'4"E | 152 | 182 |
| | Finish | 35°39'7"N-34°37'8"E | | | | Finish | 35°07'6"N-34°01'6"E | | |
| 17.5.97 | Start | 35°25'7"N-34°10'4"E | 32 | 35 | 19.07.98 | Start | 35°08'5"N-34°01'7"E | 270 | 240 |
| | Finish | 35°25'0"N-34°08'4"E | | | | Finish | 35°09'1"N-34°00'7"E | | |
| 17.5.97 | Start | 35°25'1"N-34°11'1"E | 37 | 69 | 19.07.98 | Start | 35°06'4"N-34°00'5"E | 90 | 89 |
| | Finish | 35°26'3"N-34°11'7"E | | | | Finish | 35°07'6"N-33°59'6"E | | |
| 17.5.97 | Start | 35°21'5"N-34°10'4"E | 187 | 155 | 19.07.98 | Start | 35°09'4"N-33°59'1"E | 105 | 131 |
| | Finish | 35°21'9"N-34°08'9"E | | | | Finish | 35°10'4"N-33°58'5"E | | |
| 18.5.97 | Start | 35°19'3"N-34°09'0"E | 338 | 256 | 19.07.98 | Start | 35°11'8"N-33°56'3"E | 59 | 70 |
| | Finish | 35°20'2"N-34°10'3"E | | | | Finish | 35°10'6"N-33°57'2"E | | |
| 18.5.97 | Start | 35°20'2"N-34°08'0"E | 144 | 150 | 21.07.98 | Start | 35°22'0"N-34°09'2"E | 158 | 133 |
| | Finish | 35°19'3"N-36°06'8"E | | | | Finish | 35°20'9"N-34°08'2"E | | |
| 18.5.97 | Start | 35°13'9"N-33°56'9"E | 100 | 145 | 21.07.98 | Start | 35°19'7"N-34°09'5"E | 244 | 210 |
| | Finish | 35°15'2"N-33°57'0"E | | | | Finish | 35°20'6"N-34°10'9"E | | |
| 18.5.97 | Start | 35°13'6"N-33°56'0"E | 62 | 70 | | | | | |
| | Finish | 35°15'0"N-33°55'8"E | | | | | | | |
| 18.5.97 | Start | 35°12'0"N-33°55'6"E | 38 | 37 | | | | | |
| | Finish | 35°13'2"N-33°55'1"E | | | | | | | |
| 19.5.97 | Start | 35°11'1"N-33°56'7"E | 72 | 32 | | | | | |
| | Finish | 35°10'3"N-33°55'9"E | | | | | | | |
| 19.5.97 | Start | 35°11'1"N-33°58'0"E | 150 | 66 | | | | | |
| | Finish | 35°10'2"N-33°57'0"E | | | | | | | |
| 19.5.97 | Start | 35°08'0"N-34°01'1"E | 171 | 169 | | | | | |
| | Finish | 35°08'9"N-34°00'2"E | | | | | | | |
| 20.5.97 | Start | 35°08'0"N-34°02'4"E | 328 | 265 | | | | | |
| | Finish | 35°08'8"N-34°01'3"E | | | | | | | |

**Table 2.** The list of species caught in the bottom trawls and their frequencies of occurrence in each stratum (A, B and C, see text for details) in spring 1997 and summer 1998 in the territorial waters of TRNC

| Frequency of occurrence | | 0 | 1-20 | 21-40 | 41-60 | 61-80 | 81-100 |
|---|---|---|---|---|---|---|---|
| Scientific and English names of species | | Spring 1997 | | | Summer 1998 | | |
| | | A | B | C | A | B | C |
| **Cartilaginous Fishes** | | | | | | | |
| *Heptranchias perlo* | Seven-gill shark | | | | | | |
| *Galeus melastomus* | Blackmouth catshark | | | | | | |
| *Scyliorhinus canicula* | Smallspotted catfish | | | | | | |
| *Etmopterus spinax* | Velvetbelly | | | | | | |
| *Squalus blainvillei* | Longnose spurdog | | | | | | |
| *Raja asterias* | Starry ray | | | | | | |
| *Raja clavata* | Thornback ray | | | | | | |
| *Raja polystigma* | Speckled ray | | | | | | |
| *Dasyatis pastinaca* | Stingray | | | | | | |
| **Bony Fishes** | | | | | | | |
| *Sardina pilchardus* | European pilchard | | | | | | |
| *Sardinella aurita* | Round sardine | | | | | | |
| *Etrumeus teres* | Round herring | | | | | | |
| *Engraulis encrasicolus* | Anchovy | | | | | | |
| *Chauliodus sloani* | Viper fish | | | | | | |
| *Stomias boa* | Scaly dragon fish | | | | | | |
| *Argentina sphyraena* | Argentine | | | | | | |
| *Aulopus falmentosus* | Flagfin | | | | | | |
| *Synodus saurus* | Lizardfish | | | | | | |
| *Chlorophthalmus agassizii* | Greeneye | | | | | | |
| *Macroramphosus scolopax* | Longspine snipefish | | | | | | |
| *Hippocampus hippocampus* | Sea-horse | | | | | | |
| *Sygnathus acus* | Great pipefish | | | | | | |
| *Coelorhynhcus coelorhynhcus* | Blackspot grenadier | | | | | | |
| *Nezumia sclerorhynchus* | Roughtip grenadier | | | | | | |
| *Merluccius merluccius* | Hake | | | | | | |
| *Gadiculus argenteus* | Silvery pout | | | | | | |
| *Micromesistius poutassou* | Blue whiting | | | | | | |
| *Phycis blennoides* | Greater fork-beard | | | | | | |
| *Phycis phycis* | Fork-beard | | | | | | |
| *Hoplostethus mediterraneus* | Mediterranean slimehead | | | | | | |
| *Zeus faber* | John-dory | | | | | | |
| *Capros aper* | Boarfish | | | | | | |
| *Anthias anthias* | Sea pearch | | | | | | |
| *Callanthias ruber* | Parrot sea pearch | | | | | | |
| *Epinephelus alexandrinus* | Golden grouper | | | | | | |
| *Serranus cabrilla* | Comber | | | | | | |
| *Serranus hepatus* | Brown comber | | | | | | |
| *Serranus scriba* | Painted comber | | | | | | |
| *Cepola rubescens* | Red bandfish | | | | | | |
| *Trachurus mediterraneus* | Mediterranean horse mackerel | | | | | | |

**Table 2.** Continues

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Trachurus picturatus* | Jack mackerel | | | | | | |
| *Trachurus trachurus* | Horse mackerel | | | | | | |
| *Mullus barbatus* | Red mullet | | | | | | |
| *Mullus surmuletus* | Striped mullet | | | | | | |
| *Boops boops* | Boque | | | | | | |
| *Dentex macrophthalmus* | Large-eye dentex | | | | | | |
| *Diplodus annularis* | Annular seabream | | | | | | |
| *Diplodus puntazzo* | Sharpsnout seabream | | | | | | |
| *Diplodus vulgaris* | Two-banded seabream | | | | | | |
| *Pagellus acarne* | Axillary seabream | | | | | | |
| *Pagellus erythrinus* | Red pandora | | | | | | |
| *Pagrus pagrus* | Common seabream | | | | | | |
| *Spondyliosoma cantharus* | Black seabream | | | | | | |
| *Centracanthus cirrus* | Picarel | | | | | | |
| *Spicara flexuosa* | Blotched picarel | | | | | | |
| *Spicara maena* | Blotched picarel | | | | | | |
| *Spicara smaris* | Picarel | | | | | | |
| *Chromis chromis* | Damsel fish | | | | | | |
| *Coris julis* | Rainbow wrasse | | | | | | |
| *Labrus viridis* | Green wrasse | | | | | | |
| *Symphodus mediterraneus* | Axillary wrasse | | | | | | |
| *Symphodus ocellatus* | Wrasse | | | | | | |
| *Symphodus tinca* | Peacock wrasse | | | | | | |
| *Pteragogus pelycus* | Sideburn wrasse | | | | | | |
| *Sparisoma cretense* | Parrot fish | | | | | | |
| *Trachinus draco* | Greater weever | | | | | | |
| *Uranoscopus scaber* | Stargazar | | | | | | |
| *Siganus rivulatus* | Marbled spinefoot | | | | | | |
| *Scomber japonicus* | Chub mackerel | | | | | | |
| *Gobius niger* | Black goby | | | | | | |
| *Callionymus lyra* | Dragonet | | | | | | |
| *Blennius ocellaris* | Butterfly blenny | | | | | | |
| *Tripterygion tripteronotus* | Threefin blennies | | | | | | |
| *Sphyraena crysotenia* | Obtuse barracuda | | | | | | |
| *Helicolenus dactylopterus* | Rockfish | | | | | | |
| *Scorpaena elongata* | Slender rockfish | | | | | | |
| *Scorpaena notata* | Small red scorpionfish | | | | | | |
| *Scorpaena porcus* | Black scorpionfish | | | | | | |
| *Scorpaena scrofa* | Red scorpionfish | | | | | | |
| *Aspitrigla cuculus* | Red gurnard | | | | | | |
| *Lepidotrigla cavillone* | Largescaled gurnard | | | | | | |
| *Trigla lucerna* | Tub gurnard | | | | | | |
| *Trigla lyra* | Piper gurnard | | | | | | |
| *Trigla lineata* | Streaked gurnard | | | | | | |
| *Peristedion cataphractum* | Armed gurnard | | | | | | |
| *Citharus linguatula* | Spotted flounder | | | | | | |
| *Lepidorhombus whiffiagonis* | Megrim | | | | | | |

**Table 2.** Continues

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| *Arnoglossus laterna* | Scaldfish | | | | | | |
| *Arnoglossus rueppelii* | Rüppell's scaldback | | | | | | |
| *Arnoglossus thori* | Thor's scaldfish | | | | | | |
| *Microchirus variegatus* | Thickback sole | | | | | | |
| *Stephanolephis diaspros* | File fish | | | | | | |
| *Lophius piscatorius* | Anglerfish | | | | | | |
| **Shrimps** | | | | | | | |
| *Polycheles typhlops* | Decapod crustecean | | | | | | |
| *Aristaeomorpha foliacea* | Giant red shrimp | | | | | | |
| *Plesionika martia* | Golden shrimp | | | | | | |
| *Parapenaeus longirostris* | Deep-water rose shrimp | | | | | | |
| **Cephalopods** | | | | | | | |
| *Sepia elegans* | Elegant cuttlefish | | | | | | |
| *Sepia officinalis* | Common cuttlefish | | | | | | |
| *Sepia orbigyana* | Pink cuttlefish | | | | | | |
| *Sepietta oweniana* | Common bobtail | | | | | | |
| *Sepietta sp.* | Bobtail | | | | | | |
| *Sepiola robusta* | | | | | | | |
| *Alloteuthis media* | Midsize squid | | | | | | |
| *Loligo forbesi* | Veined squid | | | | | | |
| *Loligo vulgaris* | European squid | | | | | | |
| *Todarodes sagittatus* | European flying squid | | | | | | |
| *Illex coindettii* | Shortfin squid | | | | | | |
| *Todaropsis eblanae* | Lesser flying squid | | | | | | |
| *Eledone moschata* | Musky octopus | | | | | | |
| *Octopus vulgaris* | Common octopus | | | | | | |
| *Scaeurgus unicirrhus* | Unihorn octopus | | | | | | |

**Table 3.** The percentage composition by biomass of main groups of fishery resources in the Bay of Magosa, together with biomass estimates, catch rates and catch per unit effort (CPUE) for each strata in Spring 1997

| Main Groups | Percentage weight of the total catch | Average (tonnes/hour) | Standart Deviation | CPUE (tonnes/hp) | Biomass (tonnes) | Standart Deviation of biomass |
|---|---|---|---|---|---|---|
| **Strata A (20-100 m)** | | | | | | |
| Shrimps | 0.00 | | | | | |
| Cuttlefishs | 6.70 | 0.00030 | 0.00037 | 0.00005 | 4.33 | 2.35 |
| Squids | 0.00 | | | | | |
| Octopus | 2.19 | 0.00010 | 0.00020 | 0.00002 | 1.42 | 1.27 |
| Sharks | 0.00 | | | | | |
| Rays | 0.00 | | | | | |
| Bony fishes | 91.10 | 0.00412 | 0.00322 | 0.00070 | 58.87 | 20.55 |
| **Total** | 100.00 | 0.00452 | 0.00352 | 0.00077 | 64.62 | 22.51 |
| **Strata B (101-200 m)** | | | | | | |
| Shrimps | 0.00 | | | | | |
| Cuttlefishs | 1.34 | 0.00023 | 0.00034 | 0.00004 | 2.04 | 1.37 |
| Squids | 1.53 | 0.00026 | 0.00021 | 0.00004 | 2.33 | 0.83 |

**Table 3.** Continues

| | | | | | | |
|---|---|---|---|---|---|---|
| Octopus | 1.79 | 0.00031 | 0.00054 | 0.00005 | 2.74 | 2.15 |
| Sharks | 4.89 | 0.00084 | 0.00118 | 0.00014 | 7.48 | 4.73 |
| Rays | 13.83 | 0.00236 | 0.00388 | 0.00040 | 21.13 | 15.55 |
| Bony fishes | 76.62 | 0.01308 | 0.01250 | 0.00222 | 117.06 | 50.06 |
| **Total** | 100.00 | 0.01707 | 0.01312 | 0.00289 | 152.78 | 52.54 |
| **Strata C (201-600 m)** | | | | | | |
| Shrimps | 0.39 | 0.00006 | 0.00007 | 0.00001 | 1.18 | 0.78 |
| Cuttlefishs | 1.21 | 0.00018 | 0.00010 | 0.00003 | 3.69 | 1.20 |
| Squids | 2.61 | 0.00039 | 0.00024 | 0.00007 | 7.91 | 2.81 |
| Octopus | 0.00 | | | | | |
| Sharks | 11.77 | 0.00177 | 0.00219 | 0.00030 | 35.75 | 25.56 |
| Rays | 15.38 | 0.00231 | 0.00200 | 0.00039 | 46.71 | 23.27 |
| Bony fishes | 68.64 | 0.01032 | 0.00753 | 0.00175 | 208.43 | 87.73 |
| **Total** | 100.00 | 0.01504 | 0.00557 | 0.00255 | 303.68 | 64.88 |

**Table 4.** The percentage composition by biomass of main groups of fishery resources in the Bay of Magosa, together with biomass estimates, catch rates and catch per unit effort (CPUE) for each strata in Summer 1998

| **Main Groups** | **Percentage weight of the total catch** | **Average (tonnes/hour)** | **Standart Deviation** | **CPUE (tonnes/hp)** | **Biomass (tonnes)** | **Standart deviation of biomass** |
|---|---|---|---|---|---|---|
| **Strata A (20-100 m)** | | | | | | |
| Shrimps | 0.00 | | | | | |
| Cuttlefishs | 0.29 | 0.00004 | 0.00008 | 0.00001 | 0.54 | 0.48 |
| Squids | 0.43 | 0.00006 | 0.00011 | 0.00001 | 0.80 | 0.72 |
| Octopus | 1.01 | 0.00013 | 0.00027 | 0.00002 | 1.90 | 1.70 |
| Sharks | 0.00 | | | | | |
| Rays | 5.31 | 0.00070 | 0.00139 | 0.00012 | 9.94 | 8.89 |
| Bony fishes | 92.96 | 0.01219 | 0.01154 | 0.00206 | 174.10 | 73.71 |
| **Total** | 100.00 | 0.01311 | 0.01338 | 0.00222 | 187.27 | 85.50 |
| **Strata B (101-200 m)** | | | | | | |
| Shrimps | 0.30 | 0.00007 | 0.00009 | 0.00001 | 0.59 | 0.41 |
| Cuttlefishs | 0.76 | 0.00017 | 0.00017 | 0.00003 | 1.49 | 0.76 |
| Squids | 0.03 | 0.00001 | 0.00001 | 0.00000 | 0.06 | 0.04 |
| Octopus | 5.44 | 0.00119 | 0.00084 | 0.00020 | 10.69 | 3.77 |
| Sharks | 0.63 | 0.00014 | 0.00024 | 0.00002 | 1.24 | 1.08 |
| Rays | 0.09 | 0.00002 | 0.00003 | 0.00000 | 0.17 | 0.15 |
| Bony fishes | 92.75 | 0.02035 | 0.00734 | 0.00345 | 182.15 | 32.85 |
| **Total** | 100.00 | 0.02194 | 0.00872 | 0.00372 | 196.39 | 39.05 |
| **Strata C (201-600 m)** | | | | | | |
| Shrimps | 0.15 | 0.00003 | 0.00003 | 0.00001 | 0.65 | 0.46 |
| Cuttlefishs | 0.26 | 0.00006 | 0.00002 | 0.00001 | 1.13 | 0.34 |
| Squids | 0.02 | 0.00000 | 0.00000 | 0.00000 | 0.08 | 0.06 |
| Octopus | 0.00 | | | | | |
| Sharks | 0.00 | | | | | |
| Rays | 71.26 | 0.01543 | 0.01457 | 0.00261 | 311.54 | 208.01 |
| Bony fishes | 28.31 | 0.00613 | 0.00340 | 0.00104 | 123.77 | 48.57 |
| **Total** | 100.00 | 0.02165 | 0.01803 | 0.00367 | 437.16 | 257.44 |

Canal [4]. These invasions caused considerable changes in the composition of native species in the Eastern Mediterranean Sea [5]. However, according to the present findings, the trawlable fish fauna in the TRNC seems little affected by these invasions. An inspection of Table 1 reveals that the proportion of the fish species of tropical and indo-pacific origin is fairly small. Only five lessepsian species, round herring, marbled spinefoot, obtuse barracuda, filefish and sideburn wrasse were caught. This is also consistent with Por [6], who argued that the Cyprus was one of the least invaded regions in the Eastern Mediterranean Sea.

Overall total biomass estimates for the fisheries resources in the Bay of Magosa were rather low. This may mainly be attributed to the low concentrations of nutrients, phyto- and zooplankton in the seawater, and also to the small numbers of benthic invertebrates in the bottom of the bay [1]. In addition, the preliminary studies on the size-at-age data of various commercial demersal fish indicate that there is a heavy fishing pressure in the bay.

The biomass estimates in summer 1998 were higher than in spring 1997 in all three strata. Also in both seasons the biomass estimates were lower in Stratum A than in the two other strata. However, since associated standard deviations of the biomass estimates were also very high, it is not clear whether the observed differences are due to the low number of trawl hauls or to the actual effects of seasons and depth on the fisheries resources.

## 5. REFERENCES

[1] H.A. Benli, N. Bilecik, B. Cihangir, T. Katağan, Ş. Cirik, E. Sayın, M. Kaya, T. Koray, M.E. Çınar, A. Salman, T.M. Sever, A. Ünlüoğlu, F. Küçüksezgin, E. Buhan, H. Yılmaz, and S. Akalın, *The bio-ecological properties of the surroundings waters of the Turkish Republic of Northern Cyprus*, Ministery of Aquaculture and Rural Affairs of the Turkish Republic, Fisheries Research Institute of Bodrum,Technical Report, Series B, No: 4, 1999.

[2] A. Saville, *Survey methods of appraising fishery resources*, FAO Fisheries Technical Paper, Rome, No: 171, 1977.

[3] FAO, *The collection of catch and effort statistics*, FAO Fisheries Circular, Rome, No: 730, 1980.

[4] UNEP/MED W.G., *Report of the workshop on invasive Caulerpa species in the Mediterranean*, Heraklion, Crete, Greece, 18-20 March 1998.

[5] F.D. Por, "One hundred years of Suez Canal-a century of Lessepsian Migration: Retrospect and viewpoints", *Sys. Zool.*, London, 1971, pp. (20) 138-159.

[6] F.D. Por, " Lessepsian Migration: An appraisal and new data", *Bull. Inst. Oceanogr*, Monaco, 1990, pp. (7) 1-10.