Biomass estimates of red bandfish, *Cepola macrophthalma* (L.), in the Western Aegean Sea

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The red bandfish, *Cepola macrophthalma* (Linnaeus, 1758) (= *Cepola rubescens* Linnaeus, 1766), is a benthic species found at depths ranging mainly from 10-20 m to 200 m; it is common in the Mediterranean Sea but not in the Black Sea (TORTONESE, 1986). In Greek waters, it is of no commercial value (as opposed to other Mediterranean countries, e.g. Spain, Italy); it forms a small but significant component of the trawl catch that is discarded (STERGIOU *et al.*, 1992). Here, I present recently derived estimates of its biomass in the Western Aegean Sea (Euboikos and Pagassitikos Gulfs: Fig. 1).

A stratified random sampling design was used to assign 34 trawling stations within three depth strata (0-50 m, 50-100 m and >100 m). Two areas were considered, North and South of the Euripos strait (stations 1 to 24: Region I; stations 25 to 34: Region II) (Fig. 1). Samples were collected by a 425 HP professional trawler, equipped with a 14 mm mesh-size net (knot-to-knot) at the cod-end. Sampling took place seasonally in 1986-1988 at depths ranging from 22 to 222 m. The red bandfish was found at all stations except stations 7, 11,14 and 34. The swept-area technique (e.g. SPARRE *et al.*, 1989) was employed to estimate the biomass of red bandfish: $B=(CPUE)(A)(a)^{-1}(x)^{-1}$ where **B** is the biomass, CPUE is the catch per unit of fishing effort, **A** is the total surface of the stratum, **a** is the area swept by the trawl and **x** is the catchability coefficient. A conservative range of biomass estimates was derived using the trawling speed (3.5 miles/hour), the CPUE of red bandfish at the 34 stations (Fig. 2; high CPUE values at station 2 and 9, 28.2 and 19 kg/h are not shown in Fig. 2), the opening of the trawl (13 m) and two values of **x**: 0.5 and 1.

The results are shown in Table 1. The biomass estimates were generally higher in September and June and ranged in Region I from 33.1 t in March 1988 to 233.2 t in September 1986 and in Region II from 6.4 t in March 1988 to 74 t in June 1987 (Table 1). The mean (1986-1988) biomass amounted 77.5 t (for x=0.5; 38.8 t for x=1) in Region I and 31.5 t (for x=0.5; 15.7 t for x=1) in Region II.

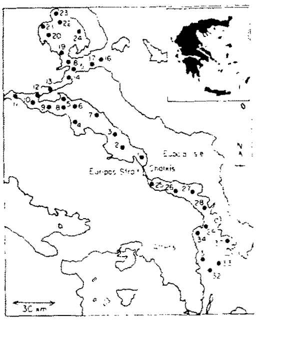

Fig. 1. Map showing location of sampling stations.

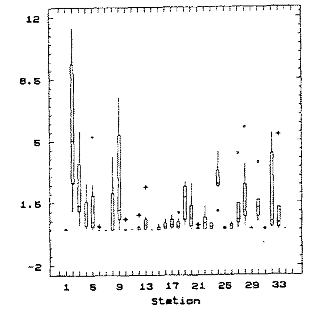

Fig.2 Box-Whiskers plots of the CPUE of red bandfish in the 34 stations (1986-1988) in **the study area.**

TABLE 1. Seasonal biomass estimates, in t, of red bandfish. A and B=mean (1986-1988) biomass for x=0.5 and 1 respectively. C=area in km^2. D and E=mean (1986-1988) density (kg/km^2) for x=0.5 and 1 respectively.

Region Stratum (m)	Month/Year (x=0.5) 9/86	12/86	3/87	6/87	9/87	12/87	3/88	6/88	A	B	C	D	E
Reg. I	233.2	58.2	33.1	95.0	65.6	41.1	41.2	52.6	77.5	38.8	2230	34.8	17.4
0-50	122.8	27.9	16.3	47.4	45.0	22.5	22.1	32.9	42.2	21.1	741	56.9	28.4
50-100	99.4	29.6	16.5	43.1	17.5	6.0	9.7	16.9	29.8	14.9	1172	25.4	12.7
>100	11.0	0.7	0.3	4.5	3.1	12.6	9.4	2.8	5.5	2.8	317	17.4	8.8
Reg. II	29.8	7.1	56.3	74.0	14.4	36.7	6.4	27.0	31.5	15.7	1404	22.4	11.2
0-50	10.7	3.7	5.6	10.1	6.4	15.1	3.1	18.2	9.1	4.6	546	16.7	8.3
50-100	19.1	3.1	45.2	49.3	7.0	21.6	3.3	8.8	19.7	9.8	680	29.0	14.5
>100	0.0	0.3	5.5	14.6	1.0	0.0	0.0	0.0	2.7	1.3	178	15.2	7.5

The density (kg/km2) was higher in Region I than Region II (Table 1). Because of the selectivity problem, estimates were corrected to account only for specimens with a total length >240 mm (STERGIOU, 1991). The total gross weight of 3351 specimens amounted 57030 g (46115 g in Region I and 10915 g in Region II) and specimens with length >240 mm made up 89.4% (41237 g) and 71.22% (7774 g) of the total gross weight in Regions I and II respectively. Hence, the biomass and density of specimens 240 mm were estimated to be 69.21 t and 31.04 kg/km2 in Region I and 22.43 t and 15.98 kg/km2 in Region II (both for x=0.5).

The geographic differences in the density of red bandfish are consistent with the facts that red bandfish in Region II is characterized by lower t_{max} lower L_{max}, statistically significant smaller length-at-ages for ages >2 yr, higher K, lower L_{oo} and W_{oo}, higher mortality (total, natural) and lower condition than is red bandfish in Region I (STERGIOU *et al.*, 1992). These differences were attributed to the differential conditions of temperature and food prevailing in the two regions (STERGIOU *et al.*, 1992). Although intraspecific differences in life history parameters may involve genetic divergence, they may also be an expression of developmental plasticity in response to proximate environmental parameters; in fact, genetic and phenotypic explanations are not mutually exclusive (e.g. LAM and CALOW, 1989; JENNINGS and BEVERTON, 1991). In any case, such intraspecific life history variations may have important implications for fisheries management (for a discussion see STERGIOU, 1992) which must be taken into account if a common fishery policy is to be reinforced in the Mediterranean Sea.

V

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