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Loligo forbesi and Ommastrephid Squids By-catches on the North-eastern Ionian Slope: Preliminary Analysis of Stock Structure Based on Exploratory Trawling

by

E. Lefkaditou[1] and G. D' Onghia[2]

[1]National Centre for Marine Research, Aghios Kosmas, Helliniko, 16604 Athens, Greece.
E-mail: teuthis@posidon.ncmr
[2]Department of Zoology, University of Bari, via E.Orabona 4, 70125 Bari, Italy.
E-mail: g.donghia@biologia.uniba.it

Abstract

Four trawl surveys were carried out on the slope of the North-eastern Ionian Sea, from September 1999 to September 2000, in the framework of the project "Interregional environmental studies in the Ionian Sea (INTERREG II)". The bottom area investigated was subdivided into four depth strata: 300-500, 500-700, 700-900 and 900-1200 m; and the sampling was based on random-stratified design. Between the cephalopod species collected during exploratory trawling, *Loligo forbesi* and Ommastrephid squids were those with the greatest commercial potential. A first analysis of the resource is presented here. Stratified CPUE indices showed that *Loligo forbesi, Todarodes sagittatus, Todaropsis eblanae and Illex coindetii* constituted the major part (>70%) of cephalopod catches between 300 and 700 m during autumn and spring, but was quite lower in summer due to the scarcity of ommastrephids in the catches. *L. forbesi* was constantly present in the stratum 300-500 m throughout the year, dominated by immature individuals. Among the two short-fined squids, the proportion of *I. coindetii* was higher in both autumns whereas *T. eblanae* was more abundant in spring. Their low catches in July are probably related with the high post-spawning mortality of these species. No seasonal trend could be defined in the catches of the pelagic *T. sagittatus*. The occurrence of fully mature males in the study area, indicates probable spawning locations of the species.

Keywords: Cephalopods, *L. forbesi, T. sagittatus, T. eblanae, I. coindetii*, Ionian Sea, Mediterranean Sea.

Introduction

Loligo forbesi and the ommastrephid squids *Todarodes sagittatus, Todaropsis eblanae and Illex coindetii* were found to be those with major commercial potential among the cephalopod species fished during exploratory trawling on the slope of the north-eastern Ionian Sea (Lefkaditou *et al.*,2000). These species, except *I. coindetii*, do not frequently appear in trawl catches from Greek waters (D' Onghia, 1996; Lefkaditou and Papaconstantinou, 1999) either from other areas in the Mediterranean Sea (Mangold-Wirtz, 1963). Preliminary results on the seasonal and spatial abundance of the resource, as well as, on the population structure of the four species on the slope of the north-eastern Ionian Sea are presented here.

Materials and Methods

Four trawl surveys were carried out on the slope of the north-eastern Ionian Sea (N: 39° 54'- 37° 57', E: 19° 18' - 20° 45'), from September 1999 to September 2000, in the framework of the project "Interregional environmental studies in the Ionian Sea (INTERREG II)". The bottom area investigated was subdivided into four depth strata: 300-500, 500-700, 700-900 and 900-1200 m; and the sampling was based on random-stratified design (Figure 1). The mesh size at the cod end was 20 mm (from knot to knot) in both trawl nets used by Greek and Italian commercial trawlers hired for these surveys.

Numbers of individuals and total weight by species were recorded on board together with the haul data (date, location, duration, depth). Specimens mantle length (in mm), weight (in g), sex and maturity stage were recorded.

Results and Discussion

Variation of species abundance by depth and season (Figure 2)

Stratified CPUE indices (Figure 2) show the decrease of species abundance with depth in general. Seasonal fluctuations suggest that highest stock levels are observed in autumn. In the depth zone 300-500 m, *L. forbesi, T. sagittatus, T. eblanae and I. coindetii* constituted the major part (80.5 % - 93.5 %) of cephalopod catches during autumn and spring, but their contribution was quite lower in summer due to the scarcity of the short-fin squids in the catches. Reproductive migrations of *I. coindetii* at shallower waters in summer have been mentioned by various authors (Mangold-Wirtz, 1963; Papaconstantinou *et al*., 1994), whereas frequent presence of *T. eblanae* has been in trawl catches has been recorded only in winter in the Mewditerranean Sea (Mangold-Wirtz, 1963).

Length and maturity stages composition (Figure 3, Table I)

Loligo forbesi: The mantle length of the individuals caught had a range 4.5 - 24 cm and 4 - 40 cm for females and males respectively. The length frequency distributions of females revealed the presence of at least two cohorts in the catches with ML ranges 4-12 cm and 14-23 cm. Small individuals (DML<14 cm) were present during all four surveys but their percentage was relatively higher in September 1999.

Immature individuals consisted almost exclusively the species catches. Loligo forbesi has been shown to have an extended spawning season (Martins, 1982; Martins and Porteiro, 1988;), with mature individuals less frequent in autumn (Porteiro and Martins, 1994). In the central Mediterranean the maximum occurrence of mature individuals of both sexes in trawl catches has been observed in winter (Ragonese and Jereb, 1986)

Todarodes sagittatus: Very few but relatively large individuals (DML: 17-33.5 cm) were caught. As stated by other authors this species seems to live in small groups (Quetlas *et al.*, 1998). The occurrence of fully mature males in the study area, indicates probable spawning locations of the species.

Todaropsis eblanae: The individuals caught had mantle lengths between 26 and 162 mm. Recruits (ML: 26-70 mm) were found during autumn and winter cruises, representing the major part of the population in autumn. The information regarding the biology of this species is very limited ((Mangold-Wirtz, 1963). The highest occurrence of mature females recorded in April and their disappearance from the catches in July is probably suggesting a peak of spawning in late spring

Illex coindetii: This species was caught during all cruises in depths between 300 and 500 m, whereas, only in the autumn cruises a small number of large individuals (ML: 150-213 mm) were fished in deeper waters.

The mantle length of *Illex coindetii* ranged from 36 mm (July 2000) to 213 mm (September 2000). The population presented a bimodal distribution in autumn 1999, with ML ranges of 50-110 mm and 120-190 mm. In March 2000 only the group of larger individuals (ML: 120-190 mm) was present in the caches, whereas, in July 2000 only two recruits (ML: 36-49 mm) were found due probably to migration of larger individuals at shallower waters.

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Table 1. Percentage of maturity stages for the four squid species caught on the slope of the eastern Ionian Sea during exploratory trawl surveys from September 1999 to September 2000.

		L. forbesi		T. sagittatus		*T. eblanae*		*I. coindetii*	
		Males	Females	Males	Females	Males	Females	Males	Females
September 1999	immature	100	100	25	50	87	76	31	26
	maturing	0	0	0	50	9	24	1	15
	mature	0	0	75	0	4	0	67	59
April 2000	immature	94	100			52	57	0	0
	maturing	6	0			14	38	0	0
	mature	0	0			33	5	100	100
July 1999	immature	100	100	0	100	0	100	100	
	maturing	0	0	25	0	0	0	0	
	mature	0	0	75	0	100	0	0	
September 2000	immature	100	100	0	100	86	100	70	33
	maturing	0	0	20	0	14	0	0	8
	mature	0	0	80	0	0	0	30	58

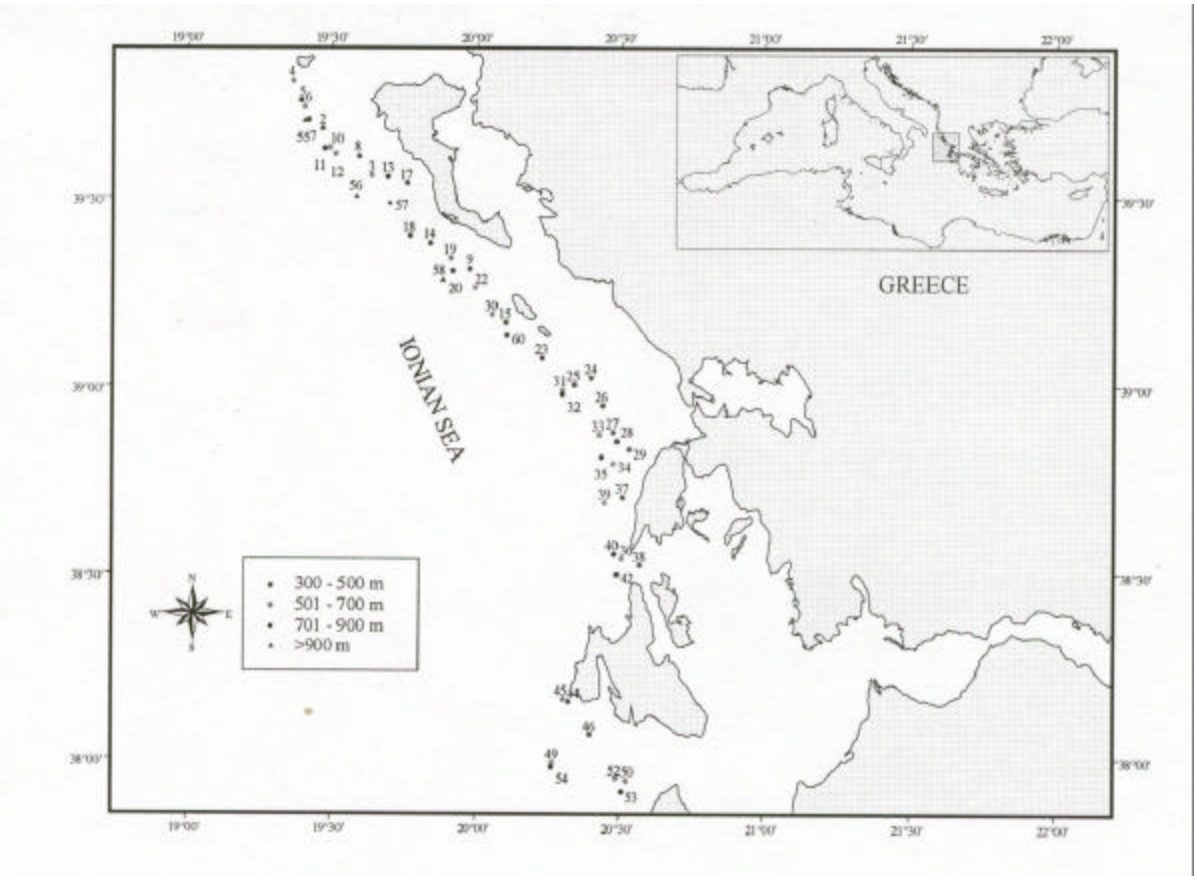

Fig. 1. Map of sampling stations.

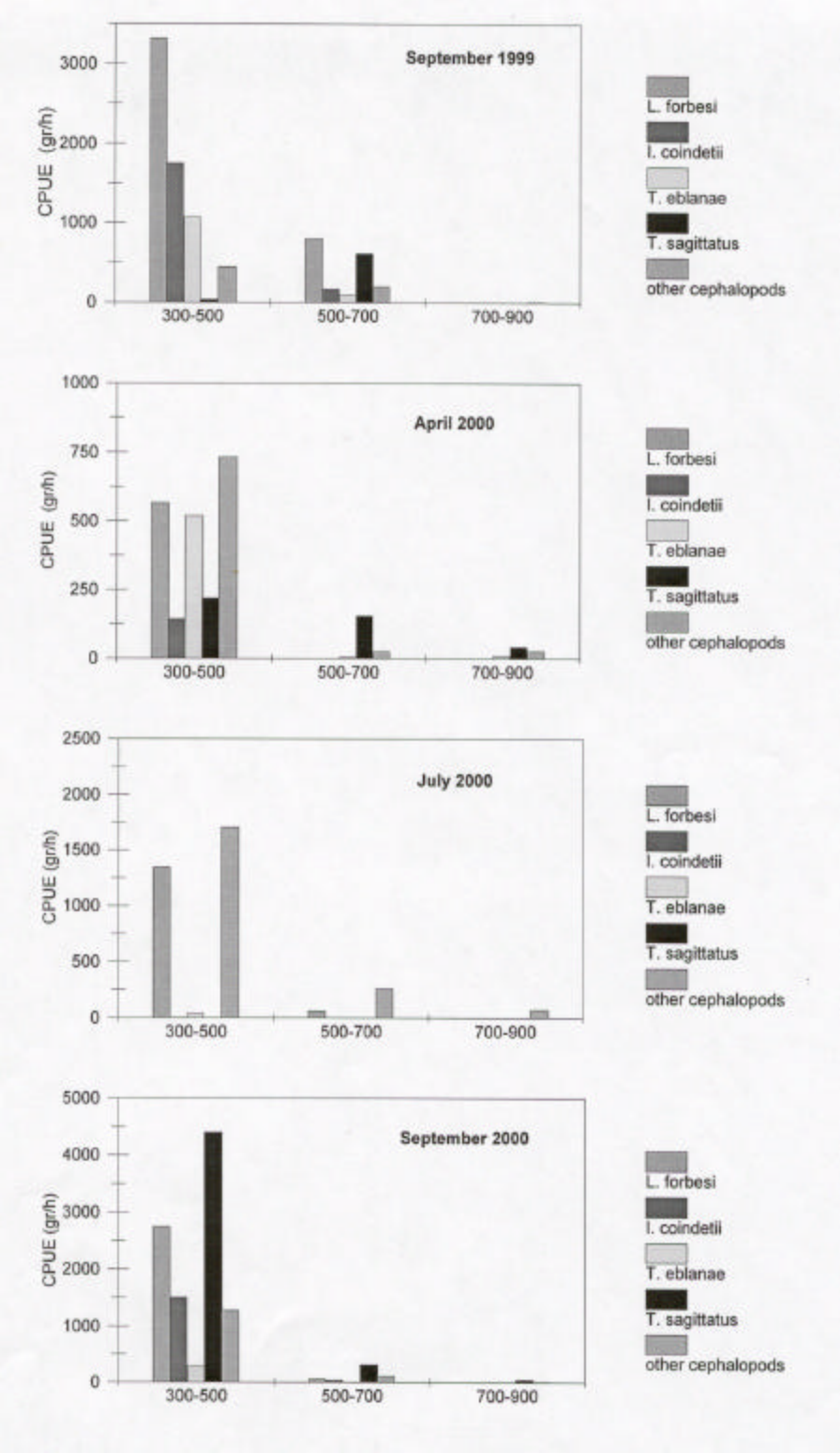

Fig. 2. Variation of species CPUE (kg/h) by season and depth.

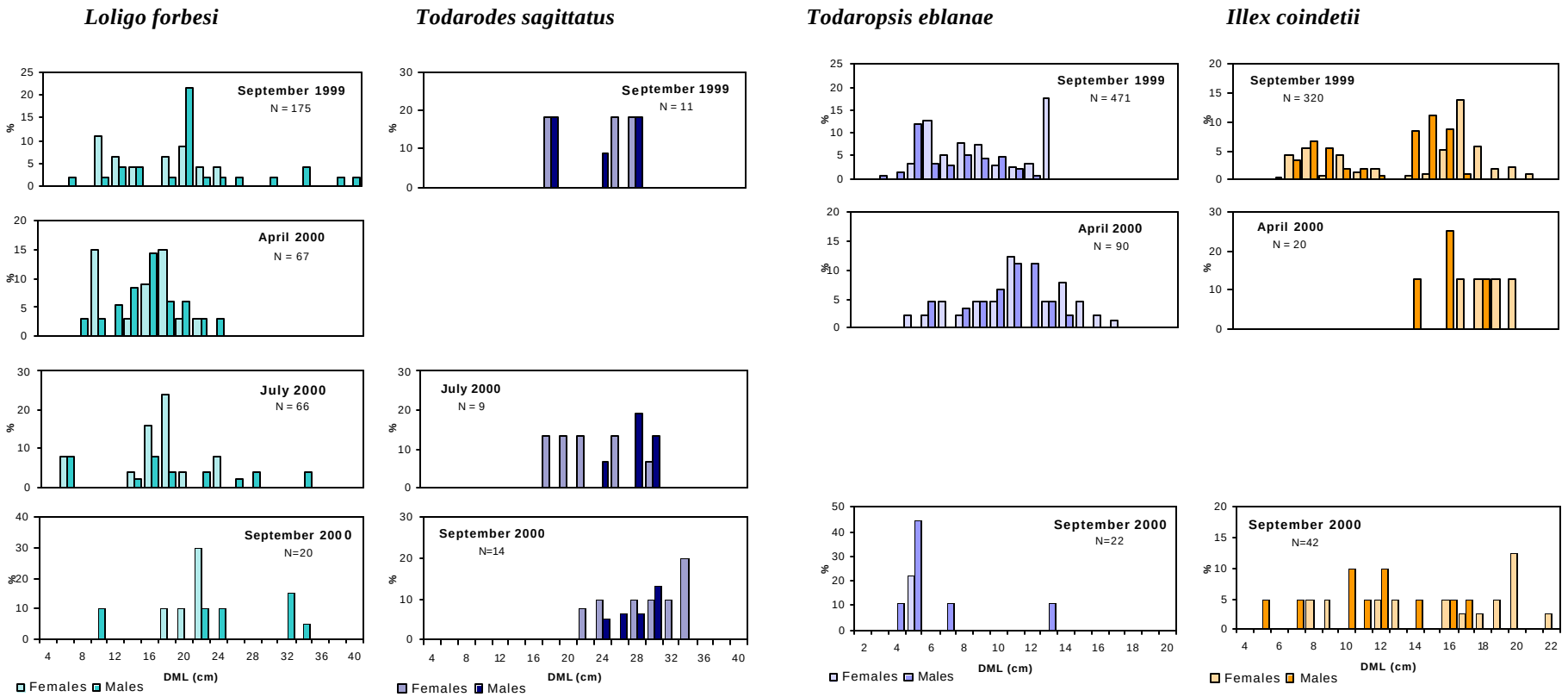

Fig. 3. Length composition of *L. forbesi, T. sagitatus, T.eblanae and I. coindetii* on the northeastern Ionian slope during the four surveys of the INTERREG project.