



Serial No. N4560

NAFO SCR Doc. 01/165

SCIENTIFIC COUNCIL MEETING - SEPTEMBER 2001
(Deep-sea Fisheries Symposium – Poster)

Occurrence of *Histioteuthis bonnellii* and *Histioteuthis reversa* (Cephalopoda: Histioteuthidae) in the Southern Tyrrhenian Sea (Western Mediterranean)

by

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Abstract

Data on occurrence of *Histioteuthis bonnellii* and *Histioteuthis reversa* collected in the southern Tyrrhenian Sea from 1994 to 1998 during five trawl surveys of the Medits eight trawl survey of the Grund project are reported. The International bottom trawl survey (the MEDITS programme) has been designed from a European Commission's initiative to produce biological data on the demersal resources along the coasts of the four Mediterranean countries of the European Union (Spain, France, Italy and Greece). The main objective was to obtain independent knowledge useful for the fishery management, in an area where it is difficult to follow in detail the exploitation patterns of the fishing fleets. In Italian seas, before 1985, there was no research at national level on biological aspect and assessment of demersal resources. Within the framework of the first national plan (1985-1988) of the Law 41/82, three main research groups to assess demersal resources were organized: Tyrrhenyan group, Adriatic and Ionian group and Sicily group. All the seas were covered, with the exception of Ionian part of Sicily. The stratified random sample design was mainly used and five strata were chosen (0-50, 50-100, 100-200, 200-450 and 450-700m). During the third national plan all the researchers involved in trawl surveys were joined in one national group (GRUND: Gruppo Nazionale Demersali) and the same protocol for campaign, data collection and process was adopted by eleven Operative Units belonging to GRUND.

Introduction

This study was a note on the presence of *H. reversa* and *H. bonnellii* in the Southern Tyrrhenian Sea.

The Histioteuthidae is a monotypic family of pelagic squids that occurs in abundance in the mid-waters of the oceans from the Subarctic to the Subantarctic (Voss *et al.*, 1998; Kristensen T.K., 1980). In the Italian Seas only *Histioteuthis reversa* and *H. bonnelli* were found (Jatta, 1896; Naef, 1923; Arbocco, 1958; Torchio, 1965; Voss, 1969; Würtz, 1979; Belcari e Sartor, 1993; Bello, 1986; Jereb and Ragonese, 1994; Lazzaretto *et al.*, 1995; Giordano and Perdichizzi, 1998; Giordano and Carbonara, 1999; Pastorelli *et al.*, 1995) often in the stomach contents (Bello G., 1997) of some predators as *Xiphias gladius* and some *Condroichthys* (*Prionace glauca*, *Scyliorhinus canicula*, *Galeus melastomus*, *Etmopterus spinax*). This paper analyses the results of 5-year trawl surveys carried out in the southern Tyrrhenian Sea from the Medits and the Grund projects. The study area was the same in the two projects, from Suvero Cape (Calabria) to San Vito Cape (Sicily) in the southern Tyrrhenian Sea (western Mediterranean).

The MEDITS international programme (Bertrand et al., 1997) began in 1993 and, for now, five annual surveys have been conducted. Involving about twenty institutes and laboratories from the seven participating countries, the programme is the first one which produces such common data at this scale in the Mediterranean, covering all the trawlable areas on the shelves and the upper slopes (at depth from 10 to 800 m) and using the same standardized protocol. During each survey, about one thousand hauls are carried out. At the end of each survey, all the data are combined and a working group produces standardized analyses on the abundance and the length distribution of around thirty reference species. The GRUND national programme (Relini G., 1998) was used to improve the knowledge of biological parameters and population structure of the following ten target species: red mullet (*Mullus barbatus*), hake (*Merluccius merluccius*), greater forkbeard (*Phycis blennoides*), blue whiting (*Micromesistius poutassou*), Norway lobster (*Nephrops norvegicus*), red shrimp (*Aristaeomorpha foliacea*), blue shrimp (*Aristeus antennatus*), deep water pink shrimp (*Parapenaeus longirostris*), common octopus (*Octopus vulgaris*), horned octopus (*Eledone cirrhosa*). For each of these species (Fischer et al., 1987) the following data were provided: a) length/frequency distributions for each survey and stratum, b) sex ratio, c) growth parameters, d) length-weight relationship, e) maturity, f) mortality. For all the other species the total number and weight were carried out.

Materials and Methods

The data here reported were gathered during the MEDITS trawl surveys carried out from 1994 to 1999. In the Medits project the gear used had a small codend (20 mm, stretched mesh) and between 2 and 2.5 meters of vertical opening. The duration of each haul was 30 minutes at depth of less than 200 meters. The duration was doubled below this limit. They were conducted each year between the end of spring and the middle of summer. For each haul, all the species were identified and numbered. Estimate of the abundance indices were based on stratified random sampling. In the GRUND project a different gear were used (36 mm, stretched mesh) and the trawl survey of the 1996, 1997 and 1998 were conducted in autumn in the same study area of the MEDITS project, while in 1994 and 1995 two trawl-surveys, in spring and autumn, were conducted. The duration of each haul was 60 minutes for all depth range. The abundance indices were calculated with the same methods used in the Medits elaborations.

Demersal resources of all the seas around Italy (excepted Ionian Sicily) were assessed by means of two trawl surveys per year (spring and autumn). During the fourth national plan (1996-1999) the Italian surveys were coordinated to MEDITS: all the hauls of the previous national two campaigns per year are, from 1996, concentrated in autumn campaign, with 1.089 hauls over a surface area of 289,860 km². The GRU.N.D. protocol has been adapted to the MEDITS protocol, in particular with the regard to strata subdivisions and stations. Hauls stations are the same for both surveys and do not change from year to year.

For the identification characters important in distinguishing among taxa include the photophore patterns on the mantle, around the right eyelid and on the arms, the sculpture of the dorsal pad of the funnel organ, the sucker enlargement pattern on the club, the development and structure of the inner web, the number of elements and the attachments of the buccal membrane, the single or double nature of the male genitalia, the internal structure of the spermatophore, the morphologies of the gladius and the lower beak, and the surface morphology of the skin (Voss et al., 1998).

Results and Discussion

In the southern Tyrrhenian Sea *H. reversa* occurrence in a total of 9 hauls in the Grund (Greco et al., 1998) and 9 in the Medits (Greco et al., 1998) projects (Tab. 1) in the depth range of 540-645 meter, while *H. bonnellii* occurrence in a total of 6 hauls in the Grund and 5 hauls in the Medits project (Tab. 2) with a depth range of 529-560 meters. In the whole Mediterranean these species were found in all the study area (Albania, Francia, Espania, Grecia and Italy), but were most abundant in the subregion M4 of the Italian area (Tab. 3). The presence of species in the MEDITS hauls was reported for the all areas of the Mediterranean sea, in two bathymetrical dept: 1 (0-200 m), 2: (200-800).

The morfometric characteristic of four juvenile samples of *H. reversa* and *H. bonnelli* were reported (Tab. 4-5). The other samples were most maltreated by fishery.

H. reversa is confined to the north temperate, north subtropical, tropical waters of the Atlantic and in Mediterranean Sea. The group members uniquely share photophore patterns composed of intermixed large and small organs on the mantle and 17 large and one small organ around the right eyelid, glacial vanes that are narrow to moderately wide and diamond-shaped, and a poorly developed median ridge on the lateral walls of the lower beak. *H. bonnellii* is present in a subarctic, north temperate and E tropical Atlantic; Mediterranean Sea; Benguela Current; nearly circumglobal in southern half of south subtropical regions. Two species constitute this group (Clarke, 1980), uniquely characterized by a single, markedly enlarged, elongate photophore on the ends of arms I-III in the juvenile through adult stage; a group of two or three prominent, round photophores on the left posteroventral margin of the head; a deep inner web between arms HIII that exceeds 50% of the length of the longest arm; multiple attachments of the fourth supports of the buccal membrane; and broad, roughly triangular glacial vanes.

A total of 32 *Histioteuthis reversa* (20 from MEDITS and 12 from GRUND projects) and 18 *Histioteuthis bonnellii* (6 from MEDITS and 12 from GRUND projects) were caught.

The samples of *H. reversa* and *H. bonnellii* that was possible analysed (tab. 4,5) were juvenile and immature. Only one sample of *H. bonnellii* showed the right arm tentacular intact. This sample showed a Total Length of 228 mm, Arm Tentacular length right of 175 mm and Club length right of 12 mm.

Also only one sample of *H. reversa* showed arms tentacular intact. This sample showed a Total Length of 240 mm, Arm Tentacular length left of 175 mm and Arm Tentacular length right of 167 mm, Club length left of 22 mm and Club length right of 15 mm.

Therefore the present work should be rather considered a “starting point”, which will be hopefully improved by further, ad hoc focused research. This in relation with the increasing both scientific and economic interest in cephalopod resources.

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Table 1. Captures of *H. reversa* from Suvero Cape (Calabria) to S.Vito Cape (Sicily) during six trawl surveys of Medits project and seven trawl surveys of Grund project with indication of point of hauls, depth, weight and number of samples. * For this samples the measurement(mean values) were reported in tab. 4

<i>Histioteuthis reversa</i>						
MEDITS (Region M3b)						
Years	Hauls	Lat.in/fin	Long in/fin	Depth (m)	Weight (gr)	Number
1995	82	3825.36/3827.68	1537.01/1539.38	500	0.15	5
	84	3807.95/3807.60	1253.16/1256.83	625	0.1	1
1996	78	3808.36/3807.34	1336.09/1339.11	542	0.05	1
	80	3814.46/3816.94	1504.33/1502.25	634	0.2	3
	82	3825.37/3827.68	1537.03/1539.35	645	0.22	2
1997	82	3825.37/3827.69	1537.03/1539.36	646	0.01	1*
1998	78	3807.20/3808.44	1339.40/1335.74	555	0.01	1*
1999	78	3807.20/3808.44	1339.40/1335.74	555	0.05	3
	79	3852.49/3855.47	1552.69/1553.35	585	0.08	3
GRUND Unit T6						
Years	Hauls	Lat.in/fin	Long in/fin	Depth (m)	Weight (gr)	Number
1994	7E spring	3808.29/3808.16	1252.48/1255.08	643	0.07	1
	104E spring	3815.75/3817.93	1505.33/1503.30	615	0.08	2
	104E autumn	3815.75/3817.94	1505.33/1503.31	615	0.082	2
1996	48E autumn	3808.54/3807.25	1335.25/1338.06	540	0.3	1
	49E autumn	3807.71/3807.51	1339.10/1342.39	560	0.25	1
1997	3E autumn	3807.31/3807.46	1251.15/1253.05	527	0.01	1*
1998	3E autumn	3807.31/3807.46	1251.15/1253.05	527	0.05	2
	15E autumn	3817.32/1316.83	1309.06/1307.00	553	0.04	1*
	102E autumn	3814.49/3816.63	1504.77/1502.70	615	0.05	1

Table 2. Captures of *H. bonnellii* from Suvero Cape (Calabria) to S.Vito Cape (Sicily) during six trawl surveys of Medits project and seven trawl surveys of Grund project with indication of point of hauls, depth, weight and number of samples. * For this samples the measurement (mean values) were reported in tab. 5

<i>Histioteuthis bonnellii</i>						
MEDITS (Unit M3b)						
Years	Hauls	Lat.in/fin	Long in/fin	Depth (m)	Weight (gr)	Number
1994	78	3808.36/3807.34	1336.09/1339.11	542	0.05	1*
1995	85	3808.58/3807.42	1335.52/1338.97	529	1.9	2
1996	78	3808.36/3807.34	1336.09/1339.11	542	0.02	1*
1997	78	3808.36/3807.34	1336.09/1339.11	542	0.15	1
	84	3808.07/3807.90	1252.77/1256.53	546	1.45	1
GRUND (Unit T6)						
Years	Hauls	Lat.in/fin	Long in/fin	Depth (m)	Weight (gr)	Number
1994	172E autumn	3849.81/3851.63	1553.10/1553.88	548	0.03	1*
1995	63E autumn	3806.13/3805.85	1400.76/1403.35	545	1.2	3
1996	7E autumn	3807.51/3807.86	1253.34/1256.74	560	5	1
1997	7E autumn	3807.51/3807.87	1253.34/1256.75	560	4.35	2
1998	7E autumn	3807.51/3807.88	1253.34/1256.76	560	2.6	4
	172E autumn	3849.81/3851.63	1553.10/1553.88	548	0.05	1*

Table 3. Occurrence of species in the MEDITS hauls (N° of hauls in which the species has been identified) all surveys 1994-1999. Depth 1: 10-200 m - Depth 2: 200-800 m

Species	Depth	ALB	ESP	FRA	GRC-G1	GRC-G2	GRC-G3	
<i>Histioteuthis bonnellii</i>	1		1					
	2	2	33	13	2	3		
	Depth	HRV	ITA-M	ITA-M	ITA-M3	ITA-M4	ITA-M5	MAR
	1		1		1	2	1	
	2		50	13	67	76	1	
Species	Depth	ALB	ESP	FRA	GRC-G1	GRC-G2	GRC-G3	
<i>Histioteuthis reversa</i>	1							
	2	10	31	8	2	1	2	
	Depth	HRV	ITA-M	ITA-M	ITA-M3	ITA-M4	ITA-M5	MAR
	1		1					
	2		81	13	45	102	1	

Table 4. Weight and main measurement (mean values mm) of four juvenile samples of *H. Reversa*.

<i>Histioteuthis reversa</i>		
Weight	W	15.9
Total length	TL	
Total length without tentacular arm		100
Dorsal mantel length	DML	35.7
Ventral mantel length	VML	35.3
Mantel width	MW	19.3
Head length	HL	18.8
Head width	HW	7.7
Fins length	FL	8.5
Fins width	FW	14.8
Right eye diameter	RYAD	7.1
Left eye diameter	LYAD	13.5
Arm I length left	ALL	46
Arm I length right	ALR	73.8
Arm II length left	ALL	78.8
Arm II length right	ALR	71.9
Arm III length left	ALL	80.1
Arm III length right	ALR	85
Arm IV length left	ALL	65
Arm IV length right	ALR	59

Table 5. Weight and main measurement (mean values mm) of four juvenile samples of *H. bonnellii*

<i>Histioteuthis bonnellii</i>		
Weight	W	36.71 gr.
Total length	TL	
Total length without tentacular arm		185
Dorsal mantel length	DML	52.85
Ventral mantel length	VML	59
Mantel width	MW	22.1
Head length	HL	29.5
Head width	HW	18
Fins length	FL	18.4
Fins width	FW	32
Right eye diameter	RYAD	12.7
Left eye diameter	LYAD	21.15
Arm I length left	ALL	95.25
Arm I length right	ALR	94.5
Arm II length left	ALL	100.25
Arm II length right	ALR	92
Arm III length left	ALL	116
Arm III length right	ALR	99.4
Arm IV length left	ALL	96.75
Arm IV length right	ALR	93.75