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Marine Vertebrates and Cephalopods

Patterns and overlap in the feeding of two selachians  
of bathyal fishing grounds in the Ligurian sea

Relini Orsi L. and M. Wurtz

Istituto di Anatomia Comparata dell'Università di Genova (Italia)

RESUME : L'alimentation de Galeus melastomus et Etmopterus spinax à été étudiée par analyse des contenus stomacaux, en comparant des lots des individus jeunes et adultes capturés sur les fonds bathyales de la Mer Ligure.

Galeus melastomus (Scyliorinidae) and Etmopterus spinax (Squalidae) are two small sized squaliforms of bathyal trawling grounds of the Ligurian Sea. Their distribution is distinguished according to age; the young of Galeus melastomus are found in abundance at the start of summer on bottoms at a depth of 350-500 m, whilst the adults are normally fished (in coincidence with the fishing of red shrimps) below 450 meters and preferably at about 700 m. On these latter bottoms they frequently represent the dominant species and are, therefore, used commercially.

The young of Etmopterus spinax have also been observed on epibathyal bottoms (about 450 m) in late spring, whilst the adults are observable in varying numbers (from one or two to multiples of ten per trawl) at 500 meters, throughout the year.

The feeding was studied by analysing the stomach contents in adults and young of each species recovered during the day and, as far as was possible, in the same area. The table which follows compares the four groups mentioned above and, for each one, furnishes the total of the prey identified (column A). One is concerned with 17 different taxa to which has been added other feeding material not of marine origin. Generally, the prey-specimens identified represent at least 75% of all the material analysed.

So as to facilitate the comparison, the same values are related to 100 predator specimens (column B). One may note that the total number of prey is sensibly greater for the adults of Galeus melastomus than with respect to Etmopterus spinax; this is the result, at least in part, of the swallowing of numerous small sized prey. The young of the two species, however, are markedly analogous both quantitatively and qualitatively.

Finally, the third column (C) gives the percentage composition of the total stomach contents; It should be emphasised that this latter aspect (which should be representative of the "diet") was obtained from the number of prey and does not, therefore, take into account the biomasses. From this point of view, it is obvious that a single "Cephalopoda Decapoda", for example, is greater than several Meganyctiphanes norvegica.

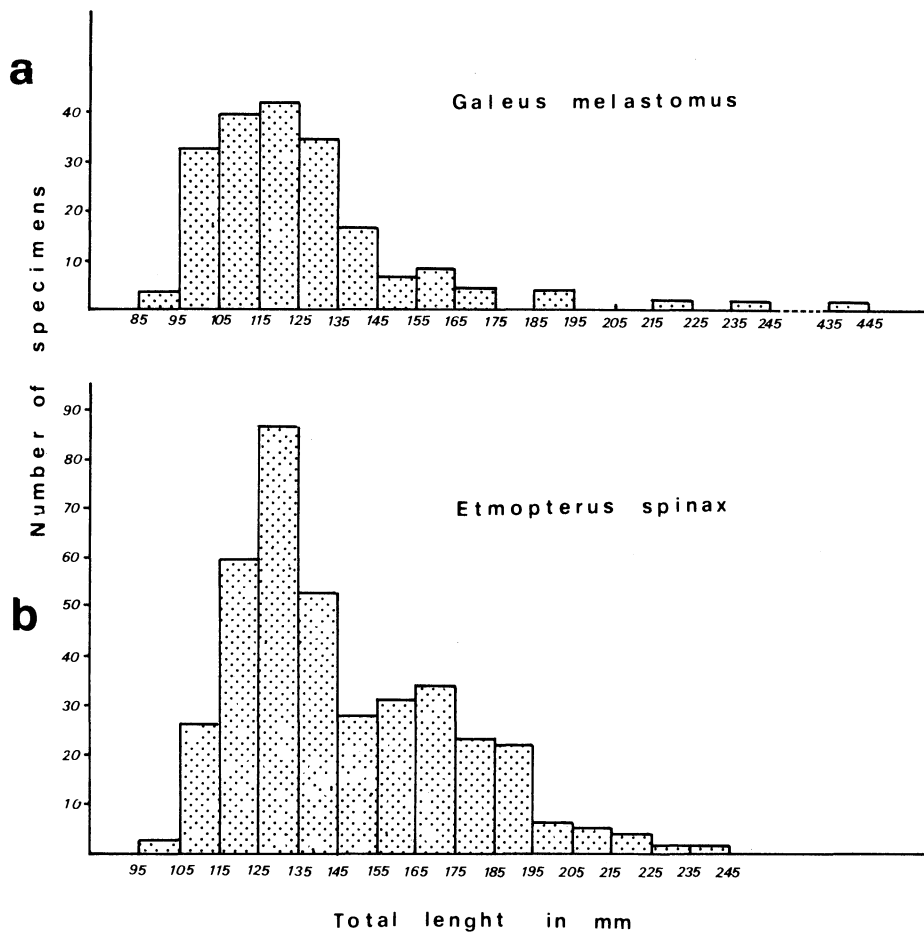


FIG. 1. - Length/frequency graphs of two groups of young fished on the epibathyal bottoms of the Gulf of Genoa.

Above : *G. melastomus*; 300-500 m depth; July 1974; 3 hours trawling (from RELINI ORSI L. e M. WÜRTZ).

Below : *E. spinax*; 450 m depth; June 1975; 4 hours trawling (from RELINI ORSI L. e M. WÜRTZ 1976).

FIG. 2. - The gastic contents from one *G. melastomus* : *Heteroteuthis* sp., rarely fished with the otter-trawl, is a common food item of many bathyal species.

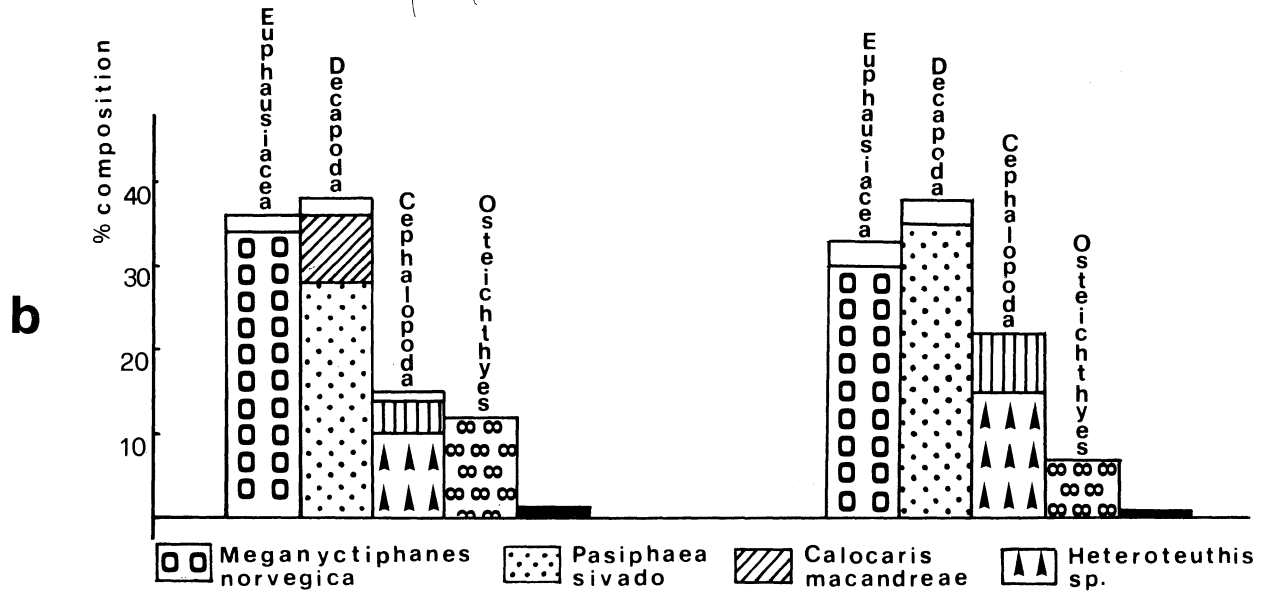
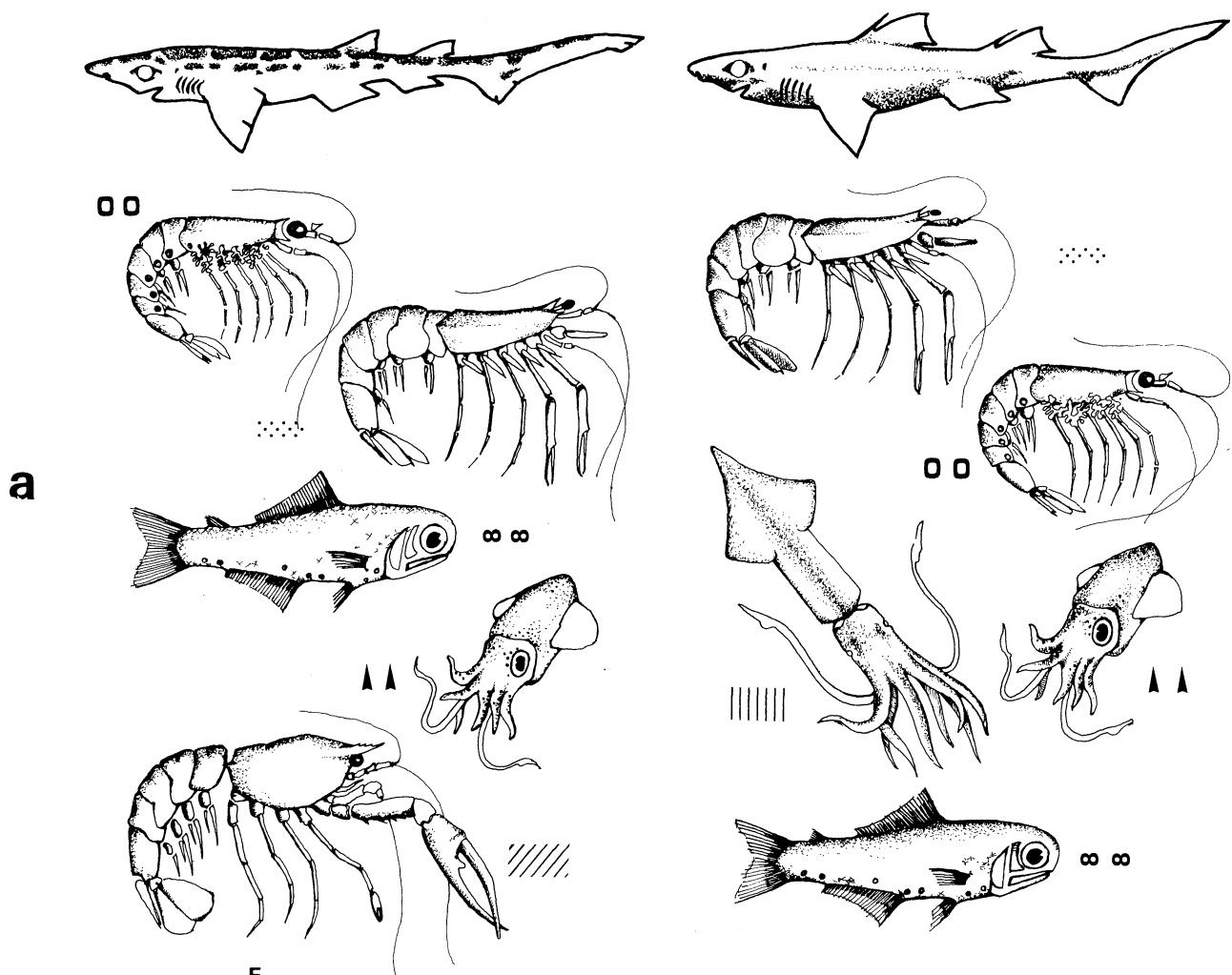


FIG. 3. - Percentage composition of total stomach contents of young specimens *G. melastomus* and *E. spinax*, (b). (a) a simplified figurative representation of (b).

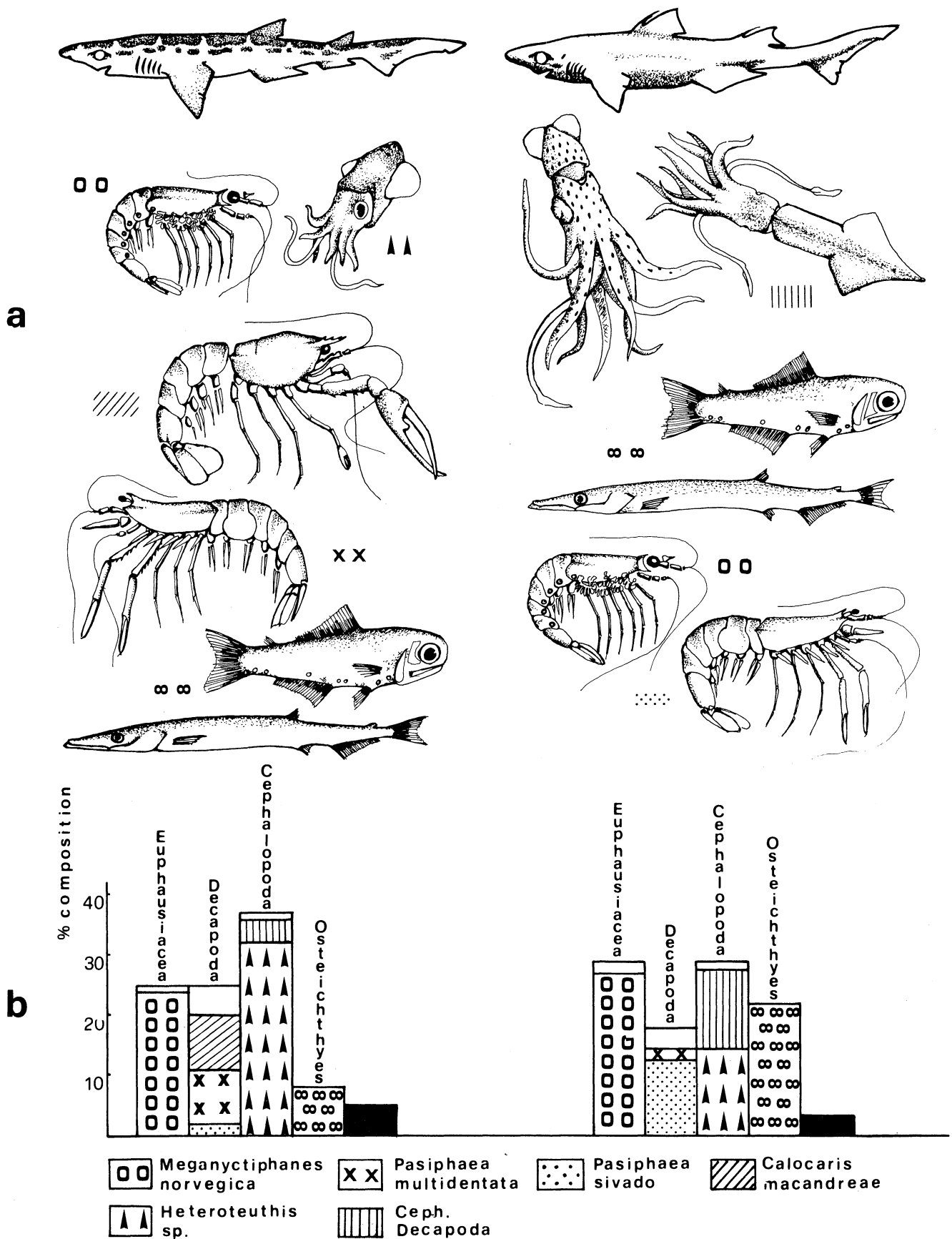


FIG. 4. - Percentage composition of total stomach contents of adult specimens *G. melastomus* and *E. spinax*, (b). (a) a simplified figurative representation of (b).

## FOOD HABITS OF GALEUS MELASTOMUS AND ETMOPTERUS SPINAX

Number of specimens examined	G. melastomus mm 250-530 T.L.			E. spinax mm 200-450 T.L.			G. melastomus mm 100-249 T.L.			E. spinax mm 100-199 T.L.		
	A	B	C	A	B	C	A	B	C	A	B	C
TAXA IDENTIFIED												
HYDROZOA												
SIPHONOPHORA				2	2,5	0,8						
CRUSTACEA												
OSTRACODA	13	18,5	2									
ISOPODA				1	1,2	0,4	1	1,4	0,45			
AMPHIPODA	9	12,8	1,4	1	1,2	0,4	2	2,8	0,9	2	1,4	0,5
EUPHAUSIACEA												
Meganyctiphanes norvegica	150	214,2	23,6	61	76,2	26,6	75	107,1	33,6	128	94,8	30,0
Other Euphausiacea	4	5,7	0,6	5	6,2	2,0	3	4,2	1,3	12	8,8	2,8
DECAPODA												
Pasiphaea sivado	14	20,0	2,2	30	37,5	13,1	63	90,0	28,3	148	109,6	34,7
Pasiphaea multidentata	57	81,4	9,0	5	6,2	2,0						
Calocaris macandreae	55	78,5	8,6				17	24,2	7,6			
Geryon longipes	6	8,5	1,0									
Other Decapoda	23	32,8	3,6	7	8,7	3,0	4	5,7	1,8	13	9,6	3,0
CEPHALOPODA												
Heteroteuthis sp.	204	291,4	32,1	35	43,7	15,2	23	32,8	10,3	65	48,1	15,2
Other Cephalopoda Decapoda (Ommastrephidae, Histioteu- thidae, Onycoteuthidae etc.)	22	31,4	3,5	29	36,2	12,6	8	11,4	3,6	28	20,7	6,6
Ottopoda	2	2,8	0,3	2	2,5	0,8	1	1,4	0,45			
OPHIUROIDEA	1	1,4	0,2									
THALIACEA	7	10,0	1,1	3	3,7	1,3						
OSTEICHTHYES	49	70,0	7,7	50	62,5	21,8	26	37,1	11,7	31	22,9	7,2
Food items from land	20	28,5	3,1									
TOTALS	636	908	100	229	286	100	223	318	100	427	316	100
Number of items per stomach	max. 34 mean 9,08			max. 9 mean 2,86			max. 8 mean 3,18			max. 9 mean 3,16		

A) Number of preys; B) Number of preys for 100 predators; C) Percentage composition of total stomach contents.

More generally one may conclude that:

1) These bathyal predators live, for the most part, on euribathyal organisms and; therefore, are strictly tied to primary production in surface waters. Along with Pasiphaeidae and Euphausiacea, the alimentary importance of which is already known for some bathyal species as *Micromesistius potassou* (Brian 1936) and the red shrimps (Lagardère 1971-72), one may conclude that *Heteroteuthis sp.* should also be considered; this latter being noticeable in the feeding of *Mora moro* also (Relini Orsi 1975).

2) The young of the two selachii considered here have a similar diet although there is a certain difference in the use of crustaceans and the benthic species *Calocaris macandreae*, in particular; this latter is important for *G. melastomus* and negligible for *E. spinax*. The feeding pattern in adults, however, is noticeably different. The use of euribathyal organisms - but in different quantities - and

of Teleostei is common. These latter (for that part which it was possible to systematically identify and equal to a third of the total) are Myctophidae, Chauliodontidae and Paralepididae, that is, groups without commercial value. G. melastomus, then, feeds on a quantity of crustaceans - but not red shrimps - and on refuse which it probably finds on the bottom. E. spinax feeds in the pelagic zone above all on large sized prey; its food speciality seems to be orientated towards nektonic cephalopods.