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STOMACH CONTENTS STUDY OF INMATURE BLUEFIN TUNA IN THE BAY OF BISCAY (REGION 3 OF EEC)

by
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Abstract

Thirty stomachs from examples of immature bluefin tuna (Thunnus thynnus, L.) caught by troll line in the Bay of Biscay during the months of July to October 1985, were examined.

The studies carried out produced the following results on the qualitative and quantitative composition of the diet: bluefin tuna consumed 90% fish, 30% crustaceans (30% Euphasiids), and 15% cephalopods by frequency of occurrence, and 39.8% fish, 58.5% crustaceans (58.3% Euphasiids) and 1.7% cephalopods by numerical frequency. The numerical and weight frequency obtained for the anchovy (Engraulis encrasicholus, L.) shows the great importance of this species in the diet as a whole. Length distribution of this species (anchovy) found in the stomachs shows that bluefin tuna feed mainly on specimens of the "young of the year".

Resumé

Trente contenus estomacaux appartenant aux jeunes thons rouges (Thunnus thynnus, L.) capturés à la traine pendant le mois de Juillet-Octobre 1985, dans le Golfe de Gascogne, on été examinés.

L'étude de ces estomacs a donné les suivants résultats sur la composition qualitative et quantitative du régime alimentaire :
en ce qui concerne la fréquence-occurrence des proies, le thon rouge consomme 90% de poissons, 30% de crustacés (30% euphausiacea) et 15% de céphalopodes.

La fréquence en nombre a été aussi étudiée : 39.8% poissons, 58.5 crustacés (58.3% euphausiacea) et 1.7% céphalopodes.

On remarque l'importance en nombre et en poids, de l'anchois sur tout l'ensemble de la diète. La distribution des tailles de cette espèce montre que les exemplaires étaient de la classe d'age 0.

INTRODUCTION

In 1985 the collecting of stomachs of examples of the bluefin tuna was begun for a study of the diet of this species in the Bay of Biscay.

The aim was to achieve an understanding of the interspecific relations of bluefin tuna during the summer months which are the tuna fishing season of the fleet (bait boat and trolling lines) in this area.

A thorough knowledge of the feeding habits of this species is needed for a better understanding of its behaviour habits and the impact of predation mortality on several prey organisms that support a fishing effort : anchovy, horse-mackerel (Trachurus trachurus, L.), and squid.

This paper presents and estimate of the feeding habits of the immature bluefin tuna.

In addition it establishes the basis for the future availability of data that will allow for the measurement of the predation originated by the population of bluefin tuna in this area.

There is a lack of literature on bluefin tuna feeding habits in the Bay of Biscay.

MATERIAL AND METHODS

The stomachs collected belonged to 30 examples of bluefin tuna caught by commercial fishing boats in the Bay of Biscay (Figure 1) between 2nd July and 31st October 1985.

The system of fishing used was the troll line. The range of length in the specimens caught was from 47-117 cms (Figure 2) which comprises the age range 1, 2 and 3.

The surface temperature during this period varied between 19°C and 21°C.

Following the system described by Aloncle et Delaporte (1970, 1973) the stomachs were extracted immediately after the fish were caught and kept separately in canvas bags accompanied by cards with the following information : date, situation, temperature of the water, length of fish. All the bags were placed in containers of preserving fluid, in this case 70^{o} alcohol. All the exampled were taken to the laboratory for examination.

In the laboratory the stomach contents were classified under large groups of prey and from there the prey was identified to the lowest possible taxonomic level. The examples of each particular prey item were weighed, counted and measured when this was possible. In the case of the fish, the length of the otolith was measured. For the blue whiting (Micromesistius poutassou, L.) the regression equation $Y = 3.351 + 0.0337 X$ (Robles, 1970) was used, which related the length of the otolith and the length of the fish.

For the evaluation of the data, the following methods, as described by Dragovich (1969), were used : frequency of occurrence (number of stomachs in which a type of prey appears expressed as a percentage of the total number of stomachs), this index gives us an idea of the type of diet. The index of numerical frequency and that of weight frequency expressed as a percentage of the total number of stomachs give us an idea of the number (abundance) and weight (biomass) which a certain prey represents in the diet of the predator. The Index of Relative Importance (IRI) Pinkas et al. (1971) was calculated. This is expressed as the sum of the index of both numerical frequency and weight frequency, multiplied by frequency of occurrence (IRI = % FO (%FN + % FW)). This is used to compare the consumption of anchovy and other fish as was also done by Bernard et al. (1985).

RESULTS AND DISCUSSION

The qualitative study of the stomach contents shows the prey items and the frequency with which they appear (Table 1).

From the analyses made from the application of the indices (Table 2) we see that the frequency of occurrence of fish was 90% with and outstanding presence of anchovy 55%. The crustaceans appeared as 30% and the cephalopods as 15%. In the index of numerical frequency, fish represented 39.8%, of which 76.2% corresponded to anchovy with a range of length from 3-13 cms (Figure 3) and the total of remaining fish 28.3%. The crustaceans represented the highest numerical percentage with 58.5% which corresponded almost entirely to Euphasiids (58.3%) while the cephalopods constituted 1.7%. The index of weight frequency gives a high rating for the fish 90.4% while the crustaceans (Euphasiids) were 8.1% given the small size of these organisms, and the molluscs (cephalopods) were 1.5%.

The calculation of the Index of Relative Importance (IRI) for the anchovy (Engraulis encrasicholus) and for the rest of the fish in total gives a rating of 5,115 and 2,268 respectively (Table 3) which indicates the importance which the anchovy has in relation to fish as a whole, as Bernard et al. (1985) also observed.

The majority of the anchovy found in the stomachs were of the class age "0".

The study of the stomach content of the bluefin tuna and other tunas could be a source which would allow us to deduce an index of relative abundance of the class age "0" in this area.

This paper was written on the basis of few samples and presents a first attempt to analyse the feeding habits of bluefin tuna in the Bay of Biscay. it is to be hoped that the collecting of stomachs can be continued and the data added to in succeeding years.

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PREY	NUMBER	SIZE INTERVAL (cm)
FISHES		
Engraulis encrasicholus	128	3 - 13
Micromesistius poutassou	16	9 - 22
Trachurus trachurus	14	8 - 10
Scomberesox saurus	1	11
unidentified fishes	9	--
CRUSTACEANS		
Euphausiids	246	--
Decapoda		
Polibius henslowi	1	--
MOLLUSCS		
Cephalopods (Loliginidae, Ommatostrephidae)	7	--
TOTAL	422	

Number of stomachs examined = 30

Table 1.- Observed frequency of prey organism in the stomach contents examined. Bay of Biscay. 1985.

PREY	% Weight frequency.	% Numerical frequency.	% frequency of occurrence.
FISHES	90.4	39.8	90
Engraulis encrasicholus	62.2	30.8	55
Micromesistius poutassou	8	3.8	20
Trachurus trachurus	13	3.4	25
Scomberesox saurus	0.2	0.2	5
unidentified fishes	7	2.2	30
CRUSTACEANS	8.1	58.5	30
Euphausiids	6.5	58.3	30
Decapoda			
Polibius henslowi	1.1	0.2	5
MOLLUCS	1.5	1.7	15
Cephalopods	1.5	1.7	15

Table 2.- Analysis results of stomachs contents of bluefin tuna. Bay of Biscay, 1985.

	Engraulis encrasicholus	Other fishes
NUMERICAL PERCENTAGE	30.8 %	9.6 %
WEIGHT PERCENTAGE	62.2 %	28.2 %
FREQUENCY OF OCCURRENCE	55 %	60 %
IRI (PINKAS ET AL., 1971)	5,115	2,268

Table 3.- Percentages used in IRI Calculation for anchovies and other fishes.

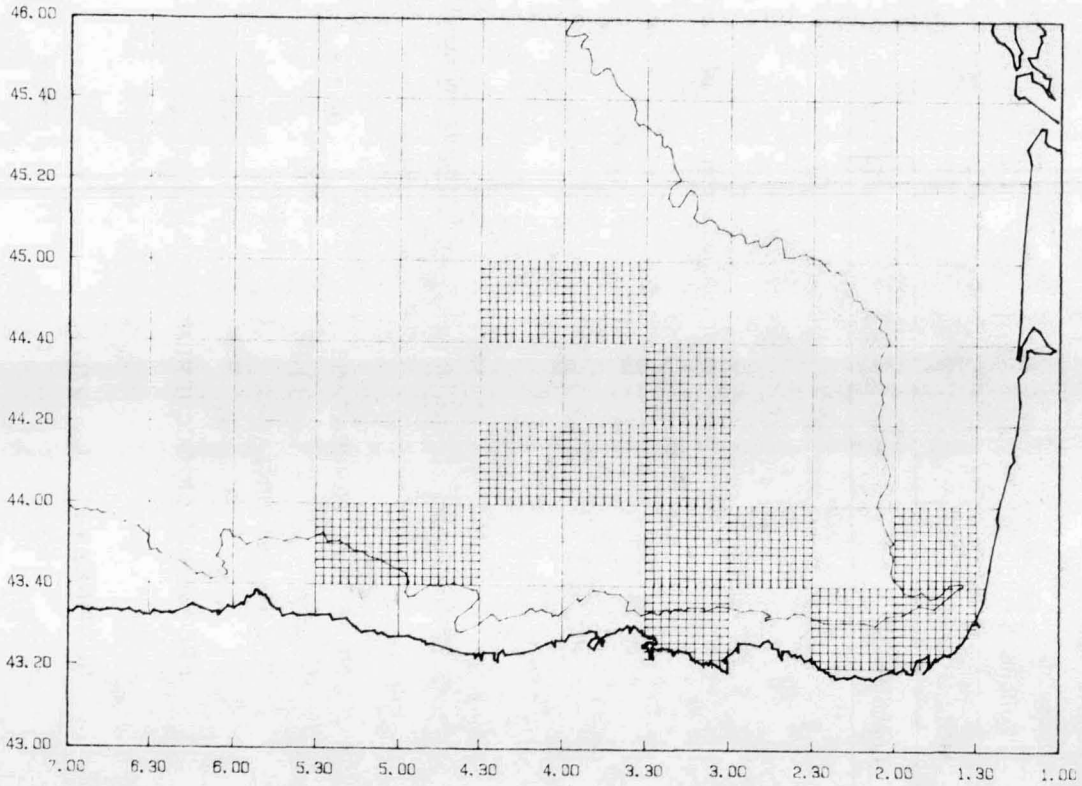

Fig. 1.- Capture locations of bluefin tuna examined for study contents. Bay of Biscay. 1985.

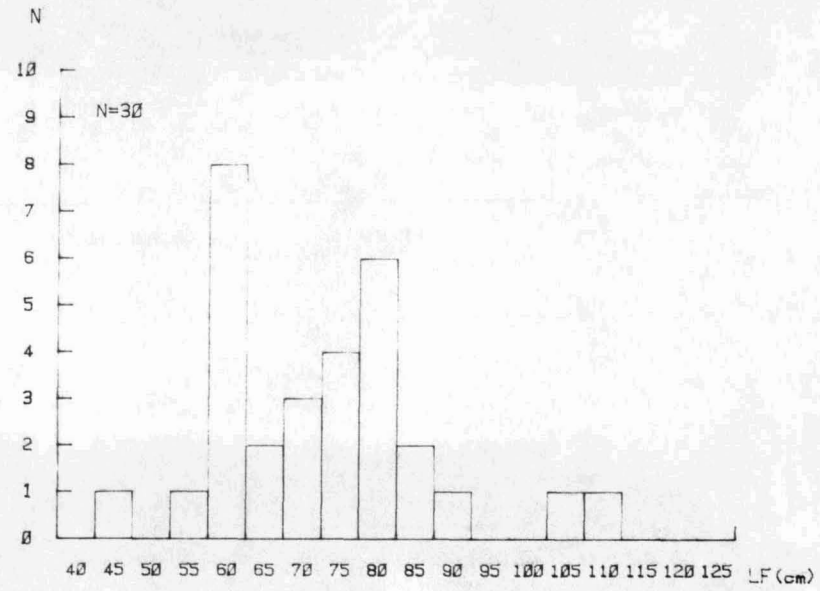

Fig. 2.- Length-frequency distribution of bluefin tuna sampled for collecting stomachs. Bay of Biscay. 1985.

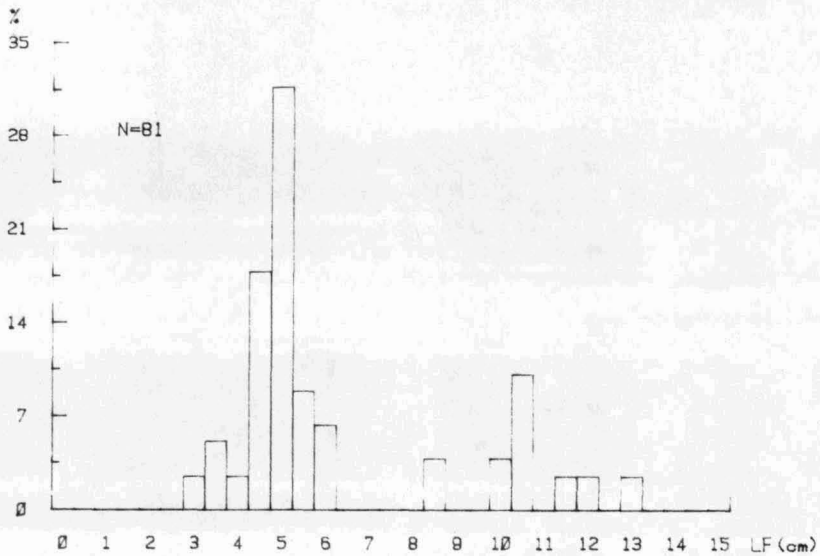

Fig. 3.- Length-frequency distribution of anchovies (Engraulis encrasicholus) found in bluefin tuna stomachs. Bay of Biscay. 1985.

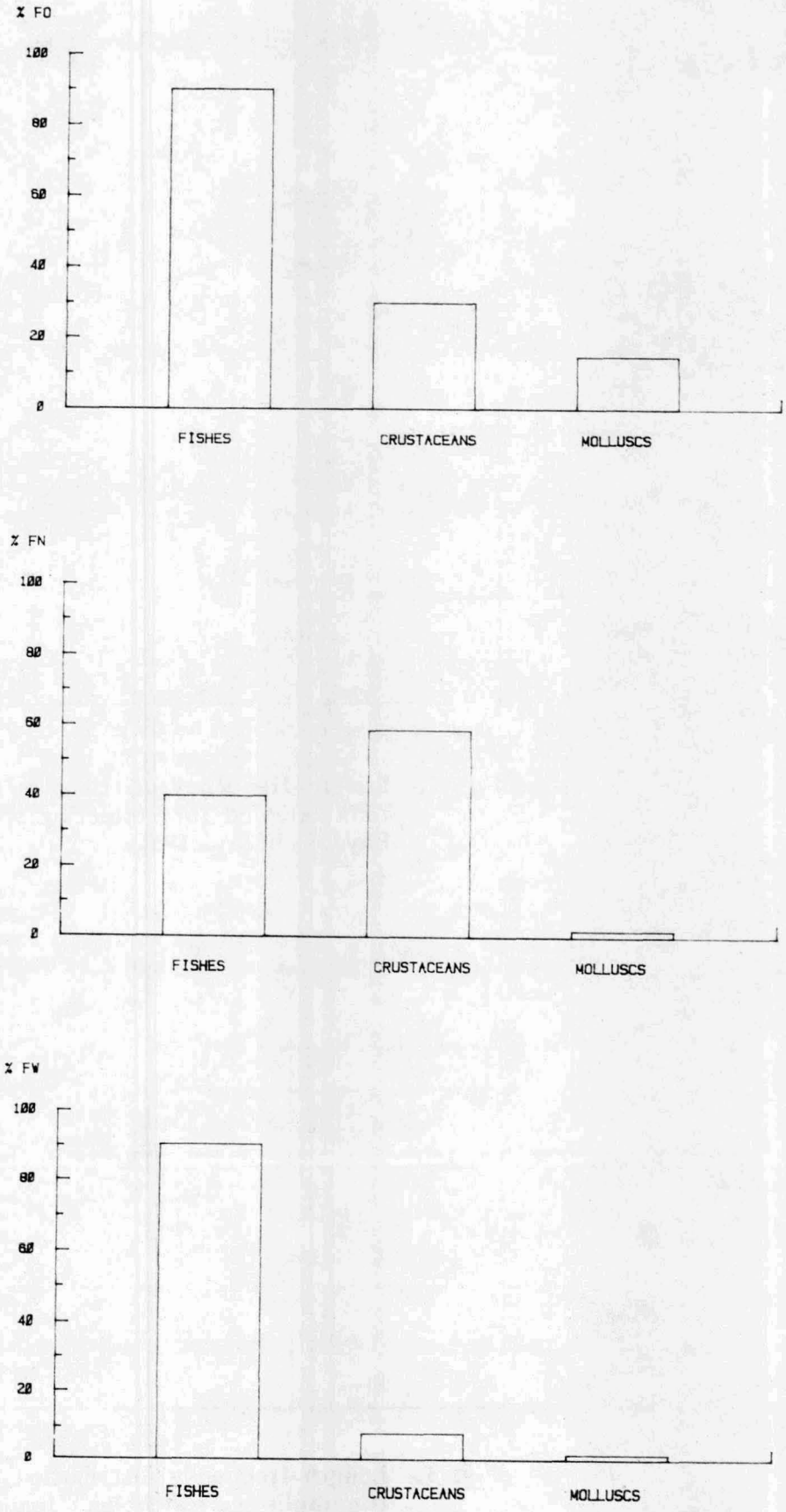

Fig. 4.- Percent frequency of occurrence, numerical frecuency and weight frequency of prey consumed by fluefin tuna. Bay of Biscay. 1985.