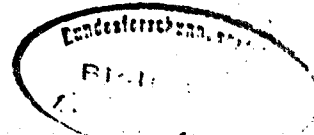


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Observations on *Raja miraletus* (Pisces, Elasmobranchii, Rajidae)
off West Africa.

by

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Abstract

Since 1972, a study on the biology of *Raja miraletus* has been done off West Africa. Most part of the material examined was obtained during three cruises carried out between Cape Stafford and Cape Vert. Although two of the cruises were done in the same season, and the oceanographic conditions were more or less the same, differences of sex composition, meristic characters, maturity and stomach content have been found. In this communication are presented the results of the measurements and the observations done on sex composition and stomach contents.

Introduction

Since 1972, a study on the biology of the Elasmobranchii around the Canary Islands and the west coast of Africa has been done. *Raja miraletus* Linnaeus, 1758, is the most common, and perhaps the most abundant species, on the slope and deeper part of the continental shelf off west Africa between Cape Stafford and Cape Timiris. In spite of the many references on the presence of this species on the region, there are not many studies on the ecology, reproduction and migrations of *Raja miraletus* in this part of the Atlantic.

In the present communication we describe the observations done on board of the "G.O.Sars" (Institute of Marine Research, Directorate of Fisheries, Bergen) in November-December 1972. The rest of the observations were done on the research vessel "Cornide de Saavedra" during the cruises NORCANARIAS I (August, 1972) and SAHMAS I (July, 1974).

During the cruise SAHMAS I we had the opportunity to study material from the

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northern and southern part of the Spanish Sahara collected with a few days of difference.

Differences in the stomach content, meristic characters and proportion between males and females have been found and presented in this communication.

Material and methods

The total number of specimens examined and studied was 125. They were collected in the stations 1 (223 meters, 2 ♂), 5 (160 m., 1♂ 1♀), 13 (159 m., 3♂ 2♀), 18 (136 m., 1♂), 27 (48 m., 3♂ 6♀), 29 (85 m., 5♂ 12♀) and 36 (62 m., 2♂ 6♀) on the cruise of the "G.O. Sars" to west Africa in 1972. During the cruise NORCANARIAS was caught only one young male off Cape Bojador at 30 meters depth. The rest of the specimens studied were collected in the stations 3 (66 m., 1♂), 4 (50 m., 2♂ 2♀), 5 (82 m., 5♂ 2♀), 8 (42 m., 1♀), 10 (60 m., 3♂ 7♀), 13 (110 m., 10♂ 6♀) and 15 (126 m., 25♂ 10♀) during the cruise SAHMAS I in July of 1972.

In the present communication, we name GROUP B the material collected in the stations 3, 4, 5, 8 and 10 of the cruise SAHMAS I. Specimens collected in the stations 13 and 15 is named GROUP A; and the rest, corresponding to the station 29 of the "G.O.Sars" is the GROUP C.

Figure 1 shows the situation of these three groups, of all the bottom trawl stations of the three cruises and the stations where Raja miraletus was caught.

The net used during the cruise of the "G.O.Sars" was a Granton Trawl of the same type as employed by commercial fishing vessels at the North Sea and Arctic Sea. On the cruises NORCANARIAS I and SAHMAS I we use a net of the same type and mesh size of those utilized by the spanish fishing vessels of the north-west part of Spain.

All the specimens have been weighted and measured. Measures were done following the schema of CLARK (1926). In our tables, we have replace the name of the distance measured by a number. The correspondence between names and numbers is showed on table 1.

Results

During the three cruises we have collected 69 males and 65 females. The captures of Raja miraletus were realized in 16 of the 39 stations from 42 to 223 m. depth.

During the cruise of the "G.O. Sars", Raja miraletus was collected in 8 of the 22 trawl stations. Two of these 8 stations were realized north off Cape Blanc, while the six others were done somewhere between Cape Timiris and Cape Vert. at 48 to 223 meters depth.

In the table 2 we show the number of males and females collected and the depths in which these specimens were captured. A decreasing number of females captured is observed by increasing the depth. The females were found along with young males up to 85 meters.

During the cruise NORCANARIAS I (in August, 1972) trawl stations were realized in the area of Cape Bojador. In that occasion only one young male was captured at 30 of depth.

During the cruise SAHMAS I, specimens of Raja miraletus were caught only in the areas off Peña Grande- Cape Leven (North) and off Cape Blanc-Cape Timiris (South). In the northern part, the specimens were collected between 110 and 126 meters with a temperature on the bottom of 18'20 C.. About 63% of the skates were adult males, 18'5% young males, and about 13% females with ovules and capsules. In the southern part, between Cape Blanc and Cape Timiris, the specimens were collected at 42 to 60 meters and at 18'10 C to 220 C.. In this zone, young males (46%) predominate on adult males (7'7%) and females of different conditions. About 23'1% were adult females without ovules and capsules while a 7'7% were young females and another 7'7% females with both ovules and capsules.

In the table 3 is showed the number and percentage of specimens of different conditions captured in the different cruises. The temperature and depth in which they were captured is also included.

The size of the males of the GROUP A oscilate somehow between 385 and 630 mm. , the females between 430 and 580 mm.. The medium weight of both females and males are 697 and 597 grams respectively.

The size of the males from the GROUP B was between 310 and 595 milimeters, and for the females of 268 and 615 milimeters. The medium weight was 438 (males) and 654 grams (females).

The size of the specimens of the GROUP C changes from 374 to 530 milimeters for the males, and from 362 to 582 milimeters for the females. The medium weight was 356 and 462 grams respectively.

Tables 4, 5, 6 show the medium values and standard deviation of the body measurements of the three groups of skates. For the different groups, we have calculate the value of the 16 measurements expressed in percentages of total length. In the table 7 we present the oscilation of this percentages and their mean values.

In the content of the stomachs of 75 specimens examined was found a 96'2% of

Crustaceans, a 2'9% of Fishes, a 0'42% of Annelids and a 0'42% of Mollusks. The most abundant Crustaceans were MISIDACEA (43'2%) and DECAPODA NATANTIA (28'8%). From the DECAPODA NATANTIA, the species of the family Processidae (50'8%) and Cranonidae (41'3%) the most represented. The DECAPODA REPTANTIA were represented by the families Portunidae (44'8%) and Calappidae (31%). In the tables 8, 9, 10 and 11 we show the percentages of the different groups and families found in all the stomachs studied. In the tables 12, 13, 14 and 15 are presented the percentages of the total number of individuals collected. On these tables, the observations done on the groups A and B of Raja miraletus are separated.

On the north area (Group A of Raja miraletus) the MISIDACEA are the most abundant while in the southern area (Group B of Raja miraletus) they don't appear. In this area, the group of the DECAPODA NATANTIA (63'3%) is the most representative. The family Calappidae (DECAPODA REPTANTIA) is the most abundant (37%) in the stomach content of Raja miraletus of the Group A. Specimens of this family were not found in the stomachs of the Group B as well as species of the families Thiidae and Atelecyclidae. It is very rare because in the trawl stations where the stomachs didn't contain species of Calappa, they were caught by the net in quite large quantities. In the stations where the stomachs of the skates had species of Calappa, we didn't find any either in the net nor in the dredging done in the same area.

We present in the tables 16, 17, 18, 19 the percentages of the stomachs containing the different groups and families. In the northern area DECAPODA NATANTIA (87'5%) are more abundant meanwhile in the southern one, DECAPODA REPTANTIA (72%) are very common.

The list of genus and species of Crustaceans collected in the stomachs is presented in table 20.

The results obtained of the study of stomach contents of Raja miraletus indicate that there are differences in the alimentation. In spite of that Crustaceans occupy the main place in the diet, there are local habits that indicate the possibility of the occurrence of several populations along the coast of west Africa. We have seen how in the northern part of the area, the family Calappidae (Decapoda Reptantia) is the main food of this skate. Off Cape Blanc, in the southern part, the nutrition is based on Decapoda Natantia in spite of that several species of Calappidae are common in this area.

There are also differences in vertical distribution, sex composition and maturity of the specimens collected. These last characteristics are difficult to explain. During the cruise SAHMAS I the depths covered were very wide. We have found

Raja miraletus in places where the temperature was between 18°C and 22°C. This can explain that this species was captured off Cape Leven in deeper waters than off Cape Blanc. The differences between the sex composition can only be explained if we consider that these groups have different reproduction seasons.

The meristic characters show some differences between the skates of the groups A and B. Specimens collected off Cape Leven and Peña Grande are bigger than those off Cape Blanc. The proportions of the body expressed in percentages of the total length change from one group to the other.

For all these reasons we estimate that along the coast of west Africa are several populations of Raja miraletus. One of them can be situated in the area off Cape Blanc. The other is probably located north of Cape Leven.

References

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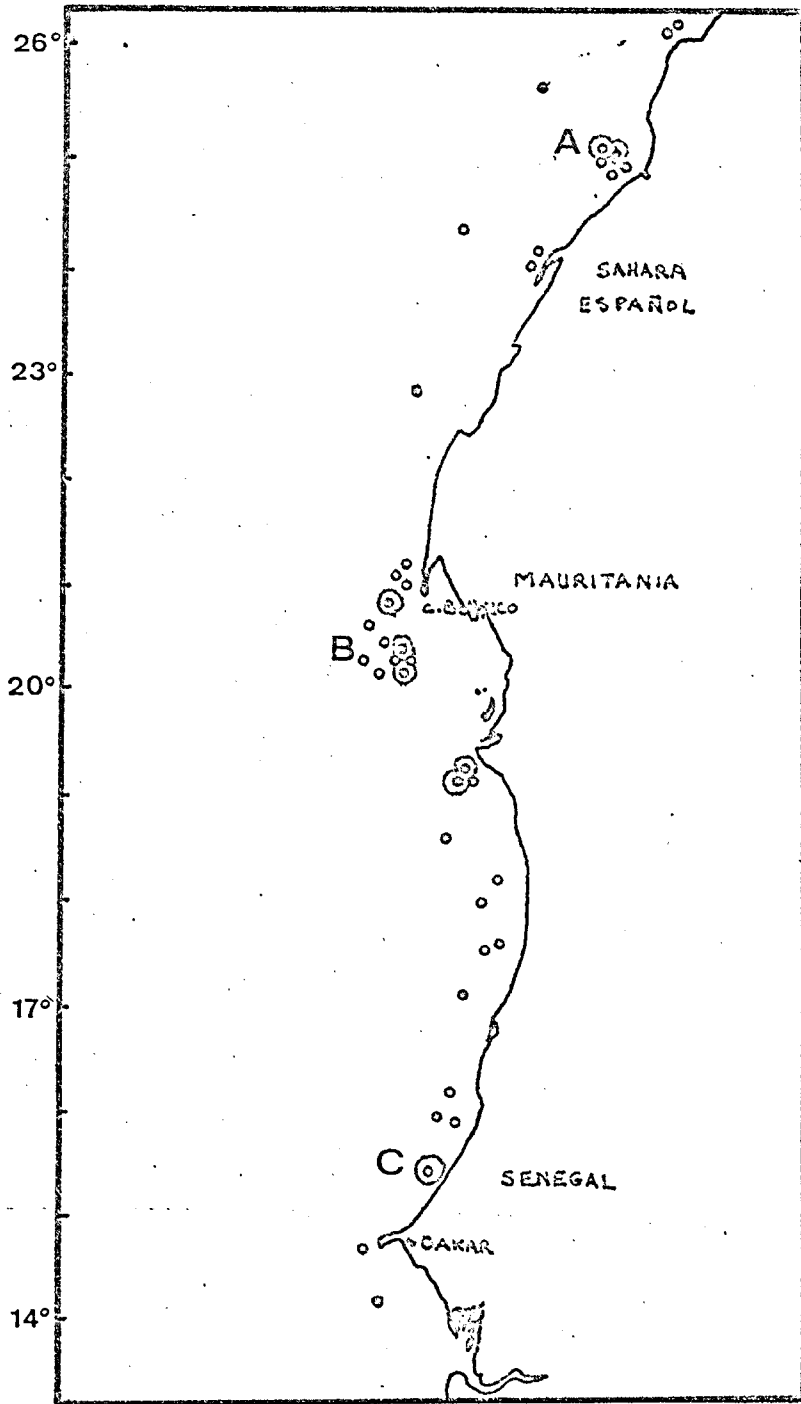


Figure 1.- Situation of the trawl stations done during the cruises of the G.O. Sars, NORCANARIAS I and SAHMAS I. o stations where Raja miraletus was caught. ⊙ stations where the specimens studied in this communication were collected.

- 1 = Total length.
- 2 = Disc width.
- 3 = Disc length.
- 4 = Preocular length.
- 5 = Distance between orbits.
- 6 = Eyeball length.
- 7 = Distance between origin of orbits and posterior tip of spiracles.
- 8 = Prenarial length.
- 9 = Preoral length.
- 10 = Internarial distance.
- 11 = Mouth width.
- 12 = Snout to pelvic fin tip.
- 13 = Precloaca length.
- 14 = Cloaca to tail tip.
- 15 = First dorsal origin to tail tip.
- 16 = Pelvic fin length in females. Clasper length in males.

Depth	Males	Females
223	2	7
160	1	1
159	3	2
136	1	-
85	5	12
62	2	6
48	3	6

Table 2.- Number of specimens and depth of capture of Raja miraletus during the cruise of the "G.O. Sars" to West Africa in 1972.

Table 1.- Correspondence between numbers and names of the different measurements done on Raja miraletus.

	Group A	Group B	Group C
Males juv.	10 (18,5%)	12 (46 %)	4(23,5%)
" adult.	25 (46,3%)	2 (7,7%)	1(5,9%)
Females juv.	4 (7,4%)	2 (7,7 %)	-
" adult. without ovules	3 (5,5%)	6 (23,1%)	12(70,6%)
" " with ovules and capsules	7 (13 %)	2 (7,7%)	-
" " " " and no caps.	5 (9,3%)	2 (7,7%)	-
Temperature (° C)	18'7° C	18'1 to 22°	17'6° C
Depth (meters)	110 - 126	40 - 60	85

Table 3 .- Sex composition of the 3 groups of Raja miraletus. Group A correspond to the material collected in the North part of the area. Group B are the specimens collected off Cape Blanc and Cape Timiris (Southern part) and Group C correspond to the material obtained off St. Louis (Senegal).

N	S		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Peso
35	♂	Σ	536	316	252	59	17	18	28	42	52	34	37	305	221	307	99	92	597
		σ	57,5	28	36	5,3	2,8	2,8	3,7	3,5	9,2	3,1	4,3	34,5	23,6	32,9	15,9	38	172,7
19	♀	Σ	541	338	270	66	19	17	33	50	66	36	36	309	236	297	102	48	697
		σ	36,6	19,1	21,1	4	1,8	2,1	38	3,4	4,4	2,6	21	21	18,8	22	11,1	8,5	138,9

Table 4.- Raja miraletus (GROUP A). Number of specimen examined, means, standard deviations.

N	S		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Peso
13	♂	Σ	441	282	219	46	16	12	21	34	45	30	30	250	182	250	93	42	438
		σ	91,4	56,3	41	5,6	3,5	2,8	3,6	2,3	3,3	5,7	5,5	52	35,3	52,3	22,3	21	248
12	♀	Σ	505	333	250	54	19	14	23	40	52	34	34	287	213	284	108	52	654
		σ	92	63,7	45,7	11	4,2	3,6	4,7	7,2	9,5	6	6,6	55,9	40,2	51,6	19,8	16,3	319

Table 5.- Raja miraletus (GROUP B). Number of specimen examined, means and standard deviations.

N	S		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Peso
5	♂	Σ	416	261	201	42	15	12	18	30	39	29	32	229	166	245	35	42	356
		σ	68,5	44,6	38	4,6	3,7	1,7	3,5	2,9	3,2	4,6	5,8	46	28,8	40,2	11,2	14,5	237,7
12	♀	Σ	441	283	219	47	17	12	20	34	45	30	33	247	183	249	88	38	464
		σ	72,8	48,3	41,4	9,0	3	4,2	4,6	6,	9,3	4,8	6,7	47	37,8	36	19	10	246

Table 6.- Raja miraletus (Group C). Number of specimen examined, means and standard deviations of the different meristic characters.

	GROUP C		GROUP B		GROUP A							
	(5) Males	(12) Females	(13) Males	(12) Females	(35) Males	(9) Females						
2	52,8	61,6-65	54,1	52 -70	54,2	62,1-66,1	55,7	63 -70,7	59,3	55,5-73,8	62,5	59 -69,3
3	48,3	46,5-50,5	49,5	47,5-53,4	49,8	47 -51,9	49,5	51,5-46,5	47,2	46 -57,1	50	47,7-57,7
4	10,2	9,4-11,1	10,7	9,6-11,5	10,7	9,3-12,6	10,6	9,2 -10,2	11	8,4-12,6	12,3	10,9-13,5
5	3,7	3 --4,1	3,9	3,5-4,4	3,6	3,3- 4,2	3,8	2,8- 4,55	3,1	2,1- 4,7	3,5	2,8-4,4
6	2,9	2,8- 3,2	2,9	2 - 3,5	2,6	1,9- 3,2	2,8	1,9- 3,8	3,4	2,4- 5,5	3,2	2,6-3,7
7	4,3	4 - 4,5	4,5	3,9- 5,2	4,7	4,3- 5,1	4,6	3,7- 5,3	5,2	4,4- 9,1	4,8	4,2-5,3
8	7,2	8 - 6,2	7,7	7,1- 8,6	7,9	5,9-10	7,8	6,5- 9	8	6,2- 9,4	9,2	8,5-10
9	9,5	10,7- 8,1	10,3	11,3- 9,4	10,4	7,9-12,9	10,3	8,7-10,9	10,1	7,9-12,7	12,2	11 -13,7
10	7	7,4- 6,5	7	6 - 7,2	6,9	6,5- 7,4	6,8	6,2- 7,4	6,4	5,7- 7,5	6,7	5,5-7,5
11	7,6	8 - 7	7,5	8,6- 6,4	6,9	6,4- 7,5	6,6	5,1- 7,1	6,8	5,4- 9,6	6,7	6,3-7,4
12	54,7	51,2-58,4	55,8	52,7-60	57	55,6-58,4	56,6	54,1-60,2	57	54,4-66,2	57,2	54,8-59,8
13	39,8	39,1-40,5	41,2	46 -37,8	41,5	40,4-43,2	42	39,5-43,3	40,7	38,9-47,5	43,6	42,1-45,3
14	58,7	59,8-58	56,7	58,9-52,9	56,8	54,8-58,9	56,3	54,8-57,8	57,3	53,7-61,6	54,9	53,7-58,4
15	20,4	21,4-19,2	20,1	24,2-12,7	21,2	19,6-22,7	21,4	19,5-23,4	18,7	10,2-20,8	18,9	17,4-20,7
16	10	12,8- 9	8,7	10,6- 7,2	9,2	5,4-14,5	10	6,7-13	17,7	5,7-24,1	3,7	7,2-10,5

Table 7.- Meristic characters of Raja rinaletus expressed in percentage of the total length. The column of the left indicates the mean value of the percentages calculated: The other two columns indicate the oscillation of these percentages.

MOLLUSKS	CRUSTACEANS	ANNELIDS	FISHES
0'42 %	96'2 %	0'42 %	2'9 %

Table 8.- Percentage of the different zoological groups in the stomach content of 75 Raja miraletus examined.

MISIDACEA	STOMATOPODA	DECAPODA	
		Natantia	Reptantia
43'2 %	0'9 %	28'8 %	27 %

Table 9.- Stomach content of Raja miraletus. Composition of Crustaceans.

PENAEIDEA	CARIDEA		
Penaeidae	Pandalidae	Processidae	Crangonidae
6'3 %	1'6 %	50'8 %	41'3 %

Table 10.- Stomach content of Raja miraletus. Composition of Decapoda Natantia expressed in percentage of total number collected.

MACRURA REPTANTIA	BRACHYURA				
	Raninidae	Calappidae	Atelecyclidae	Portunidae	Thiidae
10'3 %	1'72 %	31 %	8'6 %	44'8 %	3'5 %

Table 11.- Stomach content of Raja miraletus. Composition of Decapoda Reptantia expressed in percentage of total number collected.

	MOLLUSKS	CRUSTAC	ANNEL.	FISHES
GROUP A	0'5 %	97 %	-	2'5 %
GROUP B	-	91'7 %	2'7 %	5'5 %

Table 12.- Stomach content of the two groups of Raja miraletus. Numbers express the percentage of the total collected.

MISIDACEA	STOMATOPODA	DECAPODA		IRREC
		Natant.	Rept.	
49 %	0'5 %	22 %	25 %	3'5 %
-	3 %	63'6 %	33'3 %	-

Table 13.- Stomach content of the two groups of Raja miraletus. Composition of Crustaceans.

	PENAEIDEA	CARIDEA		
	Penaeidae	Pandalidae	Processidae	Crangonidae
GROUP A	-	-	50 %	50 %
GROUP B	19 %	11'7 %	52'4 %	23'8 %

Table 14.- Stomach content of the two groups of Raja miraletus. Composition of Decapoda Natantia.

	MACRURA REPTANTIA	BRACHYURA				
		Raninidae	Thiidae	Calappidae	Atelecyclidae	Portunidae
GROUP A	1	-	5 %	37 %	10 %	48 %
GROUP B	54'5 %	18'2 %	-	-	-	27'3 %

Table 15.- Stomach content of the two groups of Raja miraletus. Composition of Decapoda Reptantia.

	MOLLUSKS	CRUSTACEANS	ANNELIDS	FISHES	IRRECOGNOS/
GROUP A	-	47'1	11'8	5'9	52'9
GROUP B	2'9	71'4	-	11'4	20

Table 16.- Percentage of stomachs presenting the different groups.

	MISIDACEA	STOMATOPODA	DECAPODA		Irrecognoscible
			Natantia	Reptantia	
GROUP A	52	4	20	72	28
GROUP B	-	12'5	87'5	50	-

Table 17.- Stomach content of Raja miraletus. Percentage of stomachs presenting the different groups of Crustaceans.

	PENAEIDEA		CARIDEA		
	Penaeidae	Pandalidae	Processidae	Crangonidae	No identified
GROUP A	1	-	55'6	66'7	11'1
GROUP B	57'1	14'3	57'1	28'6	-

Table 18.- Stomach content of Raja miraletus. Percentages of stomachs containing the different groups of Decapoda Natantia.

	MACRURA		BRACHYURA				
	REPTANTIA	Raninidae	Thiidae	Calappidae	Atelecyclidae	Portunidae	No iden.
GROUP A	--	--	11'1	66'7	27'8	55'6	5'6
GROUP B	25	25	--	--	--	75	25

Table 19.- Stomach content of Raja miraletus. Percentages of stomachs containing the different groups and families of Decapoda Reptantia.

Group	Family	Genus	Species
MISIDACEA	PETALOPHTHALMIDAE		1 sp.
MACRURA REPT.		Scyllarus	sp.
BRACHYURA	RANINIDAE	Ranilia	<u>Ranilia atlantica</u> (Studer, 1885)
"	CALAPPIDAE	Calappa	<u>C. granulata</u> , <u>C. neli</u> , <u>Calappa</u> sp.
"	ATELECYCLIDAE	Atelecyclus	<u>A. rotundatus</u>
"	THIIDAE	Thia	<u>Thia</u> sp.
"	PORTUNIDAE	Macropipus	<u>M. rugosus</u>
PENAEIDEA	PENAEIDAE	Solenocera	<u>Solenocera</u> sp.
CARIDEA	PANDALIDAE	Plesionika	<u>Plesionika heterocarpus</u>
"	PROCESSIDAE	Processa	<u>P. parva</u> , <u>P. sp. aff. elegantula</u>
"	CRANGONIDAE	Pontophilus	<u>P. sculptus</u>
"	"	Pontocaris	<u>P. cataphracta</u>

Table 20.- Families and Genus of Crustaceans founded in stomachs of Raja miraletus.