

DATA ON LENGTH-AGE COMPOSITION AND GONAD MATURITY STAGES
OF SKIPJACK (KATSUWONUS PELAMIS) OF THE EASTERN TROPICAL ATLANTIC

V. N. Chur, V. B. Grudinin, V. L. Zharov

AtlantNIRO, Kaliningrad, USSR

SUMMARY

The data collected during the research and experimental cruises by the AtlantNIRO in the eastern part of the tropical Atlantic in Subareas 1-4 in 1969-1977 period are used. The characteristic of the skipjack size and weight composition is given. The analyses of the gonad maturity stages suggest different times of the sexual product maturation in various areas of the ocean.

RESUME

On a utilisé les données rassemblées par l'AtlantNIRO au cours de campagnes de recherche expérimentale dans les sous-secteurs 1-4 penant la période 1969-1977. Le présent document fait état des caractéristiques de la composition par

taille et par prises du listao. L'examen des gonades à différents stades de maturité montre que la maturité sexuelle est atteinte à différents moments selon les régions.

RESUMEN

Se emplea los datos recogidos durante los cruceros experimentales y de investigación por el NIRO-Atlántico en la parte Este del Atlántico tropical en las Sub-áreas 1-4 en el periodo 1969 a 1977. Se dá la característica de la talla y composición de peso del listado. Los análisis de los estados de madurez de la gónada, indican diferentes tiempos productivos de maduración sexual en varias zonas del océano.

Introduction

Skipjack is considered to be the most abundant of all commercial tuna species in the Atlantic Ocean. Beginning from 1964 its stocks have been increasingly exploited and the maximum catch of 114.7 thous. tons was taken in 1974.

World-wide demand for tuna products and the insignificant increase of other tuna catches in the Atlantic Ocean suggest the possibility of expansion of the skipjack fishery.

However, all the reviews of skipjack biology available do not seem to support the idea of possible increase of this species catches with certainty, since the data on a number of important problems concerning the biology of skipjack are lacking.

Material and Methods

The samples collected during the Soviet research and experimental cruises conducted in 1969-1977 were used as the material for the present paper. The fishing for skipjack was conducted by tuna purse-seines in Subareas 1, 2, 3 and 4 (by ICCAT division). Biological analysis were made directly at sea after catching the tunas. The length (LF) was measured to within 0.5 cm and the mass to within 50 g. The gonad maturity stages were determined according to 6-grade scale: I - immature individuals; II - sex is discerned visually; III - ovaries are at the initial stage of trophoplasmatic growth; IV - ovaries are at the final stage of trophoplasmatic growth; V - running sexual products; VI - ovaries with traces of past spawning.

A total of 1 783 specimens was measured and 1 122 specimens weighted, 1 316 specimens of skipjack were examined for the gonad maturity stages.

Results

The size-composition of the skipjack aggregations in Subareas 1-4 is given in tables 1-4. Over the entire observation periods the sizes fluctuated within the range of 28-64 cm, and the lateral line changed from 35.9 to 53.8 cm. The largest tunas were caught in Subarea 1 in May 1969, the smallest individuals were taken in Subarea 3 in September 1973.

The weight composition of the aggregations is presented in tables 5-8. The mass of tunas varied between 0.2 and 5.6 kg, the mean mass ranged from 0.92 to 4.74 kg.

The maturity stages and the ratio of males and females in the aggregations are shown in figs. 1-3. It is worth noting that no females with running sexual products (stage V) were recorded in our catches which is evidently characteristic of this fish species. Judging from the occurrence of spent females (stage VI) the spawning of skipjack took place in January (Subarea 2), in June-July (Subarea 3) and in November-December (Subarea 4). The ratio of males and females approximated 1 in most cases.

178 specimens of spent females (stage VI) were examined in 1976-1977 to determine the minimum size at the attainment of sexual maturity. The minimum size of the spent female was 39 cm, and the size of the majority of females spent for the first time was 40 cm.

Conclusion

The skipjack aggregations in different parts of the East Atlantic are not homogeneous and consist of the fishes of diverse size and mass. Various size groups are fished not only in different areas, but also in one and the same area in different periods which is indicative of a complex population structure of the species.

The sexual maturity of tunas is attained at the length over 39 cm. According to our data the spawning of skipjack occurs during the warmest period of the year depending on the area. The ratio of males and females in the spawning aggregations approaches 1.

Table 1

Size composition of skipjack aggregations
in Subarea 1

Length ;	No. of sp., May 1969 ;	%
43	1	1.3
44	-	-
45	2	2.6
46	2	2.6
47	4	5.2
48	7	9.1
49	1	1.3
50	3	3.9
51	7	9.0
52	6	7.8
53	6	7.8
54	6	7.8
55	5	6.5
56	3	3.9
57	2	2.6
58	5	6.5
59	5	6.5
60	2	2.6
61	3	3.9
62	3	3.9
63	3	3.9
64	1	1.3

77 100%

mean = 53.8

Table 2

Size composition of skipjack aggregations in Subarea 2

Length	April. 1969		Januar. 1971		Febr. 1971		March 1971		April 1971	
	sp.	%%	sp.	%%	sp.	%%	sp.	%%	sp.	%%
35					3	3.0	1	1.2	1	0.8
36					15	14.8	-	-	-	-
37					12	11.8	-	-	-	-
38					9	8.9	7	8.6	-	-
39					8	7.9	5	6.2	1	0.8
40					7	6.9	12	14.8	3	2.3
41			3	7.3	2	2.0	7	8.6	12	9.1
42			4	9.8	7	6.9	7	8.6	12	9.1
43			1	2.4	4	4.0	7	8.6	7	5.3
44			3	7.3	7	6.9	3	3.7	5	3.8
45			3	7.3	3	3.0	-	-	7	5.3
46	2	8.8	4	9.8	6	5.9	4	4.9	1	0.8
47	-	-	-	-	1	1.0	2	2.5	3	2.3
48	4	17.4	1	2.4	3	3.0	2	2.5	2	1.5
49	3	13.0	-	-	-	-	1	1.2	-	-
50	5	21.7	2	4.9	1	1.0	-	-	4	3.0
51	4	17.4	1	2.4	1	1.0	2	2.5	5	3.8
52	1	4.3	3	7.3	3	3.0	1	1.2	9	6.8
53	2	8.8	4	9.8	2	2.0	1	1.2	11	8.2
54	-	-	3	7.3	2	2.0	1	1.2	7	5.3
55	1	4.3	6	14.7	1	1.0	7	8.6	7	5.3
56	1	4.3	2	4.9	1	1.0	4	4.9	7	5.3

Table-2 (continued)

Length	Apr. 1969		Jan. 1971		Febr. 1971		March 1971		April 1971	
	sp.	%%	sp.	%%	sp.	%%	sp.	%%	sp.	%%
57			1	2.4	--	-	3	3.7	3	2.3
58					-	-	4	4.9	15	11.4
59					1	1.0			6	4.5
60									4	3.0
<hr/>										
23 100% 41 100% 101 100% 81 100% 132 100%										
Mean=50.2 Mean=49.1 Mean=41.9 Mean=45.5 Mean = 50.0										

Table 3

Size composition of skipjack aggregations in Subarea 3

Length	Sept. 1973		Oct. 1973		June 1976		July 1977		July 1977	
	sp.	%%	sp.	%%	sp.	%%	sp.	%%	sp.	%%
28	1	2.0								
29	-									
30	1	2.0								
31	7	14.0								
32	3	6.0	1	2.0						
33	2	4.0	-	-						
34	3	6.0	1	2.0						
35	4	8.0	2	4.0						
36	7	14.0	14	28.0						
37	2	4.0	24	48.0			1	1.0		
38	4	8.0	8	16.0						
39	6	12.0					1	0.8	1	1.0
40	7	14.0					2	1.6	2	2.0
41	2	4.0					4	3.4	1	1.0
42	-	-					11	9.1	6	5.8
43	-	-					22	18.2	2	2.0
44	1	2.0					14	11.6	3	3.0
45			1	1.5	17	14.0	6	5.8		
46			-	-	5	4.1	11	10.9		
47			-	-	3	2.5	12	11.9		
48			1	1.5	2	1.6	13	12.9		
49			-	-	3	2.5	19	18.8		
50			5	7.4	-	-	13	12.9		
51			4	5.9	-	-	4	4.0		
52			5	7.4	-	-	2	2.0		

Table 3 (continued)

Length	Sept. 1973		October 1973		June 1976		June 1977		July 1977		
	sp.	%%	sp.	%%	sp.	%%	sp.	%%	sp.	%%	
53					7	10.3	2	1.6	1	1.0	
54					14	20.6	-	-	3	3.0	
55					8	11.8	4	3.4	-	-	
56					2	2.8	2	1.6	1	1.0	
57					4	5.9	6	5.0			
58					4	5.9	7	5.8			
59					2	2.8	7	5.8			
60					6	8.8	7	5.8			
61					-	-	1	0.8			
62					4	5.9	1	0.8			
63					1	1.5					
<hr/>											
		50	100%	50	100%	68	100%	121	100%	101	100%
		mean=35.9		mean=36.6		mean=54.9		mean=48.2		mean=47.4	

Table 4

Size composition of skipjack aggregations in Subarea 4

Length:	: Oct. 1973:		Nov. 1973:		Nov. 1976:		Dec. 1976:		Nov. 1977:		Dec. 1977	
	sp.	%	sp.	%	sp.	%	sp.	%	sp.	%	sp.	%
35	5	10.0										
36	15	30.0										
37	16	32.0	4	2.8					1	2.0		
38	6	12.0	12	8.3	5	1.2			1	2.0		
39	4	8.0	21	14.9	10	2.5	15	6.3	2	4.0	5	10.0
40	2	4.0	24	16.7	46	11.4	39	16.4	4	8.0	11	22.0
41	-	-	9	6.3	60	14.8	28	11.8	1	2.0	14	28.0
42	-	-	13	9.0	52	12.8	18	7.5	6	12.0	12	24.0
43	-	-	8	5.5	36	8.9	12	5.0	6	12.0	1	2.0
44	1	2.0	10	6.8	27	6.7	9	3.8	6	12.0	4	8.0
45	-	-	10	6.8	16	4.0	7	2.9	2	4.0	1	2.0
46	-	-	14	9.7	18	4.4	9	3.8	3	6.0	1	2.0
47	1	2.0	11	7.6	25	6.2	10	4.2	7	14.0		
48			4	2.8	29	7.2	6	2.5	4	8.0		
49			2	1.4	22	5.4	8	3.3	1	2.0		
50			1	0.7	22	5.4	20	8.4	4	8.0		
51			-	-	13	3.2	13	5.4	2	4.0		
52			1	0.7	10	2.5	14	5.8	1	2.0		
53					7	1.7	9	3.8				
54					1	0.3	7	2.9				
55					3	0.7	5	2.1				
56					3	0.7	8	3.3				
57							2	0.8				
50	100%	144	100%	405	100%	239	100%	50	100%	50	100%	
mean=37.2		mean=42.3		mean=44.5		mean=45.7		mean=44.86		mean=41.20		

Table 5

Weight composition of skipjack aggregations in Subarea 1

(May 1969)

Mass, kg	sp.	May 1969 %
1.4-1.6	4	5.2
1.6-1.8	5	6.6
1.8-2.0	6	7.8
2.0-2.2	3	3.9
2.4-2.6	6	7.8
2.9-2.8	7	9.1
2.8-3.0	1	1.3
3.0-3.2	7	9.1
3.2-3.4	4	5.2
3.4-3.6	5	6.6
3.6-3.8	5	6.6
3.8-4.0	5	6.6
4.0-4.2	3	3.9
4.2-4.4	3	3.9
4.4-4.6	3	3.9
4.6-4.8	2	2.3
4.8-5.0	2	2.3
5.0-5.2	2	2.3
5.2-5.4	2	2.3
Total	77	100%
		Mean = 3.08

Table 6

Weight composition of skipjack aggregations in Subarea 1

Mass, kg	Apr. 1969		Jan. 1971		Febr. 1971		March 1971		Apr. 1971	
	sp.	%	sp.	%	sp.	%	sp.	%	sp.	%
0.2-0.4					1	1.0				
0.4-0.6					1	1.0				
0.6-0.8	2	8.7			5	4.9				
0.8-1.0	1	4.3			26	25.5	5	6.2		
1.0-1.2	6	26.1			15	14.7	13	16.0	1	1.9
1.2-1.4	6	26.1	6	14.6	14	13.7	17	20.9	5	9.4
1.4-1.6	5	21.8	4	9.8	10	9.8	10	12.3	2	3.8
1.6-1.8	2	8.7	7	17.1	6	5.9	6	7.4	-	-
1.8-2.0	1	4.3	2	4.9	8	7.8	3	3.7	1	1.9
2.0-2.2			-	-	1	1.0	2	2.5	2	3.8
2.2-2.4			3	7.3	1	1.0	1	1.2	-	-
2.4-2.6			1	2.4	1	1.0	3	3.7	3	5.7
2.6-2.8			2	4.9	3	2.9	-	-	5	9.4
2.8-3.0			4	9.8	3	2.9	1	1.2	7	13.1
3.0-3.2			3	7.3	3	2.9	2	2.5	-	-
3.2-3.4			5	12.2	2	2.0	2	2.5	3	5.7
3.4-3.6			2	4.9	1	1.0	4	5.0	2	3.8
3.6-3.8			1	2.4	-	-	5	6.2	2	3.8
3.8-4.0			1	2.4	-	-	2	2.5	7	13.1
4.0-4.2					1	1.0	4	5.0	9	17.0
4.2-4.4							-	-	2	3.8
4.4-4.6							1	1.2	1	1.9
4.6-4.8									1	1.9

23 100% 41 100% 102 100% 81 100% 59 100%
 mean=2.28 mean=2.35 mean=1.47 mean = 2.00 mean=3.10

Table 7

Weight composition of skipjack aggregations in Subarea 3

Mass, kg	Sept. 1973		Oct. 1973		June 1976		June 1977		July 1977	
	sp.	%	sp.	%	sp.	%	sp.	%	sp.	%
0.2-0.4	1	2.0								
0.4-0.6	12	24.0								
0.6-0.8	8	16.0	2	4.0						
0.8-1.0	10	20.0	40	80.0					1	1.0
1.0-1.2	11	22.0	8	16.0					3	3.0
1.2-1.4	7	14.0					6	5.0	7	6.9
1.4-1.6							3	26.4	4	3.9
1.6-1.8	1	1.0					21	17.4	9	8.9
1.8-2.0							15	12.4	14	13.9
2.0-2.2							4	3.3	21	20.8
2.2-2.4							3	2.5	22	21.8
2.4-2.6							3	2.5	11	10.9
2.6-2.8									3	3.0
3.0-3.2									4	3.9
3.2-3.4							1	0.8	1	1.0
3.4-3.6							1	0.8		
3.6-3.8							2	1.6		
3.8-4.0							3	2.5	1	1.0
4.0-4.2						2	13.3	3	2.5	
4.2-4.4						2	13.3	4	3.3	
4.4-4.6						1	6.7	10	8.3	
4.6-4.8						1	6.7	3	2.5	
4.8-5.0						2	13.3	3	2.5	
5.0-5.2						2	13.3	5	4.1	
5.2-5.4								1	0.8	
5.4-5.6						2	13.3	1	0.8	

Table 7 (continued)

Mass, kg	Sept. 1973		Oct. 1973		June 1976		June 1977		July 1977	
	sp.	%	sp.	%	sp.	%	sp.	%	sp.	%
5.6-5.8										
5.8-6.0										
Total:	50	100%	50	100%	15	100%	121	100%	101	100%
	Mean=0.88		Mean=0.92		Mean=4.74		Mean=2.49		Mean=2.08	

Table 8

Weight composition of skipjack aggregations in Subarea 4

Mass, kg	Oct. 1973		Nov. 1973		Nov. 1976		Dec. 1976		Nov. 1977		Dec. 1977	
	sp.	%	sp.	%	sp.	%	sp.	%	sp.	%	sp.	%
0.6-0.8	8	16.0										
0.8-1.0	35	70.0	1	1.7							1	2.0
1.0-1.2	5	10.0	19	32.8	2	4.0	6	4.0	6	12.0	10	20.0
1.2-1.4	-	-	9	15.3	16	32.0	29	19.4	6	12.0	30	60.0
1.4-1.6	1	2.0	-	-	11	22.0	18	12.0	12	24.0	6	12.0
1.6-1.8	-	-	7	12.1	2	4.0	5	3.3	5	10.0	2	4.0
1.8-2.0	1	2.0	7	12.1	1	2.0	10	6.6	7	14.0	1	2.0
2.0-2.2			7	12.0	4	8.0	5	3.3	8	16.0		
2.2-2.4			6	10.3	3	6.0	9	6.0	1	2.0		
2.4-2.6			1	1.7	3	6.0	15	10.0	3	6.0		
2.6-2.8			1	1.7	4	8.0	23	15.4	1	2.0		
2.8-3.0					1	2.0	7	4.7	1	2.0		
3.0-3.2					2	4.0	8	5.3				
3.2-3.4					-	-	8	5.3				
3.4-3.6					1	2.0	1	0.7				
3.6-3.8							3	2.0				
3.8-4.0							2	1.3				
4.0-4.2							1	0.7				
	50	100%	58	100%	50	100%	150	100%	50	100%	50	100%
	Mean=0.92		Mean=1.59		Mean=1.82		Mean=2.16		Mean=1.73		Mean=1.30	

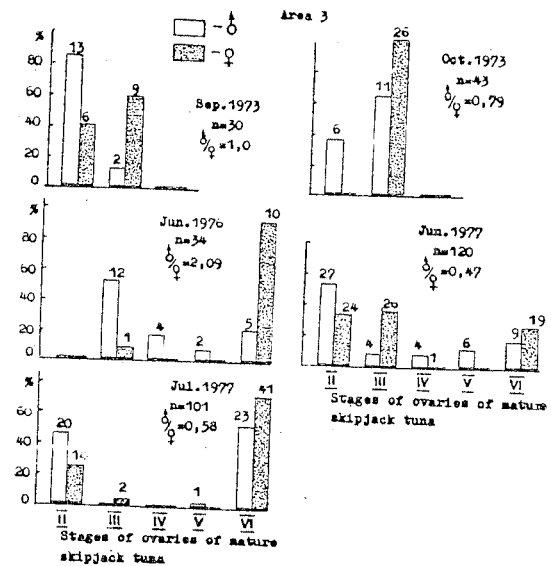
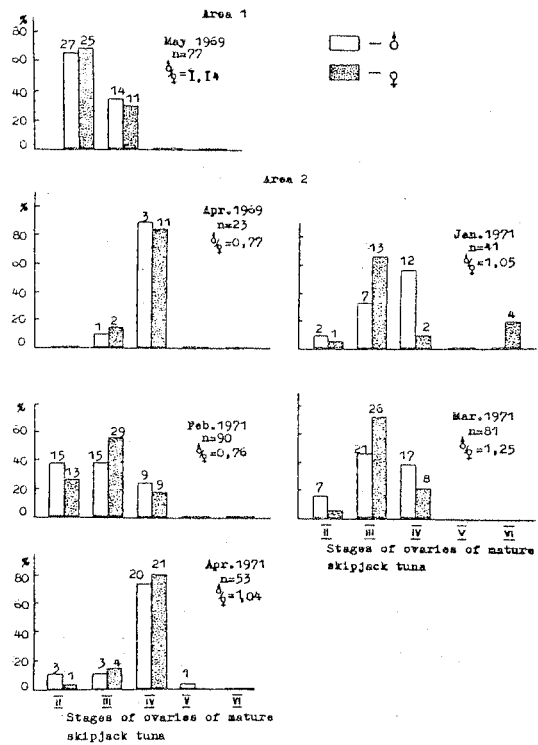


Fig. 2. Maturity stages of skipjack tuna in Subarea 3.

Fig. 1. Maturity stages of skipjack tuna in Subareas 1 and 2.

(Figures above show the number of examined fish)

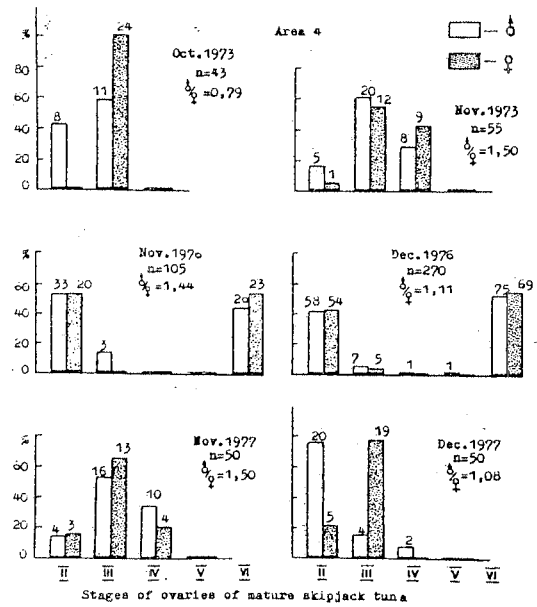


Fig. 3. Maturity stages of skipjack tuna in Subarea 4.