

LENGTH AND WEIGHT DATA FOR WESTERN ATLANTIC
SWORDFISH, XIPHIAS GLADIUS

by

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In recent years there has been a marked resurgence in the commercial fishery for swordfish in the western North Atlantic. Concurrently, following the development of night-time fishing techniques for swordfish, the recreational fishery in the U.S. has developed rapidly. Although accurate figures on total catch from either fishery are not yet available it is probably substantial. A recent decision in the U.S. to raise the Federal guidelines on mercury contamination in swordfish flesh from 0.5 to 1.0 ppm will likely result in a further expansion of the swordfish fishery in the western North Atlantic.

Following recommendations of the Swordfish Workshop held in Miami, Florida, in June 1977, (SCRS/77/70) scientists with the Miami Laboratory of the National Marine Fisheries Service Southeast Fisheries Center, the University of Miami Rosenstiel School of Marine and Atmospheric Science, and the Florida Department of Natural Resources began a cooperative investigation into the biology and dynamics of swordfish off the southeast coast of Florida. In 1977 and 1978, 168 swordfish were sampled. The specimens were caught at night by recreational anglers using rod and reel and ranged in size from 81 to 281 cm lower jaw fork length (3.5 to 268 kg) (Figure 1). Various length measurements were recorded (Appendix), gonad samples were removed for reproductive studies, and caudal vertebrae and dorsal spines taken for analysis of age and growth. Lengths were recorded in centimeters and weights in pounds, converted to kilograms for this report. The lengths used in this analysis are

overall -- tip of the upper jaw to an imaginary line connecting the tips of the caudal lobes.

bill-fork -- tip of the upper jaw to the tips of the mid-caudal rays.

lower jaw-fork length -- tip of the lower jaw to tips of the mid-caudal rays

operculum-fork length -- rear of the operculum (or the opercular groove if operculum removed) to the anterior insertion of the caudal keel.

The relationship between length and weight is

$$Y = a + bX$$

where

Y = log₁₀ weight

a = intercept

b = coefficient

X = log₁₀ length

Figures 2 and 3 show the relationship between lower-jaw length and opercular length to weight. Swordfish landed by the commercial fishery are usually dressed on board the vessel, and the operculum-fork length-weight relationship will permit a ready conversion to round weight.

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Conversion factors were calculated between lower jaw-fork lengths and operculum-fork length using the formula

$$Y = a + bX$$

where

Y = lower-jaw fork length

a = intercept

b = coefficient

X = operculum-fork length

The relationship between these measurements of length are shown in Figure 4.

The various intercepts, coefficients, sample sizes and standard errors are shown in Table 1.

Table 1. - Parameter estimates for swordfish length and weight conversions calculated by the geometric mean regression.

x	y	a	b	sample size	standard error
log ₁₀ LJ-F ⁽¹⁾	log ₁₀ W	- 5.5669	3.2994	166	.0370
OPER.	LJ-F	14.8961	1.5783	49	.0267
log ₁₀ OPERC.	log ₁₀ W	-3.9394	2.8795	49	.0697

(1) LJ-F Lower jaw-fork length
W Weight
OPERC. Operculum-fork length

Appendix Table -

<u>OVERALL</u>	<u>BILL-FORK</u>	<u>LOWER JAW-FORK</u>	<u>OPERCULAR</u>	<u>WEIGHT</u>
182	164	112		14.1
		191		105.7
		145		37.0
295	276	190		92.3
239	216	146		36.4
319	291	214		125.9
298	273	189		79.5
		193		92.3
275	254	175		70.5
320	294	201		97.0
229.5	209	147		40.9
269	249	174		59.1
312	288	206		112.3
303	282	207		104.5
344	318	209		118.2
264	240.5	169		67.7
278	257	176		73.9
207	189	128		25.0
318	298	204		100.0
265	247	165		60.0
223	204	139		28.6
295	271	196		88.2
299	278	192		93.2
233	215	148	86	38.0
320	290	210	121	121.8
253	229	160	92	51.6
318	305	213	122	143.2
312	287	200	122	110.4
325	306	212	129	122.3
306	287	201	120	120.4
305	285	213.5	124	111.1
276	259	175.5	107	64.3
221	206	137	79	32.6
217	195	133	72.5	24.5
275	256	177	104	74.0
231	208	141	80	36.3
279	258	186	106	72.4
281	259	181	110	77.3
248	228.5	157	91	49.8
247	231	160	92	48.4
307	287	209	124	114.5
191	176	118	66	20.2
395	365	258	153	188.0
202	185	124	66	23.9
290.5	269	190	108	82.5
182	164	115	63	15.9
308	285	214	124	125.5
319	298	218	134	114.5
154	140	109.5	59	17.0
232	218	150	86	36.8

Appendix Table -

<u>OVERALL</u>	<u>BILL-FORK</u>	<u>LOWER JAN-FORK</u>	<u>OPERCULAR</u>	<u>WEIGHT</u>
239	220	158	88	50.2
288	266	175	96	68.4
313	288	196	111	108.5
214	202	161	90	58.6
377	350	249	146	220.2
303	281	198	112	102.7
312	289.5	211	125	136.4
243	227	156	87	47.3
274	254	174	99	73.8
217.5	200	134	76	30.1
263.4	252	170	96	65.4
179	161.5	109	59.5	13.9
258.5	243.5	169	103	58.6
283	270	178	104	77.3
227	206	135	78	31.8
208	192	130	72	30.2
208	201.5	139	75	34.1
192	175	117	65.5	19.3
221	210	140	82	39.2
206	189	132	75	26.7
151	137	95	53.5	8.8
277	252	170	103	72.0

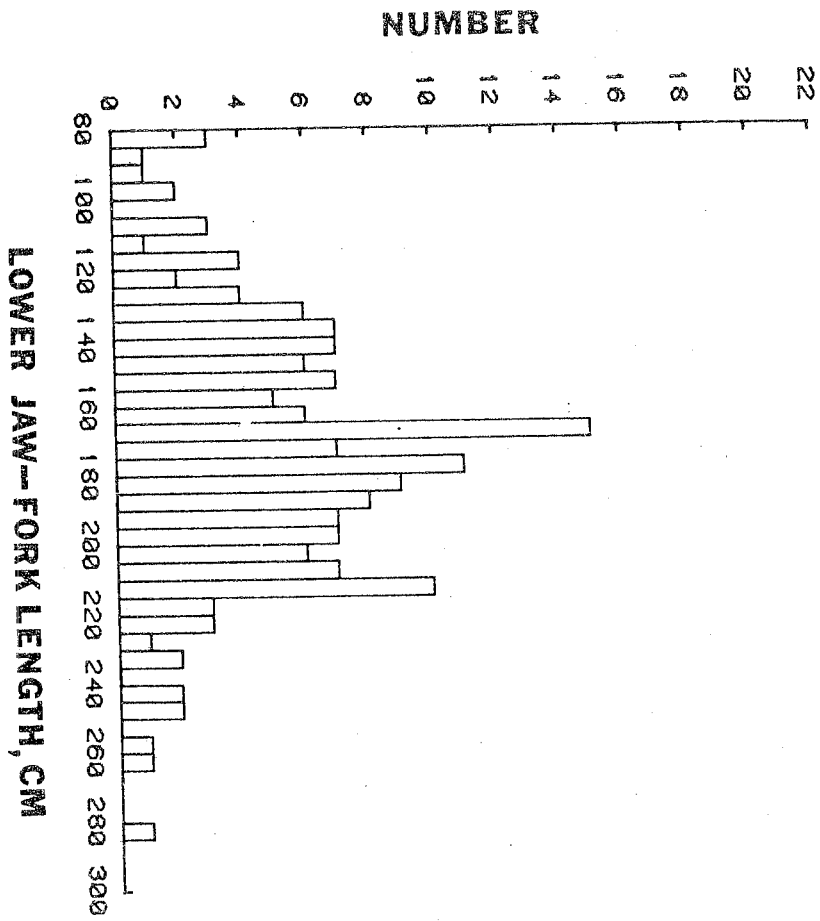


Figure 1. - Length-frequency of swordfish from the western North Atlantic Ocean, 1977-78.

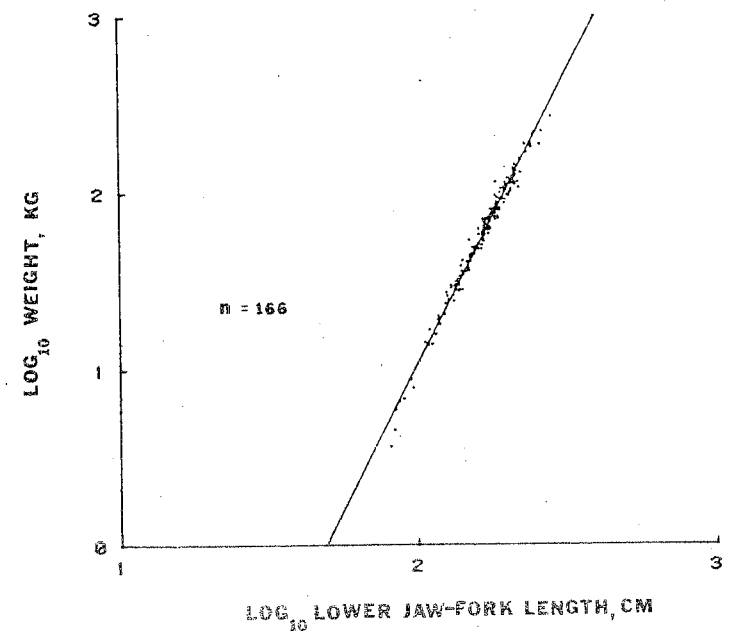
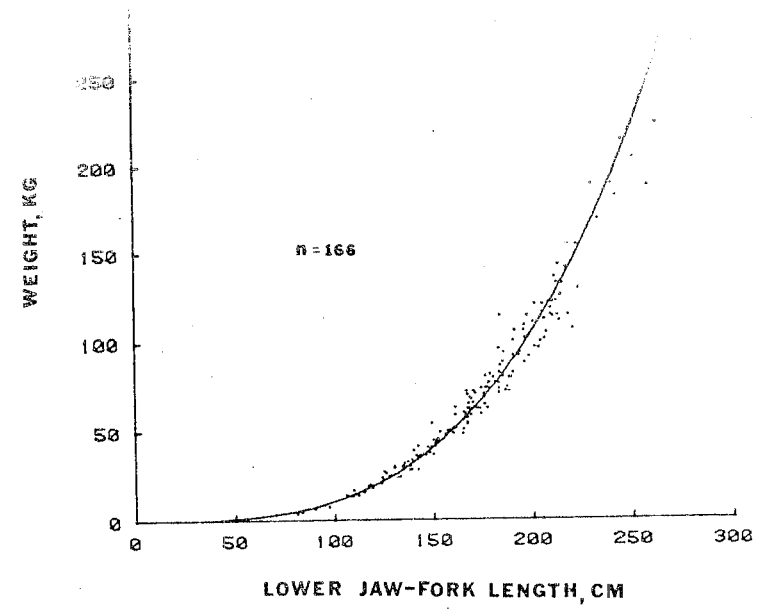


Figure 2. - Relationship between lower jaw-fork length and weight for swordfish, *Xiphus gladius*.

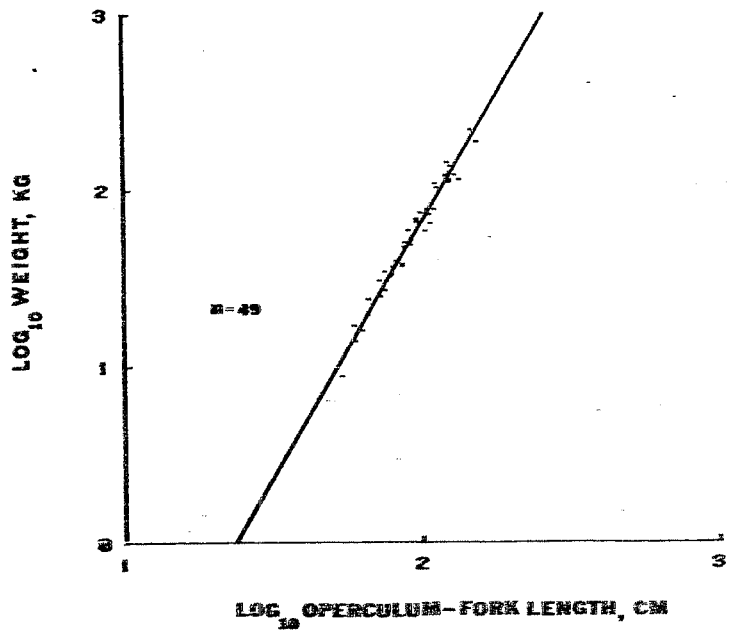
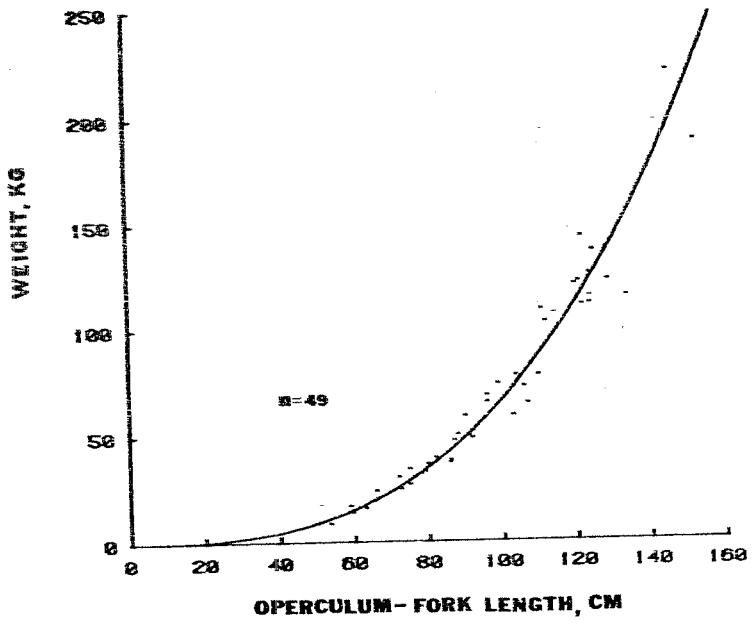


Figure 3. - Relationship between operculum-fork length and weight for Atlantic swordfish, *Xiphias gladius*.

Figure 4. - Relationship between lower jaw-fork length and operculum-fork length for Atlantic swordfish, *Xiphias gladius*.

