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SWIMBLADDER CROSS SECTIONS AND ACOUSTIC TARGET STRENGTHS OF 13 POLLACK AND 2 SAITHE

By

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ABSTRACT

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Data are presented on the swimbladder form and acoustic target strengths of each of 15 surface-adapted gadoids, 13 pollack (POLLACHIUS POLLACHIUS) and 2 saithe (POLLACHIUS VIRENS), of lengths from 31.5 to 44.5 cm. The swimbladder data consist in sagittal cross sections of the swimbladder, derived by shock-freezing of the whole fish and slicing with a microtome. The acoustic data consist in the dependence of the target strength on tilt angle for both dorsal and ventral aspects for each of four echo sounder frequencies, from 38 to 120 kHz. Possible uses of such data in acoustic modelling of swimbladder-bearing fish and in systematic studies of swimbladder morphometry are mentioned.

INTRODUCTION

Quantitative estimation of fish abundance with an echo sounder demands detailed knowledge of the target strength (MIDTTUN 1984). This has been recognized for at least three decades through a multiplicity of experimental and theoretical studies. While arguably no definitive result has been obtained, there has been nearly universal agreement on the importance of the swimbladder when present.

Attempts to estimate the magnitude of the swimbladder contribution to the echo energy have varied considerably. This is especially true for experimental studies involving direct acoustic measurement on fish with successively inflated and artificially deflated or removed swimbladders (HARDEN JONES and PEARCE 1958, SHIBATA 1970, 1971, HASLETT 1979). The estimated contribution has been under 50% as often as it has been over the same. Difficulties with technique, especially in ensuring the removal of all residual gas from the swimbladder or cavity created by its excision, can be imagined when not admitted.

That body of experimentally based evidence which is intrinsically non-intrusive is, however, consistent in its findings. Comparison of the measured target strengths of swimbladder-bearing fish with the measured target strengths of mackerel *(Scomber scombrus)*, which lacks a swimbladder, shows that the mean swimbladder contribution to the echo energy exceeds 90%. This has been established both for physoclists, as represented by the gadoids cod *(Gadus morhua)*, saithe *(Pollachius virens)*, and pollack *(Pollachius pollachius)* (McCartney and Stubbs 1971, Foote 1980), and for physostomes, as represented by herring *(Clupea harengus)* (Edwards and Armstrong 1983a,b).

Modelling swimbladder-bearing fish through the swimbladder for computing target strengths thus appears quite reasonable. It has, in fact, been done, although without particular advancement since the first model calculations performed by Midttun (Midttun and Hoff 1962), notwithstanding the notable but limited extension by Kalikhman (Kalikhman 1978, Yudanov and Kalikhman 1981). The general poorness in agreement of computation and measurement has probably been due to the simplicity of the assumed swimbladder form. Spheres, truncated right circular cylinders, and prolate ellipsoids are computationally convenient but apparently physically unsuitable for modelling the acoustic properties of typical, commercially important teleosts.

Recent work performed at the Institute of Marine Research, Bergen, based on the exact shape of the swimbladder has, however, been quite successful in predicting fish target strengths (Foote 1985). The new acoustic model can be improved, nonetheless, and it can be exercised differently with respect to the fundamental swimbladder data. To facilitate this process, the primary data source is presented here.

The novel and central experimental part of the data gathering, namely, the shock-freezing and slicing of the fish, is due entirely to Ona (1982). The description of the method below is not meant to supplant the original description or to preclude further publication by its originator. The target strength data tabulated by Ona (1982) are, however, superseded by those presented in this work.

MATERIALS AND METHODS

FISH

At the outset of the investigation, the subject fish specimens were 20 gadoids. These were selected at random from a holding pen containing several hundred pollack and saithe at the time of their measurement on 24 July 1980, during the project at Skogsvaagen (Foote 1983). After the final measurement procedure,

Table 1. Length, weight, and swimbladder dimensions of the 13 pollack and 2 saithe, including maximal dimensions, surface area, and volume of each swimbladder.

Fish no.	Species	Length (cm)	Mass (g)	Swimbladder: Maximal Length	dimensions (cm) Height	Width	Surface area (cm^2)	Volume (cm^3)
201	Pollack	31.5	195	10.58	0.98	1.44	39.03	6.88
202	Pollack	44.0	533	13.00	1.40	2.62	69.47	16.37
204	Pollack	35.5	321	12.44	1.18	1.66	52.57	10.16
205	Pollack	39.0	380	13.93	1.08	1.78	56.54	11.31
206	Pollack	35.0	287	8.74	1.34	1.76	35.46	7.83
207	Pollack	44.5	635	16.39	1.54	2.12	89.35	19.76
209	Saithe	38.5	385	11.31	1.28	1.74	48.37	10.12
213	Pollack	34.5	259	9.89	1.05	1.64	45.06	7.18
214	Pollack	39.0	406	12.71	1.30	1.64	54.21	9.82
215	Pollack	37.0	332	10.71	1.03	1.54	40.89	8.27
216	Pollack	36.5	343	11.99	1.17	1.80	48.79	10.46
217	Pollack	34.5	253	10.93	0.99	1.72	39.30	6.61
218	Pollack	32.5	257	11.00	0.98	1.36	35.26	6.28
219	Pollack	35.5	292	10.98	1.04	1.46	40.10	8.04
220	Saithe	38.0	406	13.27	1.18	1.68	53.87	10.57

complete data sets were available for only 15 specimens. The basic biology of these, including swimbladder dimensions, is shown in Table 1. The maximal swimbladder dimensions were determined directly from the swimbladder cross sections, and the swimbladder surface area and volume were derived from a surface triangulation.

TARGET STRENGTH MEASUREMENT

The acoustic backscattering properties of each fish were measured in the patented Institute manner, hence similarly to methods used by NAKKEN and OLSEN (1977), RØTTINGEN (1976), DALEN *et al.* (1976), and AKSLAND (1983). The particular procedure is described in FOOTE (1983), albeit for herring.

Briefly, a near-surface-swimming fish was scooped out of the holding pen and anesthetized by immersion in a sea water bath with 0.02% benzocaein. It was then tethered in a suspension system, lowered to 2.5 m depth, and tilted over an angular range spanning 90 deg, centered on the horizontal, while pairs of echo sounders pinged alternately. The measurements were performed for both dorsal and ventral aspects for each of the four combinations of center frequency and pulse duration described in Table 2. Calibration of the echo sounders was performed by means of a solid spherical target, whose absolute target strength at each of the several frequencies was determined retroactively through an intercalibration with subsequently better-known targets.

Table 2. Center frequencies and pulse durations of the four SIMRAD echo sounders used in measuring the target strength functions.

Echo-sounder	Center frequency (kHz)		Pulse duration (ms)	
	Nominal	Measured	Nominal	Measured
EK-38	38.0	38.1	0.6	0.64
EK-50	49.5	49.6	0.6	0.57
EY-M	70.0	68.4	0.6	0.60
EK-120	120.0	120.4	0.6	0.68

Shock-freezing and slicing of fish

Immediately following measurement of the target strength functions and length and weight of each fish, the still-anesthetized fish was shock-frozen (ONA 1982). The procedure itself consisted in holding the fish in horizontal, outstretched posture between pairs of tongs grasping the snout and tail. The fish was lowered into a bath of alcohol maintained at a temperature of − 50° C by the frequent addition of Dry Ice. It was thoroughly frozen after only a few minutes. The frozen fish was then tagged and stored in a portable, insulated box containing Dry Ice for later transfer to a freezer at the Institute for long-term storage.

The fish were retrieved from the freezer in February 1981. They were then encased in blocks of carboxymethyl cellulose (CMC) by immersion of the frozen fish in a solution of liquid CMC held in the microtome's freezing frame and immediate rapid freezing of the entire system in an alcohol bath maintained at − 70° C. The block-encased fish was then trimmed in the sagittal plane. This process was performed at 200 μm intervals until the fish was first exposed. Slicing through the fish and fish swimbladder was performed at 100 μm intervals.

At more or less regular intervals, depending on the observed degree of form change, the entire cross section was photographed. Use of various visual references, either singly or multiply, enabled the individual sagittal cross sections to be aligned in the subsequent swimbladder-mapping operation. A ruler, flush with the plane of the exposed cross section, was invariably photographed.

Four fish were damaged irremediably in the course of the slicing, and the visual reference system of one fish was lost during the photography. Thus the 20 specimens of first measurement became the 15 of final and complete measurement.

Digitization of swimbladder cross section

This procedure consisted in tracing the outline of the swimbladder inner wall on the photographed sagittal cross sections with a cursor connected to a digital computer. The data were stored for later editing. This involved checking the fidelity of the digitization for each cross section, alignment of all swimbladder cross sectional contours for the same fish, scaling of dimensions to the true size, and further referral of these to the horizontal, with head to the right. The absolute orientation of the swimbladder was determined by associating the fish centerline, or imaginary line running from the tip of the upper jaw to the root of the tail, with the horizontal, as the two were assumed to coincide for the normal fish posture.

The described procedure is utterly routine, although or hence requiring some attention, if not vigilance, in its conduct. One aid to the digitization part of the procedure is preliminary enhancement of the swimbladder inner wall with a fine drafting pen. This is best performed by a knowing fisheries biologist.

DATA

Swimbladder cross sections

The swimbladder cross sections are shown in Figs. 1–15. These are derived from the described digitizations, including required editing, alignment, absolute orientation, and scaling operations. As mentioned above, the viewing plane is sagittal, the head is oriented to the right, and the fish centerline is parallel with the horizontal. The single opening in each contour merely indicates the gap between first and last points of the non-overlapping portion of each digitization.

Each frame or cross section is labelled with three numbers in the upper left-hand corner. These denote, respectively, the fish number, the number of the frame or cross section, and the depth of the cross section in units of millimeters.

Target strength functions

The target strengths of the fish whose swimbladders are shown in cross section in Figs. 1–15 are shown in Tables 3–17 and Figs. 16–30. These are paired for each fish.

The target strengths are expressed as functions of the tilt angle. This is defined as the angle made by the fish centerline with the horizontal. Positive tilt angles denote the true head-up posture, and negative tilt angles denote the true head-down posture. The measurements were interpolated at 1 deg intervals for the tables, and at 0,5 deg intervals for the figures.

Both the target strength and the backscattering cross section are shown for each tilt angle for each aspect for each frequency. The backscattering cross section was determined through the echo energy (FOOTE 1982), as the pulse durations were finite, if long compared to the respective acoustic wavelengths, cf. Fig. 1. The target strength TS is defined in terms of the backscattering cross section σ_b through the usual definition (URICK 1975),

$$TS = 10 \log (\sigma_b/4\pi),$$

although with use of SI units, hence with expression of σ_b in units of square meters.

In the table headings, THETA denotes the tilt angle and SB, the backscattering cross section. For convenience, SB is expressed in units of square centimeters, and TS is expressed in units of decibels, each specified to the nearest 0.1 in the respective units. For this particular representation, the target strength value is more precise for weak echoes, and the backscattering cross section value is more precise for strong echoes. The crossover occurs at SB=4.3 cm^2 or TS=-44.7 dB.

SOME USES OF THE DATA

The envisaged primary use of the data presented here is in the acoustic modelling of swimbladder-bearing fish, at least for the represented gadoids. The data may be employed in the development of shape-dependent models by confirming computations based on the exact swimbladder shape with measurement. Given success, the developed model may then be exercised in a systematic study of fish target strength.

One limitation to such modelling is imposed by the rather narrow length range, from 31.5 to 44.5 cm, of the present data. However, because of performance of the measurements over the frequency range from 38 to 120 kHz, the effective size range at a given frequency is larger. Full exploitation of this expansion in effective fish lengths does depend on the hypothesis of scaling, i.e., of constant proportions of the swimbladder of the same fish over a certain size range. Clearly this has an approximate validity, although its extent is unknown.

A collateral use of the data presented here is thus apparent, namely in a morphometric study of the swimbladder. This can only be begun however, for what is required is a systematic study that elucidates the swimbladder form, its size, shape, and form variations, with species, fish size, and biological condition, e.g., sex, state of maturity, and degree of stomach filling. Additional quantitative data on the variation of swimbladder form with ambient pressure may contribute to the solution of some of the outstanding problems of fisheries acoustics. Included among these are the problems of the pressure or pressure-history-dependence of fish target strength, and species differentiation by *in situ* target strength measurement.

ACKNOWLEDGEMENTS

R. Pedersen and A. Raknes are thanked for assistance during the original data collection. K. Ingebrktsen and colleagues at Norges Veterinærhøyskole are warmly thanked for allowing and assisting in use of their cryomicrotome. Norges Fiskeriforskningsråd is thanked for its support of the 1980 project «Akustisk spredning fra fisk», which facilitated both the data collection and some of the early data analysis.

REFERENCES

AKSLAND, M. 1983. Acoustic abundance estimation of the spawning component of the local herring stock in Lindaaspollene, western Norway. *FiskDir. Skr. Ser. HavUnders., 17:*297–334.

DALEN, J., RAKNES, A. and RØTTINGEN, I. 1976. Target strength measurements and acoustic biomass estimation of capelin and 0-group fish. *Coun. Meet. int. Coun. Explor. Sea, 1976* (B:37): 1–13. [Mimeo.]

EDWARDS, J. I. and ARMSTRONG, F. 1983a. Measurement of the target strength of live herring and mackerel. *FAO Fish. Rep.*, (300): 69–77.

EDWARDS, J. I. and ARMSTRONG, F. 1983b. Target strength measurements on herring, sprat and mackerel. *Coun. Meet. int. Coun. Explor. Sea, 1983* (B:23): 1–9. (Mimeo.)

FOOTE, K. G. 1980. Importance of the swimbladder in acoustic scattering by fish: A comparison of gadoid and mackerel target strengths. *J. Acoust. Soc. Am.*, 67: 2084–2089.

FOOTE, K.G. 1982. Optimizing copper spheres for precision calibration of hydroacoustic equipment. *J. Acoust. Soc. Am., 71:* 742–747.

FOOTE, K. G. 1983. Linearity of fisheries acoustics, with addition theorems. *J. Acoust. Soc. Am., 73:* 1932–1940.

FOOTE, K. G. 1985. Rather high-frequency sound scattering by swimbladdered fish. *J. Acoust. Soc. Am., 78:* 688–700.

HARDEN JONES, F. R. and PEARCE, G. 1958. Acoustic reflexion experiments with perch *(Perca fluviatilis* Linn.) to determine the proportion of the echo returned by the swimbladder. *J. Exp. Biol., 35:* 437–450.

HASLETT, R. W. G. 1979. The fine structure of sonar echoes from underwater targets, such as fish. Pp. 307–320 in *Anon.* ed. *Ultrasonics International 79 Conf. Proc. Graz, Austria, 15–17 May 1979.* IPC Sci. and Tech. Press, Guildford, England.

KALIKHMAN, I. L. 1978. Scattering of sound by fish and fish models. *Proc. All-Union Res. Inst. Mar. Fish. Oceanog. (VNIRO), 135:* 83–88.

McCARTNEY, B. S. and STUBBS, A. R. 1971. Measurements of the acoustic target strengths of fish in dorsal aspect, including swimbladder resonance. *J. Sound Vib., 15.*, 397–420.

MIDTTUN, L. 1984. Fish and other organisms as acoustic targets. *Rapp. P.-v. Réun. Cons. int. Explor. Mer, 184:* 25–33.

MIDTTUN, L. and HOFF, I. 1962. Measurements of the reflection of sound by fish. *FiskDir. Skr. Ser. HavUnders., 13*(3): 1–18.

NAKKEN, O. and OLSEN, K. 1977. Target strength measurements of fish. *Rapp. P.-v. Réun. Cons. int. Explor. Mer, 170:* 52–69.

ONA, E. 1982. *Kartlegging av svømmeblærens form og formstabilitet for teoretiske beregninger av akustisk refleksjon fra fisk.* Thesis (Cand. real.). University of Bergen. 231 pp.

RØTTINGEN, I. 1976. On the relation between echo intensity and fish density. FISKDIR. SKR. SER. HAV UNDERS., 16: 301–314.

SHIBATA, K. 1970. Study on details of ultrasonic-reflection from individual fish. *Bull. Fac. Fish. Nagasaki Univ.*, (29): 1–82.

SHIBATA, K. 1971. Experimental measurement of target strength of fish. Pp. 104–108 in KRISTJONSSON, H., ed. *Modern fishing gear of the world: 3.* Fishing News (Books) Ltd., London.

URICK, R.J. 1975 *Principles of Underwater Sound.* Rev. ed. McGraw-Hill Book Company, New York. 384 pp.

YUDANOV, K. and KALIKHMAN, I. L. 1981. Sound scattering by marine animals. Pp.53–95 in SUOMALA, J. B., JR. ed. *Meeting on hydrocoustical methods for the estimation of marine fish populations. Cambridge, Massachusetts, 25–29 June 1979. Vol. 2.* Draper Laboratory, Cambridge, Massachusetts.

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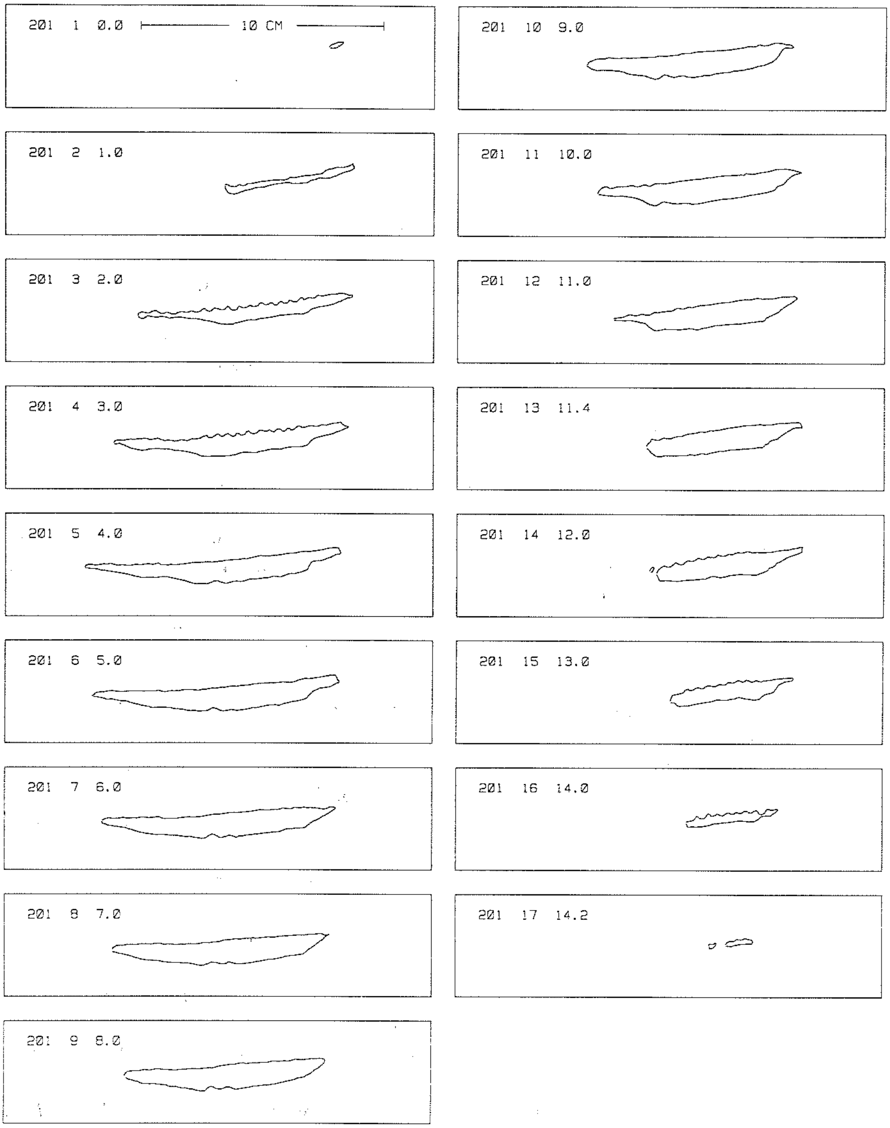


FIG. 1. SWIMBLADDER CROSS SECTIONS OF FISH NO. 201: POLLACK, 31.5 CM, 195 G.

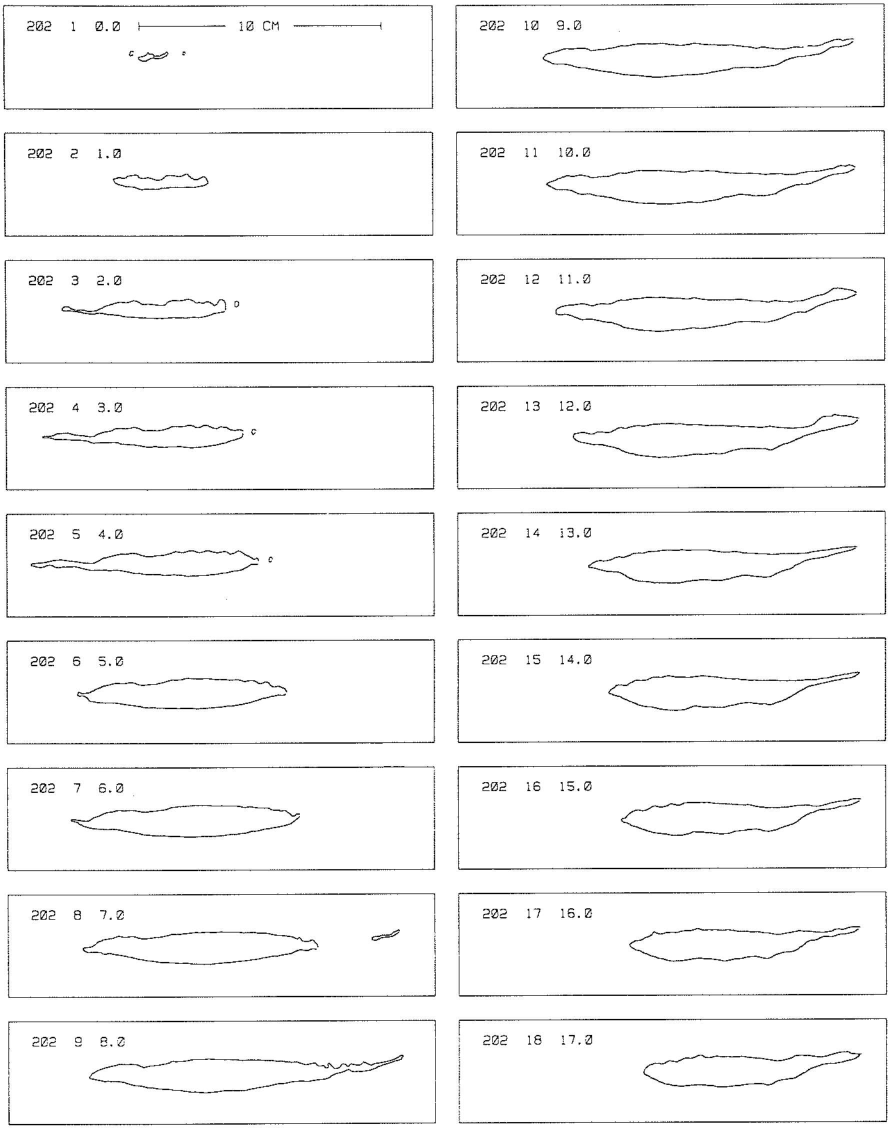
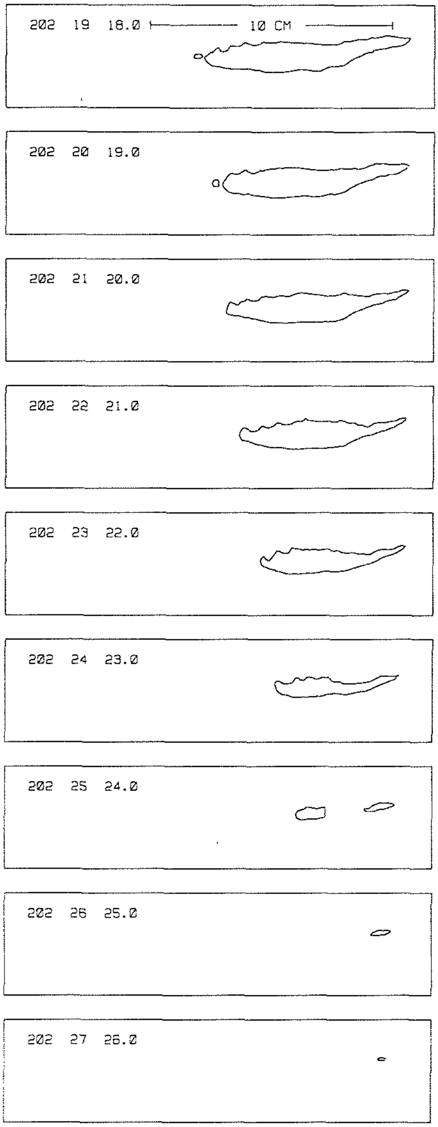


FIG. 2. SWIMBLADDER CROSS SECTIONS OF FISH NO. 202: POLLACK. 44.0 CM. 533 G.



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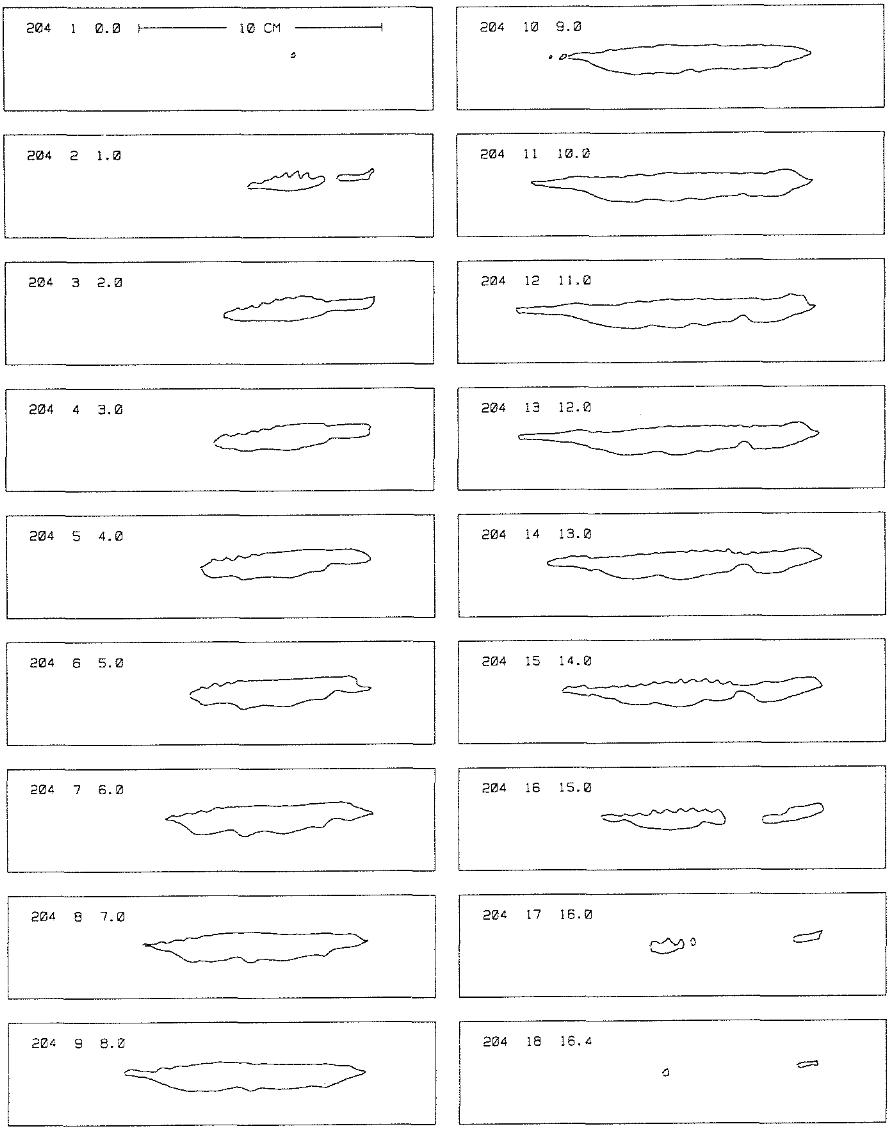


FIG. 3. SWIMBLADDER CROSS SECTIONS OF FISH NO. 204: POLLACK, 35.5 CM, 321 G.

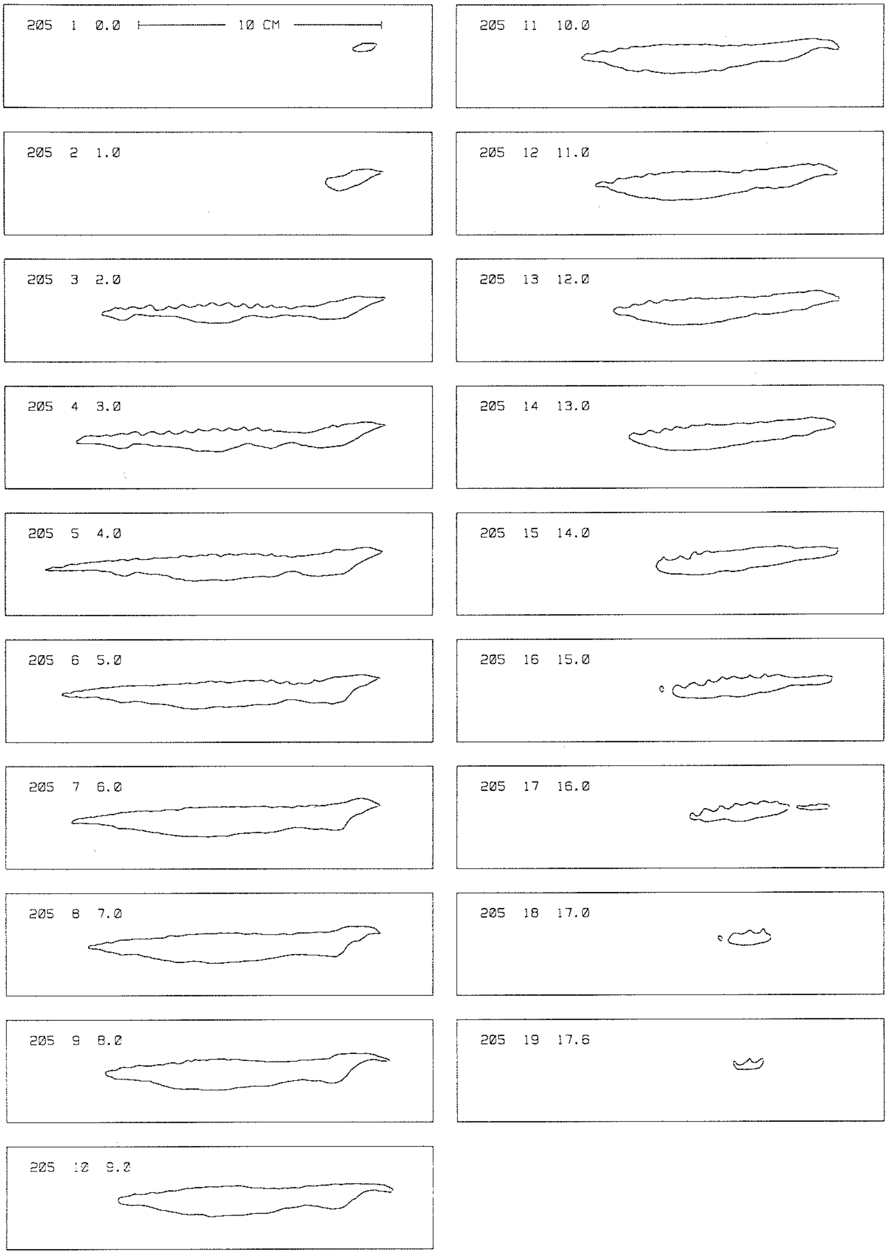


FIG. 4. SWIMBLADDER CROSS SECTIONS OF FISH NO. 2Ø5: POLLACK, 39.Ø CM, 38Ø G.

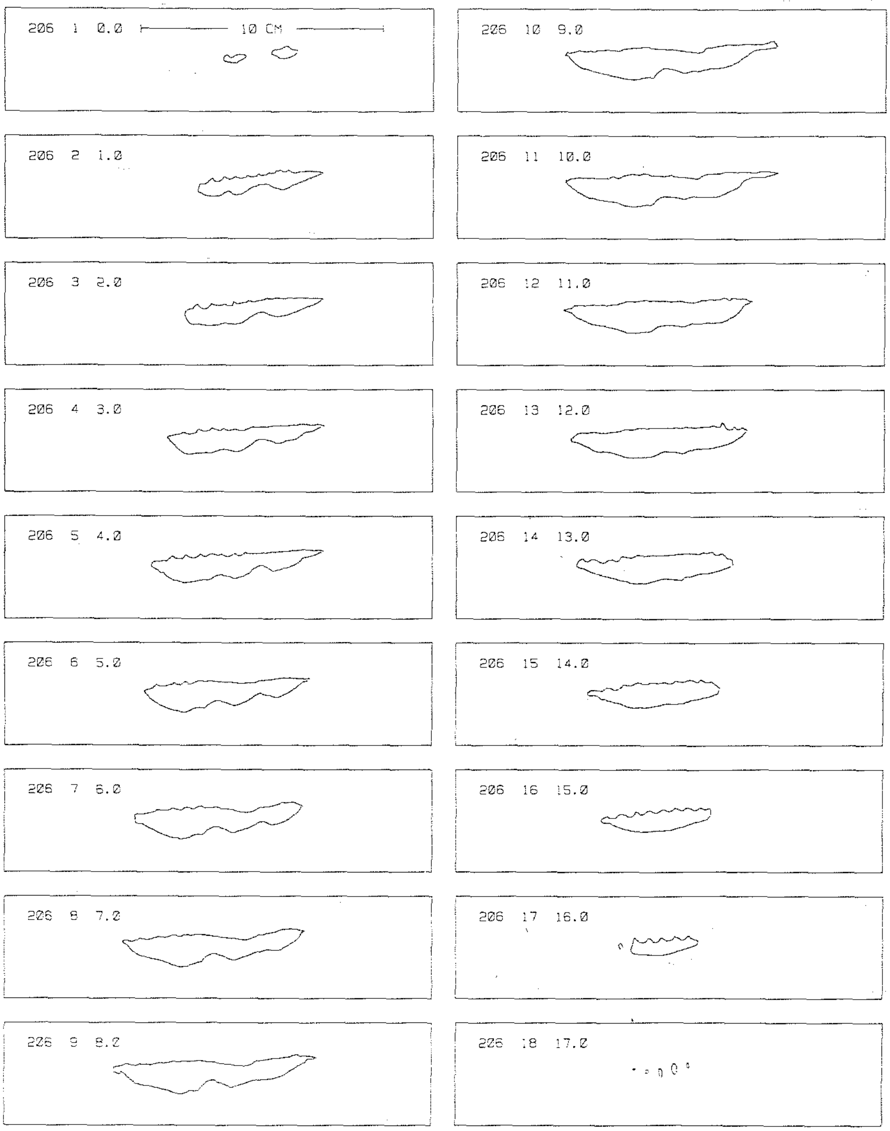


FIG. 5. SWIMBLADDER CROSS SECTIONS OF FISH NO. 206: POLLACK. 35.0 CM. 287 G.

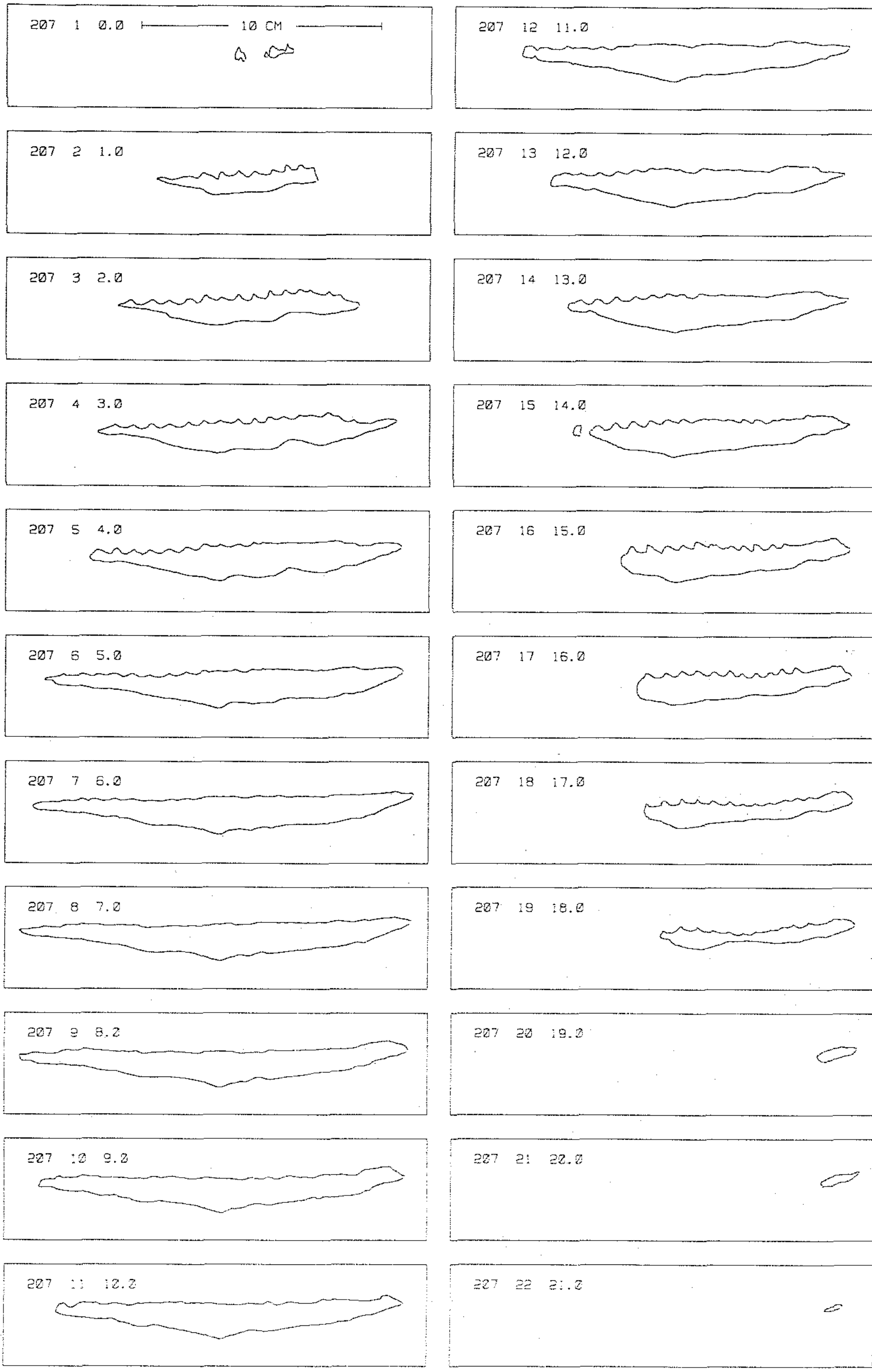


FIG. 6. SWIMBLADDER CROSS SECTIONS OF FISH NO. 207: POLLACK, 44.5 CM, 635 G.

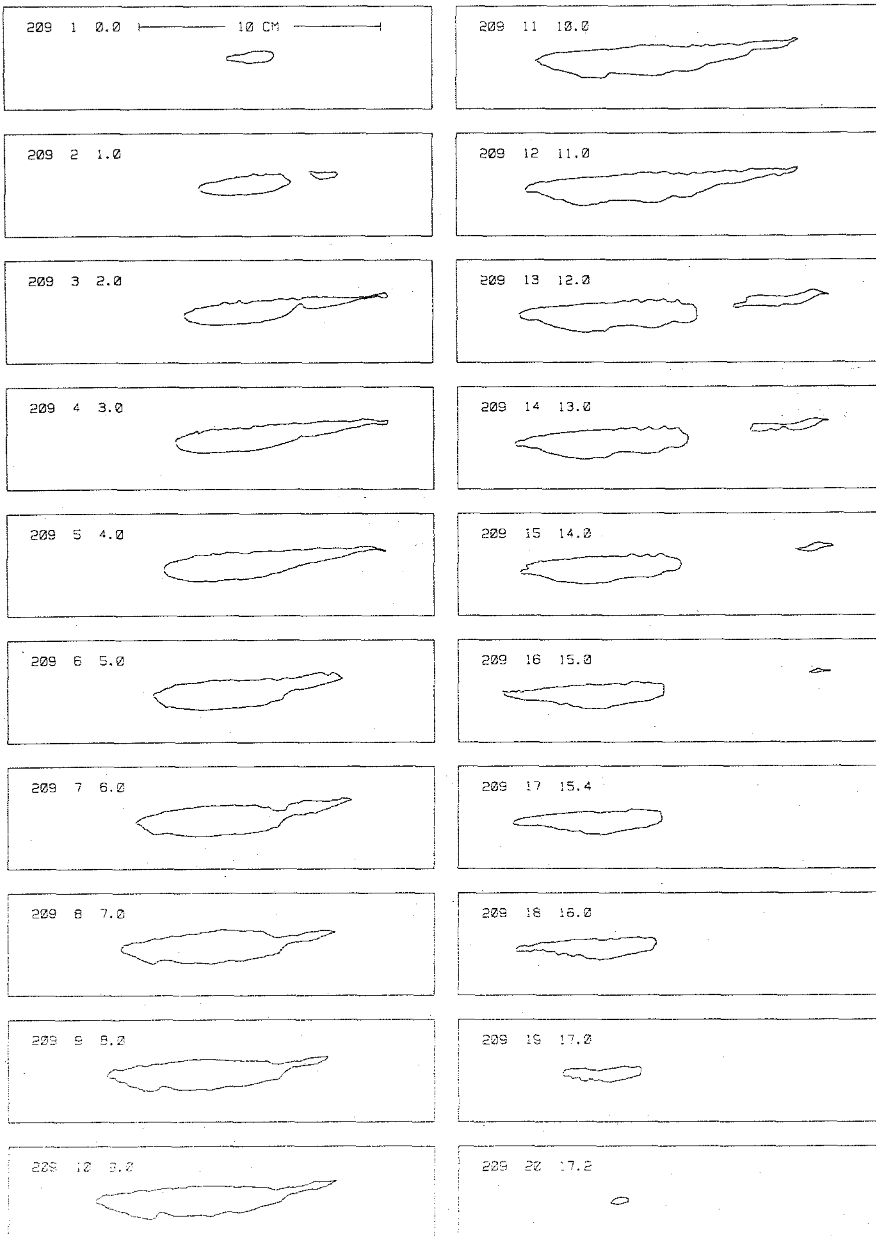


FIG. 7. SWIMBLADDER CROSS SECTIONS OF FISH NO. 209: SAITHE. 38.5 CM, 385 G.

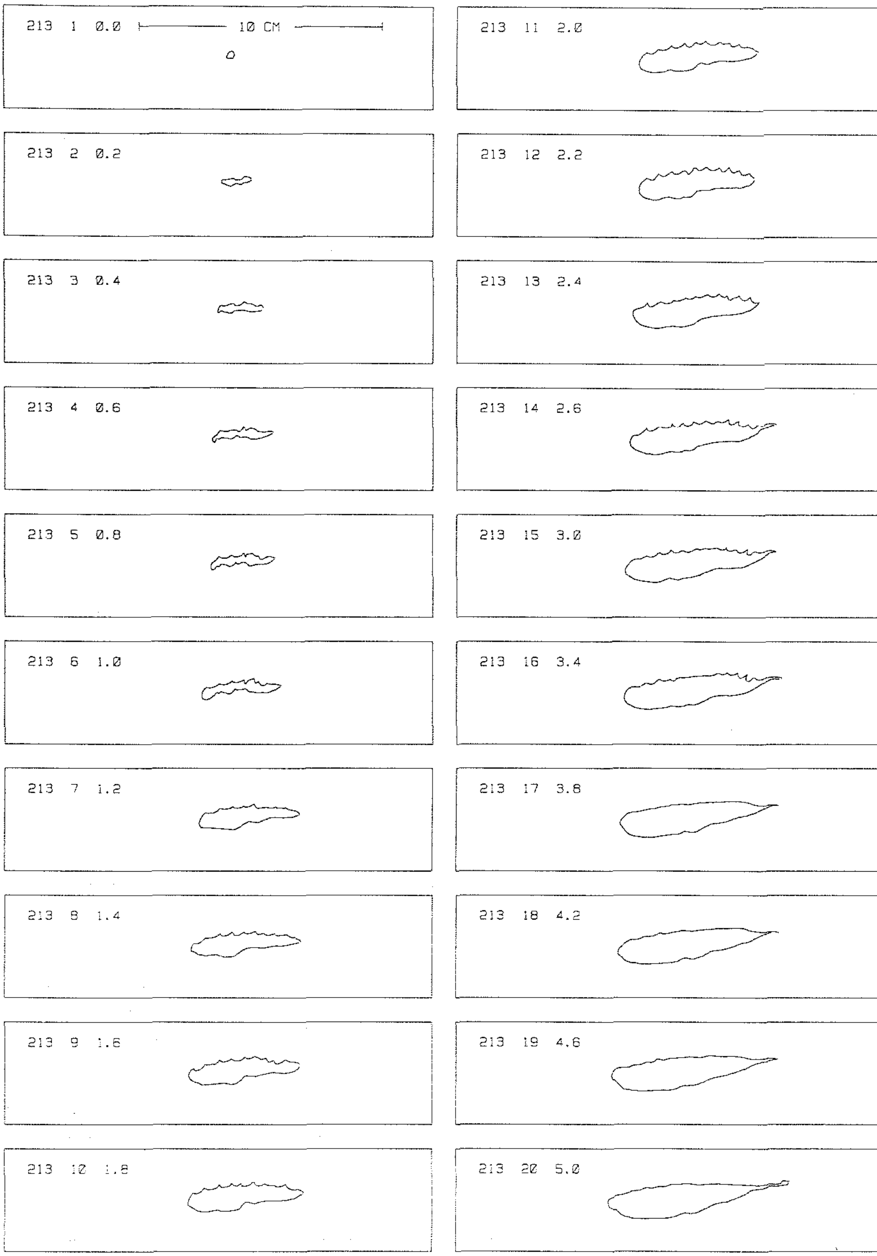


FIG. 8. SWIMBLADDER CROSS SECTIONS OF FISH NO. 213: POLLACK, 34.5 CM, 259 G.

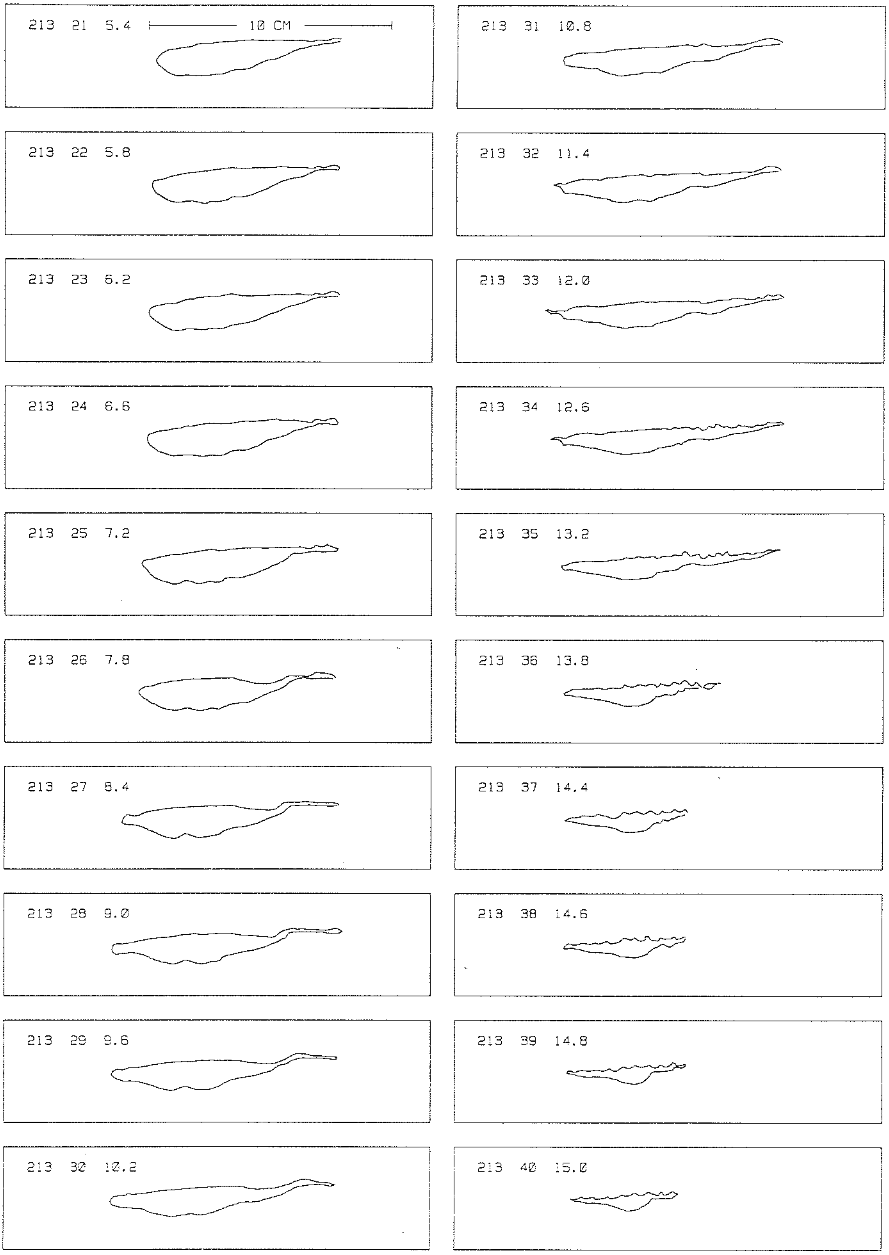
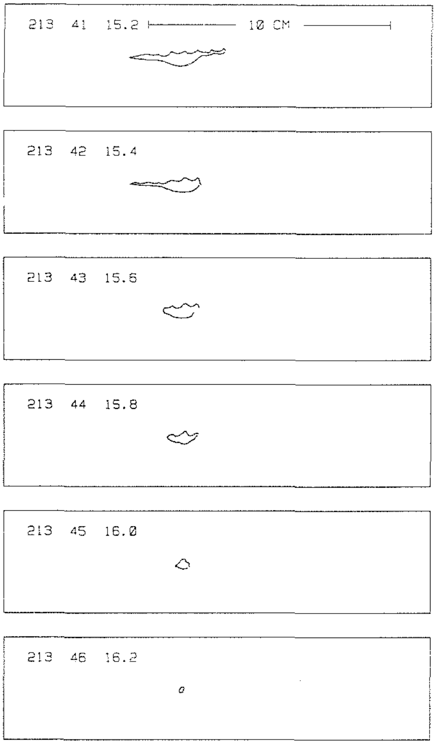


FIG. 8. (CONTINUED)



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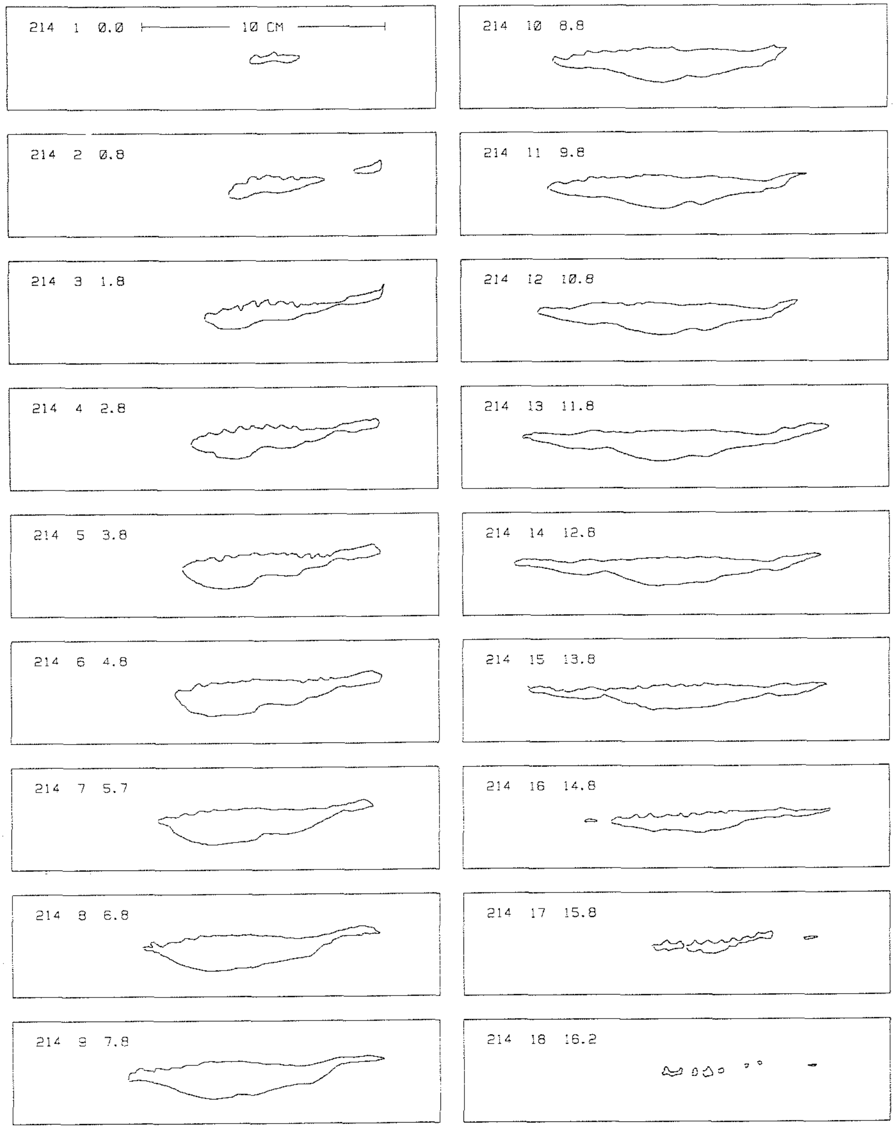

FIG. 9. SWIMBLADDER CROSS SECTIONS OF FISH NO. 214: POLLACK. 39.Ø CM. 4Ø6 G.

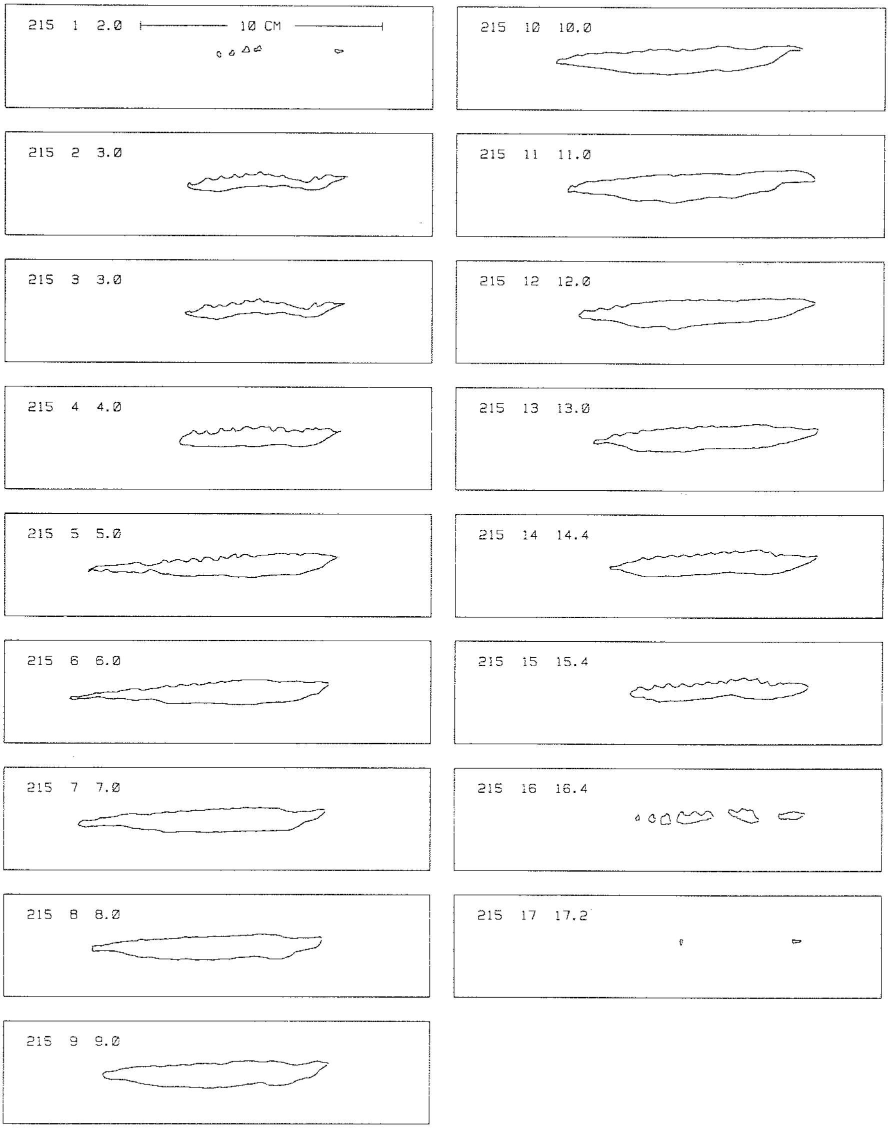

FIG. 1Ø. SWIMBLADDER CROSS SECTIONS OF FISH NO. 215: POLLACK, 37.Ø CM, 332 G.

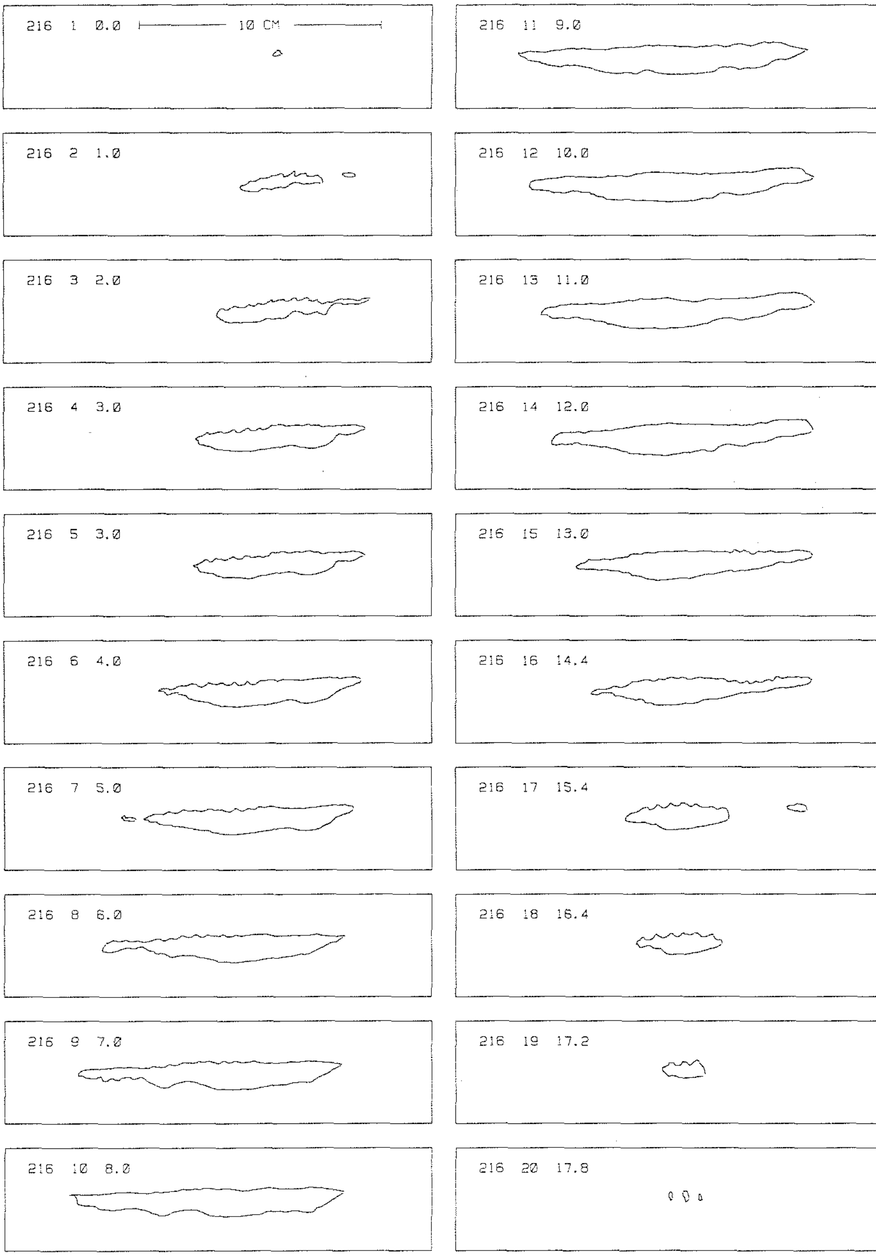

FIG. 11. SWIMBLADDER CROSS SECTIONS OF FISH NO. 216: POLLACK, 36.5 CM, 343 G.

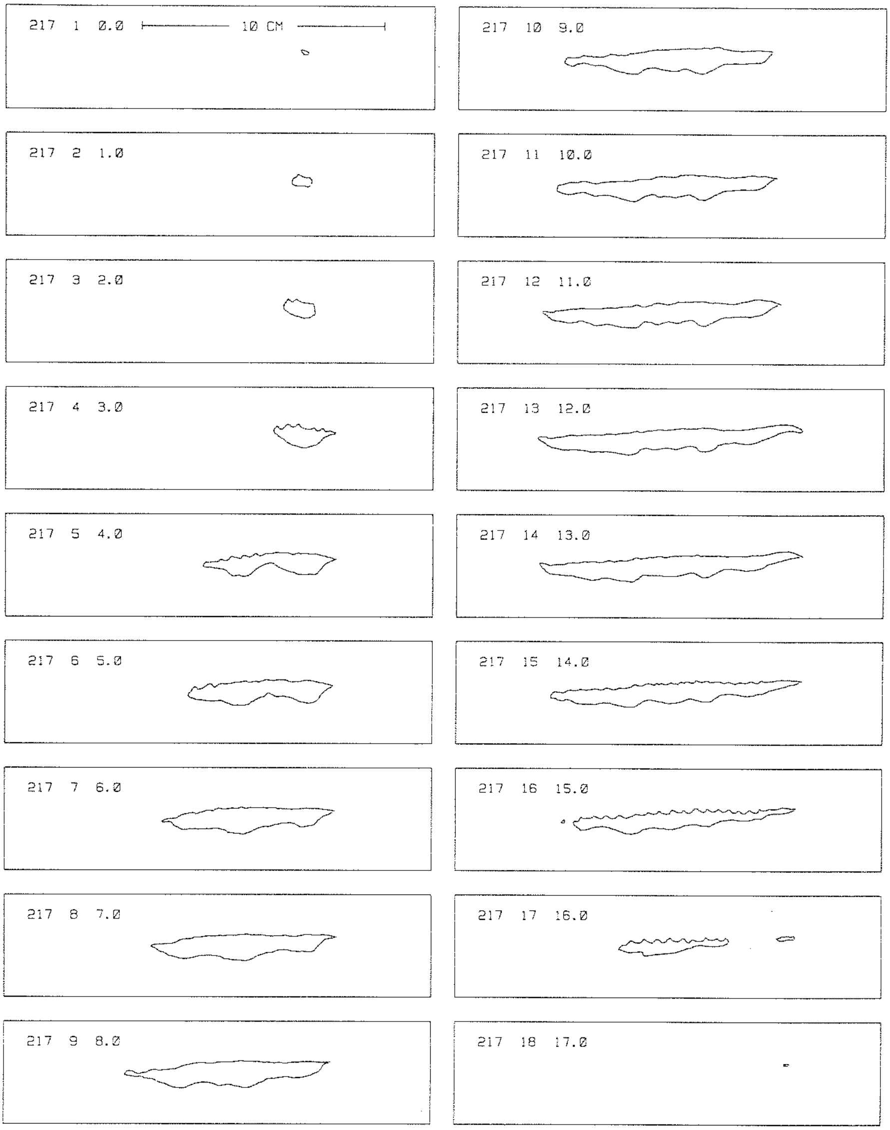

FIG. 12. SWIMBLADDER CROSS SECTIONS OF FISH NO. 217: POLLACK, 34.5 CM, 253 G.

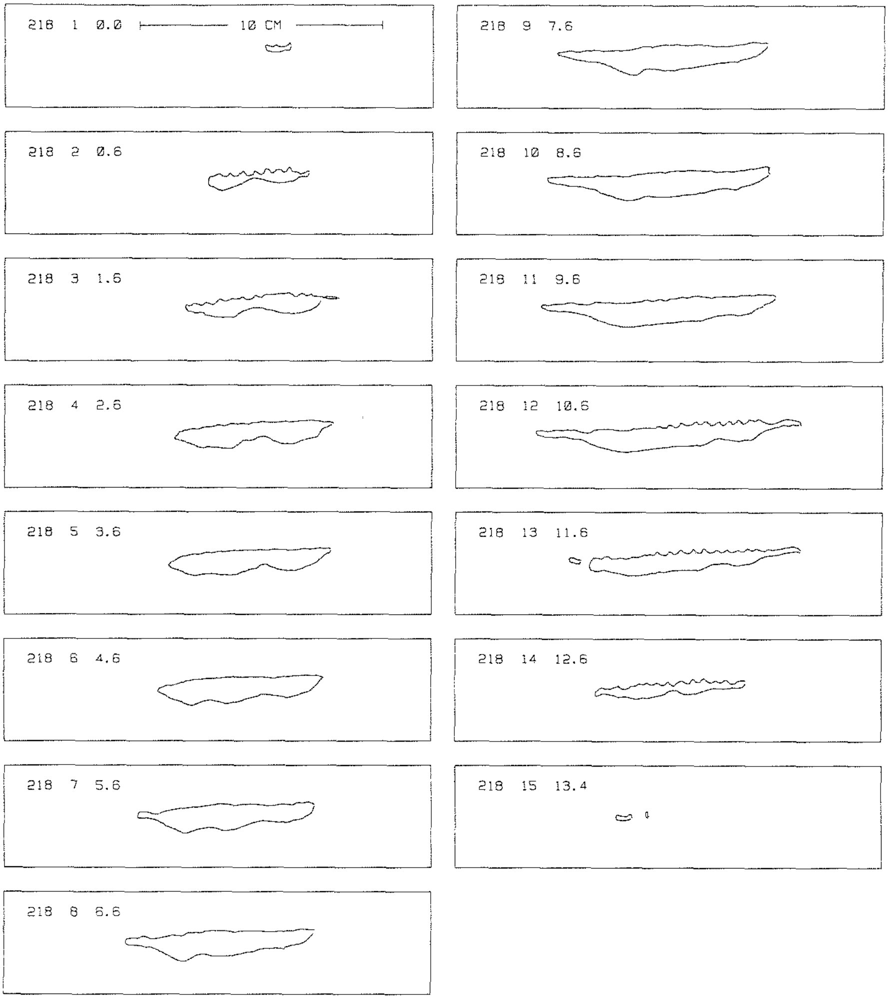

FIG. 13. SWIMBLADDER CROSS SECTIONS OF FISH NO. 218: POLLACK, 32.5 CM, 257 G.

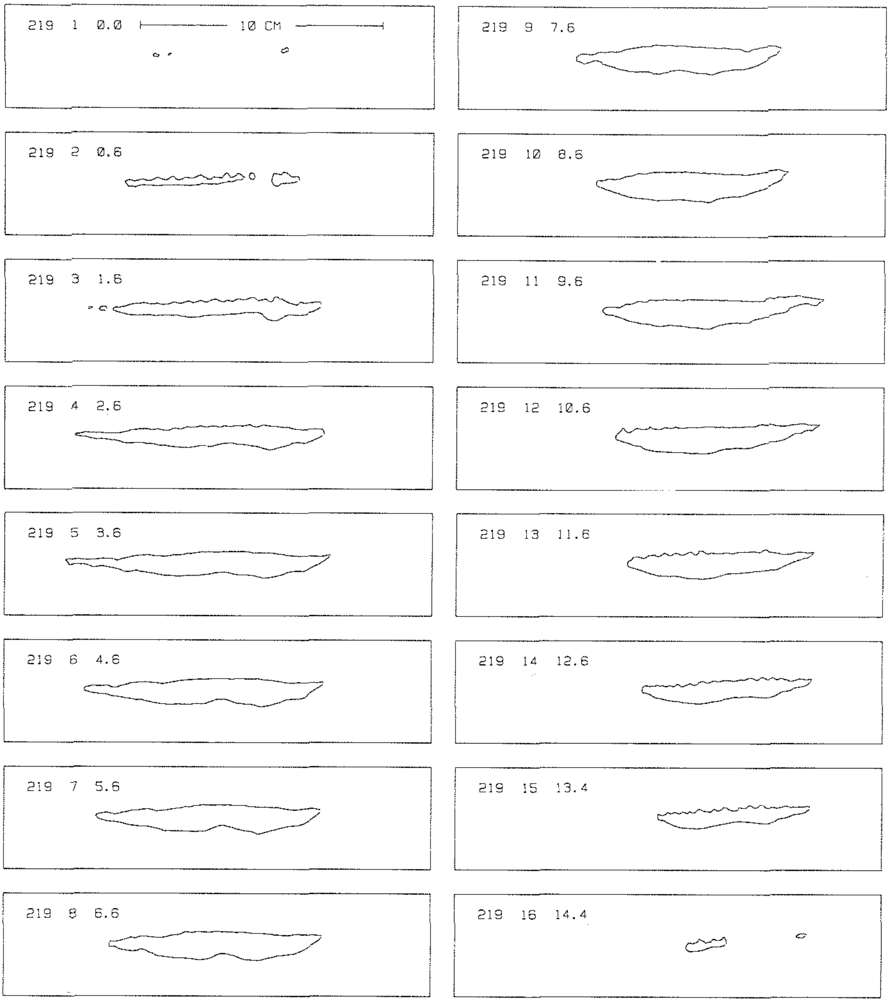

FIG. 14. SWIMBLADDER CROSS SECTIONS OF FISH NO. 219: POLLACK, 35.5 CM, 292 G.

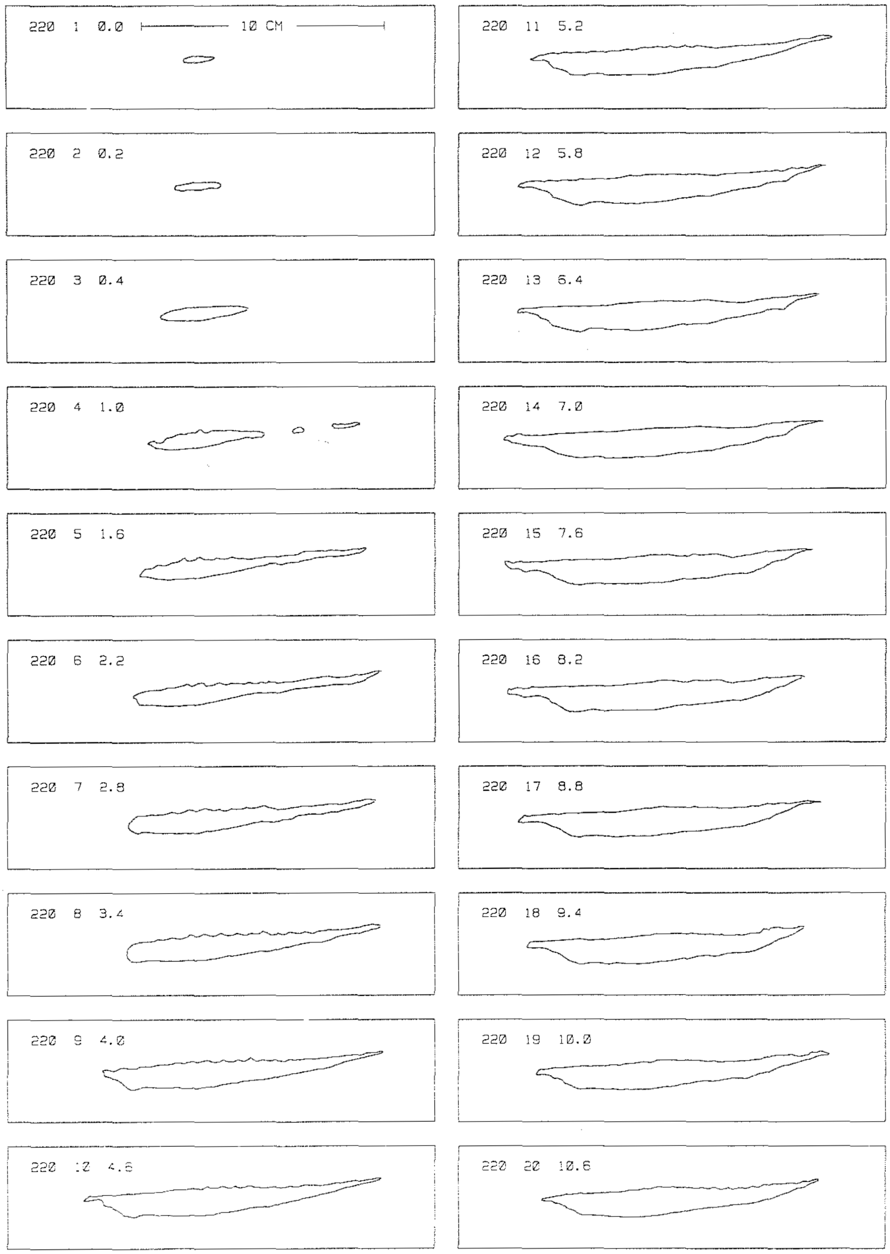

FIG. 15. SWIMBLADDER CROSS SECTIONS OF FISH NO. 220: SAITHE, 38.0 CM, 406 G.

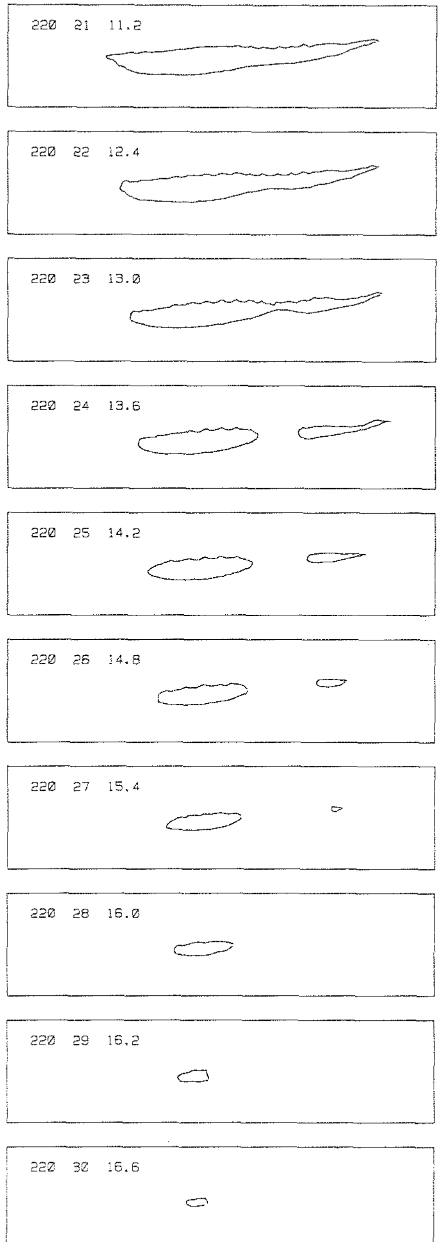

FIG. 15. (CONTINUED)

TABLE 3. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 201: POLLACK, 31.5 CM, 195 G.

THETA	38.1 KHZ DORSAL SB	TS	38.1 KHZ VENTRAL SB	TS	49.6 KHZ DORSAL SB	TS	49.6 KHZ VENTRAL SB	TS	68.4 KHZ DORSAL SB	TS	68.4 KHZ VENTRAL SB	TS	120.4 KHZ DORSAL SB	TS	120.4 KHZ VENTRAL SB	TS
-45	0.0	-64.9	2.5	-47.1	1.5	-49.2	3.8	-45.2	0.7	-52.4	0.3	-56.1	0.4	-55.0	11.2	-40.5
-44	0.0	-67.1	1.9	-48.2	1.1	-50.7	4.5	-44.5	0.9	-51.6	0.4	-54.5	0.5	-54.4	14.4	-39.4
-43	0.0	-67.1	3.5	-45.6	0.5	-54.1	4.8	-44.2	0.6	-52.9	0.7	-52.3	2.0	-48.0	8.3	-41.9
-42	0.0	-67.1	0.8	-51.8	0.4	-55.3	4.4	-44.6	0.1	-61.7	1.5	-49.1	3.6	-45.4	7.1	-42.5
-41	0.0	-67.1	2.8	-46.5	1.3	-49.9	3.0	-46.2	0.0	-65.2	2.5	-47.1	4.6	-44.4	4.7	-44.3
-40	0.1	-62.5	3.5	-45.6	0.7	-52.6	1.9	-48.3	0.1	-59.7	3.7	-45.3	4.1	-44.9	1.2	-50.2
-39	0.2	-58.3	2.0	-48.0	0.5	-53.7	2.8	-46.5	0.4	-55.0	6.4	-42.9	0.3	-55.9	0.9	-51.5
-38	0.3	-56.3	3.9	-45.1	1.2	-50.1	4.2	-44.8	0.7	-52.3	6.2	-43.1	0.7	-52.5	0.8	-51.7
-37	0.5	-54.4	2.4	-47.2	2.4	-47.2	5.7	-43.4	1.5	-49.3	3.9	-45.1	0.5	-53.8	0.6	-53.5
-36	0.6	-52.9	1.2	-50.3	2.5	-47.0	6.3	-43.0	2.2	-47.6	4.7	-44.3	0.1	-61.3	1.5	-49.2
-35	0.8	-52.1	1.3	-50.0	1.6	-49.0	6.4	-42.9	3.3	-45.8	5.2	-43.8	1.0	-51.1	1.6	-48.9
-34	0.9	-51.6	0.4	-55.3	0.5	-54.0	6.2	-43.1	3.5	-45.5	4.7	-44.3	2.7	-46.6	4.8	-44.2
-33	0.8	-52.0	2.4	-47.2	0.2	-57.5	9.1	-41.4	2.5	-47.0	3.8	-45.2	2.5	-47.1	12.9	-39.9
-32	0.5	-54.3	1.1	-50.4	0.2	-57.1	10.2	-40.9	2.2	-47.6	2.2	-47.5	0.3	-56.5	13.5	-39.7
-31	0.4	-55.4	0.8	-52.2	0.9	-51.3	9.5	-41.2	2.4	-47.2	1.2	-50.2	0.5	-53.7	6.9	-42.6
-30	0.9	-51.3	0.8	-52.0	1.3	-49.9	8.1	-41.9	1.5	-49.2	3.4	-45.7	0.7	-52.7	2.7	-46.7
-29	1.4	-49.5	0.1	-59.6	1.2	-50.1	6.9	-42.6	0.3	-55.8	11.7	-40.3	0.1	-60.9	1.7	-48.8
-28	1.6	-48.9	1.5	-49.3	0.5	-53.6	10.0	-41.0	1.1	-50.6	16.6	-38.9	0.6	-52.9	1.0	-51.0
-27	1.6	-48.9	1.1	-50.7	1.2	-50.1	12.0	-40.2	1.9	-48.3	17.0	-38.7	0.6	-53.5	0.1	-60.5
-26	1.2	-50.1	1.0	-51.0	1.5	-49.1	12.0	-40.2	1.4	-49.4	11.7	-40.3	0.1	-59.8	0.8	-52.1
-25	0.7	-52.7	2.2	-47.6	1.3	-50.0	8.9	-41.5	0.7	-52.5	14.4	-39.4	0.5	-54.1	0.7	-52.3
-24	0.7	-52.6	1.0	-51.2	0.4	-55.2	5.0	-44.0	1.9	-48.2	15.8	-39.0	2.2	-47.5	0.2	-57.2
-23	1.3	-49.8	1.7	-48.8	1.5	-49.3	2.9	-46.4	1.3	-49.8	17.0	-38.7	6.9	-42.6	0.6	-53.0
-22	2.5	-47.0	2.0	-47.9	1.9	-48.1	1.5	-49.2	0.1	-62.7	25.1	-37.0	14.4	-39.4	4.8	-44.2
-21	2.4	-47.2	2.0	-47.9	1.5	-49.1	1.0	-50.9	0.2	-58.4	25.1	-37.0	4.3	-44.7	6.4	-42.9
-20	1.6	-48.9	1.7	-48.6	1.1	-50.7	2.2	-47.6	0.9	-51.4	17.3	-38.6	4.5	-44.5	2.4	-47.2
-19	3.8	-45.2	0.9	-51.4	1.3	-50.0	5.5	-43.6	3.5	-45.6	13.8	-39.6	2.9	-46.4	4.9	-44.1
-18	5.7	-43.4	1.7	-48.7	1.6	-49.0	7.7	-42.1	4.5	-44.5	22.9	-37.4	0.7	-52.8	2.3	-47.4
-17	8.7	-41.6	1.1	-50.6	6.6	-42.8	9.8	-41.1	2.7	-46.7	15.1	-39.2	8.3	-41.8	9.3	-41.3
-16	9.8	-41.1	3.2	-45.9	10.7	-40.7	11.5	-40.4	11.5	-40.4	4.0	-45.0	7.7	-42.1	4.7	-44.3
-15	9.5	-41.2	6.7	-42.7	20.4	-37.9	12.0	-40.2	20.4	-37.9	1.8	-48.4	3.9	-45.1	4.5	-44.5
-14	7.1	-42.5	9.1	-41.4	26.9	-36.7	12.0	-40.2	20.4	-37.9	0.8	-52.2	1.7	-48.8	2.2	-47.5
-13	6.3	-43.0	11.2	-40.5	31.6	-36.0	10.7	-40.7	13.8	-39.6	1.1	-50.6	6.9	-42.6	2.0	-47.9
-12	9.8	-41.1	14.1	-39.5	35.4	-35.5	6.9	-42.6	42.6	-34.7	2.8	-46.5	21.3	-37.7	26.3	-36.8
-11	17.3	-38.6	17.0	-38.7	40.7	-34.9	10.2	-40.9	46.7	-34.3	8.9	-41.5	30.9	-36.1	26.3	-36.8
-10	25.1	-37.0	19.9	-38.0	46.7	-34.3	15.8	-39.0	54.9	-33.6	19.5	-38.1	35.4	-35.5	14.1	-39.5
-9	32.3	-35.9	21.3	-37.7	53.6	-33.7	20.9	-37.9	65.9	-32.8	25.7	-36.9	33.9	-35.7	6.7	-42.7
-8	40.7	-34.9	22.3	-37.5	64.4	-32.9	25.1	-37.0	89.0	-31.5	27.5	-36.6	131.6	-29.8	5.0	-44.0
-7	51.2	-33.9	22.9	-37.4	85.0	-31.7	25.1	-37.0	117.3	-30.3	41.6	-34.8	194.6	-28.1	30.1	-36.2
-6	61.5	-33.1	21.3	-37.6	99.8	-31.0	33.1	-35.8	141.0	-29.5	58.8	-33.3	208.5	-27.8	56.1	-33.5
-5	77.5	-32.1	30.1	-36.2	109.4	-30.6	51.2	-33.9	154.6	-29.1	56.1	-33.5	151.1	-29.2	63.0	-33.0
-4	86.9	-31.6	36.2	-35.4	114.6	-30.4	64.4	-32.9	161.9	-28.9	46.7	-34.3	86.9	-31.6	104.5	-30.8
-3	89.0	-31.5	46.7	-34.3	114.6	-30.4	70.7	-32.5	151.1	-29.2	54.9	-33.6	37.1	-35.3	77.5	-32.1
-2	86.9	-31.6	52.4	-33.8	104.5	-30.8	69.1	-32.6	64.4	-32.9	67.5	-32.7	3.7	-45.3	72.3	-32.4
-1	74.0	-32.3	58.8	-33.3	70.7	-32.5	69.1	-32.6	17.3	-38.6	91.1	-31.9	28.1	-36.5	137.8	-29.6
0	58.8	-33.3	63.0	-33.0	19.9	-38.0	69.1	-32.6	1.9	-48.2	93.0	-31.8	50.0	-34.0	128.6	-29.9
1	42.6	-34.7	67.5	-32.7	5.1	-43.9	79.3	-32.0	6.6	-42.8	75.7	-32.2	37.1	-35.3	89.0	-31.5
2	29.5	-36.3	69.1	-32.6	0.4	-55.1	89.0	-31.5	16.2	-38.9	102.1	-30.9	16.6	-38.8	16.6	-38.9
3	20.4	-37.9	72.3	-32.4	2.1	-47.8	95.3	-31.2	27.5	-36.6	122.8	-30.1	32.3	-35.9	15.1	-39.2
4	11.2	-40.5	67.5	-32.7	9.8	-41.1	97.5	-31.1	29.5	-36.3	122.8	-30.1	50.0	-34.0	22.3	-37.5
5	4.9	-44.1	60.1	-33.2	15.1	-39.2	93.2	-31.3	28.8	-36.4	104.5	-30.8	0.8	-51.7	10.2	-40.9
6	2.9	-46.3	45.6	-34.4	17.8	-38.5	83.0	-31.8	18.2	-38.4	61.5	-33.1	0.2	-58.9	79.3	-32.0
7	1.6	-49.0	36.2	-35.4	17.3	-38.6	72.3	-32.4	0.8	-51.8	28.1	-36.5	0.9	-51.6	97.5	-31.1
8	2.4	-47.2	27.5	-36.6	14.1	-39.5	58.8	-33.3	1.9	-48.3	60.1	-33.2	0.9	-51.6	89.0	-31.5
9	4.3	-44.7	15.8	-39.0	7.2	-42.4	39.8	-35.1	2.9	-46.4	63.0	-33.0	0.6	-53.0	97.5	-31.1
10	5.5	-43.6	8.9	-41.5	1.9	-48.2	25.1	-37.0	2.8	-46.5	46.7	-34.3	4.6	-44.4	63.0	-33.0
11	6.6	-42.8	6.4	-42.9	1.2	-50.1	14.1	-39.5	1.9	-49.3	37.9	-35.2	8.1	-41.9	28.8	-36.4
12	6.7	-42.7	6.4	-42.9	0.7	-52.5	12.3	-40.1	0.4	-54.7	28.1	-36.5	8.1	-41.9	5.6	-43.5
13	6.4	-42.9	6.4	-42.9	0.7	-52.4	14.1	-39.5	0.3	-56.3	23.9	-37.2	4.2	-44.8	7.4	-42.3
14	5.5	-43.6	6.2	-43.1	1.7	-48.7	15.5	-39.1	0.2	-57.1	19.5	-38.1	5.0	-44.0	14.4	-39.4
15	4.1	-44.9	5.5	-43.6	2.0	-48.0	16.2	-38.9	0.3	-55.6	14.9	-39.3	4.1	-44.9	7.2	-42.4
16	2.0	-48.0	4.6	-44.4	1.9	-48.3	17.0	-38.7	0.4	-54.7	9.8	-41.1	3.8	-45.2	1.2	-50.3
17	0.9	-51.4	3.0	-46.2	1.3	-49.9	14.8	-39.3	0.1	-59.9	4.3	-44.7	8.1	-41.9	4.0	-45.0
18	0.4	-54.9	1.7	-48.8	1.9	-48.3	10.7	-40.7	0.9	-51.6	1.0	-51.0	2.6	-46.9	4.9	-44.1
19	0.4	-55.4	1.4	-49.4	2.2	-47.5	6.6	-42.8	1.4	-49.4	0.9	-51.3	6.3	-43.0	6.6	-42.8
20	1.4	-49.4	2.4	-47.2	2.1	-47.7	3.8	-45.2	1.3	-49.7	2.9	-46.4	1.4	-49.4	2.6	-46.9
21	2.2	-47.6	3.2	-46.0	2.3	-47.3	1.3	-49.9	0.5	-53.8	2.4	-47.2	0.5	-53.7	8.9	-41.5
22	2.6	-46.8	2.9	-46.4	2.7	-46.6	0.3	-56.4	0.1	-61.4	4.8	-44.2	1.1	-50.6	8.9	-41.5
23	2.3	-47.3	2.4	-47.2	1.6	-48.9	0.1	-62.9	0.0	-65.8	4.9	-44.1	1.0	-50.9	0.5	-53.6
24	1.5	-49.3	1.8	-48.5	0.0	-64.6	0.2	-57.1	0.2	-58.0	1.6	-48.9	0.2	-58.5	3.2	-46.0
25	0.7	-52.4	0.6	-52.9	0.3	-56.5	0.9	-51.5	1.0	-51.1	0.4	-55.3	1.0	-51.1	4.6	-44.4
26	0.8	-52.2	0.1	-61.1	1.1	-50.5	1.2	-50.1	1.6	-49.0	1.2	-50.3	1.6	-49.0	0.7	-52.7
27	0.4	-55.0	0.4	-54.9	1.5	-49.1	1.2	-50.1	1.4	-49.6	0.8	-52.0	1.6	-49.0	4.0	-45.0
28	0.1	-61.7	0.4	-54.8	1.3	-50.0	0.7	-52.6	0.4	-55.4	0.7	-52.9	0.8	-52.0	2.7	-46.7
29	0.5	-54.4	0.1	-61.8	0.5	-53.7	0.3	-55.9	0.4	-55.4	0.6	-53.2	2.7	-46.7	5.0	-44.0
30	0.9	-51.5	0.5	-53.7	0.5	-54.4	0.1	-63.4	1.2	-50.1	0.7	-52.4	1.1	-50.5	1.7	-48.8
31	1.0	-51.1	0.5	-53.6	0.9	-51.4	0.2	-58.0	1.9	-48.1	0.5	-54.3	0.1	-62.3	2.8	-46.5
32	0.8	-52.1	0.2	-58.0	1.0	-51.2	0.3	-56.7	1.6	-48.9	0.1	-60.5	0.3	-56.3	1.8	-48.5
33	0.4	-54.7	0.1	-62.3	0.7	-52.8	0.3	-56.2	1.2	-50.1	0.5	-54.4	0.4	-55.1	0.3	-56.7
34	0.1	-60.0	0.2	-59.3	0.1	-60.0	0.2	-59.9	1.4	-49.4	1.3	-49.7	0.2	-58.9	1.0	-51.1
35	0.3	-55.6	0.3	-56.2	0.9	-51.4	1.6	-49.9	2.2	-47.6	1.3	-49.9	0.3	-56.4	0.1	-62.9
36	0.5	-54.0	0.3	-55.6	0.8	-51.9	2.1	-47.8	2.4	-47.2	0.3	-57.0	1.0	-51.1	0.4	-55.4
37	0.4	-54.9	0.2	-59.8	0.2	-57.4	2.1	-47.7	2.0	-47.9	0.1	-59.8	2.5	-47.1	2.5	-47.1
38	0.2	-59.2	1.0	-50.9	0.3	-56.7	1.6	-49.0	3.3	-45.8	1.0	-51.2	6.7	-42.7	1.9	-48.2
39	0.2	-58.2	1.0	-51.1	0.2	-58.1	0.7	-52.3	5.2	-43.8	0.9	-51.3	9.1	-41.4	4.0	-45.0
40	0.1	-59.4	0.4	-55.5	0.0	-64.4	0.2	-58.9	2.9	-46.3	0.5	-54.3	7.2	-42.4	2.6	-46.9
41	0.0	-65.6	0.9	-51.4	0.1	-60.0	0.5	-54.3	0.3	-56.8	0.1	-59.9	3.1	-46.1	0.9	-51.3
42	0.2	-57.7	0.9	-51.3	0.1	-62.1	0.6	-53.4	0.1	-60.0	0.2	-59.1	0.2	-57.9	1.1	-50.7
43	0.1	-59.5	0.1	-61.4	0.1	-60.7	0.5	-53.8	0.3	-56.6	0.4	-55.1	0.2	-58.5	0.3	-56.3
44	0.0	-65.6	0.3	-56.7	0.2	-57.1	0.2	-57.2	0.0	-65.1	1.7	-48.8	0.6	-53.3	1.1	-50.7
45	0.1	-61.6	2.0	-47.9	0.3	-56.7	0.8	-51.9	0.6	-53.5	2.3	-47.4	6.0	-43.2	1.5	-49.1

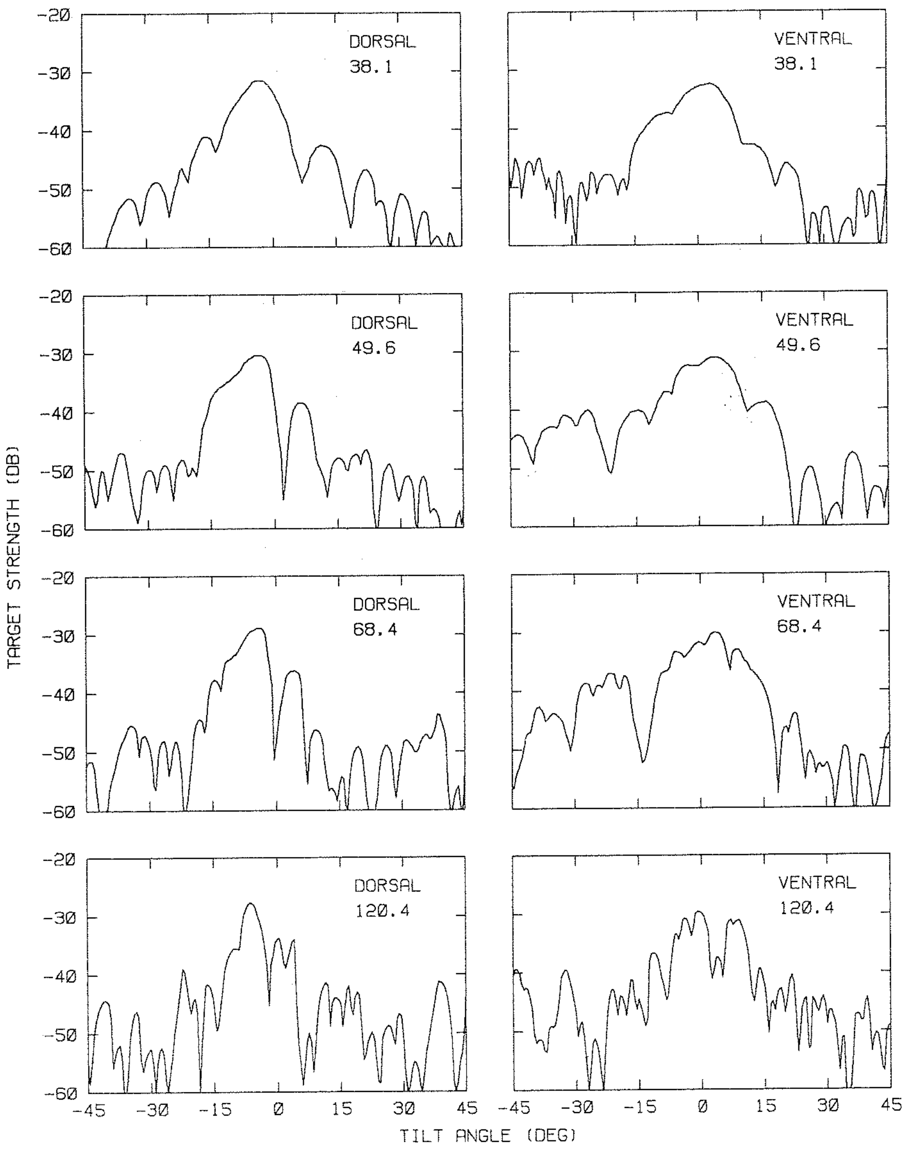

FIG. 16. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 201:
POLLACK, 31.5 CM, 195 G.

TABLE 4. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 202: POLLACK, 44.0 CM, 533 G.

	38.1 KHZ				49.6 KHZ				68.4 KHZ				120.4 KHZ			
	DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL	
THETA	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS
-45	2.3	-47.3	3.3	-41.8	1.0	-51.1	17.0	-38.7	1.9	-48.3	2.6	-46.8	2.2	-47.6	6.9	-42.6
-44	1.9	-48.2	5.2	-43.8	0.4	-54.9	16.2	-38.9	2.9	-46.4	4.6	-44.6	0.7	-52.6	6.6	-42.8
-43	3.2	-46.0	5.9	-43.3	0.8	-51.9	13.5	-39.7	3.4	-45.7	11.5	-40.6	7.2	-42.4	2.0	-48.0
-42	4.2	-44.8	4.8	-44.2	1.1	-50.6	10.7	-40.7	2.9	-46.4	20.9	-37.8	15.1	-39.2	2.1	-47.7
-41	3.7	-45.3	4.7	-44.3	1.3	-49.8	9.3	-41.8	1.3	-49.9	25.1	-37.0	17.3	-38.6	4.6	-44.4
-40	1.9	-48.1	6.4	-42.9	2.5	-47.1	4.7	-44.3	0.3	-56.2	26.9	-36.7	16.2	-38.9	1.8	-48.4
-39	2.6	-46.8	6.4	-42.9	5.0	-44.0	5.9	-43.3	0.1	-61.3	25.7	-36.9	12.9	-39.9	7.6	-42.2
-38	3.5	-45.5	6.2	-43.1	4.6	-44.4	6.6	-42.8	0.1	-60.2	22.3	-37.5	7.1	-42.5	13.2	-39.8
-37	4.7	-44.3	4.7	-44.3	2.9	-46.3	6.0	-43.2	1.7	-48.8	16.2	-38.9	2.9	-46.3	14.8	-39.3
-36	5.1	-43.9	2.3	-47.3	1.0	-50.8	2.1	-47.7	1.4	-49.4	8.9	-41.5	1.0	-51.2	8.1	-41.9
-35	4.9	-44.1	1.1	-50.5	1.2	-50.1	1.9	-48.3	0.6	-53.4	3.9	-45.1	2.3	-47.3	2.7	-46.7
-34	2.2	-47.5	0.1	-59.8	1.3	-49.7	3.3	-45.8	1.5	-49.3	10.7	-40.7	0.5	-54.2	5.5	-43.6
-33	4.5	-44.5	0.1	-61.8	1.1	-50.6	4.2	-44.8	1.9	-48.1	13.8	-39.6	1.4	-49.6	7.1	-42.5
-32	6.2	-43.1	0.3	-55.7	1.5	-49.1	6.9	-42.6	0.7	-52.6	12.6	-40.0	1.2	-50.1	1.3	-50.0
-31	5.9	-43.3	0.7	-52.8	4.6	-44.4	13.2	-39.8	5.5	-43.6	23.9	-37.2	4.4	-44.6	6.9	-42.6
-30	3.7	-45.3	2.5	-47.1	5.9	-43.3	19.5	-39.1	11.5	-40.4	21.8	-37.6	0.5	-53.8	46.7	-34.3
-29	1.9	-48.1	7.7	-42.1	4.2	-44.8	23.9	-37.2	14.4	-39.4	14.4	-39.4	0.8	-51.7	9.3	-41.3
-28	2.5	-47.0	5.7	-43.4	2.0	-48.0	30.1	-36.2	16.6	-38.8	9.3	-41.1	4.0	-45.0	0.1	-60.7
-27	2.1	-47.7	9.1	-41.4	3.9	-45.1	32.3	-35.9	23.9	-37.2	5.5	-43.6	13.8	-39.6	0.4	-55.5
-26	0.8	-52.1	15.8	-39.0	5.9	-43.3	30.1	-36.2	23.9	-37.2	2.6	-46.9	21.3	-37.7	1.9	-48.2
-25	0.8	-52.0	16.2	-38.9	6.6	-42.8	25.7	-36.9	19.5	-38.1	4.5	-44.5	19.0	-38.2	1.9	-48.2
-24	0.2	-58.6	9.3	-41.3	5.9	-43.3	22.3	-37.5	9.5	-41.2	14.4	-39.4	5.9	-43.3	9.3	-41.3
-23	0.3	-56.0	14.1	-39.5	4.0	-45.0	15.5	-39.1	3.6	-45.4	20.4	-37.9	1.6	-49.0	17.0	-38.7
-22	1.7	-48.6	12.0	-40.2	1.8	-48.5	4.9	-44.1	3.4	-45.7	19.9	-38.0	5.1	-43.9	11.7	-40.3
-21	5.2	-43.8	6.3	-43.0	5.9	-43.3	10.5	-40.8	7.4	-42.3	25.7	-36.9	0.9	-51.3	0.7	-52.6
-20	11.2	-40.5	8.1	-41.9	19.9	-38.0	17.0	-38.7	6.0	-43.2	33.8	-35.7	8.3	-41.8	12.3	-40.1
-19	19.0	-38.2	10.5	-40.8	41.6	-34.8	22.3	-37.5	3.2	-46.0	6.4	-42.9	16.6	-38.8	27.5	-36.6
-18	26.3	-36.8	7.1	-42.5	72.3	-32.4	22.9	-37.4	5.2	-43.8	2.1	-47.8	17.8	-38.5	26.9	-36.7
-17	33.1	-35.8	6.0	-43.2	91.0	-31.4	17.8	-38.5	18.6	-38.3	0.3	-54.8	0.7	-52.4	42.6	-34.7
-16	37.9	-35.2	4.7	-44.3	102.1	-30.9	12.6	-40.0	61.5	-33.1	1.0	-51.2	12.3	-40.1	42.6	-34.7
-15	37.1	-35.3	5.4	-43.7	97.5	-31.1	10.7	-40.7	112.0	-30.5	9.8	-41.1	75.7	-32.2	17.8	-38.5
-14	28.8	-36.4	6.2	-43.1	89.0	-31.5	11.7	-40.3	147.6	-29.3	11.2	-40.5	89.0	-31.5	22.9	-37.4
-13	33.8	-35.7	15.8	-39.0	86.9	-31.6	10.5	-40.8	154.6	-29.1	7.9	-42.0	70.7	-32.5	22.9	-37.4
-12	54.9	-33.6	35.4	-35.5	122.8	-30.1	19.5	[illegible]	137.8	-29.6	23.4	-37.3	104.5	-30.8	29.5	-36.3
-11	79.3	-32.0	47.3	-34.2	165.7	[illegible]	30.9	[illegible]	102.1	-30.9	[illegible]	-34.5	[illegible]	[illegible]	[illegible]	[illegible]
-10	107.0	-30.7	54.9	-33.6	274.9	-26.6	46.7	-34.3	158.2	-29.0	15.1	-39.2	308.5	-26.1	58.8	-33.3
-9	137.8	-29.6	60.1	-33.2	346.1	-25.6	63.0	-33.0	190.2	-28.2	8.7	-41.6	91.0	-31.4	28.1	-36.5
-8	194.6	-28.1	57.4	-33.4	294.6	-26.3	79.3	-32.0	181.6	-28.4	12.9	-39.9	26.9	-36.7	67.5	-32.7
-7	245.0	-27.1	52.4	-33.8	190.2	-28.2	93.2	-31.3	122.8	-30.1	45.6	-34.4	120.0	-30.2	4.4	-44.6
-6	228.7	-27.4	45.6	-34.4	122.8	-30.1	97.5	-31.1	67.5	-32.7	104.5	-30.8	141.0	-29.5	69.1	-32.6
-5	154.6	-29.1	56.1	-33.5	83.0	-31.8	93.2	-31.3	28.1	-36.5	114.6	-30.4	33.1	-35.8	137.8	-29.6
-4	114.6	-30.4	75.7	-32.2	57.4	-33.4	86.9	-31.6	9.3	-41.3	102.1	-30.9	65.9	-32.8	213.4	-27.7
-3	83.0	-31.8	97.5	-31.1	42.6	-34.7	70.7	-32.5	51.2	-33.9	85.0	-31.7	91.0	-31.4	308.5	-26.1
-2	61.5	-33.1	134.7	-29.7	18.2	-38.4	75.7	-32.2	83.0	-31.8	262.5	-26.8	40.7	-34.9	370.9	-25.3
-1	50.0	-34.0	177.5	-28.5	35.4	-35.5	102.1	-30.9	97.5	-31.1	294.6	-26.3	70.7	-32.5	294.6	-26.3
0	40.7	-34.9	190.2	-28.2	104.5	-30.8	122.8	-30.1	81.1	-31.9	250.7	-27.0	46.7	-34.3	218.4	-27.6
1	26.9	-36.7	181.6	-28.4	137.8	-29.6	134.7	-29.7	33.1	-35.8	177.5	-28.5	3.4	-45.7	154.6	-29.1
2	10.9	-40.6	141.0	-29.5	117.3	-30.3	144.3	-29.4	54.9	-33.6	122.8	-30.1	12.9	-39.9	86.9	-31.6
3	10.9	-40.6	104.5	-30.8	25.7	-36.9	137.8	-29.6	47.8	-34.2	63.0	-33.0	44.6	-34.5	41.6	-34.8
4	28.8	-36.4	81.1	-31.9	1.7	-48.7	128.6	-29.9	8.7	-41.6	86.9	-31.6	6.0	-43.2	81.1	-31.9
5	57.4	-33.4	57.4	-33.4	4.1	-44.9	120.0	-30.2	6.4	-42.9	93.2	-31.3	22.9	-37.4	4.6	-44.4
6	65.9	-32.8	41.6	-34.8	48.9	-34.1	102.1	-30.9	12.3	-40.1	39.7	-35.0	38.8	-35.1	185.9	-28.3
7	65.9	-32.8	29.5	-36.3	44.6	-34.5	58.8	-33.3	12.9	-39.9	28.1	-36.5	15.8	-39.0	154.6	-29.1
8	47.8	-34.2	19.0	-38.2	27.5	-36.6	24.5	-37.1	14.4	-39.4	234.0	-27.3	28.1	-36.5	112.0	-30.5
9	17.8	-38.5	15.5	-39.1	3.8	-45.2	57.4	-33.4	32.3	-35.9	218.4	-27.6	54.9	-33.6	109.4	-30.6
10	1.1	-50.6	28.1	-36.5	6.7	-42.7	120.0	-30.2	17.3	-38.6	95.3	-31.2	57.4	-33.4	173.5	-28.6
11	4.6	-44.4	37.1	-35.3	6.2	-43.1	131.6	-29.8	1.2	-50.1	85.0	-31.7	41.6	-34.8	53.6	-33.7
12	21.3	-37.7	38.8	-35.1	2.2	-47.6	112.0	-30.5	0.3	-56.2	95.3	-31.2	9.8	-41.1	0.7	-52.3
13	23.4	-37.3	36.2	-35.4	2.2	-47.6	72.3	-32.4	1.3	-50.0	26.9	-36.7	9.5	-41.2	40.7	-34.9
14	17.8	-38.5	23.4	-37.3	13.2	-39.8	35.4	-35.5	11.7	-40.3	32.3	-35.9	5.6	-43.5	47.8	-34.2
15	3.7	-45.3	12.0	-40.2	13.8	-39.6	15.8	-39.0	9.8	-41.1	44.6	-34.5	21.3	-37.7	15.5	-39.1
16	0.4	-55.0	13.8	-39.6	12.0	-40.2	11.5	-40.4	3.6	-45.4	22.3	-37.5	4.1	-44.9	21.8	-37.6
17	1.4	-49.4	15.1	-39.2	7.2	-42.4	8.5	-41.7	9.3	-41.3	2.6	-46.9	13.5	-39.7	61.5	-33.1
18	3.4	-45.7	13.5	-39.7	7.9	-42.0	6.3	-43.0	10.2	-40.9	5.1	-43.9	2.5	-47.0	58.8	-33.3
19	2.7	-46.7	7.9	-42.0	6.9	-42.6	4.4	-44.6	6.2	-43.1	2.6	-46.8	35.4	-35.5	19.5	-38.1
20	2.9	-46.3	1.9	-48.2	4.9	-44.1	2.9	-46.4	2.3	-47.4	0.2	-58.3	25.1	-37.0	9.3	-41.3
21	2.2	-47.5	1.5	-49.2	2.6	-46.9	2.1	-47.7	0.7	-52.7	1.3	-49.8	10.2	-40.9	2.3	-47.4
22	7.2	-42.4	2.9	-46.4	0.8	-51.7	4.9	-44.1	0.6	-53.1	2.0	-48.0	4.3	-44.7	4.2	-44.8
23	10.0	-41.0	3.5	-45.5	3.2	-46.0	7.7	-42.1	1.0	-51.0	1.0	-50.9	2.3	-47.4	6.9	-42.6
24	13.2	-39.8	1.3	-49.8	9.8	-41.1	9.8	-41.1	2.2	-47.6	3.6	-45.4	7.4	-42.3	6.6	-42.8
25	15.8	-39.0	0.1	-59.3	4.4	-44.6	11.2	-40.5	2.7	-46.6	5.2	-43.8	21.3	-37.7	0.7	-52.3
26	17.0	-38.7	0.1	-63.2	2.9	-46.3	12.6	-40.0	2.3	-47.3	3.1	-46.1	26.3	-36.8	0.5	-54.1
27	8.1	-41.9	0.1	-59.3	3.7	-45.3	15.8	-39.0	1.0	-51.1	0.5	-54.3	23.9	-37.2	2.7	-46.6
28	10.2	-40.9	0.1	-61.1	5.1	-43.9	21.8	-37.6	1.6	-49.0	0.2	-57.8	16.6	-38.8	12.3	-40.1
29	11.5	-40.4	0.5	-54.2	7.1	-42.5	19.5	-39.1	3.2	-45.9	1.5	-49.1	0.3	-56.0	13.5	-39.7
30	12.0	-40.2	1.4	-49.5	8.3	-41.8	9.5	-41.2	5.7	-43.4	4.3	-44.7	1.9	-48.3	5.2	-43.8
31	9.8	-41.1	2.1	-47.9	8.1	-41.9	2.0	-48.0	4.7	-44.3	10.5	-40.8	6.7	-42.7	8.3	-41.8
32	1.5	-49.2	2.6	-46.9	6.4	-42.9	0.6	-53.2	0.6	-53.4	13.8	-39.6	7.4	-42.3	11.7	-40.3
33	0.4	-54.9	1.8	-48.5	1.9	-48.1	3.2	-46.0	0.9	-51.6	13.5	-39.7	4.1	-44.9	9.8	-41.1
34	0.3	-56.4	1.0	-51.2	0.6	-53.0	3.5	-45.5	1.6	-49.9	12.0	-40.2	7.2	-42.4	6.3	-43.0
35	1.9	-48.3	1.7	-48.6	1.9	-48.2	2.3	-47.4	0.9	-51.4	8.9	-41.5	18.2	-38.4	1.0	-51.0
36	2.5	-47.0	2.7	-46.6	2.7	-46.6	1.3	-49.9	0.4	-54.7	6.7	-42.7	28.1	-36.5	1.1	-50.7
37	1.0	-50.9	2.7	-46.7	1.2	-50.1	0.7	-52.7	1.1	-50.7	4.1	-44.9	28.1	-36.5	2.7	-46.6
38	0.5	-54.2	1.7	-48.6	1.4	-49.5	1.0	-51.1	1.4	-49.4	0.4	-55.5	23.9	-37.2	1.1	-50.7
39	0.6	-52.9	0.8	-52.2	1.5	-49.2	2.6	-46.9	0.7	-52.3	1.5	-49.2	15.8	-39.0	3.2	-46.0
40	0.4	-54.8	2.0	-47.0	1.4	-49.5	2.9	-46.3	0.4	-55.4	2.5	-47.1	3.8	-45.2	2.5	-47.1
41	0.5	-53.8	1.4	-49.5	3.2	-46.0	2.3	-47.3	1.0	-51.2	1.5	-49.3	0.9	-51.4	2.7	-46.7
42	0.9	-51.6	1.4	-49.5	4.0	-45.0	3.8	-45.2	1.3	-49.8	0.8	-51.9	0.9	-51.6	2.2	-47.5
43	0.3	-56.8	2.9	-46.4	3.2	-46.0	4.9	-44.1	0.7	-52.6	0.5	-53.9	5.1	-43.9	0.3	-56.0
44	0.2	-59.1	4.7	-44.3	2.1	-47.8	4.2	-44.8	1.1	-50.6	1.3	-49.9	4.5	-44.5	1.5	-49.2
45	0.4	-53.1	5.0	-44.0	2.1	-47.7	1.0	-51.0	2.5	-47.1	1.7	-48.7	5.1	-43.9	3.1	-46.1

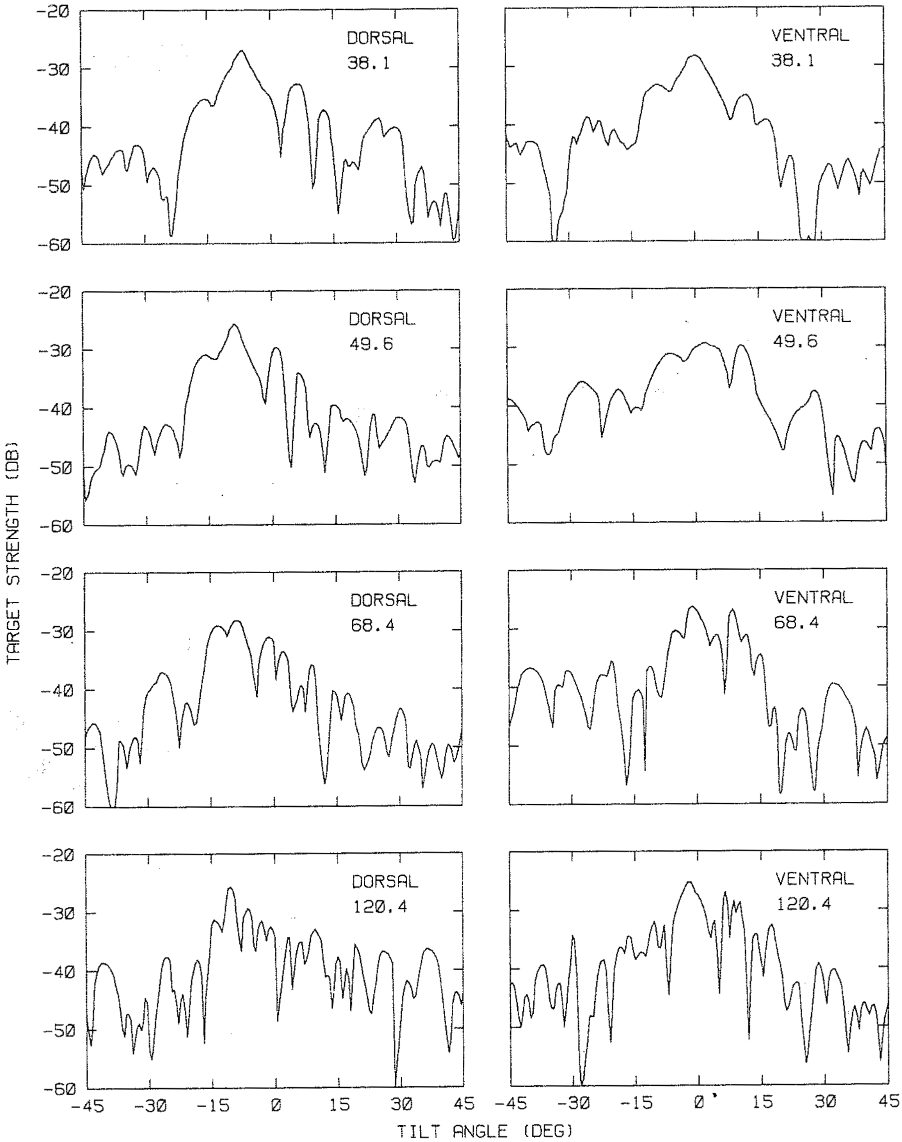

FIG. 17. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 202:
POLLACK, 44.0 CM, 533 G.

TABLE 5. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 204: POLLACK, 35.5 CM, 321 G.

THETA	38.1 KHZ DORSAL SB	TS	38.1 KHZ VENTRAL SB	TS	49.6 KHZ DORSAL SB	TS	49.6 KHZ VENTRAL SB	TS	68.4 KHZ DORSAL SB	TS	68.4 KHZ VENTRAL SB	TS	120.4 KHZ DORSAL SB	TS	120.4 KHZ VENTRAL SB	TS
-45	2.2	-47.5	3.3	-45.8	1.2	-50.2	3.2	-46.0	1.6	-47.9	2.0	-47.9	0.2	-57.5	1.5	-49.1
-44	0.2	-57.9	4.2	-44.9	1.7	-48.6	2.9	-46.3	1.5	-49.3	0.9	-51.5	1.2	-50.2	0.2	-58.6
-43	0.2	-58.0	4.8	-44.2	2.7	-46.7	2.5	-47.1	0.8	-52.1	0.2	-57.2	1.9	-48.2	1.0	-50.9
-42	0.3	-56.4	5.5	-43.6	3.9	-45.1	1.3	-48.4	0.1	-61.0	0.1	-62.1	1.3	-49.8	2.2	-47.5
-41	0.1	-59.8	6.3	-43.0	5.0	-44.0	0.9	-51.4	0.4	-55.5	0.2	-59.5	0.3	-56.4	3.9	-45.1
-40	0.0	-66.2	6.6	-42.8	5.2	-43.8	0.9	-51.4	0.5	-54.0	3.2	-45.9	0.8	-51.7	5.5	-43.6
-39	0.1	-63.5	4.8	-44.2	5.5	-43.6	0.7	-52.4	0.1	-59.8	7.1	-42.5	2.2	-47.5	5.7	-43.4
-38	0.1	-61.0	5.6	-43.5	5.2	-43.8	0.9	-51.4	0.5	-54.0	8.7	-41.6	3.2	-46.0	3.2	-45.9
-37	0.0	-64.8	6.7	-42.7	4.5	-44.5	1.2	-50.1	1.3	-49.9	9.5	-41.2	3.7	-45.3	0.7	-52.6
-36	0.0	-65.6	6.7	-42.7	5.9	-43.3	1.5	-49.3	1.1	-50.4	7.1	-42.5	3.5	-45.6	1.4	-49.6
-35	0.1	-63.9	5.0	-44.0	6.2	-43.1	1.4	-49.6	0.3	-56.3	7.2	-42.4	0.5	-54.4	1.0	-51.0
-34	0.2	-57.5	3.5	-45.6	5.1	-43.9	1.3	-49.9	0.1	-62.2	12.0	-40.2	1.1	-50.7	0.1	-61.6
-33	0.5	-53.8	2.0	-48.0	2.7	-46.6	2.5	-47.1	0.0	-64.4	8.9	-41.5	1.6	-49.0	2.5	-47.1
-32	0.6	-53.1	1.2	-50.2	1.2	-50.2	4.4	-44.6	0.2	-59.1	4.1	-44.9	1.2	-50.3	4.2	-44.8
-31	0.4	-54.9	0.5	-54.2	0.3	-55.8	6.2	-43.1	0.6	-53.3	2.0	-47.9	0.4	-55.5	4.2	-44.9
-30	0.1	-61.1	0.7	-52.6	0.3	-55.9	10.2	-40.9	1.9	-48.1	1.3	-49.9	0.1	-61.0	2.3	-47.3
-29	0.4	-55.0	0.5	-54.1	1.1	-50.7	15.8	-39.0	0.8	-51.7	0.9	-51.3	0.5	-54.0	4.2	-44.8
-28	0.6	-53.0	0.2	-58.0	2.7	-46.7	17.0	-38.7	0.8	-51.9	2.1	-47.8	0.9	-51.3	2.5	-47.1
-27	0.9	-51.4	0.1	-60.2	5.6	-43.5	15.5	-39.1	2.3	-47.4	3.9	-45.1	1.2	-50.2	0.4	-55.2
-26	1.4	-49.5	0.5	-53.9	5.9	-43.3	13.2	-39.8	2.7	-46.6	10.2	-40.9	0.8	-51.8	1.4	-49.6
-25	1.0	-50.8	1.7	-48.7	4.5	-44.5	9.8	-41.1	1.9	-48.1	12.0	-40.2	1.3	-49.7	2.7	-46.6
-24	1.9	-48.1	3.5	-45.5	3.2	-45.9	6.9	-42.6	0.3	-55.9	10.0	-41.0	2.6	-46.8	6.0	-43.2
-23	1.5	-49.3	4.8	-44.2	4.6	-44.4	4.7	-44.3	0.1	-61.2	4.4	-44.6	2.3	-47.4	6.6	-42.9
-22	0.9	-51.6	5.1	-43.9	5.2	-43.8	1.3	-49.7	0.0	-66.6	11.5	-40.4	1.0	-51.0	3.4	-45.7
-21	1.3	-49.7	5.5	-43.6	4.7	-44.3	0.2	-57.2	0.2	-59.0	19.5	-38.1	2.2	-47.6	6.2	-43.1
-20	2.6	-46.9	5.6	-43.5	1.2	-50.3	0.0	-65.4	0.7	-52.3	23.9	-37.2	4.4	-44.6	13.8	-39.6
-19	4.8	-44.2	5.6	-43.5	1.1	-50.5	0.0	-66.7	1.0	-51.1	26.9	-36.7	6.6	-42.8	11.7	-40.3
-18	7.7	-42.1	5.2	-43.9	1.4	-49.4	0.4	-55.2	1.4	-49.4	19.5	-38.1	9.5	-41.2	6.4	-42.9
-17	11.5	-40.4	4.6	-44.4	0.2	-58.2	2.7	-46.7	2.1	-47.8	10.5	-40.8	12.6	-40.0	1.3	-49.7
-16	19.0	-38.2	5.2	-43.8	0.2	-57.7	8.1	-41.9	3.4	-45.7	7.6	-42.2	15.5	-39.1	17.3	-38.6
-15	25.1	-37.0	7.4	-42.3	7.6	-42.2	17.0	-38.7	5.7	-43.4	7.7	-42.1	15.1	-39.2	33.1	-35.8
-14	29.5	-36.3	10.5	-40.8	26.9	-36.7	20.4	-37.9	10.0	-41.0	6.6	-42.8	6.4	-42.9	28.1	-36.5
-13	29.5	-36.3	14.4	-39.4	36.2	-35.4	19.5	-38.1	17.0	-38.7	4.8	-44.2	0.2	-57.2	12.0	-40.2
-12	30.8	-36.1	19.5	-38.1	51.2	-33.9	25.7	-36.9	39.7	-35.0	2.4	-47.2	0.8	-52.2	22.3	-37.5
-11	30.8	-36.1	25.1	-37.0	63.0	-33.0	33.8	-35.7	75.7	-32.2	1.3	-49.7	6.9	-42.6	13.2	-39.8
-10	28.8	-36.4	32.3	-35.9	75.7	-32.2	37.9	-35.2	89.0	-31.5	2.8	-46.5	35.4	-35.5	1.4	-49.4
-9	29.5	-36.3	39.7	-35.0	91.0	-31.4	39.7	-35.0	93.2	-31.3	16.2	-38.9	91.0	-31.4	0.3	-55.6
-8	43.6	-34.6	45.6	-34.4	104.5	-30.8	38.8	-35.1	102.1	-30.9	37.9	-35.2	109.4	-30.6	6.2	-43.1
-7	60.1	-33.2	52.4	-33.8	122.8	-30.1	36.2	-35.4	109.4	-30.6	53.6	-33.7	131.6	-29.8	33.1	-35.8
-6	77.5	-32.1	56.1	-33.5	173.5	-28.6	50.0	-34.0	161.9	-28.9	81.1	-31.9	228.7	-27.4	65.9	-32.8
-5	95.3	-31.2	58.8	-33.3	213.4	-27.7	69.1	-32.6	228.7	-27.4	107.0	-30.7	274.9	-26.6	147.6	-29.3
-4	120.0	-30.2	60.1	-33.2	213.4	-27.7	79.3	-32.0	234.0	-27.3	147.6	-29.3	268.7	-26.7	218.4	-27.6
-3	141.0	-29.5	57.4	-33.4	181.6	-28.4	86.9	-31.6	203.8	-27.9	161.9	-28.9	181.6	-28.4	234.0	-27.3
-2	134.7	-29.7	56.1	-33.5	128.6	-29.9	89.0	-31.5	81.1	-31.9	147.6	-29.3	30.1	-36.2	75.7	-32.2
-1	107.0	-30.7	61.5	-33.1	63.0	-33.0	85.0	-31.7	1.0	-51.0	117.3	-30.3	41.6	-34.8	104.5	-30.8
0	77.5	-32.1	58.8	-33.3	24.5	-37.1	75.7	-32.2	2.5	-47.0	77.5	-32.1	79.3	-32.0	122.8	-30.1
1	47.8	-34.2	58.8	-33.3	8.1	-41.9	70.7	-32.5	12.6	-40.0	77.5	-32.1	50.0	-34.0	83.0	-31.8
2	23.9	-37.2	69.1	-32.6	2.9	-46.4	83.0	-31.8	26.3	-36.8	93.2	-31.3	3.1	-46.1	34.6	-35.6
3	12.3	-40.1	75.7	-32.2	10.5	-40.8	107.0	-30.7	32.3	-35.9	91.0	-31.4	0.3	-55.7	16.6	-38.8
4	10.2	-40.9	72.3	-32.4	28.1	-36.5	117.3	-30.3	15.5	-39.1	77.5	-32.1	39.7	-35.0	10.5	-40.8
5	8.1	-41.9	65.9	-32.8	35.4	-35.5	114.6	-30.4	2.9	-46.4	39.7	-35.0	21.8	-37.6	3.7	-45.3
6	2.1	-47.8	43.6	-34.6	33.8	-35.7	85.0	-31.7	0.1	-59.4	7.7	-42.1	2.8	-46.5	10.5	-40.8
7	2.3	-47.3	23.9	-37.2	26.9	-36.7	46.7	-34.3	1.6	-49.0	47.8	-34.2	9.1	-41.4	95.3	-31.2
8	2.9	-46.3	10.2	-40.9	13.2	-39.8	25.1	-37.0	4.9	-44.1	64.4	-32.9	5.1	-43.9	109.4	-30.6
9	4.0	-45.0	6.6	-42.8	3.9	-45.1	17.8	-38.5	4.3	-44.7	69.1	-32.6	3.9	-45.1	57.4	-33.4
10	7.4	-42.3	10.9	-40.6	1.5	-49.1	29.5	-36.3	0.6	-53.5	69.1	-32.6	8.9	-41.5	53.6	-33.7
11	9.8	-41.1	15.5	-39.1	3.2	-46.0	37.1	-35.3	0.2	-59.0	65.9	-32.8	2.3	-47.3	69.1	-32.6
12	9.3	-41.3	18.6	-38.3	5.5	-43.6	43.6	-34.6	0.0	-66.9	60.1	-33.2	5.5	-43.6	79.3	-32.0
13	7.1	-42.5	17.3	-38.6	2.7	-46.7	50.0	-34.0	0.0	-66.9	47.8	-34.2	13.2	-39.8	51.2	-33.9
14	1.7	-48.7	12.6	-40.0	0.5	-53.4	53.6	-33.7	0.2	-57.6	38.8	-35.1	10.2	-40.9	23.4	-37.3
15	0.1	-61.6	12.0	-40.2	0.1	-60.5	51.2	-33.9	0.1	-59.5	28.8	-36.4	10.2	-40.9	13.2	-39.8
16	0.2	-58.6	12.0	-40.2	0.1	-62.1	37.9	-35.2	0.0	-65.6	17.3	-38.6	13.8	-39.6	5.6	-43.5
17	0.3	-55.9	12.0	-40.2	0.1	-61.8	18.6	-38.3	0.2	-57.4	4.6	-44.4	5.9	-43.3	6.6	-42.8
18	0.3	-55.9	10.7	-40.7	0.1	-63.0	2.4	-47.2	0.7	-52.4	7.6	-42.2	1.0	-50.8	17.0	-38.7
19	0.2	-58.6	7.9	-42.0	0.1	-60.7	4.4	-44.4	1.1	-50.7	7.4	-42.3	1.1	-50.7	8.7	-41.6
20	0.5	-53.7	3.3	-45.9	0.3	-56.0	7.7	-42.1	1.2	-50.3	3.5	-45.6	4.0	-45.0	1.2	-50.2
21	1.9	-48.3	1.7	-48.7	0.1	-61.1	10.9	-40.6	0.1	-63.6	4.9	-44.1	3.7	-45.3	2.6	-46.8
22	2.6	-46.9	1.1	-50.7	0.0	-64.3	8.7	-41.6	0.2	-59.2	6.4	-42.9	3.2	-45.9	2.7	-46.6
23	2.1	-47.3	1.1	-50.7	0.3	-56.8	3.2	-45.9	1.0	-51.2	3.3	-45.8	3.7	-45.3	4.2	-44.8
24	1.4	-49.6	2.0	-48.0	0.2	-57.7	0.8	-51.7	0.5	-53.9	1.3	-50.0	1.3	-50.0	2.3	-47.4
25	2.0	-47.9	2.1	-47.9	0.1	-61.8	0.1	-63.3	0.2	-58.0	1.8	-51.0	2.6	-46.9	1.3	-50.0
26	3.1	-46.1	1.3	-49.9	0.0	-66.0	0.1	-59.5	0.4	-55.3	1.1	-50.5	6.6	-42.8	0.8	-52.2
27	2.2	-47.6	0.6	-53.9	0.1	-61.2	0.2	-58.2	1.1	-50.4	1.0	-51.2	8.5	-41.7	0.4	-54.5
28	1.9	-48.3	0.2	-58.9	0.3	-55.8	0.1	-61.7	2.3	-47.4	0.7	-52.7	8.1	-41.9	1.3	-49.9
29	1.9	-48.1	0.0	-67.1	0.6	-53.0	0.0	-66.3	3.5	-45.5	0.1	-59.5	6.4	-42.9	2.7	-46.6
30	[illegible]	[illegible]	0.0	-67.1	1.2	-50.1	0.4	-55.5	4.2	-44.8	0.0	-64.6	3.0	-46.2	2.6	-46.8
31	[illegible]	-43.8	0.0	-67.1	0.1	-59.4	2.0	-48.0	3.5	-45.5	0.1	-60.9	0.9	-51.5	0.3	-56.8
32	[illegible]	-46.3	0.0	-67.1	0.2	-59.2	3.7	-45.3	6.2	-43.1	1.3	-49.8	0.4	-55.4	1.1	-50.7
33	1.9	-48.3	0.0	-67.1	0.1	-61.5	4.1	-44.9	4.9	-44.1	1.6	-49.0	0.6	-53.2	2.0	-48.0
34	1.0	-51.0	0.1	-62.6	0.2	-58.2	3.3	-45.8	5.7	-43.4	1.4	-49.5	0.8	-51.8	1.6	-49.0
35	0.6	-53.2	0.1	-61.4	0.2	-58.4	2.5	-47.0	3.5	-45.5	0.4	-55.3	1.5	-49.1	3.2	-46.0
36	0.4	-55.5	0.0	-64.4	0.1	-64.0	1.1	-50.6	1.5	-49.2	0.1	-60.6	2.3	-47.3	4.1	-44.9
37	0.7	-52.8	0.1	-60.7	0.3	-55.2	0.4	-55.4	1.3	-50.0	0.0	-64.9	1.8	-48.4	2.7	-46.6
38	1.1	-50.7	0.1	-63.0	0.1	-62.1	0.7	-52.7	1.4	-49.6	0.1	-62.7	1.3	-50.0	1.3	-49.9
39	0.9	-51.5	0.0	-67.1	0.4	-55.4	1.2	-50.3	0.7	-52.5	0.0	-66.6	0.3	-56.0	0.4	-55.5
40	1.3	-50.0	0.3	-56.6	0.6	-53.0	0.7	-52.7	0.2	-57.3	0.1	-63.7	0.9	-51.6	0.8	-51.7
41	1.5	-49.1	0.9	-51.6	0.7	-52.5	0.2	-59.9	0.1	-61.5	0.1	-61.2	1.1	-49.4	1.7	-48.5
42	2.1	-47.7	1.3	-48.4	0.4	-53.4	0.3	-55.6	0.2	-57.1	0.2	-59.2	3.2	-46.0	2.3	-47.3
43	2.2	-47.5	2.0	-48.0	1.2	-50.2	0.7	-52.3	0.1	-63.3	0.4	-55.2	5.2	-43.8	0.8	-52.2
44	1.9	-48.3	1.4	-49.3	1.3	-48.4	0.9	-52.1	0.4	-54.8	0.9	-51.7	7.0	-42.0	0.4	-53.1
45	1.5	-49.3	0.9	-51.5	2.5	-47.1	0.3	-56.4	0.4	-53.1	1.4	-49.4	8.1	-41.9	0.2	-57.2

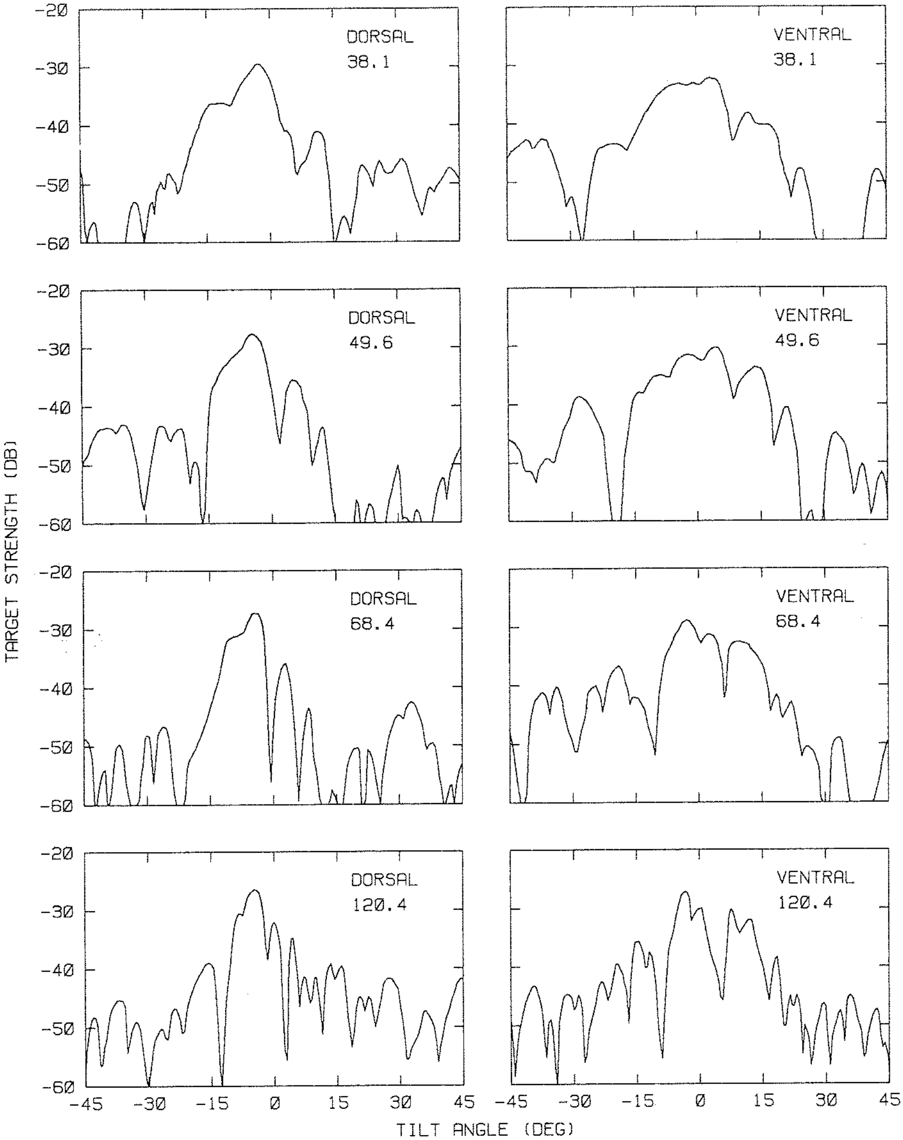

FIG. 18. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 204: POLLACK, 35.5 CM, 321 G.

TABLE 6. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 205: POLLACK, 39.0 CM, 380 G.

	38.1 KHZ				49.6 KHZ				68.4 KHZ				120.4 KHZ			
	DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL	
THETA	SR	TS	SR	TS	SR	TS	SR	TS	SR	TS	SR	TS	SR	TS	SR	TS
-45	0.1	-59.6	8.7	-41.6	1.0	-51.0	1.9	-48.2	2.3	-47.3	11.2	-40.5	0.5	-54.3	7.1	-42.5
-44	0.0	-64.1	7.2	-42.4	1.9	-48.1	0.8	-51.8	2.4	-47.2	11.2	-40.5	1.0	-50.9	6.7	-42.7
-43	0.2	-57.9	5.0	-44.0	2.9	-46.3	0.3	-55.9	1.5	-49.3	8.1	-41.9	2.0	-48.0	5.0	-44.0
-42	0.2	-58.4	6.2	-43.1	4.1	-44.9	0.2	-58.4	0.2	-57.6	4.3	-44.7	2.9	-46.3	2.5	-47.0
-41	0.0	-64.3	7.4	-42.3	4.9	-44.1	0.1	-60.0	0.0	-65.9	1.9	-48.1	5.4	-43.7	3.5	-45.5
-40	0.0	-64.2	9.3	-41.3	6.9	-42.6	0.5	-53.8	0.1	-60.1	0.9	-51.6	5.2	-43.9	5.5	-43.6
-39	0.1	-63.5	8.9	-41.5	8.7	-41.6	1.0	-51.0	0.4	-55.3	0.6	-53.5	4.0	-45.0	4.7	-44.3
-38	0.3	-56.2	6.3	-43.0	8.3	-41.8	1.9	-48.2	1.9	-48.3	1.6	-49.0	1.5	-49.3	2.8	-46.5
-37	1.0	-51.1	5.0	-44.0	5.4	-43.7	2.9	-46.3	1.7	-48.6	7.6	-42.2	1.7	-48.8	5.7	-43.4
-36	2.9	-46.3	7.4	-42.3	3.5	-45.5	4.6	-44.4	1.0	-51.1	15.8	-39.0	1.0	-51.1	3.7	-45.3
-35	5.6	-43.5	7.9	-42.0	2.4	-47.2	5.7	-43.4	0.1	-61.1	19.5	-38.1	1.1	-50.4	2.3	-47.4
-34	8.1	-41.9	6.7	-42.7	3.1	-46.1	6.2	-43.1	1.0	-50.8	19.9	-38.0	0.7	-52.5	9.3	-41.3
-33	9.1	-41.4	5.0	-44.0	2.9	-46.3	5.9	-43.3	3.5	-45.6	18.6	-38.3	2.0	-48.0	10.0	-41.0
-32	12.0	-40.2	3.7	-45.3	0.6	-53.0	3.9	-45.1	6.7	-42.7	17.0	-38.7	3.4	-45.7	7.6	-42.2
-31	13.8	-39.6	7.6	-42.2	0.2	-58.8	7.6	-42.2	10.0	-41.0	14.1	-39.5	3.1	-46.1	3.4	-45.7
-30	13.2	-39.8	8.3	-41.8	3.2	-46.0	8.9	-41.5	13.5	-39.7	10.5	-40.8	3.4	-45.7	1.5	-49.3
-29	10.2	-40.9	6.9	-42.6	11.5	-40.4	9.8	-41.1	17.0	-38.7	6.7	-42.7	1.4	-49.6	3.7	-45.3
-28	7.2	-42.4	5.5	-43.6	20.4	-37.9	14.4	-39.4	20.9	-37.8	11.2	-40.5	0.9	-51.5	10.7	-40.7
-27	5.1	-43.9	5.9	-43.3	25.1	-37.0	19.0	-38.2	20.9	-37.8	13.8	-39.6	0.3	-55.9	11.2	-40.5
-26	5.9	-43.3	7.1	-42.5	23.9	-37.2	20.4	-37.9	17.3	-38.6	11.5	-40.4	0.3	-55.8	11.2	-40.5
-25	4.0	-45.0	7.9	-42.0	21.3	-37.7	19.9	-38.0	14.1	-39.5	11.7	-40.3	3.5	-45.5	10.5	-40.8
-24	2.1	-47.8	7.7	-42.1	18.2	-38.4	18.2	-38.4	1.6	-49.0	16.2	-38.9	2.9	-46.3	8.9	-41.5
-23	0.8	-52.2	5.7	-43.4	14.8	-39.3	15.5	-39.1	0.4	-54.6	15.5	-39.1	1.2	-50.1	4.9	-44.1
-22	0.1	-60.1	7.9	-42.0	15.8	-39.0	10.9	-40.6	0.1	-60.6	13.2	-39.8	2.4	-47.2	1.3	-49.9
-21	0.5	-54.3	9.5	-41.2	18.2	-38.4	8.5	-41.7	0.4	-55.0	10.2	-40.9	4.5	-44.5	0.3	-56.0
-20	2.6	-46.9	10.2	-40.9	18.6	-38.3	6.6	-42.8	2.8	-46.5	6.9	-42.6	5.6	-43.5	3.8	-45.2
-19	6.7	-42.7	8.7	-41.6	12.9	-39.9	4.7	-44.3	4.8	-44.2	4.1	-44.9	4.4	-44.6	13.2	-39.8
-18	11.7	-40.3	10.0	-41.0	5.4	-43.7	9.1	-41.4	3.2	-45.9	6.0	-43.2	2.7	-46.7	12.0	-40.2
-17	17.0	-38.7	13.2	-39.8	4.8	-44.2	13.8	-39.6	1.7	-48.8	10.7	-40.7	7.4	-42.3	11.2	-40.5
-16	23.4	-37.3	10.7	-40.7	5.9	-43.3	17.8	-38.5	7.2	-42.4	9.3	-41.3	9.3	-41.8	17.3	-38.6
-15	30.1	-36.2	6.2	-43.1	6.3	-43.0	18.6	-38.3	16.6	-38.2	6.0	-43.2	6.3	-43.0	1.3	-49.9
-14	36.2	-35.4	9.8	-41.1	6.0	-43.2	19.9	-38.0	36.2	-35.4	3.6	-45.4	4.9	-44.1	4.0	-45.0
-13	38.8	-35.1	10.2	-40.9	21.8	-37.6	35.4	-35.5	48.9	-34.1	1.7	-48.7	12.6	-40.0	6.2	-43.1
-12	38.8	-35.1	8.9	-41.5	35.4	-35.5	43.6	-34.6	56.1	-33.5	0.7	-57.7	21.8	-37.6	7.1	-42.5
-11	37.1	-35.3	4.3	-44.7	43.6	-34.6	41.6	-34.[illegible]	63.0	-33.0	[illegible]	-63.9	33.1	-35.8	56.1	-33.5
-10	35.4	-35.5	0.2	-58.1	57.4	-33.4	33.1	-35.8	74.0	-32.3	0.1	-61.0	56.1	-33.5	69.1	-32.6
-9	37.1	-35.3	3.0	-46.2	75.7	-32.2	25.7	-36.9	91.0	-31.4	0.5	-54.4	75.7	-32.2	33.1	-35.8
-8	42.6	-34.7	8.7	-41.6	107.0	-30.7	25.7	-36.9	131.6	-29.8	5.7	-43.4	158.2	-29.0	17.8	-38.5
-7	60.1	-33.2	19.0	-38.2	147.6	-29.3	29.5	-36.3	177.5	-28.5	6.6	-42.8	208.5	-27.8	79.3	-32.0
-6	95.3	-31.2	26.3	-36.8	213.4	-27.7	30.1	-36.2	245.0	-27.1	1.7	-48.8	199.2	-28.0	37.1	-35.3
-5	120.0	-30.2	42.6	-34.7	228.7	-27.4	25.7	-36.9	294.6	-26.3	0.1	-59.6	169.5	-28.7	7.6	-42.2
-4	141.0	-29.5	72.3	-32.4	208.5	-27.8	28.8	-36.4	287.9	-26.4	8.5	-41.7	125.7	-30.0	0.5	-53.9
-3	154.6	-29.1	91.0	-31.4	177.5	-28.5	44.6	-34.5	177.5	-28.5	37.9	-35.2	81.1	-31.9	10.0	-41.0
-2	147.6	-29.3	97.5	-31.1	141.0	-29.5	54.9	-33.6	114.6	-30.4	89.0	-31.5	20.4	-37.9	26.3	-36.8
-1	137.8	-29.6	107.0	-30.7	107.0	-30.7	64.4	-32.9	11.2	-40.5	165.7	-28.8	93.2	-31.3	75.7	-32.2
0	117.3	-30.3	109.4	-30.6	69.1	-32.6	70.7	-32.5	32.3	-35.9	185.9	-28.3	50.0	-34.0	173.5	-28.6
1	86.9	-31.6	112.0	-30.5	36.2	-35.4	83.0	-31.8	77.5	-32.1	141.0	-29.5	86.9	-31.6	268.7	-26.7
2	72.3	-32.4	114.6	-30.4	15.1	-39.2	97.5	-31.1	74.0	-32.3	144.3	-29.4	65.9	-32.9	308.5	-26.1
3	56.1	-33.5	114.6	-30.4	25.7	-36.9	114.6	-30.4	61.5	-33.1	239.4	-27.2	23.4	-37.3	239.4	-27.2
4	38.8	-35.1	102.1	-30.9	57.4	-33.4	147.6	-29.3	34.6	-35.6	208.5	-27.8	4.4	-44.6	125.7	-30.0
5	21.3	-37.7	93.2	-31.3	86.9	-31.6	199.2	-28.0	17.3	-38.6	114.6	-30.4	1.0	-50.9	74.0	-32.3
6	6.7	-42.7	72.3	-32.4	77.5	-32.1	190.2	-28.2	8.9	-41.5	83.0	-31.8	11.7	-40.3	61.5	-33.1
7	10.9	-40.6	43.6	-34.6	33.1	-35.8	114.6	-30.4	8.5	-41.7	63.0	-33.0	19.9	-38.0	128.6	-29.9
8	19.5	-38.1	25.7	-36.9	6.2	-43.1	54.9	-33.6	18.6	-38.3	40.7	-34.9	21.3	-37.7	134.7	-29.7
9	22.9	-37.4	15.8	-39.0	0.1	-59.6	16.2	-38.9	19.0	-38.2	24.5	-37.1	3.5	-45.6	65.9	-32.8
10	18.2	-38.4	14.1	-39.5	1.4	-49.4	20.4	-37.9	10.0	-41.0	33.1	-35.8	2.4	-47.2	6.6	-42.8
11	10.5	-40.8	15.1	-39.2	3.9	-45.1	23.9	-37.2	2.3	-47.4	63.0	-33.0	7.4	-42.3	44.6	-34.5
12	3.8	-45.2	8.5	-41.7	1.7	-48.6	19.0	-38.2	1.4	-49.5	75.7	-32.2	14.8	-39.3	51.2	-33.9
13	0.1	-61.4	4.0	-45.0	0.3	-55.7	16.2	-38.9	1.5	-49.3	44.6	-34.5	12.9	-39.9	37.1	-35.3
14	0.2	-57.7	2.1	-47.8	0.8	-51.8	30.8	-36.1	1.2	-50.2	13.8	-39.6	1.2	-50.1	4.0	-45.0
15	0.4	-54.6	8.3	-41.8	0.2	-57.6	37.1	-35.3	0.7	-52.8	5.4	-43.7	3.8	-45.2	14.1	-39.5
16	0.4	-54.8	18.6	-38.3	1.5	-49.2	19.9	-38.0	0.5	-53.9	0.4	-54.7	3.2	-45.9	15.1	-39.2
17	0.1	-60.0	23.4	-37.3	2.3	-47.4	1.9	-48.1	1.4	-49.6	4.2	-44.8	6.9	-42.6	5.6	-43.5
18	0.0	-64.8	21.8	-37.6	1.2	-50.1	0.1	-60.2	0.9	-51.3	7.2	-42.4	14.1	-39.5	1.0	-50.8
19	0.2	-57.1	14.4	-39.4	0.2	-57.7	1.5	-49.3	0.1	-62.6	2.6	-46.9	9.8	-41.1	0.7	-52.7
20	0.9	-51.3	5.9	-43.3	0.6	-52.9	3.8	-45.2	0.2	-58.9	1.0	-51.1	1.8	-48.4	1.2	-50.1
21	0.9	-51.3	1.9	-48.2	1.3	-48.5	0.7	-52.8	0.1	-59.5	0.4	-55.4	2.5	-47.1	1.0	-50.9
22	0.6	-53.5	5.0	-44.0	2.0	-47.9	0.4	-54.8	0.2	-58.6	0.1	-63.7	1.3	-49.9	0.6	-53.5
23	0.3	-56.4	6.0	-43.2	0.6	-53.0	8.9	-41.5	3.8	-45.2	0.4	-55.3	0.1	-62.2	4.1	-44.9
24	2.2	-47.6	3.2	-45.9	0.4	-54.8	10.2	-40.9	6.7	-42.7	3.5	-45.6	1.4	-49.5	6.4	-42.9
25	3.7	-45.3	1.5	-49.1	1.1	-50.7	7.9	-42.0	10.0	-41.0	3.8	-45.2	2.5	-47.0	8.9	-41.5
26	4.4	-44.6	0.3	-55.7	3.5	-45.5	5.2	-43.8	13.2	-39.9	1.9	-48.1	6.7	-42.7	3.5	-45.5
27	4.3	-44.7	0.6	-53.1	5.7	-43.4	1.8	-48.4	14.9	-39.3	0.7	-52.6	10.9	-40.6	0.2	-57.5
28	3.8	-45.2	1.5	-49.3	7.1	-42.5	0.2	-58.7	15.5	-39.1	0.2	-57.7	10.5	-40.8	0.1	-59.6
29	1.7	-48.7	2.2	-47.5	6.4	-42.9	0.1	-60.2	10.5	-40.8	0.3	-55.6	4.1	-44.9	9.3	-41.3
30	0.1	-60.8	2.9	-46.4	5.9	-43.3	0.7	-52.6	15.8	-39.0	0.7	-52.8	0.1	-60.3	8.3	-41.8
31	0.2	-58.5	1.9	-48.1	5.6	-43.5	1.3	-49.9	19.0	-38.2	0.3	-55.7	0.4	-55.0	1.3	-49.8
32	1.0	-50.9	0.3	-56.1	4.1	-44.9	1.3	-50.0	15.8	-39.0	0.1	-60.7	3.7	-45.3	0.8	-51.9
33	1.6	-49.0	0.4	-55.5	1.9	-48.4	2.8	-46.5	9.5	-41.2	0.0	-65.9	7.9	-42.0	0.4	-54.7
34	1.4	-49.6	1.3	-49.9	0.7	-52.3	5.5	-43.6	2.2	-47.5	0.3	-56.2	9.5	-41.2	3.2	-46.0
35	1.0	-51.2	1.8	-48.4	0.2	-57.2	5.9	-43.3	1.0	-51.1	1.9	-48.2	7.2	-42.4	4.1	-44.9
36	0.5	-53.8	1.4	-49.4	0.1	-60.5	4.6	-44.4	0.3	-55.6	1.2	-50.3	1.1	-50.5	4.8	-44.2
37	0.1	-60.3	1.1	-50.5	0.2	-58.0	2.6	-46.9	0.7	-52.3	0.5	-53.7	1.4	-49.6	2.7	-46.6
38	0.1	-61.4	1.4	-49.4	0.5	-53.4	1.5	-49.1	0.9	-51.6	0.6	-53.3	5.1	-43.9	0.7	-52.8
39	0.2	-57.6	1.2	-50.3	1.3	-49.3	1.0	-51.2	0.1	-59.7	0.7	-52.3	9.1	-41.4	0.1	-60.1
40	0.3	-55.6	0.4	-55.3	1.9	-48.1	0.7	-52.3	0.3	-55.9	0.1	-63.3	10.5	-40.9	4.7	-44.3
41	0.5	-53.6	0.6	-53.0	1.8	-48.5	2.1	-47.8	0.5	-53.6	0.6	-53.3	9.9	-41.5	6.9	-42.6
42	0.4	-54.6	1.6	-49.0	1.3	-50.0	3.7	-45.3	0.8	-52.0	2.2	-47.4	5.4	-43.7	7.1	-42.5
43	0.4	-54.6	1.9	-48.2	1.9	-48.2	3.4	-45.7	0.6	-53.5	2.3	-47.4	1.7	-48.6	6.2	-43.1
44	1.0	-50.9	1.9	-48.3	1.9	-48.1	1.3	-49.9	0.1	-62.2	1.9	-48.4	0.3	-55.7	2.7	-46.6
45	1.3	-49.9	1.6	-48.9	1.5	-49.1	1.4	-49.5	0.2	-59.1	1.5	-49.2	1.0	-51.2	0.6	-53.4

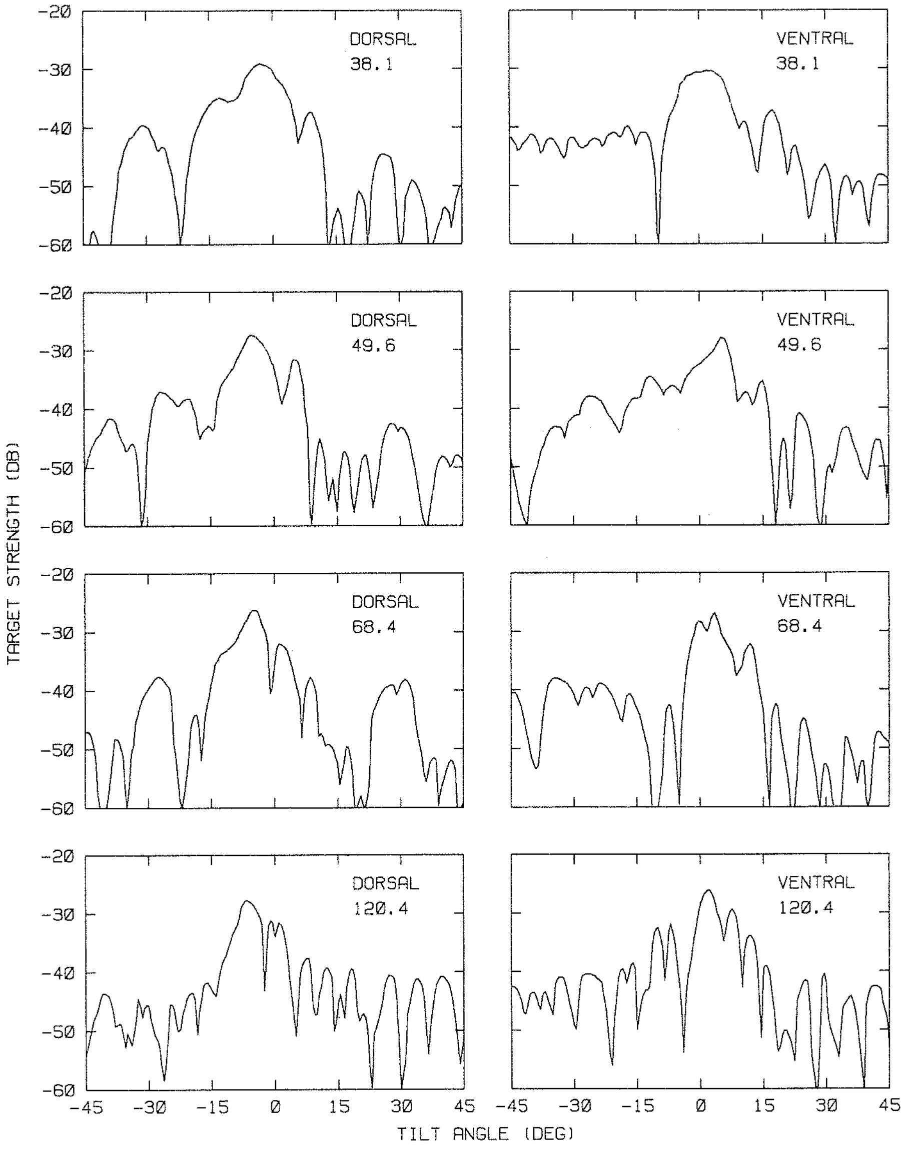

FIG. 19. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 205: POLLACK, 39.0 CM, 380 G.

TABLE 7. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 206: POLLACK, 35.0 CM, 287 G.

	38.1 KHZ				49.6 KHZ				68.4 KHZ				120.4 KHZ			
	DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL	
THETA	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS
-45	5.5	-43.6	1.3	-49.7	1.3	-50.0	2.6	-46.9	4.3	-44.7	4.0	-45.0	0.1	-59.4	0.8	-52.1
-44	5.4	-43.7	0.8	-52.0	3.5	-45.6	1.9	-48.3	4.5	-44.5	2.9	-46.4	0.2	-58.9	2.6	-46.8
-43	3.9	-45.1	0.7	-52.5	5.0	-44.0	1.3	-49.8	3.4	-45.7	1.7	-48.7	0.1	-61.3	3.8	-45.2
-42	1.8	-48.4	1.1	-50.6	4.7	-44.3	1.9	-48.3	1.3	-49.8	2.6	-46.8	0.4	-55.2	3.1	-46.1
-41	1.3	-49.8	1.6	-49.0	3.9	-45.1	1.0	-50.8	0.7	-52.3	2.8	-46.5	2.9	-46.3	2.6	-46.9
-40	2.3	-47.4	2.2	-47.5	1.9	-48.2	1.1	-50.6	2.2	-47.5	2.6	-46.8	3.5	-45.5	2.8	-46.5
-39	2.0	-48.0	2.7	-46.7	0.9	-51.5	0.6	-53.4	2.3	-47.4	2.3	-47.4	1.7	-48.8	3.4	-45.7
-38	0.6	-53.1	2.9	-46.4	1.8	-48.5	1.8	-48.4	1.3	-49.9	2.0	-47.9	0.2	-58.0	1.3	-49.7
-37	0.3	-57.0	2.7	-46.6	3.9	-45.1	3.2	-46.0	0.4	-55.3	1.7	-48.6	0.2	-59.0	4.8	-44.2
-36	1.1	-50.5	2.5	-47.1	7.2	-42.4	4.4	-44.6	0.0	-64.5	1.5	-49.3	1.2	-50.1	1.8	-48.4
-35	2.7	-46.7	1.9	-48.3	10.5	-40.8	5.0	-44.0	0.1	-62.5	3.2	-46.0	0.8	-51.9	1.6	-48.9
-34	2.7	-46.6	1.2	-50.1	13.2	-39.8	5.0	-44.0	1.0	-50.9	2.9	-46.4	2.9	-46.3	0.7	-52.4
-33	1.9	-48.3	0.6	-52.9	12.6	-40.0	4.5	-44.5	1.4	-49.4	7.6	-42.2	2.9	-46.3	0.7	-52.7
-32	0.5	-54.2	0.7	-52.5	17.3	-38.6	7.6	-42.2	0.9	-51.5	8.1	-41.9	7.4	-42.3	2.8	-46.5
-31	0.1	-60.9	1.5	-49.1	25.1	-37.0	8.7	-41.6	0.3	-55.8	4.5	-44.5	2.9	-46.4	10.7	-40.7
-30	0.3	-55.9	2.6	-46.9	37.9	-35.2	8.9	-41.5	5.0	-44.0	2.7	-46.6	3.2	-46.0	7.1	-42.5
-29	0.1	-60.5	2.6	-46.8	41.6	-34.8	6.9	-42.6	5.1	-43.9	3.5	-45.6	5.2	-43.8	10.0	-41.0
-28	0.4	-55.3	2.1	-47.2	39.7	-35.0	5.6	-43.5	6.4	-42.9	3.5	-45.6	3.2	-46.0	8.1	-41.9
-27	0.9	-51.6	1.0	-51.1	32.3	-35.9	9.3	-41.3	13.8	-39.6	9.3	-41.3	6.2	-43.1	4.8	-44.2
-26	0.3	-56.9	0.6	-53.1	17.3	-38.6	11.2	-40.5	15.8	-39.0	14.4	-39.4	3.3	-45.8	1.0	-50.9
-25	0.7	-52.7	1.5	-49.2	9.3	-41.3	11.5	-40.4	15.8	-39.0	13.2	-39.8	3.5	-45.6	0.5	-53.9
-24	1.9	-48.3	3.3	-45.8	10.9	-40.6	6.2	-43.1	19.5	-38.1	12.6	-40.0	2.3	-47.4	3.2	-45.9
-23	2.6	-46.9	5.2	-43.8	11.5	-40.4	3.5	-45.6	28.1	-36.5	11.7	-40.3	10.0	-41.0	13.5	-39.7
-22	3.7	-45.3	8.7	-41.6	9.3	-41.1	1.9	-48.3	19.0	-38.2	8.3	-41.8	22.9	-37.4	13.8	-39.6
-21	4.7	-44.3	12.0	-40.2	5.1	-43.9	1.0	-50.8	13.5	-39.7	1.4	-49.6	18.6	-38.3	4.9	-44.1
-20	5.1	-43.9	15.8	-39.0	3.3	-45.8	1.4	-49.6	15.8	-39.0	1.9	-48.1	13.5	-39.7	1.3	-49.9
-19	4.7	-44.3	17.8	-38.5	2.5	-47.1	1.4	-49.4	6.2	-43.1	0.3	-55.7	20.9	-37.8	17.0	-38.7
-18	3.0	-46.2	19.5	-38.1	1.5	-49.2	0.7	-52.6	9.3	-41.3	2.2	-47.6	4.0	-45.0	44.6	-34.5
-17	3.6	-45.4	21.3	-37.7	0.5	-53.9	2.7	-46.6	6.7	-42.7	6.4	-42.9	3.3	-45.8	38.8	-35.1
-16	10.2	-40.9	21.8	-37.6	0.9	-51.3	6.0	-43.2	0.2	-58.9	11.7	-40.3	10.5	-40.8	16.2	-38.9
-15	19.9	-38.0	21.8	-37.6	5.7	-43.4	21.3	-37.7	14.1	-39.5	22.9	-37.4	22.9	-37.4	5.7	-43.4
-14	23.9	-37.2	19.9	-38.0	18.2	-38.4	45.6	-34.4	19.0	-38.2	31.6	-36.0	5.2	-43.8	0.1	-59.4
-13	26.9	-36.7	16.2	-38.9	28.1	-36.5	61.5	-33.1	19.0	-38.2	31.6	-36.0	1.5	-49.1	3.7	-45.3
-12	30.1	-36.2	10.2	-40.9	44.6	-34.5	67.5	-32.7	41.6	-34.8	25.7	-36.9	2.2	-47.5	30.1	-36.2
-11	33.8	-35.7	7.9	-42.0	61.5	-33.1	72.3	-32.4	74.0	-32.3	25.7	-36.9	0.2	-58.7	65.9	-32.8
-10	36.2	-35.4	12.6	-40.0	86.9	-31.6	72.3	-32.4	86.9	-31.6	45.6	-34.4	23.4	-37.3	86.9	-31.6
-9	43.6	-34.6	23.4	-37.3	107.0	-30.7	64.4	-32.9	89.0	-31.5	55.9	-32.8	72.3	-32.4	122.8	-30.1
-8	63.0	-33.0	42.6	-34.7	128.6	-29.9	48.9	-34.1	89.0	-31.5	77.5	-32.1	102.1	-30.9	173.5	-28.6
-7	83.0	-31.8	57.4	-33.4	147.6	-29.3	39.7	-35.0	97.5	-31.1	85.0	-31.7	64.4	-32.9	199.2	-28.0
-6	102.1	-30.9	79.3	-32.0	154.6	-29.1	30.8	-36.1	125.7	-30.0	91.0	-31.4	194.6	-28.1	218.4	-27.6
-5	117.3	-30.3	95.3	-31.2	154.6	-29.1	37.1	-35.3	151.1	-29.2	91.0	-31.4	416.1	-24.8	181.6	-28.4
-4	120.0	-30.2	93.2	-31.3	151.1	-29.2	47.8	-34.2	147.6	-29.3	125.7	-30.0	354.2	-25.5	102.1	-30.9
-3	117.3	-30.3	79.3	-32.0	134.7	-29.7	64.4	-32.9	107.0	-30.7	173.5	-28.6	29.5	-36.3	128.6	-29.9
-2	107.0	-30.7	60.1	-33.2	74.0	-32.3	137.8	-29.6	67.5	-32.7	173.5	-28.6	3.5	-45.6	102.1	-30.9
-1	93.2	-31.3	45.6	-34.4	38.8	-35.1	165.7	-28.8	39.7	-35.0	141.0	-29.5	16.6	-38.8	83.0	-31.8
0	69.1	-32.6	33.1	-35.8	39.7	-35.0	165.7	-28.8	5.6	-43.5	102.1	-30.9	52.4	-33.8	48.9	-34.1
1	53.6	-33.7	20.9	-37.8	46.7	-34.3	128.6	-29.9	2.5	-47.1	61.5	-33.1	22.3	-37.5	25.7	-36.9
2	28.1	-36.5	22.9	-37.4	51.2	-33.9	83.0	-31.8	5.0	-44.0	36.2	-35.4	8.7	-41.6	44.6	-34.5
3	20.4	-37.9	33.8	-35.7	28.1	-36.5	42.6	-34.7	47.8	-34.2	65.9	-32.8	23.4	-37.3	38.8	-35.1
4	20.9	-37.8	36.2	-35.4	7.1	-42.5	28.1	-36.5	50.0	-34.0	93.2	-31.3	1.0	-51.2	41.6	-34.8
5	13.8	-39.6	37.9	-35.2	21.3	-37.7	45.6	-34.4	25.7	-36.9	89.0	-31.5	37.1	-35.3	64.4	-32.9
6	2.8	-46.5	33.8	-35.7	34.6	-35.6	36.2	-35.4	10.0	-41.0	8.3	-41.8	29.5	-36.3	85.0	-31.7
7	1.9	-48.1	20.9	-37.8	43.6	-34.6	24.5	-37.1	2.3	-47.3	17.8	-38.5	18.2	-38.4	16.6	-38.8
8	3.0	-46.2	9.8	-41.1	38.8	-35.1	19.9	-38.0	5.9	-43.3	34.6	-35.6	6.3	-43.0	74.0	-32.3
9	4.1	-44.9	0.5	-54.2	23.4	-37.3	11.2	-40.5	4.3	-44.7	53.6	-33.7	1.0	-50.9	102.1	-30.9
10	5.5	-43.6	0.5	-53.6	5.2	-43.8	25.7	-36.9	13.5	-39.7	46.7	-34.3	7.6	-42.2	64.4	-32.9
11	7.2	-42.4	4.4	-44.6	6.2	-43.1	37.1	-35.3	10.2	-40.9	28.1	-36.5	5.7	-43.4	27.5	-36.6
12	9.3	-41.3	12.9	-39.9	4.5	-44.5	33.1	-35.8	37.9	-35.2	12.0	-40.2	8.1	-41.9	12.9	-39.9
13	10.7	-40.7	27.5	-36.6	1.9	-48.3	21.8	-37.6	27.5	-36.6	14.4	-39.4	0.7	-52.8	22.3	-37.5
14	10.9	-40.6	35.4	-35.5	4.1	-44.9	27.5	-36.6	43.6	-34.6	22.3	-37.5	21.3	-37.7	30.1	-36.2
15	10.7	-40.7	34.6	-35.6	4.3	-44.7	23.9	-37.2	43.6	-34.6	39.7	-35.0	5.5	-43.6	34.6	-35.6
16	5.4	-43.7	24.5	-37.1	0.9	-51.6	11.5	-40.4	18.6	-38.3	50.0	-34.0	11.7	-40.3	9.5	-41.2
17	0.8	-52.0	7.7	-42.1	2.7	-46.7	18.6	-38.3	17.0	-38.7	41.6	-34.8	7.1	-42.5	2.4	-47.2
18	0.9	-51.5	1.1	-50.5	3.9	-45.1	24.5	-37.1	8.9	-41.5	22.9	-37.4	11.7	-40.3	20.4	-37.9
19	3.7	-45.3	1.4	-49.6	10.2	-40.9	28.8	-36.4	1.6	-48.9	1.0	-51.2	7.4	-42.3	53.6	-33.7
20	3.2	-45.9	6.2	-43.1	11.7	-40.3	29.5	-36.3	0.3	-56.4	16.2	-38.9	1.0	-51.2	39.7	-35.0
21	0.3	-56.5	10.5	-40.8	2.6	-46.8	21.8	-37.6	0.1	-63.7	23.4	-37.3	2.8	-46.5	5.5	-43.6
22	0.1	-60.3	13.2	-39.8	9.3	-41.8	4.0	-45.0	0.7	-52.6	8.7	-41.6	2.9	-46.4	9.3	-41.3
23	0.5	-54.3	14.4	-39.4	10.0	-41.0	0.1	-59.6	2.3	-47.3	1.5	-49.3	1.3	-50.0	2.3	-47.3
24	0.4	-55.1	12.9	-39.9	4.2	-44.8	0.1	-59.6	0.5	-54.0	0.3	-56.6	0.3	-55.6	10.0	-41.0
25	0.1	-62.6	9.8	-41.1	1.1	-50.5	0.3	-56.0	5.0	-44.0	15.8	-39.0	0.2	-58.8	8.9	-41.5
26	0.5	-54.3	4.9	-44.1	3.4	-45.7	7.2	-42.4	6.3	-43.0	21.8	-37.6	1.2	-50.3	1.0	-50.9
27	0.5	-54.4	2.5	-47.0	1.7	-48.5	15.1	-39.2	0.8	-52.2	5.1	-43.9	3.9	-45.1	18.2	-38.4
28	0.3	-56.0	1.9	-48.3	0.2	-58.8	15.5	-39.1	3.4	-45.7	0.4	-54.8	7.9	-42.0	12.9	-39.9
29	2.9	-46.4	3.8	-45.2	0.7	-52.8	10.5	-40.8	1.3	-49.7	0.6	-53.0	9.3	-41.3	1.4	-49.4
30	5.0	-44.0	4.5	-44.5	0.5	-54.3	3.6	-45.4	0.2	-58.5	2.6	-46.9	11.2	-40.5	1.7	-48.6
31	2.5	-47.1	3.7	-45.3	0.7	-52.4	0.9	-51.3	0.2	-59.2	1.2	-50.1	8.3	-41.8	3.4	-45.7
32	0.1	-62.8	2.3	-47.4	2.6	-46.8	1.1	-50.6	2.4	-47.2	0.4	-55.4	8.7	-41.6	2.1	-47.8
33	0.7	-52.3	0.8	-52.1	0.9	-51.3	0.8	-52.2	6.2	-43.1	0.6	-53.0	2.4	-47.2	0.7	-52.8
34	3.5	-45.6	0.2	-58.4	4.7	-44.3	0.3	-51.7	5.5	-43.6	7.2	-42.4	2.3	-47.4	1.4	-49.4
35	3.4	-45.7	0.1	-60.1	5.5	-43.6	0.8	-51.9	1.7	-48.6	7.9	-42.0	0.4	-54.5	0.8	-51.7
36	1.2	-50.2	0.5	-53.9	2.7	-46.7	1.1	-50.6	4.7	-44.3	3.2	-46.0	1.7	-48.7	3.1	-46.1
37	0.1	-59.5	2.6	-46.8	2.3	-47.4	1.9	-48.1	1.2	-50.1	0.7	-52.8	2.7	-46.7	1.7	-48.6
38	1.1	-50.6	3.1	-46.1	9.3	-41.3	4.0	-45.0	1.4	-49.5	2.8	-46.5	1.1	-50.6	0.2	-57.3
39	1.4	-49.4	3.2	-45.9	10.0	-41.0	5.9	-43.3	2.9	-46.4	5.5	-43.6	0.9	-51.6	1.8	-48.5
40	1.4	-49.5	3.1	-46.1	6.7	-42.7	5.2	-43.9	3.4	-45.7	5.0	-44.0	0.9	-51.4	2.9	-46.3
41	1.0	-51.1	2.7	-46.7	7.6	-42.2	2.2	-47.6	1.2	-50.1	2.7	-46.6	0.6	-53.4	0.5	-54.4
42	0.1	-63.5	2.3	-47.4	7.1	-42.5	0.2	-58.5	1.9	-48.1	1.4	-49.4	2.1	-47.7	1.7	-48.6
43	0.0	-67.1	1.7	-48.7	5.5	-43.6	0.2	-57.3	1.4	-49.4	1.6	-49.0	1.0	-50.9	1.0	-50.9
44	0.1	-61.2	0.7	-52.3	6.7	-42.7	0.3	-56.1	0.4	-55.0	2.1	-47.7	2.9	-46.3	0.2	-57.5
45	0.7	-52.4	0.1	-60.5	6.9	-42.6	1.6	-53.4	0.4	-54.5	1.9	-48.3	7.7	-42.1	2.0	-48.0

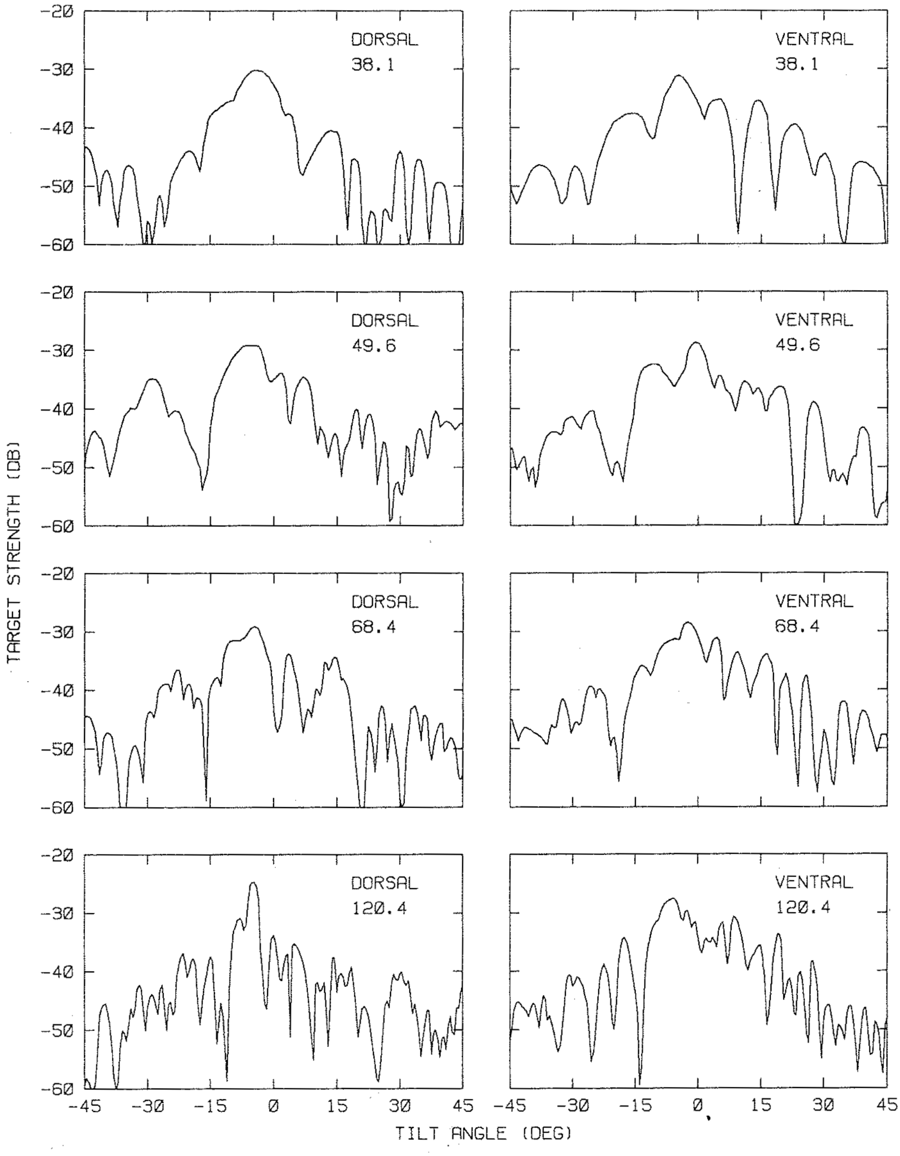

FIG. 20. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 206: POLLACK. 35.0 CM. 287 G.

TABLE 8. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 207: POLLACK, 44.5 CM, 635 G.

THETA	38.1 KHZ DORSAL SR	38.1 KHZ DORSAL TS	38.1 KHZ VENTRAL SR	38.1 KHZ VENTRAL TS	49.6 KHZ DORSAL SR	49.6 KHZ DORSAL TS	49.6 KHZ VENTRAL SR	49.6 KHZ VENTRAL TS	68.4 KHZ DORSAL SR	68.4 KHZ DORSAL TS	68.4 KHZ VENTRAL SR	68.4 KHZ VENTRAL TS	120.4 KHZ DORSAL SR	120.4 KHZ DORSAL TS	120.4 KHZ VENTRAL SR	120.4 KHZ VENTRAL TS
-45	2.0	-47.9	2.5	-47.0	7.4	-42.3	8.9	-41.5	8.7	-41.6	3.1	-46.1	2.2	-47.5	3.3	-45.8
-44	0.7	-52.3	5.0	-44.0	9.3	-41.3	5.4	-43.7	9.5	-41.2	3.1	-46.1	2.1	-47.8	0.6	-53.2
-43	0.1	-60.3	8.7	-41.6	16.2	-38.9	3.0	-46.2	14.4	-39.4	2.6	-46.8	3.2	-46.0	0.4	-54.8
-42	0.0	-66.1	10.0	-41.0	17.8	-38.5	3.7	-45.3	13.8	-39.6	2.2	-47.6	2.6	-46.8	7.1	-42.5
-41	0.1	-60.5	9.8	-41.1	8.3	-41.8	2.9	-46.4	9.3	-41.3	3.9	-45.1	0.1	-62.2	15.1	-39.2
-40	0.5	-54.0	7.4	-42.3	11.7	-40.3	2.1	-47.9	3.2	-46.0	6.7	-42.7	0.8	-51.9	20.4	-37.9
-39	1.3	-49.8	4.3	-44.7	12.9	-39.9	1.1	-50.5	1.0	-51.2	9.5	-41.2	2.2	-47.6	11.5	-40.4
-38	2.4	-47.2	4.3	-44.7	10.7	-40.7	2.6	-46.8	0.4	-55.5	11.2	-40.5	3.7	-45.3	5.9	-43.3
-37	5.1	-43.9	8.7	-41.6	6.3	-43.0	3.2	-46.0	0.4	-54.8	10.5	-40.8	1.7	-48.6	5.1	-43.9
-36	6.7	-42.7	15.5	-39.1	9.3	-41.3	2.7	-46.6	2.3	-46.5	8.9	-41.5	11.5	-40.4	4.1	-44.9
-35	8.5	-41.7	14.8	-39.3	9.8	-41.1	4.9	-44.1	6.0	-43.2	12.6	-40.0	29.5	-36.3	4.5	-44.5
-34	8.1	-41.9	10.9	-40.6	4.3	-44.7	8.1	-41.9	12.9	-39.9	14.4	-39.4	37.9	-35.2	2.7	-46.7
-33	7.2	-42.4	12.9	-39.9	1.0	-51.2	11.7	-40.3	21.3	-37.7	13.8	-39.6	27.5	-36.6	0.8	-52.0
-32	7.4	-42.3	14.8	-39.3	0.2	-57.1	8.7	-41.6	27.5	-36.6	12.3	-40.1	7.1	-42.5	0.6	-53.4
-31	9.8	-41.1	16.2	-38.9	3.3	-45.8	9.8	-41.1	24.9	-36.7	9.5	-41.2	0.8	-51.8	13.2	-39.8
-30	8.5	-41.7	15.8	-39.0	13.2	-39.8	9.5	-41.2	21.8	-37.6	5.7	-43.4	11.5	-40.4	14.4	-39.4
-29	3.6	-45.4	14.4	-39.4	14.8	-39.3	6.4	-42.9	8.9	-41.5	2.5	-47.0	18.6	-38.3	10.7	-40.7
-28	1.1	-50.5	12.9	-39.9	10.7	-40.7	5.2	-43.8	12.9	-39.9	3.1	-46.1	16.6	-38.8	8.5	-41.7
-27	0.9	-51.4	11.2	-40.5	6.7	-42.7	8.7	-41.6	13.2	-39.8	3.7	-45.3	9.1	-41.4	1.9	-48.3
-26	1.3	-49.9	8.5	-41.7	9.8	-41.1	6.6	-42.8	6.9	-42.6	1.2	-50.2	4.6	-44.4	3.2	-46.0
-25	1.3	-49.9	6.2	-43.1	10.9	-40.6	5.0	-44.0	1.2	-50.2	2.5	-47.0	1.3	-49.7	14.8	-39.3
-24	0.6	-53.1	4.0	-45.0	10.7	-40.7	11.2	-40.5	1.6	-49.0	6.4	-42.9	3.5	-45.6	31.6	-36.0
-23	2.5	-47.0	0.8	-51.9	9.5	-41.2	15.5	-39.1	6.0	-43.2	13.8	-39.6	10.5	-40.8	39.7	-35.0
-22	4.7	-44.3	0.3	-56.1	7.9	-42.0	16.6	-38.8	6.9	-42.6	30.8	-36.1	14.8	-39.3	41.6	-34.8
-21	8.1	-41.9	0.1	-63.9	4.0	-45.0	17.0	-38.7	5.4	-43.7	52.4	-33.8	19.0	-38.2	8.5	-41.7
-20	14.8	-39.3	1.1	-50.5	3.2	-46.0	15.5	-39.1	2.6	-46.9	53.6	-33.7	22.3	-37.5	3.4	-45.7
-19	22.9	-37.4	7.6	-42.2	5.7	-43.4	13.8	-39.6	4.8	-44.2	36.2	-35.4	8.1	-41.9	10.0	-41.0
-18	32.3	-35.9	13.2	-39.8	11.5	-40.4	8.5	-41.7	8.5	-41.7	19.9	-33.0	43.6	-34.6	23.9	-37.2
-17	44.6	-34.5	10.5	-40.9	23.9	-37.2	1.8	-48.5	13.8	-39.6	8.9	-41.5	47.8	-34.2	13.5	-39.7
-16	57.4	-33.4	12.3	-40.1	48.9	-34.1	0.3	-56.0	26.9	-36.7	12.9	-39.9	13.5	-39.7	25.1	-37.0
-15	72.3	-32.4	37.1	-35.3	86.9	-31.6	1.1	-50.7	45.6	-34.4	26.3	-36.8	18.6	-38.3	29.5	-36.3
-14	83.0	-31.8	48.9	-34.1	117.3	-30.3	2.3	-47.3	93.2	-31.3	22.3	-37.5	52.4	-33.8	18.2	-38.4
-13	85.0	-31.7	50.0	-34.0	141.0	-29.5	4.3	-44.7	147.6	-29.3	16.2	-38.9	65.9	-32.8	70.7	-32.5
-12	85.0	-31.7	54.9	-33.6	144.3	-29.4	6.9	-42.6	185.9	-28.3	10.0	-41.0	38.8	-35.1	125.7	-30.0
-11	70.7	-32.5	69.1	-32.6	134.7	-29.7	11.7	-40.3	239.4	-27.2	5.7	-43.4	97.5	-31.1	91.1	-31.9
-10	57.4	-33.4	72.3	-32.4	165.7	-28.8	25.1	-37.0	274.9	-26.6	18.2	-38.4	250.7	-27.0	25.7	-36.9
-9	69.1	-32.6	70.7	-32.5	223.5	-27.5	47.8	-34.2	315.7	-26.0	39.7	-35.0	406.6	-24.9	5.0	-44.0
-8	109.4	-30.6	61.5	-33.1	315.7	-26.0	77.5	-32.1	346.1	-25.6	40.7	-34.9	379.5	-25.2	11.5	-40.4
-7	141.0	-29.5	53.6	-33.7	379.5	-25.2	120.0	-30.2	308.5	-26.1	18.6	-38.3	185.9	-28.3	31.6	-36.0
-6	165.7	-28.8	61.5	-33.1	362.4	-25.4	137.8	-29.6	169.5	-28.7	52.4	-33.8	60.1	-33.2	43.6	-34.6
-5	169.5	-28.7	77.5	-32.1	268.7	-26.7	107.0	-30.7	89.0	-31.5	117.3	-30.3	64.4	-32.9	256.6	-26.9
-4	165.7	-28.8	95.3	-31.2	147.6	-29.3	93.2	-31.3	22.3	-37.5	147.6	-29.3	7.1	-42.5	425.8	-24.7
-3	137.8	-29.6	122.8	-30.1	48.9	-34.1	109.4	-30.6	8.3	-41.8	195.9	-28.3	102.1	-30.9	323.0	-25.9
-2	102.1	-30.9	181.6	-28.4	51.2	-33.9	131.6	-29.8	15.5	-39.1	213.4	-27.7	86.9	-31.6	223.5	-27.5
-1	74.0	-32.3	223.7	-27.4	58.8	-33.3	137.9	-29.6	37.9	-35.2	213.4	-27.7	31.6	-36.0	281.3	-26.5
0	43.6	-34.6	268.7	-26.7	48.9	-34.1	181.6	-28.4	70.7	-32.5	203.8	-27.9	10.7	-40.7	213.4	-27.7
1	25.7	-36.9	245.0	-27.1	56.1	-33.5	208.5	-27.8	81.1	-31.9	231.3	-26.5	2.8	-46.5	5.9	-43.3
2	29.5	-36.3	181.6	-28.4	75.7	-32.2	209.5	-27.8	81.1	-31.9	308.5	-26.1	43.6	-34.6	9.5	-41.2
3	27.5	-36.6	120.0	-30.2	97.5	-31.1	194.6	-28.1	14.4	-39.4	262.5	-26.8	44.6	-34.5	83.0	-31.8
4	21.8	-37.6	83.0	-31.8	95.3	-31.2	165.7	-28.8	12.6	-40.0	109.4	-30.6	52.4	-33.8	165.7	-28.8
5	42.6	-34.7	58.8	-33.3	4.7	-44.3	95.3	-31.2	19.9	-38.0	58.8	-33.3	107.0	-30.7	234.0	-27.3
6	58.8	-33.3	44.6	-34.5	0.8	-51.8	45.6	-34.4	20.4	-37.9	53.6	-33.7	18.6	-38.3	169.5	-28.7
7	72.3	-32.4	33.1	-35.8	21.8	-37.6	141.0	-29.5	28.1	-36.5	177.5	-28.5	63.0	-33.0	151.1	-29.2
8	72.3	-32.4	25.1	-37.0	39.7	-35.0	199.2	-28.0	34.6	-35.6	208.5	-27.8	20.4	-37.9	301.4	-26.2
9	30.8	-36.1	38.8	-35.1	37.9	-35.2	208.5	-27.8	1.4	-49.5	169.5	-28.7	1.2	-50.2	154.6	-29.1
10	9.1	-41.4	70.7	-32.5	15.5	-39.1	107.0	-30.7	36.2	-35.4	117.3	-30.3	3.2	-46.0	95.3	-31.2
11	2.1	-47.7	69.1	-32.6	8.1	-41.9	58.8	-33.3	52.4	-33.8	46.7	-34.3	4.0	-45.0	41.6	-34.8
12	2.5	-47.1	56.1	-33.5	12.6	-40.0	58.8	-33.3	28.8	-36.4	54.9	-33.6	0.5	-54.0	5.2	-43.8
13	20.9	-37.8	36.2	-35.4	13.8	-39.6	47.8	-34.2	3.3	-45.8	42.6	-34.7	2.5	-47.0	8.1	-41.9
14	25.7	-36.9	22.3	-37.5	8.9	-41.5	36.2	-35.4	15.8	-39.0	16.6	-38.8	14.4	-39.4	7.9	-42.0
15	22.3	-37.5	9.5	-41.2	1.5	-49.2	18.2	-38.4	30.8	-36.1	19.5	-38.1	19.5	-38.1	1.1	-50.5
16	8.1	-41.9	6.9	-42.6	1.5	-49.1	14.1	-39.5	4.8	-44.2	11.5	-40.4	15.1	-39.2	1.7	-48.8
17	1.4	-49.5	4.9	-44.1	1.2	-50.2	15.1	-39.2	0.5	-53.6	6.3	-43.0	3.5	-45.6	3.5	-45.6
18	0.5	-53.8	0.6	-52.9	4.1	-44.9	5.7	-43.4	0.8	-51.8	3.7	-45.3	0.6	-53.5	13.2	-39.8
19	2.4	-47.2	0.2	-57.1	2.0	-48.0	0.8	-51.7	2.7	-46.7	2.2	-47.5	1.2	-50.3	19.5	-38.1
20	2.8	-46.5	10.2	-40.9	2.2	-47.6	4.5	-44.5	2.7	-46.6	0.5	-54.0	6.9	-42.6	2.9	-46.3
21	1.2	-50.2	13.2	-39.8	2.9	-46.3	7.7	-42.1	2.5	-47.1	0.3	-57.0	13.5	-39.7	10.5	-40.8
22	0.5	-54.2	9.5	-41.2	2.4	-47.2	9.1	-41.4	5.9	-43.3	1.7	-48.6	16.6	-38.8	3.7	-45.3
23	0.2	-57.5	5.7	-43.4	1.3	-48.4	7.1	-42.5	6.9	-42.6	3.2	-45.9	19.5	-38.1	1.0	-51.1
24	0.1	-62.6	2.2	-47.6	1.3	-50.0	13.5	-39.7	3.8	-45.2	1.0	-51.2	19.0	-38.2	2.6	-46.8
25	1.3	-50.0	0.0	-66.4	5.9	-43.3	14.8	-39.3	0.9	-51.5	0.2	-57.1	6.7	-42.7	1.3	-50.0
26	2.9	-46.4	0.8	-52.2	4.2	-44.8	5.9	-43.3	0.3	-56.2	0.6	-53.5	1.8	-48.5	0.3	-56.3
27	3.1	-46.1	0.9	-51.4	2.8	-46.5	2.1	-47.7	0.7	-52.5	0.4	-54.6	0.8	-52.2	3.3	-45.8
28	0.2	-58.4	0.7	-52.8	4.5	-44.5	2.6	-46.8	2.0	-48.0	0.3	-57.0	6.6	-42.8	1.6	-48.9
29	0.8	-52.1	0.2	-56.3	3.8	-45.2	1.5	-49.1	2.1	-47.7	0.3	-56.9	12.9	-39.9	5.9	-43.3
30	0.8	-52.0	0.7	-52.3	2.1	-47.7	4.0	-45.0	1.0	-50.8	0.1	-60.3	15.8	-39.0	0.2	-58.8
31	1.0	-51.2	1.0	-51.2	2.4	-47.2	4.6	-44.4	1.9	-48.2	0.0	-64.6	15.1	-39.2	2.1	-47.8
32	0.8	-51.7	0.8	-51.9	1.9	-48.1	2.2	-46.3	2.5	-47.0	0.7	-52.6	8.7	-41.6	0.1	-61.2
33	0.5	-54.4	0.1	-59.7	5.6	-43.5	1.5	-49.1	2.4	-47.2	2.0	-47.9	2.5	-47.1	1.1	-50.5
34	0.3	-56.8	0.0	-66.1	7.4	-42.3	2.1	-47.7	2.0	-47.9	1.0	-50.9	0.3	-56.9	0.7	-52.7
35	0.3	-56.8	0.1	-63.1	8.9	-41.5	0.5	-54.0	4.2	-44.8	0.2	-58.3	0.4	-54.6	0.7	-52.5
36	0.8	-51.8	0.2	-58.0	8.7	-41.6	0.1	-60.0	6.4	-42.9	0.1	-61.5	0.5	-53.9	1.0	-51.0
37	1.3	-50.0	0.5	-54.2	6.7	-42.7	0.5	-54.4	6.3	-43.0	0.2	-58.7	0.3	-56.4	3.5	-45.5
38	1.0	-50.8	1.4	-49.6	11.2	-40.5	0.7	-52.5	12.3	-40.1	1.9	-48.2	0.6	-52.9	3.4	-45.7
39	0.1	-60.0	3.1	-46.1	11.7	-40.3	0.3	-55.6	12.0	-40.2	2.4	-47.2	1.3	-48.4	4.2	-44.8
40	0.2	-58.1	4.4	-44.6	7.4	-42.3	1.5	-49.2	7.1	-42.5	2.7	-46.7	7.6	-42.2	1.4	-49.4
41	1.2	-50.3	3.5	-45.5	6.4	-42.9	4.7	-44.3	3.1	-46.1	2.5	-46.9	12.9	-39.9	0.3	-56.8
42	1.1	-50.6	0.5	-54.2	6.2	-43.1	3.5	-45.5	1.5	-49.3	2.1	-47.9	16.6	-38.8	1.1	-50.4
43	0.6	-53.4	0.1	-59.4	2.9	-46.3	1.4	-49.6	1.2	-49.5	1.2	-50.1	16.2	-38.9	2.3	-47.3
44	0.1	-60.0	1.1	-50.4	5.4	-43.7	1.0	-50.9	1.9	-48.3	0.3	-56.6	12.9	-39.9	3.2	-45.9
45	0.4	-54.6	2.2	-47.5	5.6	-43.5	2.0	-48.0	1.7	-48.8	0.5	-54.1	7.7	-42.1	3.4	-45.7

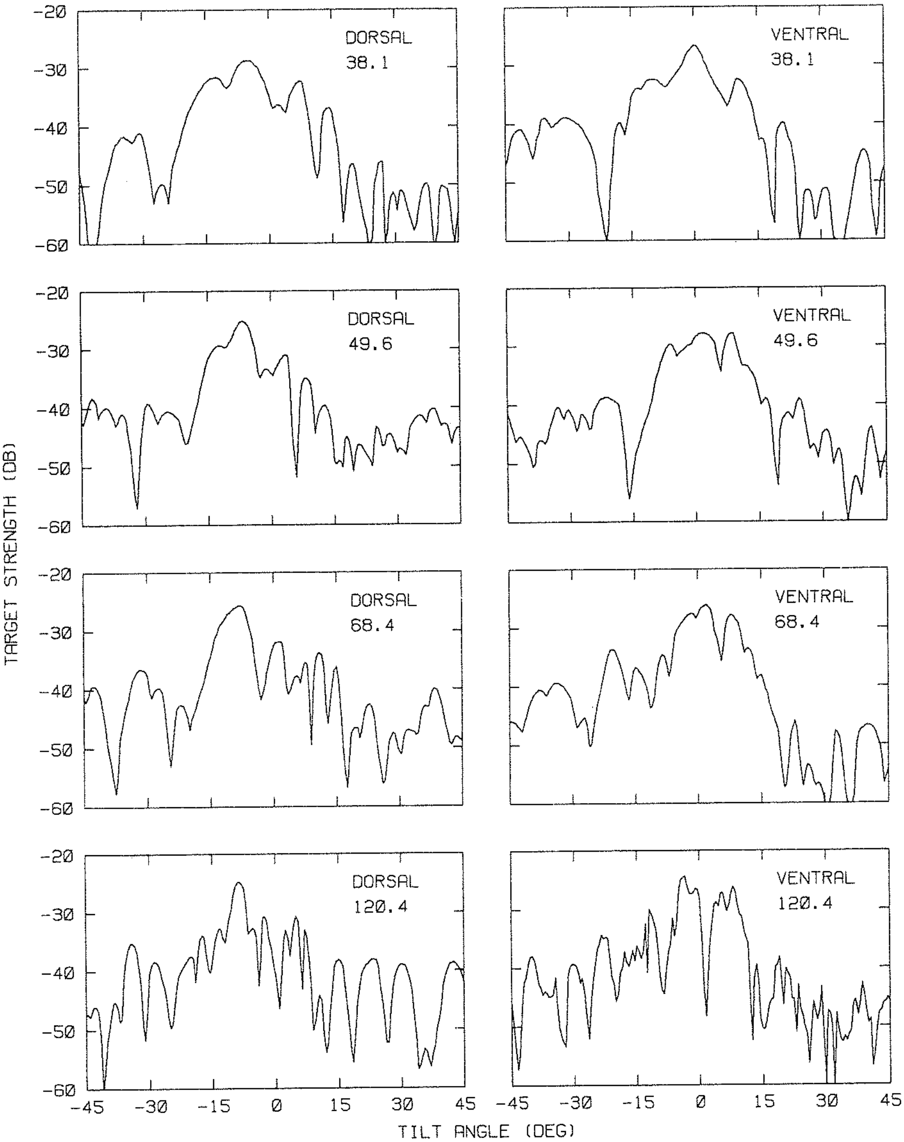

FIG. 21. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 207: POLLACK, 44.5 CM, 635 G.

TABLE 9. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 209: SAITHE, 38.5 CM, 385 G.

	38.1 KHZ				49.6 KHZ				68.4 KHZ				120.4 KHZ			
	DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL	
THETA	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS
-45	0.0	-67.0	3.2	-45.9	1.0	-51.0	3.0	-46.2	1.0	-51.1	2.6	-46.9	2.8	-46.5	3.0	-46.2
-44	0.0	-67.1	3.3	-45.8	0.5	-53.7	3.0	-46.2	1.1	-50.5	1.5	-49.3	3.9	-45.1	2.0	-47.9
-43	0.1	-63.0	3.4	-45.7	1.1	-50.5	2.8	-46.5	0.3	-52.2	0.6	-52.9	1.3	-48.5	4.7	-44.3
-42	0.3	-56.2	3.4	-45.7	1.5	-49.1	2.5	-47.0	0.6	-53.1	0.2	-58.9	0.6	-53.3	6.7	-42.7
-41	0.6	-53.4	3.2	-45.9	1.4	-49.4	2.1	-47.7	1.4	-49.6	0.2	-57.1	0.1	-61.0	4.1	-44.9
-40	0.9	-51.4	2.6	-46.8	1.5	-49.3	2.1	-47.8	1.1	-50.7	0.3	-55.8	0.4	-55.5	4.1	-44.9
-39	1.4	-49.5	4.6	-44.4	1.9	-48.3	2.7	-46.7	0.4	-54.9	0.3	-54.3	2.3	-47.4	4.8	-44.2
-38	1.4	-49.4	4.9	-44.1	2.1	-47.8	3.2	-45.9	0.1	-59.9	0.2	-57.8	5.2	-43.8	2.2	-47.5
-37	0.7	-52.6	2.2	-47.5	1.5	-49.3	2.9	-46.3	0.0	-64.5	1.1	-50.7	6.6	-42.8	0.8	-52.1
-36	0.0	-66.8	3.8	-45.2	0.7	-52.7	2.5	-47.0	0.0	-64.8	1.8	-48.5	4.0	-45.0	1.4	-49.6
-35	1.6	-48.9	4.6	-44.4	3.1	-46.1	2.2	-47.5	0.3	-57.0	2.4	-47.2	1.3	-49.8	8.9	-41.5
-34	2.4	-47.2	4.6	-44.4	4.8	-44.2	2.3	-47.4	0.5	-53.8	3.1	-46.1	0.2	-58.3	13.2	-39.8
-33	2.2	-47.5	4.4	-44.6	4.0	-45.0	2.9	-46.4	0.4	-54.6	4.4	-44.6	0.6	-53.3	8.3	-41.8
-32	1.6	-49.0	4.0	-45.0	3.4	-45.7	4.0	-45.0	0.5	-54.1	7.4	-42.3	0.7	-52.8	19.0	-38.2
-31	0.7	-52.7	3.5	-45.6	4.5	-44.5	5.2	-43.8	0.7	-52.9	9.3	-41.8	0.8	-51.8	21.3	-37.7
-30	0.1	-62.4	3.0	-46.2	4.8	-44.2	5.9	-43.3	0.9	-51.4	7.7	-42.1	1.0	-50.8	17.0	-38.7
-29	0.0	-66.9	2.6	-46.8	2.3	-47.4	6.2	-43.1	1.0	-51.2	11.2	-40.5	0.7	-52.4	11.2	-40.5
-28	0.0	-65.1	2.1	-47.7	2.8	-46.5	5.4	-43.7	0.2	-57.3	17.0	-38.7	0.2	-59.0	3.4	-45.7
-27	0.1	-60.5	1.4	-49.4	3.0	-46.2	6.7	-42.7	0.3	-56.8	20.9	-37.8	2.1	-47.7	1.1	-50.6
-26	0.3	-55.8	1.7	-48.6	2.3	-47.4	7.7	-42.1	0.6	-52.9	24.5	-37.1	5.0	-44.0	12.0	-40.2
-25	0.6	-53.0	1.0	-51.1	0.4	-54.6	8.1	-41.9	1.1	-50.6	25.1	-37.0	6.0	-43.2	13.2	-39.8
-24	1.2	-50.2	1.0	-50.9	0.1	-60.5	8.3	-41.8	1.9	-48.3	23.9	-37.2	6.0	-43.2	4.7	-44.3
-23	1.6	-48.9	2.1	-47.8	0.7	-52.8	9.1	-41.9	1.8	-48.5	19.9	-38.0	5.6	-43.5	0.3	-56.0
-22	2.2	-47.5	3.1	-46.1	2.3	-47.4	7.6	-42.2	1.0	-50.9	12.6	-40.0	2.0	-47.9	17.8	-38.5
-21	2.0	-48.0	4.3	-44.7	2.9	-46.3	6.0	-43.2	1.7	-48.7	7.2	-42.4	1.9	-48.3	33.1	-35.8
-20	1.3	-49.8	6.0	-43.2	3.1	-46.1	4.4	-44.6	0.6	-52.9	5.2	-43.8	2.5	-47.1	37.1	-35.3
-19	3.4	-45.7	8.3	-41.8	2.6	-46.9	3.2	-45.9	0.0	-66.0	4.2	-44.8	2.0	-47.9	24.5	-37.1
-18	7.2	-42.4	11.5	-40.4	1.4	-49.4	2.5	-47.0	0.1	-59.3	4.9	-44.1	1.3	-50.0	20.4	-37.9
-17	10.5	-40.8	13.5	-39.7	2.8	-46.5	5.9	-43.3	1.1	-50.4	5.4	-43.7	3.4	-45.7	35.4	-35.5
-16	13.8	-39.6	13.8	-39.6	7.9	-42.0	8.3	-41.8	4.7	-44.3	5.6	-43.5	5.2	-43.8	18.6	-38.3
-15	15.5	-39.1	18.6	-38.3	14.4	-39.4	10.2	-40.9	7.1	-42.5	5.4	-43.7	2.5	-47.0	19.9	-38.0
-14	15.5	-39.1	30.1	-36.2	21.3	-37.7	20.4	-37.9	5.2	-43.8	6.2	-43.1	0.3	-55.8	23.9	-37.2
-13	12.3	-40.1	43.6	-34.6	25.7	-36.9	32.3	-35.9	10.9	-40.6	10.5	-40.8	1.6	-49.0	9.3	-41.3
-12	12.3	-40.1	63.0	-33.0	28.8	-36.4	45.6	-34.4	30.8	-36.1	37.9	-35.2	4.7	-44.3	61.5	-33.1
-11	19.5	-38.1	77.5	-32.1	35.4	-35.5	69.1	-32.6	46.7	-34.3	74.0	-32.3	11.7	-40.3	56.1	-33.5
-10	30.1	-36.2	91.0	-31.4	57.4	-33.4	83.0	-31.8	57.4	-33.4	91.0	-31.4	25.7	-36.9	51.2	-33.9
-9	45.6	-34.4	107.0	-30.7	107.0	-30.7	95.3	-31.2	79.3	-32.0	107.0	-30.7	33.1	-35.8	107.0	-30.7
-8	69.1	-32.6	120.0	-30.2	161.2	-28.9	102.1	-30.9	112.0	-30.5	120.0	-30.2	67.5	-32.7	239.4	-27.2
-7	91.0	-31.4	128.6	-29.9	199.2	-28.0	104.5	-30.8	199.2	-28.0	131.6	-29.8	203.8	-27.9	323.0	-25.9
-6	122.8	-30.1	131.6	-29.8	208.5	-27.8	131.6	-29.8	294.6	-26.3	147.6	-29.3	281.3	-26.5	262.5	-26.8
-5	161.9	-28.9	128.6	-29.9	208.5	-27.8	151.1	-29.2	315.7	-26.0	161.9	-28.9	274.9	-26.6	169.5	-28.7
-4	181.6	-28.4	114.6	-30.4	194.6	-28.1	154.6	-29.1	281.3	-26.5	154.6	-29.1	177.5	-28.5	102.1	-30.9
-3	177.5	-28.5	91.0	-31.4	131.6	-29.8	144.3	-29.4	52.4	-33.8	144.3	-29.4	19.5	-38.1	61.5	-33.1
-2	158.2	-29.0	72.3	-32.4	56.1	-33.5	122.8	-30.1	10.9	-40.6	102.1	-30.9	128.6	-29.9	89.0	-31.5
-1	125.7	-30.0	58.8	-33.3	12.9	-39.9	99.8	-31.0	0.2	-58.0	61.5	-33.1	28.1	-36.5	53.6	-33.7
0	77.5	-32.1	46.7	-34.3	3.9	-45.1	83.0	-31.8	1.3	-49.9	31.6	-36.0	7.1	-42.5	141.0	-29.5
1	45.6	-34.4	37.1	-35.3	21.8	-37.6	64.4	-32.9	51.2	-33.9	34.6	-35.6	53.6	-33.7	151.1	-29.2
2	25.7	-36.9	28.1	-36.5	33.8	-35.7	48.9	-34.1	29.5	-36.3	65.9	-32.8	64.4	-32.9	72.3	-32.4
3	13.5	-39.7	20.4	-37.9	44.6	-34.5	34.6	-35.6	13.5	-39.7	79.3	-32.0	9.3	-41.3	18.2	-38.4
4	7.7	-42.1	12.0	-40.2	40.7	-34.9	25.7	-36.9	1.5	-49.1	89.0	-31.5	21.8	-37.6	69.1	-32.6
5	5.5	-43.6	10.5	-40.8	13.5	-39.7	23.4	-37.3	2.5	-47.1	89.0	-31.5	27.5	-36.6	102.1	-30.9
6	5.4	-43.7	22.3	-37.5	3.2	-45.9	29.5	-36.3	8.5	-41.7	63.0	-33.0	5.5	-43.6	79.3	-32.0
7	8.5	-41.7	33.1	-35.8	0.6	-53.0	33.8	-35.7	11.2	-40.5	30.8	-36.1	0.8	-52.2	30.1	-36.2
8	11.2	-40.5	34.6	-35.6	1.5	-49.2	35.4	-35.5	11.2	-40.5	27.5	-36.6	0.1	-59.6	7.1	-42.5
9	12.6	-40.0	30.1	-36.2	7.4	-42.3	35.4	-35.5	1.9	-48.1	23.9	-37.2	1.4	-49.5	11.5	-40.4
10	10.9	-40.6	19.5	-38.1	8.5	-41.7	28.8	-36.4	1.5	-49.2	18.6	-38.3	0.9	-51.5	36.2	-35.4
11	4.8	-44.2	13.2	-39.8	2.6	-46.9	17.0	-38.7	1.3	-50.0	20.9	-37.8	4.5	-44.5	43.6	-34.6
12	2.3	-47.4	9.1	-41.4	0.9	-51.4	7.9	-42.0	2.6	-46.8	30.8	-36.1	0.8	-52.0	17.9	-38.5
13	0.5	-54.1	10.2	-40.9	0.1	-61.3	3.2	-46.0	2.1	-47.7	32.3	-35.9	0.8	-51.8	4.4	-44.6
14	0.8	-52.0	10.7	-40.7	0.6	-53.2	18.2	-38.4	0.8	-52.0	19.9	-38.0	1.1	-50.5	36.2	-35.4
15	1.5	-49.2	8.1	-41.9	0.5	-54.0	20.4	-37.9	1.4	-49.6	3.0	-46.2	0.4	-55.2	16.2	-38.9
16	3.5	-45.5	4.5	-44.5	0.2	-57.4	14.9	-39.3	0.5	-54.4	0.7	-52.7	0.5	-54.3	5.5	-43.6
17	3.3	-45.8	4.7	-44.3	0.4	-54.6	4.9	-44.1	0.2	-58.5	3.5	-45.6	2.0	-47.9	33.1	-35.8
18	2.4	-47.2	5.1	-43.9	1.7	-48.6	8.5	-41.7	0.1	-59.4	8.3	-41.8	7.7	-42.1	15.8	-39.0
19	1.4	-49.4	4.6	-44.4	1.9	-48.3	13.5	-39.7	0.0	-65.7	9.8	-41.1	14.4	-39.4	4.4	-44.6
20	0.3	-56.6	3.4	-45.7	1.7	-48.6	15.5	-39.1	0.6	-53.2	7.7	-42.1	12.6	-40.0	6.3	-43.0
21	0.1	-60.6	2.3	-47.4	1.5	-49.3	9.8	-41.1	2.5	-47.1	4.2	-44.8	4.8	-44.2	4.8	-44.2
22	0.0	-64.5	3.7	-45.3	1.4	-49.4	1.4	-49.4	2.9	-46.4	1.3	-49.7	1.7	-48.7	3.3	-45.8
23	0.0	-65.3	4.7	-44.3	1.5	-49.2	0.3	-56.2	2.3	-47.3	3.4	-45.7	0.8	-52.2	0.7	-52.6
24	0.2	-58.6	4.7	-44.3	1.6	-49.0	1.5	-49.3	0.4	-54.8	3.9	-45.1	5.9	-43.3	7.9	-42.0
25	0.4	-55.3	3.6	-45.4	1.4	-49.6	2.7	-46.6	0.8	-51.7	2.7	-46.7	11.2	-40.5	12.9	-39.9
26	0.5	-54.2	1.8	-48.5	0.4	-54.8	3.1	-46.1	1.3	-50.0	1.3	-49.9	16.6	-38.8	1.4	-49.4
27	0.6	-53.4	0.5	-54.3	0.2	-58.1	3.2	-45.9	1.4	-49.4	0.5	-54.0	20.4	-37.9	1.8	-48.5
28	1.3	-49.7	0.1	-64.0	0.1	-62.8	3.2	-45.9	0.8	-51.7	0.2	-57.2	17.3	-38.6	1.1	-50.7
29	1.3	-49.9	0.2	-58.2	0.0	-64.1	3.0	-46.2	0.1	-64.0	1.5	-49.1	10.2	-40.9	0.5	-54.1
30	1.2	-50.3	0.6	-53.5	0.0	-64.6	1.4	-49.6	0.1	-61.3	3.2	-46.0	3.5	-45.6	2.0	-47.9
31	0.9	-51.3	0.9	-51.3	0.0	-66.3	1.3	-49.8	0.1	-60.6	1.4	-49.6	0.9	-51.4	2.0	-48.0
32	0.6	-53.4	1.3	-50.0	0.4	-54.8	1.1	-50.7	0.0	-66.0	1.1	-50.5	0.2	-58.1	1.1	-50.7
33	1.1	-50.7	1.5	-49.2	0.8	-51.8	0.2	-58.9	0.2	-57.3	3.6	-45.4	0.1	-62.0	4.6	-44.4
34	1.3	-49.8	0.6	-52.9	1.7	-48.6	1.7	-48.8	0.0	-64.4	4.2	-44.8	0.1	-59.4	5.1	-43.9
35	1.1	-50.5	0.3	-56.5	1.7	-48.6	2.1	-47.8	0.2	-58.4	3.1	-46.1	0.1	-59.5	1.1	-50.4
36	1.3	-50.0	1.8	-48.4	1.3	-49.8	2.0	-47.9	0.6	-53.3	0.3	-56.0	0.1	-59.4	0.2	-57.3
37	0.8	-52.0	1.4	-49.6	1.0	-50.8	1.2	-50.1	1.4	-49.6	1.2	-50.3	0.1	-63.0	1.3	-49.8
38	0.3	-55.6	0.8	-52.0	0.8	-52.0	0.6	-53.5	1.3	-50.0	1.1	-50.5	0.1	-59.8	3.7	-45.3
39	0.2	-59.0	1.8	-48.5	1.3	-49.7	0.3	-56.7	1.7	-48.7	0.4	-55.2	0.1	-63.0	0.3	-56.7
40	0.4	-55.1	1.3	-49.7	1.6	-48.9	0.1	-61.4	1.4	-49.4	0.2	-57.3	0.3	-56.5	0.9	-51.6
41	0.1	-59.4	0.4	-55.4	1.4	-49.0	0.1	-62.8	1.9	-48.2	1.7	-48.7	0.8	-51.9	1.0	-51.2
42	0.0	-67.0	0.1	-62.2	1.2	-50.1	0.3	-55.7	1.4	-49.6	2.9	-46.3	0.6	-53.0	1.0	-51.2
43	0.0	-67.1	0.3	-56.3	0.6	-52.9	0.4	-55.2	0.9	-51.6	2.4	-47.2	0.6	-53.5	2.1	-47.8
44	0.0	-67.1	1.1	-50.4	0.3	-56.7	0.8	-52.2	0.8	-51.9	0.5	-53.7	0.7	-52.3	1.9	-48.2
45	0.0	-67.1	1.9	-48.1	0.3	-55.6	1.8	-48.4	0.5	-53.7	2.1	-47.8	1.0	-51.2	1.0	-50.8

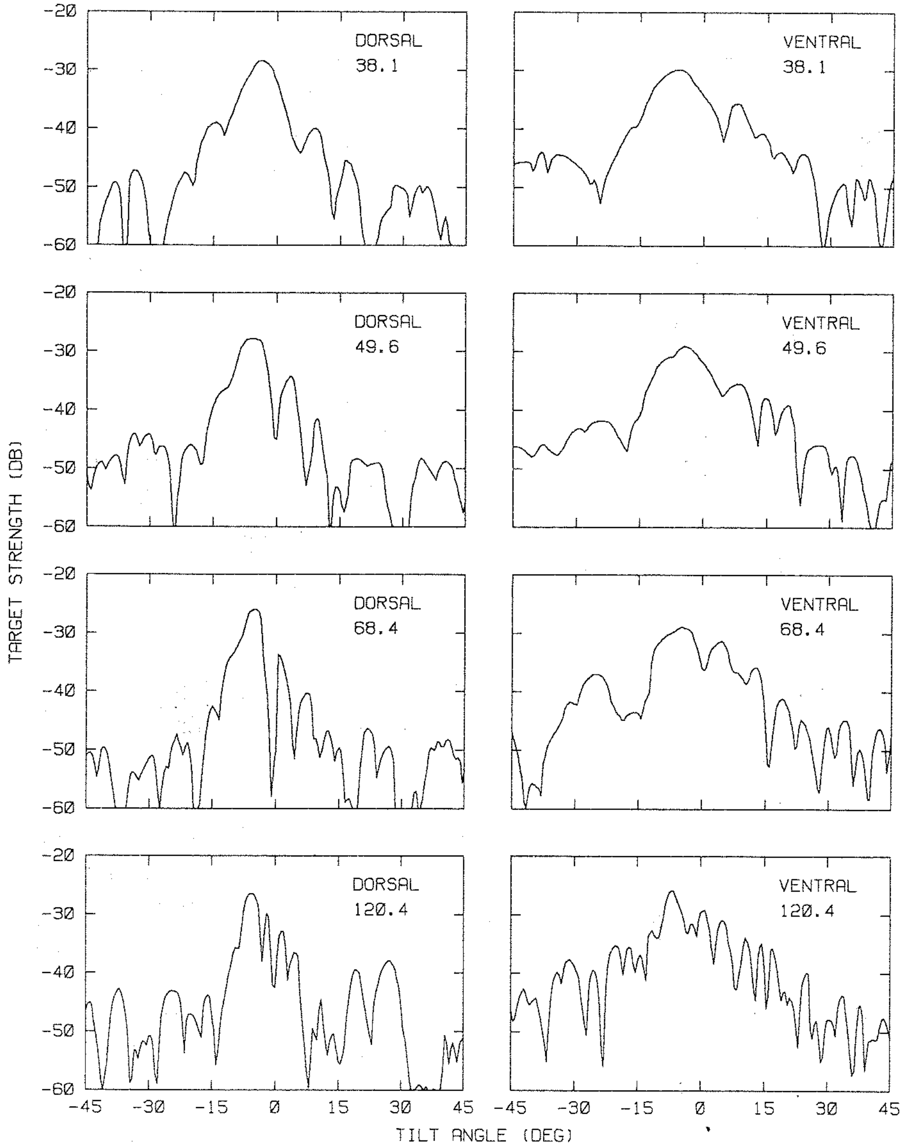

FIG. 22. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 209: SAITHE, 38.5 CM, 209 G.

TABLE 10. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 213: POLLACK, 34.5 CM, 259 G.

THETA	38.1 KHZ DORSAL SB	38.1 KHZ DORSAL TS	38.1 KHZ VENTRAL SB	38.1 KHZ VENTRAL TS	49.6 KHZ DORSAL SB	49.6 KHZ DORSAL TS	49.6 KHZ VENTRAL SB	49.6 KHZ VENTRAL TS	68.4 KHZ DORSAL SB	68.4 KHZ DORSAL TS	68.4 KHZ VENTRAL SB	68.4 KHZ VENTRAL TS	120.4 KHZ DORSAL SB	120.4 KHZ DORSAL TS	120.4 KHZ VENTRAL SB	120.4 KHZ VENTRAL TS
-45	0.2	-58.3	0.1	-63.0	4.8	-44.2	0.8	-51.9	10.7	-40.7	10.2	-40.9	1.4	-49.6	13.5	-39.7
-44	0.2	-57.2	0.9	-51.5	5.7	-43.4	1.1	-50.6	7.7	-42.1	9.8	-41.1	2.1	-47.7	13.8	-39.6
-43	0.2	-58.1	1.6	-48.9	6.4	-42.9	0.2	-57.2	1.4	-49.5	7.6	-42.2	0.4	-55.1	6.3	-43.0
-42	0.3	-56.6	1.7	-48.8	5.6	-43.5	0.4	-54.8	1.1	-50.7	4.6	-44.4	1.2	-50.3	7.9	-42.0
-41	0.4	-55.2	0.6	-53.0	3.4	-45.7	0.7	-52.6	2.1	-47.7	2.5	-47.0	3.6	-45.4	5.6	-43.5
-40	0.1	-62.2	0.0	-66.6	3.9	-45.1	0.2	-57.4	1.8	-48.5	5.4	-43.7	3.0	-46.2	1.3	-49.9
-39	0.6	-53.1	0.5	-53.8	4.5	-44.5	0.1	-61.7	0.3	-56.1	5.7	-43.4	2.1	-47.7	1.2	-50.1
-38	1.6	-49.0	0.7	-52.8	2.9	-46.4	0.4	-55.3	0.6	-53.1	9.5	-41.2	6.7	-42.7	2.1	-47.8
-37	2.5	-47.1	0.1	-60.9	1.1	-50.6	0.7	-52.4	1.6	-48.9	14.1	-39.5	3.4	-45.7	3.6	-45.4
-36	2.7	-46.6	1.0	-51.2	1.0	-50.9	0.7	-52.6	4.6	-44.4	15.5	-39.1	0.1	-59.5	5.9	-43.3
-35	2.6	-46.9	0.7	-52.3	0.9	-51.5	1.0	-51.0	5.1	-43.9	12.0	-40.2	0.5	-54.2	6.2	-43.1
-34	2.0	-47.9	0.8	-52.1	0.2	-58.5	2.9	-46.3	4.7	-44.3	8.7	-41.6	5.6	-43.5	5.6	-43.5
-33	1.1	-50.5	1.8	-48.5	0.6	-53.4	6.7	-42.7	3.3	-45.2	9.3	-41.3	5.2	-43.8	4.4	-44.6
-32	0.6	-53.0	2.9	-46.3	2.6	-46.9	10.2	-40.9	3.3	-45.8	8.3	-41.8	2.9	-46.4	9.1	-41.4
-31	0.4	-55.2	3.0	-46.2	3.7	-45.3	11.7	-40.3	2.8	-46.5	3.8	-45.2	1.4	-49.6	12.3	-40.1
-30	0.1	-59.9	2.3	-47.4	4.9	-44.1	8.5	-41.7	0.2	-58.7	2.0	-47.9	0.5	-54.2	10.5	-40.8
-29	0.2	-57.9	1.8	-48.5	4.8	-44.2	11.5	-40.4	0.6	-53.0	0.8	-51.9	3.2	-46.0	3.1	-46.1
-28	0.2	-58.6	2.4	-47.2	9.1	-41.4	12.9	-39.9	6.3	-43.0	3.4	-45.7	6.2	-43.1	0.6	-53.0
-27	0.1	-61.0	2.9	-46.3	13.8	-39.6	12.3	-40.1	5.9	-43.3	6.2	-43.1	5.5	-43.6	2.1	-47.8
-26	0.0	-64.5	3.2	-46.0	10.2	-40.9	8.3	-41.8	2.7	-46.6	9.5	-41.2	1.1	-50.7	1.5	-49.1
-25	0.2	-58.5	1.6	-49.0	6.2	-43.1	4.6	-44.4	4.8	-44.2	12.3	-40.1	0.4	-54.6	2.4	-47.2
-24	1.4	-49.6	2.1	-47.7	2.2	-47.5	1.6	-48.9	4.5	-44.5	15.1	-39.2	0.6	-53.0	3.9	-45.1
-23	2.1	-47.8	1.1	-50.5	5.7	-43.4	3.3	-45.8	3.3	-45.8	14.8	-39.3	5.0	-44.0	2.3	-47.3
-22	2.9	-46.4	4.8	-44.2	6.2	-43.1	7.1	-42.5	3.2	-46.0	9.1	-41.4	15.1	-39.2	0.4	-54.6
-21	4.1	-44.9	6.2	-43.1	1.6	-48.9	13.5	-39.7	2.7	-46.6	4.6	-44.4	26.3	-36.8	2.5	-47.0
-20	5.9	-43.3	5.6	-43.5	0.9	-51.4	15.1	-39.2	1.5	-49.3	6.9	-42.6	7.9	-42.0	3.2	-46.0
-19	6.7	-42.7	4.3	-44.7	0.5	-54.0	13.2	-39.8	1.7	-48.6	10.9	-40.6	3.5	-45.6	2.7	-46.7
-18	4.0	-45.0	2.7	-46.6	1.0	-51.2	6.9	-42.6	0.3	-55.7	11.5	-40.4	4.0	-45.0	1.7	-48.6
-17	7.1	-42.5	1.6	-48.9	2.7	-46.6	2.7	-46.7	0.4	-54.6	14.8	-39.3	14.8	-39.3	0.4	-55.2
-16	13.8	-39.6	1.9	-48.3	8.9	-41.5	4.7	-44.3	6.3	-43.0	13.8	-39.6	23.9	-37.2	3.0	-46.2
-15	17.3	-38.6	2.7	-46.6	13.2	-39.8	9.5	-41.2	14.1	-39.5	7.2	-42.4	30.8	-36.1	17.0	-38.7
-14	19.9	-38.0	4.8	-44.2	19.9	-38.0	14.4	-39.4	19.9	-38.0	3.3	-45.8	4.9	-44.1	20.4	-37.9
-13	21.3	-37.7	6.6	-42.8	31.6	-36.0	20.4	-37.9	27.5	-36.6	4.8	-44.2	11.7	-40.3	19.5	-38.1
-12	20.4	-37.9	8.5	-41.7	50.0	-34.0	27.5	-36.6	38.8	-35.1	2.5	-47.0	10.0	-41.0	17.3	-38.6
-11	21.3	-37.7	10.9	-40.6	72.3	-32.4	33.8	-35.7	56.1	-33.5	16.2	[illegible]	71.7	[illegible]	12.3	-40.1
-10	29.5	-36.3	14.1	-39.5	85.0	-31.7	32.3	-35.9	70.7	-32.5	42.6	-34.7	93.2	-31.3	1.9	-48.1
-9	39.7	-35.0	17.8	-38.5	95.3	-31.2	25.1	-37.0	93.2	-31.3	53.6	-33.7	69.1	-32.6	9.3	-41.3
-8	56.1	-33.5	22.3	-37.5	97.5	-31.1	15.5	-39.1	112.0	-30.5	50.0	-34.0	64.4	-32.9	17.3	-38.6
-7	72.3	-32.4	25.7	-36.9	104.5	-30.8	13.8	-39.6	120.0	-30.2	35.4	-35.5	181.6	-28.4	46.7	-34.3
-6	97.5	-31.1	29.5	-36.3	134.7	-29.7	21.3	-37.7	144.3	-29.4	26.9	-36.7	406.6	-24.9	97.5	-31.1
-5	112.0	-30.5	30.8	-36.1	154.6	-29.1	29.5	-36.3	213.4	-27.7	42.6	-34.7	370.9	-25.3	158.2	-29.0
-4	120.0	-30.2	30.1	-36.2	144.3	-29.4	35.4	-35.5	245.0	-27.1	51.5	-33.1	262.5	-26.8	194.6	-28.1
-3	117.3	-30.3	26.9	-36.7	112.0	-30.5	38.8	-35.1	239.4	-27.2	79.3	-32.0	161.9	-28.9	185.9	-28.3
-2	99.8	-31.0	22.9	-37.4	63.0	-33.0	40.7	-34.9	70.7	-32.5	85.0	-31.7	4.2	-44.8	120.0	-30.2
-1	70.7	-32.5	19.5	-38.1	33.8	-35.7	33.1	-35.8	13.8	-39.6	89.0	-31.5	13.5	-39.7	29.5	-36.3
0	51.2	-33.9	21.3	-37.7	17.8	-38.5	23.4	-37.3	1.0	-50.8	86.9	-31.6	5.2	-43.8	1.5	-49.1
1	37.9	-35.2	33.8	-35.7	8.3	-41.8	20.4	-37.9	8.1	-41.9	69.1	-32.6	21.3	-37.7	15.8	-39.0
2	28.1	-36.5	52.4	-33.8	1.9	-48.1	31.6	-36.0	12.9	-39.9	50.0	-34.0	37.1	-35.3	4.4	-44.6
3	20.9	-37.8	64.4	-32.9	0.2	-57.3	51.2	-33.9	21.3	-37.7	28.8	-36.4	39.7	-35.0	2.2	-47.6
4	15.1	-39.2	72.3	-32.4	1.6	-49.0	81.1	-31.9	22.9	-37.4	58.8	-33.3	3.5	-45.6	2.5	-47.0
5	9.3	-41.3	69.1	-32.6	8.5	-41.7	93.2	-31.3	13.5	-39.7	85.0	-31.7	1.0	-51.0	9.3	-41.3
6	3.6	-45.4	61.5	-33.1	20.4	-37.9	95.3	-31.2	0.4	-54.5	85.0	-31.7	0.3	-56.3	7.7	-42.1
7	0.2	-57.5	47.8	-34.2	15.8	-39.0	79.3	-32.0	3.4	-45.7	75.7	-32.2	0.7	-52.5	128.6	-29.9
8	0.8	-52.0	25.1	-37.0	8.9	-41.5	63.0	-33.0	4.5	-44.5	60.1	-33.2	13.8	-39.6	158.2	-29.0
9	3.2	-46.0	21.8	-37.6	0.2	-57.4	53.6	-33.7	1.9	-48.1	48.9	-34.1	1.5	-49.3	112.0	-30.5
10	8.1	-41.9	28.8	-36.4	2.6	-46.8	50.0	-34.0	3.5	-45.5	61.5	-33.1	12.9	-39.9	63.0	-33.0
11	10.2	-40.9	33.1	-35.8	4.8	-44.2	44.6	-34.5	5.1	-43.9	79.3	-32.0	15.1	-39.2	38.8	-35.1
12	10.0	-41.0	34.6	-35.6	3.7	-45.3	40.7	-34.9	0.2	-59.1	77.5	-32.1	3.1	-46.1	41.6	-34.8
13	6.2	-43.1	34.6	-35.6	1.7	-48.8	35.4	-35.5	0.9	-51.4	43.6	-34.6	10.7	-40.7	58.8	-33.3
14	1.1	-50.6	31.6	-36.0	1.7	-48.6	24.5	-37.1	5.9	-43.3	9.1	-41.4	14.4	-39.4	14.8	-39.3
15	1.1	-50.5	23.9	-37.2	3.1	-46.1	31.6	-36.0	5.7	-43.4	18.6	-38.3	4.5	-44.5	2.0	-47.9
16	1.1	-50.7	17.0	-38.7	3.8	-45.2	30.8	-36.1	0.5	-54.0	26.3	-36.8	5.9	-43.3	5.5	-43.6
17	1.1	-50.5	11.7	-40.3	1.9	-48.2	23.4	-37.3	1.3	-49.9	28.1	-36.5	2.5	-47.1	0.6	-52.9
18	1.0	-51.1	7.7	-42.1	0.1	-59.8	12.0	-40.2	0.8	-52.0	5.0	-44.0	0.4	-54.7	17.0	-38.7
19	1.7	-48.8	4.7	-44.3	0.6	-53.5	5.7	-43.6	0.3	-56.3	0.6	-53.1	0.8	-51.9	18.6	-38.3
20	1.9	-48.3	2.7	-46.6	2.7	-46.7	2.5	-47.1	0.3	-56.0	0.8	-52.1	1.8	-48.5	2.8	-46.5
21	1.8	-48.5	1.3	-49.7	2.7	-46.7	0.0	-65.6	0.2	-59.0	1.7	-48.8	2.2	-47.5	8.9	-41.5
22	1.6	-48.9	0.1	-61.9	1.8	-48.4	0.3	-55.8	0.3	-55.8	2.4	-47.2	1.1	-50.7	13.5	-39.7
23	1.0	-50.8	1.7	-48.7	2.9	-46.4	1.1	-50.7	1.0	-50.9	2.5	-47.0	6.3	-43.0	14.8	-39.3
24	0.6	-52.9	2.6	-46.8	3.5	-45.5	0.2	-57.5	0.4	-54.8	1.3	-49.9	5.2	-43.8	12.0	-40.2
25	0.9	-51.6	2.6	-46.8	1.5	-49.1	0.3	-56.6	0.1	-59.3	0.5	-54.3	1.1	-50.4	4.2	-44.8
26	0.7	-52.3	1.9	-48.1	0.4	-54.7	0.7	-52.5	0.4	-54.7	0.8	-51.7	1.3	-50.0	0.3	-55.7
27	0.1	-60.8	1.1	-50.7	0.1	-60.9	0.5	-54.4	2.1	-47.7	1.3	-49.9	1.3	-50.0	0.8	-52.1
28	0.2	-58.5	0.4	-55.3	0.4	-56.6	0.0	-65.6	3.2	-46.0	2.2	-47.6	0.5	-53.6	3.7	-45.3
29	0.8	-51.8	0.5	-53.7	1.3	-49.7	0.1	-62.0	3.1	-46.1	6.9	-42.6	0.7	-52.5	8.5	-41.7
30	2.7	-46.7	1.0	-51.1	1.9	-48.3	0.3	-56.6	2.1	-47.8	7.4	-42.3	6.7	-42.7	14.4	-39.4
31	3.5	-45.6	0.7	-52.9	1.9	-48.3	0.6	-53.2	2.7	-46.7	6.4	-42.9	5.4	-43.7	19.5	-38.1
32	1.1	-50.5	0.3	-55.7	0.4	-54.5	1.1	-50.4	2.5	-47.1	7.7	-42.1	2.3	-47.3	18.6	-38.3
33	1.4	-49.4	0.3	-56.6	0.0	-64.1	1.3	-49.8	2.2	-47.6	12.5	-40.1	1.7	-48.8	14.9	-39.3
34	2.7	-46.7	0.1	-60.2	0.1	-60.2	1.3	-49.9	3.0	-46.2	11.5	-40.4	2.3	-47.4	3.2	-46.0
35	2.9	-46.4	0.2	-58.3	0.3	-55.7	1.8	-48.4	2.9	-46.4	7.1	-42.5	2.3	-47.3	0.6	-52.9
36	1.9	-48.3	0.3	-55.9	0.8	-51.8	3.4	-45.7	2.0	-48.0	2.9	-46.5	1.0	-51.1	1.5	-49.3
37	2.2	-47.5	0.7	-52.7	1.0	-50.2	3.7	-45.3	1.8	-48.5	4.1	-44.9	0.7	-52.5	5.2	-43.8
38	1.9	-49.2	1.0	-50.9	0.6	-53.2	3.2	-45.9	1.3	-49.9	6.4	-42.9	1.9	-48.1	5.0	-44.0
39	0.3	-56.7	0.8	-51.9	0.2	-59.1	2.4	-47.2	0.1	-59.6	6.6	-42.8	2.7	-46.6	3.2	-46.0
40	0.2	-58.8	0.4	-55.2	0.1	-63.4	2.5	-47.1	1.4	-49.5	5.5	-43.6	1.7	-48.6	0.5	-54.2
41	0.6	-52.9	0.2	-59.7	0.2	-59.3	5.5	-43.6	0.4	-54.5	2.5	-47.0	2.5	-47.1	0.6	-53.2
42	1.5	-49.3	0.9	-51.5	0.5	-54.2	8.9	-41.5	0.8	-52.2	0.6	-53.4	3.0	-46.2	3.1	-46.1
43	1.4	-49.5	1.4	-49.5	0.9	-51.6	10.5	-40.9	1.2	-50.2	0.4	-55.5	3.5	-45.6	1.4	-49.4
44	0.4	-54.7	1.5	-49.3	1.3	-50.0	9.5	-41.2	0.6	-53.1	1.2	-50.3	2.3	-47.3	4.6	-44.4
45	0.3	-55.7	0.3	-56.7	1.5	-49.1	7.2	-42.4	0.2	-59.0	1.0	-50.9	0.5	-54.0	5.9	-43.3

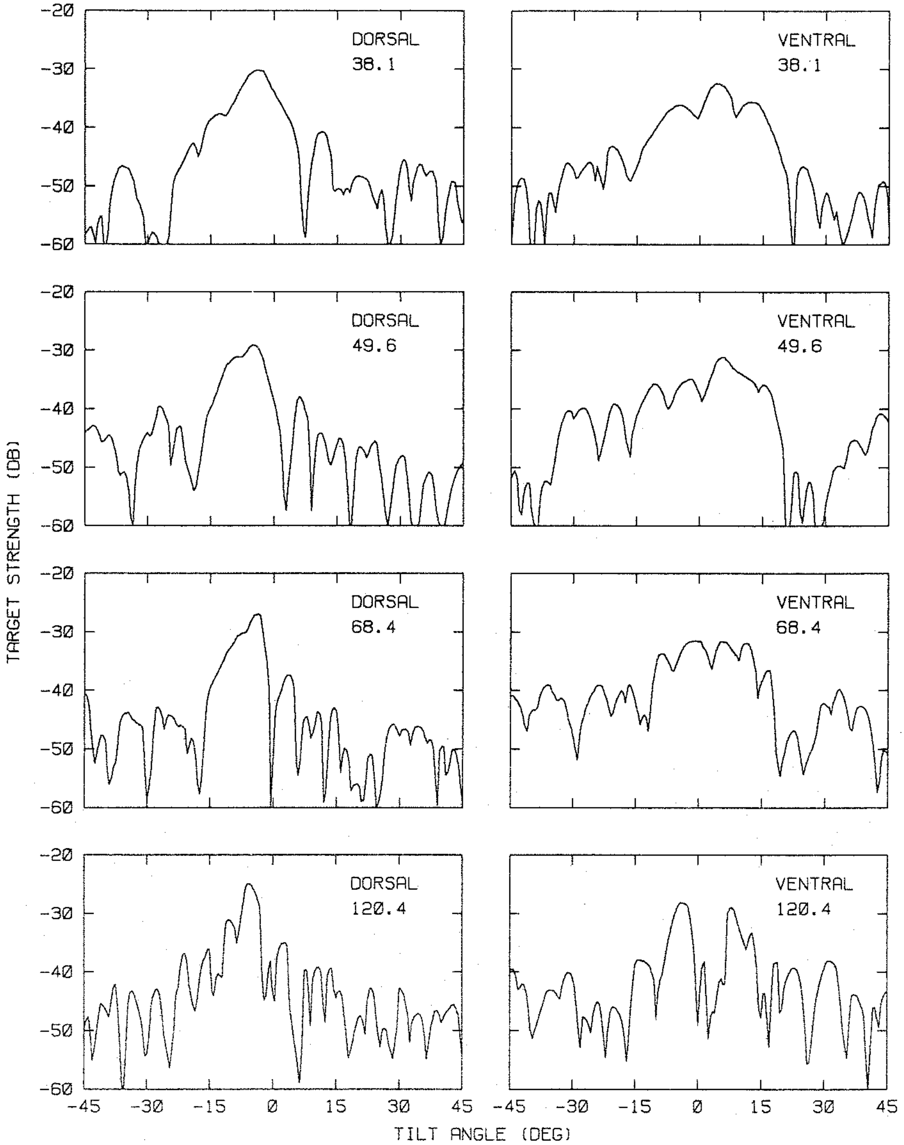

FIG. 23. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 213: POLLACK, 34.5 CM, 259 G.

TABLE 11. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 214: POLLACK, 39.0 CM, 406 G.

	38.1 KHZ				49.6 KHZ				68.4 KHZ				120.4 KHZ			
	DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL	
THETA	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS
-45	2.9	-46.4	17.0	-38.7	0.8	-51.9	0.7	-52.8	7.2	-42.4	1.4	-49.5	4.7	-44.3	12.3	-40.1
-44	1.8	-48.4	20.4	-37.9	1.2	-50.2	0.6	-53.0	5.0	-44.0	4.2	-44.8	8.9	-41.5	9.8	-41.1
-43	0.7	-52.7	22.3	-37.5	1.0	-50.9	3.6	-45.4	2.3	-47.4	2.2	-47.6	10.7	-40.7	9.1	-41.4
-42	1.3	-49.7	22.9	-37.4	1.5	-49.2	4.8	-44.2	1.1	-50.6	1.4	-49.6	8.1	-41.9	4.1	-44.9
-41	2.4	-47.2	22.3	-37.5	4.2	-44.8	5.0	-44.0	0.8	-51.8	0.2	-57.5	1.3	-50.0	3.2	-46.0
-40	2.5	-47.0	21.3	-37.7	6.2	-43.1	8.9	-41.5	1.7	-48.9	0.1	-62.4	1.6	-48.9	3.5	-45.6
-39	1.1	-50.4	19.5	-38.1	3.9	-45.1	13.2	-39.8	0.8	-51.7	0.3	-54.7	3.0	-46.2	2.2	-47.5
-38	0.8	-52.0	15.1	-39.2	5.7	-43.4	17.0	-38.7	0.2	-58.1	1.0	-51.2	4.1	-44.9	0.8	-52.2
-37	1.7	-48.8	12.3	-40.1	10.7	-40.7	19.5	-38.1	0.9	-51.4	1.9	-48.1	1.5	-49.2	1.1	-50.4
-36	1.4	-49.5	9.8	-41.1	9.1	-41.4	20.4	-37.9	0.3	-56.4	2.2	-47.5	2.1	-47.9	3.8	-45.2
-35	3.2	-46.0	7.7	-42.1	6.6	-42.8	19.9	-38.0	0.4	-54.9	2.0	-47.9	0.4	-55.1	7.4	-42.3
-34	14.1	-39.5	6.4	-42.9	7.1	-42.5	14.4	-39.4	0.7	-52.7	3.3	-45.8	2.2	-47.5	10.5	-40.8
-33	18.6	-38.3	5.4	-43.7	5.2	-43.8	10.0	-41.0	0.2	-57.2	3.4	-45.7	8.5	-41.7	11.2	-40.5
-32	17.3	-38.6	4.2	-44.8	1.3	-50.0	7.4	-42.3	0.3	-55.9	7.1	-42.5	11.5	-40.4	7.6	-42.2
-31	12.0	-40.2	1.9	-48.3	2.4	-47.2	5.5	-43.6	3.3	-45.8	8.1	-41.9	8.7	-41.6	2.9	-46.4
-30	12.3	-40.1	2.3	-47.3	5.4	-43.7	4.7	-44.3	5.9	-43.3	6.2	-43.1	0.4	-54.8	0.3	-56.1
-29	17.8	-38.5	2.3	-47.3	12.0	-40.2	7.9	-42.0	6.9	-42.6	4.3	-44.7	2.7	-46.7	0.7	-52.4
-28	19.5	-38.1	2.1	-47.8	26.3	-36.8	10.7	-40.7	7.2	-42.4	2.7	-46.6	14.4	-39.4	0.3	-56.1
-27	12.6	-40.0	2.9	-46.4	33.8	-35.7	13.8	-39.6	6.3	-43.0	3.5	-45.6	15.8	-39.0	0.5	-53.7
-26	8.7	-41.6	4.9	-44.1	37.1	-35.3	17.3	-38.6	9.3	-41.3	6.0	-43.2	9.5	-41.2	2.2	-47.6
-25	4.2	-44.8	5.6	-43.5	36.2	-35.4	20.9	-37.8	9.5	-41.2	7.1	-42.5	3.4	-45.7	9.5	-41.2
-24	5.0	-44.0	4.7	-44.3	22.9	-37.4	21.3	-37.7	7.6	-42.2	4.7	-44.3	7.2	-42.4	12.9	-39.9
-23	4.1	-44.9	8.7	-41.6	17.0	-38.7	17.8	-38.5	8.7	-41.6	3.4	-45.7	7.6	-42.2	10.5	-40.8
-22	2.3	-47.4	14.1	-39.5	18.2	-38.4	13.8	-39.6	7.7	-42.1	5.6	-43.5	0.5	-54.3	7.1	-42.5
-21	1.8	-48.5	14.4	-39.4	15.1	-39.2	9.8	-41.1	4.5	-44.5	9.3	-41.3	2.9	-46.4	8.5	-41.7
-20	1.1	-50.7	13.2	-39.8	5.0	-44.0	4.1	-44.9	1.4	-49.5	12.0	-40.2	14.1	-39.5	5.9	-43.3
-19	5.9	-43.3	9.5	-41.2	4.7	-44.3	4.2	-44.8	0.7	-52.8	13.5	-39.7	11.2	-40.5	10.9	-40.6
-18	8.5	-41.7	6.9	-42.6	0.9	-51.7	5.1	-43.9	0.3	-56.3	13.8	-39.6	4.0	-45.0	24.9	-36.7
-17	12.6	-40.0	8.1	-41.9	2.8	-46.5	8.7	-41.6	0.3	-55.9	13.5	-39.7	7.9	-42.0	51.2	-33.9
-16	23.4	-37.3	9.5	-41.2	3.0	-46.2	25.7	-36.9	2.0	-47.9	12.6	-40.0	14.4	-39.4	53.6	-33.7
-15	37.1	-35.3	7.2	-42.4	1.2	-50.1	30.8	-36.1	7.4	-42.3	10.9	-40.6	13.5	-39.7	28.8	-36.4
-14	44.6	-34.5	5.5	-43.6	2.5	-47.0	35.4	-35.5	17.8	-38.5	8.7	-41.6	8.7	-41.6	15.1	-39.2
-13	40.7	-34.9	4.0	-45.0	14.1	-39.5	33.8	-35.7	42.6	-34.7	5.1	-43.9	7.6	-42.2	30.1	-36.2
-12	33.1	-35.8	4.4	-44.6	43.6	-34.6	28.8	-36.4	36.9	-31.6	6.2	-43.1	11.2	-40.5	38.8	-35.1
-11	41.6	-34.8	10.5	-40.8	75.7	-32.2	43.6	-34.6	120.0	-30.2	15.8	-39.0	22.9	-37.4	29.5	-36.3
-10	50.0	-34.0	25.1	-37.0	86.9	-31.6	52.4	-33.8	137.8	-29.6	18.2	-38.4	43.6	-34.6	2.5	-47.1
-9	48.9	-34.1	23.9	-37.2	97.5	-31.1	47.8	-34.2	158.2	-29.0	18.6	-38.3	158.2	-29.0	0.7	-52.7
-8	44.6	-34.5	27.5	-36.6	107.0	-30.7	34.6	-35.6	169.5	-28.7	18.6	-38.3	203.3	-27.9	1.5	-49.1
-7	41.6	-34.8	45.6	-34.4	107.0	-30.7	28.8	-36.4	161.9	-28.9	45.6	-34.4	245.0	-27.1	41.6	-34.8
-6	67.5	-32.7	61.5	-33.1	107.0	-30.7	34.6	-35.6	208.5	-27.8	120.0	-30.2	274.9	-26.6	109.4	-30.6
-5	99.8	-31.0	77.5	-32.1	109.4	-30.6	52.4	-33.8	301.4	-26.2	141.0	-29.5	291.3	-26.5	181.6	-28.4
-4	117.3	-30.3	91.0	-31.4	114.6	-30.4	72.3	-32.4	323.0	-25.9	141.0	-29.5	208.5	-27.8	141.0	-29.5
-3	125.7	-30.0	99.8	-31.0	112.0	-30.5	97.5	-31.1	294.6	-26.3	141.0	-29.5	37.9	-35.2	120.0	-30.2
-2	122.8	-30.1	104.5	-30.8	89.0	-31.5	114.6	-30.4	104.5	-30.8	137.8	-29.6	44.6	-34.5	181.6	-28.4
-1	114.6	-30.4	109.4	-30.6	31.6	-36.0	120.0	-30.2	17.3	-38.6	128.6	-29.9	79.3	-32.0	185.9	-28.3
0	97.5	-31.1	97.5	-31.1	11.7	-40.3	117.3	-30.3	29.5	-36.3	102.1	-30.9	85.0	-31.7	165.7	-28.8
1	77.5	-32.1	91.0	-31.4	16.6	-38.8	112.0	-30.5	72.3	-32.4	89.0	-31.5	57.4	-33.4	72.3	-32.4
2	60.1	-33.2	95.3	-31.2	23.9	-37.2	141.0	-29.5	89.0	-31.5	93.2	-31.3	23.9	-37.2	16.6	-38.8
3	32.3	-35.9	97.5	-31.1	30.1	-36.2	173.5	-28.6	89.0	-31.5	95.0	-31.7	24.5	-37.1	30.8	-36.1
4	14.8	-39.3	91.0	-31.4	29.5	-36.3	199.2	-28.0	28.8	-36.4	67.5	-32.7	19.9	-38.0	27.5	-36.6
5	0.3	-56.8	81.1	-31.9	25.1	-37.0	181.6	-28.4	3.4	-45.7	37.1	-35.3	4.5	-44.5	60.1	-33.2
6	0.2	-59.2	64.4	-32.9	17.3	-39.6	102.1	-30.9	0.2	-58.9	70.7	-32.5	7.4	-42.3	169.5	-28.7
7	3.2	-45.9	44.6	-34.5	11.2	-40.5	30.8	-36.1	1.7	-48.8	95.0	-31.7	7.2	-42.4	161.9	-28.9
8	7.1	-42.5	22.3	-37.5	4.0	-45.0	8.3	-41.8	1.9	-48.1	81.1	-31.9	0.8	-52.1	128.6	-29.9
9	11.2	-40.5	0.5	-53.8	2.9	-46.3	32.3	-35.9	10.9	-40.6	53.6	-33.7	1.9	-48.2	67.5	-32.7
10	12.0	-40.2	1.7	-48.8	6.6	-42.8	54.9	-33.6	12.0	-40.2	61.5	-33.1	1.5	-49.1	26.9	-36.7
11	10.2	-40.9	6.3	-43.0	10.2	-40.9	57.4	-33.4	10.2	-40.9	64.4	-32.9	3.2	-46.0	9.8	-41.1
12	0.4	-54.9	10.0	-41.0	7.1	-42.5	53.6	-33.7	7.6	-42.2	15.5	-39.1	9.3	-41.3	9.8	-41.1
13	1.4	-49.6	11.5	-40.4	4.5	-44.5	42.6	-34.7	5.4	-43.7	3.9	-45.1	1.0	-51.0	10.5	-40.8
14	3.7	-45.3	11.2	-40.5	4.6	-44.4	33.1	-35.8	3.5	-45.5	1.1	-50.5	0.4	-55.0	4.8	-44.2
15	4.6	-44.4	10.2	-40.9	4.3	-44.7	22.3	-37.5	2.7	-46.7	2.9	-46.4	2.4	-47.2	1.1	-50.4
16	3.2	-46.0	9.3	-41.3	3.2	-46.0	8.3	-41.8	3.0	-46.2	0.9	-51.4	10.9	-40.6	5.5	-43.6
17	2.6	-46.8	8.1	-41.9	1.9	-48.1	1.2	-50.1	1.6	-49.0	0.4	-55.2	6.0	-43.2	1.7	-48.8
18	2.5	-47.1	6.3	-43.0	2.6	-46.8	3.4	-45.7	0.9	-51.6	0.7	-52.3	14.1	-39.5	4.2	-44.8
19	0.7	-52.4	4.8	-44.2	3.1	-46.1	4.3	-44.7	1.9	-48.2	1.3	-49.7	15.8	-39.0	14.1	-39.5
20	0.1	-60.1	3.6	-45.4	1.9	-48.1	3.3	-45.8	2.7	-46.6	3.2	-45.9	11.5	-40.4	6.0	-43.2
21	1.5	-49.3	1.8	-48.5	1.0	-51.2	1.5	-49.3	6.0	-43.2	3.2	-45.9	5.5	-43.6	7.1	-42.5
22	3.4	-45.7	0.8	-51.7	0.5	-53.8	0.6	-53.5	7.6	-42.2	1.9	-48.3	0.4	-55.5	11.2	-40.5
23	3.8	-45.2	0.6	-53.2	0.4	-54.8	0.4	-54.9	7.4	-42.3	1.5	-49.1	2.0	-47.9	1.8	-48.5
24	0.5	-53.7	0.3	-55.9	0.2	-59.1	0.3	-56.4	6.0	-43.2	1.0	-51.0	5.4	-43.7	0.7	-52.7
25	0.9	-51.6	0.1	-61.4	1.0	-50.9	1.1	-50.7	2.9	-46.4	1.4	-49.6	7.1	-42.5	2.4	-47.2
26	1.7	-48.6	0.4	-55.2	4.2	-44.8	1.9	-48.2	0.6	-53.0	2.6	-46.8	3.3	-45.8	6.7	-42.7
27	2.5	-47.1	0.2	-57.7	6.4	-42.9	2.7	-46.6	0.2	-57.6	2.7	-46.6	2.4	-47.2	8.3	-41.8
28	2.6	-46.8	0.1	-60.2	6.9	-42.6	3.5	-45.6	0.6	-52.9	2.1	-47.7	3.9	-45.2	7.9	-42.0
29	1.7	-48.7	0.0	-64.9	5.4	-43.7	4.2	-44.8	1.5	-49.3	2.1	-47.8	3.8	-45.2	14.1	-39.5
30	0.1	-59.4	0.1	-62.7	5.6	-43.5	3.4	-45.6	1.4	-49.4	2.1	-47.7	1.9	-48.1	15.1	-39.2
31	0.5	-53.8	0.1	-60.5	7.2	-42.4	1.5	-49.2	3.5	-45.5	0.2	-58.1	0.1	-60.7	14.1	-39.5
32	1.5	-49.2	0.1	-61.5	7.6	-42.2	1.1	-50.6	7.9	-42.0	0.1	-59.4	0.5	-53.7	13.8	-39.6
33	2.4	-47.2	0.2	-57.3	7.7	-42.1	1.3	-49.9	13.8	-39.6	0.3	-56.6	2.0	-48.0	6.2	-43.1
34	1.9	-48.2	0.3	-56.8	7.1	-42.5	1.2	-50.1	13.5	-39.7	0.6	-53.5	4.3	-44.7	0.8	-52.2
35	0.2	-57.4	0.1	-63.8	6.2	-43.1	1.1	-50.7	10.2	-40.9	0.4	-54.8	4.9	-42.6	0.4	-55.0
36	0.7	-52.6	0.1	-60.6	5.2	-43.8	0.8	-52.1	11.7	-40.3	1.5	-49.3	9.3	-41.1	0.7	-52.7
37	2.4	-47.2	1.2	-57.9	4.5	-44.5	0.3	-56.9	13.2	-39.8	2.8	-46.5	13.2	-39.8	0.3	-56.0
38	3.0	-46.2	0.2	-57.3	3.7	-45.3	0.9	-51.5	13.2	-39.8	1.5	-49.1	15.1	-39.2	3.0	-46.2
39	3.6	-45.4	0.0	-65.2	2.7	-46.6	5.2	-43.8	10.2	-40.9	0.8	-52.0	13.3	-39.6	2.1	-47.8
40	4.9	-44.1	0.0	-64.9	1.9	-42.3	9.3	-41.3	4.3	-44.2	0.3	-57.0	5.7	-43.4	0.3	-55.9
41	6.6	-42.8	0.2	-58.0	0.8	-52.0	10.7	-40.7	6.2	-43.1	0.1	-61.1	2.2	-47.5	2.0	-47.9
42	6.6	-42.8	0.5	-53.6	0.2	-57.3	10.0	-41.0	6.2	-43.1	1.3	-49.7	0.6	-53.4	6.2	-43.1
43	4.8	-44.2	1.1	-50.7	0.0	-65.4	7.4	-42.3	6.2	-43.1	4.4	-44.7	2.3	-47.4	5.4	-43.7
44	2.8	-46.5	1.5	-49.3	0.1	-59.9	4.6	-44.4	4.5	-44.5	5.9	-43.3	4.9	-44.1	3.9	-45.1
45	2.5	-47.0	1.5	-49.2	0.3	-56.2	2.4	-47.2	2.9	-46.4	5.1	-43.9	7.7	-42.1	1.9	-48.2

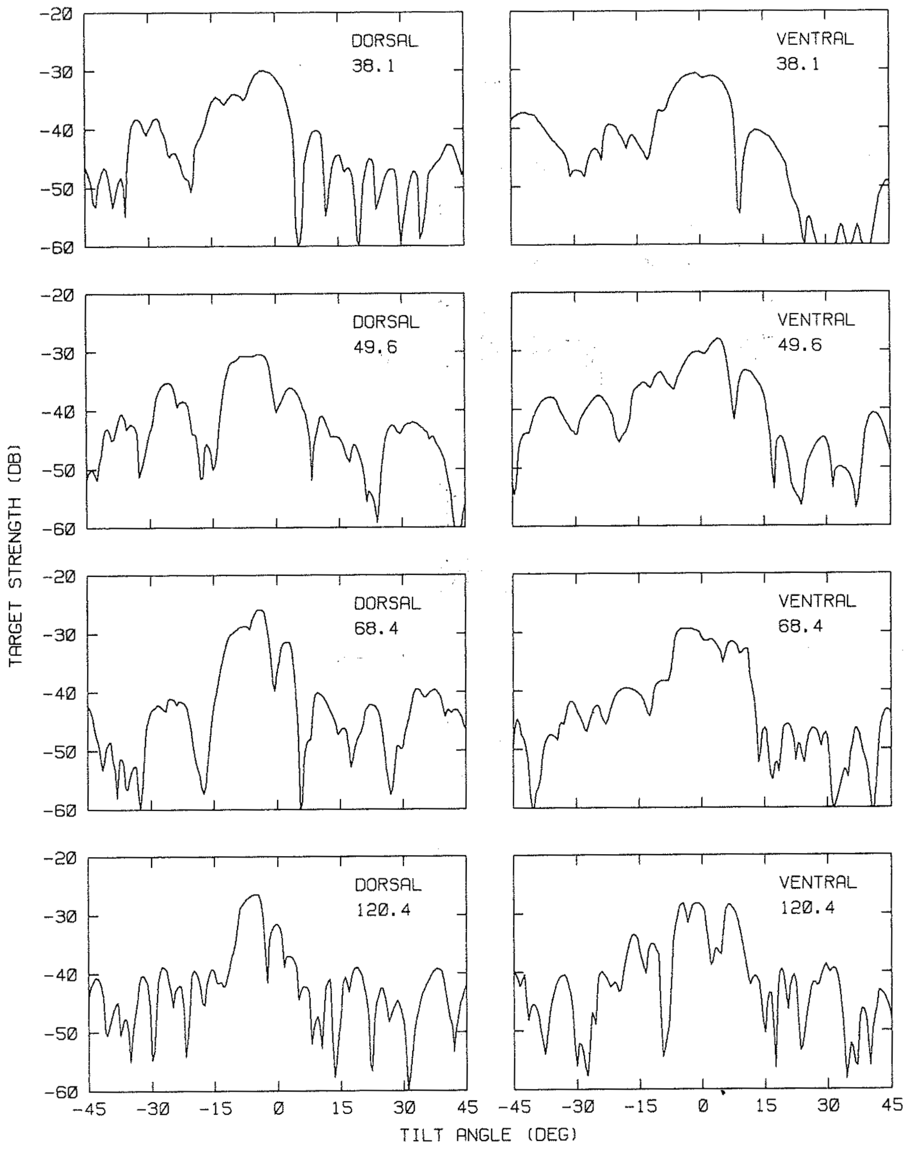

FIG. 24. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 214: POLLACK, 39.0 CM, 406 G.

TABLE 12. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 215: POLLACK. 37.0 CM. 332 G.

	38.1 KHZ				49.6 KHZ				68.4 KHZ				120.4 KHZ			
	DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL	
THETA	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS
-45	0.4	-55.2	0.8	-52.2	3.7	-45.3	0.8	-52.2	2.6	-46.8	2.6	-46.8	0.1	-61.1	2.8	-46.5
-44	0.5	-54.4	0.5	-54.1	2.5	-47.0	0.5	-53.6	2.3	-47.4	2.6	-46.9	0.5	-53.8	1.8	-48.4
-43	0.3	-56.4	0.5	-54.3	2.3	-47.3	0.4	-54.6	1.2	-50.3	1.5	-49.2	1.1	-50.4	0.8	-51.7
-42	0.6	-53.3	0.9	-51.4	3.8	-45.2	0.6	-53.3	3.4	-45.7	3.2	-45.9	3.1	-46.1	0.4	-54.9
-41	1.0	-50.9	1.9	-48.2	4.7	-44.3	0.3	-55.9	4.1	-44.9	2.1	-47.7	7.2	-42.4	0.1	-60.1
-40	1.2	-50.2	2.7	-46.6	4.0	-45.0	0.1	-60.0	2.1	-47.8	1.1	-50.7	6.0	-43.2	0.6	-53.2
-39	0.5	-53.9	2.8	-46.5	2.5	-47.1	0.0	-64.4	0.2	-58.0	1.7	-48.7	2.9	-46.3	1.7	-48.8
-38	0.7	-52.7	2.1	-47.8	3.0	-46.2	0.1	-59.3	0.5	-53.2	1.1	-50.5	0.3	-56.4	0.6	-53.2
-37	1.4	-49.5	1.5	-49.3	3.5	-45.5	0.4	-54.6	0.3	-56.9	4.6	-44.4	7.2	-42.4	0.8	-51.9
-36	2.8	-46.5	0.8	-52.1	3.6	-45.4	0.6	-53.0	0.1	-59.7	5.7	-43.4	8.3	-41.8	0.8	-51.9
-35	4.1	-44.9	0.4	-55.0	3.2	-45.9	0.8	-52.2	1.1	-50.6	6.6	-42.8	8.3	-41.8	0.8	-52.1
-34	4.4	-44.6	1.7	-48.6	2.1	-47.8	0.9	-51.5	2.9	-46.3	7.1	-42.5	2.1	-47.8	3.1	-46.1
-33	6.2	-43.1	1.6	-49.0	2.8	-46.5	1.3	-49.9	2.2	-47.5	6.6	-42.8	4.2	-44.8	5.2	-43.8
-32	8.5	-41.7	1.1	-50.7	2.9	-46.4	2.2	-47.6	1.0	-50.8	5.5	-43.6	3.0	-46.2	5.5	-43.6
-31	8.9	-41.5	2.1	-47.8	2.9	-46.4	2.8	-46.5	3.2	-46.0	4.6	-44.4	0.8	-51.7	4.1	-44.9
-30	2.7	-46.6	3.5	-45.6	2.4	-47.2	6.0	-43.2	2.4	-47.2	3.3	-45.2	0.2	-58.6	4.0	-45.0
-29	0.7	-52.6	3.3	-45.8	5.5	-43.6	9.1	-41.4	1.5	-49.1	4.6	-44.4	0.2	-57.7	3.6	-45.4
-28	0.5	-54.4	2.5	-47.1	10.7	-40.7	10.7	-40.7	2.9	-46.4	3.5	-45.6	0.8	-52.1	2.5	-47.1
-27	0.6	-52.9	1.3	-49.8	12.9	-39.9	10.7	-40.7	4.0	-45.0	2.1	-47.7	0.3	-57.0	1.3	-49.9
-26	0.5	-53.6	2.7	-46.6	12.0	-40.2	9.3	-41.3	7.2	-42.4	4.1	-44.9	1.6	-49.0	0.6	-53.4
-25	0.4	-55.0	1.8	-48.4	8.5	-41.7	6.7	-42.7	8.9	-41.5	13.2	-39.8	1.7	-48.7	4.6	-44.4
-24	0.2	-57.4	0.3	-55.8	3.4	-45.7	3.8	-45.2	6.9	-42.6	15.8	-39.0	0.1	-60.6	9.3	-41.3
-23	1.1	-50.6	0.1	-61.1	1.9	-48.3	4.5	-44.5	3.7	-45.3	13.2	-39.8	1.3	-49.8	7.7	-42.1
-22	1.7	-48.8	1.1	-50.5	3.2	-46.0	4.9	-44.1	11.2	-40.5	8.3	-41.8	3.4	-45.7	6.5	-44.5
-21	2.5	-47.1	2.7	-46.7	6.7	-42.7	6.3	-43.0	11.7	-40.3	5.9	-43.3	9.1	-41.4	0.3	-56.1
-20	3.7	-45.3	4.6	-44.4	7.2	-42.4	8.7	-41.6	9.3	-41.3	1.8	-48.5	13.5	-39.7	0.8	-51.7
-19	6.9	-42.6	6.7	-42.7	5.5	-43.6	9.1	-41.4	1.5	-49.3	2.7	-46.7	2.8	-46.5	0.7	-52.5
-18	12.0	-40.2	8.9	-41.5	2.8	-46.5	6.3	-43.0	3.0	-46.2	4.0	-45.0	14.4	-39.4	22.9	-37.4
-17	18.6	-38.3	9.3	-41.3	3.6	-45.4	1.5	-49.2	4.0	-45.0	3.1	-46.1	26.3	-36.8	21.8	-37.6
-16	26.9	-36.7	10.5	-40.8	8.5	-41.7	4.1	-44.9	3.2	-45.9	2.3	-47.3	22.9	-37.4	8.1	-41.9
-15	41.6	-34.8	14.4	-39.4	19.5	-38.1	12.0	-40.2	11.5	-40.4	4.3	-44.2	13.8	-39.6	10.9	-40.6
-14	47.8	-34.2	12.9	-39.9	38.8	-35.1	32.3	-35.9	29.5	-36.3	1.5	-49.1	2.9	-46.3	26.9	-36.7
-13	52.4	-33.8	19.0	-38.2	69.1	-32.6	45.6	-34.4	48.9	-34.1	0.5	-53.7	3.8	-45.2	28.1	-36.5
-12	53.6	-33.7	23.9	-37.2	85.0	-31.7	53.6	-33.7	77.5	-32.1	4.3	-44.7	8.3	-41.8	20.4	-37.9
-11	53.6	-33.7	30.8	-36.1	97.5	-31.1	51.2	-33.9	112.0	-30.5	30.1	-36.2	14.7	-38.9	4.3	-44.7
-10	50.0	-34.0	37.1	-35.3	93.2	-31.3	48.9	-34.1	144.3	-29.4	60.1	-33.2	95.3	-31.2	3.3	-45.8
-9	46.7	-34.3	47.8	-34.2	97.5	-31.1	54.9	-33.6	165.7	-28.8	86.9	-31.6	169.5	-28.7	23.4	-37.3
-8	58.8	-33.3	64.4	-32.9	120.0	-30.2	56.1	-33.5	169.5	-28.7	89.0	-31.5	185.9	-28.3	38.8	-35.1
-7	77.5	-32.1	81.1	-31.9	151.1	-29.2	58.8	-33.3	169.5	-28.7	74.0	-32.3	274.9	-26.6	43.6	-34.6
-6	99.8	-31.0	97.5	-31.1	177.5	-28.5	67.5	-32.7	169.5	-28.7	65.9	-32.8	601.5	-23.2	268.7	-26.7
-5	128.6	-29.9	109.4	-30.6	195.9	-28.3	83.0	-31.8	169.5	-28.7	97.5	-31.1	354.2	-25.5	262.5	-26.8
-4	147.6	-29.3	120.0	-30.2	181.6	-28.4	102.1	-30.9	165.7	-28.8	131.6	-29.8	51.2	-33.9	239.4	-27.2
-3	154.6	-29.1	125.7	-30.0	147.6	-29.3	122.8	-30.1	151.1	-29.2	173.5	-28.6	5.4	-43.7	199.2	-28.0
-2	147.6	-29.3	125.7	-30.0	86.9	-31.6	131.6	-29.8	56.1	-33.5	185.9	-28.3	33.1	-35.8	79.3	-32.0
-1	125.7	-30.0	125.7	-30.0	44.6	-34.5	125.7	-30.0	7.6	-42.2	177.5	-28.5	104.5	-30.8	104.5	-30.8
0	86.9	-31.6	125.7	-30.0	17.3	-38.6	114.6	-30.4	8.3	-41.8	147.6	-29.3	19.9	-38.0	51.2	-33.9
1	53.8	-33.3	120.0	-30.2	3.5	-45.5	104.5	-30.8	13.5	-39.7	112.0	-30.5	15.5	-39.1	1.3	-50.0
2	39.7	-35.0	114.6	-30.4	1.7	-48.7	107.0	-30.7	39.7	-35.0	63.0	-33.0	14.8	-39.3	2.4	-47.2
3	26.9	-36.7	104.5	-30.8	8.7	-41.6	102.1	-30.9	40.7	-34.9	67.5	-32.7	35.4	-35.5	24.5	-37.1
4	14.8	-39.3	81.1	-31.9	46.7	-34.3	97.5	-31.1	31.6	-36.0	67.5	-32.7	2.3	-47.4	53.6	-33.7
5	3.7	-45.3	60.1	-33.2	57.4	-33.4	81.1	-31.9	14.4	-39.4	48.9	-34.1	7.6	-42.2	83.0	-31.8
6	1.4	-49.5	33.1	-35.8	54.9	-33.6	61.5	-33.1	0.1	-61.4	28.1	-36.5	1.0	-51.1	165.7	-28.8
7	4.6	-44.4	13.5	-39.7	25.1	-37.0	42.6	-34.7	6.2	-43.1	64.4	-32.9	2.3	-47.4	185.9	-28.3
8	19.0	-38.2	13.2	-39.8	3.5	-45.6	42.6	-34.7	10.7	-40.7	107.0	-30.7	8.3	-41.8	165.7	-28.8
9	29.5	-36.3	25.7	-36.9	2.6	-46.9	63.0	-33.0	11.5	-40.4	109.4	-30.6	1.9	-48.2	134.7	-29.7
10	30.8	-36.1	41.6	-34.8	11.2	-40.5	72.3	-32.4	6.7	-42.7	93.2	-31.3	4.8	-44.2	33.1	-35.8
11	24.5	-37.1	53.6	-33.7	14.8	-39.3	67.5	-32.7	4.8	-44.2	26.9	-36.7	4.8	-44.2	45.6	-34.4
12	14.1	-39.5	54.9	-33.6	12.9	-39.9	52.4	-33.8	7.2	-42.4	20.4	-37.9	1.4	-49.4	0.9	-51.6
13	3.7	-45.3	45.6	-34.4	3.2	-45.9	36.2	-35.4	12.6	-40.0	36.2	-35.4	11.2	-40.5	2.0	-47.9
14	1.3	-49.9	30.8	-36.1	0.5	-54.2	24.5	-37.1	15.5	-39.1	37.1	-35.3	1.2	-50.2	10.9	-40.6
15	2.1	-47.7	11.5	-40.4	0.9	-51.3	12.6	-40.0	5.5	-43.6	19.5	-38.1	0.7	-52.5	27.5	-36.6
16	2.7	-46.6	2.6	-46.9	1.3	-49.7	4.9	-44.1	2.9	-46.4	4.0	-45.0	9.3	-41.3	17.3	-38.6
17	3.3	-45.8	2.0	-48.0	1.2	-50.3	1.5	-49.3	2.6	-46.9	14.8	-39.3	0.4	-54.5	2.9	-46.3
18	4.0	-45.0	3.1	-46.1	1.2	-50.1	0.8	-52.0	1.5	-49.1	15.5	-39.1	0.7	-52.6	6.0	-43.2
19	4.4	-44.6	3.5	-45.5	4.7	-44.3	0.3	-55.9	0.2	-57.7	10.0	-41.0	0.3	-57.0	6.4	-42.9
20	1.5	-49.1	3.7	-45.3	6.7	-42.7	0.4	-55.5	1.0	-50.8	1.3	-49.7	4.2	-44.8	1.8	-48.4
21	1.6	-48.9	2.6	-46.8	4.4	-44.6	1.0	-51.1	1.4	-49.4	6.9	-42.6	1.7	-48.8	1.7	-48.6
22	0.5	-54.4	1.4	-49.5	3.2	-46.0	3.4	-45.7	0.6	-53.3	6.4	-42.9	0.2	-58.2	1.7	-48.8
23	0.1	-63.9	0.6	-52.9	2.3	-47.3	12.3	-40.1	0.0	-64.6	3.8	-45.2	0.2	-58.9	1.8	-48.5
24	1.2	-50.1	0.2	-58.6	0.6	-53.2	14.1	-39.5	0.4	-54.6	2.6	-46.9	1.2	-50.1	1.2	-50.3
25	2.1	-47.8	0.5	-53.9	0.9	-51.5	10.0	-41.0	0.9	-51.5	4.2	-44.8	3.2	-45.9	1.1	-50.5
26	3.4	-45.7	1.2	-50.1	0.5	-54.3	4.3	-44.7	0.2	-58.1	3.4	-45.7	5.6	-43.5	1.3	-49.9
27	4.9	-44.1	5.2	-43.8	0.2	-57.6	0.9	-51.6	0.4	-55.2	1.0	-51.0	3.5	-45.6	0.2	-57.5
28	6.7	-42.7	8.9	-41.5	0.3	-56.0	6.7	-42.7	0.9	-51.6	1.4	-49.6	4.2	-44.8	8.7	-41.6
29	7.1	-42.5	10.0	-41.0	0.3	-55.8	8.5	-41.7	0.4	-54.6	8.3	-41.8	3.4	-45.7	13.8	-39.6
30	6.4	-42.9	9.8	-41.1	0.1	-61.4	8.5	-41.7	0.1	-59.3	8.1	-41.9	1.7	-48.6	8.1	-41.9
31	5.1	-43.9	5.9	-43.3	0.2	-57.1	7.7	-42.1	1.7	-48.6	5.6	-43.5	3.2	-46.0	7.1	-42.5
32	2.6	-46.8	2.0	-47.9	0.2	-59.2	5.1	-43.9	3.0	-46.2	0.3	-56.1	3.7	-45.3	4.7	-44.3
33	2.6	-46.9	0.8	-52.0	0.1	-62.2	1.3	-49.8	3.3	-45.8	0.0	-65.2	3.2	-46.0	2.6	-46.9
34	1.7	-48.6	1.7	-48.6	0.2	-58.7	1.7	-48.8	2.7	-46.6	0.1	-60.1	0.9	-51.3	0.3	-56.1
35	0.8	-52.1	3.2	-46.0	0.3	-56.0	1.9	-48.3	1.6	-49.0	1.2	-50.2	0.9	-51.3	1.4	-49.6
36	1.2	-50.2	3.3	-45.9	0.1	-60.1	2.0	-47.9	4.0	-45.0	4.4	-44.6	0.6	-52.9	2.6	-46.8
37	1.0	-51.0	2.1	-47.8	0.3	-56.5	4.6	-44.4	4.6	-44.4	6.2	-43.1	1.2	-50.3	2.2	-47.5
38	0.7	-52.8	2.7	-46.6	0.9	-51.3	8.1	-41.9	4.2	-44.8	4.6	-44.4	2.0	-47.9	0.1	-63.8
39	0.5	-54.2	1.9	-48.1	1.4	-49.5	10.5	-40.8	3.2	-45.9	4.8	-44.2	3.5	-45.6	1.0	-50.8
40	0.5	-54.2	1.0	-51.2	1.4	-49.6	11.5	-40.4	0.8	-51.7	9.3	-41.3	3.2	-45.9	0.7	-52.8
41	0.4	-55.4	1.5	-49.2	1.1	-50.6	11.7	-40.3	1.3	-49.9	7.7	-42.1	0.9	-51.3	1.1	-50.4
42	0.5	-53.6	1.2	-50.1	0.1	-59.6	11.2	-40.5	1.0	-50.9	5.5	-43.6	0.1	-59.5	3.5	-45.5
43	0.5	-53.6	0.9	-51.4	0.1	-60.8	8.5	-41.7	0.5	-54.1	4.9	-44.1	0.1	-60.0	3.4	-45.7
44	0.5	-54.4	0.6	-53.1	0.0	-66.6	4.8	-44.2	1.4	-49.6	3.4	-45.7	0.3	-56.6	2.0	-47.9
45	0.1	-61.5	0.7	-52.6	0.1	-61.5	3.6	-45.4	1.3	-49.8	1.9	-48.1	0.5	-54.3	0.6	-53.1

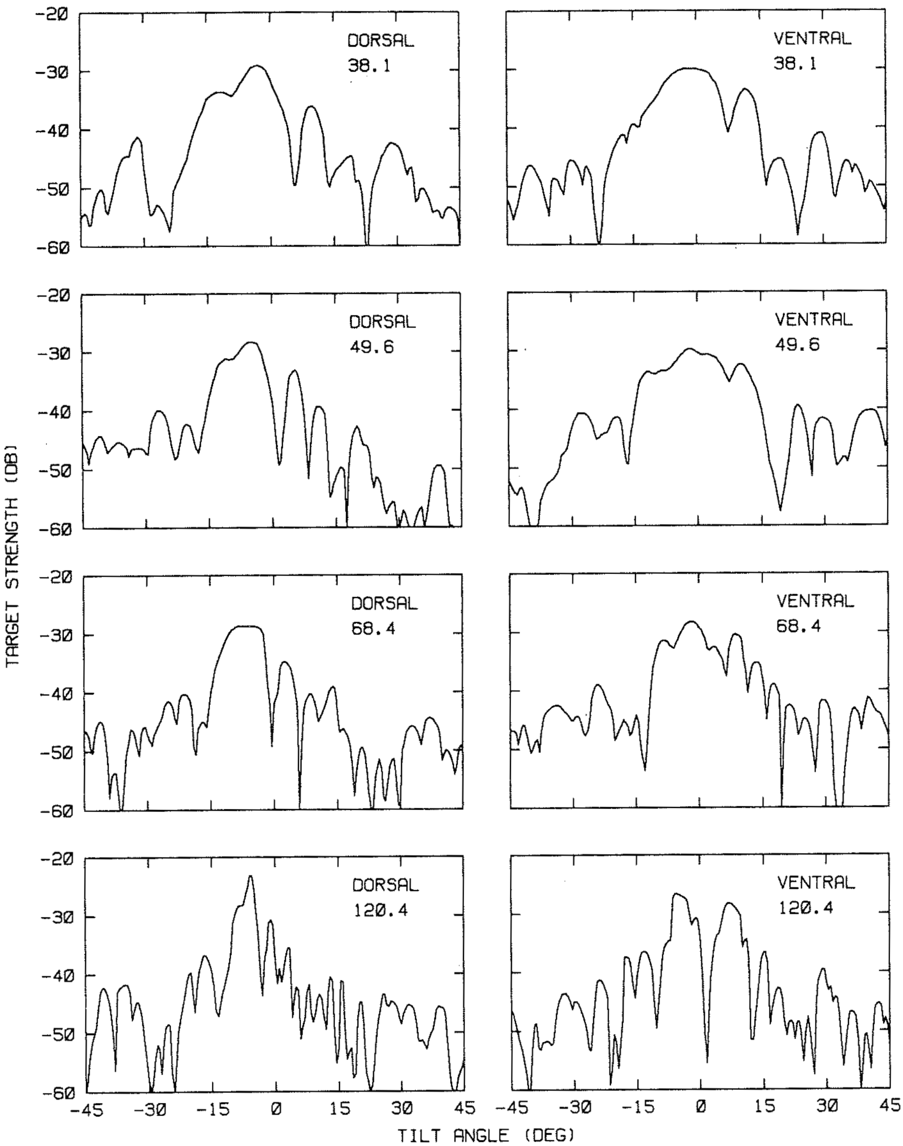

FIG. 25. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 215: POLLACK, 37.0 CM, 332 G.

TABLE 13. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 216: POLLACK, 36.5 CM, 343 G.

	38.1 KHZ				49.6 KHZ				68.4 KHZ				120.4 KHZ			
	DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL	
THETA	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS
-45	2.8	-46.5	0.3	-56.2	9.1	-41.4	1.8	-48.4	2.4	-47.7	3.0	-46.2	1.4	-49.4	5.4	-43.7
-44	2.8	-46.5	0.5	-54.2	8.7	-41.6	2.2	-47.5	1.5	-49.1	2.3	-47.4	5.5	-43.6	7.6	-42.2
-43	0.9	-51.6	0.6	-53.1	7.7	-42.1	1.7	-48.7	2.3	-47.3	1.6	-48.9	7.2	-42.4	5.0	-44.0
-42	1.0	-51.2	0.7	-52.5	5.4	-43.7	1.3	-49.9	3.3	-45.8	3.0	-46.2	7.9	-42.0	2.6	-46.9
-41	1.9	-48.3	0.8	-52.2	1.9	-48.1	2.2	-47.5	3.7	-45.3	2.9	-46.3	6.3	-43.0	0.7	-52.6
-40	3.3	-45.8	1.5	-49.2	0.7	-52.6	3.2	-45.9	2.7	-46.6	2.2	-47.5	2.9	-46.3	1.6	-48.9
-39	3.5	-45.6	2.1	-47.8	1.0	-50.8	3.5	-45.5	3.2	-46.0	0.6	-52.9	2.0	-48.0	2.9	-46.3
-38	2.2	-47.6	2.6	-46.8	1.2	-50.1	3.6	-45.4	1.9	-48.3	0.1	-60.7	1.4	-49.4	5.1	-43.9
-37	3.5	-45.6	2.9	-46.4	0.4	-54.9	3.5	-45.6	1.5	-49.3	0.1	-62.0	0.4	-55.0	7.4	-42.3
-36	5.4	-43.7	2.9	-46.3	0.0	-65.5	3.4	-45.7	0.6	-53.3	0.3	-55.6	3.4	-45.7	10.2	-40.9
-35	5.7	-43.4	3.2	-45.9	0.1	-63.4	3.2	-46.0	1.1	-50.4	2.0	-47.9	3.1	-46.1	13.8	-39.6
-34	5.5	-43.6	5.1	-43.9	0.0	-65.8	2.4	-47.2	1.4	-49.4	4.5	-44.5	1.4	-49.4	16.6	-38.8
-33	3.7	-45.3	6.4	-42.9	1.4	-49.4	1.7	-48.8	2.0	-47.9	9.8	-41.1	2.1	-47.8	18.2	-38.4
-32	7.2	-42.4	7.1	-42.5	5.1	-43.9	1.0	-50.9	3.9	-45.1	12.6	-40.0	2.7	-46.6	17.8	-38.5
-31	6.9	-42.6	7.2	-42.4	5.6	-43.5	0.8	-52.1	3.7	-45.3	12.3	-40.1	3.0	-46.2	13.5	-39.7
-30	4.9	-44.1	5.6	-43.5	8.5	-41.7	2.3	-47.3	1.6	-49.0	8.9	-41.5	0.4	-55.5	8.3	-41.8
-29	2.8	-46.5	4.0	-45.0	9.8	-41.1	6.6	-42.8	0.2	-59.3	7.4	-42.3	1.1	-50.5	7.2	-42.4
-28	4.6	-44.4	2.3	-47.4	7.7	-42.1	12.0	-40.2	2.7	-46.7	4.7	-44.3	2.6	-46.9	9.3	-41.3
-27	5.4	-43.7	1.3	-50.0	10.2	-40.9	15.5	-39.1	4.4	-44.6	5.5	-43.6	2.9	-46.4	10.5	-40.8
-26	4.2	-44.8	5.0	-44.0	14.8	-39.3	14.1	-39.5	3.5	-45.5	7.2	-42.4	1.7	-48.7	7.9	-42.0
-25	0.7	-52.6	4.9	-44.1	14.8	-39.3	16.6	-38.8	8.5	-41.7	6.7	-42.7	1.7	-48.8	2.3	-47.3
-24	0.0	-65.6	3.8	-45.2	12.0	-40.2	21.3	-37.7	9.8	-41.1	4.9	-44.1	2.9	-46.3	7.4	-42.3
-23	0.1	-60.3	2.7	-46.6	7.6	-42.2	23.4	-37.3	6.0	-43.2	4.9	-44.1	4.1	-44.9	9.3	-41.8
-22	0.3	-56.5	3.6	-45.4	7.6	-42.2	20.4	-37.9	10.9	-40.6	3.5	-45.6	5.0	-44.0	7.1	-42.5
-21	1.4	-49.6	5.4	-43.7	2.0	-47.9	15.1	-39.2	13.8	-39.6	1.3	-49.7	5.0	-44.0	2.7	-46.7
-20	5.6	-43.5	8.7	-41.6	0.5	-53.7	9.8	-41.1	14.1	-39.5	0.4	-52.9	2.7	-46.6	1.5	-49.2
-19	8.5	-41.7	13.8	-39.6	0.1	-62.7	2.7	-46.7	10.2	-40.9	0.7	-52.5	0.6	-53.0	14.8	-39.3
-18	7.9	-42.0	19.9	-38.0	2.2	-47.6	1.8	-48.5	4.1	-44.9	6.0	-43.2	0.3	-55.8	20.9	-37.8
-17	22.3	-37.5	26.3	-36.8	11.2	-40.5	4.2	-44.8	3.6	-45.4	22.9	-37.4	2.8	-46.5	18.2	-38.4
-16	32.3	-35.9	33.8	-35.7	19.9	-38.0	11.5	-40.4	4.8	-44.2	53.6	-33.7	5.9	-43.3	11.5	-40.4
-15	37.9	-35.2	41.6	-34.8	30.8	-36.1	28.1	-36.5	17.9	-39.9	79.3	-32.0	14.8	-39.3	1.1	-50.5
-14	41.6	-34.8	43.6	-34.6	46.7	-34.3	63.0	-33.0	26.9	-36.7	91.0	-31.4	27.5	-36.6	46.7	-34.3
-13	44.6	-34.5	44.6	-34.5	60.1	-33.2	89.0	-31.5	53.6	-33.7	89.0	-31.5	32.3	-35.9	54.9	-33.6
-12	45.6	-34.4	37.1	-35.3	75.7	-32.2	89.0	-31.5	85.0	-31.7	77.5	-32.1	23.9	-37.2	52.4	-33.8
-11	43.6	-34.6	32.3	-35.9	86.9	-31.6	85.0	-31.7	104.5	-30.8	57.4	-33.4	104.5	-30.8	38.8	-35.1
-10	37.1	-35.3	33.8	-35.7	89.0	-31.5	95.3	-31.2	109.4	-30.6	74.0	-32.3	154.6	-29.1	61.5	-33.1
-9	29.5	-36.3	39.7	-35.0	89.0	-31.5	95.3	-31.2	109.4	-30.6	93.2	-31.3	161.9	-28.9	112.0	-30.5
-8	30.1	-36.2	45.6	-34.4	93.2	-31.3	70.7	-32.5	104.5	-30.8	93.2	-31.3	141.0	-29.5	144.3	-29.4
-7	43.6	-34.6	54.9	-33.6	134.7	-29.7	44.6	-34.5	97.5	-31.1	83.0	-31.8	287.9	-26.4	109.4	-30.6
-6	70.7	-32.5	65.9	-32.8	181.6	-28.4	28.8	-36.4	120.0	-30.2	64.4	-32.9	416.1	-24.8	67.5	-32.7
-5	104.5	-30.8	81.1	-31.9	194.6	-28.1	41.6	-34.8	223.5	-27.5	44.6	-34.5	301.4	-26.2	112.0	-30.5
-4	134.7	-29.7	95.3	-31.2	161.9	-28.9	58.8	-33.3	274.9	-26.6	45.6	-34.4	93.2	-31.3	120.0	-30.2
-3	137.8	-29.6	95.3	-31.2	102.1	-30.9	91.0	-31.4	199.2	-28.0	60.1	-33.2	1.9	-48.3	114.6	-30.4
-2	122.8	-30.1	86.9	-31.6	58.8	-33.3	114.6	-30.4	74.0	-32.3	61.5	-33.1	75.7	-32.2	58.8	-33.3
-1	102.1	-30.9	69.1	-32.6	45.6	-34.4	125.7	-30.0	26.3	-36.8	52.4	-33.8	114.6	-30.4	19.9	-38.0
0	83.0	-31.8	47.8	-34.2	33.1	-35.8	109.4	-30.6	7.4	-42.3	30.8	-36.1	33.1	-35.8	81.1	-31.9
1	56.1	-33.5	28.1	-36.5	24.5	-37.1	56.1	-33.5	13.2	-39.8	33.8	-35.7	1.4	-49.5	112.0	-30.5
2	26.9	-36.7	20.4	-37.9	5.1	-43.9	23.4	-37.3	29.5	-36.3	81.1	-31.9	32.3	-35.9	64.4	-32.9
3	15.8	-39.0	37.9	-35.2	3.5	-45.6	40.7	-34.9	56.1	-33.5	89.0	-31.5	31.6	-36.0	28.8	-36.4
4	15.5	-39.1	51.2	-33.9	33.1	-35.8	89.0	-31.5	56.1	-33.5	64.4	-32.9	14.4	-39.4	51.2	-33.9
5	13.5	-39.7	56.1	-33.5	69.1	-32.6	104.5	-30.8	3.9	-45.1	12.0	-40.2	30.1	-36.2	64.4	-32.9
6	7.9	-42.0	56.1	-33.5	70.7	-32.5	104.5	-30.8	6.2	-43.1	63.0	-33.0	35.4	-35.5	74.0	-32.3
7	2.9	-46.3	48.9	-34.1	43.6	-34.6	72.3	-32.4	22.9	-37.4	147.6	-29.3	20.9	-37.8	75.7	-32.2
8	2.9	-46.4	25.1	-37.0	12.9	-39.9	29.5	-36.3	10.5	-40.8	147.6	-29.3	6.4	-42.9	72.3	-32.4
9	5.2	-43.0	10.9	-40.6	2.6	-46.9	46.7	-34.3	2.6	-46.8	51.2	-33.9	0.5	-53.6	58.8	-33.3
10	13.2	-39.8	22.3	-37.5	12.0	-40.2	61.5	-33.1	6.3	-43.0	41.6	-34.8	1.0	-51.0	44.6	-34.5
11	12.3	-40.1	32.3	-35.9	17.8	-38.5	67.5	-32.7	9.8	-41.1	75.7	-32.2	2.7	-46.6	33.1	-35.8
12	7.2	-42.4	37.9	-35.2	10.7	-40.7	43.6	-34.6	10.0	-41.0	67.5	-32.7	4.5	-44.5	13.2	-39.8
13	2.1	-47.7	33.1	-35.9	0.1	-61.2	11.7	-40.3	5.7	-43.4	15.1	-39.2	5.6	-43.5	14.4	-39.4
14	0.8	-52.1	19.5	-38.1	0.5	-53.6	14.1	-39.5	15.8	-39.0	24.5	-37.1	2.6	-46.8	21.3	-37.7
15	1.9	-48.1	10.2	-40.9	1.8	-48.4	26.9	-36.7	20.4	-37.9	30.1	-36.2	5.9	-43.3	10.5	-40.8
16	3.5	-45.5	4.2	-44.8	6.4	-42.9	29.5	-36.3	18.6	-39.3	25.7	-36.9	3.6	-45.4	4.8	-44.2
17	5.0	-44.0	2.0	-48.0	7.1	-42.5	17.3	-38.6	9.5	-41.2	8.9	-41.5	0.3	-56.8	17.0	-38.7
18	4.6	-44.4	7.1	-42.5	6.2	-43.1	1.0	-51.2	3.6	-45.4	4.3	-44.7	1.1	-50.6	7.1	-42.5
19	0.5	-53.8	9.1	-41.4	10.0	-41.0	0.7	-52.3	0.0	-64.3	6.7	-42.7	0.5	-54.2	1.0	-51.2
20	0.1	-62.4	7.2	-42.4	10.7	-40.7	5.6	-43.5	1.4	-49.5	1.5	-49.1	1.3	-49.7	11.2	-40.5
21	0.0	-67.1	2.8	-46.5	4.6	-44.4	7.6	-42.2	1.7	-48.7	11.2	-40.5	0.2	-59.0	2.3	-47.4
22	0.3	-56.6	0.1	-60.2	7.1	-42.5	2.1	-47.7	2.3	-47.3	9.3	-41.3	3.0	-46.2	2.6	-46.9
23	0.6	-53.2	0.9	-51.4	8.7	-41.6	0.3	-55.7	7.1	-42.5	5.0	-44.0	0.8	-51.9	1.9	-48.1
24	1.2	-50.2	1.4	-49.4	4.0	-45.0	2.1	-47.7	7.6	-42.2	0.8	-51.7	1.1	-50.5	0.4	-55.2
25	1.3	-49.7	1.1	-50.4	3.2	-45.9	7.4	-42.3	3.4	-45.7	4.5	-44.5	1.1	-50.7	0.1	-63.5
26	0.3	-55.8	1.7	-48.7	2.9	-46.3	7.4	-42.3	4.0	-45.0	5.4	-43.7	0.2	-58.1	15.5	-39.1
27	1.1	-50.7	1.9	-48.3	1.1	-50.5	1.9	-49.2	1.1	-50.5	0.5	-54.0	0.5	-53.6	12.6	-40.0
28	3.0	-46.2	0.8	-52.0	0.4	-55.4	0.9	-51.4	0.3	-56.3	1.9	-48.2	1.4	-49.6	7.2	-42.4
29	5.7	-43.4	0.3	-56.3	0.7	-52.8	0.4	-54.7	0.9	-51.3	4.0	-45.0	3.5	-45.5	2.5	-47.1
30	6.9	-42.6	0.5	-53.0	1.2	-50.1	4.1	-44.9	2.0	-48.0	5.0	-44.0	7.4	-42.3	5.6	-43.5
31	5.4	-43.7	0.3	-55.7	1.5	-49.2	5.6	-43.5	1.3	-49.9	4.5	-44.5	10.7	-40.7	8.5	-41.7
32	7.2	-42.4	2.0	-48.0	0.5	-53.6	4.6	-44.4	5.7	-43.4	9.3	-41.8	11.7	-40.3	4.5	-44.5
33	6.7	-42.7	2.7	-46.7	1.8	-48.5	1.0	-50.9	7.6	-42.2	12.3	-40.1	10.2	-40.9	0.9	-51.8
34	3.6	-45.4	0.6	-53.2	4.5	-44.5	0.4	-54.9	9.1	-41.4	10.5	-40.8	7.4	-42.3	0.4	-54.6
35	2.9	-46.3	0.1	-63.1	4.9	-44.1	0.6	-53.4	9.8	-41.1	7.2	-42.4	2.9	-46.3	0.3	-56.0
36	6.3	-43.0	0.0	-65.1	2.9	-46.3	0.5	-53.0	6.0	-43.2	5.1	-43.9	1.1	-50.7	0.1	-59.9
37	6.7	-42.7	0.1	-62.3	4.3	-44.7	0.3	-56.5	8.1	-41.9	4.1	-44.9	0.1	-63.9	1.0	-50.9
38	6.2	-43.1	1.1	-50.7	4.3	-44.7	0.1	-62.4	8.1	-41.9	2.5	-47.0	0.1	-60.2	0.7	-52.3
39	2.5	-47.0	1.5	-49.2	4.5	-44.5	0.1	-63.3	7.2	-42.4	1.0	-50.8	0.3	-55.8	0.4	-55.3
40	0.9	-51.3	0.5	-53.9	3.2	-45.9	0.3	-56.9	5.7	-43.4	0.3	-56.7	0.1	-63.9	1.1	-50.6
41	0.4	-54.7	0.1	-60.2	2.4	-47.2	0.2	-57.4	5.2	-43.8	0.1	-60.1	0.1	-63.9	0.7	-52.6
42	0.7	-52.7	0.0	-65.1	3.0	-46.2	0.5	-53.6	3.8	-45.2	0.1	-63.8	0.1	-63.9	4.8	-44.2
43	0.4	-52.9	0.2	-57.2	1.9	-48.1	1.0	-50.9	2.4	-47.2	0.0	-66.1	0.3	-55.6	6.6	-42.8
44	0.8	-51.7	0.4	-54.7	0.4	-55.5	1.0	-51.2	0.9	-51.3	0.4	-55.1	0.9	-51.6	5.5	-43.6
45	1.6	-48.9	0.3	-55.6	0.7	-52.6	0.8	-52.0	0.3	-56.6	0.8	-51.7	1.0	-50.9	4.4	-44.6

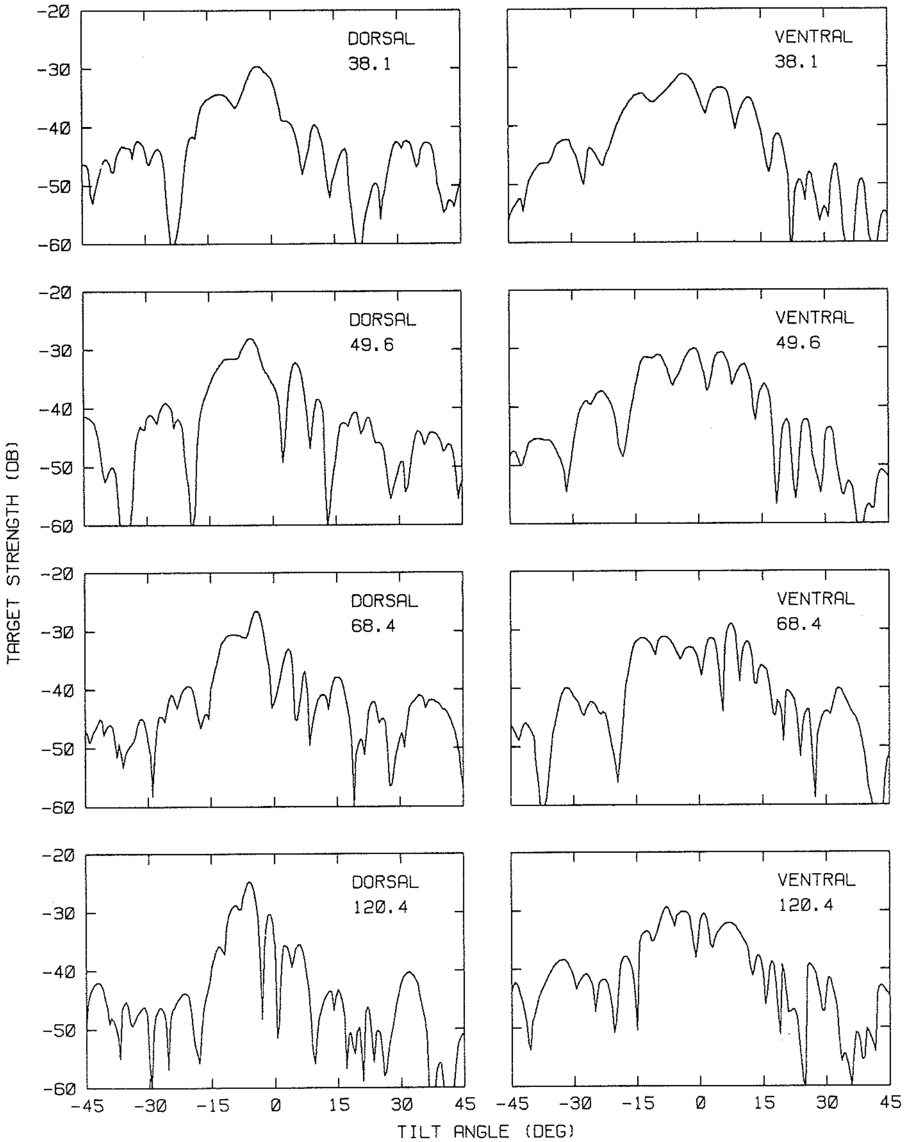

FIG. 26. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 216: POLLACK, 36.5 CM, 343 G.

TABLE 14. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 217: POLLACK, 34.5 CM, 253 G.

THETA	38.1 KHZ DORSAL SD	38.1 KHZ DORSAL TS	38.1 KHZ VENTRAL SD	38.1 KHZ VENTRAL TS	49.6 KHZ DORSAL SD	49.6 KHZ DORSAL TS	49.6 KHZ VENTRAL SD	49.6 KHZ VENTRAL TS	68.4 KHZ DORSAL SD	68.4 KHZ DORSAL TS	68.4 KHZ VENTRAL SD	68.4 KHZ VENTRAL TS	120.4 KHZ DORSAL SD	120.4 KHZ DORSAL TS	120.4 KHZ VENTRAL SD	120.4 KHZ VENTRAL TS
-45	0.1	-61.0	2.8	-46.5	0.5	-53.7	2.3	-47.4	5.4	-43.7	2.0	-48.0	2.5	-47.1	7.1	-42.5
-44	0.1	-62.7	3.2	-45.9	0.7	-52.8	2.6	-46.3	6.7	-42.7	1.1	-50.6	1.4	-49.5	6.7	-42.7
-43	0.6	-52.9	3.7	-45.3	1.2	-50.2	2.9	-46.4	7.6	-42.2	0.2	-57.3	0.3	-56.0	5.0	-44.0
-42	1.3	-49.9	3.7	-45.3	1.3	-49.7	3.2	-45.9	5.7	-43.4	0.3	-56.7	0.6	-53.4	5.1	-43.9
-41	2.2	-47.5	3.5	-45.5	0.9	-51.5	3.9	-45.1	2.9	-46.4	0.6	-53.2	0.6	-53.0	6.0	-43.2
-40	3.0	-46.2	2.7	-46.6	0.5	-54.0	5.4	-43.7	1.6	-48.9	1.6	-49.0	0.3	-57.0	5.7	-43.4
-39	3.0	-46.2	5.6	-43.5	0.3	-56.5	6.4	-42.9	2.2	-47.5	1.6	-48.9	1.1	-50.6	4.3	-44.7
-38	2.4	-47.2	7.9	-42.0	1.9	-48.2	6.0	-43.2	3.2	-45.9	2.5	-47.0	0.2	-57.9	2.7	-46.6
-37	0.9	-51.5	7.6	-42.2	2.5	-47.1	4.5	-44.5	2.7	-46.7	5.4	-43.7	1.0	-50.9	0.9	-51.5
-36	1.4	-49.4	6.6	-42.8	1.3	-49.8	2.8	-46.5	0.1	-63.2	6.0	-43.2	3.3	-45.8	0.2	-58.1
-35	1.9	-48.2	3.2	-46.0	2.3	-47.3	1.8	-48.4	0.2	-57.1	5.6	-43.5	0.1	-59.8	1.0	-51.1
-34	2.4	-47.2	1.3	-49.8	3.8	-45.2	1.6	-48.9	0.5	-54.3	2.0	-47.9	0.5	-54.3	0.9	-51.6
-33	2.1	-47.8	0.4	-55.1	5.7	-43.4	2.9	-46.3	0.8	-52.2	2.5	-47.1	2.5	-47.1	0.2	-57.9
-32	1.5	-49.2	0.1	-62.5	7.4	-42.3	5.4	-43.7	0.3	-56.4	2.4	-47.2	5.1	-43.9	0.1	-59.8
-31	2.3	-47.3	0.0	-65.8	7.6	-42.2	7.7	-42.1	0.1	-61.3	1.1	-50.5	5.2	-43.8	0.3	-56.8
-30	2.9	-46.4	0.1	-61.2	6.6	-42.8	10.5	-40.8	0.4	-54.7	0.6	-52.9	3.7	-45.3	0.3	-56.8
-29	2.3	-47.4	0.4	-55.0	4.9	-44.1	12.9	-39.9	0.4	-54.9	2.5	-47.0	0.2	-57.3	0.1	-63.9
-28	2.1	-47.8	1.2	-50.2	2.3	-46.5	15.1	-39.2	0.1	-59.7	5.4	-43.7	1.3	-50.0	0.1	-63.9
-27	3.0	-46.2	2.1	-47.7	4.5	-44.5	15.8	-39.0	0.6	-53.3	6.9	-42.6	2.6	-46.8	0.1	-60.0
-26	3.4	-45.7	3.3	-45.8	6.3	-43.0	14.4	-39.4	2.2	-47.5	6.7	-42.7	2.2	-47.5	2.9	-46.4
-25	3.4	-45.7	5.0	-44.0	7.1	-42.5	10.0	-41.0	5.4	-43.7	6.4	-42.9	0.4	-54.8	5.0	-44.0
-24	2.8	-46.5	6.4	-42.9	7.1	-42.5	6.2	-43.1	9.3	-41.8	5.9	-43.3	0.4	-55.1	4.0	-45.0
-23	2.2	-47.6	6.9	-42.6	4.4	-44.6	3.2	-45.9	10.2	-40.9	4.8	-44.2	2.9	-46.4	2.5	-47.0
-22	1.5	-49.3	6.4	-42.9	0.7	-52.5	0.3	-56.0	6.3	-43.0	10.7	-40.7	7.9	-42.0	0.9	-51.5
-21	2.1	-47.7	4.1	-44.9	0.3	-56.9	0.2	-58.9	15.1	-39.2	11.7	-40.3	10.7	-40.7	6.2	-43.1
-20	6.2	-43.1	3.6	-45.4	0.4	-54.5	0.8	-51.7	18.6	-38.3	10.7	-40.7	9.8	-41.1	8.1	-41.9
-19	16.2	-38.9	5.5	-43.6	1.2	-50.3	3.5	-45.5	15.5	-39.1	9.8	-41.1	4.8	-44.2	7.9	-42.0
-18	28.1	-36.5	7.6	-42.2	6.4	-42.9	7.1	-42.5	5.1	-43.9	8.7	-41.6	6.7	-42.7	15.5	-39.1
-17	33.1	-35.8	6.6	-42.8	13.8	-39.6	11.2	-40.5	0.9	-51.6	5.7	-43.4	16.6	-38.8	32.3	-35.9
-16	34.6	-35.6	5.9	-43.3	18.6	-38.3	13.2	-39.8	0.9	-51.5	4.5	-44.5	22.3	-37.5	43.6	-34.6
-15	34.6	-35.6	6.7	-42.7	26.3	-36.8	14.1	-39.5	1.7	-48.6	1.8	-48.4	21.8	-37.6	30.1	-36.2
-14	36.2	-35.4	8.3	-41.8	33.8	-35.7	12.9	-39.9	21.8	-37.6	0.1	-60.1	18.6	-38.3	15.8	-39.0
-13	42.6	-34.7	7.6	-42.2	42.6	-34.7	23.9	-37.2	48.9	-34.1	0.4	-55.3	11.7	-40.3	4.6	-44.4
-12	45.6	-34.4	6.0	-43.2	52.4	-33.8	47.6	-34.2	81.1	-31.9	0.6	-53.3	0.2	-57.0	22.3	-37.5
-11	46.7	-34.3	10.9	-40.6	67.5	-32.7	53.6	-33.7	89.0	-31.5	0.5	-53.8	32.3	-35.9	27.5	-36.6
-10	43.6	-34.6	16.2	-38.9	91.0	-31.4	53.6	-33.7	89.0	-31.5	7.7	-42.1	104.5	-30.8	26.9	-36.7
-9	36.2	-35.4	23.4	-37.3	112.0	-30.5	43.6	-34.6	89.0	-31.5	25.1	-37.0	169.5	-28.7	12.9	-39.9
-8	30.8	-36.1	33.1	-35.8	137.8	-29.6	33.1	-35.8	93.2	-31.3	42.6	-34.7	185.9	-28.3	1.0	-51.0
-7	48.9	-34.1	58.8	-33.3	147.6	-29.3	21.3	-37.7	141.0	-29.5	51.2	-33.9	151.1	-29.2	20.4	-37.9
-6	75.7	-32.2	91.0	-31.4	144.3	-29.4	30.1	-36.2	234.0	-27.3	51.2	-33.9	203.8	-27.9	107.0	-30.7
-5	97.5	-31.1	112.0	-30.5	137.8	-29.6	57.4	-33.4	250.7	-27.0	40.7	-34.9	346.1	-25.6	154.6	-29.1
-4	120.0	-30.2	122.8	-30.1	120.0	-30.2	112.0	-30.5	190.2	-28.2	60.1	-33.2	234.0	-27.3	185.9	-28.3
-3	131.6	-29.8	122.8	-30.1	89.0	-31.5	165.7	-28.8	99.8	-31.0	109.4	-30.6	35.4	-35.5	181.6	-28.4
-2	120.0	-30.2	109.4	-30.6	63.0	-33.0	199.2	-28.0	52.4	-33.8	151.1	-29.2	17.0	-38.7	93.2	-31.3
-1	99.8	-31.0	89.0	-31.5	43.6	-34.6	213.4	-27.7	22.3	-37.5	173.5	-28.6	72.3	-32.4	120.0	-30.2
0	72.3	-32.4	64.4	-32.9	25.7	-36.9	158.2	-29.0	1.5	-49.1	181.6	-28.4	120.0	-30.2	77.5	-32.1
1	45.6	-34.4	41.6	-34.8	13.8	-39.6	104.5	-30.8	17.0	-38.7	112.0	-30.5	28.1	-36.5	33.1	-35.8
2	8.1	-41.9	28.8	-36.4	5.9	-43.3	45.6	-34.4	39.7	-35.0	56.1	-33.5	3.7	-45.3	13.2	-39.8
3	1.7	-48.8	38.8	-35.1	0.4	-54.8	28.1	-36.5	51.2	-33.9	50.0	-34.0	5.4	-43.7	43.6	-34.6
4	1.8	-48.5	43.6	-34.6	5.5	-43.6	42.6	-34.7	47.8	-34.2	44.6	-34.5	22.9	-37.4	109.4	-30.6
5	2.8	-46.5	44.6	-34.5	27.5	-36.6	57.4	-33.4	2.7	-46.7	23.9	-37.2	19.5	-38.1	125.7	-30.0
6	3.1	-46.1	35.4	-35.5	44.6	-34.5	56.1	-33.5	2.3	-47.4	6.3	-43.0	2.6	-46.9	69.1	-32.6
7	0.7	-52.8	22.3	-37.5	45.6	-34.4	28.1	-36.5	1.9	-48.1	22.3	-37.5	19.9	-38.0	30.1	-36.2
8	2.8	-46.5	7.1	-42.5	28.1	-36.5	1.1	-50.5	0.7	-52.6	51.2	-33.9	3.5	-45.5	50.0	-34.0
9	5.7	-43.4	1.1	-50.4	11.7	-40.3	0.4	-54.9	2.7	-46.7	61.5	-33.1	0.4	-54.9	11.2	-40.5
10	10.5	-40.8	3.9	-45.1	2.5	-47.0	11.2	-40.5	9.8	-41.1	60.1	-33.2	12.3	-40.1	37.9	-35.2
11	13.2	-39.8	11.7	-40.3	1.8	-48.5	21.8	-37.6	9.3	-41.3	46.7	-34.3	18.2	-38.4	40.7	-34.9
12	12.0	-40.2	19.5	-38.1	3.1	-46.1	24.5	-37.1	4.4	-44.6	32.3	-35.9	9.1	-41.4	20.9	-37.8
13	7.9	-42.0	22.9	-37.4	2.7	-46.7	25.1	-37.0	1.0	-51.1	9.3	-41.3	2.5	-47.0	9.8	-41.1
14	5.1	-43.9	21.8	-37.6	0.1	-62.5	25.1	-37.0	2.9	-46.3	2.5	-47.0	6.3	-43.0	1.9	-48.3
15	0.6	-53.5	15.5	-39.1	0.1	-61.7	25.1	-37.0	5.6	-43.5	11.7	-40.3	4.0	-45.0	10.9	-40.6
16	0.3	-56.2	8.7	-41.6	1.2	-50.3	21.8	-37.6	5.0	-44.0	15.5	-39.1	4.1	-44.9	11.2	-40.5
17	1.0	-50.8	2.6	-46.9	5.0	-44.0	13.5	-39.7	0.7	-52.3	6.0	-43.2	18.2	-38.4	5.9	-43.3
18	1.5	-49.3	3.4	-45.7	5.6	-43.5	6.2	-43.1	0.1	-61.8	0.8	-51.8	25.7	-36.9	0.1	-63.5
19	1.9	-48.1	6.3	-43.0	3.8	-45.2	2.1	-47.7	0.1	-63.4	9.8	-41.1	11.7	-40.3	7.7	-42.1
20	2.0	-48.0	7.2	-42.4	0.7	-52.6	0.3	-55.6	0.2	-58.3	29.5	-36.3	2.2	-47.5	10.7	-40.7
21	1.5	-49.1	6.3	-43.0	0.3	-56.4	0.7	-52.3	0.6	-52.9	19.9	-38.0	2.2	-47.5	5.4	-43.7
22	0.2	-59.2	8.9	-41.5	2.3	-47.3	1.1	-50.6	1.4	-49.4	1.7	-48.6	1.7	-48.8	2.6	-46.9
23	0.7	-52.5	8.1	-41.9	3.7	-45.3	0.7	-52.5	0.9	-51.4	1.0	-50.9	1.6	-49.0	4.0	-45.0
24	2.3	-47.4	5.6	-43.5	2.6	-46.9	1.9	-48.3	1.4	-49.6	1.4	-49.5	4.0	-45.0	2.4	-47.2
25	3.2	-46.0	2.7	-46.6	1.0	-51.0	4.3	-44.7	1.7	-48.8	0.4	-55.2	3.7	-45.3	10.0	-41.0
26	3.7	-45.3	0.9	-51.4	0.0	-65.6	5.4	-43.7	1.6	-48.9	2.1	-47.7	1.4	-49.6	4.1	-44.9
27	3.9	-45.1	0.2	-58.4	0.1	-59.3	5.2	-43.9	0.5	-54.3	6.2	-43.1	1.8	-48.4	0.6	-53.3
28	3.6	-45.4	0.8	-51.8	0.3	-55.7	2.5	-47.0	0.1	-60.3	8.1	-41.9	0.7	-52.8	0.3	-56.0
29	3.2	-45.9	3.1	-46.1	0.8	-51.9	0.6	-53.3	0.2	-58.3	4.9	-44.1	1.3	-49.7	1.3	-49.8
30	1.7	-48.7	4.1	-44.9	2.1	-47.8	0.3	-55.8	1.6	-48.9	0.4	-54.5	3.0	-46.2	2.1	-47.8
31	0.5	-53.7	4.4	-44.6	2.2	-46.6	1.6	-48.9	1.3	-49.8	3.0	-46.2	4.7	-44.3	10.0	-41.0
32	0.5	-53.8	4.0	-45.0	2.8	-46.5	2.1	-47.8	2.6	-46.8	2.9	-46.3	0.8	-51.9	2.6	-46.9
33	0.7	-52.7	2.9	-46.3	3.9	-45.1	1.8	-48.4	5.2	-43.9	2.3	-47.4	0.2	-59.1	4.3	-44.7
34	0.7	-52.0	1.7	-48.6	6.4	-42.9	1.1	-50.5	6.7	-42.7	2.1	-47.8	0.3	-57.0	5.6	-43.5
35	0.6	-53.3	1.0	-51.2	6.7	-42.7	0.8	-52.1	7.1	-42.5	17.3	-38.6	0.1	-59.3	2.1	-47.8
36	0.0	-65.4	0.5	-54.1	6.0	-43.2	0.5	-54.1	4.6	-44.4	12.6	-40.0	0.3	-55.7	4.3	-44.7
37	0.1	-61.6	0.1	-59.4	3.5	-45.5	0.2	-57.6	4.2	-44.8	4.6	-44.4	0.3	-56.9	2.8	-46.5
38	0.2	-58.7	0.5	-53.6	6.3	-43.0	0.8	-51.8	4.7	-44.3	0.3	-56.1	0.1	-63.6	15.8	-39.0
39	0.3	-56.9	1.2	-50.2	7.6	-42.2	2.9	-46.4	3.5	-45.5	0.4	-54.5	0.1	-63.9	12.9	-39.9
40	0.2	-58.2	1.7	-48.2	6.6	-42.8	5.5	-43.6	0.9	-51.3	1.1	-50.5	0.1	-63.9	2.9	-46.3
41	0.0	-64.9	1.8	-48.5	6.2	-43.1	7.4	-42.3	0.5	-54.2	0.9	-51.4	0.1	-60.9	0.8	-52.1
42	0.1	-61.7	1.8	-48.5	6.0	-43.2	7.1	-42.5	0.0	-66.7	0.3	-56.6	0.2	-58.2	4.8	-44.2
43	0.0	-64.6	1.6	-48.9	4.7	-44.3	6.4	-42.9	0.2	-58.6	0.3	-55.8	0.7	-52.5	5.5	-43.6
44	0.2	-57.3	1.3	-50.0	3.5	-45.5	5.1	-43.9	0.2	-59.2	0.3	-56.0	0.6	-53.2	0.7	-57.6
45	0.5	-54.4	0.3	-52.1	2.0	-47.9	2.5	-47.0	0.0	-65.7	0.1	-63.7	0.5	-54.0	0.8	-51.7

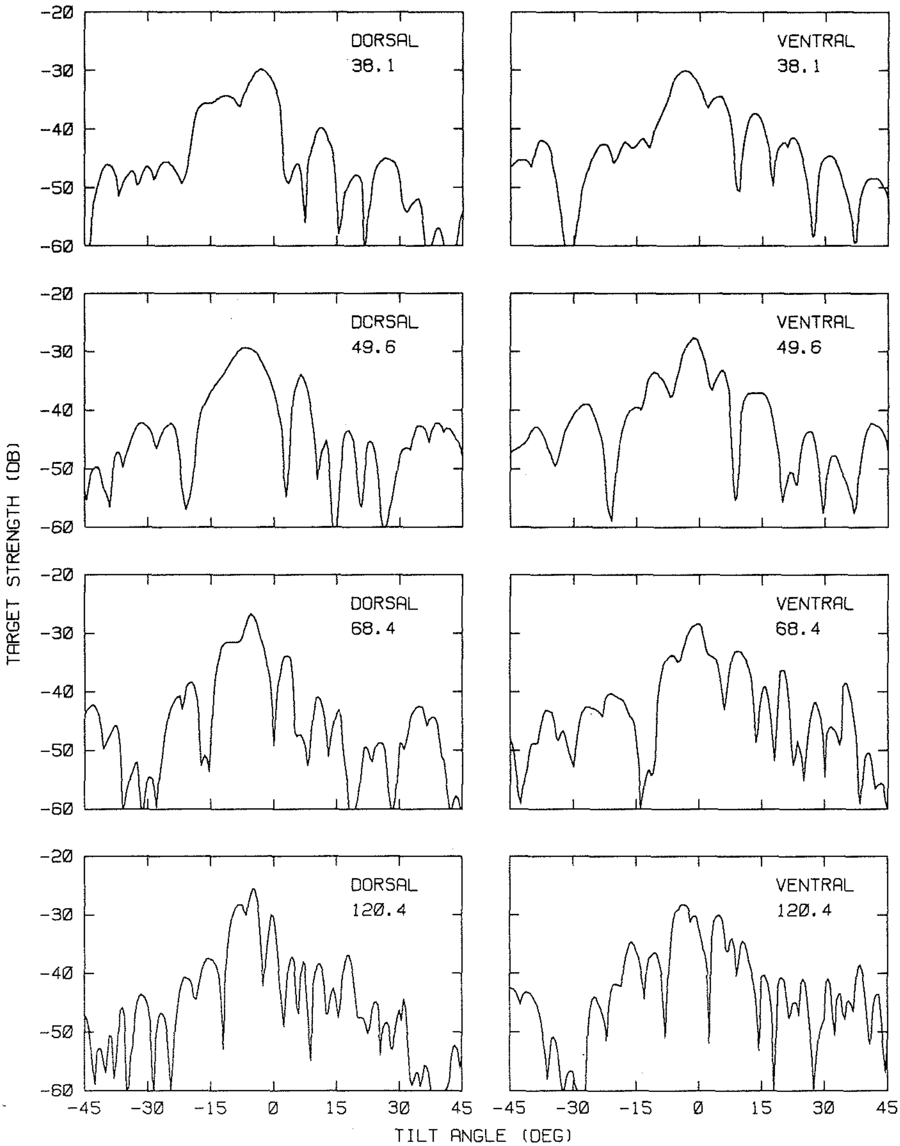

FIG. 27. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 217:
POLLACK, 34.5 CM, 253 G.

TABLE 15. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 218: POLLACK, 32.5 CM, 257 G.

	38.1 KHZ				49.6 KHZ				68.4 KHZ				120.4 KHZ			
	DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL	
THETA	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS
-45	0.3	-56.4	5.1	-43.9	3.2	-46.0	2.8	-46.5	1.7	-48.6	0.6	-52.9	1.0	-51.1	2.3	-47.3
-44	1.3	-50.0	6.0	-43.2	2.7	-46.7	3.7	-45.3	0.9	-51.6	0.2	-58.1	1.3	-50.0	2.7	-46.6
-43	1.6	-48.9	7.1	-42.5	1.8	-48.4	4.0	-45.0	0.6	-53.4	0.3	-55.8	0.5	-53.9	2.9	-46.3
-42	2.1	-47.7	7.7	-42.1	1.3	-49.7	2.9	-46.3	0.4	-54.6	1.9	-48.3	1.1	-50.6	1.1	-50.6
-41	3.0	-46.2	7.9	-42.0	1.0	-50.9	1.3	-50.0	0.2	-57.2	2.6	-46.8	3.1	-46.1	0.7	-52.3
-40	3.8	-45.2	7.9	-42.0	0.7	-52.5	1.9	-48.3	0.7	-52.6	2.8	-46.5	3.0	-46.2	3.7	-45.3
-39	3.9	-45.1	7.4	-42.3	0.4	-55.5	1.6	-48.9	1.0	-50.8	2.2	-47.6	1.1	-50.6	5.7	-43.4
-38	2.9	-46.3	6.4	-42.9	0.2	-58.2	0.8	-51.8	2.1	-47.8	1.4	-49.5	0.5	-53.7	5.9	-43.3
-37	3.3	-45.8	5.2	-43.8	0.7	-52.5	1.7	-48.9	3.1	-46.1	2.9	-46.4	0.2	-58.6	5.4	-43.7
-36	4.8	-44.2	4.3	-44.7	1.3	-49.7	2.0	-48.0	2.1	-47.8	3.5	-45.6	1.3	-49.7	5.6	-43.5
-35	3.7	-45.3	3.5	-45.6	1.7	-48.8	2.0	-48.0	2.3	-47.4	3.2	-45.9	0.9	-51.6	8.7	-41.6
-34	2.8	-46.5	2.7	-46.7	1.5	-49.3	2.7	-46.6	2.3	-47.4	1.9	-48.1	0.7	-52.6	6.3	-43.0
-33	3.1	-46.1	2.0	-48.0	1.6	-49.0	5.9	-43.3	1.9	-48.2	1.6	-49.0	2.9	-46.4	3.5	-45.5
-32	1.5	-49.1	1.5	-49.3	3.5	-45.6	11.5	-40.4	3.9	-45.1	1.9	-48.3	5.5	-43.6	2.0	-48.0
-31	0.8	-51.9	1.3	-49.9	4.3	-44.7	17.9	-38.5	5.1	-43.9	1.4	-49.6	0.7	-52.6	1.0	-51.1
-30	1.3	-50.0	1.7	-48.7	5.2	-43.8	19.9	-38.0	3.0	-46.2	0.8	-52.0	4.5	-44.5	0.4	-55.2
-29	1.6	-49.0	2.5	-47.0	5.0	-44.0	20.4	-37.9	9.5	-41.2	2.6	-46.9	10.7	-40.7	0.4	-54.9
-28	1.6	-48.9	4.2	-44.5	4.6	-44.4	19.9	-38.0	12.0	-40.2	5.1	-43.9	7.4	-42.3	1.3	-50.0
-27	0.4	-54.5	7.9	-42.0	3.4	-45.7	15.8	-39.0	11.7	-40.3	7.2	-42.4	3.6	-45.4	3.3	-45.8
-26	0.2	-57.6	10.2	-40.9	1.8	-48.5	12.0	-40.2	8.1	-41.9	7.2	-42.4	0.5	-53.8	4.0	-45.0
-25	0.7	-52.4	11.5	-40.4	1.1	-50.6	8.7	-41.6	10.2	-40.9	13.3	-39.6	0.2	-57.1	2.3	-47.3
-24	1.0	-50.8	12.6	-40.0	3.4	-45.7	5.9	-43.3	10.2	-40.9	19.5	-38.1	6.4	-42.9	1.2	-50.2
-23	1.0	-51.0	13.2	-39.8	2.8	-46.5	3.6	-45.4	7.9	-42.0	26.3	-36.8	10.0	-41.0	5.5	-43.6
-22	0.9	-51.5	11.7	-40.3	1.3	-49.9	4.1	-44.9	4.8	-44.2	32.3	-35.9	11.7	-40.3	5.1	-43.9
-21	1.1	-50.5	5.6	-43.5	1.3	-50.0	6.9	-42.6	2.2	-47.6	34.6	-35.6	14.4	-39.4	3.7	-45.3
-20	1.7	-48.8	2.9	-46.3	2.1	-47.8	10.9	-40.6	0.3	-56.3	35.4	-35.5	10.7	-40.7	4.9	-44.1
-19	3.1	-46.1	3.5	-45.6	1.8	-48.4	16.2	-38.9	0.8	-51.7	31.6	-36.0	1.5	-49.2	4.1	-44.9
-18	6.2	-43.1	6.3	-43.0	0.9	-51.4	22.9	-37.4	1.7	-48.7	25.7	-36.9	0.3	-56.3	8.7	-41.6
-17	9.5	-41.2	8.9	-41.5	0.5	-54.3	28.8	-36.4	3.3	-45.8	15.5	-39.1	1.9	-48.3	33.8	-35.7
-16	15.5	-39.1	10.2	-40.9	4.8	-44.2	32.3	-35.9	9.3	-41.3	6.7	-42.7	7.1	-42.5	50.0	-34.0
-15	17.8	-38.5	8.9	-41.5	16.6	-38.8	29.5	-36.3	10.9	-40.6	1.5	-49.2	14.4	-39.4	30.8	-36.1
-14	16.6	-38.8	10.0	-41.0	27.5	-36.6	19.9	-38.0	7.9	-42.0	0.5	-53.6	8.5	-41.7	4.4	-44.6
-13	13.8	-39.6	13.8	-39.6	36.2	-35.4	13.8	-39.6	15.8	-39.0	0.1	-59.3	5.0	-44.0	23.4	-37.3
-12	20.9	-37.8	20.4	-37.9	42.6	-34.7	28.1	-36.5	37.9	-35.2	0.0	-65.0	5.6	-43.5	45.6	-34.4
-11	23.9	-37.2	26.9	-36.7	50.0	-34.0	30.8	-36.1	64.4	-32.9	0.8	-52.2	2.3	-47.4	38.8	-35.1
-10	19.5	-38.1	35.4	-35.5	54.9	-33.6	25.7	-36.9	65.9	-32.8	4.8	-44.2	20.4	-37.9	23.9	-37.2
-9	22.3	-37.5	47.8	-34.2	58.8	-33.3	20.9	-37.8	58.8	-33.3	18.6	-38.3	57.4	-33.4	4.3	-44.7
-8	38.8	-35.1	58.8	-33.3	58.8	-33.3	20.4	-37.9	83.0	-31.8	36.2	-35.4	134.7	-29.7	1.8	-48.5
-7	64.4	-32.9	69.1	-32.6	75.7	-32.2	35.4	-35.5	120.0	-30.2	52.4	-33.8	177.5	-28.5	0.9	-51.3
-6	95.3	-31.2	75.7	-32.2	104.5	-30.8	52.4	-33.8	158.2	-29.0	79.3	-32.0	262.5	-26.8	48.9	-34.1
-5	128.6	-29.9	72.3	-32.4	147.6	-29.3	81.1	-31.9	218.4	-27.6	93.2	-31.3	330.5	-25.8	154.6	-29.1
-4	154.6	-29.1	65.9	-32.8	169.5	-28.7	93.2	-31.3	250.7	-27.0	93.2	-31.3	346.1	-25.6	161.9	-28.9
-3	151.1	-29.2	56.1	-33.5	161.9	-28.9	93.2	-31.3	213.4	-27.7	86.9	-31.6	281.3	-26.5	99.8	-31.0
-2	144.3	-29.4	47.8	-34.2	117.3	-30.3	85.9	-31.6	131.6	-29.8	72.3	-32.4	120.0	-30.2	83.0	-31.8
-1	128.6	-29.9	42.6	-34.7	72.3	-32.4	74.0	-32.3	15.8	-39.0	58.8	-33.3	30.1	-36.2	104.5	-30.8
0	99.8	-31.0	40.7	-34.9	36.2	-35.4	56.1	-33.5	0.4	-55.5	47.8	-34.2	56.1	-33.5	69.1	-32.6
1	61.5	-33.1	41.6	-34.8	19.5	-38.1	44.6	-34.5	3.1	-46.1	67.5	-32.7	75.7	-32.2	10.2	-40.9
2	29.5	-36.3	46.7	-34.3	3.8	-45.2	65.9	-32.8	13.2	-39.8	77.5	-32.1	15.8	-39.0	1.0	-51.0
3	10.0	-41.0	51.2	-33.9	0.3	-57.0	81.1	-31.9	34.6	-35.6	74.0	-32.3	2.9	-46.3	2.5	-47.1
4	3.8	-45.2	56.1	-33.5	8.9	-41.5	89.0	-31.5	44.6	-34.5	47.8	-34.2	48.9	-34.1	1.4	-49.5
5	2.4	-47.2	50.0	-34.0	17.3	-38.6	81.1	-31.9	24.5	-37.1	10.2	-40.9	45.6	-34.4	0.1	-60.0
6	3.3	-45.8	39.7	-35.0	37.9	-35.2	60.1	-33.2	0.6	-53.3	22.9	-37.4	4.5	-44.5	10.7	-40.7
7	4.4	-44.6	23.4	-37.3	39.7	-35.0	35.4	-35.5	0.6	-53.0	53.6	-33.7	10.7	-40.7	102.1	-30.9
8	4.6	-44.4	11.2	-40.5	34.6	-35.6	22.9	-37.4	13.5	-39.7	48.9	-34.1	10.9	-40.6	93.2	-31.3
9	4.2	-44.8	5.7	-43.4	23.4	-37.3	15.5	-39.1	12.9	-39.9	19.5	-38.1	6.9	-42.6	17.9	-38.5
10	6.6	-42.8	7.7	-42.1	4.0	-45.0	19.9	-38.0	0.8	-52.2	44.6	-34.5	0.1	-59.8	29.5	-36.3
11	11.2	-40.5	13.5	-39.7	2.6	-46.9	19.5	-38.1	0.4	-55.0	53.6	-33.7	1.1	-50.4	14.4	-39.4
12	13.8	-39.6	14.8	-39.3	3.7	-45.3	12.9	-39.9	0.9	-51.5	54.9	-33.6	1.0	-50.8	42.6	-34.7
13	11.2	-40.5	12.9	-39.9	4.7	-44.3	12.0	-40.2	0.6	-53.4	19.5	-38.1	1.7	-48.7	44.6	-34.5
14	6.9	-42.6	10.5	-40.9	4.6	-44.4	20.4	-37.9	0.2	-57.5	30.8	-36.1	8.5	-41.7	22.9	-37.4
15	0.4	-54.7	8.9	-41.5	3.2	-45.9	29.5	-36.3	0.2	-57.5	37.9	-35.2	10.2	-40.9	37.1	-35.3
16	0.1	-62.7	6.4	-42.9	0.6	-53.0	33.8	-35.7	2.1	-47.8	33.1	-35.8	9.8	-41.1	30.8	-36.1
17	1.1	-50.6	9.1	-41.4	0.2	-57.1	28.1	-36.5	6.0	-43.2	2.6	-46.9	4.3	-44.7	13.5	-39.7
18	0.8	-52.1	7.6	-42.2	0.2	-57.1	16.6	-38.8	5.4	-43.7	1.3	-49.8	9.5	-41.2	2.1	-47.7
19	0.5	-54.3	9.1	-41.4	0.6	-53.4	7.6	-42.2	1.8	-48.4	4.4	-44.6	8.1	-41.9	21.3	-37.7
20	1.1	-50.5	10.7	-40.7	1.7	-48.7	5.1	-43.9	0.5	-54.4	3.2	-46.0	2.3	-47.3	27.5	-36.6
21	1.1	-50.6	9.3	-41.3	1.8	-48.5	6.4	-42.9	2.1	-47.8	1.4	-49.5	0.5	-53.6	6.4	-42.9
22	0.9	-51.4	6.0	-43.2	1.1	-50.6	6.6	-42.8	1.6	-48.9	0.5	-53.8	1.0	-51.0	7.4	-42.3
23	0.3	-56.8	1.5	-49.1	0.6	-53.2	4.6	-44.4	1.4	-49.6	7.9	-42.0	0.1	-63.2	9.3	-41.3
24	0.4	-54.5	0.5	-54.0	0.4	-55.0	2.5	-47.1	1.5	-49.2	8.9	-41.5	0.1	-61.6	1.2	-50.1
25	0.4	-55.0	0.7	-52.3	0.9	-51.5	1.3	-50.0	0.4	-55.3	7.1	-42.5	0.2	-58.4	2.9	-46.4
26	0.2	-57.6	0.5	-54.0	2.7	-46.7	0.4	-53.3	1.9	-48.3	3.9	-45.1	0.1	-59.5	4.0	-45.0
27	0.0	-64.6	1.1	-50.7	2.5	-47.1	0.1	-60.6	1.5	-49.3	1.4	-49.5	0.2	-59.0	3.5	-45.5
28	0.0	-65.2	1.5	-49.2	1.0	-51.2	0.1	-60.2	0.1	-63.6	0.8	-52.1	0.3	-54.8	0.4	-55.2
29	0.0	-66.0	1.3	-49.7	0.3	-56.8	0.3	-56.4	0.1	-61.6	2.1	-47.7	0.1	-60.0	0.7	-52.5
30	0.0	-64.9	0.7	-52.4	0.0	-66.7	0.3	-57.0	0.1	-61.8	2.2	-47.6	0.1	-61.7	0.4	-54.5
31	0.1	-62.1	0.4	-54.5	0.0	-66.7	0.4	-53.2	0.1	-63.2	0.3	-51.7	0.3	-56.7	3.7	-45.3
32	0.1	-60.6	0.5	-54.3	0.0	-66.7	1.1	-50.4	0.8	-52.1	0.2	-57.4	0.7	-52.6	4.3	-44.7
33	0.3	-56.2	0.5	-53.[illegible]	0.1	-63.9	2.3	-47.3	1.4	-49.6	1.9	-48.1	1.5	-49.2	2.6	-46.8
34	0.8	-52.2	0.6	-53.3	0.0	-65.0	3.5	-45.6	0.8	-52.2	1.5	-49.3	3.9	-45.1	0.2	-57.5
35	0.1	-60.5	0.3	-56.2	0.0	-66.7	4.6	-44.4	2.0	-48.0	0.5	-54.3	3.9	-45.1	0.6	-53.2
36	0.5	-54.4	0.3	-51.3	0.1	-63.9	4.7	-44.3	2.2	-47.5	0.1	-61.3	1.4	-49.6	0.9	-51.4
37	0.4	-55.0	1.9	-48.3	0.3	-55.7	3.3	-45.8	1.5	-49.2	0.9	-51.3	0.1	-60.5	0.4	-54.8
38	0.5	-54.6	1.9	-48.2	0.6	-53.5	0.8	-51.7	3.9	-45.1	1.1	-50.5	0.4	-55.3	0.2	-59.0
39	0.7	-52.7	1.2	-50.3	0.7	-52.8	0.3	-56.3	4.1	-44.9	0.5	-54.3	0.9	-51.3	0.5	-53.9
40	0.6	-53.4	0.4	-55.0	0.5	-54.0	0.1	-59.4	3.6	-45.4	1.2	-50.2	2.9	-46.3	0.9	-51.4
41	0.1	-63.3	0.2	-58.7	1.0	-50.9	0.1	-63.0	1.2	-50.1	1.7	-48.6	5.7	-43.4	0.6	-53.3
42	0.2	-57.5	0.2	-57.1	1.1	-50.5	0.0	-65.5	0.8	-51.9	1.5	-49.3	7.1	-42.5	0.2	-57.9
43	0.5	-54.0	0.1	-60.5	0.9	-51.5	0.1	-62.3	1.1	-50.4	0.9	-51.9	7.9	-42.0	1.4	-49.5
44	1.1	-50.7	0.0	-64.2	0.7	-52.4	0.1	-61.6	1.7	-48.7	1.9	-48.1	7.9	-42.0	0.9	-51.5
45	1.3	-50.0	0.5	-54.1	1.0	-50.9	0.0	-64.4	2.1	-47.7	3.2	-45.9	7.6	-42.2	0.1	-59.8

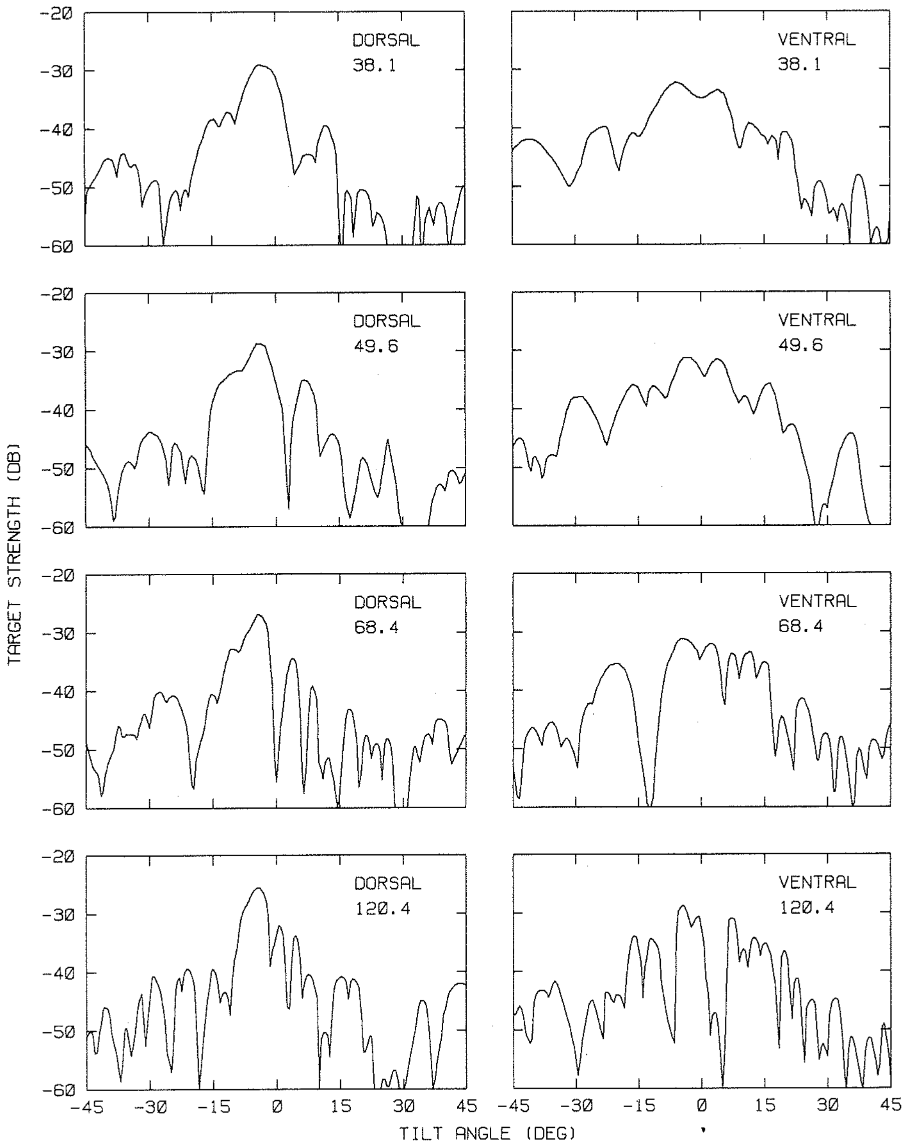

FIG. 28. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 218: POLLACK, 32.5 CM, 257 G.

TABLE 16. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 219: POLLACK, 35.5 CM, 292 G.

	38.1 KHZ				49.6 KHZ				68.4 KHZ				120.4 KHZ			
	DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL	
THETA	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS
-45	0.6	-52.9	5.5	-43.6	2.1	-47.7	2.5	-47.1	0.5	-53.7	4.8	-44.2	3.1	-46.1	1.4	-49.4
-44	0.5	-54.3	5.4	-43.7	3.5	-45.5	2.1	-47.7	0.6	-53.4	1.9	-48.3	3.9	-45.1	0.3	-55.8
-43	0.3	-56.2	6.0	-43.2	3.5	-45.6	2.1	-47.7	0.3	-55.9	1.7	-48.8	3.3	-45.8	0.9	-51.4
-42	0.2	-59.0	5.9	-43.3	2.1	-47.8	4.2	-44.9	2.2	-47.6	1.2	-50.1	1.9	-48.2	0.7	-52.4
-41	0.1	-61.4	4.1	-44.9	2.6	-46.8	5.0	-44.0	2.1	-47.7	0.8	-52.2	1.3	-50.0	2.5	-47.1
-40	0.3	-56.9	2.4	-47.2	4.5	-44.5	3.9	-45.1	0.4	-54.5	2.0	-47.9	0.2	-58.2	3.2	-46.0
-39	0.4	-55.5	3.5	-45.6	4.7	-44.3	2.8	-46.5	0.0	-65.4	3.9	-45.1	0.4	-55.4	1.8	-48.5
-38	0.2	-59.0	4.4	-44.6	2.5	-47.0	4.4	-44.6	0.0	-64.1	6.3	-43.0	2.6	-46.9	0.4	-54.5
-37	0.8	-52.0	4.1	-44.9	4.5	-44.5	4.6	-44.4	0.2	-58.9	8.1	-41.9	7.6	-42.2	0.6	-53.1
-36	1.0	-51.0	2.6	-46.8	7.2	-42.4	3.9	-45.1	0.6	-53.5	9.5	-41.2	6.2	-43.1	0.7	-52.3
-35	1.3	-49.8	1.6	-49.0	8.1	-41.9	2.3	-47.4	0.4	-54.6	8.1	-41.9	3.2	-46.0	0.4	-54.8
-34	2.1	-47.8	1.5	-49.2	5.4	-43.7	3.6	-45.4	1.3	-49.9	6.9	-42.6	0.5	-53.9	0.1	-61.6
-33	3.1	-46.1	2.6	-46.8	1.1	-50.4	7.9	-42.0	3.0	-46.2	7.2	-42.4	0.7	-52.7	3.5	-45.6
-32	4.2	-44.8	2.9	-46.3	0.9	-51.3	9.1	-41.4	4.0	-45.0	6.2	-43.1	0.4	-55.2	6.6	-42.8
-31	3.2	-45.9	2.5	-47.0	1.0	-50.9	8.5	-41.7	4.0	-45.0	4.8	-44.2	0.8	-52.0	6.7	-42.7
-30	0.6	-53.1	1.3	-49.7	0.9	-51.5	7.7	-42.1	2.6	-46.8	5.2	-43.8	1.3	-49.9	2.1	-47.8
-29	0.8	-52.2	2.6	-46.8	0.6	-52.9	13.2	-39.8	2.2	-47.5	4.6	-44.4	1.1	-50.5	0.7	-52.4
-28	1.4	-49.4	6.0	-43.2	4.2	-44.8	10.7	-40.7	5.7	-43.4	7.4	-42.3	0.6	-53.0	0.9	-51.6
-27	2.1	-47.7	6.7	-42.7	9.1	-41.4	6.9	-42.6	9.5	-41.2	10.5	-40.8	0.3	-56.9	0.3	-55.7
-26	2.1	-47.8	4.6	-44.4	8.9	-41.5	7.2	-42.4	10.7	-40.7	12.6	-40.0	0.5	-53.8	2.2	-47.5
-25	0.6	-52.9	8.9	-41.5	5.1	-43.9	7.7	-42.1	9.1	-41.4	13.2	-39.8	2.0	-48.0	4.8	-44.2
-24	0.4	-55.1	13.5	-39.7	10.2	-40.9	6.4	-42.9	2.5	-47.0	12.0	-40.2	2.0	-48.0	4.8	-44.2
-23	0.6	-53.1	15.8	-39.0	13.2	-39.8	4.3	-44.7	4.5	-44.5	5.7	-43.4	4.0	-45.0	2.8	-46.5
-22	1.4	-49.5	17.0	-38.7	12.6	-40.0	1.7	-48.6	6.4	-42.9	8.1	-41.9	9.8	-41.1	10.2	-40.9
-21	3.3	-45.8	15.5	-39.1	10.5	-40.8	0.6	-53.4	6.6	-42.8	15.1	-39.2	10.9	-40.6	19.5	-38.1
-20	3.9	-45.1	13.2	-39.8	6.9	-42.6	0.1	-60.1	3.6	-45.4	21.8	-37.6	7.7	-42.1	20.4	-37.9
-19	5.7	-43.4	10.0	-41.0	3.5	-45.5	0.2	-57.1	2.5	-47.0	23.9	-37.2	8.7	-41.6	13.5	-39.7
-18	8.5	-41.7	6.9	-42.6	1.6	-49.0	0.9	-51.4	2.6	-46.8	23.9	-37.2	19.5	-38.1	4.5	-44.5
-17	12.0	-40.2	3.9	-45.1	2.1	-47.8	3.7	-45.3	0.9	-51.3	21.8	-37.6	20.4	-37.9	8.9	-41.5
-16	17.0	-38.7	1.0	-50.8	5.4	-43.7	13.5	-39.7	3.8	-45.2	18.6	-38.3	16.6	-38.8	38.8	-35.1
-15	23.4	-37.3	3.1	-46.1	12.9	-39.9	27.5	-36.4	9.8	-41.1	15.1	-39.2	8.3	-41.8	54.9	-33.6
-14	27.5	-36.6	5.1	-43.9	23.4	-37.3	29.5	-36.3	17.3	-38.6	12.3	-40.1	12.0	-40.2	25.7	-36.9
-13	30.8	-36.1	6.4	-42.9	34.6	-35.6	19.9	-38.0	25.7	-36.9	9.3	-41.3	18.2	-38.4	19.0	-38.2
-12	34.6	-35.6	8.3	-41.8	54.9	-33.6	13.8	-39.6	37.9	-35.2	[illegible]	[illegible]	26.3	-36.8	30.1	-36.2
-11	36.2	-35.4	13.5	-39.7	67.5	-32.7	15.1	-39.2	[illegible]	-34.2	[illegible]	[illegible]	42.5	-34.7	[illegible]	-36.8
-10	33.1	-35.8	26.3	-36.8	79.3	-32.0	14.4	-39.4	51.2	-33.9	22.3	-37.5	70.7	-32.5	2.1	-47.7
-9	35.4	-35.5	33.8	-35.7	91.0	-31.4	13.8	-39.6	75.7	-32.2	47.8	-34.2	58.8	-33.3	1.9	-48.3
-8	47.8	-34.2	45.6	-34.4	99.8	-31.0	16.2	-38.9	95.3	-31.2	54.9	-33.6	46.7	-34.3	7.7	-42.1
-7	64.4	-32.9	57.4	-33.4	107.0	-30.7	21.3	-37.7	102.1	-30.9	50.0	-34.0	177.5	-28.5	15.1	-39.2
-6	91.0	-31.4	69.1	-32.6	112.0	-30.5	28.8	-36.4	131.6	-29.8	53.6	-33.7	228.7	-27.4	37.1	-35.3
-5	114.6	-30.4	81.1	-31.9	125.7	-30.0	44.6	-34.5	161.9	-28.9	77.5	-32.1	223.5	-27.5	107.0	-30.7
-4	131.6	-29.8	89.0	-31.5	151.1	-29.2	75.7	-32.2	169.5	-28.7	91.0	-31.4	112.0	-30.5	151.1	-29.2
-3	131.6	-29.8	89.0	-31.5	144.3	-29.4	97.5	-31.1	169.5	-28.7	93.2	-31.3	18.6	-38.3	154.6	-29.1
-2	122.8	-30.1	79.3	-32.0	95.3	-31.2	107.0	-30.7	131.6	-29.8	85.0	-31.7	42.6	-34.7	77.5	-32.1
-1	104.5	-30.8	64.4	-32.9	68.9	-34.1	104.5	-30.8	30.1	-36.2	102.1	-30.9	41.6	-34.8	161.9	-28.9
0	72.3	-32.4	79.3	-32.0	17.0	-38.7	93.2	-31.3	29.5	-36.3	120.0	-30.2	10.7	-40.7	185.9	-28.3
1	41.6	-34.8	93.2	-31.3	6.7	-42.7	93.2	-31.3	34.6	-35.6	120.0	-30.2	23.4	-37.3	165.7	-28.8
2	27.5	-36.6	97.5	-31.1	9.3	-41.3	89.0	-31.5	28.1	-36.5	114.6	-30.4	30.1	-36.2	48.9	-34.1
3	15.5	-39.1	89.0	-31.5	15.8	-39.0	99.8	-31.0	21.3	-37.7	104.5	-30.8	12.6	-40.0	53.6	-33.7
4	9.8	-41.1	79.3	-32.0	22.9	-37.4	104.5	-30.8	14.8	-39.3	89.0	-31.5	10.9	-40.6	44.6	-34.5
5	7.1	-42.5	61.5	-33.1	23.4	-37.3	102.1	-30.9	9.8	-41.1	26.9	-36.7	20.4	-37.9	53.6	-33.7
6	4.9	-44.1	45.6	-34.4	21.3	-37.7	79.3	-32.0	3.5	-45.5	35.4	-35.5	24.5	-37.1	81.1	-31.9
7	5.9	-43.3	25.7	-36.9	5.2	-43.8	48.9	-34.1	3.2	-46.0	69.1	-32.6	12.9	-39.9	93.2	-31.3
8	7.2	-42.4	13.2	-39.8	0.5	-54.4	28.8	-36.4	15.8	-39.0	64.4	-32.9	15.8	-39.0	75.7	-32.2
9	7.4	-42.3	7.2	-42.4	0.2	-58.4	20.4	-37.9	14.8	-39.3	30.8	-36.1	19.5	-38.1	38.8	-35.1
10	6.9	-42.6	9.1	-41.4	1.4	-49.4	16.2	-38.9	1.7	-48.6	19.5	-38.1	4.7	-44.3	11.2	-40.5
11	5.7	-43.4	10.9	-40.6	9.1	-41.4	17.0	-38.7	0.7	-52.6	36.2	-35.4	0.1	-63.5	48.9	-34.1
12	4.1	-44.9	11.2	-40.5	7.7	-42.1	21.8	-37.6	1.0	-50.8	35.4	-35.5	9.3	-41.3	33.1	-35.8
13	2.2	-47.5	8.3	-41.8	1.2	-50.1	23.9	-37.2	0.8	-52.2	19.0	-38.2	16.2	-38.9	9.5	-41.2
14	0.6	-52.9	5.7	-43.4	0.1	-60.6	19.9	-38.0	2.9	-46.3	7.9	-42.0	8.5	-41.7	20.4	-37.9
15	0.0	-65.6	4.7	-44.3	0.1	-63.9	10.7	-40.7	3.0	-46.2	4.5	-44.5	8.5	-41.7	15.1	-39.2
16	0.0	-67.1	5.9	-43.3	0.2	-58.7	3.5	-45.6	1.1	-50.7	2.6	-46.9	8.9	-41.5	7.6	-42.2
17	0.1	-60.9	5.1	-43.9	0.3	-56.0	2.6	-46.8	0.2	-57.7	8.7	-41.6	1.1	-50.5	4.3	-44.7
18	1.3	-50.0	2.7	-46.6	0.1	-63.9	4.8	-44.2	0.3	-56.4	16.6	-38.8	0.1	-63.1	2.1	-47.8
19	2.1	-47.8	3.5	-45.6	0.2	-57.3	5.0	-44.0	0.3	-57.0	12.9	-39.9	9.5	-41.7	0.5	-54.3
20	1.9	-48.1	2.9	-46.3	0.3	-55.8	3.1	-46.1	1.3	-49.8	8.5	-41.7	14.1	-39.5	5.0	-44.0
21	1.3	-50.0	1.9	-48.2	1.1	-50.7	0.9	-51.3	2.2	-47.5	8.5	-41.7	10.9	-40.6	6.6	-42.8
22	0.5	-54.3	2.5	-47.0	1.5	-49.3	0.3	-56.0	2.9	-46.4	4.1	-44.9	5.5	-43.6	2.6	-46.8
23	0.3	-56.9	2.5	-47.1	1.4	-49.4	2.3	-47.3	2.5	-47.0	2.5	-47.0	6.9	-42.6	2.0	-47.9
24	0.1	-59.3	0.7	-52.9	1.0	-51.2	2.9	-46.3	1.9	-48.2	0.8	-52.2	6.0	-43.2	4.0	-45.0
25	0.1	-62.7	0.2	-57.3	1.1	-50.5	2.1	-47.8	3.2	-46.0	1.1	-50.7	4.2	-44.8	1.1	-50.7
26	0.1	-62.2	0.4	-54.7	2.0	-47.9	1.2	-50.1	3.7	-45.3	0.4	-55.4	2.5	-47.0	9.8	-41.1
27	0.7	-52.6	0.3	-57.0	1.5	-49.1	1.3	-49.8	3.7	-45.3	1.6	-48.9	1.3	-49.7	7.2	-42.4
28	1.5	-49.3	0.1	-61.7	0.9	-51.5	2.5	-47.0	3.3	-45.8	5.1	-43.9	2.3	-47.4	0.5	-54.3
29	1.8	-48.4	0.2	-58.8	1.5	-49.3	2.7	-46.6	2.6	-46.8	5.0	-44.0	2.1	-47.7	0.6	-53.0
30	1.5	-49.1	0.2	-57.8	2.0	-47.9	1.0	-51.2	1.3	-49.9	3.0	-46.2	2.8	-46.5	0.6	-53.5
31	1.0	-51.1	0.2	-57.3	2.3	-47.4	0.3	-56.1	0.6	-53.3	1.5	-49.2	2.2	-47.5	4.2	-44.8
32	0.2	-58.0	0.2	-57.7	1.4	-49.5	0.4	-54.6	1.5	-49.1	6.2	-43.1	1.1	-50.4	9.1	-41.4
33	0.1	-60.4	4.5	-44.5	0.7	-52.4	0.5	-53.9	2.5	-47.0	4.0	-45.0	1.3	-49.7	3.9	-45.1
34	0.2	-58.7	5.7	-43.4	2.0	-47.9	0.2	-58.6	2.9	-46.4	1.9	-48.4	1.5	-49.3	5.7	-43.4
35	0.2	-57.5	6.2	-43.1	2.6	-46.9	0.2	-58.4	3.1	-46.1	3.0	-46.2	0.1	-63.9	5.5	-43.6
36	0.2	-58.8	5.6	-43.5	2.0	-47.9	0.3	-55.6	2.7	-45.7	3.1	-46.1	0.1	-63.9	1.5	-49.1
37	0.1	-61.8	3.9	-45.1	1.6	-48.9	0.2	-58.3	1.7	-48.7	0.4	-55.0	0.1	-63.6	6.3	-43.0
38	0.6	-53.0	2.4	-47.2	2.3	-47.3	0.1	-60.3	1.4	-49.5	1.6	-49.0	0.6	-53.4	2.7	-46.6
39	0.8	-52.0	1.0	-51.2	3.9	-45.1	0.2	-57.8	1.5	-49.1	2.2	-47.6	1.2	-50.1	0.2	-58.1
40	0.8	-51.9	1.7	-48.7	4.1	-44.9	0.3	-56.9	0.7	-52.6	0.8	-51.8	1.2	-50.2	0.1	-63.6
41	0.7	-52.4	1.6	-49.9	3.9	-45.1	0.2	-58.4	0.3	-56.2	1.0	-50.9	0.6	-53.3	0.3	-56.7
42	0.5	-54.4	1.2	-50.2	3.5	-45.5	0.3	-56.9	0.2	-59.1	0.7	-52.6	1.2	-50.3	0.9	-51.4
43	0.1	-59.6	0.8	-51.8	3.2	-46.0	1.1	-50.4	0.0	-64.6	0.4	-54.6	0.4	-54.5	1.8	-48.4
44	0.1	-63.5	0.4	-54.7	2.6	-46.9	2.2	-47.6	0.5	-53.7	0.7	-52.4	1.1	-50.4	1.4	-49.6
45	0.0	-66.3	0.2	-57.2	1.3	-49.9	2.4	-47.2	0.2	-57.2	0.2	-57.3	1.9	-48.1	3.0	-46.2

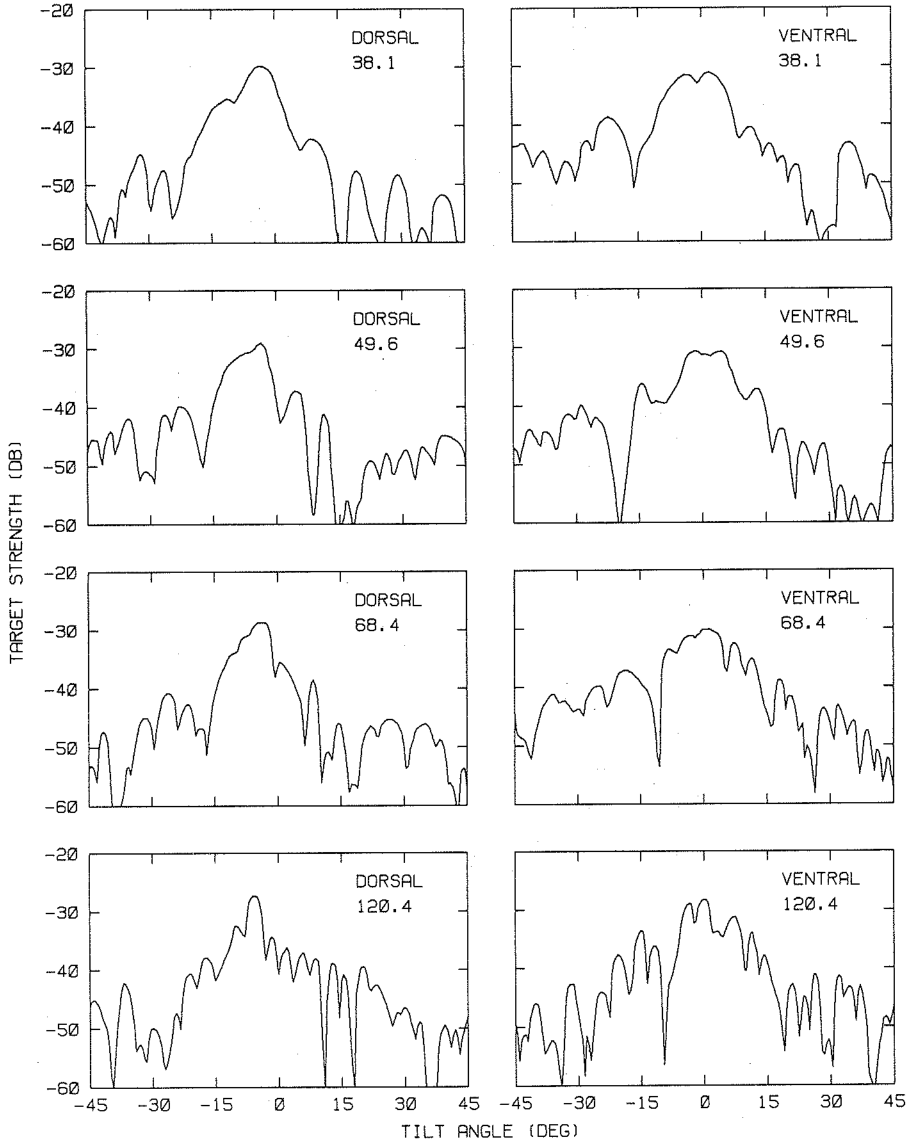

FIG. 29. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 219:
POLLACK, 35.5 CM, 292 G.

TABLE 17. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 220: SAITHE, 38.0 CM, 406 G.

	38.1 KHZ				49.6 KHZ				68.4 KHZ				120.4 KHZ			
	DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL		DORSAL		VENTRAL	
THETA	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS	SB	TS
-45	0.1	-59.3	1.9	-48.2	0.3	-56.5	3.1	-46.1	3.5	-45.5	0.4	-55.2	1.5	-49.3	0.2	-58.5
-44	0.1	-59.9	1.7	-48.8	0.2	-58.8	3.2	-45.9	2.9	-46.4	0.3	-56.1	0.4	-54.5	0.1	-61.7
-43	0.7	-52.5	2.3	-47.3	1.0	-50.8	4.5	-44.5	0.9	-51.3	0.2	-57.8	0.6	-53.4	0.6	-53.3
-42	3.2	-45.9	3.2	-45.9	1.3	-49.7	5.1	-43.9	1.1	-50.7	0.3	-57.0	0.5	-53.9	1.7	-48.8
-41	4.3	-44.7	3.5	-45.5	1.3	-49.9	4.6	-44.4	0.8	-52.0	0.8	-51.9	0.4	-54.6	1.5	-49.1
-40	1.3	-49.7	3.5	-45.6	0.7	-52.6	4.3	-44.7	0.3	-56.9	0.9	-51.4	1.1	-50.4	2.5	-47.0
-39	0.7	-52.7	2.9	-46.4	0.0	-65.7	4.9	-44.1	0.3	-56.3	0.6	-53.5	1.6	-49.0	3.4	-45.7
-38	0.9	-51.6	1.6	-48.9	0.2	-58.9	5.0	-44.0	0.2	-57.3	1.2	-50.2	0.5	-53.9	1.6	-49.0
-37	0.3	-57.0	1.9	-48.3	0.4	-54.5	4.6	-44.4	0.1	-61.6	1.5	-49.2	0.2	-57.3	2.3	-47.3
-36	0.9	-51.4	2.7	-46.6	0.4	-54.7	2.7	-46.7	0.4	-54.8	1.4	-49.5	1.9	-48.3	0.8	-51.8
-35	2.7	-46.6	2.7	-46.6	0.1	-60.1	3.3	-45.8	1.3	-50.0	1.9	-48.3	5.4	-43.7	2.1	-47.8
-34	2.2	-47.6	2.6	-46.8	0.3	-56.0	3.2	-46.0	0.5	-53.6	2.3	-47.3	7.1	-42.5	2.9	-46.4
-33	0.2	-58.0	4.0	-45.0	0.5	-53.8	2.0	-47.9	1.9	-48.3	2.0	-47.9	2.9	-46.3	0.6	-53.3
-32	0.3	-56.7	4.8	-44.2	0.7	-52.8	2.5	-47.0	2.3	-47.3	4.7	-44.3	0.3	-56.8	0.2	-57.6
-31	0.2	-57.5	5.0	-44.0	0.1	-62.4	2.2	-47.5	1.9	-48.3	5.1	-43.9	2.9	-46.3	2.3	-47.3
-30	0.4	-54.5	4.4	-44.6	0.5	-54.2	4.0	-45.0	0.2	-57.3	5.1	-43.9	1.8	-48.5	6.3	-43.0
-29	1.4	-49.5	5.4	-43.7	1.9	-48.2	4.4	-44.6	2.0	-47.9	4.6	-44.4	3.9	-45.1	10.7	-40.7
-28	0.8	-52.0	5.1	-43.9	1.5	-49.2	3.3	-45.8	5.1	-43.9	3.5	-45.5	3.2	-45.9	10.9	-40.6
-27	0.4	-54.6	4.7	-44.3	0.5	-54.1	4.3	-44.7	9.3	-41.3	5.0	-44.0	0.6	-53.4	9.3	-41.3
-26	2.7	-46.7	6.6	-42.8	2.2	-47.6	4.4	-44.6	10.9	-40.6	6.2	-43.1	0.7	-52.3	7.2	-42.4
-25	3.5	-45.6	7.6	-42.2	5.2	-43.8	7.2	-42.4	9.3	-41.3	7.2	-42.4	2.4	-47.2	8.3	-41.8
-24	3.6	-45.4	7.4	-42.3	4.6	-44.4	10.5	-40.8	2.7	-46.7	7.9	-42.0	1.5	-49.3	6.4	-42.9
-23	2.9	-46.4	5.7	-43.4	2.3	-47.3	12.9	-39.9	4.4	-44.6	7.6	-42.2	0.2	-58.6	4.8	-44.2
-22	1.7	-48.7	2.9	-46.4	1.3	-50.0	13.2	-39.8	2.9	-46.4	6.7	-42.7	0.4	-55.4	3.5	-45.6
-21	1.9	-48.2	1.3	-49.7	0.8	-51.8	12.6	-40.0	2.1	-47.7	5.9	-43.3	7.9	-42.0	3.2	-46.0
-20	4.9	-44.1	0.6	-53.5	0.3	-56.7	11.2	-40.5	2.3	-47.4	5.0	-44.0	7.6	-42.2	15.8	-39.0
-19	10.0	-41.0	0.6	-53.5	0.2	-58.1	9.5	-41.2	0.6	-53.0	4.3	-44.7	2.4	-47.2	33.8	-35.7
-18	10.5	-40.8	1.5	-49.3	0.3	-56.6	9.5	-41.2	1.7	-48.9	8.1	-41.9	2.0	-48.0	20.4	-37.9
-17	6.6	-42.8	4.3	-44.7	1.5	-49.1	10.9	-40.6	3.6	-45.4	21.3	-37.7	5.7	-43.4	8.3	-41.8
-16	9.1	-41.4	12.3	-40.1	13.8	-39.6	10.9	-40.6	5.9	-43.3	22.3	-37.5	0.9	-51.5	3.7	-45.3
-15	19.9	-38.0	20.9	-37.8	28.8	-36.4	6.7	-42.7	4.4	-44.6	20.9	-37.8	4.4	-44.6	6.7	-42.7
-14	28.1	-36.5	29.5	-36.3	46.7	-34.3	1.5	-49.1	15.1	-39.2	14.6	-38.8	9.8	-41.1	72.3	-32.4
-13	30.1	-36.2	37.9	-35.2	64.4	-32.9	1.3	-50.0	31.6	-36.0	8.9	-41.5	19.5	-38.1	99.8	-31.0
-12	30.8	-36.1	47.8	-34.2	81.1	-31.9	26.9	-36.7	56.1	-33.5	4.2	-44.8	37.9	-35.2	102.1	-30.9
-11	30.8	-36.1	58.8	-33.3	97.5	-31.1	61.5	-33.1	91.0	-31.4	1.7	-48.7	89.0	-31.5	70.7	-32.5
-10	58.8	-33.3	72.3	-32.4	114.6	-30.4	89.0	-31.5	125.7	-30.0	50.0	-34.0	141.0	-29.5	33.8	-35.7
-9	83.0	-31.8	89.0	-31.5	128.6	-29.9	102.1	-30.9	161.9	-28.9	79.3	-32.0	228.7	-27.4	1.3	-49.7
-8	107.0	-30.7	107.0	-30.7	169.5	-28.7	104.5	-30.8	199.2	-28.0	128.6	-29.9	281.3	-26.5	9.3	-41.3
-7	122.8	-30.1	112.0	-30.5	213.4	-27.7	102.1	-30.9	218.4	-27.6	151.1	-29.2	301.4	-26.2	128.6	-29.9
-6	137.8	-29.6	114.6	-30.4	208.5	-27.8	104.5	-30.8	228.7	-27.4	165.7	-28.8	181.6	-28.4	203.8	-27.9
-5	151.1	-29.2	114.6	-30.4	185.9	-28.3	112.0	-30.5	208.5	-27.8	165.7	-28.8	2.9	-46.3	250.7	-27.0
-4	154.6	-29.1	107.0	-30.7	117.3	-30.3	120.0	-30.2	151.1	-29.2	158.2	-29.0	83.0	-31.8	228.7	-27.4
-3	147.6	-29.3	95.3	-31.2	43.6	-34.6	137.8	-29.6	28.8	-36.4	147.6	-29.3	95.3	-31.2	154.6	-29.1
-2	125.7	-30.0	83.0	-31.8	13.2	-39.8	137.8	-29.6	17.8	-38.5	125.7	-30.0	67.5	-32.7	43.6	-34.6
-1	85.0	-31.7	67.5	-32.7	10.7	-40.7	131.6	-29.8	45.6	-34.4	93.2	-31.3	17.8	-38.5	0.6	-52.9
0	37.1	-35.3	52.4	-33.8	30.8	-36.1	112.0	-30.5	69.1	-32.6	47.8	-34.2	33.1	-35.8	2.3	-47.3
1	14.1	-39.5	39.7	-35.0	46.7	-34.3	83.0	-31.8	65.9	-32.8	24.5	-37.1	85.0	-31.7	44.6	-34.5
2	7.6	-42.2	28.1	-36.5	51.2	-33.9	56.1	-33.5	10.9	-40.6	11.7	-40.3	48.9	-34.1	109.4	-30.6
3	5.6	-43.5	19.2	-38.4	44.6	-34.5	44.6	-34.5	1.3	-49.7	13.2	-39.8	29.5	-36.3	117.3	-30.3
4	6.7	-42.7	9.8	-41.1	28.1	-36.5	33.8	-35.7	0.2	-57.1	20.4	-37.9	57.4	-33.4	26.9	-36.7
5	8.3	-41.8	5.7	-43.4	14.8	-39.3	17.3	-38.6	2.3	-47.3	57.4	-33.4	7.7	-42.1	17.0	-38.7
6	10.9	-40.6	8.5	-41.7	1.0	-50.8	10.0	-41.0	28.8	-36.4	72.3	-32.4	15.8	-39.0	8.9	-41.5
7	12.0	-40.2	19.5	-38.1	0.2	-59.0	18.6	-38.3	22.9	-37.4	65.9	-32.8	15.1	-39.2	32.3	-35.9
8	11.7	-40.3	22.9	-37.4	3.8	-45.2	33.1	-35.8	3.4	-45.7	57.4	-33.4	4.9	-44.1	56.1	-33.5
9	9.8	-41.1	22.9	-37.4	8.7	-41.6	38.8	-35.1	0.1	-61.3	60.1	-33.2	7.1	-42.5	52.4	-33.8
10	6.4	-42.9	20.9	-37.8	8.5	-41.7	39.7	-35.0	0.1	-60.1	57.4	-33.4	0.6	-52.9	46.7	-34.3
11	3.3	-45.8	18.6	-38.3	6.4	-42.9	39.7	-35.0	0.7	-52.7	30.1	-36.2	2.8	-46.5	50.0	-34.0
12	1.6	-48.9	13.5	-39.7	1.3	-49.7	37.9	-35.2	0.5	-54.3	18.6	-38.3	8.1	-41.9	26.9	-36.7
13	0.6	-53.4	12.6	-40.0	0.2	-58.1	34.6	-35.6	0.8	-52.2	13.8	-39.6	7.1	-42.5	30.8	-36.1
14	0.2	-57.1	14.4	-39.4	0.5	-54.2	30.1	-36.2	1.1	-50.4	24.5	-37.1	0.5	-54.0	19.9	-38.0
15	0.4	-55.0	15.1	-39.2	0.4	-55.2	21.3	-37.7	0.5	-53.9	31.6	-36.0	1.0	-51.0	3.6	-45.4
16	3.0	-46.2	12.3	-40.1	0.1	-60.5	14.4	-39.4	2.3	-47.3	32.3	-35.9	0.8	-51.9	4.8	-44.2
17	4.8	-44.2	7.9	-42.0	0.5	-54.0	11.5	-40.4	3.2	-45.9	10.2	-40.9	0.1	-60.4	4.1	-44.9
18	5.6	-43.5	5.9	-43.3	1.1	-50.5	9.1	-41.4	2.2	-47.5	0.6	-53.0	3.1	-46.1	0.1	-63.7
19	4.6	-44.4	5.0	-44.0	1.4	-49.4	5.7	-43.4	0.3	-56.5	7.7	-42.1	7.1	-42.5	1.9	-48.2
20	1.2	-50.2	3.7	-45.3	1.6	-49.0	6.3	-43.0	0.8	-52.0	12.6	-40.0	9.1	-41.4	1.4	-49.6
21	0.9	-51.5	2.1	-47.7	1.2	-50.1	9.8	-41.1	2.5	-47.1	7.4	-42.3	10.2	-40.9	0.3	-56.5
22	1.7	-48.5	1.3	-49.9	0.8	-51.7	12.6	-40.0	3.2	-45.9	0.5	-52.9	9.1	-41.4	0.7	-52.7
23	2.4	-47.2	1.0	-51.2	1.8	-48.4	13.8	-39.6	2.5	-47.0	0.2	-57.1	3.2	-46.0	0.3	-55.6
24	1.9	-48.1	1.4	-49.5	2.9	-46.3	4.6	-44.4	0.2	-58.6	0.1	-61.7	0.8	-52.0	2.7	-46.7
25	1.3	-50.0	1.8	-48.4	3.1	-46.1	0.6	-53.3	1.6	-49.0	0.1	-60.8	0.3	-55.7	1.4	-49.6
26	0.6	-53.3	1.9	-48.1	2.3	-47.3	0.0	-64.8	1.2	-50.1	0.2	-57.6	0.3	-56.0	1.7	-48.7
27	0.6	-53.3	1.8	-48.5	1.4	-49.4	0.4	-55.0	1.3	-49.9	0.2	-57.3	0.9	-51.5	1.1	-50.7
28	0.5	-54.4	1.5	-49.1	0.7	-52.5	0.8	-51.7	1.2	-50.1	0.1	-60.3	1.9	-48.3	0.2	-57.7
29	0.1	-61.3	1.3	-49.9	0.3	-56.3	1.0	-50.8	0.3	-56.1	2.3	-47.4	3.2	-45.9	1.7	-48.6
30	0.2	-58.4	0.2	-59.2	0.8	-51.9	1.0	-50.9	0.6	-53.1	2.5	-47.0	4.4	-44.6	0.7	-52.5
31	0.5	-53.7	0.1	-59.7	1.5	-49.3	1.0	-51.1	0.3	-55.6	1.5	-49.2	5.0	-44.0	0.4	-55.0
32	0.8	-51.7	0.0	-64.7	1.5	-49.1	0.7	-52.6	0.2	-57.1	0.4	-55.0	4.5	-44.5	0.2	-57.1
33	0.9	-51.5	0.0	-65.1	1.3	-50.0	0.4	-55.2	0.3	-55.9	0.1	-59.8	3.5	-45.5	0.1	-60.0
34	0.2	-58.4	0.0	-65.3	0.8	-52.1	0.1	-59.3	0.2	-57.4	0.3	-51.7	2.4	-47.2	0.1	-63.1
35	0.6	-53.3	0.4	-55.2	0.4	-54.5	0.6	-53.4	0.4	-55.2	1.5	-49.3	1.7	-48.6	0.5	-53.9
36	0.6	-53.5	0.8	-51.9	0.4	-54.7	0.7	-52.7	0.2	-57.5	1.7	-48.8	1.8	-48.4	0.6	-53.4
37	0.3	-56.6	1.0	-51.0	0.6	-53.2	0.5	-54.0	0.3	-56.7	0.1	-62.7	1.4	-49.5	1.5	-49.2
38	1.0	-51.2	0.9	-51.6	0.7	-52.7	0.3	-56.4	1.1	-50.7	0.1	-61.7	0.5	-54.3	3.0	-46.2
39	0.8	-52.1	0.5	-53.7	0.7	-52.7	0.2	-58.2	1.5	-48.4	0.2	-59.1	1.0	-50.9	1.2	-50.3
40	0.1	-62.1	0.4	-55.1	0.5	-53.6	0.3	-56.4	1.5	-49.2	0.3	-56.6	1.7	-48.7	0.6	-53.4
41	0.2	-58.4	0.2	-58.2	0.4	-55.2	0.6	-53.4	2.5	-47.1	0.1	-59.9	1.7	-48.8	0.7	-52.7
42	0.4	-54.7	0.1	-63.4	0.1	-60.5	0.3	-56.2	1.9	-48.3	0.0	-64.7	1.1	-50.5	0.6	-53.3
43	0.6	-53.3	0.2	-57.3	0.1	-62.3	0.1	-62.6	2.2	-47.6	0.0	-66.3	0.4	-54.9	0.3	-56.7
44	0.3	-56.0	0.4	-55.3	0.1	-59.9	0.4	-54.7	2.1	-47.7	0.0	-66.9	0.4	-55.2	0.2	-58.3
45	0.5	-53.7	0.4	-55.3	0.1	-62.2	1.3	-50.0	1.7	-48.6	0.0	-66.9	0.6	-53.1	0.7	-52.6

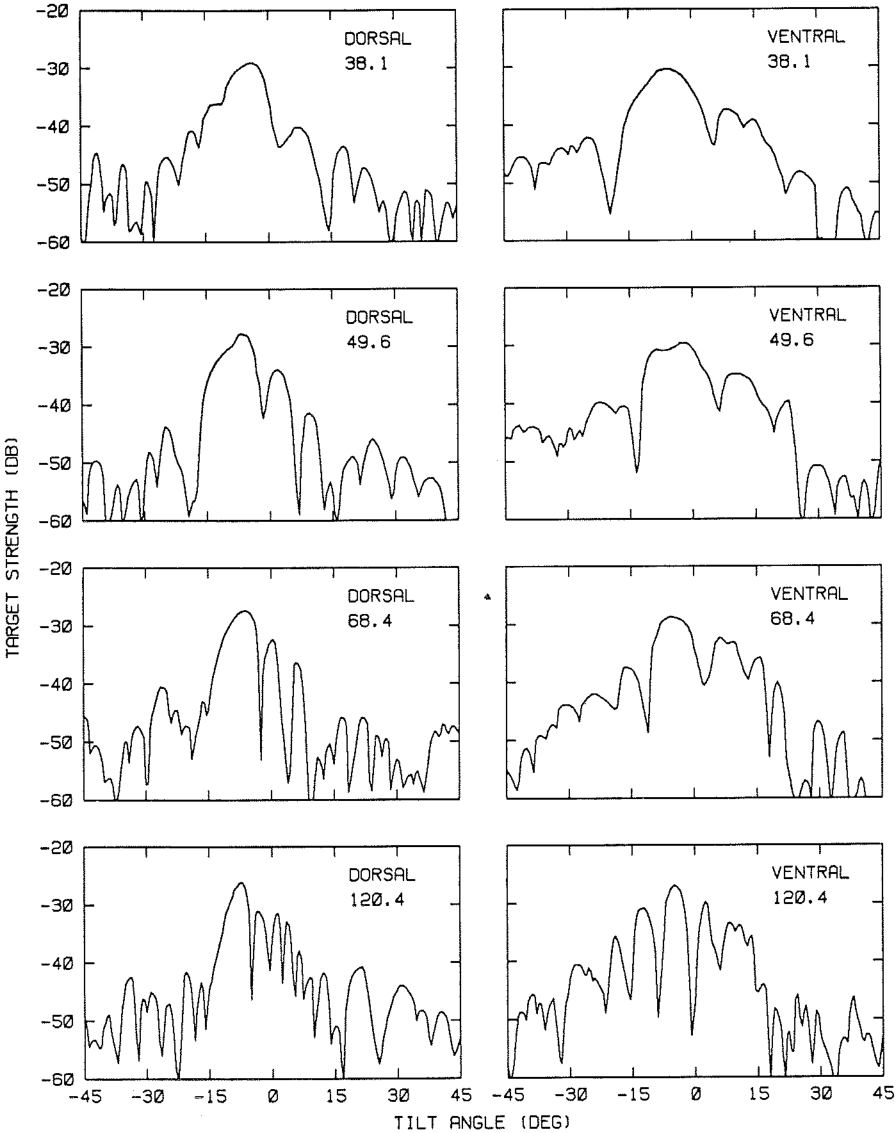

FIG. 30. MEASURED TARGET STRENGTH FUNCTIONS OF FISH NO. 220:
SAITHE. 38.0 CM. 406 G.