

## References

- Beddington, J.R. and J.G. Cooke. 1983. The potential yield of fish stocks. FAO Tech. Pap. 242:1-47.
- Beverton, R.J.H. and S.J. Holt. 1957. On the dynamics of exploited fish populations. Fish. Invest. Min. Agric. Fish Food G.B. (2. Sea Fish.) 19, 533 p. Reprinted 1993. Chapman and Hall Fish Fish. Ser. 11.
- Francis, R.I.C.C. 1993. Monte Carlo evaluation of risks for biological reference points used in New Zealand fishery assessments, p. 221-230. In S.J. Smith, J.J. Hunt and D. Rivard (eds.) Risk evaluation and biological reference points for fishery management. Can. Spec. Publ. Fish. Aquat. Sci. 120.
- Gulland, J.A. 1968. The concept of marginal yield from exploited fish stocks. J. Cons. CIEM 32:256-261.
- Gulland, J.A. 1969. Manual of methods for fish stock assessment. Part 1. Fish population analysis. FAO Man. Fish. Sci. 3, 87 p.
- Hilborn R. 1996. Computer in population dynamics, p. 176-193. In B.A. Megrey and E. Moksness (eds.) Computers in fisheries research. Chapman and Hall, London. 254 p.
- ICES. 1997. Report of the comprehensive fishery evaluation working group. International Council for the Exploration of the Sea. Copenhagen, Denmark. ICES CM 1997 Assess. 15, 140 p.
- Methot, R.D. 1990. Synthesis model: an adaptable framework for analysis of diverse stock assessment data. Int. North Pac. Fish. Comm. 50:259-277.
- Murawski, S.A. 1984. Mixed species yield-per-recruitment analyses accounting for technological interactions. Can. J. Fish. Aquat. Sci. 41: 897-916.
- Pitcher, T.J. and P.J.B. Hart. 1981. Fisheries ecology. Chapman and Hall, London. 414 p.
- Restrepo, V.R and W.W. Fox, Jr. 1988. Parameter uncertainty and simple yield per recruit analysis. Trans. Am. Fish. Soc. 117:282-298.
- Smith, S.J., J.J. Hunt and D. Rivard. 1993. Introduction. Risk evaluation and biological reference points for fishery management. Can. Spec. Publ. Fish. Aquat. Sci. 120: vi-viii.
- Sparre, P. and S.C. Venema. 1992. Introduction to tropical fish stock assessment. Part 1. Manual. FAO Fish. Tech. Pap. 306(1): 376 p.
- Sparre, P. and R. Willman. 1992. Computer programs for bio-economic analysis of fisheries: Beam 4 manual. Analytical bio-economic evaluation of space-structured multi-species and multi-fleet fisheries. FAO Comput. Info. Ser. Fish. 3, 52 p. and diskettes.
- Walters, C.J. 1996. Computers and the future of fisheries, p. 223-238. In B.A. Megrey and E. Moksness (eds.) Computers in fisheries research. Chapman and Hall, London. 254 p.

**T.J. PITCHER** is Director of the Fisheries Centre, University of British Columbia, Vancouver, Canada.

# Length-Weight Relationship of Fishes from Yemen Waters (Gulf of Aden and Red Sea)

H. al Sakaff and M. Esseen

The data for this study were gathered between 1993 and 1996 on board commercial trawlers from Somalia, China and Yemen and also from the research vessel *Ibn Magid* belonging to the Marine Science and Resources Research Centre, Aden, Republic of Yemen.

Fish were identified using FAO species identification literature

(Fischer and Bianchi 1984). All fish were measured to the nearest mm (total length) and weighed to the nearest g. Sex was determined by dissection after the length and weight had been measured. The length-weight relationships were calculated using least-squares regression on log-transformed data and the param-

eters of the relationship of the form of  $W = aL^b$  are summarized in Table 1. Maximum and minimum sizes of fish sampled are also given. Common names and recent changes in nomenclature were taken from FishBase (Froese and Pauly 1996).

**Table 1. Length-weight relationship of fishes sampled in the Gulf of Aden (GA) and the Red Sea (RS).**

Scientific name	Common name	Sex	a	b	r <sup>2</sup>	N	Length range (cm)	
<i>Argyrops spinifer</i>	King soldierbream	M	0.211	2.459	0.950	100	55.5	11.8
<i>Argyrops spinifer</i>	King soldierbream	F	0.112	2.650	0.984	98	51.5	12.1
<i>Netuma thalassina</i>	Catfish	M	0.124	2.467	0.883	52	61.8	24.0
<i>Netuma thalassina</i>	Catfish	F	0.090	2.566	0.936	59	64.1	18.1
<i>Cheimerius nufar</i>	Santer sea bream	M	0.078	2.659	0.989	144	52.0	13.3
<i>Cheimerius nufar</i>	Santer sea bream	F	0.083	2.641	0.978	148	55.5	14.4
<i>Decapterus russelli</i>	Indian scad	M	0.008	2.167	0.967	195	24.2	12.9
<i>Decapterus russelli</i>	Indian scad	F	0.011	2.033	0.986	168	23.5	7.9
<i>Diaphus coeruleus</i>	Lanternfish	M	0.019	2.831	0.832	93	14.0	7.2
<i>Diaphus coeruleus</i>	Lanternfish	F	0.029	2.678	0.849	84	15.2	8.3
<i>Lepturacanthus savala</i>	Savalani haretail	M	0.013	2.776	0.971	50	47.8	22.1
<i>Lepturacanthus savala</i>	Savalani haretail	F	0.011	2.841	0.967	32	50.2	22.0
<i>Lethrinus nebulosus</i>	Spangled emperor	M	0.067	2.708	0.967	180	70.5	22.2
<i>Lethrinus nebulosus</i>	Spangled emperor	F	0.095	2.619	0.974	120	73.5	23.0
<i>Megalaspis cordyla</i>	Torpedo scad	M	0.153	2.289	0.943	25	46.5	28.9
<i>Megalaspis cordyla</i>	Torpedo scad	F	0.300	2.104	0.923	38	69.0	31.4
<i>Nemipterus japonicus</i>	Japanese threadfin bream	M	0.058	2.666	0.953	457	26.1	7.6
<i>Nemipterus japonicus</i>	Japanese threadfin bream	F	0.059	2.664	0.930	435	23.5	8.8
<i>Nemipterus japonicus</i>	Japanese threadfin bream	M	0.042	2.692	0.928	130	25.4	9.0
<i>Nemipterus japonicus</i>	Japanese threadfin bream	F	0.042	2.682	0.905	132	23.5	9.5
<i>Nemipterus japonicus</i>	Japanese threadfin bream	Juv	0.132	2.072	0.690	27	12.0	5.5
<i>Otolithes ruber</i>	Tiger toothed croaker	M	0.158	2.334	0.967	24	42.5	21.8
<i>Otolithes ruber</i>	Tiger toothed croaker	F	0.355	2.118	0.944	18	42.0	22.7
<i>Pagellus affinis</i>	Natal pandora	M	0.038	2.886	0.985	151	42.1	6.8
<i>Pagellus affinis</i>	Natal pandora	F	0.039	2.871	0.993	103	43.7	7.1
<i>Plectrohinchus pictus</i>	Trout sweetlips	M	0.074	2.627	0.932	93	61.5	26.0
<i>Plectrohinchus pictus</i>	Trout sweetlips	F	0.044	2.786	0.932	132	72.1	23.4
<i>Pomadasys argenteus</i>	Silver grunt	M	0.009	3.138	0.891	214	39.2	13.5
<i>Pomadasys argenteus</i>	Silver grunt	F	0.015	2.999	0.873	200	38.4	14.5
<i>Pomadasys argenteus</i>	Saddle grunt	M	0.102	2.542	0.967	81	39.1	10.6
<i>Pomadasys argenteus</i>	Saddle grunt	F	0.178	2.349	0.930	89	35.0	14.2
<i>Psenopsis cyanea</i>	Indian ruff	M	0.014	3.121	0.958	204	18.1	7.7
<i>Psenopsis cyanea</i>	Indian ruff	F	0.013	3.140	0.988	147	20.4	8.3
<i>Scomber japonicus</i>	Chub mackerel	M	0.005	3.247	0.958	460	35.6	13.3
<i>Scomber japonicus</i>	Chub mackerel	F	0.004	3.307	0.960	233	35.2	14.2
<i>Selar crumenophthalmus</i>	Bigeye scad	M	0.013	3.024	0.815	23	12.6	15.7
<i>Sphyraena barracuda</i>	Great barracuda	M	0.050	2.517	0.929	26	98.7	49.0
<i>Sphyraena barracuda</i>	Great barracuda	F	1.234	1.769	0.715	30	86.0	48.5
<i>Sphyraena jello</i>	Pickhandle barracuda	M	0.019	2.721	0.981	38	85.0	21.6
<i>Sphyraena jello</i>	Pickhandle barracuda	F	0.020	2.706	0.997	32	93.2	21.6
<i>Trachinotus blochii</i>	Snub nose pompano	M	0.088	2.572	0.972	29	65.1	43.5
<i>Trachinotus blochii</i>	Snub nose pompano	F	0.352	2.252	0.891	42	80.0	41.0
<i>Trachurus indicus</i>	Arabian scad	M	0.021	2.859	0.959	164	34.5	13.1
<i>Trachurus indicus</i>	Arabian scad	F	0.019	2.890	0.974	150	36.0	16.4
<i>Trachurus indicus</i>	Arabian scad	Juv	0.015	2.962	0.954	25	13.7	6.5
<i>Trichiurus lepturus</i>	Largehead haretail	M	0.00006	3.611	0.935	81	110.2	37.5
<i>Trichiurus lepturus</i>	Largehead haretail	F	0.00002	3.813	0.891	103	122.0	43.0

## References

- Fischer, W. and G. Bianchi, Editors. 1984. FAO species identification sheets for fishery purposes. Western Indian Ocean (Fishing Area 51). Rome. Food and Agricultural Organization of the United Nations, Vols. 1-6: page.var.
- Froese, R. and D. Pauly 1996. FishBase 96: concept, design and data sources. CD-ROM. ICLARM, Manila, Philippines.