

## LENGTH–WEIGHT RELATIONS OF PELAGIC FISH SPECIES FROM EASTERN REGION OF JAVA SEA, INDONESIA

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**Abstract.** The present work estimates length–weight relations (LWRs) of fish species from eastern region of Java Sea, Indonesia. The fishes were caught by purse seines. A total of 2461 specimens belonging to five families and 12 species were analysed: *Caranx sexfasciatus* Quoy et Gaimard, 1825; *Decapterus russelli* (Rüppell, 1830); *Elagatis bipinnulata* (Quoy et Gaimard, 1825); *Megalaspis cordyla* (Linnaeus, 1758); *Parastromateus niger* (Bloch, 1795); *Selar crumenophthalmus* (Bloch, 1793); *Sardinella longiceps* Valenciennes, 1847; *Euthynnus affinis* (Cantor, 1849); *Rastrelliger kanagurta* (Cuvier, 1816); *Scomberomorus commerson* (Lacepède, 1800); *Sphyraena barracuda* (Edwards, 1771); *Lepturacanthus savala* (Cuvier, 1829). The *b* values of the LWRs ranged from 2.407 for *Sphyraena barracuda* to 3.510 for *Lepturacanthus savala*. The presently reported study is the first report on LWRs of pelagic fish species at least from eastern region of Java Sea. Five species of fish such as *Decapterus russelli*, *Parastromateus niger*, *Rastrelliger kanagurta*, *Scomberomorus commerson*, and *Sardinella longiceps* have been studied especially in western region of Indonesia. These data can be used for evaluation of the status of the investigated species.

**Keywords:** ichthyofauna, biometric relations, LWR, purse seine, growth, Madura,

Measuring individual body length and weight is a basic procedure in fisheries scientific studies. The length–weight relation (LWR) is a useful tool to predict the fish weight at a certain length (and vice versa), to compare biometric and morphological differences between fish species in the same taxonomic group, to analyse condition indices, to estimate the biomass of the fishery resources, to calculate the catch, and to assist in the fisheries management (Liouisia et al. 2012, Moutopoulos et al. 2013, Das et al. 2015, Xu et al. 2016).

Eastern region of Java Sea at north of Madura Island, Indonesia is a traditional fishing ground for local fishermen. To our knowledge, very few studies have been conducted concerning the LWRs of pelagic fish species from this area.

The study was carried out in the eastern region of Java Sea at north of Madura Island (6°00'–6°50'S, 112°50'–114°10'E), Indonesia. Fish specimens were caught by purse seines (mesh size 5.0 cm) during October–December 2016. Total length (TL, cm) and body weight (*W*, g) were measured to the nearest 0.1 cm and 0.1 g, respectively. Isometric–allometric growth of fish was commonly calculated by the equation:

$$W = aTL^b$$

which converted into its logarithmic expression:

$$\log W = \log a + b \times \log TL$$

Parameters *a* and *b* were estimated by least squares regression (Ricker 1973), as was the coefficient of determination (*r*<sup>2</sup>). The slope (*b*) is used to describe the three dimensional growth (i.e., length, width, and depth) of a fish: for *b* = 3 growth is isometric, for *b* < 3 is negatively allometric and for *b* > 3 is positively allometric (Froese 2006).

A total of 2461 specimens belonging to five families (6 Carangidae, 1 Clupeidae, 3 Scombridae, 1 Sphyraenidae, and 1 Trichiuridae) and 12 species were analysed: *Caranx sexfasciatus* Quoy et Gaimard, 1825; *Decapterus russelli* (Rüppell, 1830); *Elagatis bipinnulata* (Quoy et Gaimard, 1825); *Megalaspis cordyla* (Linnaeus, 1758); *Parastromateus niger* (Bloch, 1795); *Selar crumenophthalmus* (Bloch, 1793); *Sardinella longiceps* Valenciennes, 1847; *Euthynnus affinis* (Cantor, 1849); *Rastrelliger kanagurta* (Cuvier, 1816); *Scomberomorus*

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*commerson* (Lacepède, 1800); *Sphyraena barracuda* (Edwards, 1771); *Lepturacanthus savala* (Cuvier, 1829). LWR parameters with their descriptive statistics are given in Table 1. The *b* value of the LWRs ranged from 2.407 for *S. barracuda* to 3.510 for *L. savala*. Five species showed positive allometric growth and seven species demonstrated negative allometric growth. The coefficient of determination ( $r^2$ ) values ranged from 0.829 for *D. russelli* to 0.996 for *S. barracuda*.

The presently reported study is the first to provide LWRs of pelagic fish species caught by purse seines at least from eastern region of Java Sea at north of Madura Island. Some fish species such as *D. russelli*, *P. niger*, *R. kanagurta*, *S. commerson*, and *S. longiceps* have been studied especially in western region of Indonesia (Froese and Pauly 2017). A comparison with data from FishBase showed that the growth types (*b* values) of fish highly varied among species and locations (Froese and Pauly 2017). These differences in *b* values can be attributed to a combination of one or more factors including: habitat, area, seasonal effect, degree of stomach fullness, gonad maturity, sex, health, preservation techniques, and differences in the observed length ranges of the captured specimens (Li et al. 2013, Hossain et al. 2015, Tobes et al. 2016). The results of presently reported study are useful for evaluation of the status of the investigated species. They are also required as an important parameter in the fisheries management. This work can also serve as baseline data for species with no previous LWRs as well as for comparisons with future studies of marine fishes especially from Java Sea at north of Madura Island.

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**Table 1**

Length–weight relations of fish species caught from Java Sea at north of Madura Island, Indonesia

Family	Species	N	TL [cm]	W [g]	LWR parameter					
					a	b	Growth	r <sup>2</sup>	a CI95%	b CI95%
Carangidae	<i>Caranx sexfasciatus</i> J	32	15.4–20.8	48.7–125.4	0.020	2.878	–A	0.909	0.007–0.053	2.544–3.213
	<i>Decapterus russelli</i>	529	10.1–17.7	8.9–52.6	0.006	3.176	+A	0.829	0.004–0.008	3.053–3.300
	<i>Elagatis bipinnulata</i> J	95	16.1–22.9	40.1–83.3	0.016	2.754	–A	0.928	0.010–0.026	2.596–2.911
	<i>Megalaspis cordyla</i>	68	26.1–31.8	278.1–499.1	0.024	2.869	–A	0.899	0.011–0.052	2.635–3.103
	<i>Parastromateus niger</i>	96	16.6–30.4	100.3–544.2	0.045	2.729	–A	0.936	0.028–0.071	2.583–2.875
	<i>Selar crumenophthalmus</i>	228	9.1–23.2	10.1–122.8	0.007	3.173	+A	0.973	0.006–0.008	3.104–3.242
Clupeidae	<i>Sardinella longiceps</i>	425	13.8–20.1	6.8–73.4	0.007	3.072	+A	0.894	0.005–0.009	2.971–3.173
Scombridae	<i>Euthynnus affinis</i> J	397	20.1–35.9	97.5–549.6	0.026	2.782	–A	0.923	0.021–0.034	2.704–2.862
	<i>Rastrelliger kanagurta</i>	385	13.0–26.0	17.2–177.5	0.003	3.390	+A	0.922	0.002–0.004	3.291–3.489
	<i>Scomberomorus commerson</i>	94	38.0–58.6	298.2–989.8	0.011	2.832	–A	0.922	0.006–0.021	2.663–3.001
Sphyraenidae	<i>Sphyraena barracuda</i> J	31	23.0–36.6	72.3–221.8	0.038	2.407	–A	0.996	0.032–0.046	2.349–2.464
Trichiuridae	<i>Lepturacanthus savala</i>	81	26.1–46.9	11.4–75.7	0.000	3.510	+A	0.930	0.000–0.000	3.297–3.724

N = number of fish in sample, TL = total length measured to nearest 0.1 cm, W = body weight measured to an accuracy of 0.1 g; J = all specimens used were juveniles; a = intercept, b = slope, Growth = growth type, CI = Confidence interval, r<sup>2</sup> = coefficient of determination; –A = negative allometric growth, +A = positive allometric growth.

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