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Technical contribution

Length-weight relationships for 16 freshwater fishes caught in tributaries of Euphrates and Orontes rivers in Gaziantep (southeastern Anatolia, Turkey)

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Introduction

In fisheries biology, length-weight (L-W) relationships are useful for the conversion of growth-in-length equations to growth-in-weight for use in stock assessment models and to estimate stock biomass from limited sample sizes (according to Binohlan and Pauly, 1998; Koutrakis and Tsikliras, 2003; Valle et al., 2003; Ecoutin et al., 2005; Verdiell-Cubedo et al., 2006).

In this study the L-W relationships and length-length (L-L) conversion relationships are reported for 16 species of freshwater fish caught from rivers of Gaziantep, southern Anatolia.

Material and methods

The study was carried out from July to December 2008 in the river flowing to the Euphrates or Orontes rivers in Gaziantep (36°28′-38°01′E / 37°32′-36°38′N). Specimens were obtained by electrofishing (SAMUS 725MP). Collected fish were stored in 5-L plastic bottles with 4% formaldehyde solution and transported to the laboratory. In the laboratory species identification was according to: Krupp, 1985, 1992; Krupp and Schneider, 1991; Geldiay and Balık, 1996; Erk'akan et al., 2007; Kottelat and Freyhof, 2007; and Coad, 2009;. All scientific names are confirmed as given in FishBase (Froese and Pauly, 2009) and current status of the species checked in Eschmeyer (2011). Total weight was weighed to the nearest 0.05 g and TL, FL and SL were measured to the nearest 0.1 cm. Data in terms of length and weight were carefully checked and certain outliers removed for reliable estimations.

The L-W relationships, $W = a*L^b$ were estimated using linear regression analysis, TW vs TL (ln-transformed); $\ln W = \ln a + b\ln L$, where $\ln a$ is the intercept of the regression line and b the slope (Ricker, 1973). The 95% confidence intervals were calculated for a and b. Relationships between TL and FL, TL and SL were estimated by linear regression analysis. All statistical and regression analyses were performed with SPSS 15 for Windows.

Results and discussion

In total during the study period 36 species belonging to nine families were captured. Length-weight relationships were calculated for 16 other species but were too small a sample size ($n < 10$) for consideration. Table 1 shows for each species the sample size, minimum-maximum and mean total length and weight with standard deviation, L-W relationships

Table 1
Descriptive statistics and L-W relationship parameters for 16 fish species caught in tributaries of Euphrates and Orontes rivers in Gaziantep

Species	n	Mean TW Range TW in cm)	Mean TL (Range TL in cm)	Relationship parameters				
				a	95% CI of *a*	*b*	95% CI of *b*	r^2
*Alburnus caeruleus**	16	1.27 ± 0.77 (0.25–2.85)	5.8 ± 1.03 (3.8–7.1)	0.0027	0.0013–0.0054	3.515	3.099–3.930	0.976
*Alburnus qalilus**	29	2.39 ± 1.66 (0.30–6.25)	6.1 ± 2.96 (4.0–9.4)	0.0028	0.0019–0.0034	3.435	3.309–3.561	0.996
*Alburnus adanensis**	169	3.07 ± 1.97 (0.65–8.95)	6.93 ± 1.33 (4.6–10.4)	0.0076	0.0065–0.0089	3.038	2.943–3.132	0.980
*Capoeta barroisi**	39	6.93 ± 6.56 (0.25–23.75)	8.21 ± 3.12 (3.6–16.3)	0.0088	0.0071–0.0107	3.015	2.925–3.105	0.996
Capoeta damascina	189	26.28 ± 19.83 (3.95–85.70)	13.59 ± 3.44 (8.2–21.6)	0.0099	0.0090–0.0108	2.975	2.935–3.015	0.996
Carasobarbus luteus	13	11.50 ± 7.70 (2.05–21.04)	9.44 ± 2.39 (6.0–12.0)	0.0064	0.0051–0.0080	3.254	3.149–3.359	0.997
*Cyprinion macrostomum**	68	12.35 ± 6.62 (2.75–38.4)	10.61 ± 1.91 (6.7–16.0)	0.0113	0.0090–0.0141	2.939	2.841–3.037	0.991
Garra rufa	161	11.78 ± 5.61 (4.75–29.90)	10.05 ± 1.42 (7.6–13.9)	0.0075	0.0069–0.0082	3.149	3.102–3.195	0.996
*Garra variabilis**	170	4.81 ± 6.21 (0.25–29.95)	6.63 ± 2.64 (3.2–13.2)	0.0070	0.0063–0.0078	3.193	3.136–3.250	0.993
Squalius cephalus	42	19.10 ± 10.10 (1.45–51.50)	11.88 ± 2.37 (5.1–17.0)	0.0080	0.0065–0.0101	3.093	3.005–3.182	0.992
*Barbatula tigris**	63	1.55 ± 0.67 (0.60–2.85)	6.12 ± 0.76 (4.8–7.4)	0.0034	0.0024–0.0049	3.346	3.135–3.558	0.971
*Paracobitis tigris**	84	2.03 ± 0.65 (0.70–3.45)	6.59 ± 0.70 (5.3–8.4)	0.0061	0.0040–0.0095	3.119	2.875–3.352	0.944
*Nemacheilus hamii**	20	0.86 ± 0.28 (0.4–1.4)	5.27 ± 0.62 (4.3–6.3)	0.0099	0.0040–0.0250	2.660	2.104–3.126	0.921
*Barbatula euphratica**	18	1.04 ± 0.54 (0.20–2.05)	5.31 ± 0.86 (3.6–6.6)	0.0062	0.0015–0.0305	2.972	2.080–3.864	0.870
*Schistura ceyhanensis**	95	2.84 ± 1.13 (1.20–5.90)	7.16 ± 0.86 (5.4–8.8)	0.0056	0.0046–0.0069	3.132	3.015–3.249	0.984
*Mastacembelus mastacembelus**	49	56.95 ± 45.16 (11.70–232.45)	27.51 ± 6.69 (15.1–46.4)	0.0128	0.0052–0.0311	2.494	2.227–2.760	0.941

Species listed in systematic order (Nelson, 2006). *Species not included in FishBase (Froese and Pauly, 2009) W–L relationships. N, sample size; Range, minimum-maximum values, TW, total weight; TL, total length; FL, fork length; SL, Standard length; a and b, parameters of the equation, r^2, coefficient of determination; I, isometric; +A, positive allometric; −A, negative allometric.

Table 2
Length-length conversions for species caught in tributaries of Euphrates and Orontes rivers in Gaziantep

Species	n	TL and FL relationship	r^2	TL and SL relationship	r^2
*Alburnus caeruleus**	16	FL = 0.848*TL + 0.246	0.980	SL = 0.735*TL + 0.383	0.995
*Alburnus qalilus**	29	FL = 0.900*TL + 0.061	0.993	SL = 0.823*TL + 0.066	0.992
*Alburnus adanensis**	169	FL = 0.931*TL + 0.114	0.994	SL = 0.856*TL + 0.143	0.992
*Capoeta barroisi**	39	FL = 0.848*TL + 0.246	0.980	SL = 0.735*TL + 0.383	0.995
*Capoeta damascina**	189	FL = 0.914*TL + 0.040	0.998	SL = 0.847*TL + 0.207	0.997
Carasobarbus luteus	13	FL = 0.886*TL + 0.157	0.999	SL = 0.835*TL + 0.092	0.997
*Cyprinion macrostomum**	68	FL = 0.925*TL + 0.311	0.986	SL = 0.865*TL + 0.604	0.979
*Garra rufa**	161	FL = 0.963*TL + 0.457	0.979	SL = 0.919*TL + 0.796	0.994
*Garra variabilis**	170	FL = 0.934*TL + 0.058	0.985	SL = 0.857*TL + 0.179	0.987
Squalius cephalus	42	FL = 0.962*TL + 0.315	0.990	SL = 0.893*TL + 0.571	0.992
*Barbatula tigris**	63	FL = 0.960*TL + 0.099	0.991	SL = 0.871*TL + 0.237	0.972
*Paracobitis tigris**	84	FL = 0.958*TL + 0.032	0.993	SL = 0.859*TL + 0.080	0.974
*Nemacheilus hamii**	20	FL = 0.951*TL + 0.114	0.993	SL = 0.829*TL + 0.004	0.977
*Barbatula euphratica**	20	FL = 0.979*TL + 0.124	0.995	SL = 0.857*TL + 0.087	0.984
*Schistura ceyhanensis**	95	FL = 0.980*TL + 0.097	0.993	SL = 0.895*TL + 0.357	0.982
*Mastacembelus mastacembelus**	49	–	–	SL = 0.934*TL + 0.323	0.998

*Species not included in FishBase (Froese and Pauly, 2009) L–L relationships.

parameters a and b, standard error of b, coefficient of determination, r^2 and growth type.

No L-W relationships estimates were previously available for 12 species in the FishBase (Froese and Pauly, 2009) online version as of 11/2009. Froese (2006) stated that a is an indicator of the body shape of fishes and that there is clear increase in the a value from eel-like to short-deep. In this study most a values have been estimated as smaller than 0.01. Therefore most of the species could be classified as relatively elongated, which is expected of the fishes inhabiting river ecosystems.

L-L conversion relationships are presented in Table 2. The L-L regressions were significant ($P < 0.01$) for all species, with all R^2 values > 0.97.

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