Journal of
Fisheries and Aquatic Science

ISSN 1816-4927

Academic
Journals Inc.

www.academicjournals.com

Journal of Fisheries and Aquatic Science 10 (6): 592-596, 2015
ISSN 1816-4927 / DOI: 10.3923/jfas.2015.592.596

Length-Weight Relationship and Growth Parameters of Kingfish (*Scomberomorus commerson*) in the North of the Persian Gulf

Ali Fakhri, Hakimeh Fekrandish, Abdolrahim Pazira and Alireza Rastgoo
Department of Fisheries, Bushehr Branch, Islamic Azad University, Bushehr, Iran

Corresponding Author: Ali Fakhri, Department of Fisheries, Bushehr Branch, Islamic Azad University, Bushehr, Iran

ABSTRACT

The kingfish, *Scomberomorus commerson* is an epipelagic and migratory species found across the coastal waters of tropical region. It is a commercially important species in the North of Persian Gulf. The population parameters of species are important in fishery management. So, this study investigated some population characteristics of *S. commerson*, in the northern coasts of the Persian Gulf (Bushehr waters). Fish were selected at random from three namely landing stations during April 2010 to March 2011. The Length-Weight Relationship (LWR) was estimated by using the equation $W = aL^b$ and the FiSAT software was used to analyse the growth parameters. Length-weight relationship indicated isometric growth with b = 2.93. The growth parameters of the Von Bertalanffy equation were estimated as: L_∞ =143.85 cm, K = 0.31, t_0 = -0.63 years with a growth performance index (ø') of 3.81. These findings can be used as biological input parameters in further stock evaluations in this region.

Key words: *Scomberomorus commerson*, length-weight relationship, growth, Persian Gulf

INTRODUCTION

The kingfish, *Scomberomorus commerson* is an epipelagic and migratory species found across the coastal waters of tropical regions. It is distributed in the Indo-Pacific area, from the Red Sea and South Africa to Southeast Asia, North to China, Japan and South to Australia (Randall, 1995). This species occurs from the edge of the continental shelf to coastal waters where it is found along drop-offs, gently sloping reefs and lagoon waters from depths of 10-70 m (McPherson, 1985; Myers, 1991). *Scomberomorus commerson* is a commercially important species which is caught with a variety of gears including nets, bamboo stake traps, mid-water trawls and longlines in coastal waters around its distribution (Collette, 2001). In the North of Persian Gulf it is mainly caught using gillnets, hook and long lines. Juveniles and young fish occur in small schools, While adults may be individually (Collette, 2001). The diet mainly includes variety of small fishes such as clupeids, anchovies (Blaber *et al*., 1990) and carangids, though squids and penaeid shrimps are also consumed. For the management of fish resources, knowledge of various population parameters is an essential prerequisite. In this context, the objective of this study was to estimate length-weight relationships and growth parameters of *S. commerson* from Northern coasts of the Persian Gulf for fishery management.

MATERIALS AND METHODS

Size frequency data was collected monthly during April 2010 to March 2011 from the Northern coast of Persian Gulf. Fish were selected at random from three namely landing stations

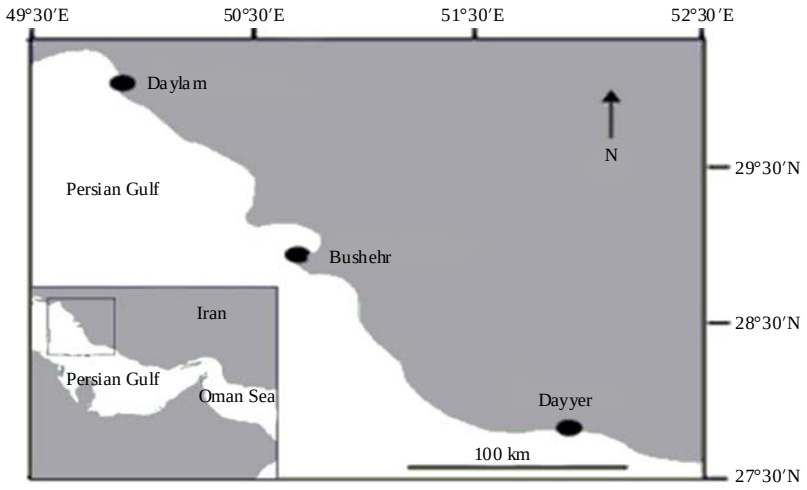

Fig. 1: Map of Persian Gulf, showing the location of the three regions where *Scomberomorus commerson* were sampled

(Deylam, Bushehr and Dayyer) in the Bushehr Province (Fig. 1). Fork Length (FL) was measured in centimeters for all fish by using a measurement board. The Length-Weight Relationship (LWR) was estimated by using the equation $W = aL^b$, where a is the intercept of the regression and b is the regression coefficient (Pauly, 1984). Additionally, in order to verify if the b value was significantly different from the isometric (b = 3), the Student's t-test with a confidence level of ±95% ($\alpha = 0.05$) was employed.

The FAO-ICLARM Stock Assessment Tools, FiSAT software (Gayanilo and Pauly, 1997) was used to analyze the monthly length-frequency data. The ELEFAN procedure in FISAT was employed to estimate L_∞ and K of the Von Bertalanffy equation: $L_t = L_\infty\{1-\exp[-K(t-t_0)]\}$, where L_∞ is the asymptotic length that an average fish would achieve if it continued to live and grow, K is the growth coefficient which determines how fast the fish approaches L_∞ and t_0 is the hypothetical age for $L_t = 0$.

t_0 was estimated by using Pauly's empirical equation (Pauly, 1979):

$$\log(-t_0) = -0.3922-0.275 \log L_\infty-1.038 K$$

The estimated growth parameters were compared with other studies using the growth performance index, Φ'{Formatting Citation} {Formatting Citation} (Munro and Pauly, 1983):

$$\Phi' = \ln K+2 \ln L_\infty$$

RESULTS

The total length of 3982 fish ranged from 20-139 cm (Fig. 2). The length-weight data for 250 specimens showed a relationship of $W = 0.016\ F.L^{2.93}$ with a regression coefficient $R^2 = 0.969$ (Fig. 3). The growth parameters were as follow: $L_\infty = 143.85$ cm, $K = 0.31$, $t_0 = -0.63$. The yearly growth curve is shown in Fig. 4. These results gave a growth performance index (Φ') of 3.81.

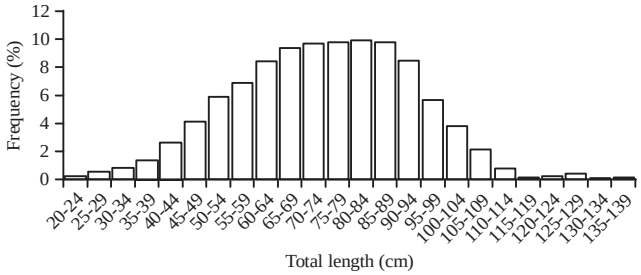

Fig. 2: Length frequency distribution of *Scomberomorus commerson* in the Persian Gulf, Bushehr waters (2010-2011)

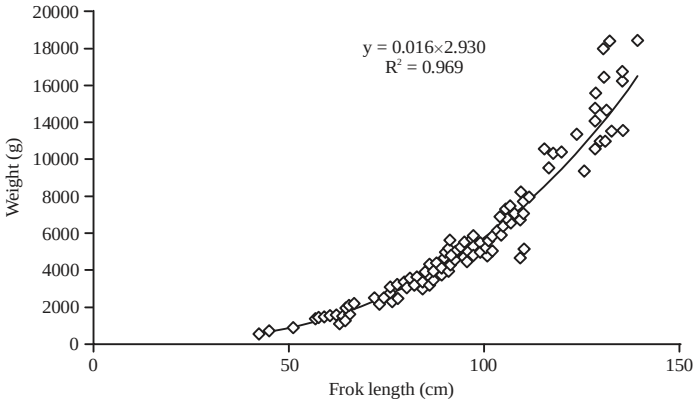

Fig. 3: Length-weight relationship of *Scomberomorus commerson* collected in Persian Gulf, Bushehr waters (2010-2011)

Fig. 4: Growth curve of *Scomberomorus commerson* collected in Persian Gulf, Bushehr waters (2010-2011)

DISCUSSION

In this study the "b" parameter value, has not shown any significant difference with 3 and it is close to 3 for the *S. commerson* in Area 51, indicating isometric growth (King, 2007) (Table 1). Differences in growth patterns can be the result of fluctuations in environmental parameters, physiological conditions of the fish at the time of collection and sex of fish (Biswas, 1993). Because

Table 1: Regression coefficients of length-weight relationship for *Scomberomorus commerson* from different areas

Areas	a	b	r^2	Authors
Oman sea	0.01530	2.8335	0.996	Taghavimotlagh *et al*. (2007)
South of Iran	0.0076	2.9826	0.9319	Shojaei *et al*. (2007)
Oman	0.0000083	3.02	0.97	Al- Hosni and Siddeek (1999)
Persian Gulf	0.016	2.93	0.969	Present study

Table 2: Comparison of the estimates of growth parameters for *Scomberomorus commerson* from different areas

Areas	L_∞ (cm)	k (year^{-1})	t_0	Φ'	Authors
Oman	138.6	0.21	-1.9	3.61	Grandcourt *et al*. (2005)
Persian Gulf	140	0.42	-0.26	3.916	Shojaei *et al*. (2007)
Oman Sea	170	0.28	-0.36	3.948	Taghavimotlagh *et al*. (2007)
Oman	173.6	0.28	-0.86	4.01	Al-Hosni and Siddeek (1999)
Persian Gulf	143.85	0.31	-0.63	3.81	Present study

*Fork length

of the difficulty in determining age of fish in tropical and subtropical waters, the length-based stock assessment methodologies, have been developed (Pauly, 1984; Pauly and Morgan, 1987). Many researchers (Ahmed *et al*., 2008; EL-Ganainy and Sabra, 2008) have successfully studied population parameters of fish species using length-frequency data. So, in the present study the length frequency was used to estimate growth parameters of *Scomberomorus commerson*. The value of L_∞ and K obtained were 143.85 cm FL and 0.31 years^{-1}, respectively. The estimates of growth parameters reported by different researchers from the Persian Gulf and other areas have a variety of ranges (Table 2). It may be due to the differences in genetic structure and/or differences in temperature, density of food and diseases (Pauly, 1994; Wootton, 1990) and other factors (e.g., area, season, number of observed individuals, sampling techniques or analytical methods) (Le Cren, 1951). The growth performance index value (3.81) obtained in this study was similar to the values of other studies (3.61-4.22) (Table 2). This indicates that the estimation of growth parameters for *S. commerson* using the length-frequency method in this study was reliable.

REFERENCES

Ahmed, M.S., A.S.M. Sharif and G.A. Latifa, 2008. Age, growth and mortality of hilsa shad, *Tenualosa ilisha* in the River Meghna, Bangladesh. Asian J. Biol. Sci., 1: 69-76.

Al-Hosni, A.H.S. and S.M. Siddeek, 1999. Growth and mortality of the narrowbarred Spanish Mackerel, *Scomberomorus commerson* (Lacepede), in Omani waters. Fish. Manage. Ecol., 6: 145-160.

Biswas, S.P., 1993. Manual of Methods in Fish Biology. 1st Edn., South Asian Publishers Pvt. Ltd., New Delhi, ISBN: 1-881318-18-4, Pages: 157.

Blaber, S.J.M., D.A. Milton, N.J.F. Rawlinson, G. Tiroba and P.V. Nichols, 1990. Diets of lagoon fishes of the Solomon Islands: Predators of tuna baitfish and trophic effects of baitfishing on the subsistence fishery. Fish. Res., 8: 263-286.

Collette, B.B., 2001. Tunas (also, Albacore, Bonitos, Mackerels, Seerfishes and Wahoo). In: FAO Species Identification Guide for Fishery Purposes: The Living Marine Resources of the Western Central Pacific, Carpenter, K.E. and V. Niem (Eds.). Food and Agricultural Organization, Rome, pp: 3721-3756.

EL-Ganainy, A.A. and M.M.M. Sabra, 2008. Age, growth, mortality and yield per recruit of the filefish *Stephanolepis diaspros* (Fraser-Brunner, 1940) (Pisces: Monacanthidae), in the Gulf of Suez, Egypt. J. Fish. Aquat. Sci., 3: 252-260.

Gayanilo, Jr. F.C. and D. Pauly, 1997. FAO-ICLARM Stock Assessment Tools (FiSAT) Reference Manual. FAO, Rome, ISBN: 9251040478, pp: 262.

Grandcourt, E.M., T.Z. Al Abdessalaam, F. Francis and A.T. Al Shamsi, 2005. Preliminary assessment of the biology and fishery for the narrow-barred Spanish mackerel, *Scomberomorus commerson* (Lacepede, 1800), in the Southern Arabian Gulf. Fish. Res., 76: 277-290.

King, M.G., 2007. Fisheries Biology, Assessment and Management. 2nd Edn., Blackwell Publishing, UK., ISBN-13: 9781405158312, pp: 340.

Le Cren, E.D., 1951. The length-weight relationship and seasonal cycle in gonad weight and condition in the Perch (*Perca fluviatilis*). J. Anim. Ecol., 20: 201-219.

McPherson, G.R., 1985. Northern line fishery for mackerels still important. Aust. Fish., 8: 12-14.

Munro, J.L. and D. Pauly, 1983. A simple method for comparing the growth of fishes and invertebrates. Fishbyte, 1: 5-6.

Myers, R.F., 1991. Micronesian Reef Fishes: A Practical Guide to the Identification of the Coral Reef Fishes of the Tropical Central and Western Pacific. 2nd Edn., Coral Graphics, Guam, USA., ISBN-13: 978-0962156427, Pages: 299.

Pauly, D., 1979. Theory and management of Tropical multi-species stocks: A review, with emphasis on the Southeast Asian demersal fisheries. ICLARM Studies and Review No. 1, International Center for Living Aquatic Resources Management, Manila, Philippines, pp: 1-35.

Pauly, D., 1984. Length-converted catch curves: A powerful tool for fisheries research in the tropics (Part 2). Fishbyte, 2: 17-19.

Pauly, D. and G.R. Morgan, 1987. Length-Based Methods in Fisheries Research. WorldFish, Manila, ISBN: 9789711022280, Pages: 468.

Pauly, D., 1994. On the Sex of Fish and the Gender of Scientists: Collected Essays in Fisheries Science. Chapman and Hall, London, ISBN: 9780412595400, Pages: 250.

Randall, J.E., 1995. Coastal Fishes of Oman. University of Hawaii Press, Honolulu, Hawaii, pp: 439.

Shojaei, M.G., S.A.T. Motlagh, J. Seyfabadi, B. Abtahi and R. Dehghani, 2007. Age, growth and mortality rate of the narrow-barred Spanish Mackerel (*Scomberomerus commerson* Lacepede, 1800) in coastal waters of Iran from length frequency data. Turk. J. Fish. Aquat. Sci., 7: 115-121.

Taghavimotlagh, S.A., M. Ghodratishojaei, S.J. Seyfabadi, B. Abtahi and R. Dehghani, 2007. Population dynamics of narrow barred Spanish mackerel (*Scomberomorus commerson*) in coastal waters of Oman Sea (Iran). Iran. J. Fish. Res., 4: 43-52.

Wootton, R.J., 1990. Ecology of Teleost Fishes. 1st Edn., Chapman and Hall, London, UK., ISBN-13: 9780412317200, Pages: 404.