OTOLITH - BODY LENGTH RELATIONSHIP OF KAIS KINGFISH (*CYPRINION KAIS* HECKEL, 1843) IN TIGRIS RIVER, TURKEY

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The relationships between standard length (SL) and otolith length (OL), and width (OW) were examined for kais kingfish (*Cyprinion kais* Heckel, 1843) from Güçlükonak location of Tigris River. Sampling was carried out every month using nets from January to December 2015. Otolith samples for analysis were obtained from 135 specimens (101 females and 34 males). Standard length and otolith length measured for all fish and sex was identified. Samples consisted of fish varying in standard length from 6.0 to 14.8 cm, weight from 2.8 to 75.55 g and otolith length from 1.51 to 3.07 mm. The relationship between fish length (SL) and otolith length (OL) was as y=0.1596x +0.4445 (R^2=0.7606), between fish length (SL) and otolith width (OW) was as y=0.1201x +0.5561 (R^2=0.8155), between fish length (SL) and otolith weight (OWe) was as y=0.0003x –0.0017 (R^2=0.7632), between otolith length (OL) and otolith width (OW) was as y=0.6655x +0.4192 (R^2=0.8385). Analysis for the relation between right and left otolith did not reveal any significant differences (t-test, p>0.05).

Keywords: Cyprinion kais, otolith, kais kingfish, Tigris River, Turkey.

INTRODUCTION

Cyprinion kais Heckel, 1843 is an endemic freshwater fish seen in the Tigris-Euphrates river basin (Nasri *et al*., 2010). *Cyprinion* species spread in a region extending from the river lndus to Orontes, Tigris and Euphrates rivers. The description of the two types of *Cyprinion* was made by Heckel in Tigris and Euphrates river systems. One of these species, *Cyprinion macrostomum* Heckel, 1843, has been mentioned in subsequent studies. The other *Cyprinion kais* has been reported in studies in Iraq and Syria. *Cyprinion kais* species have not been mentioned in studies for determination of freshwater fish in our country. However, specimens collected from the Tigris River and the Batman Creek were identified by Bănărescu & Herzig-Straschil (1995) as *Cyprinion kais*. And shows the distribution in freshwater of Turkey, Syrian Arab Republic, Iran and Iraq. In the case of wide distribution, it is under the danger of extinction in Turkey. *Cyprinion kais* is a valuable species for edible and angling. Despite its wide distribution and endangered species, it has not been studied extensively. Compared with *C. macrostomum*, there

is much doubt about its validity and sometimes it is considered synonymous with *C. macrostomum* (Nasri *et al*., 2010).

Bănărescu & Herzing-Sraschil (1995) and Geldiay & Balık (2007), reported in their studies the number of branched rays in dorsal fin of *C. kais* is around 13–15 and this number is 9–11 in *C. macrostomum. C kais* is flattened from side and its head length is less that the body height. The ratio between the standard length and body depth is ranged from 2.9 to 3.4. The mouth of fish is small and on the ventral and there is a lobe on it. There are a couple of barbels around the mouth. The last branched ray of the dorsal fin is boned and there are denticles on the ray (Bilici *et al*., 2016).

Although kais kingfish is endemic Tigris and Euphrates basin, biology and ecology have not been well studied (Alkan-Uçkun & Gökçe, 2015). For this reason, in this study, morphometric and meridional properties of *Cyprinion kais* species were tried to be given comparatively in the samples obtained from Dicle River at Şırnak province, Güçlükonak.

MATERIAL AND METHODS

A total of 135 specimens of kais kingfish was caught monthly using nets from Tigris River, Şırnak from January to December 2015. Each fish samples was measured to the nearest 1 mm for standard length (SL). Sagital otoliths were removed, cleaned and preserved dry in labeled boxes. Otolith length and otolith width were measured to the nearest 1 μm using Olympus SZ61TR+Olympus LC20. The rigth and left otoliths were dealt with separately. Broken and damaged otoliths were excluded from the calculations.

Differences between the lengths of the right and left otoliths for each species were tested using paired t-test. The relationships between otolith length and fish length were calculated using least squares regression equations to predict the standard length and weight of the original fish from otolith length. The otolith dimensions-standard length relationships were examined by using the following equation: (y=a+bx), where *y* is otolith length, *x* is fish standard length, *a* is intercept value, *b* is coefficient value (Başusta *et al.*, 2013).

RESULTS AND DISCUSSION

The sagittal otoliths of 135 kais kingfish specimens were examined. The standard length of all individuals ranged from 6.0 to 14.8 cm SL (mean 11.37±0.15 cm) and weight from 2.8 to 75.55 g (mean 29.77±1.19 g). The otolith length ranged between

1.51 and 3.07 mm (mean 2.27±0.029 mm), otolith width from 1.28 to 2.48 mm (mean 1.93±0.021 mm) and otolith weight from 0.0004 to 0.0034 g (mean 0.0018±0.00005 g). The age of kais kingfish ranged from one to six years.

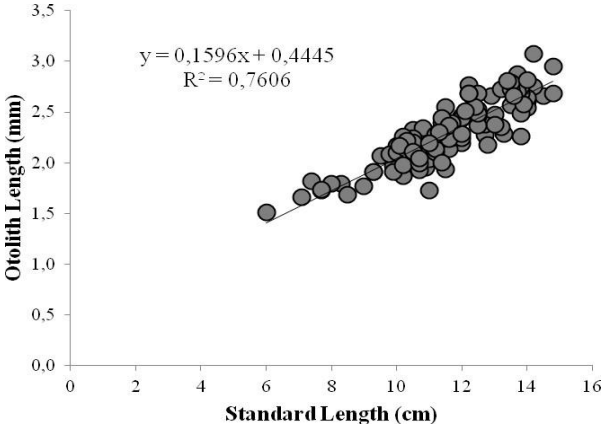

Fig. 1. Standard length-otolith length relationship of *Cyprinion kais.*

The relationship between fish length (SL) and otolith length (OL) was found as y=0.1596x +0.4445 (R^2=0.7606) (Fig. 1), between fish length (SL) and otolith width (OW) was y=0.1201x +0.5561 (R^2=0.8155) (Fig. 2), between fish length (SL) and otolith weight (OWe) was y=0.0003x –0.0017 (R^2=0.7632) (Fig. 3), between otolith length (OL) and otolith width (OW) was calculated as y=0.6655x +0.4192 (R^2=0.8385) (Fig. 4), between fish total weight (W) and otolith weight (OWe) was determined as y=0.00003x–0.0008 (R^2=0.6367) (Fig. 5). Analysis for the relation between right and left otolith did not reveal any significant differences (t-test, p>0.05).

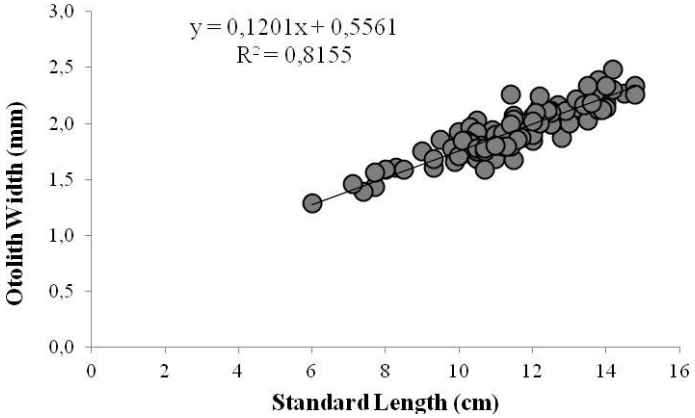

Fig. 2. Standard length-otolith width relationship of *Cyprinion kais.*

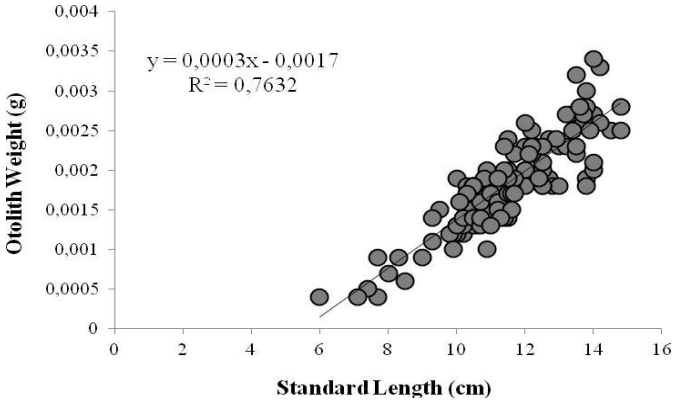

Fig. 3. Standard length-otolith weight relationship of *Cyprinion kais.*

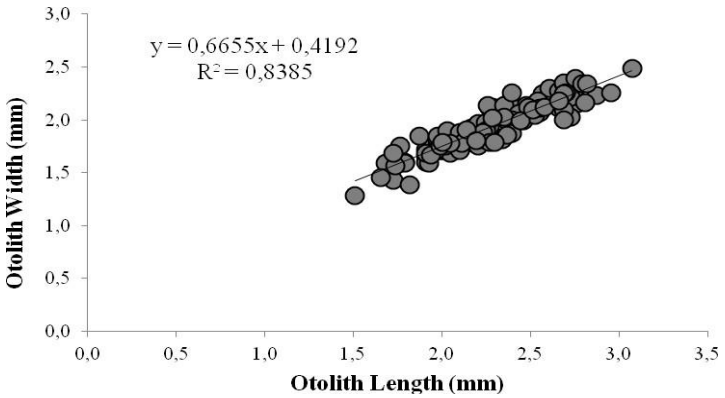

Fig 4. Otolith length-otolith width relationship of *Cyprinion kais.*

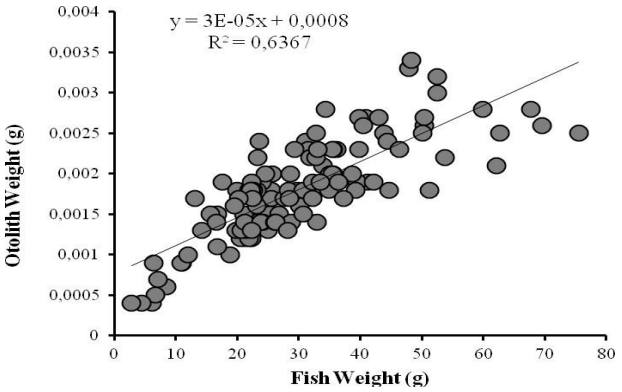

Fig. 5. Total weight-otolith weight relationship of *Cyprinion kais.*

Despite endemic kais kingfish in Tigris and Euphrates basin, otolith biometry have not been studied. Therefore, this is the first information on otolith biometry of *C. kais* from Şırnak, Turkey. Otolith length and otolith width were found to highly reliable measurement for determining the fish length.

The maximum estimated age was 6 years for kais kingfish in Şırnak. Alkan-Uçkun & Gökçe (2015) reported a maximum age of four years for *C. kais* and four years for *C. macrostomum* from Karakaya Dam Lake. Five years of age was reported for *C. macrostomum* from Gamasiab River in the Tigris River drainage in Iran (Faghani-Langroudi & Mousavi-Sabet, 2018).

There are a strong linear relationship between fish length and otolith length, and between fish length and otolith width (R^2>0.76). Başusta *et al*. (2013) reported that strong correlation between fish length-otolith length have been found in *Salmo trutta macrostigma* in Munzur River. Likewise, a strong positive correlation between fish length and otolith length have been found in some other fish species (Şen *et al*., 2001; Ross *et al*., 2005; İlkyaz *et al.*, 2011; Jawad *et al.*, 2011a, b; İşmen *et al*., 2013; Yilmaz *et al*., 2014; Dörtbudak & Özcan, 2015; Bostancı *et al*., 2017; Mat-Piah *et al*., 2017).

Also, a relationship between otolith weight and fish length has been used by some authors (Jawad *et al*., 2011b; İlkyaz *et al*., 2011; Yilmaz *et al*., 2014; Bostancı *et al*., 2017, Mat-Piah *et al.*, 2017). These all studies found that there was a positive linear relationship between fish length and otolith weight. In this study, a strong correlations was found between fish length and otolith weight.

CONCLUSIONS

Consequently, studies on the otolith biometry of kais kingfish are generally unavailable. Hence, relationship between fish length and otolith size of kais kingfish in Tigris River given in this study provides some tools for the study of food habits of piscivores and size of fish in archaelogical samples.

REFERENCES

ALKAN - UÇKUN A., GÖKÇE D., 2015, *Growth and reproduction of Cyprinion macrostomum (*Heckel, 1843*) and Cyprinion kais (*Heckel, 1843*) populations in Karakaya Dam Lake (Euphrates River), Turkey*. Turkish Journal of Zoology, **39**: 685–692.

BĂNĂRESCU P. M., HERZİG-STRASCHİL B., 1995, *A revision of the species of the Cyprinion macrostomus-group (Pisces: Cyprinidae).* Annalen des Naturhistorischen Museums in Wien, Serie B, **97**: 411–420.

BAŞUSTA A., ÖZER Eİ., GİRGİN H., 2013, *Otolith Dimensions-Fish Length Relations Between Of Red-Spotted Trout (Salmo trutta macrostigma (Dummeril, 1858)) in Munzur River*. Journal of Fisheries Sciences.com, **7** (1): 22–29.

BİLİCİ S., KAYA A., ÇİÇEK T., DÖRTBUDAK MY., 2016, *Investigation of size and shape differences depend to sex, age and season on scales of smallmouth lotak (Cyprinion kais).* Journal of Survey in Fisheries Sciences, **3** (1): 37–45.

BOSTANCI D., YEDİER S., KONTAŞ S., KURUCU G., POLAT N., 2017, *Regional variation of relationship between total length and otolith size in the three Atherina boyeri Risso, 1810 populations, Turkey.* Ege Journal of Fisheries and Aquatic Sciences, **34** (1): 11–16.

DÖRTBUDAK M. Y., ÖZCAN G., 2015, *Relationship Between Otolith Length and Fish Length of Shiraz Barb (Capoeta umbla* Heckel, 1843*) in İkizce Stream (Şırnak).* Yunus Araştırma Bülteni, **1**: 67–72. (in Turkish)

FAGHANİ - LANGROUDİ H., MOUSAVİ - SABET H., 2018, *Reproductive biology of lotak, Cyprinion macrostomum* Heckel, 1843 *(Pisces: Cyprinidae), from the Tigris River drainage*. Iranian Journal of Fisheries Sciences, **17** (2): 288–299.

GELDİAY R., BALIK S., 2007, *Freshwater Fishes in Turkey*. Ege University Publishing, İzmir, **46**: 1–644. (in Turkish)

İLKYAZ A. T., METİN G., KINACIGİL H. T., 2011, *The use of otolith length and weight measurements in age estimations of three Gobiidae species (Deltentosteus quadrimaculatus, Gobius niger and Lesueurigobius friesii).* Turkish Journal of Zoology, **35** (6): 819–827.

İŞMEN A., ARSLAN M., GÜL G., YIĞIN C. Ç., 2013, *Otolith morphometry and population parameters of red porgy, Pagrus pagrus (Linnaeus, 1758) in Saros Bay (North Aegean Sea)*. Ege Journal of Fisheries and Aquatic Sciences, **30** (1): 31–35.

JAWAD L., AMBUALİ A., AL-MAMRY J. M., AL-BUSAİDİ H. K., 2011a, *Relationship between fish length and otolith length and width in the lutjanid fish, Lutjanus bengalensis (Lutjanidae) collected from Muscat City coast on the Sea of Oman*. Journal of the Black Sea/Mediterranean Environment, **17** (2): 116–126.

JAWAD L., AL - MAMRY J., AL - BUSAİDİ H., 2011b, *Relationships between fish length and otolith length, width and weight of the Indian Mackerel Rastrelliger kanagurta (Cuvier, 1817) collected from Sea of Oman.* Ribarstvo, **69** (2): 51–61.

MAT - PİAH R., KAMARUDDİN S. A., ABDUL-KADİR N. H., AMBAK M. A., 2017, *Relationship between otolith measurements with the size of Areolate grouper, Epinephelus areolatus in Terengganu Waters, Malaysia*. Journal of Fisheries and Aquatic Science, **12** (2): 90–94.

NASRİ M., KEİVANY Y., DORAFSHAN S., 2010, *First karyological analysis of smallmouth lotak, Cyprinion kais* Heckel, 1843*, an endemic Cyprinid fish from the Tigris-Euphrates Basin*. Italian Journal of Zoology, **77** (3): 272–276.

ROSS R. M., JOHNSON J. H., ADAMS C. M., 2005, *Use of fish-otolith-length regressions to infer size of double-crested cormorant prey fish from recovered otoliths in Lake Ontario*. Northeastern Naturalist, **12** (2): 133–140.

ŞEN D., AYDİN R., ÇALTA M., 2001, *Relationships between fish length and otolith length in the population of Capoeta capeta umbla (*Heckel, 1843*) inhabiting Hazar Lake, Elazig, Turkey*. Archives of Polish Fisheries, **9** (2): 267–272.

YILMAZ S., YAZİCİOGLU O., SAYGİN S., POLAT N., 2014, *Relationships of otolith dimensions with body length of european perch, Perca fluviatilis L., 1758 from Lake Ladik, Turkey*. Pakistan Journal of Zoology, **46** (5): 1231–1238.

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