



RESEARCH PAPER

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Occurrence of cyprinid fish, *Carasobarbus sublimus* in the Al-Diwaniya River, Middle Euphrates, Iraq

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Abstract

During a fish survey from 2016 to 2017, we captured 83 specimens of the cyprinid fish, *Carasobarbus sublimus* from the Al-Diwaniya River, Middle Euphrates, Iraq. This is the first report of the occurrence of this species in this locality. Fish were captured by gill nets and electro-fishing equipment. Twenty two morphometric and eleven meristic measurements were applied to describe the species. The range of total length in the present specimens (130.4-250.1mm) is larger than the range quoted for *C. sublimus*. The indices characters to standard length (SL) varied from 7.4 % to 121.0 %, and the head characters to head length (HL) from 27.4% to 93.2%. The growth rate between body characters and SL varied from 0.085 to 1.118 and between head characters and HL from 0.210 to 1.091. The numbers of scales in lateral line and around the least circumference of the caudal peduncle are 27-29 and 12, respectively. The biometric data were successful in identifying of *C. sublimus* and confirm the presence of the species in the Al-Diwaniya River. This is the second record of the species in the Iraqi freshwaters. Based on this finding, the case would be interesting and open to discussion about the distributions of *C. sublimus* in the Tigris-Euphrates basin.

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Introduction

According to Borkenhagen and Krupp (2013), the cyprinid genus *Carasobarbus* Karaman, 1971 (the himri) belong to the family Cyprinidae, subfamily Barbinae are distributed across southwest Asia and northwest Africa. They occur in all major river systems of the Levant, Mesopotamia, southern Iran, western and south-western Arabian Peninsula and in northern Morocco.

Also, Borkenhagen and Krupp (2013) revised and expanded Karaman's (1971) diagnosis of the genus that now contains the nine following species: *Carasobarbus apoensis*, *C. canis*, *C. chantrei*, *C. exulatus*, *C. fritschii*, *C. harterti*, *C. kosswigi*, *C. luteus* and *C. sublimus*.

Three species from the genus, *C. luteus*, *C. kosswigi* and *C. sublimus* have been reported from Iranian waters (Borkenhagen and Krupp, 2013) and *C. chantrei*, *C. kosswigi* and *C. luteus* from Turkish waters (Çiçek *et al.*, 2015), while *C. luteus*, *C. kosswigi* and *C. sublimus* were found in Iraqi waters (Coad, 2010; Mohamed *et al.*, 2017).

C. sublimus was first described and reported by Coad and Najafpour in 1997 from Khuzestan waters, southwestern Iran. *C. sublimus* formerly placed in the genus *Kosswigobarbus* Berg, 1916, but Borkenhagen *et al.* (2011) placed this species in *Carasobarbus*.

Coad and Najafpour (1997) and Esmail *et al.* (2006) have rectified the species by comparing it with *C. kosswigi* and *C. luteus* on the basis of their morphology in Iran, while, Mohamed *et al.* (2017) described and compared *C. sublimus* obtained from the Shatt Al-Arab River for the first time in Iraq with *C. luteus* in Iraqi waters.

During the ichthyofauna survey for the Al-Diwania River (a branch from the Euphrates River, middle of Iraq) during November 2016 - October 2017, several specimens of cyprinid fish, *C. sublimus* have been caught for the first time from south the Daghghara barrier on this river.

The predominant vegetations on the both banks of this locality were reed, *Phragmites australis* and cattail, *Typha domingensis*, whereas hornwort, *Ceratophyllum demersum* was dominant in the deeper areas.

The water temperature of the river varied from 10.2°C in March to 32.8°C in August, dissolved oxygen fluctuated from 5.0mg/l in August to 9.6mg/l in February, salinity values ranged from 0.55‰ in April to 0.79‰ in October (Mohamed and Al-Jubouri, 2017).

So, the purpose of this paper is to describe the morphometric and meristic characters of *C. sublimus* for the first time in the middle of Iraq. Examined specimens had been placed in the fish collection of the Department of Pathology, College of Veterinary Medicine, Al-Qasim Green University, Iraq.

Materials and methods

Study area

AL-Diwaniya River is an extension of the Al-Hilla River which is a branch of Euphrates River at Al-Hindiyah Barrier, in the middle of Iraq.

It is 123 km long, 25-30m wide and 3-5m depth.

The river is the major water resource for the AL-Diwaniya city/Al-Qadidiyah Province, which flows through the city, then narrows in the districts of Sideer and Al-Hamzah and continues to flow until it fades in the district of Al-Rumaythah/Al-Muthanna Province.

During the period from July to September 2017, a number of *C. regium* individuals were caught from site 1, south the Daghghara barrier (Fig. 1) along with the specimens of other fish species during the ichthyofauna survey for the Al-Diwania River for the period from November 2016 to October 2017 (Mohamed and Al-Jubouri, 2017).



Fig. 1. Map of Al-Qadisiyah Province showing the collection site of *C. sublimus* in Al-Diwaniya River.

Fish collection

Fish were captured by gill nets (25m long with 20x20, 30x30 and 50x50mm mesh sizes) and electro-fishing equipment (provides 150-300V). Fish were immediately preserved in ice box till arrive the Al-Qasim Green University. All fish specimens were measured and examined at the laboratory of the Department of Pathology, College of Veterinary Medicine, Al-Qasim Green University, Iraq.

Biometric analysis

In the laboratory, eight specimens of *C. sublimus* were used for the morphological study after distinguished them from *C. luteus* follows Coad and Najafpour (1997), Borkenhagen and Krupp (2013) and Mohamed *et al.* (2017). Twenty two morphometric and eleven meristic characters were recorded according to Coad and Najafpour (1997) and Borkenhagen and Krupp (2013). Total, standard and fork lengths of the specimens were measured to the nearest 1.0 mm using a measuring board. Other morphometric measurements were carried out with digital caliper to the nearest 0.1mm. Names of morphometric and meristic characters are shown in Tables 1 and 2. Linear regression relationship and coefficient of correlation were calculated to determine

the strength of relationship between standard length (SL) and all morphometric characters, and between head length and certain dimensions in the head. The various statistical values, correlation coefficients and regression analysis were made using Microsoft Office Excel 2010 version.

Results

Description

Overall body shape can be seen in Figure 2. The body is relatively deep and compressed without a nuchal hump. The color of live specimen is orange to brownish on sides and belly with back olive-green. The pectoral and pelvic fins are faint brown and the anal and caudal fins are dark olive-green. *C. sublimus* can be diagnosed by the shape of the mouth (Fig. 3). The mouth is inferior and small, the lips are thick and the lower jaw is speculate with a horny sheath and a median lobe on the lower lip. Two pairs of well-developed barbells, the posterior barbell is longer and thicker than the anterior barbell. The eyes are nearer to the opercle than the mouth. Scales are large sized, cycloid and regularly arranged over the whole body. Lateral line is closer to the belly than the back, but median in caudal peduncle. The dorsal fin origin lies over the pelvic fin origin.

Table 1. Morphometric characters of *C. sublimus* collected from Al-Diwaniya River.

Morphometric characters	Range	Mean (± SD)
Total length (mm TL)	130.4-250.1	199.1 (35.4)
Standard length (mm SL)	115.6-212.5	164.7 (29.8)
Fork length (mm FL)	125.3-234.0	176.7 (34.3)
Related characters in % of SL		
Total length (TL)	107.9-129.3	121.0 (7.8)
Fork length (FL)	92.1-111.6	107.3 (6.3)
Body depth (BD)	31.1-34.9	33.5 (1.3)
Body width (BW)	13.0-17.7	15.7 (1.8)
Head length (HL)	22.8-27.2	24.7 (1.4)
Predorsal length (PDFL)	48.1-55.5	51.1 (2.2)
Dorsal fin base length (DFBL)	15.5-18.8	17.2 (1.0)
Dorsal fin length (DFL)	16.4-24.9	19.5 (2.8)
Anal fin length (AFL)	15.9-20.1	18.3 (1.6)
Anal fin base length (AFBL)	6.0-8.7	7.4 (1.0)
Pectoral fin length (PFL)	16.4-21.8	20.0 (1.6)
Ventral fin length (VFL)	15.4-19.1	17.6 (1.3)
Caudal peduncle length (CPL)	15.1-19.9	18.2 (1.8)
Caudal peduncle depth (CPD)	10.6-13.4	11.9 (1.0)
Related characters in % of HL		
Head depth (HD)	78.1-103.9	93.2 (7.9)
Head width (HW)	51.7-69.3	60.5 (5.6)
Snout length (SNL)	26.7-32.7	29.0 (2.3)
Interorbital distance (ID)	39.0-45.1	42.5 (2.0)
Orbital (Eye) diameter (ED)	24.3-31.1	27.4 (1.9)
Upper jaw length (UJL)	25.5-33.4	28.2 (2.8)

The dorsal fin is slightly too strongly concave on its margin. The pectoral fin margin is concave. The pelvic fin has a straight to rounded posterior margin.

The caudal fin is deeply forked with the lower lobe more developed and with longer rays than upper lobe. The anal fin reaches or obviously passes the base of the caudal fin rays.

Table 2. Comparison of biometric characteristics of *C. sublimus* from the Al-Diwania River with other studies.

Biometric characters	Present study	Mohamed <i>et al.</i> (2017)	Esmaeili <i>et al.</i> (2006)	Borkenh-agen & Krupp (2013)	Coad & Najafpour (1997)
Body depth in % of SL	31.1-34.9 (33.5)	31.2-34.7 (32.6)		27.9-33.4 (30.6)	28.6-30.3
Head length in % of SL	22.8-27.2 (24.7)	22.4-28.8 (24.9)		25.2-30.1 (27.7)	
Predorsal length (PDFL) in % SL	48.1-55.5 (51.1)	50.1-53.5 (52.1)		49.1-57.0 (52.5)	
Caudal peduncle depth CPD in % of SL	10.6-13.4 (11.9)	11.4-12.1 (11.8)		11.8-13.8 (12.8)	
Number of scales in lateral line	27-29	27-29	24-28	27-29	24-27
Number of scales above lateral line	4-5	4.5-4.5	-	4.5-5.5	4-5
Number of scales below lateral line	3-5	4-5	-	3.5-5.5	4-5
Number of scales in caudal peduncle	12-12	12-12		12-12	
Number of branched dorsal fin rays	9-10	9-10	11	9-10	10-11
Number of spiny rays in dorsal fin	3-3	3-3	3-3	4	
Number of branched pectoral fin rays	16-16	16-16	16-18		14-15
Number of branched ventral fin rays	9-9	9-9	9.4		8
Number of branched anal fin rays	6-7	7-7	6-8	6-6	6
Number of spiny rays in anal fin	3-3	3-3	3-3	3	
Number of gill rakers	10-13	10-13	10-12		10-12, 15
Number of pharyngeal teeth	2.3.4-5.3.1, 2.3.4-5.3.2, 2.3.5-5.3.1, 2.3.5-5.3.2,	2.3.4-5.3.2, 2.3.5-5.3.2, 2.3.4-5.3.2, 2.3.4-5.3.1	-	2.3.4-5.3.2, 2.3.4-5.3.1 or 3.3.4-4.3.3	2.3.5-4.3.2, 1.3.5-4.3.2, 3.3.4-4.3.2

Morphometric characters

A total of eight specimens of *C. sublimus* with length range of 115.6-212.5 mm in standard length (SL) were measured in the present study. Nineteen morphometric characters were calculated as numerical ratio to standard and head lengths (Table 1).

The indices characters to standard length varied from 7.4 % of anal fin base length to 121.0 % of total length. However, the ratio of body depth (33.5%) was greater than the ratio of body width (15.7%). The indices characters of head depth, head width, snout length, eye diameter, interorbital width and upper jaw length

with head length ranged from 27.4% of eye diameter to 93.2% of head depth (Table 1).

The results of the relationship between all morphometric characters against standard length of *C. sublimus* are shown in Figure 4. The analysis of the relation revealed that the highest value of slop (b) with total length ($b= 1.118$) and lowest value with anal fin base length ($b= 0.085$). However, the relation with total length, fork length and predorsal fin length showed high growth rate, while anal fin base length and caudal peduncle depth indicated very slow growth rate.



Fig. 2. *C. sublimus* captured from Al-Diwaniya River (Fish, 217 mm TL).

The values of correlation coefficient obtained were found to be highly significant (when $r > 0.90$) with body depth, predorsal fin length, head length, body width and ventral fin length and significant correlations (when $r < 0.90$) were observed for other morphometric characters of *C. sublimus* (Fig. 4).

Figure 5 showed the relation between head length of *C. sublimus* and certain dimensions in the head. The values of regression slop (b) for the relation varied from 0.210 for eye diameter to 1.091 for head depth. The relation with head depth and head width showed

high growth rate, while snout length and eye diameter indicated slow growth rate. Also, the analysis of the relation between head length and other head characters revealed the correlation values ranged from 0.740 for snout length to 0.956 for head width (Fig. 5).

Meristics characters

The meristic characters data of *C. sublimus* with length range of 115.6-212.5 mm in standard length were presented in Table 2. Two pairs of well-developed barbells (Fig. 3A).

The numbers of scales in lateral line, above and below lateral line are 27-29, 4-5 and 3-5, respectively. The number of scales around the least circumference of

the caudal peduncle is 12. The dorsal fin rays are 3, 9-10, pectoral fin rays 16, ventral fin rays 9 and anal fin rays 3, 6-7.

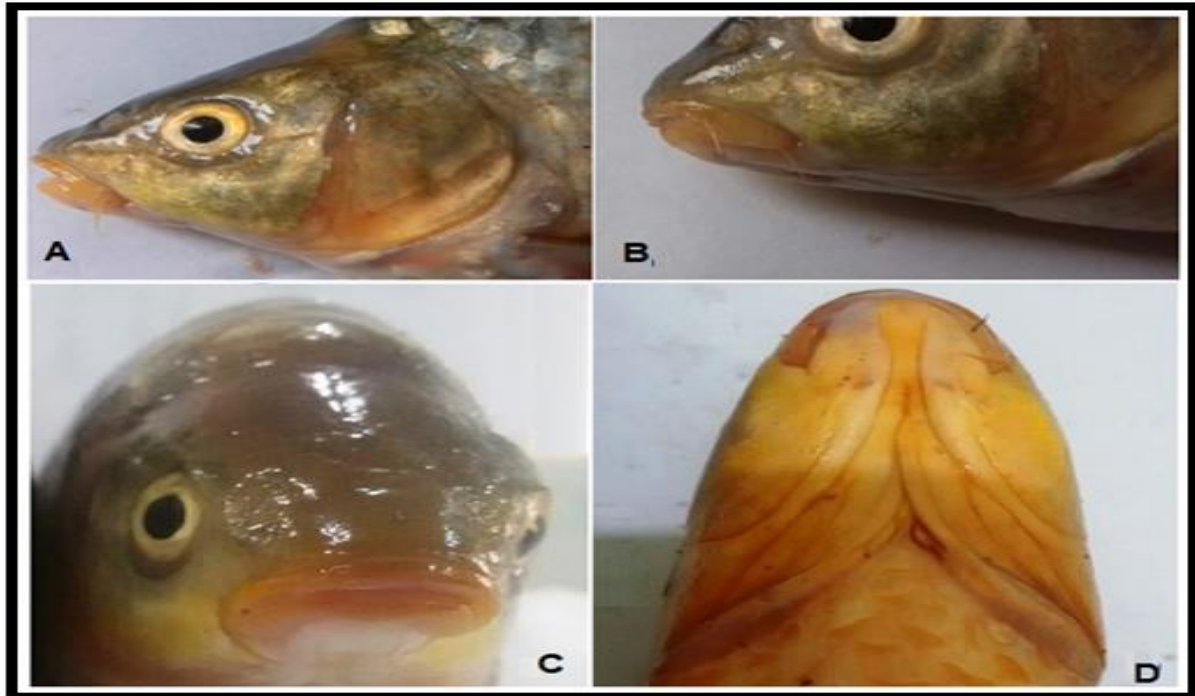


Fig. 3. Front, side and ventral views of the head of *C. sublimus* (Fish, 250 mm TL).

The number of gill rakers is 10-13 and the pharyngeal teeth count is 2.3.4-5.3.1, 2.3.4-5.3.2 or 3.3.5-5.3.1, 3.3.5-5.3.2 (Fig. 6).

Discussion

C. sublimus was previously recorded for the first time in the Iraqi waters by Mohamed *et al.* (2017) from the Shatt Al-Arab River, southern of Iraq. They got seven specimens of this species on February 2016 from the upper reaches of the River at Dair City, 60 km south of Qurna City, where the Tigris and Euphrates Rivers merged. They concluded that the species had spread or moved from Iranian waters adjacent to the Iraqi border to the Shatt Al-Arab River.

After this discrimination of the species from *C. luteus*, hundreds of individuals from *C. sublimus* were caught, 673 fish, i.e. 2.5% from the fish assemblage in the upper reaches of the Shatt Al-Arab River or about 0.71% from the total fish assemblage in the river (Mohamed and Abood, 2017).

Again several individuals (83 fish, i.e. 0.63% of total fish collection) were caught from the Al-Diwaniya River, in the middle of Iraq (Mohamed and Al-Jubouri, 2017). The description of these individuals has been based on a series of morphometric and meristic characters in a multivariate analysis during the present study. These characters of the individuals agree with the description of *C. sublimus* given by Coad and Najafpour (1997), Esmaeili *et al.* (2006), Borkenhagen and Krupp (2013) and Mohamed *et al.* (2017). Such agreement indicated that these specimens are *C. sublimus*.

On the other hand, Coad (2010) stated that *C. kosswigi* reported from Haditha in Iraq on the Euphrates River in October 1953, and it may be more common but has not always been recognized in field samples or museum collections.

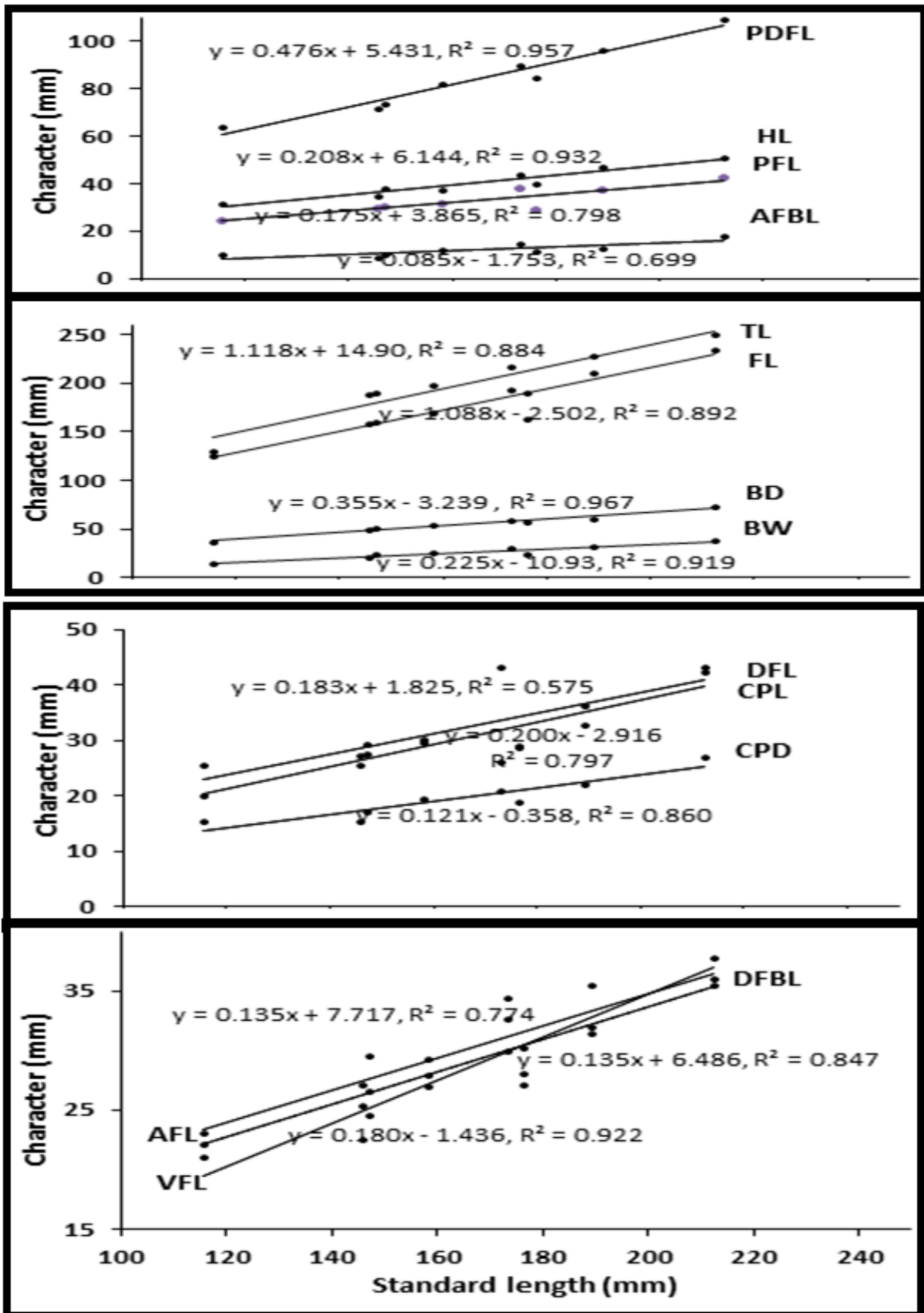


Fig. 4. The relationships between morphometric characters against standard length of *C. sublimus* in Al-Diwaniya River.

Haditha on the Euphrates River is approximately 350 km north the Al-Hindiyah Barrier where Al-Hilla River and then Al-Diwaniya River branches from the Euphrates River. *C. kosswigi* is distinguished from *C. sublimus* by having 32 to 38 scales in the lateral line

vs. 27 to 29 and usually 14 to 16 scales around the least circumference of the caudal peduncle vs. 12, and the maximum length of *C. kosswigi* is about 150 mm SL (Borkenhagen and Krupp, 2013).

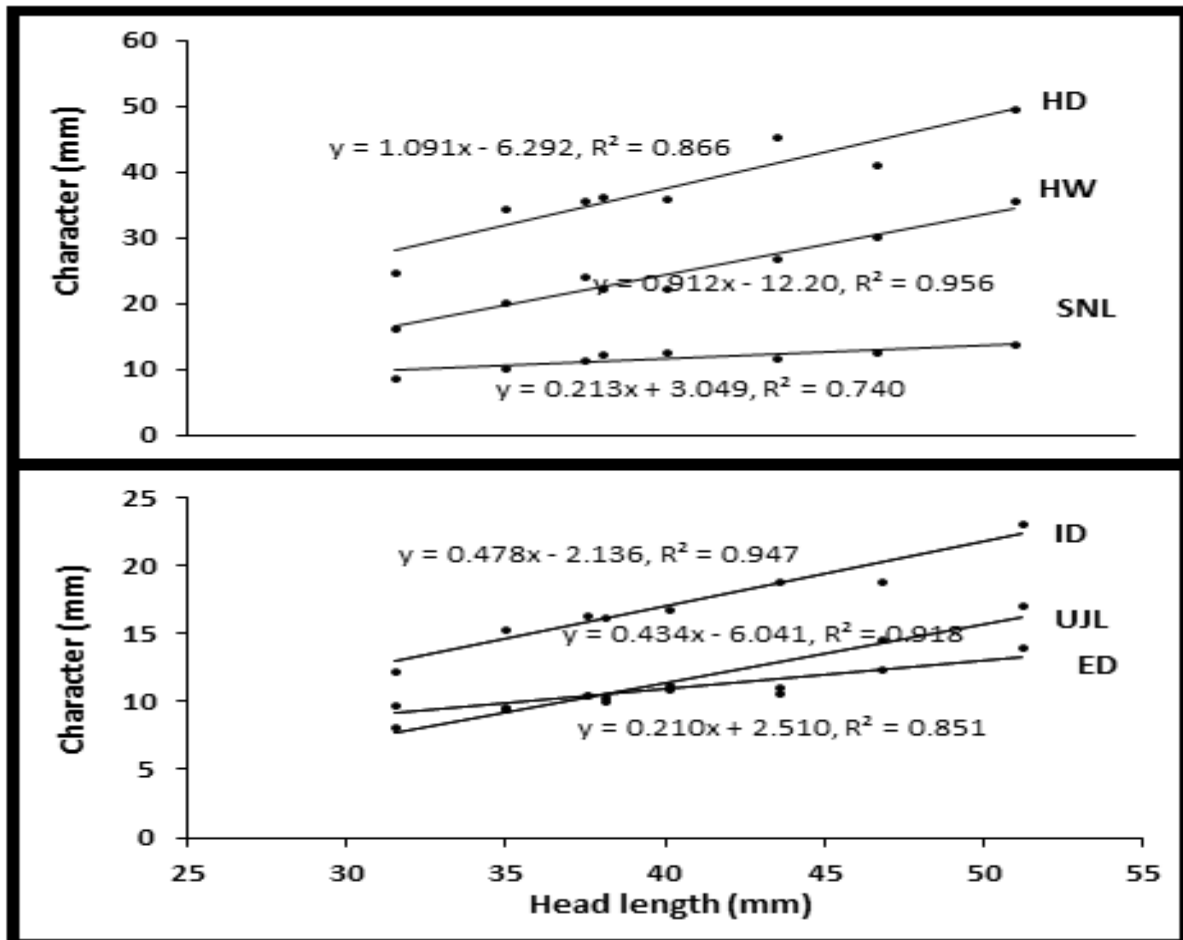


Fig. 5. The relationships between head characters against head length of *C. sublimus* in Al-Diwaniya River.

The size of the specimens obtained in the present study (130.4-250.1 mm TL, 115.6-212.5 mm SL) is larger than the ranges of the total length of *C. sublimus* obtained from other waters. Mohamed *et al.* (2017) reported a range of 119–170 mm TL (95–140 mm SL) for specimens of *C. sublimus* obtained from the Shatt Al-Arab River.

However, the biggest specimen of *C. sublimus* from Khuzestan waters in Iran was 115.0 mm SL (Coad and Najafpour, 1997). This makes the largest specimen attained a new record size for this species. All the morphometric characters of *C. sublimus* in the

present study show high values of linear correlation with standard length or with head length, indicating that the growth of fish in one area of the body is correlated to growth in another area of the body. Similar linear relationship was also reported by Jaiswar *et al.* (2004), Saroniya *et al.* (2013) and Mohamed *et al.* (2016) in various fish species.

From the past, some local fishermen in the south of Iraq (personal information) were distinguishing between two types of himri, *C. luteus* and the other was called them Al-Aroosa (the bride) in the local name due to the orange color of its lips (Fig. 3C), which may be referred to *C. sublimus* fish.



Fig. 6. Pharyngeal bone of *C. sublimus* (Fish, 217 mm TL).

If we consider the question of whether the population of *C. sublimus* was already there in Iraqi waters before but were not captured in the previous studies, may be due to inadequate sampling techniques or misidentified fish species by some researchers and consider them as one species (*C. luteus*). Subsequently, if this population of the species has appeared in the Shatt Al-Arab River (southern of Iraq) previously and now in the Al-Diwaniya River (middle of Iraq), the case would be interesting and open to discussion about the distributions of *C. sublimus* in the Tigris-Euphrates basin.

Conclusions

The results showed that the biometric data were successful in identifying of *C. sublimus* and confirm the presence of the species in the Al-Diwaniya River. This is the second record of this species in the Iraqi freshwaters. Based on this finding, the case would be interesting and open to discussion about the distributions of *C. sublimus* in the Tigris-Euphrates basin.

References

Borkenhagen K, and Krupp F. 2013. Taxonomic Revision of the Genus *Carasobarbus* Karaman, 1971 (Actinopterygii, Cyprinidae). *ZooKeys* **339**, 1-53. <http://dx.doi.org/10.3897/zookeys.339.4903>

Borkenhagen K, Esmaceli HR, Mohsenzadeh S, Shahryari F, Gholamifard A. 2011. The molecular systematics of the *Carasobarbus* species from Iran and adjacent areas, with comments on *Carasobarbus albus* (Heckel, 1843). *Environmental Biology of Fishes* **91(3)**, 327-335.

<http://dx.doi.org/10.1007/s10641-011-9787-1>

Çiçek E, Birecikligil SS, Fricke R. 2015. Freshwater fishes of Turkey: a revised and updated annotated checklist. *Biharean Biologist* **9(2)**, 141-157. <http://biozoojournals.ro/bihbiol/index.html>

Coad BW, Najafpour N. 1997. *Barbus sublimus*, a new species of cyprinid fish from Khuzestan Province, Iran. *Ichthyological Exploration of Freshwaters* **7(3)**, 273-278.

Coad BW. 2010. *Freshwater Fishes of Iraq*. Pensoft Ser. Faunist. Moscow: Pensoft Publishers.

Esmaceli HR, Teimori A, Gholami Z, Hosseinie F. 2006. Range extension of *Barbus sublimus* Coad and Najafpour, 1997 (Actinopterygii: Cyprinidae) and Its Sympatric Species in Southwest of Iran. *Iranian Journal of Animal Biosystematics* **2**, 19-24.

Jaiswar AK, Parida PK, Chakraborty SK, Palaniswamy R. 2004. Morphometry and length weight relationship of obtuse barracuda *Sphyraena obtusata* (Cuvier) (Teleostomi/ Actinopterygii/ Sphyraenidae) from Bombay waters, west coast of India. *Indian Journal of Marine Sciences* **33(3)**, 307-309.

Mohamed ARM, Abood AN. 2016. Occurrence of the King Nase, *Chondrostoma regium* (Heckel, 1843) in the Shatt Al-Arab River, Iraq. *IOSR Journal of Agriculture and Veterinary Science* **9(8)**, 85-89. <http://dx.doi.org/10.9790/2380-0908018589>

Mohamed ARM, Abood AN. 2017. Compositional change in fish assemblage structure in the Shatt Al-Arab River, Iraq. *Asian Journal of Applied Sciences* **5(5)**, 944-958.

Mohamed ARM, Al-Jubouri MOA. 2017. Fish assemblage structure in Al-Diwaniya River, middle of Iraq. Asian Journal of Natural and Applied Sciences, **6(4)**: 10-20.

Mohamed ARM, Abood AN, Jawad LA. 2017. Presence of *Carasobarbus sublimus* (Coad & Najafpour, 1997) in the upper reaches of Shatt al-Arab River, Basrah, Iraq. Zoology and Ecology **27(1)**, 30-34.
<http://dx.doi.org/10.1080/21658005.2016.1272833>

Saroniya RK, Saksena DN, Nagpure NS. 2013. The morphometric and meristic analysis of some *Puntius* species from central India. Biolife **1(4)**, 144-154.