# Morphometric and meristic comparison between two similar species of *Luciobarbus barbulus* (Heckel, 1847) and *Luciobarbus pectoralis* (Heckel, 1843)

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## Introduction

The two species, *Luciobarbus barbulus* (Heckel, 1847) and *Luciobarbus pectoralis* (Heckel, 1843) are similar to each other and some researchers get confused and mistake one for the other. During a one year seasonal sampling, 79 specimens were collected from the main rivers of west and southwest of Iran in the Tigris River basin using electrofishing as the main method for sampling. Samples were fixed in 10% formalin and transferred to the laboratory, Then 24 morphometric and meristic parameters as well as 11 ratios of the major parameters between the two species were studied. According to the results of this study in addition to similarities there are ten differences between them, with the most important ones being the shape of the head and lips, number of gill rakers and number of pectoral fin branched rays.

The Tigris River basin has a catchment area of 240,000 $km^2$.The major rivers are Karoon (890 km), Karkheh (765 km), Dez (515 km), Zohreh (490 km), Kashkan (255 km) and Gamasiab (170 km ) (Afshin,1994). The main catch composition in the inland waters of Iran includes cyprinids with species of the genus *Lucio barbus* contributing a large proportion (Coad, 2016). *L. barbulus* and *L.pectoralis* have economic values and local people catch and use them as food. In recent years their stock has reduced. The important reasons for the decline of some fish species are; overfishing, deterioration of their spawning grounds and restrictions in their habitats (Ramin and Doustdar, 2012). Due to the lack of complete information about the species

*Lucio barbus* and its geographic variation, the taxonomy of this species is not stable, and there are some changes to the taxonomic opinions. Taxonomic experiences is very important for the evaluation of taxonomic characters. There are similarities between some species of *Lucio barbus* including *L. pectoralis* and *L. barbulus*, *L.capito* and *L.brachycephalus*, *L.plebejus* and *L.lacerta*. Different authors have identified two species of *B.barbulus* and *B.pectoralis* as *B.mystaceus*, *B.rajanorum* and *B.capito*. Due to the similarities, an attempt was made to compare the two species and identify the differences between them.

**Materials and methods**

A research project on freshwater fishes of Iran was carried out from 2010 to 2014. As a part of that project during a one year seasonal sampling in 2013, 79 specimens of *L. barbulus* and *L. pectoralis* were obtained from the major rivers of the Tigris River basin. Electrofishing was used as the main method for sampling (Nielsen and Johnson, 1992; Zalewski, 1986). Specimens were preserved in 10% of formalin and transported to the laboratory for further biological measurements. Fishes were identified based on morphologic and meristic characters. 24 morphometric and meristic factors, as well as 11 ratios of these two species were studied. The various morphometric and meristic data were registered in Excel sheet and statistically analyzed by using the SPSS software.

**Results and discussion**

*Luciobarbus barbulus* (Heckel, 1847)
DIV/8; AII/6; LL50-56
Common name: Orontes barbel
Local names: Berzeme lab pahn, dolenj, bezmahi, Zardmahi and chaharsool

The shape of the body is elongated, the inferior mouth is moderate with thick lips and with or without a median lower lip lobe. Barbels are thick, the anterior barbel may reach to the anterior eye margin and the posterior one may reach to the posterior eye margin. The body is without any spots. The number of lateral line scales is usually 50- 56. The number of scales between the anterior dorsal fin base and the lateral line is 9-10 and the number of scales between anterior anal fin base and lateral line is 5- 7. Dorsal fin has 4 unbranched rays followed by 8-9 branched rays and the anal fin with 2 unbranched rays followed by 6 branched rays. The pectoral fin has 15-16 branched rays, and the pelvic fin has 7-9 branched rays. The last dorsal fin spine is very strong with 23- 32 denticles. Gillrakers number14- 21, and total vertebrae 40. Pharyngeal teeth 2.3.4 - 4.3.2 (Table 1).

**Table1: Different ratios of some biometric data in *Luciobarbus barbulus.***

| | N | Min | Max | Average | S.D |
|---|---|---|---|---|---|
| T.L/H.L | 37 | 3.97 | 5.40 | 4.60 | 0.34 |
| T.L/Body.D | 37 | 3.82 | 5.63 | 4.73 | 0.51 |
| T.L/Pc.L | 37 | 5.96 | 7.43 | 6.45 | 0.46 |
| H.L/Snout.L | 37 | 2.21 | 3.15 | 2.69 | 0.25 |
| H.L/D.Spine.L | 35 | 0.98 | 2.07 | 1.33 | 0.24 |
| A.L/D.Spine.L | 35 | 0.74 | 1.43 | 0.93 | 0.15 |
| H.L/Eye.D | 37 | 4.20 | 6.89 | 5.26 | 0.61 |
| H.L/BarbL1 | 37 | 3.09 | 5.25 | 4.24 | 0.61 |
| H.L/BarbL2 | 37 | 2.62 | 4.20 | 3.51 | 0.52 |
| A.L/D.L | 37 | 0.57 | 0.82 | 0.72 | 0.05 |
| A.L/Body.D | 37 | 0.59 | 0.89 | 0.72 | 0.08 |

*Luciobarbus pectoralis* (Heckel,1843)
DIV/8; AII/6; LL54-58
Common name: Orontes barbel
Local names: Berzem, Nabbash and Dolenj

Body is elongated and head is rather snaggy. The mouth is without median lower lip lobe. Two pairs of barbels are thick and long. The anterior barbels reach the anterior eye margin and the posterior ones reach the posterior eye margin. Body is without any spots. Lateral line scales number 54-58. The number of scales between the anterior dorsal fin base and lateral line is 9-10 and the number of scales between the anterior anal fin base and lateral line is 6-7. Dorsal fin with 4 unbranched rays followed by 8 branched rays and anal fin with 2 unbranched rays followed by6 branched rays. Pectoral fin with 18-19 branched rays and the pelvic fin with 9 branched rays. The last dorsal fin spine is very strong with 29- 39 strong denticles. Gill rakers number 17-19.Total vertebrae 42- 43. Pharyngeal teeth 2.3.4- 4.3.2 or 2.3.5- 5.3.2 (Table 2).

Karaman placed *B. barbulus* in the synonym of *B. rajanorum*. Other authors consider it to be *B. pectoralis* (Coad, 2016). Almaca (1983) considered *B.barbulus* as a subspecies of *B. mystaceus*.The average ratio of T.L/H.L of *L. barbulus* in the current study was 4.6.

**Table 2: Different ratios of some biometric data in *Luciobarbus pectoralis***

| | N | Min | Max | Average | S.D |
|---|---|---|---|---|---|
| T.L/H.L | 42 | 4.49 | 5.69 | 5.06 | 0.31 |
| T.L/Body.D | 42 | 3.88 | 6.04 | 4.71 | 0.52 |
| T.L/Pc.L | 42 | 5.64 | 8.04 | 6.62 | 0.61 |
| H.L/Snout.L | 42 | 2.16 | 2.86 | 2.59 | 0.20 |
| H.L/D.Spine.L | 41 | 0.86 | 1.31 | 1.01 | 0.10 |
| A.L/D.Spine.L | 41 | 0.61 | 1/00 | 0/74 | 0.09 |
| H.L/Eye.D | 42 | 4.33 | 8.50 | 6.12 | 0.97 |
| H.L/BarbL1 | 42 | 3.22 | 6.00 | 4.37 | 0.83 |
| H.L/BarbL2 | 42 | 2.64 | 4.54 | 3.52 | 0.51 |
| A.L/D.L | 42 | 0.52 | 0.81 | 0.64 | 0.07 |
| A.L/Body.D | 42 | 0.52 | 1/00 | 0.69 | 0.12 |

According to Almaca (1986), it was 4.8; Najafpour (1996) reported it as 5; Abdoli and Kiabi (1998) as 4.7; Eizadi (2002) as 4.2 and Valiollahi (1999) as 4.1.The average ratio of T.L/Body. D in the present study was 4.7. It was 4.6 according to Almaca (1990), 4.6 according to Eizadi (2002), and 5.1 based on Valioallahi (1999). The average ratio of T.L/ Pc. L in the present study was 6.4. According to Almaca (1991) it was 6.1 and 6.6 based on Najafpour (1996).The average ratio of H.L/Snout. L in the present study was 2.7. According to Abdoli and Kiabi (1998), it was 2.8. Karaman placed *B. pectoralis* as a subspecies of *B. capito* (Almaca, 1986). Heckel's *B. mystaceus* is most probably either *B. barbulus* or *B. pectoralis* (Coad, 2016). Krupp places *B. barbulus* and Heckel's *L. Mystaceus* under *B. Pecctoralis* (Coad, 2016).

The average ratio of T.L/ H.L of *L.pectoralis* in this study was 5. According to Almaca (1986), it was 4.8; 4.9 according to Najafpour (1996), and 4.7 according to Sadeghinejad (2001). The average ratio of T.L/ Body. D in this study was 4.7. According to Almaca (1990), it was 4.9. Sadeghinejad (2001) found it to be 4.9 and Najafpour (1996) reported it as 4.8.The average ratio of T.L/ Pc. L in this study was 6.6. This ratio was 6.1 according to Almaca (1991), 6.3 according to Najafpour (1996) and 6.1 according to Sadeghinejad (2001).

*L. barulus* and *L. pectoralis* have many similarities in appearance so most researchers make a mistake in recognizing them from each other. The similarities between them concern mainly the shape of body, head, mouth and fins, the number of barbels, and number of scales on lateral line, and the orange or yellowish colour of the lower flank, pectoral, pelvic, anal and caudal fins. In Table 3 systematic differentiations of the two species are explained, which will make it easy to recognize each species from the other.

**Table3: Comparing of some factors and ratios in two species of *Luciobarbus barbulus* and *Luciobarbus pectoralis* based on present study**

| *Luciobarbus pectoralis* | *Luciobarbus barbulus* |
|---|---|
| The lips are median | The lips are thick and fleshy |
| The lower lip is without median lobe | The lower lip may have a median lobe |
| Head length is shorter. | Head length is longer |
| T.L/H.L=4.5-5.7 | T.L/H.L=4-5.4 |
| Body depth is lower | Body depth is a little more |
| T.L/B.D=3.9-6 | T.L/B.D=3.8-5.6 |
| Pharyngeal teeth formula is 2.3.4- 4.3.2 or 2.3.5- 5.3.2 | Pharyngeal teeth formula is 2.3.4-4.3.2 |
| Gill rakers number are 17- 19 | Gill rakers number are 14-21 |
| Total vertebrae are 42-43 | Total vertebrae are 40 |
| Denticles are strong and the number of them are 29-39 | Denticles are weaker and the number of them are 23-32 |
| Lateral line scale number are 54-58 | Lateral line scales number are 50-56 |
| Pectoral fin branched rays are 18-19 | Pectoral fin branched rays are 15-16 |

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