



## STUDY ON FISH SPECIES RECORDED FROM KHAJJJAR LAKE OF CHAMBA DISTRICT, HIMACHAL PRADESH, INDIA

Vikram Singh\* & H. S. Banyal

Department of Biosciences, Himachal Pradesh University, Shimla-171 005, Himachal Pradesh, INDIA

Email ID: proliferate@yahoo.com

### ABSTRACT

*Cyprinus carpio* is an exotic species which originated in European rivers around the Black Sea and the Aegean basin, especially the Danube. During the present study a good population of this species was reported from Khajjiar Lake of district Chamba of Himachal Pradesh (India). It appears to be introduced in the lake as also revealed by the locals. During the course of present study some specimens of two different varieties of *Cyprinus carpio communis* Linnaeus, 1758 (Common Carp) and *Cyprinus carpio specularis* Lacepedes, 1803 (Mirror Carp) have been recorded from the lake.

**KEY WORDS:** Khajjiar Lake, *Cyprinus carpio communis*, *Cyprinus carpio specularis*, exotic fish.

### INTRODUCTION

The living fishes are divided into 4 classes, out of which 2 classes, viz., Chondrichthyes (those with cartilaginous skeleton) and Osteichthyes (those with bony skeleton) are represented in India. Fishes comprises about half the total number of vertebrates. According to one estimate there are 27,977 valid species of fishes under 62 orders, 515 families and 4,494 genera in the world and the eventual number of extant fish species was projected to be close to 32,500 (Nelson, 2006). About 11,952 species or 42.72%, normally live in freshwater lakes and rivers that cover only 1% of the earth's surface and account for a little less than 0.01% of its water. The secondary freshwater species number 12,457 and the remaining 3,568 species are exclusively marine. Jayaram listed 852 freshwater species of fishes under 272 genera, 71 families and 16 orders, including both primary and secondary freshwater fishes from India, Bangladesh, Myanmar, Nepal, Pakistan and Sri Lanka (Jayaram, 1999).

The Indian species represent about 8.9% of the known fish species of the world. Talwar and Jhingram estimated 2,546 species of fish belonging to 969 genera, 254 families and 40 orders in the Indian region (Talwar and Jhingram, 1991). Chondrichthyes are represented by 131 species belonging to 67 genera, 28 families and 10 orders, and Osteichthyes by 2,415 species in 902 genera, 226 families and 30 orders (Barman, 1998). The checklist of Menon (1999) lists 446 primary freshwater species under 33 families and 11 orders from the Indian region alone. Of the primary freshwater species 68% are constituted by the Cyprinoids, 18% by Siluroids and 14% by other groups. Many workers have important contribution in study of fishes in India (Jayaram, 2006; Ponniah and Gopalakrishnan, 2000; Ponniah, and Sarkar, 2000; Day, 1889 a; b; Vishwanath, *et al.*, 2007).

Studies on the fish fauna of Himachal Pradesh have been carried out by various workers among them important contributors are McClelland (1839; 1842), Stenidachner (1867), Hora (1927), Menon (1951, 1954, 1962, 1974, 1987), Bhatnagar (1973), Tilak and Husain (1977), Sharma and Tandon (1990), Mehta (2000), and Dhanze

and Dhanze (2004). Mehta and Uniyal (2005) reported 104 species of fish belonging to 48 genera, 14 families and 8 orders from all 12 districts of Himachal Pradesh. They have recorded maximum number of species i.e. 57 from Sirmour district, followed by 55 from Kangra and 50 from Bilaspur. Minimum number of species (2 species) was from Lahaul and Spiti district. Moreover, Mehta and Sharma (2008) have reported three species of fish from Pin Valley National Park, Lahaul and Spiti of Himachal Pradesh. Study on the hydrological conditions of river Beas and its fish fauna in Kullu Valley has been conducted by Kumar (2010) and revealed the presence of 6 species of fish belonging to 3 orders and 3 families.

### STUDY AREA AND METHODOLOGY

Khajjiar Lake "The Mini Switzerland of Himachal Pradesh" present in the western part of Chamba district of Himachal Pradesh. Khajjiar Lake lies 32° 26' north and 76° 32' east about 6300 feet (1920 meters) above sea level between Chamba and Dalhousie (Fig. 1). The average depth of this lake is stated to be thirteen feet as per district gazetteer. Khajjiar Lake has a clump of reeds and grasses exaggeratedly called an island in it. Fed by slim streams this small lake rests in the centre of large glade of Khajjiar. This glade is greenish in its turf and contains in its centre a small lake having approximate area of 5000 square yards. Khajjiar Lake has thick forest of Kala Top sanctuary surrounding its soft green grass. There is a 'golden' domed temple at the edge of this meadow, dedicated to the deity 'Khajjinag', from whom the area derives its name. Khajjiar Lake is situated in Khajjiar-Kalatoop wild life sanctuary. This small sanctuary lies in the catchments of the Ravi River, located in western part of Chamba District (Fig. 2). It is one of the oldest preserved forests of state (notified on 01.07.1949). Total area of sanctuary is 2,026.89 hectares (20.69 sq. km.). Its mean annual rainfall is 800 mm. Temperature varies from -10° C to 35°C. The climate of Khajjiar summers being mild and winters cold and bitter. It experiences south-western monsoon rains in July-September.



**FIGURE 1:** Over view of Khajjiar Lake



A: *Cyprinus carpio specularis*  
(Common Carp)



B: *Cyprinus carpio communis*  
(Mirror Carp)



C: Population of *Cyprinus carpio*  
**FIGURE 2:** Fish fauna of Khajjiar Lake

Fish fauna of the lake was trapped in the net and photographed for identification. Living specimens after photography were transferred back to the lake. No

specimen was brought to laboratory. Identification of these specimens was based on morphological characters. Related research literature, identifying keys and earlier

records of this species along with their distributional ranges were taken into consideration. The identification was confirmed and authenticated at High Altitude Zoological Regional Station, ZSI, Solan Himachal Pradesh.

## RESULTS & DISCUSSION

A single species of Pisces i.e. *Cyprinus carpio* Linnaeus has been reported from the Khajjiar Lake. It appears to be introduced into the lake as also revealed by the locals. During the course of present study some specimens of two different varieties of *Cyprinus carpio communis* Linnaeus, 1758 (Common Carp) and *Cyprinus carpio specularis* Lacepedes, 1803 (Mirror Carp) have been recorded from the lake.

**Sub-Class:** Actinopterygii

**Order:** Cypriniformes

**Family:** Cyprinidae

This family is commonly known as carp family. It is the largest family of fresh-water fish. Members of this family have oblique mouth which extends from the eyes. They have toothless jaws but pharyngeal teeth are present which helps in chewing. Snout is rounded or triangular in shape. Barbels are present on either side of mouth, and stout spine present on dorsal fin. Body has small and crowded scales.

**Genus :** *Cyprinus* Linnaeus

1758. *Cyprinus* Linnaeus, *Syst. Nat.* 10 ed.: 320

Snout is rounded or triangular in shape. A stout saw-toothed spine in front of the dorsal and anal fins. Lateral line complete, with about 35 scales.

***Cyprinus carpio* Linnaeus, 1758** (Common Carp)

1758. *Cyprinus carpio* Linnaeus, *Syst. Nat.* 10 ed.: 320

**Diagnostic Characters:** Body laterally compressed, moderately elongate and covered with large cycloid scales. Snout blunt, mouth large and inferior. Two pairs of short barbels present on each side of upper jaw. Lips thick, mouth toothless, with the upper jaw slightly protruding. Lateral line complete, with about 35 scales. One long dorsal fin present with 21 soft rays, and a stout saw-toothed spine in front of the dorsal and anal fins. Pectoral fins with 14 rays. Pelvic fins thoracic of 8 rays, originating beneath origin of dorsal fin, one anal fin with 5 branched rays. Colour dark on back and golden on sides. Belly, pectorals and pelvics light-yellow, caudal fin gray with orange shade.

**Distribution:** Found in the rivers and streams, many natural lakes and impoundments, and some farm ponds, throughout India. Elsewhere distributed throughout the continental United States and extends from central Canada to central Mexico. Carp can tolerate a variety of environmental conditions and habitat types which has allowed them to invade such a large geographical area. The natural range of the species is composed of two regions, water bodies of the Ponto-Caspian-Aral basin and basins of the Far East rivers and rivers of south-eastern Asia, from the Amur River in the north to Yunnan (South China) and Burma in the south (Bogutskaya, 1998).

**Habits and Habitat:** Carp prefers water bodies with stagnant and slowly flowing waters. It feeds at temperature above 8-10<sup>0</sup> C, reproduces, as a rule, at temperature above 15<sup>0</sup>C. Feeding is heterotrophic, consumes zooplankton, vegetable and animal detritus, zoobenthos, macrophytes. The food spectrum changes with age depending on food

supply in a water body. Young fish feed on plankton, overgrowing, and colonial green algae. Adults feed more on molluscs and aquatic plants.

Of the two varieties of carp, Mirror Carp, though very similar to Common Carp has been distinguished from the later, by the presence of a irregular, patchy scale pattern, robust body with flakes in the dorsal and lateral part, and large scales resembling mirrors. Earlier this species has been reported from some districts of Himachal Pradesh, including Chamba by Mehta and Uniyal (2005). The common carp originated in European rivers around the Black Sea and the Aegean basin, especially the Danube (Berra 2007; Freyhof and Kottelat, 2008). Prior to human influence the common carp was found in the Black, Caspian and Aral Sea drainages, east into Siberia and China and west as far as the Danube River (Balon, 1995). Common carp has been a popular aquaculture fish for more than 2,000 years (FAO 2010). This condition has resulted in *C. carpio* being the third most frequently introduced species worldwide (Saikia and Das, 2009).

During the present study a very good population of this fish was recorded in this small lake. This lake is highly polluted. An important concern of ecology which was noticed during the present investigation was of stray cattle and cows. These are in huge numbers and can be seen grazing in and around the Khajjiar lake. Population of these stray animals is increasing day by day. This leads to increased addition of faecal matter in the lake which is leading to eutrophication of lake. Due to this heavy silt is accumulating in the lake and water of this lake is becoming unable to sustain this high population of fish. Keeping in mind the eutrophication of the lake, entry of stray and domesticated animals to the Khajjiar meadow should be immediately checked. A barbet wire fencing the lake and meadow will prevent stray animals to the lake. Proper management of horse dung is immediately needed. Proper management of non-biodegradable as well biodegradable wastes like plastic and bottles (plastic and glass) is required.

## ACKNOWLEDGEMENTS

Vikram Singh is grateful to University Grants Commission for providing financial assistance in form of Rajeev Gandhi National Fellowship. Authors are also thankful Director, High Altitude Regional Centre, Zoological Survey of India, Saproon, Solan, Himachal Pradesh for help in identification.

## REFERENCES

- Balon, E.K. (1995) Origin and domestication of the wild carp, *Cyprinus carpio*: From Roman gourmets to the swimming flowers. *Aquaculture*. 129: 3-48.
- Barman, R.P. (1998) Pisces. In: Faunal Diversity in India. Zoological Survey of India, Kolkata, 418-426.
- Berra, T.M. (2007) Freshwater fish distribution. Chicago. The University of Chicago Press, 615 pp.
- Bhatanagar, G.K. (1973) On a collection of fish from Bhakra reservoir, Sutlej river and closely associated waters. *Journal of Inland Fisheries Society of India*. 5: 134-136.

- Day, F. (1889 a) Fishes-I. In: The Fauna of British Indian including Ceylon and Burma. Taylor and Francis Ltd. London, p 548.
- Day, F. (1889 b) Fishes-II. In: The Fauna of British Indian including Ceylon and Burma. Taylor and Francis Ltd. London, p 449.
- Dhanze, R. and Dhanze, J.R. (2004) Fish diversity of Himachal Pradesh. In: Fish diversity in protected habitats. NATCON, Publication, U.P.
- Food and Agriculture Organization (2010) The State of World Fisheries and Aquaculture (SOFIA) FAO Fisheries and Aquaculture Department Food and Agriculture Organization of the United Nations Rome, Italy.
- Freyhof, J. and Kottelat, M. (2008) *Cyprinus carpio*. In: IUCN 2010. IUCN Red List of Threatened Species. Version 2010.4.
- Hora, S.L. (1927) On a peculiar fishing implement from Kangra Valley, Punjab. *Journal and Proceedings of Asiatic Society of Bengal*. 22: 81-84.
- Jayaram, K. C. (1999) The fresh water fishes of the Indian region. Narendra Publishing House, Delhi, p 551.
- Jayaram, K.C. (2006) The Catfishes of India. Narendra Publishing House, New Delhi, p 383.
- Kumar, A. (2010) Hydrological conditions of River Beas and its fish fauna in Kullu Valley, Himachal Pradesh, India. *Environment Conservation Journal*. 11: 7-10.
- McClelland, J. (1839) Indian Cyprinidae. *Asiatic Research*. 19: 262-450.
- McClelland, J. (1842) On the freshwater fishes collection by William Griffith. Calcutta *Journal of Natural History*. 2: 560-589.
- Mehta, H. S. and Sharma, I. (2008) Pisces. In: Fauna of Pin Valley National Park. Zoological survey of India publication, Kolkata, 34: 75-84.
- Mehta, H.S. and Uniyal, D.P. (2005) Pisces. In: Fauna of Western Himalaya (Part 2). Zoological Survey of India, Kolkata, 255-268.
- Mehta, H.S. (2000) Pisces. In: Fauna of Renuka Wetland. Zoological Survey of India, Kolkata, 141-149.
- Menon, A.G.K. (1954) Fish geography of Himalayas. *Proceedings of the national institute of sciences, India*. 20, 467-493.
- Menon, A.G.K. (1951) Note on fishes in the Indian Museum. XLVII. On two new species of the genus *Nemachilus* from Kangra Valley, Punjab. *Indian Museum of science*, 49: 227-230.
- Menon, A.G.K. (1962) A distribution list of fishes of the Himalayas. *Journal of Zoological Society of India*. 14: 23-32.
- Menon, A.G.K. (1974) A checklist of fishes of the Himalayan and the Indo-Gangetic plains. Special publication no. 1. Inland Fisheries Society of India, Barrackpore, India, p 136.
- Menon, A.G.K. (1987) Pisces, 4 (I). In: Fauna of India and the Adjacent Countries. Zoological Survey of India, Kolkata, p 259.
- Menon, A.G.K. (1999) Checklist of freshwater fishes of India. *Records of Zoological Survey of India*. 175: 366.
- Nelson, J.S. (2006) Fishes of the World. Fourth Edition, John Wiley and Sons, Inc., 1- 601.
- Ponniah, A.G. and Gopalakrishnan, A (2000) Endemic Fish Diversity of the Western Ghats. NBFGR- NATP Publication, 1: 1-347.
- Ponniah, A.G. and Sarkar, U.K. (2000) Fish Biodiversity of North-East India. NBFGR- NATP Publication, 2: 1-228.
- Saikia S.K. and Das, D.N. (2009) Feeding ecology of common carp (*Cyprinus carpio* L.) in a rice-fish culture system of the Apatani plateau (Arunachal Pradesh, India). *Aquatic Ecology*. 43 559-568.
- Sharma, V.K. and Tandon, K.K. (1990) The fish and fisheries of Himachal Pradesh state of India. *Publication of Fish Bulletin*. 14: 41-46.
- Stenidachner, F. (1867) Ichthyologische Notizen. IV. Sitzungsberichte der Konigl Akademie der Wissenschaften zu Munchen, 55: 517-534.
- Talwar, P.K. and Jhingram, A.G. (1991) Inland fishes of India and adjacent countries. Oxford publication, New Delhi, 1-2: 1-1158.
- Tilak, R. and Husain, H. (1977) A checklist of fishes of Himachal Pradesh. *Zool. Jb. Syst. Bd*. 104: 265-301.
- Vishwanath, W.; Lakra, W.S. and Sarkar, U.K. (2007) Fishes of North East India. National Bureau of Fish Genetic Resources Publication, 1-264.