NOTES ON FISHES FROM RAJASTHAN, INDIA.

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Introduction.

In 1941 and 1948, the Zoological Survey of India conducted surveys of Rajputana (Rajasthan) to study its fish fauna, particularly of the Aravalli Range. The 1941 collection was made by Drs. B. N. Chopra and M. L. Roonwal and that of 1948 by Mr. K. S. Pradhan. They visited the States of Udaipur, Jodhpur, Sirohi and Palanpur and collected fishes from rivers, streams, waterfalls, tanks and pools. When I started research work in the Department of Zoology, University of Delhi, at the request of Dr. M. L. Bhatia, these fishes were sent to the Department of Zoology by Dr. S. L. Hora, Director, Zoological Survey of India, for my study and training in systematic ichthyology. This paper embodies the results of study of these two collections.

Description of Localities, with lists of Fishes collected from each.

1. *Soorpur ki nadi* (*River Soorpur*), *3 miles from Dungarpur town* (*Dungarpur State*). *26-10-1941.*

Barbus (*Tor*) *khudree* Sykes. *Labeo calbasu* (Ham.).

2. *Tanks and pools around Dungarpur town* (*Dungarpur State*). *28-10-1941.*

Chela clupeoides Bloch.

3. *Rajsamand near Kankroli ; the former is about 20 miles from Mavli Camp. 27-2-1948.*

The water is clear with plenty of aquatic vegetation ; it is more or less stagnant and is about 2 feet deep.

Chela clupeoides Bloch
Rasbora daniconius (Ham.)
Barilius bendelisis Ham.
Barbus (*Tor*) *khudree* Sykes.
Barbus (*Puntius*) *ticto* (Ham.).

4. *River Phulad, about 1 mile south of Phulad Railway Station. 1-3-1948.*

The current of this river is moderately swift flowing over a sandy bottom with small pebbles at certain places ; depth is about one and a half feet, with very little aquatic vegetation.

Esomus danricus (Ham.).
Barbus (*Puntius*) *sophore* Ham.
Garra mullya (Sykes).
Nemachilus denisonii Day.
Rasbora daniconius (Ham.).
Barbus (*Puntius*) *ticto* (Ham.).
Nemachilus botia Ham.
Ophicephalus punctatus Bloch.

5. *River Phulad, about one and a half miles south-east of Phulad Station. 1-3-1948.*

The river has clear water flowing over a bed of stones and pebbles ; no vegetation of any kind and the depth varies from 9 inches to 1 foot.

Rasbora daniconius (Ham.).
Barbus (Puntius) ticto (Ham.).
Garra mullya (Sykes).
Labeo boggut (Sykes).
Nemachilus botia Ham.
Nemachilus denisonii Day.
Mastacembelus armatus (Lacep.).

6. *Pools along the course of Kothian Jharna downward and westward of Pipli Yard. 2-3-1948.*

The pools are with rocky bed, have plenty of vegetation, especially algae, on the stones and the water is clear.

Garra mullya (Sykes).
Nemachilus denisonii Day.

7 *A place 5 yards away from the mouth of a stream issuing at the foot of a hill near Pipli village, about 18 miles east of Phulad. 2-3-1948.*

The stream is of moderately swift current flowing over a bed of stones with comparatively few pebbles and sand ; there is no vegetation and the depth is about one foot.

Nemachilus denisonii Day.

8. *Jogmandi Jharna about 12 miles east of Phulad station. 3-3-1948.*

The place of collection consisted of a shallow pond along the zig-zag course of a stream of rather swift current with very little vegetation.

Garra mullya (Sykes).
Nemachilus denisonii Day.

9. *Trevor Tal, Mount Abu, Sirohi State. 7-3-1948.*

The bottom of this tank is rocky and pebbly. Water is clear with no vegetation. Depth is considerable.

Garra mullya (Sykes).
Nemachilus denisonii Day.

10. *Jag Vilas palace tank, Mount Abu, Sirohi State. 7-3-1948.*

The water of this tank is clear having a depth of about six feet to eight feet. The bottom is rocky with slight mud mixed with sand.

Barbus (Puntius) sophore Ham.
Ophicephalus punctatus Bloch.

11. *A nala near Dilwara temple, Mount Abu, Sirohi State. 7-3-1948.*

This nala is fed by the water of Trevor Tal. Bottom is pebbly, gravelly and sandy with no vegetation. The nala is quite shallow.

Barbus (Puntius) sophore Ham.
Garra mullya (Sykes).
Nemachilus denisonii Day.

12. *Kudra Dam, Mount Abu, Sirohi State. 8-3-1948.*

The water is quite clear with rocky bottom having no aquatic vegetation. Depth is considerable.

Garra mullya (Sykes).

13. *Bendermere lake, Mount, Abu, Sirohi State. 8-3-1948.*

The water of this lake is stagnant and clear on a rocky bottom. Depth is more than 12 feet.

Danio devario (Ham.).
Barbus (Puntius) sophore Ham.

14. *Kudra Nala, Mount Abu, Sirohi State. 9-3-1948.*

This nala is near the Abu Cart Road. The depth varies from nine inches to one and a half feet. The bottom is rocky and pebbly. There are no water weeds, except some algae growing on stones.

Garra mullya (Sykes).

15. *Gora chapra nala, Mount Abu, Sirohi State. 10-3-1948.*

This nala is about 2 miles east of Dak-Bungalow. The bed of this nala is rocky, gravelly and pebbly and at places with plenty of mud mixed with sand.

Danio devario (Ham.).
Garra mullya (Sykes).
Nemachilus denisonii Day.

16. *River Banas near Wadaval (Palanpur State). 12-3-1948.*

This place is about six miles from Deesa Dak-Bungalow. The current of the water is swift, flowing over a sandy bed. The water is clear with no vegetation. Depth varies from 1 foot to 5 feet.

Chela clupeoides Bloch.
Barbus (Puntius) sophore Ham.
Labeo boggut (Sykes).
Glossogobius giuris (Ham.).
Barilius bendelisis Ham.
Labeo boga (Ham.).
Cirrhina reba (Ham.).

17. *River Banas (Near Akhol), about 2 miles from Deesa Dak-Bungalow. 13-3-1948.*

The bottom here is sandy with water weeds at the edge, otherwise the water is clear. The current is swift. Depth is from one and a half feet to two feet.

Chela clupeoides Bloch.
Barilius bendelisis Ham.
Barbus (Puntius) ticto (Ham.).
Labeo boggut (Sykes).
Danio devario (Ham.).
Barbus (Puntius) sarana (Ham.).
Labeo boga (Ham.).
Labeo nigripinnis Day.

18. *Deep-pool at Gakwar, about one mile from Deesa Dak-Bungalow. 14-3-1948.*

The bottom of this pool is sandy ; the water is very clear.

Barbus (Puntius) sarana (Ham.).
Barilius bendelisis Ham.
Labeo boggut (Sykes).

19. *Wadaval (Palanpur State), about 7 miles west of Camp Deesa. 15-3-1948.*

Depth of this varied from three feet to six feet.

Danio devario (Ham.).
Labeo nigripinnis Day.

20. *A stream about 2 miles north of Palanpur guest house. 15-3-1948.*

The current of this stream is rather swift with aquatic vegetation all along its course ; bottom is fairly sandy.

Lepidocephalichthys guntea Ham.
Ophicephalus punctatus Bloch.

21. *Balaram river, about 10 miles from Palanpur. 16-3-1948.*

The current of the river is swift, flowing over a rocky, pebbly and sandy bottom. The water is clear and its depth varied from two feet to eight feet. Aquatic vegetation is only at the edges of the river.

Rasbora daniconius (Ham.).
Barbus (Puntius) amphibius (C. V.).
Cirrhina reba (Ham.).
Lepidocephalichthys guntea (Ham.).
Nemachilus denisonii Day.
Mastacembelus armatus (Lacép.).
Barilius bendelisis Ham.
Barbus (Puntius) ticto (Ham.).
Labeo nigripinnis Day.
Nemachilus botia (Ham.).
Ophicephalus punctatus Bloch.

Systematic list of the species, with their known range of distribution.

Name of species.	Range of distribution.
Family : Cyprinidae.	
Sub-family : *Abramidinae.*	
1. *Chela clupeoides* Bloch . . .	Cutch, Peninsular India Vindhya-Satpura Mountains, Chota-Nagpur and Burma.
Sub-family : *Rasborinae.*	
2. *Barilius bendelisis* Ham. . . .	Throughout India.
3. *Danio devario* (Ham.)	All over Northern India.
4. *Esomus danricus* (Ham.) . . .	Throughout India.
5. *Rasbora daniconius* (Ham.) . . .	Widely distributed in the Oriental Region.
Sub-family : *Cyprininae.*	
6. *Barbus (Puntius) amphibius* (C. V.) .	Ceylon, Peninsular India and the Satpura-Vindhya mountains.
7. *Barbus (Puntius) sarana* (Ham.) .	Ceylon, India, Burma and S. China.
8. *Barbus (Puntius) sophore* Ham. .	India, Burma and S. China.
9. *Barbus (Puntius) ticto* (Ham.) . .	Ceylon, India, Burma and Siam.
10. *Barbus (Tor) khudree* Sykes . . .	Ceylon, Peninsular India and the Satpura-Vindhya Mountains.
11. *Cirrhina reba* (Ham.)	Throughout India.
12. *Garra mullya* (Sykes)	Peninsular India, Satpura-Vindhya mountains and the Chota-Nagpur plateau.
13. *Labeo boga* (Ham.)	Throughout India and Burma.
14. *Labeo boggut* (Sykes)	Peninsular India, Central Provinces (Satpura Vindhyas) and Malaya.
15. *Labeo calbasu* (Ham.)	India and Burma. Also known from China.
16. *Labeo nigripinnis* Day . . .	"Sind hills and rivers at their bases" Day.
Family : *Cobitidae.*	
17. *Lepidocephalichthys guntea* (Ham.) .	Ceylon, India and Burma.
18. *Nemachilus botia* Ham. . . .	Ceylon, India and Burma.
19. *Nemachilus denisonii* Day. . . .	Western-ghat, Satpura-Vindhya trend of mountains and the Chota Nagpur plateau.
Family : *Gobiidae.*	
20. *Glossogobius giuris* (Ham.) . . .	India, Burma and Further East.
Family : *Ophicephalidae.*	
21. *Ophicephalus punctatus* Bloch . .	India, Burma and Malaya.
Family : *Mastacembelidae.*	
22. *Mastacembelus armatus* (Lacép.)	Ceylon, India, Burma and Further East.

Palaeogeographical Observations regarding the Aravalli Hills Based on the Distribution of Fishes.

The fish fauna of Rajasthan, as reported above, can be divided into the following groups from a zoogeographical point of view :—

Group 1.—Species distributed throughout India, Burma and further east.

1. *Rasbora daniconius* (Ham.).
2. *Barbus* (*Puntius*) *sarana* (Ham.).
3. *Barbus* (*Puntius*) *sophore* Ham.
4. *Barbus* (*Puntius*) *ticto* (Ham.).
5. *Labeo boga* (Ham.).
6. *Labeo calbasu* (Ham.).
7. *Lepidocephalichthys guntea* (Ham.).
8. *Nemachilus botia* Ham.
9. *Glossogobius giuris* (Ham.).
10. *Ophicephalus punctatus* Bloch.
11. *Mastacembelus armatus* (Lacép.).

Group 2.—Species distributed throughout India.

1. *Bardius bendelisis* Ham.
2. *Esomus danricus* (Ham.).
3. *Danio devario* (Ham.).
4. *Cirrhina reba* (Ham.).

Group 3.—Species so far known from the Sind hills.

1. *Labeo nigripinnis* Day.

Group 4.—Species found all over the Peninsula, the Satpura-Vindhya trend of mountains and the Chota-Nagpur plateau.

1. *Chela clupeoides* Bloch.
2. *Barbus* (*Tor*) *khudree* Sykes.
3. *Barbus* (*Puntius*) *amphibius* (C. V.).
4. *Garra mullya* (Sykes).
5. *Labeo boggut* (Sykes).
6. *Nemachilus denisonii* Day.

Of the 22 species listed above, 11 are widely distributed in India, Burma and further east ; 4 are distributed all over India : 6 are found all over Peninsular India, including the Western ghats, the Vindhya-Satpura Mountains and the Chota-Nagpur plateau, while one is restricted to the Sind Hills. Of these, species widely distributed in the Oriental Region or in India proper are of little significance for a study of the Zoogeography of the Aravalli Hills and, therefore, need not be taken into consideration here. The occurrence of the fishes of the Sind Hills and of the Deccan Plateau in the Aravalli Hills, however, needs further consideration.

Owing to the folding movements that took place with the rise of the Himalayas, it is well-established fact that the northern portion of the Peninsula sagged and the Himalayas actually rode over it. Auden (1935) has discovered the Aravalli rocks on the northern face of the Himalayas indicating thereby that in that region Aravallis must have been secondarily lifted up. In referring to the above palaeogeographical findings, our purpose is to indicate that the Aravallis during the more recent geological epochs tilted towards the north and in this process carried the fauna of the Peninsula, more particularly of the Satpuras, northwards. Owing to the foredeep in front of the Himalayas and the possibility of a large river flowing through it, this Peninsular fauna could not extend to the Himalayas and, for the same reason, the Himalayan fauna could not spread to the Aravallis. The absence of any characteristic Himalayan species in the Aravallis is very significant in this connection. The common species of the plains could, however, become widely distributed in this process. It will thus be seen that the distribution of fishes in the Aravallis is more or less similar to what Hora (1949) had already observed in the case of the Rihand River fishes of the Kaimur Range, north of the Vindhyas in the Mirzapur District of U. P.

There is a sunken ridge below the desert areas of Rajasthan and Sind which once connected the Aravalli Hills with the Sind Hills through the Sangla Hills in the Punjab (Auden, 1950, 18). The occurrence of *Labeo nigripinnis* in such widely separated areas as the Sind Hills and the Aravalli Hills today indicates that once its range would have been continuous over the sunken ridge.

CONCLUSION.

The fish fauna of the Aravalli Hills has not yet been systematically investigated or thoroughly studied. The collection dealt with here shows very clearly that their study can be of great value in understanding the palaeogeography of this region.

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