ZOOGEOGRAPHY OF FRESH WATER FAUNA OF INDUS VALLEY

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(Received October 4, 1967)

The history of the Indus river and its tributaries is both interesting and highly disputed. Not only has the Indus been changing its course on a very wide scale but the origin and evolution of the entire river system flowing into it have been subject to great changes during the palaeontological eras since the Tertiary period.

The well known British geographers, Pilgrim and Pascoe, had suggested that towards the end of the Tertiary era, when the Himalayan mountains were in the process of formation, there flowed a gigantic river named "Indo Brahm" along their southern slopes. This great river flowed from the eastern end of the Himalayas along its whole length and deflected towards south after abutting against the Hindu Kush mountains. This river finally flowed down into the Arabian Sea in the gulf of Kutch.

Krishna and De-Terra opposed this view and said that such a river did not exist and that only lakes existed along the southern slopes of the Himalayas.

Ahmad and Abbasi also believed in the existence of lakes and thought that they were interconnected. It was in these lakes that the Siwaliks were deposited. They also hold that the Indus cut its course through the Salt Range and the rest of its principal tributaries cut their own separate courses through the Siwaliks.

The recent studies of Water and Power Development Authority of Pakistan show that a few thousand years ago the direction of the flow of Indus and Ganges systems was towards the west. Owing to some major subsequent catastrophic changes the Jamuna and Ganges rivers changed their course towards the east and flowed into the Bay of Bengal and the Indus river shifted towards further west and poured itself into the Arabian Sea.

In addition to these changes an interesting change took place in the Sutlej river and in the lost river "Hakra". The Sutlej was flowing independently of the Indus but due to some accident got itself connected with the Indus somewhere near Bhawalpur. The Hakra formed by ancient rivers Ghaggar and Chitrunji disappeared by the eastward march of the Thar desert. Prior to, or after its disappearance, it also probably got itself connected with the Indus near Sukker but also ins dependently flowed down southward to enter the Gulf of Kutch. Near the sea it was met by another famous river named Loni which flowed from Rajasthan. Very recently the lost river Hakra also was re-excavated as a big canal known as Eastern Nara Canal.

This brief account of the larger changes in the evolution of river system does not cover the subsidiaries, but important events caused in the Indus valley as a result of floods and excavations of a large number of canals from the extreme north of West Pakistan down south up to Kotri. Serious consideration should also be given to the fact that the Indus received a tributary of the Kabul river arising from the Hindu Kush mountain in Afghanistan.

The earliest studies of the zoogeography of Indus river are attributed to Murray (1860) who held that in the present Indio Gangetic valley there was a sea in which a dolphin '*Platanista*' used to inhabit. Following the disappearance of the sea and separation of the Indus river from the Ganges river the Genus *Platanista* was separated into two closely allied species, *P.indi* Blythe and *P. gangeticus* Gray.

Subsequent studies of zoogeographical significance were made by James Murray[7,8] Jerdon and Blanford and were published in a number of volumes of the fauna of the British India dealing with the relevant groups and also in the Journal of Bombay Natural History Society.

Krishna and Deterra hold that the riverian fauna of Indus and Ganges have made their dispersal along the coast line and have no inter-river connection. The whole subject gets further complicated owing to the vast changes in the physiography of the Indo-Gangetic plain following the deposition of the Siwaliks and the filling in of space between the southern continental part and the base of Himalayas.

The Indus system has a vast and varied fauna belonging to a number of groups. A comprehensive account of all the important fresh water faunal groups cannot be satisfactorily undertaken in view of lack of information and paucity of collections.

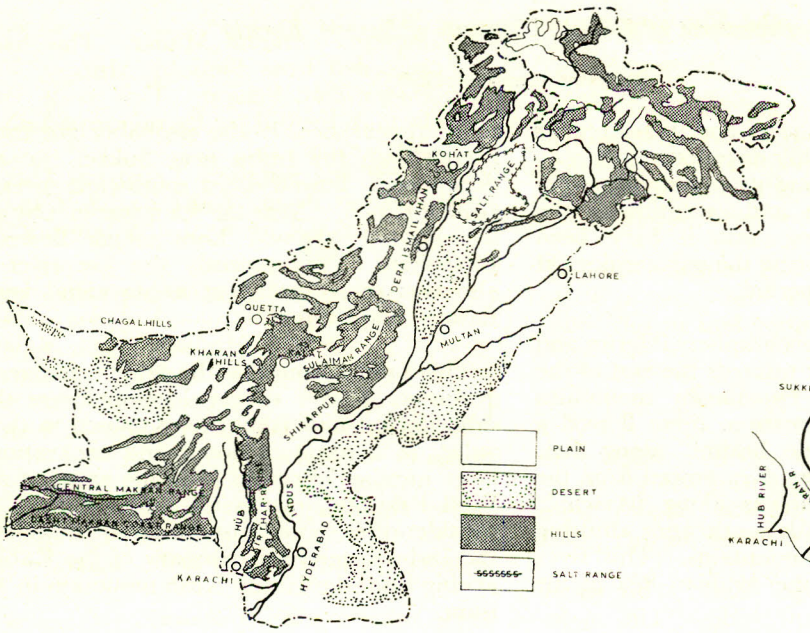

Fig. 1.—Physical map of West Pakistan.

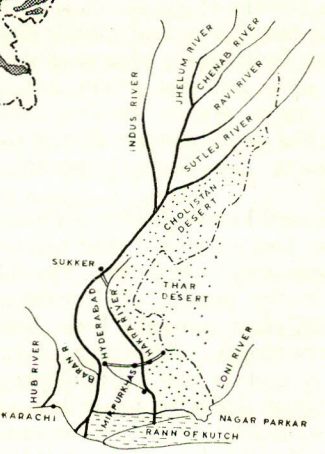

Fig. 2.—South West Pakistan Rivers.

These studies are therefore obviously restricted and incomplete.

Among the Arthropoda, Crustacea and Insecta deserve special consideration. Qadri [10] and Baqai have recently published an account of fresh water Phyllopoda including Anostraca or fairy shrimps and Conchostraca or Mussel shrimps collected from West Pakistan. A remarkable form in the collection is the *Streptocephalus bengalensis* Alcock, collected from Calcutta. [2] This species of the fairy shrimp was collected from the Ravi at Lahore and from the Malir river near Karachi. The mussel shrimps belonging to genus *Eocyzicus* are also important since they are purely fresh water and have been collected from Kashmir, from the Thar desert in Sind and from fresh water reservoirs and lakes near Karachi.

Among the fresh water prawns belonging to genus *Palaemon* the species collected from West Pakistan have been recorded by Qadri in the Proceedings of Pan India Ocean Science Conference (1960). The following species were recorded:

1. *Palaemon malcolmsoni*, H. Milne-Edwards. This prawn ranges from Naushera on the Kabul river down south to Karachi all along the Indus river.
2. *P. olamarei*, H. Milne-Edwards. This species has a big population in the lower reaches of the Indus .
3. *Palaemon* sp. Nr. mirabilis kemp. This species is closely allied to *P. mirabilis* kemp. It is curiously restricted to eastern Nara Canal or the old Hakra river. No trace of *P. mirabilis* has been found in the Indus.
4. *P. carcinus* Fabricius. In the estuary and lower reaches of Indus river.

Among the fresh water crabs the following forms have been collected from West Pakistan:

1. *Potamon atkinsonian*-wood Mason var.: *emphysetium* (*Alcock*).
2. *P. fluviatile* Latrelli var: *gederosianum* (*Alcock*).
3. *Paratelphusa spinigera.*
4. *P. blanfordi Alcock.*

These crabs are distributed in West Pakistan and have been collected from Abbottabad in the north,

to Karachi in the south. Of these fresh water crabs, *P. spinigera* causes great damage to the paddy fields in the Thatta district.

The author has studied the following forms from among the insects.

1. Heteroptera: F. Nepidae *Laccotrephes rubur* Linneus. This water scorpion occurs widely in West Pakistan lakes and ponds and is also widely distributed in India and Southern China.
2. *L. griseus* Guer. This was collected from lower Sind lakes.
3. *Ranatra elongata.* It was collected from all parts of West Pakistan and is also found in Kashmir, Bengal, Calcutta, Bombay and in the Nilgri Hills.

F. Belostomatidae:

1. *Belostomata indica.* It occurs widely in India and the neighbouring countries.
2. *Nectocoris stali* Mayr. It was collected from Sind and is distributed in the northern part of India.
3. *Sphaerodemma annulatum* Fab. This water bug is also found in India. The males of these bugs carry eggs over their backs.

Corixidae

1. *Micronecta striata* Fieb. These bugs were collected from the different parts of the Indus valley and are also reported from India by Distant and Lafroy.
2. *Corixa promontoria Distant.* It was collected from lower Indus valley and was recorded from India and Nepal.
3. *C. substriata* Uhler.

Also collected from lower Indus valley and has been recorded from India by Distant and also by Hafiz and Pardhan.

Notonectidae

1. *Enithares indica Distant.*

These boatmen bugs were collected from Abbottabad in N.W. Frontier Province and also from the lower part of the Indus valley. They are also recorded from India.

Phylum Mollusca.

Class Pelecypoda (Fresh water mussels). The following fresh water mussels have been recorded from West Pakistan:

(1) *Nodularia caeruleus* Lea. This was reported from Salt Range by Hora and was also collected from the northern part of West Pakistan by the Zoological Survey of Pakistan.
(2) *Parreysia corrugata* Muller. This has been recorded from Sind by Murray.
(3) *P. favidens* Benson. This is a common form in the Sukker Barrage especially in the Nara canal.
(4) *Lamellidens marginalis* Lamark. This mussel abounds in the Kalri Baghar Canal areas in lakes and in canal distributories.

These fresh water mussels are widely distributed in West and East Pakistan and have also been recorded from Ceylon, India, Burma, Malaya and Southern China.

An incomplete and brief study of fresh water chordates is given below:

Class Reptilia:

Order Ophidia (Fresh water snakes)

(1) *Natrix piscator* piscator.

Tropidonotus quincuneiatus Schelgel.
Sind and throughout India, Ceylon, Assam, Pegu, Mesopotamia to South China.
It is found in fresh water lakes, ponds and canals in Sind.

(2) *Natrix stalatus* Linn.

Tropidonotus stolatus Boulenger.
Sind, Ceylon, throughout India.
Southern China, Hainan, Indo-China.
Specimens were collected by Zoology Department.

(3) *Macropisthodon plumbicolor.*

Tropidonotus plumbicolor Cantor. Sind, northern, southern, western and central India, throughout Bengal and Ceylon.

The snake occurs below the culvert and under fresh water weed in the canals of Lower Sind Barrage in the Thatta district.

Order-Crocodilia:

Crocodilus palustris Lesson (Indian Crocodile).

Found throughout India, Ceylon, extending west as far as the Dasht river (Baluchistan), north

to Nepal and east as far as the Darrang district on the Brahmaputra in Assam.

2. *Gavialis gangeticus* Gmel.

Lacerta gangetica Gmelin.

Found in Indus, Ganges, Mahanadi, and putra rivers and their tributaries, and the Kaladan Brahmariver, Arakan.

Fresh water turtles and tortoises:

(1) *Trionyx gangeticus* Cuvier. This is of wide occurrence near the Indus, Ganges and Mahanadi and their tributaries. It is common in Dera Ismail Khan, N.W.F. Province, and also occurs in the neighbourhood of Karachi. It is also recorded from East Pakistan.
(2) *Chitra indica* Gray. It is also widely found in Sind, Punjab, N.W.F. Province and Bengal.
(3) *Lissemys punctata* Lacepede. This species is also distributed in the valleys of the Indus, Ganges and their tributaries.
(4) *Hardella thurgi* Gray. This tortoise is extremely abundant in Sind and is also found in the Ganges and Brahamputra river systems.
(5) *Kachuga smithi* Gunth. It is one of the common chelonia occurring in the tributaries of the Indus. It is very common in the G.M. Barrage but rare in the Ganges system.
(6) *Kuchuga dhongoka* B. Ham. It has been reported by Murray from Sind. It also occurs in N.E. India in the Ganges as far west as Allahabad and in the north in Nepal.
(7) *Kachuga tectum.* Indus river and its tributaries.
(8) *Geoclemys hamiltoni.* Spotted pond turtle Indus valley.
(9) *Emylagranosa* Schoepff. The Indus valley, Sind and Punjab.

Order Lacertelia: The semi aquatic monitors are of special zoogeographical interest. They are as follows:

(Fresh water monitors)

Varanus monitor Linnaeus (the Indian fresh water monitor). It occurs throughout India, Ceylon, Assam, and the greater part of Burma, S.E. Persia, Waziristan, Nepal, W. Himalayas, and Darjeeling, E. Himalayas. It is found commonly along the canal banks in Thatta district.

2. *Varanus flavescens* Gray. It also inhabits Sind, Kutch, southern and central India, Concan Deccan, Baluchistan, Punjab, N.W.F. Province, Bengal, Burma, Nepal and Ceylon.
3. *Varanus (Hydrosaurus) salvator* Laurenti. This aquatic monitor was found near Karachi and is also recorded from the East Indian Archipelago, N. Australia, the Andaman and Nicobar islands. It occurs in the extreme north-east, eastern Bengal and the eastern Himalayas. Common in the Sundarbans and plentiful throughout Burma, in suitable localities, also common in Siam.

A list of more important water birds is given below:

1. *Porzana maruetta* Briss. Spotted rail.
Distribution: Sind, Punjab, Himalayas, Burma, Ceylon.
2. *Ardea cinerea Linn.* Blue heron.
Distribution: Pakistan, India, Europe.
3. *Ardeola gray Sykes.* Paddy hereon.
Distribution: Sind, Punjab, India.
4. *Bubulcus coromandus.* Cattle Rgret.
Distribution: Migrant in East and West Pakistan.
5. *Anastomus oscitans* Bodd. Shell Ibis.
Distribution: Sind, Punjab, Baluchistan, Iran, India.
6. *Threskiornis melanocephalus* Lathan. White ibis.
Distribution: Sind, Mekran, India, Iran.
7. *Larus cacchinans* Pall. tellorleg Gull.
Distribution.
8. *Larus ichthyaetus* Pall. Large black head Gull.
Distribution.
9. *Gelochelidon nilotica* Hasselq. Gull billed Tern.
Distribution: Sind, East Pakistan, India.
10. *Sterna caspia* Pall. Largest tern.
Distribution: Sind, Punjab, Iran.
11. *Sterna albifrons.* Pall Small tern.
Distribution: Sind, Mekran, Africa.
12. *Sterna seena Sykes.*
Distribution: Sind, Punjab, Baluchistan, Persian Gulf.
13. *Pelecanus crispus.* Bruch Dalmation. Pelecan.
Distribution: Sind, Punjab, Baluchistan.
14. *Phalcrocorax carbo.* Vicellot Large Cormorant.
Distribution: Sind, Baluchistan, Iran.
15. *Phalcrocorax carbo* var Sinensis. Small cormorant.
Distribution: Sind, Kutch.
16. *Plotus melanogaster Penn.* Serpentine Neck Heron.
Distribution: Sind, Kutch, Bengal Rajputana.

17. *Podiceps nigricollis*. Brehm. Black head grebe.
18. *Alcedo at this* Linn. var pallasii. Pied King fisher.
    Distribution: Sind, Kashmir, Punjab Baluchistan, Iran.
19. *Alcedo ispida* Linn. European King fisher.
    Distribution: Sind, Baluchistan, Afghanistan, Iran, Europe.
20. *Ceryle rudis* Linn. var. leucomelanura-India Pied King fisher
    Distribution: Pakistan, Kashmir, India, Ceylon.
21. *Halcyon smyrnensis* Linn. White bellied, King fisher.
    Distribution: Sind, Kutch, Himalayas, China.
22. *Prinia Socialis* Sykes var *Stewarti* Ashy Warbler.
    Distribution: Punjab, East Pakistan.
23. *Porphyrio poliocephalus* Lalham poliocephalus. Moorhen.
    Distribution: Pakistan, India, Ceylon, Burma.
24. *Fulica atra* Linn.
    Distribution: Sind, Punjab, Baluchistan, India, Eastern Europe.
25. *Hydrophasiasms Chirurgus* Scopoli Jackana.
    Distribution: Pakistan, India, Burma.
26. *Gallinula chloropus* Linn. var. Indicus. Water hen.
    Distribution: Pakistan, India, Burma, Ceylon.
27. *Gallicrex cinereus Gmel.* Water cock.
    Distribution: Sind, South India, Burma, Malaya.
28. *Lobivanellus indicus* Bodd var aigneri. Red wattled Lap wing.
    Distribution: Sind, Punjab, India.
29. *Sarciophorus bilobus*. Gmel. Yellow wattled Lap wing.
    Distribution: Sind, Punjab, India.
30. *Grus antigone* Linn Sarus crane.
    Distribution: Punjab, India, East Pakistan.

N.B.—This list does not include migratory birds including Swans, Ducks, Pintails, Mullards, Sheldrakes, Teals, Spoon bills, Curlews, Plovers, Storks, Sandpipers, Snipes and the wood-cock-Scolopax rusticola. Linn.

1. *Class Mammalia* (*Fresh water Otters*). The otters have a special significance in relation to fresh water fish distribution in Pakistan. The two species are described below:

1. *Lutra lutra* nair Cuvier.
   Lutra nair Cuvier.
   Lutra indica Gray.

This otter is found throughout India, from the extreme south of Ceylon to the Himalayas and from the Indus to Burma and Malaya.

The species which is widely occurring in West Pakistan rivers and canals is responsible for damaging canal banks.

2. 2. *Lutra lutra monticola* Hodgson.
   Lutra vulgaris Anderson.

It is recorded from Kangra, Kumaun, Nepal, Sikim, Assam.

This otter is inflicting serious damage in Kaghan to the trout fisheries projects.

Note:—A study of fresh water fisheries of Pakistan has been made by Dr. M.R. Qureshi.

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