XXXI. REPORT ON A COLLECTION OF AQUATIC ANIMALS MADE IN TIBET BY CAPTAIN F. H. STEWART, I.M.S., DURING THE YEAR 1907.

PART I.—INTRODUCTION, CŒLENTERATES, NEMATOMORPHA, ROTIFERS AND GASTROTRICHA, ENTOMOSTRACA, ARACHNIDS, FISH (*Systematic*) AND BATRACHIA.

INTRODUCTION.

By F. H. STEWART, *M.A., D.Sc., M.B., Capt., I.M.S.*

The collection which forms the subject of the following report, was made in the district between the Tang-la and the town of Gyantse in Tibet during the year 1907. The Tang-la is the pass which leads from the Chumbi Valley into Tibet proper, crossing the watershed of the main chain of the Himalayas at a height of 15,000 feet above sea-level. To the north of it the streams run into the Tsang-po, to the south into the Brahmaputra and the Ganges. Gyantse lies about one hundred miles by road north of the Tang-la at an altitude of 13,100 feet. Collections made in this region thus obviously have a double interest, firstly from the geographical position, and secondly from the altitude of their source.

No general collections of the aquatic invertebrate fauna of this part [1] of Tibet have been made previously, but fishes and amphibians were collected during the Tibet Expedition of 1904 in this district, while those from the upper reaches of the Sutlej and Indus may also be counted as Tibetan.

In crossing the Tang-la the character of the country is seen to change entirely. We are leaving the well-watered sphere of the monsoon for a region of dry arid hills which, during the greater part of the year, are entirely bare of vegetation. The rainfall changes from the steady six months' downpour of Sikkim to a scanty fall for one month only about August. Snow also falls in very small quantities except in the immediate neighbourhood of the passes. During the winter of 1906-07 it only lay in the Gyantse valley for one day, and on the hills around for short periods which, if added together, would not total more than one month. Thus during the greater part of the year the lakes and rivers are fed only from springs, which arise here and there on the hillsides.

[1] Specimens of the Phyllopods *Branchinecta orientalis* and *Estheria davidi* were collected in Gyantse by Capt. Lloyd, I.M.S., and noticed by Gurney in *Journ. Asiat. Soc. Bengal*, ii (N.S.), 1906.

The first considerable mass of water met with is the Rham-Tso (see plate xxvi), a lake situated about twenty miles from the pass at an elevation of 14,700 ft. It is about eight miles long by four broad, and appears to be shallow throughout. It occupies the whole of the north-eastern end of a broad plain which is surrounded on all sides by mountain chains. The southern portion of this boundary is the Chumolhari group of mountains covered with perpetual snow. From April to October this lake is entirely free from ice. In October ice begins to form round the margins and gradually spreads until it covers the whole surface. The winter months are, of course, intensely cold. During the summer, however, no climate could be more delightful. In the daytime the temperature rises to about that of an English summer's day and even at night remains moderate, so ringed in is the plain by bare hills which store up the sun's heat. During these months the Rham-Tso is well peopled. All round its grassy banks, bar-headed geese rear their families, while ducks of many kinds are to be seen on its waters. Fish are exceedingly plentiful, and large numbers are caught in nets set on stakes across the outlet at the northern corner of the lake, where a small river runs out to fall into Kala-Tso four miles to the north. These fish are preserved by the Tibetans by being split like findon haddocks and dried in the sun. They are not salted or smoked. When fresh they are exceedingly good eating, the flesh sweet and free of the muddy taste and the multitude of bones which render Tibetan river fish so unpleasant. The dried fish are, however, not for European taste.

Water weeds grow in abundance for many yards out from the margins of the lake, and Amphipods, Copepods, shells and a species of Hydra flourish among this vegetation.

From Kala-Tso, a lake closely resembling Rham-Tso, but on a somewhat smaller scale, the water escapes under ground in the direction of Gyantse. It reappears about twelve miles off near the village of Mang-tsa (14,500 feet) and, reinforced by several small streams issuing from springs on the hillsides, forms the commencement of the Nyang Chu, the river which flows through the Gyantse valley and ultimately falls into the Tsang-po.

These streams are only completely frozen during the coldest months of the year—February and March. The spring water is sufficiently warm to keep ice-free for some miles during the rest of the year. Here among the moss which grows in the small rivulets, shells and Amphipods, Oligochætes and Turbellarians abound. Small loaches (*Nemachilus stoliczkæ*) are also common.

Twenty miles nearer Gyantse, at Kang-ma, is a group of springs, the water of which is tepid and heavily charged with carbon dioxide. The only animals found in these springs are certain Ostracods (*Eucypris minuta*, v. Dad.).

In the Gyantse valley itself the river flows with considerable rapidity. The water is grey and loaded with mud. It does not freeze over even in the depth of winter, but from December until April the surface is dotted with ice carried down from above.

The natives of the valley say that the large fish migrate down into the Tsang-po in the autumn and return in spring. The first fish of any size which I obtained in spring were all *Schizopygopsis stoliczkæ* or *Ptychobarbus conirostris*. The other species appeared later.

In the Gyantse valley, as elsewhere in Tibet, there is an elaborate system of irrigation channels branching off from the rivers. During autumn these abound with young fish, and as in November most of these channels are allowed to run dry, a great loss of young life must result.

Two of the best collecting places in the valley are Te-ring Gompa and High Hill Gompa, two monasteries situated on the hill faces several thousand feet above the valley. A spring arises near each, and Turbellarians, Amphipods, Oligochætes, Rotifers and frogs abound among the moss, algæ and stones.

Through the courtesy of the Director General of Observatories I am able to give the following table showing the maximum and minimum temperatures recorded each month during 1907 in Gyantse.

GYANTSE, 1907.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Maximum temperature in degrees Fahr.	43·3	39·5	46·3	57·2	65·6	73·0	74·8	74·5	73·4	66·4	54·6	43·4	59·3
Minimum temperature.	8·7	8·8	13·8	27·6	32·9	42·7	47·6	44·4	43·1	32·3	12·3	4·0	26·5

OBSERVATIONS ON SPECIMENS OF *HYDRA* FROM TIBET, WITH NOTES ON THE DISTRIBUTION OF THE GENUS IN ASIA.

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Hydra fusca, Linn.

? H. rhætica, *Asper, Zool. Anz.*, 1880, p. 205.

Several specimens from among weeds in the Rham-Tso (lake) at an altitude of about 15,000 feet; taken in August, 1907 (Capt. F. H. Stewart).