Some Notes on the Giant Salamander of Japan

(Cryptobranchus Japonicus, Van der Hoeven.)

By

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In the summer of 1880 and 1881, I visited some provinces in the interior of our island, for the purpose of collecting specimens of the Giant Salamander.

I succeeded in capturing seventy-one specimens, varying in length from 19 cm. to 69 cm., and in weight from 41 grams to 1926 grams, and in gathering some facts respecting their habits, and mode of life.

Although my observations on the above points are of a fragmentary character, I think I may assume that they will not be wholly devoid of interest, especially as they concern an animal which is remarkable not only in itself, but also for its close relationship with that celebrated fossil discovered more than a century and a half ago in the tertiary fresh-water deposits of Oeningen, and called by its discoverer Scheuchzer, "Homo diluvii, testes."

It is now generally admitted that Schenchzer's "Homo," which he regarded as "ein recht seltenes Denckmal jenes verfluchten Menschengeschlechts der ersten Welt," belongs to the same genus as the giant salamander of Japan.

Cuvier, who first recognized the amphibian character of this fossil, which should now be called Cryptobranchus Scheuchzeri,* estimated its length at three feet five inches, a size seldom, if ever, reached by its Japanese representative.

It is remarkable that C. Japonicus is now no longer found outside a very limited area of central Japan, which, according to Temminck and Schlegel,† lies between 34° and 36° North latitude. My specimens were all collected in the three provinces, Iga, Ise, and Yamato. Siebold obtained a specimen said to have come from the mountains of Suzuga-yama, somewhat farther north.

The above named provinces are traversed in various directions by mountain ranges, between which are numerous valleys, raised several thousand feet above the level of the sea. Through these valleys pass swift running brooks, fed with clear cold water from mountain springs. I visited the streams of 13 valleys, seven in Iga, two in Ise, and four in Yamato.

These streams have everywhere stony beds, are quite shallow, and seldom attain a width of more than a few metres. In these small but swiftly flowing brooks,‡ thickly shaded, for the most part, with shrubs and trees, lives the subject of this paper.

It conceals itself in dark places under rocks, along the banks or in the middle of the stream. It seems to delight in solitary life; for so far as I was able to learn, not more than a single specimen is ever found under one rock.

The animal may be easily captured with a fish-hook, baited with

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* Naturgeschichte der Lurche, p. 132.

† Temminck and Schlegel. Siebold's "Fauna Japonica." Reptilia.

‡ The temperature of the water in the middle of August was found to be between 17° and 23° C.

a fish, frog or several earth-worms and tied to a string, a few feet in length. This is thrust by the aid of a small bamboo stick into the salamander's retreat. The string is not tied to the stick, but the point of the loaded hook is forced into one end of it, far enough to keep it in place while this end of the rod is pushed under the rock. When the bait has been thus brought near the salamander, any bite will be instantly felt through the rod.

When the bite is felt, the rod is withdrawn as quietly as possible, the hook and bait being left. As soon as a jerk of the string is noticed, a pull is made, which generally ends in the capture of the unfortunate animal. If the first pull should fail, the bait is replaced as before, and a second opportunity is offered which the unwary creature accepts as readily as the first. The fisherman having obtained one bite, is sure of ultimate success, as the salamander does not learn by experience to refuse the proffered morsel.

When captured, this animal emits a peculiar slimy secretion, having an odor much like that of the leaves of the Japan pepper (Xanthoxylon peperitum.) This secretion hardens into a gelatinous mass on short exposure to the air.

Temminck and Schlegel (*l. c., p.* 128) state that the act of inspiration is ordinarily performed once every 6—10 minutes. This is true for specimens kept in tubs; but my observations lead me to think that they perform this act less frequently in their native brooks.

The eyes are remarkably small (measuring only 4 mm. in diameter), and this fact is perhaps correlated with their mode of life. For the capture of their prey (fish, frogs &c.), which they do, not by pursuing, but by waiting for the near approach of it, their eyes are obviously of comparatively little importance.

Besides they keep themselves habitually in dark places, and

thus live, as regards light, under conditions similar to those of cave life.

The manner in which they secure their food is correctly stated by Temminck and Schlegel, *p.* 129. "They slowly approach their prey and, by a swift lateral movement of the head, seize it with their teeth: holding it for some time in the mouth, the next act consists in swallowing it."

The Salamander is eaten by Japanese, and the flesh, when properly cooked, is said to be delicious. It is also used for medicinal purposes by both Japanese and Chinese, being supposed to be good for "Rogai," a kind of consumption.

Young Specimens.

The smallest individual found by Siebold measured about 30 cm., and showed no trace of external gills or branchial clefts. The youngest of my specimens, measuring 19 to 20 cm., have three pairs of very short branchial processes (from 3 to 5 mm. in length), attached just inside the branchial orifice. Each process is somewhat flattened and tapering, and most of them still have branchlets.

The color differs from that of the mature individual only in being lighter.

In another specimen, 20.5 cm. in length, the gills have almost wholly disappeared, but the branchial slits are still to be seen.

Another individual, 24.5 cm. in length, shows no trace of the gills, and the branchial orifice has completely closed, its original position being marked by a light streak. In this specimen a few of those dermal protuberances, characteristic of the adult forms, are to be seen on the dorsal surface of the head. In the larger specimens these protuberances are thickly crowded on the dorsal side of the head, extending down the sides and on the lateral portions of the

same. There are four rows of these protuberances on the dorsal side of the body. Two of them run along each side of the median dorsal line, at some distance from it; while the remaining two run just above the lateral dermal folds, extending to the tip of the tail.

The following gives the weights and measurements of five specimens.

No.	Length.	Width taken at head.	Weight.
1	20.0 cm.	2.6 cm.	42 grms.
2	20.5 "	2.9 "	55 "
3	24.5 "	3.0 "	61 "
4	55.0 "	9.1 "	970 "
5	69.0 "	11.0 "	1926 "

The Eggs, Time of Deposit, &c.

The fishermen report that the eggs are laid in August and September. I succeeded in getting a few eggs deposited about the middle of August.

The eggs are not laid one by one as in the case of our common Triton, nor in smooth cylindrical strings as in the case of the Toad, but in a string that resembles in form a rosary.

Each egg floats in a clear fluid inclosed in a bead-shaped gelatinous envelope (1.62—1.35 cm); and this envelope is connected with the next by means of a comparatively small string which is about equal in length to the longer axis of the envelope. The egg has an oblate spheroidal form, measuring about 6 mm. by 4 mm., and is yellow everywhere except at the upper pole, where it is whitish.

All attempts to make Cryptobranchus breed in captivity have failed hitherto, owing no doubt to the difficulty of obtaining in the city cool water such as the animal is accustomed to in its mountain home.