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ON CORMORANT FISHING IN JAPAN.

BY P. L. JOUY.

IN the clear mountain streams of Central Japan there is found a peculiar fish of the family *Salmonidæ*, the *Plecoglossus altivelis* T. & S. This fish, the "Ai" of the Japanese, is something between a trout and a smelt in appearance, grows to a length of twelve to fourteen inches, and is a bright silvery in color, with a golden spot on each shoulder. It is very delicate in flavor, and is much prized for the table. In a country celebrated for the variety and excellence of its fish, this species holds the highest place and commands the best price in the market. Many ingenious methods are employed for its capture, among the most interesting of which is the use of cormorants.

We are all familiar with the stories of cormorant fishing in China where the fisherman has his birds trained to obey a call-note or whistle, and where they sit around the edge of the boat, and go and return to and from the water like a well-trained spaniel; but cormorant fishing in a rapid mountain stream in Japan, is quite a different thing from fishing in a sluggish, muddy river in China, and I believe that the Japanese methods are quite unknown, being carried on at *night*, and in remote and out of the way places.

Before quoting from my note-book I will preface by stating that I made a journey, of about twenty-five miles, from Tokio to a small river, the Banugawa, on purpose to witness this interesting and, to me, novel sight.

September 8th, 1886. We left the tea-house about eight o'clock to keep our appointment with the cormorant fisher. It was

a bright moonlight night, said to be a bad night for fishing, a cloudy or dull evening being preferred, as the fish were then not so active. The river consisted of two branches, running very swiftly, and each from twenty to fifty yards wide, but in flood-time it extended over a space of 200 yards or more, running between high bluffs. The man with his bird was waiting for us on the stony bed of the river, with his torch of pine-fat burning brightly. The bird (*Phalacrocorax* sp.) was very tame, and sat perched on a rock close by. A cord was tied pretty tightly around the lower part of the throat and between the shoulders, from which was attached a piece of bamboo (having a swivel at each end), long enough to extend beyond the bird's wings and prevent fouling of the cord while the bird was in the water. The man carried a basket at his side to put the fish in, and a sort of apron in front to hold pine chips for the light. The lantern was a wire cage or basket placed on the end of a long bamboo pole. This, with the cord attached to the bird, which gives him a range of about twenty feet, is held in the left hand, the right being employed in guiding the bird, replenishing the fire and taking the fish.

Everything being ready, the fisherman takes the torch in his left hand, and clasping the cord, to which the bird is attached, wades out into the stream, the bird following him and, after performing a hasty toilet, dipping his head and neck in the water and preening himself, begins the business of the night. The fisherman holds the fire directly in front and above the bird's head, so that it can see the fish in the clear water. The bird seems to be perfectly fearless, and as he comes up sparks of fire are constantly falling on his head and back.

The fishing is done up-stream, the man finding it all he could do to keep pace with the bird as the water surges up nearly to his thighs; in fact it was hard work for us on shore to scramble along among the rocks in the uncertain light and watch the bird at the same time.

The bird dives, swims under water for eight or ten yards, comes up and is down again, working very rapidly and constantly taking fish. When the fishes are small the bird is allowed to retain two or three in his throat at a time, but a fair-sized fish is immediately taken from him and put into the basket.

During a space of half an hour fifteen fishes were taken, which was pronounced a good catch considering the brightness of the

night. The largest of these fishes, which were all of the same species, were nine to ten inches in length, and having been taken immediately from the beak of the bird were scarcely bruised. The largest and best of these we had the next morning for breakfast, the others we gave to our friend, the cormorant, who was kindly assisted by his master to get them past the cord which constricted his throat so that he could not otherwise have swallowed.

The birds are trained especially for the work, and do not fish in the day-time. Our bird was two years old, and was considered a very bright and active fisher, having on good nights, fishing all night, caught as many as 400 fishes,—300 was considered a fair night's work. Only calm nights are available, and the darker the better.

THE MECHANICAL CAUSES OF THE ORIGIN OF THE DENTITION OF THE RODENTIA.

BY E. D. COPE.

THE phylogeny of the Rodentia as an order is now tolerably clear. I at first suggested,[1] and later asserted, that this order was derived by descent from the Tillodont suborder of the Bunotheria. The Tillodont suborder had a common origin with the Tæniodonta, from some type of Bunotheria with unspecialized molars and premolars, in which some of the incisor teeth had begun to display enlarged size. A form allied to this ancestor is the genus Esthonyx, which differs from it in but few respects. Professor Ryder, in discussing the origin of the Rodentia,[2] writes as follows:

"The significance of accessory rudimentary incisors present in some forms of true rodents, as pointing to the manner in which the evolution of the rodent type of dentition took place, may be overrated; yet when it is borne in mind that in other groups the appearance of diastemata between the different kinds of teeth took place gradually and in a way which unmistakably shows the gradual steps of the

[1] American Naturalist, April, 1883; Report U. S. Geol. Surv. Tertiary Vertebrata, 1885, 814; American Naturalist, April, 1884.

[2] Proceed. Academy Philada., 1877, p. 317.