



G. H. Angas, del^t J. Jennens, lith.

Stannard & Dixon.

ORNITHORHYNCHUS ANATINUS

June 28, 1859.

Dr. Gray, F.R.S., V.P., in the Chair.

The following papers were read:—

1. NOTES ON THE DUCK-BILL (*ORNITHORHYNCHUS ANATINUS*).
BY DR. GEORGE BENNETT, F.Z.S.

(Mammalia, Pl. LXXI.)

On the morning of the 14th of September, 1848, I received through the kindness of Henry Brooks, Esq., of Penrith, six specimens of the *Ornithorhynchus*—an unusually large number to be captured and sent at one time—consisting of four full-grown males and two full-grown females. As usual, the latter were much smaller in size than the former. Some of these animals had been shot, and others captured in nets at night, at a place named Robe's Creek, near the South Creek, Penrith, about thirty miles from Sydney. They were all in good and fresh condition, excepting one of the females, in which some degree of decomposition had taken place, but not sufficient to prevent examination. On dissection, I found the uteri of the females (although it was the commencement of the breeding season) unimpregnated; but in the four males the testes were all enlarged, resembling pigeons' eggs in size, and of a pure white colour. At other seasons of the year I have observed them in these animals not larger than a small pea, and this being the commencement of the breeding season could alone account for their size; so that they show in this respect a great resemblance to what is observed in most birds during the breeding season of the year. I am not aware of this peculiarity existing in any other Mammalia. The testes in all the specimens were of equal size, and measured $1\frac{3}{8}$ inch in length and 1 inch in the diameter. I preserved one animal with the testes *in situ*, and detached the testes from the others, placing them in spirits for a further examination if required.

On examining the cartilaginous lips of these animals as they were lying heaped upon the table, dripping wet as if just emerged from the water, they were dark grey above, and mottled of a darker or lighter colour underneath, as is shown in the drawing made from life by G. F. Angas, Esq. (Pl. LXXI.), and which I have not yet seen correctly represented in any coloured drawing or engraving of the animal, in consequence of their not being taken from a living or recently dead animal. Over the eye is a tawny brownish-yellow spot, which marks distinctly the situation of that minute but brilliant organ of vision. These animals have horny teeth on the tongue. On the back part of this organ there is a bulb which serves to prevent the passage of the food collected in the mouth together with

the water into the gullet, and to direct the former into the temporary receptacles—the cheek pouches, which have an opening on each side at the back part of the mouth. In these I have found the food well comminuted, mingled with fine gravel of a muddy consistence, the food consisting of débris of insects and small shell-fish mingled with mud and gravel to aid digestion, and I have also found the whole length of the alimentary canal filled with mud or sand mingled with débris of food. I have observed the same in the *Echidna* or ‘Porcupine Ant-eater’ of the colonists. In the stomach of that animal I have found the sand which filled it exhibit under the microscope the remains of ants alone. The sand appears to me to be necessary for the proper digestion of the food in both animals.

On the morning of the 28th of December, 1858, I received a male and female specimen of the *Ornithorhynchus* alive; the male very large, and the female much smaller; they had been captured four days before the opportunity occurred of sending them. They were packed in a box with straw, carefully and securely fastened down; they had burrowed into the straw, and seemed warm and comfortable. When taken out and placed into a tub of water, they were very lively, diving down and remaining out of sight; and were so timid, that, when reappearing, it was only to place the end of the mandibles out of the water to inhale some fresh air, when they would speedily disappear again, seeming to be perfectly aware they were watched. The longest time this animal could remain under water, without rising to the surface to breathe, was full 7 minutes 15 seconds, by the watch. I placed them in the evening in a tub of water with turf and grass; they remained quite tranquil, bubbles of air rising occasionally to the surface of the water alone indicating their position, with a movement as if they were shifting their place in the tub, but without showing the body. After some minutes had elapsed, the tip of the black snout would appear on the side of the tub, to the length of about an inch, or just sufficient for the nostrils to be above the surface of the water, they being at the same time dilated as if to imbibe a supply of atmospheric air. They would only remain a few seconds, when they again speedily disappeared. When watched at a distance, one was seen to crawl out from the tub and escape upon the ground, but it was speedily captured and replaced. After leaving them in the water for about an hour, I placed my hand in the tub and took them out, and, on replacing them in the box, they soon burrowed down in the straw.

They are, as may be expected, fond of darkness and concealment, and dive under water or burrow under ground, coming to the surface to feed and enjoy themselves, principally at the dusk of the evening or at night.

I do not believe that the Duck-bill has ever been found in South Australia, no specimen having yet been brought from that locality.

These animals are rather crepuscular in their habits, sleeping for the most part of the day; and, in captivity, I have always found them very annoying at night, disturbing the rest of every one within hearing by the scratching and restless noises which they make in

their vigorous efforts to escape ; whereas in the morning they will be found rolled up and fast asleep. Still I am now of opinion that all the Australian crepuscular and night animals—judging from those I have been able to observe in captivity—although very active, and feeding principally at night, will leave their places of concealment during the day for a short time for the purpose of feeding.

The male animal, as if to keep up its bird-like character, has a spur, moveable, like that of the barn-door cocks. This is found also in the *Echidna* or Porcupine Ant-eater, another of the Monotrematous family ; but, judging from experiments on both animals, cannot be considered a weapon of offence or defence, and is for some purpose in the economy of the animal at present unknown to us. From my recent observations I consider the question of the spur in the male being a poisonous weapon as now decided ; for the living male specimen, though very shy and wild, can be handled with impunity. Although making violent efforts to escape, and even giving me some severe scratches with the hind claws in its attempts, still either in or out of the water he has never attempted to use the spur as a weapon of offence. Indeed the scratching I have before alluded to has not been done by the animal intentionally, as it is to all intents and purposes perfectly harmless ; but accidentally by the hind claws, which alone are sharp, in the efforts made to extricate itself from my grasp. The female will float feeding upon the water, and is much tamer than the male. The latter keeps swimming about below, and it is a long time before he ventures to put more than the snout above the water, and then rarely more than the head and a little of the upper part of the body.

From the 29th to the 31st of December they were lively and well. I placed them for one or two hours in the water morning and evening, to feed and wash themselves, which they appeared to enjoy exceedingly. I placed some meat minced very fine in the water, to try to feed them, so as to send them alive to Europe, as I considered the manner of feeding them an important preliminary step to ascertain. In their natural state they evidently feed in water. Just before I took them out in the evening they had burrowed to the bottom of the box, among the straw, very warm and comfortable, and they were cuddled close together.

On the third morning I found them much tamer, and, instead of diving down immediately they were placed in the water, they floated upon the surface. The female would permit me to look close to her little twinkling eyes ; her ears were always much dilated, and she would remain tranquil even when I touched or scratched her head or back ; but the instant I touched the sensitive mandibles, she would either dip down partially or disappear altogether under water for a short time. The male is evidently much more timid. I have only once seen his body on the surface of the water ; and when taking him out of the water and replacing him in his box, I found great difficulty in capturing him. The female, being generally upon the surface, is secured and placed in the box very easily, but the struggles of the male are very great ; and this makes it more difficult to take

him every time. The female paddles about upon the surface, and occasionally performs somersaults in the water; the male sometimes comes up, but dives rapidly down again. The female floats upon the water without any apparent paddling, and remains in a sort of half-immersed position for a great length of time, with the beak lying flat upon the water. If any dust comes near the sensitive nostrils, a bubbling of water is seen to issue from them, as if to drive away the irritating substance; and, if this does not succeed, the beak is washed in the water to remove it.

January 1st, 1859.—Both the animals this morning had a sleek, healthy, and lively appearance; they did not require to be taken out of the box to be placed in the tub of water, but ran in themselves as soon as the lid of the box was opened. On entering the water they turned and gamboled about, and then reclined on one side, scratching themselves with the hind claws. They would permit me to touch them without being disturbed; indeed they had become so tame as to allow me to tickle and scratch them gently, and appeared to enjoy it very much. They generally remained half-submerged in the water; it is only when touching the sensitive mandibles that they would dive down; but even then they would not remain long under water. Their favourite position was half-submerged, with the mandibles resting down upon the surface of the water.

The female is languid and weak, but the male continues vigorous, diving and swimming about. When in the water they play together, occasionally tumbling one over the other, and then remain on the surface of the water, gently combing their fur. No attempt was ever made (even when he growled at being disturbed) by the male to injure or even scratch with the spur. When I took the male out or disturbed him at night, he growled, and afterwards made a peculiar shrill whistling noise, as if a signal call to his companion. It is principally in the evening and at night that these animals are in the habit of coming out of their burrows to sport and feed both in the water and upon the banks. On retiring to their burrows to repose, they roll themselves up like furred balls.

January 2nd.—The female appeared quite exhausted this evening. On being placed in the water, it paddled feebly about, and then, dropping its head, sank. On removing it, I found it was dead. It appeared, on examination, to be in poor condition.

January 3rd.—The male does not appear to be thriving, but I have now a large tub prepared for his reception, in which I have made the following arrangements:—The tub is 3 feet 6 inches in length by 1 foot 9 inches broad, and 2 feet deep. At one end I have had a wooden enclosure made, which was partially filled with earth and a sprinkling of straw; this attempt to imitate the burrow was 12 inches deep and 15 inches in length. I then placed sand from a pond a few inches deep in the tub, in which I planted some fresh plants of *Damasonium ovatum* and other river plants from a pond in the Botanic Gardens. The tub was filled with water up to an inclined plane, which was turfed like a bank; a level space was also left, on which turf was placed, so that the animal might repose

and clean himself on emerging from the water. On placing the male into it, he dived down and seemed to enjoy himself very much. He was still lively, lying upon the surface of the water and scratching himself, and again diving and swimming among the weeds; he then went upon the level bank and again plunged into the water; after remaining there for nearly an hour, sometimes upon the surface and often for a long time under water, he found his way into the burrow, where he remained. I covered the whole of the cage with zinc wire, by which means he had light and air, and we could observe all his actions. This was to prevent his escape, as he could readily have climbed up the surface of the tub. There are openings at each end of the cask, by which means we could draw off all the dirty stagnant water, and replace it with clean, as often as was required. I fed the animal on meat minced very small, and then thrown into the water.

Both of these animals were captured in a net. The man who took them stated he had kept two alive for fourteen days, feeding them upon river mussels, which he broke and gave them in the water: that they seemed to thrive very well; and that he supposed that they fed upon these mussels, as they had been in good health, their death having been occasioned by accident.

It surprises many why these animals, when captured in a net and left all night, are found drowned in the morning. It is my opinion that when one of these animals is captured in a net (as was the case with a male specimen taken in that way a short time since in the Mulgoa Creek, and found dead in the morning), it is entangled in the meshes, and, being unable to rise to the surface to breathe, is drowned.

January 5th.—Last night I observed the animal emerge from the water and enter the burrow: this was about 11 P.M. This morning I did not see him in the water; he appeared yesterday evidently drooping and sickly, and I fear we have not yet got into the method of feeding them. Their food being minute and delicate, it requires some experience to give it to these peculiar animals successfully. On opening the burrow the animal was not there, and on drawing off the water we found him dead and stiff at the bottom. Having, no doubt, been too weak to regain the burrow, he perished when in the water. Thus ends the first experiment of keeping Duck-bills alive.

On dissection I found that they had been starved; there was no food or sand either in the intestines or pouches,—nothing but dirty water. Should I procure other specimens, it is my intention to introduce into my tank river-shrimps and insects of different kinds, previous to placing them in it, so that they may obtain a sufficient supply of their natural food. Still all this will increase the difficulty of taking them to Europe, as the supply cannot be kept up at sea. They evidently are very delicate animals, and life is soon destroyed if nutriment is not rapidly kept up. These specimens were not emaciated in body before they died.

The testes in this male were very small, being not larger than

peas. The animal was full-grown, and of the size of the largest specimens usually seen.

Sometimes I have seen the male with the spur so far thrown back and concealed from view, as at a glance to be taken for the female, and when opened for anatomical examination to be mistaken for one; so that it is not improbable that the large testes resembling pigeons' eggs may have given rise to the notion of the animal laying eggs.

I have no doubt that the Duck-bills make their burrows high in the banks, so as to be out of the reach of the floods which occasionally prevail. Although amphibious in their habits, they require to repose on the dry land, and also to breathe atmospheric air at short intervals of time. Did they not adopt some plan of the kind, they would be destroyed or drowned in their burrows by the floods.

Another very young specimen was kept for three weeks, and fed upon worms; it had a rudimentary spur; it was very tame and easily fed by hand; it died on the 7th of February, and was preserved in spirits.

The plan I propose, besides introducing shell-fish, &c., is to feed them in captivity upon worms, and, if we succeed in keeping them alive in Sydney by that method for three months, to send them in the place of confinement, arranged as before described, to England, keeping them upon the same diet. At all events it is worthy of a trial; and, on quitting Sydney, I left the artificial burrow and other preparations with a person interested in the subject, in order that he might try the experiment.

I have remarked that, when healthy, these animals on emerging from the water are in the habit of cleaning and drying their fur, and seem to pay great attention to their being in a clean and dry condition, and appear also to be fond of warmth. Not long previous to the death of both these animals, I remarked that they did not dry or clean their fur, and I have no doubt that the chilliness produced by that circumstance accelerated their death, as the body—more especially in the male—was not so emaciated as would have been the case had death ensued from starvation.

2. ON THE LONG-TAILED FLYING-OPOSSUM (*BELIDEUS FLAVIVENTRIS*)*, IN A STATE OF NATURE AND IN CAPTIVITY. BY DR. GEORGE BENNETT, F.Z.S.

In November 1858 I received from the district near Broulee, south of Sydney, from a station on the Mooruya River, a young female of this comparatively rare species, and, although so young, found it of a very savage and vicious disposition, spitting, screeching, and growling when handled, accompanying the noise by scratching and biting. The claws were sharp, producing scratches as severe as those of a cat; but the teeth, being as yet only partially developed, were not sufficient to produce much effect. It was evident that any animal displaying such

* See Gould, *Mamm. of Austr.*, pt. 1. pl. 3.



Bennett, George. 1859. "1. Notes on the Duck-bill (*Ornithorhynchus anatinus*).*" Proceedings of the Zoological Society of London* 27, 213–218.

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