

are now, I believe, in the Natural History Museum, Aberdeen. I only saw a portion of these bones for a few minutes shortly after they were discovered, and have had no opportunity of examining them since; but Mr. Page (in whose possession they were) stated, at the Aberdeen Meeting of the British Association, that they belonged to some species of *Oidemia* and *Somateria*. However this may be, there is, in the Natural History Museum, St. Andrew's, the cranium of a duck, minus the bill, the zygomatic, tympanic, and pterygoid bones, that was found in the brick-clay of Tyrie, near Kirkaldy. This cranium has the closest resemblance to that of *Oidemia nigra*, but is much larger than the cranium of this or any other of the genus that now frequents our coasts. The skull of *O. perspicillata*, however, I have never seen; but Gould and others represent *O. fusca* as the largest of the genus. When the fossil cranium is compared with the latter species, it is found to be a full eighth of an inch larger in transverse diameter; its vertical diameter is likewise greatest. The cranium of *Somateria mollissima* exceeds the fossil in size exactly in the proportion that the latter exceeds *O. fusca*. If the body bore the same proportion to the cranium in Pliocene times as now, this Duck must have been intermediate in size between *O. fusca* and *S. mollissima*. This is the more remarkable when we consider the close resemblance which exists between the fossil cranium in all its parts and that of *O. nigra*; for, excepting the larger size of the former, there appears to me to be no tangible difference whatever in the crania of sufficient importance to separate them specifically. The fossil cranium is perhaps a little more depressed than the recent, and the post-orbital processes form a rather better defined angle on each side with the posterior of the orbital cavity than they do in *O. nigra*, and in this respect somewhat resemble *O. fusca*. But there are the superiorly approximating orbits, the upward and backward ascending processes on the lachrymal (?) bones; although large in the fossil, they form part of the circular ridge across the base of the bill, followed by a deep median depression, as in *O. nigra*. The foramina appear to be the same in both; the fossil cranium has likewise a single optic foramen, and well-defined grooves for the olfactory nerves.

XL.—*On the Habits of Pagurus Prideauxii and Adamsia palliata.* By Lieut.-Col. STUART WORTLEY.

IN the month of July last, while dredging on the 'Diamond' off Hastings, I obtained many specimens of this interesting Hermit Crab with its lovely lilac-and-white companion. I selected a pair, of convenient size, living in the shell of a *Natica monili-*

fera. Bringing it to London, I gave it a glass vase, 12 inches in diameter, with 3 inches of water, and about an inch or sand, for its future home. At first the Pagurus was very shy, withdrawing itself into the shell whenever I went to look at it; but it gradually became less timid, and after I had had it about three weeks in the aquarium, I was pleased to find it eagerly eat a small piece of meat dropped into the vase by its side. It ate a second piece; but on my giving it a third, I was agreeably surprised to see it seize the piece with its large claw, and insert it into the expectant mouth of the Adamsia. Being anxious to verify this somewhat singular fact, I waited a few seconds, and then lifting the pair out of water, found the piece of meat disappearing down the throat of the Adamsia. About half an hour after, he acted in a precisely similar manner with a fourth piece of meat. The digested pieces were afterwards rejected by the Adamsia. Whenever I feed him, I see him feed the Adamsia as soon as he has had enough himself.

On two occasions of my dropping meat into the vase at a time when the Pagurus was not hungry, he inserted his claw within the tentacles of the Adamsia, and jerked it backwards and forwards; but the tentacles not closing on the claw, he appeared to decide that Adamsia was also not hungry, and rejected the meat altogether.

This attachment of the Pagurus to the Adamsia appears very great, and it cannot bear to be separated from it. When it changes from one shell to another, immediately on having securely established itself in its new house, it returns to the shell just vacated, and drags the Adamsia off with its pointed legs, holding fast the shell the while with its large fore claw. The Adamsia does not resent this rough treatment from its friend (though the slightest irritation from any other source will cause it to pour forth in great quantity its acontia), but, detaching its broad lobes, drops off the shell. As soon as Adamsia is free, Pagurus takes it up, and holds it firmly in his fore arms pressed against the shell, till the Adamsia has re-attached its base. On one occasion, Pagurus had to hold Adamsia thus in his arms for upwards of an hour, Adamsia evidently disliking the new shell, and being reluctant to fasten itself to it. When fastened, Adamsia did not feel at home, as instead of firmly attaching the lobes to the shell above Pagurus's head, they were allowed to float loosely in the water. This was evidently a hint to Pagurus that the shell was an unsuitable one; and he shortly vacated that shell, and returned to the old one, where Adamsia soon attached itself as completely and firmly as before. On all other occasions of Pagurus changing his shell, I have constantly observed that his remaining or not in the new one appeared entirely to depend on

Adamsia finding it suitable or not, the latter showing its dislike to the shell by not attaching the lobes above the crab's head. Finding, after an hour or so, this to be the case, *Pagurus* invariably sought another shell.

On one occasion I found *Pagurus* out of his shell, in the act of searching for a new habitation; and it was curious to see how little he seemed to care for the exposed position of his own tail, so long as he could continue firmly to clasp the *Adamsia* in his arms. On another occasion, *Pagurus* was in his new shell, and had not yet succeeded in detaching *Adamsia* from the old one, when I was anxious to take out the *Adamsia* in order to examine the acontia under the microscope. I took up the shell to which *Adamsia* was still fixed; but the crab could not be induced to leave hold, preferring to be lifted quite out of the water to forsaking his companion. I was obliged to drop them both back into the water, when *Pagurus*, with the most rapid of movements, whipped his tail from out the new shell and back into the one to which *Adamsia* was still attached; he then stood and gazed at me in the most impudent and provoking manner, evidently feeling that he had disappointed his enemy and saved his friend.

He is now very sociable and not at all shy; but the way in which he constantly twiddles his antennæ prevents me, I am sorry to say, from obtaining a satisfactory photograph of him, which I am anxious to obtain, to add to my other photographic illustrations of marine natural history.

It is difficult to imagine why the *Pagurus* so insists on the companionship of the *Adamsia*. He may be luxurious enough to appreciate the soft cushion which *Adamsia* makes for his back and chest, or he may find that the white worm-like tentacles of the *Adamsia* act as a sort of bait to small creatures, who thus bring themselves incautiously within the reach of *Pagurus*'s sharp claws.

Anyhow, I see enough to prove that *Adamsia palliata* is almost a necessity of existence to *Pagurus Prideauxii*.

The *Pagurus* has changed his skin once since he has been in my possession.

I have thrown these few remarks together, as I am told by those keepers of aquaria with whom I am acquainted that they have never succeeded in keeping these animals alive; and it is possible that some of their peculiarities may be new to the readers of the 'Annals of Natural History.'

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