

Mr. Hunstein informs me that he shot the female bird on the nest, and that there cannot be any possibility of a mistake as to its authenticity, which judging from the state the egg was in, I can quite believe.

ON SOME HABITS OF *PELOPÆUS LÆTUS* AND A SPECIES OF
LARRADA.

BY H. RAWES WHITTELL, ESQ.

On the 2nd January, 1880, numbers of a species of hornet, *Pelopæus lætus*, took possession of our fireplace for the purpose of constructing their nests. I began to observe their movements, confining my attention principally to one pair; this pair readily decided upon a site, and began to build by securing thereon a shapeless mass of mud about half a square inch in area, which they brought in small portions from the bank of the Darling River, which was close by.

One of them worked out a shallow circular space, similar in shape to a saucer, using its mandibles, tarsi of the first pair of legs, and antennæ in the operation. The loads of mud before deposited almost promiscuously, are now arranged by each one on the edge of this saucer-shaped cavity, pressed into proper shape and thickness, and finished off forthwith. As the cell grows, the upper portion is made to project considerably beyond the lower. This is convenient, owing to the position they assume; always getting beneath the cell, and invariably working from the upper to the lower portion.

The work progresses in this way without interruption until the cell is about half or two-thirds the required depth; when the owners begin to insert their own bodies occasionally evidently to see how the interior is for size. About this time also they begin to draw out the lower portion of the cell, to a more nearly equal distance with the upper, from the base; it is also further strengthened by mud being piled on the top, and at either side. When the hornet finds that the cell is equal, or nearly so, in depth

to its own length, and all parts of the edge are equally distant from the base, it bends in the outer edge until the aperture barely admits of the passage of its own body.

Beneath this cell are built two, or sometimes three others in a roughly horizontal row; then another row containing more cells than the one above it, and so on until the nest has reached the required maximum breadth; when the number of cells in each row diminish, until on the completion of the whole it is in shape a rough oval. The mandibles appear to be the principal building organs, as they are used to press the mud to any required thickness. The anterior tarsi before mentioned and the antennæ are also largely used; the tarsi support the load of building material, which is about the size and shape of a small pea, during transport; they also assist the mandibles in shaping. The antennæ are, no doubt, the final smoothing and polishing instruments; they beat the mud with such velocity as to render their motion almost invisible, and create a loud humming noise.

I may remark here, that in the construction of cells, the antennæ do not appear to be the organs of sensation, which determine when the wall of the cell has arrived at the required thickness. The anterior tarsi, judging from their movements, perform this office; from which it would appear that in *Pelopæus lætus* these tarsi are capable of conveying sensation, of a kind usually, I believe, accredited, in all insects, to the antennæ alone.

On one occasion, while the hornets were in search of more material, I pressed a portion of the edge of a cell, in course of construction, out of shape. On the return of the first one the damage was detected, apparently by sight, almost instantly; he seemed for a time quite nonplussed, but presently he deposited and arranged his load in another place and then repaired damages.

Again I repeated this experiment, but on his return this time he showed no hesitation whatever; took in the situation at a glance, as it were; deposited and arranged his load on the intact portion of the edge of the cell, then repaired the damage. He alighted and went to work with such rapidity that I thought the

damage had escaped notice in the latter case, and I was much astonished when, as soon as his organs were at liberty, he went to the other side of the cell and straightened it up.

As soon as each individual cell is completed, work in cell building is suspended until the spiders, which are to nourish the embryo are collected, and the ovum deposited. The number of spiders stored in each cell varies from four to seven, according to their size. The ova are always deposited on the under surface of the abdomen of the first spider placed in the cells, and are firmly attached thereto, the female entering the cell backwards to perform this office. The change from the ovum to the larva is very rapid, but I cannot state with certainty as to the time occupied, possibly within twenty-four hours.

The larvæ of this species appears to live by suction for about fourteen days, devouring all the soft parts of the spiders first; at this age a sharp, strong, pair of mandibles are distinctly seen with which, in almost all cases, every scrap of the store of food both hard and soft which remains is devoured. In the course of a few more days the larva spins for itself a cocoon and enters the pupa state, attaining the imago about twenty-five days from the time the egg was deposited.

I may mention that I sat in the fireplace to conduct my observations. I have frequently watched these and other hornets at work at a distance of from four to six inches from my face.

On the 20th January, 1880, I examined a complete nest of this species containing thirty six cells. The average number of spiders in each cell was five, so that one pair of these hornets destroy one hundred and eighty spiders in one season.

The entrance to each cell is closed immediately the store of food contained is sufficient, and when the last cell is closed, both hornets set to work and cover the whole with a network of mud ridges, giving it decidedly an ornamental appearance.

I have now to refer to a singular circumstance connected with this species, and a species of Larrada probably *Larrada Australis*?

On the 4th January, 1880, on resuming my observations, I saw to my surprise ; that two cells of a nest of *Pelopæus lætus* which which had been finally closed, and were intact on the preceding day, had been broken open. This nest had been finished for some time, so I was at a loss to account for the re-opening, but the whole was explained when another hornet, *Larrada Australis*, suddenly emerged from one of these cells. This hornet kept running in and out of these cells in a very restless manner, appearing to snatch a mouthful of something each time it entered, I hastily concluded that it must be devouring the food therein, and fearing to lose the specimen I captured and transferred it to my specimen box ; I place it on the table for inspection, together with a specimen of *Pelopæus lætus*.

More of the species *Larrada Australis*, came about the nests of *Pelopæus lætus* that I was watching, and I observed several more of their cells broken open by the *Larrada*, but I could come to no satisfactory conclusion, as to their real object in pursuing this predaceous course ; until the 18th January, 1880. I then saw one of this species deliberately take possession of a cell of *Pelopæus lætus*, on which they were at work. No decided attempt was made by the *Pelopæus*, to regain possession, although this cell contained its own ovum, and three spiders. Both hornets skirmished about for a time, each seeming afraid of the other, at last *Larrada Australis* entered the cell, and settled down to its work without further opposition ; the aperture of this cell being much larger than the one made by *Larrada Australis* itself, admitted of more light, so I determined at the risk of a sting to find out what was going on inside ; I accordingly placed my eye right close to the entrance, and saw that the *Larrada* was dividing the cell into two portions by erecting a wall of mud ; it then became evident to me that this hornet was playing the part of the Cuckoo, by depositing its own egg in the nest of another species, so that its young might be developed at the expense of the labours of another. After this I examined all the cells which had been taken possession of by this hornet, and as I anticipated, I found in every case the ovum of *Larrada Australis*?

therein, and these cells were sub-divided as I had witnessed in the first instance.

There is no possibility of mistaking the ova, that of *Larrada Australis*, being only about half the size of that of *Pelopæus lætus*. The *Larrada* does not go to the river for the material used in subdividing the cell, but takes it from any convenient part of the nest it has attacked, moistening it with a secretion of its own, it also, when at work, emits the same sound as *Pelopæus lætus*, but so faintly as to be only distinguished at very close quarters.

I could not discover what was done with the ovum of *Pelopæus* but I believe it is devoured by the *Larrada* before it deposits its own. If it were thrown out of the cell I should have seen it done I think, and it was certainly not in any of the cells I then examined, so that the only way it could be disposed of is as I have suggested. If it is eaten by *Larrada Australis*, what purpose does this serve, it is surely not the natural food of this insect?

The locality from which these specimens came, and where my observations were made, is situated in about $31^{\circ} 30'$ south latitude, and longitude about $143^{\circ} 30'$ east, and about six miles from the town of Wilcannia on the Darling River.

ON THE VORACITY OF A SPECIES OF HETEROSTOMA.

BY H. RAWES WHITTELL, ESQ.

On the 18th September, 1879, while insect hunting, I turned over a dead log, and beheld to my surprise a lizard (*Diplodactylus*), held fast by a centipede of the genus *Heterostoma*, which was eating it alive. Neither seemed in any way disturbed by my intrusion. I sat down to watch results, and occasionally stirred up the *Diplodactylus* with a stick, which caused it to make feeble and futile efforts to release itself.



Whittell, H. Rawes. 1883. "On some habits of Pelopoeus Laetus and a species of Larrada." *Proceedings of the Linnean Society of New South Wales* 8, 29–33.
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