Translation of Jacobson, 1935

Edward Jacobson's "Aanteekeningen over Stenogastrinae" of 1935 was an important early contribution to stenogastrine biology and is often cited. As far as I know, it has not previously been translated into any major language of science, so that many such citations are probably from secondary sources. In addition, the paper is in a rather obscure journal. My English translation below is provided in order to make Jacobson's observations more directly accessible. I have modernized the paper's format somewhat and explicitly cited some papers where Jacobson simply implied them.

The results are not of equal significance. Most important are the observation of Parischnogaster spp. foraging on leftover prey fragments in spider webs and observations on the semi-translucent white substance. As far as is now known, the conjecture that all stenogastrines forage on spider webs is correct. The argument that the white substance (now called abdominal substance) is of glandular origin has been confirmed, but Stefano Turrillazzi has conclusively shown that it is not in fact a larval food. Jacobson's casual implication that the rings above and below the cells, which are now known to be chemical ant-guards of P. nigricans, are of the same substance as the putative larval food was long overlooked and almost certainly correct. On the other hand, his experiments on homing orientation in P. mellyi contribute nothing of evident value and can safely be ignored. The three criticisms given at the end of the paper are all correct, but only one is of lasting significance. Saussure was indeed mistaken to infer that the combs of P. mellyi are connected by petioles, and it now seems certain that no stenogastrine constructs a petiole.

A few remarks on the author are in order here. These are mostly taken from an obituary by J.C.H. de Meijere and personal communications from Kees van Achterberg. Edward Jacobson (1870 - 1944) was a Dutch businessman who moved to the Dutch East Indies (now Indonesia) in 1897. As an ardent naturalist he collected and observed extensively on Java and Sumatra and associated small islands. In 1908 he may have been the first to collect aculeates on Krakatau, just 25 years after the eruption. He sent specimens especially to the Rijksmuseum in Leiden and the University of Amsterdam. Jacobson was not fond of business, and at about 40 years of age he retired to devote himself fully to natural history. He was apparently wealthy enough to do so without constraint. In World War II he was captured by the Japanese and died as a prisoner of war.

Meijere included a partial bibliography of 54 papers by Jacobson in four languages, mostly insects. A complete bibliography would be hard to compile. The Dutch East Indies were a company colony, largely independent of the state and with their own rather isolated scientific organizations. There are very likely other papers of his lying in obscure colonial journals.

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Notes on stenogastrine wasps (Hymenoptera: Vespidae)[1]

by
Edward Jacobson

The subfamily Stenogastrinae is divided into just two genera[2], Stenogaster Guérin (= Ischnogaster Guérin) and Parischnogaster Schulthess, which was earlier included in the old genus Stenogaster (Schulthess 1927). Although the group is fairly large and the wasps easy to observe, little is known of their natural history. We have good figures of the nests of a number of species in each genus, but for the majority even this is lacking. Most of the known biological details have been reported by Williams (1919, 1928).

Although I collected a large series of natural history observations on several stenogastrine species in Java quite some time ago, through an unfortunate set of circumstances these remained unpublished and were later lost, while the specimens on which they partly depended were also lost. I had no better luck with material which I later assembled in Sumatra; this was sent to an American specialist for analysis, but it was not worked up, nor did I receive it back. Unfortunately, I am no longer in a position to collect new material. Nonetheless, I would like at least to call up some recollections on the subject, in hopes that these will stimulate younger entomologists to undertake fresh investigations. To my great regret, my notes from 1900-1912 are no longer in my posession, so that I must rely entirely on memory for my facts. These observations primarily relate to Parischnogaster mellyi and nigricans; I am uncertain exactly which other species were also studied.

An interesting fact which came to my attention in 1908 in Batavia[3] concerns foraging by these wasps. At that time nothing had been reported about this, though Williams (1919) has since made much the same observations as I did. Although my observations thus lose much of their novelty, I would still like to communicate what I have found in the interim.

I had already earlier noticed stenogastrines (probably P. mellyi and nigricans) collecting honey at the extra-floral nectaries of Ricinus communis, but I never saw them at flowers, nor did I ever come upon any taking prey. At my request the French specialist R. du Buysson made a microscopic investigation of some stomach contents, from which it appears that these consist of fragments of various kinds of insects. Upon further observation in the vicinity of the nest, I made the surprising discovery that these wasps prey on all sorts of small insects entangled in the webs of spiders. They have a habit of "standing" motionless in the air and repeatedly shifting abruptly to a new position. While thus hovering they closely inspect the entire surface of a web and then quickly pounce upon one or another of the entangled insects and pluck it from the web. They then fly off so swiftly that it is difficult to follow their route.

With the puzzle thus solved, I knew where to look for foraging wasps. The outbuildings of my house had an abundance of spider webs under the eaves, where I could observe foraging on any day I chose. I have not observed the wasps to take the spiders themselves, though the possibility cannot be discounted. Although these particular observations are limited to two species of Parischnogaster, I think it is likely that a similar mode of foraging will be found throughout the Stenogastrinae.

Williams (1919) has since made observations on foraging which are consistant with mine. As prey of stenogastrines he makes mention only of "small and tiny midges", by which are meant such nematoceran flies as cecidomyiids, mycetophilids, chironomids, psychodids, etc. Although the webs on my outbuildings were too high to let me see exactly which insects the wasps pluck from them, it seemed to me that these comprised many different kinds of small, delicate insects, not just flies. And Buysson's examination of stomach contents revealed fragmented insects from various orders, including psocids.

Another question which called for solution concerned the feeding of the larvae. They are given a semi-translucent, pap-like substance with the appearance of starch-paste. I presume that the females prepare a special food from the insects which they collect, though I have no idea how they might accomplish this. A certain amount of this semi-translucent pap is deposited into each cell after an egg has been placed in the base of the cell.

Williams (1919) reached no conclusion about the source of this larval food. He doubted that it was of animal origin and notes that "it is otherwise quite uniform in consistency and color and rather difficult to reconcile with mastication and probably regurgitated midges". He further speaks of "a sticky, rather transparent ball of jelly-like food", of "the viscid lump of jelly", and states that "the larva is fed from time to time with a soft paste whose composition I did not ascertain, but suspect it to be a plant product". No evidence is given in support of this latter suspicion, and

I cannot believe that honey from extra-floral nectaries could be transformed into such a pap.

In 1908 in Batavia I found attached to a thin rootlet a nest consisting of several cask-shaped cells in a single column, each cell opening downwards. The cell walls show distince transverse bands where material of different colors has been used. Masses of the larval food were stuck onto the rootlet above and below the column of cells, forming rings around the rootlet. One of the two masses consisted of two or three parallel rings, and in other nests I have later found as many as five such rings. Wasps on the nest were often observed occupied with these larval-food reserves, whether adding to them or taking from them. Some wasps also showed the following peculiar behavior. Sitting with the body axis parallel to the rootlet, the wasp sharply flexes the abdomen under the body and forward between the legs until the tip of the abdomen meets the head. The mouthparts could then be seen to lick the anal opening. With intermittent pauses, the wasp is then actively engaged with the larval-food rings, though I was not close enough to see exactly what she does with them. It may be that the larval food is a product of the female gut and that it is collected in this manner. Alternatively, it may be that it has a different origin, whether this be animal, vegetable or mineral, and that the wasps merely add a preservative substance from the gut. After testing the larval food for the presence of starch by the addition of iodine - with negative results - I sent a small amount of it to Prof. Treub at Buitenzorg[4] with a request to look further into its chemical composition. The attempted analysis revealed nothing though, so that this remains an open question.

The species which makes these larval-food rings has since been described as Parischnogaster serrei (Buysson 1905), though Dr. van der Vecht (pers. comm.) considers this a junior synonym of P. nigricans. I have found several more nests of this species, always with larval-food rings, and in a museum I encountered some similar nests with the dried up rings still visible.

I collected the P. nigricans nest shown in Plate II Figure 2[5] in July 1910 near Semarang at an altitude of 50 m. It was based on a vertical piece of wire and comprised three capped cells, two open complete cells and about seven incomplete cells. The last few incomplete cells were very small and apparently just newly begun. Rings of reserve food can be seen above and below the column of cells. The wasp on the fourth cell from the top is a female.

I made only one test of the powers of orientation in P. mellyi. If a colony and its nest are enclosed in a rearing cage for one day, when the wasps are then allowed to fly out they unerringly find their way back to the nest. I covered the open side of such a cage with a piece of cardboard, leaving only a small opening at the top. After the wasps had learned to leave and reënter by this opening, I drove them all from the cage and then moved just the cardboard about 50 cm to one side. The returning wasps at first flew against the cardboard at the point where the opening had been, but they soon found their way to the nest, and when they later flew out they did not again mistake its position. This demonstrates that in order to find the nest the wasps, like honey bees, orient not just to what immediately surrounds it but also to features of the local environment. It further appears from this test that P. mellyi adapts much more quickly to a new situation than do honey bees, which keep returning all day to the old location if the hive has been moved.

I would like to make a few comments on some errors in the literature about stenogastrines. In his original description of P. mellyi, Saussure (1852) figured the nest like a small chandelier of three horizontal combs placed one above the other, but he showed it upside-down. This reversal has then been followed by Sharp (1899) and Schulthess (1927), though Sharp expressed some doubt on this point.

Schulthess (1927) stated that according to Williams P. mellyi is a solitary species. This is a misunderstanding, as Williams characterized only Stenogaster[6] eximius and micans as solitary and correctly regarded P. mellyi as social.

Saussure (1853-1858) described the nest of P. mellyi as gymnodomous, stelocyttarous and rectinidal, i.e. with a naked comb or combs, each suspended from a centric petiole. He mistakenly assumed, though, that the wasps construct the petiole. Rather, each comb is attached directly to and around the existing substrate. This is usually a thin root, a mycelium filament from a horsehair fungus (Marasmius equicrinus or another Marasmius sp), or quite often an indjoek[7] filament.

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Footnotes

1. A translation of "Aanteekeningen over Stenogastrinae (Hym., Vespidae)", Ent. Med. Ned.-Indië 1: 15-19 (1935).
2. Now further divided into six genera. (Trans.)
3. Now called Jakarta. (Trans.)
4. Now called Bogor. (Trans.)
5. The figure is a clear photograph of a typical nest of this species, showing just what the author describes. (Trans.)
6. Both now placed in Eustenogaster. (Trans.)
7. Injoek, or idjoek, is the black threads growing at the bases of leafstalks of the sugar palm Arenga saccharifera. (Author)