

How To keep Mallophaga a long time
in life?

It is a general complaint of amateurs of "lice" that they cannot be nourished up, for they starve, as soon as their host is cooled. This is the reason, why still nothing is known about their embryonal and postembryonal development.

When one now, as I formerly communicated, with a "catch-apparatus" of Berlese Mallophaga catches in mass, one can investigate them minutely and will find that they pass through the next stages: larva, protonympha, deutonympha, adulti (♂ and ♀).

But there is yet more: one can clip off parts of feathers with eggs at them, and investigate them. In this manner one gets complete series of embryonal development-stages and one can yet get to know many specialities. (look here underneath).

When one brings a dead bird or a dead mammal into an oven with a constant temperature (+ 35 °C.), it follows as a matter of course that the lice will stay longer alive. But alas, then begins also sooner the decay.

What to do? Well, very simple.

Cut off the bird's wings, tail and a lot of down, while of a mammal can be saved tail, legs and a mass of hair.

These objects must be brought into an oven with constant temperature of + 35 °C.; Bring also therein a bottle (narrow above), filled with water, so that the air in the oven not becomes too dry. And look, the lice keep on living.

A wing of a horse-kite - *Gyps fulvus* Gmel. - was too big for the oven. No trouble, I put this upon a radiator. At night-time the radiator is cold and I feared the lice to be starved next day.

But they weren't, in spite of the periodical nightly important fall of temperature (the radiator stands just before the window) and of very dry warmth in the day-time, the Mallophaga live at least 4 weeks!

Some specialities at eggs.

In Piaget, *Les Pédiculines*, p.XXIII, we read:

"Sans doute que le couvercle de l'oeuf, avec son arrangement de micropyles (Micropylapparat de Leuckart), permet assez bien de reconnaître les divers genres: les pediculus à leur couvercle uni, les phthirus à leur couvercle ridé, les lipeurus à leur couvercle à mailles armées de poils, à leur chorion à mailles, etc.;. . ."

In the *Entomologische Berichten* vol.3 nr.49 I communicated already something about holes in the egg-lid of one Mallophaga-species (as I remember it was a *Docophorus*-sp.)

I supposed then, that these holes were closed by a thin membrane and should be of the use to exchange the respiration-gasses. Leuckart and Piaget are evidently of another idea and are thinking that the spermatozoon enter through these holes.

I however stay at my idea and compare them with primordial stigmata of some Acari-eggs.

At eggs of a big *Lipeurus*-sp., *L. quadripunctatus* Denny of host *Gyps fulvus* Gmel., I observed following specialities.

The eggs are sticked with their tail's end (that is the end where is situated the abdomen of the developed embryo) at the "beards" of feathers, with their head's end free pointed at the point of the feather-beard.

By this I deduce that the tail's end leaves first female's body, in other words is situated caudally in the uterus; one can also say it to pass first the receptaculum seminis. By this I deduce again the micropyle is situated at the tail's end of egg and not at the lid, as Leuckart and Piaget suppose.

The amorphous egg-shell shows a hexagonal design, similar to the facets of Arthropoda eyes or to a honey-comb or gauze.

No doubt this retiform design is called by Piaget "mailles" (look above).

At the head's end of egg there is a semi-convex small lid, likewise with a hexagonal design, but no trace of hairs ("poils", look above) as Piaget noticed. Along the lid's margin one sees a - seldom closed - row funnelshaped holes. The funnels are pointed out with their orifice, just as the primordial stigmata of the eggs of some Acari. When one sees such a funnel aslant, one perceives therein 2 concentrical rings. This causes a fine perspective.

O n n y m p h a e f e m i n i n a e a n d m a s c u l i n a e .

Genus *Lipeurus* is characterized, just as well as some other genera, by the different shape of antennae of ♀ and ♂.

Now I have remarked the nymphae show already a difference in antennae-shape, so that one may speak of nymphae femininae and masculinae.

The nymphae masculinae-antennae are viz. thickened at first and second joint. I have not yet investigated enough larvae, but do not doubt these will show also the secondary sex-marks. Now I'll look after secondary sex-marks at larvae and nymphae also at other genera.

O n m a r e s a n d f e m i n a e a n d t h e
c o p u l a t i o n .

Piaget says, p.XXVI:

"Il est rare de trouver des parasites en copulation, cette chance ne m'est encore arrivé que 5 ou 6 fois; ce n'est donc bien souvent que par la comparaison qu'on parvient à reconnaître si tel individu est adulte ou non. Pour les femelles la présence dans l'abdomen d'un oeuf en voie de développement peut donner quelque certitude à cet égard; mais quant aux mâles, je n'ai pas encore pu trouver de signe bien constant; les antennes ne peuvent servir que quand elles diffèrent dans les deux sexes. Du reste le sexe se constate surtout par l'examen des derniers segments, d'ordinaire assez transparents pour permettre de distinguer les organes génitaux",

and on p.6:

"Pendant la copulation le mâle se place sous la femelle,..."

When somebody as Piaget, who investigated thousands of larvae, communicate that he found but 5-6 times Mallophaga in copula, then I was very lucky.

In my nursery of *Gyps fulvus* lice I found three couples in copula. Abdomen of ♂ is dorsally bowed. ♀ is enabled to run over a feather with the abdomen highly raised; this is a comical sight.

When one then looks more exactly at her with a magnifying-glass, one remarks under her abdomen the smaller ♂, running as fast as she does.

♀ does not cling to ♂. The copulation is thus fervent that the animals -cast in spiritus or acetic acid 10%- does not separate.

As for the complaint of Piaget, expressed on the trouble of discerning the nymphae from the adulti, I don't understand that, for the adulti are to discern by more strongly chitinised caput and thorax and sclerites at sides of abdomen of nymphae.

Besides - and Piaget acknowledges this himself too - the chitinised inner genital (better: copulation)-organs give an absolute trusted decision.

Above we have seen that the difference in antennae is not sufficient, for the antennae also differ in the nymphae.

O n t h e p o s t e m b r y o n a l d e v e l o p m e n t .

Piaget says, p.6:

"La larve se développe rapidement et sort de l'oeuf par un couvercle rond, à l'état d'insecte incomplet. La bouche et l'appareil digestif sont les seuls organes complètement développés; la tête est informe, les antennes courtes et grosses, sans différence sexuelle, l'appareil génital n'est guère indiqué; les pattes courtes et faibles. L'insecte subit plusieurs mues, et à chaque mue il apparaît plus avancé dans son développement; les antennes s'allongent et s'assouplissent; les pattes grossissent; les mouvements de l'animal deviennent plus rapides; les taches apparaissent, les bandes se colorent. Malheureusement les observations me manquent sur la durée de la gestation (le développement de l'oeuf fécondé), sur la vie de la larve, sur le nombre des mues. Dans une autre partie de ce travail je me propose de revenir sur l'anatomie et sur l'histoire du développement des parasites".

Strange is the contradiction "la larve se développe rapidement" and "les observations me manquent sur la durée de la gestation".

In truth we still know nothing about the duration of the embryonal period.

"La tête est informe", that is true, from that we can learn much, e.g. larvae of *Lipeurus* and *Nirmus* already have almost the caput of adulti; on the contrary *Docophorus*-larvae have a *Nirmus*-caput. By this we may conclude *Lipeurus* and *Nirmus* to be more specialised forms.

"Les antennes" (de la larve sont) "sans différence sexuelle". Since I did find this at the nymphae-antennae, I dare not underscore this assertion without further exact investigation.

"Plusieurs mues" does not agree with the following assertion "les observations me manquent sur le nombre des mues". I have already told that only three juvenile forms appear, but I still not succeeded - without comparison - in determining an individual, whether it to be a larve, a proto- or a deutonymphe.

In vain I have looked in Piaget's papers for further communications about anatomy and embryologic observations.

O n t h e m o v e m e n t s o f M a l l o p h a g a .

Their movements are quick. Therefore it is often difficult to catch them. As they cling strongly, one must catch them with two finger-tips or with a pincet; even then they slip out often, being as slippery as an eel. Also one sees them suddenly disappear - as in the twinkling of an eye - so that one asks oneself of: where is it now? At the finger? At the pincet? No, it has suddenly disappeared at the feather's margin; lift up the feather, there it is! By Jove, how happened this so quick? Pay attention! It runs surprising quick to the margin, puts its body along the margin; now the three right legs brought under the margin, and... it has disappeared without leaving any trace. Such a stupid animal!

A.C.Oudemans.

Transl. F. Smit
Nijmegen
Nederland.
15-2-1946.