

Variation in Dragon-fly Legs.

A careful study of the legs of dragon-flies, discloses great variation in the size, length and general development of the spines on the femur ^{and} ~~and~~ and tibiae.

Altho' these variations are not, in most cases, sufficiently marked nor sufficiently constant to be of much value from a systematic stand point, still there are many points which are most interesting. Generally speaking, each femur and each tibia has a double row of spines, one on the anterior and one on the posterior aspect, the spines increase ~~in both size and number~~ from the front to the hind legs and all the spines are inclined toward the tarsi.

In a tabular comparison of representatives of the various sub-families, we find, as we should naturally expect, that those forms which are least specialized in other respects, exhibit also, a much less marked development of the spines. In Gomphus, for example, and in Cordulegaster, we find the spines small and slight; on the femur at least, not arranged in regular rows and with the net or leg-barbet scarcely at all developed. This is strictly in accordance with the ^{condition} ~~generalization~~ of these sub-families in other respects, and corresponds moreover, with their habits, for the representatives of these groups have not the habit of vigorously hunting or hawking their prey, but keep low down among the bushes and defend a surprise for

the capture of their favorite food.

Among the Cerebrines. the Libellulidae and generally among the Aequiornidae we have the "leg-basket" developed into a most ingenious and highly specialized apparatus for seizing and holding the small but particularly active insects on which these dragonflies habitually feed. The spines are long and close set, in some species, for example *Calopteryx maculata*, ^{*} their length is four or five times as great as the diameter of the limb which bears them. The spines on the opposite sides ^{of the two rows} of the legs point in opposite directions, and as those of the femur are directed toward the knee and those of the tibia away from it, they form, when the tibiae are held, as they normally are, at an angle with the femur, a labyrinth whose every opening is defended by sharp spines, and which must seem to the hapless insect caught within it, no less confusing than ^{did} that of the Cretan King, Minos, to his victims.

Altho' the theory of the operation of the leg-basket is perfectly comprehensible it is // difficult actually to observe the process, because of the lightning swiftness of the hunter's movements. We see him flying in his accustomed beat, a sudden reverse to the side

shows that he has caught sight of some appetizing morsel, but all in an instant the insect is seized and devoured and the dragonfly sweeps on in his regular circle.

Kellogg in "American Insects" says of the manner in which the "leg-basket" operates, "When the prey is come up with, however, it is caught not by the mouth but by the 'leg-basket'. The thorax is so modified and the insertion of the legs is such, that all the legs are brought close together and far forward, so that they can be clasped together like six slender, springy, grasping arms just below the head. Altho' the catching and eating is all done in the air and very quickly, observers have been able to see that the prey is caught in this 'leg basket' and then held in the fore legs while being bitten and devoured."

* Upon the anterior sides of the first tibiae, appears an interesting modification of the spines which is undoubtedly to be correlated with the manner in which the dragon fly holds his food while he is dining. Instead of a regular series of long spines, such as are found upon the second and third tibiae, the ^{inferior} lower portion of the first tibia bears a series of small spines, very numerous and closely set, so as to form

a sort of ^{comb}brush. This ^{comb}brush-like arrangement, no doubt, enables the dragon fly to hold firmly the small insects which compose his bill of fare, he is able to keep a secure grip upon the struggling creature while it is torn into small pieces by the strongly chitinized mouth parts, and the fragments, which otherwise might drop to the ground and be lost, are devoured to the last morsel. This modification of the tibial spines was found in dragon flies of all species, in some forms, notably *Hagenius brevistylus*, where the basket was very imperfectly developed, this character, also, was less conspicuous, but it appears in a greater or less degree in all forms.

A close examination of the legs of dragon flies, then, shows that they have become specialized in a very curious direction. Instead of becoming ^{adapted} increasingly useful as means of locomotion, they have attained a degree of specialization which renders them quite unfit for their original purpose: instead, they are useful only for perching or clinging to grasses or twigs, and have developed an entirely new function as a net or basket in which the dragon fly catches his prey.

While this conclusion is true of the great majority of the species of Odonata, there are two

sub-families in which the tendency has been in an entirely different direction. If the Odonata are considered from a systematic standpoint, these two sub-families stand very far apart, but the legs have become specialized in a manner strikingly similar. The habits of the representatives of these sub-families are entirely different from those of the generality of dragon-flies and might be inferred from an examination of the curious aspect of the legs, particularly of the hind femur. Instead of spending their lives as adults almost entirely upon the wing, as do the other Odonata, Leptheimis and Brachogomphus sprawl on the ground with the hind legs extended in a position similar to that of grasshoppers. The hind legs, particularly the femora, are enormously developed, and instead of a double row of slender spines, forming an angle of a basket, ^{the anterior row} exhibits from five to seven very large, sturdy spines which support the leg as it is extended upon the ground.

This characteristic variation from the line of specialization which has been followed by most families of dragon flies, has been used as a systematic character, as have also certain peculiarities in the arrangement and development

of the spines in the Cordulidae, Eurythronna, and
Macrothemis. In general, however, there are other
characters, more conspicuous and hence much
easier to use in determining the species of dragon-
flies, and the characters of these species have been
but little observed.

1597-*Libellula flavola* Charpentier

Gordius Libellulae flavicollae Wiering-v. Siebold
Stettin. ent. Zeit. 1850 - page 7 - Cebdau -

1598 - *Libellula variegata* T+abr.

Gordius Libellulae variegatae Wiesing-Syst.
Stelm II. pag. 98. Cnidar.

1598. *Libellula* spec? (larva)

Is country spec? 'Ercolani-Hell' adathament
H. pag. 23- tax. # - fig 26-27

1604 b. Cognate-spec?

L. isomum spec.? Villot - Bullett. soc. statistique
d'Orere, 3 ser.; 4 # - 1869 - pag. 9.

L. forficatus - Gut. *Actinocephalus* *disjunctus*
cinn-8 sh.

~~Echinomera~~ *Echinomera* *trispida*. " "

~~Cidela wald~~ " "

~~Bavovissia affinis~~ Leg.

Coccidius schubergi - Schaud.

" lacazei -

Calopteryx virgo larva - Gut - *Staphorhynchus*
varius Filicellulidae - Gut - *oligacanthus* (Lieb)

various Libellulidae - Gut- ^{Oligacanthus (Sieb}
 Geni only values monievi

Aquiospuella-laua-
menospora polycantha - Leg. G. Schum.

Menosford - epism - in form of a cup, bordered with
hooks. This species from gut of *Legia puella* larva
in form of disc. bordered with sharp teeth - from
gut of *Colopteryx virgo* - larva.

"In the egg state we have found a small red mite, an
arachnid, which swims rapidly over the water in
search of an *Odonat* egg, upon which it either deposits
an egg or excavates it for immediate nourishment.
A minute *Diptera* genus, unknown, was also seen
to oviposit on the egg of *Diplax*" Mrs. C. P. Carson -
1890 -
The *Dipterous* enemies of man - Their life histories
and structure - a treatise on their extermination.
Adult *Negon* fly will eat the severed abdominal
segments.