

bristles, the male does not have the striking tuft on the inner side of the front femur and there are slight differences in the other peculiarities of the front legs. It is considerably smaller than the preceding species, the male measuring hardly more than 3 mm. and the female about 3.5 mm. The front and face are green instead of purple and the third vein runs closer to the second than in *mandibulata*, curving considerably backward, near the tip of the wing.

Paratype, Female No. 25241, U. S. N. M.

MANDIBLE SUBSTITUTES IN THE DOLICHOPODIDAE.

BY R. E. SNODGRASS.

A first view of the face of *Melanderia mandibulata* (pl. 14, fig. 1) gives one a decided shock, followed by a desire to discover by what morphological trick the fly so cleverly imitates the features of a mandibulate insect. But the disguise is a flimsy one. Each labellum of the proboscis (fig. 6) is divided into an upper and a lower lobe (*a* and *b*, *c*), free terminally, but united basally by an ample infolded membrane. The lower lobe is differentiated again into a basal part (*c*) and a terminal part (*b*), the latter of thick, polished chitin and produced into a large, sharp, free tooth turned inward toward the one on the opposite side (fig. 1). These are the "mandibles." The lobe (*c*) is movably articulated at its base to the basal plate (fig. 6 *Th*) of the labium. This sclerite, called the theca, as in most flies, presents a high median ridge on its inner or anterior surface which gives attachment to muscles diverging to the lobes of the labellum. The fibers on each side are separated into two bundles, the proximal ones being inserted on the upper outer angle of the basal lobe (*c*) of the labellum, and the distal ones on the inner, median angle of the same lobe, which is united internally to the lower margin of *Th* by a special median articular condyle. Thus the lobe (*c*), terminating in the strongly chitinized point (*b*), can be worked in and out in true mandibular fashion. Figure 2 shows the parts of the labellum in repose with the mandible-like lobes (*b*) concealed beneath the upper lobes (*a*). The insect now presents the aspects of an ordinary fly.

But *Melanderia* possesses, besides its pseudo-mandibles, other mouth structures of interest which, however, are not visible externally. These are four great prongs depending from the epipharynx (fig. 3, *Ephy*), in addition to the usual hypopharynx (*hphy*), which is a strongly-developed, decurved appendage projecting from the lower lip of the mouth within the anterior enclosure of the labium. These parts may be exposed as shown in figure 3 by dissecting off the rest of the head

and the labium along the line *g*. This discloses the chitinous floor (*Phy*) of the sucking pharynx with its two posterior cornua, and the dilator muscles of the pharynx (*Phy Mcl*) stretched between the invaginated roof of the pharynx and the edges of the lower facial plate (*Clp*) which is apparently the clypeus. These muscles form two lateral sheets in the Dolichopodidae, between which is a large apodeme (*d*) from the epipharynx carrying another set of muscles. The true labrum (*Lm*) is somewhat membranous in *Melanderia* but a basal plate (*x*) intervenes between it and the clypeus which might belong to either, though, judging from some other forms, it is probably the base of the labrum. A removal of the clypeus, as in figure 4, fully exposes the muscles (*Ephy Mcl*) attached to the epipharyngeal apodeme (*d*) and inserted on the plate (*x*). Figure 5 shows all parts removed except the epipharyngeal armature and its apodeme (*d*). It is here seen that the two sets of prongs (*Ephy*) are carried on two basal plates (*e* and *f*). Each plate is grooved and weakly chitinized along the median line, and the posterior plate (*f*) supports the great flat apodeme (*d*) between the bases of its prongs. The contraction of the muscles (fig. 4, *Ephy Mcl*), pulling forward and downward against the base of the labrum (*x*), turns the posterior prongs of the epipharynx backward. A lobe on the anterior angle of the posterior basal plate (fig. 5, *f*) on each side, pressing downward on the posterior angle of the anterior plate (*e*), turns the anterior prongs forward. At the same time the median flexibility of both plates (*e* and *f*) allow the prongs to flare outward. Thus the action of one set of muscles brings about a simultaneous diverging of all the prongs in four directions, forward, backward and laterally.

Such a complicated epipharyngeal structure as that of *Melanderia* has apparently not been noted before in any fly, though something similar is common to all or most of the Dolichopodidae. Langhoffer (1902) divided the genera of this family into four groups according to the development and character of the armature of the epipharynx, but he had only two-pronged species, and in a former paper (1888) he had described the processes as true mandibles. While we can not accept this idea Langhoffer's study of the organs themselves is interesting. In his first group of genera, typified by *Hydrophorus*, he includes forms in which two processes are well-developed and project as long hooks or tusk-like spikes beneath the labrum, recurved in some cases, decurved in others. In *Hydrophorus signatus* there is a prominent tooth at the base of each large anterior prong suggesting the quadruple structure of *Melanderia*. In this connection it is interesting to note the great development of the hypopharynx in *Aphrosylus venator*, which belongs to the *Hydrophorus* group, the organ forming a long beak-like rod projecting from between the lobes of the

labellum and curving back to between the front coxae. The epipharyngeal prongs are also well developed, forming two decurved tusks extending beyond the labrum.

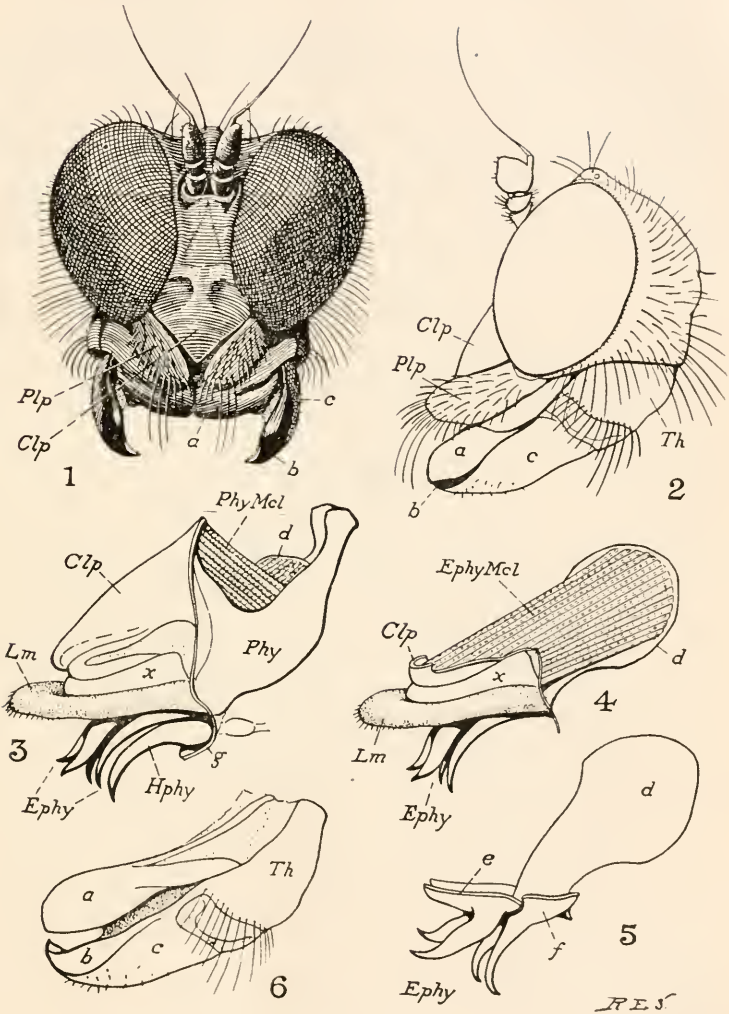
In Langhoffer's second group, including genera similar to *Dolichopus*, the epipharyngeal armature is less developed and consists of two ventral, longitudinal ridges beneath the labrum, ending anteriorly in free points. In the next two groups, including a smaller number of genera, *Porphyrops*, *Neurigona* and *Orthochile*, the armature is still weaker. In all four groups the presence and position of spines and teeth on the lobes constitute also distinguishing characters.

It is evident that Langhoffer was not acquainted with species having the characters of *Melandria*, else he would have had to define a fifth group to include forms having four well-developed epipharyngeal prongs. In this he was fortunate, however, for such a discovery might have embarrassed his mandible theory.

Melandria mandibulata does not stand alone as a unique thing; it culminates a small series of forms tending toward an excessive development of mouth armature, all of which live along ocean beaches where they probably feed on small animals stranded by the tide, as do other members of the family. We may suppose that their mouth hooks and prongs give them a special efficiency in ripping open the soft skin of the creatures from which they then suck out the body fluids. Dr. Aldrich, who has furnished the material for this paper, describes how he has seen shore-inhabiting species of *Dolichopus*, with the proboscis attached to one end of living prey, apparently sucking the blood, undisturbed by the squirming and writhing of the victim.

Hypocharassus pruinosus, from the beaches of Florida, Georgia and North Carolina, has an epipharyngeal armature of four thick, wide pieces, the anterior plates being especially deep and provided on the front edges with a series of small teeth above the principal hooks. This apparatus constitutes a lacerating implement probably quite as effective as the epipharyngeal parts of *Melandria*. But this species has no labial "mandibles," though the general outlines of the lateral lobes of the labellum are very suggestive of those of *Melandria* when its jaws are closed (fig. 2).

Melandria curvipes, of the coast of Southern California, is distinctly of the *mandibulata* type. It was formerly placed in the genus *Hydrophorus*, but Dr. Aldrich would now transfer it to *Melandria*. The labellum on each side is separated into a dorsal and a ventral division, and the tip of the lower one is prolonged and curved inward as a strongly chitinous, polished lobe, but with a rounded edge instead of a sharp point. The epipharyngeal armature is like that of *mandibulata*, but the plate (x) at the base of the labium, on which the epipharyngeal



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muscles are inserted, is distinct all around from the clypeus, instead of being united mesially with this plate as in *mandibulata* (fig. 3).

Melanderia mandibulata, of the coast of Washington, boldly goes to the logical extreme and has the jaw lobes of its labella developed into well-formed, tapering, sharp-pointed organs of true mandibular form.

We have here, evidently, a case of species badly in need of jaws, but, mandibles having been lost by their ancestors, and irrevocably, the family has developed substitutes for these organs in the form of prongs and hooks on the epipharynx, while *Melanderia* has supplemented these with special jaw-like lobes of the labellum.

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 1902. Langhoffer, A. Mandibulae Dolichopodidarum. Verhandlungen des V Internationalen Zoologen-Congresses zu Berlin, 1901, pp. 480-486, 4 figs.

EXPLANATION OF PLATE 14.

Melanderia mandibulata Aidrich.

- Fig. 1—Facial view of head with "mandibles" open.
 Fig. 2—Side view of head with "mandibles" (*b*) closed and concealed beneath upper lobes (*a*) of labellum.
 Fig. 3—The clypeus (*Clp*), labrum (*Lm*), epipharynx (*Ephy*) and hypopharynx (*Hphy*) removed from rest of head and labium along the line (*g*), exposing the sucking pharynx (*Phy*) and its dilator muscles (*PhyMcl*).
 Fig. 4—The labrum and epipharynx, with clypeus, pharynx and hypopharynx removed, exposing the epipharyngeal apodeme (*d*) and its muscles (*EphyMcl*) attached to basal plate (*x*) of labrum.
 Fig. 5—The epipharyngeal armature and apodeme (*d*) with muscles removed. The four epipharyngeal prongs (*Ephy*) separated and shown arising from two basal plates (*e* and *f*) beneath labrum, which is removed. The second plate (*f*) carries the apodeme (*d*) between bases of prongs.
 Fig. 6—Side view of labium, showing basal plate (*Th*), and the three lateral divisions of the labellum (*a*, *b* and *c*), the middle one strongly chitinous and mandible-like.

a, upper lateral lobe of labellum; *b*, jaw-like lobe of labellum; *c*, lower basal lobe of labellum; *Clp*, lower part of face, probably the clypeus; *d*, epipharyngeal apodeme; *e*, basal plate of anterior epipharyngeal prongs; *Ephy*, epipharynx; *f*, basal plate of posterior epipharyngeal prongs; *g*, epipharyngeal apodeme; *Hphy*, hypopharynx; *Phy*, pharynx; *PhyMcl*, dilator muscles of pharynx; *Plp*, maxillary palpus; *Th*, theca; *x*, plate between labrum and clypeus, probably basal part of labrum.