NOTES ON HIPPOBOSCIDAE. 18. THE GENUS *BRACHYPTEROMYIA* WILLISTON; WITH THE DESCRIPTION OF A NEW SPECIES (DIPTERA)

By J. Bequaert [1]

Brachypteromyia Williston

Brachypteromyia Williston, 1896, Ent. News, VII, p. 184. Monotypic for *Brachypteromyia femorata* Williston, 1896 = *Anapera fimbriata* Waterhouse, 1887.

Brachyptomyia Speiser, 1907, Ent. News, XVIII, p. 104. Misspelling of *Brachypteromyia*.

Brachypteromia Aldrich, 1907, Jl. New York Ent. Soc., XV, p. 6. Misspelling of *Brachypteromyia*.

Head horizontal, oval, as long as or longer than wide, deeply inserted in the very concave humeral margin of the thorax. Dorsal appendage of second antennal segment long, flattened, rounded off at apex. Eyes small, of many small facets, elliptical, placed dorso-laterally and far from fronto-clypeus and postvertex. Fronto-clypeus occupying nearly half the length of the head, separated by a long mediovertex from the large postvertex. Palpi well developed. Ocelli absent. Thorax with large, lobate humeral callosities and prominent preälar angles; dorsal sutures either vestigial, incomplete or absent. Scutellum transverse, short, distinctly divided from the mesoscutum. Mesothoracic spiracle dorsal; metathoracic spiracle between the more or less developed metapleural ("pleurotergal") protuberance and the base of the hind coxa. Legs very long and thick; tarsal claw three-toothed, the basal "heel" being unusually long and slender; two pad-like pulvilli and one slender, feathered empodium. Wing functionless, reduced to a very short pad, about as wide as long, with a few thick rudimentary veins in the anterior half. Halteres well developed. Abdomen

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with only the basal and sometimes a pair of preäpical dorsal sclerites differentiated; otherwise membranous and uniformly hairy above and below; no median striated area dorsally. Pilosity of body and legs very long and dense, the whole insect hirsute.

Brachypteromyia is closely related to *Myophthiria* Rondani, with which genus Ferris (1928, Pan-Pacific Entom., IV, p. 140) proposes to unite it. No serious objection to such a course can be offered. The discovery of a second species, much more like *B. fimbriata* than like the two or three known species of *Myophthiria*, suggests, however, that *Brachypteromyia* might be retained at least with subgeneric rank. Three main differences can be pointed out between the two groups. In *Myophthiria* the thorax is slightly less evolved, with the dorsal sutures more distinct, the scutellum longer and narrower, and the chaetotaxy sparser and more in accordance with the primitive arrangement. The wing is longer and narrower, with the venation more distinct and somewhat less reduced. The abdomen is much less hirsute; in the female it bears dorsally a pair of transverse preäpical sclerotized plates, preceded by one or two small median sclerites; while in the male there are, in addition to the preäpical pair, three transverse median tergal plates, the hindmost of which is very large.

The three females of *B. fimbriata* examined show dorsally no traces of median sclerites nor of sclerotized preäpical plates. In two males of that species there appear to be two minute preäpical sclerites, placed far apart; but I can find no trace of them in the male holotype of *B. neotropica*. More material will have to be studied before a final conclusion can be reached. If, however, the difference in the structure of the abdomen proves reliable, there might be some justification for retaining *Brachypteromyia* as generically distinct from *Myophthiria*.

It should also be noted that *Brachypteromyia* is the most specialized type of the subfamily Ornithomyinæ. It is the final step in a series of changes leading from the fully winged to the subapterous condition. This series, one of the most instructive evolutionary sequences I am acquainted with, is perhaps best understood by following first the gradual reduction of the wings. The more common species of *Ornithomyia*, such as the Palearctic *O. avicularia* (Linné) and the Holarctic *O. fringillina* Curtis (= *O. anchineuria* Speiser), have fully developed

wings, with a complete venation, and are as good fliers as any of the Hippoboscidæ. Some species, however, such as the Indian *O. comosa* Austen, show a decided shortening of the wing, though the venation remains normal. The further reduction of the wing to a functionless condition apparently proceeded along two different lines. In one, leading to *Stenepteryx*, the wing retained its length, but reduced its area by losing most of the membrane, while some of the veins disappeared and the remainder were crowded near the costa. In the other, leading through *Crataerina* and *Myophthiria* to *Brachypteromyia*, the whole wing was shortened, with concomitant loss of most of the venation. All known species of these four subapterous genera appear to be incapable of flight. Moreover, the reduction of the wings was accompanied by other changes which affected nearly all parts of the body. The most striking of these are the lengthening of the head, the reduction of the eyes, the loss of the ocelli, the obsolescence of the dorsal thoracic sutures, the gradual disappearance of most of the tergal plates of the abdomen, and the unusual development of the legs and particularly of the claws.

The restricted choice of a host and even more so the type of host selected were no doubt the main factors which determined this orthogenetic evolution. Most species of *Ornithomyia* show very little host specificity, being found mainly on a variety of passerine and some game birds. Some species, however, are restricted to swallows and martins (Hirundinidæ) and *O. comosa* is one of these. It may be significant that typical *Stenepteryx hirundinis* (Linné) occurs on swallows; while a form regarded either as a race of *hirundinis* or as a distinct species (*cypseli* Rondani) lives on swifts (Apodidæ or Micropodidæ). All known species of *Cratœrina*, *Myophthiria* and *Brachypteromyia*, on the other hand, are restricted to the Apodidæ. It seems reasonable to assume that the ancestors of these swift-flies were swallow-flies and that the change of hosts — from swallows to swifts — was in some way responsible for the series of morphological changes eventually culminating in *Brachypteromyia*. As in most such cases, the mechanism of these changes is a matter of speculation; but the end result is readily recognized as an efficient adaptation to the peculiar morphology and habits of the host.

Swallows and swifts are amongst the most aërial of birds,

with the swifts by far the speedier of the two groups. Some species of swifts are possibly the fastest birds for their size, capable of reaching 70 to 100 miles per hour.[2] Both swallows and swifts are also capable of long-sustained flight, as they catch their food on the wing; but, again, the swifts spend much longer periods in the air, some species being unable to perch. When not nesting, some swifts must stay aloft for the major part of the day, at one stretch. In swallows and even more so in swifts, the narrow, pointed wings, very long in proportion to the small body, and often the more or less forked tail (the fork capable of opening and closing) are clearly adaptations to a predominantly aërial life. The body, particularly the head, is built so as to offer the least resistance to the air and is perhaps a little more "stream-lined" in the swifts than in the swallows. The plumage is very even and smooth at the surface. That of the swifts is usually coarser, stiffer, with less down on the bases of the body-feathers, than that of the swallows.[3] Several of these features explain well the peculiarities of the parasitic flies of these birds. The wings of the flies have become reduced or atrophied, because on birds travelling at high speed they increase the risk of the fly's being blown off the host. They are, moreover, of little use for reaching a new host, on birds spending so much of their life in mid-air and far away from the nest.[4]

[2] Most published observations on the average and maximum speed of birds are unreliable, as they fail to take in account a number of important outside factors. The following data seem, however, to be fairly trustworthy. R. Meinertzhagen (1921, The Ibis, Ser. 11, III, pp. 232 and 237) gives the observed speed of a Mesopotamian swift (species?) as 68 miles per hour and estimates that of the alpine swift, *Apus melba* (Linné), as 70 to over 100 miles per hour. A. Magnan (1922, Ann. Sci. Nat., Zool., Ser. 10, V, p. 167) includes the European swift, *Apus apus* (Linné), with the European swallows and martins in a group of high-speed birds averaging 45 to 80 miles (80 to 150 kilometers) per hour. E. Stresemann (1931 and 1934, in Kükenthal, Handbuch der Zoologie, VII, pt. 2, pp. 584 and 837) gives the speed of the Asiatic swift, *Hirundapus caudacuta* (Latham), as 80 miles (144 kilometers) per hour. J. P. Chapin (1939, Bull. Amer. Mus. Nat. Hist., LXXV, p. 464) observed the Ruwenzori alpine swift, *Apus melba maximus* (O.-Grant), shooting by at a terrific speed and was tempted to estimate its velocity at about 100 miles per hour.

[3] These and other adaptive peculiarities of swifts and swallows were acquired independently, as the two groups are not related in the opinion of modern ornithologists. The Hirundinidæ are placed in the order Passeres, and the Apodidæ in the order Macrochires. Fossil Apodidæ are known from the Oligocene to date (possibly from the Upper Eocene) (K. Lambrecht, 1933, Handbuch der Palaeornithologie, p. 621).

[4] The larvæ of *Stenepteryx* and *Crataerina* are known to be laid in the nests of the host, where they hatch. In colder climates, some of the puparia remain unchanged through the winter, after the birds have migrated. They hatch upon

The lengthened head and much flattened, nearly wingless body enable the insect to glide swiftly in the dense, coarse plumage, where it can grasp a firm hold with the unusually strong legs and the long, deeply split claws. The many long stiff hairs covering body and legs also help the fly to adhere to the feathers, endowing it with the properties of a burr. The obsolescence of the thoracic sutures is the result of the disuse of the wings and is not directly useful to the insect. The same is true of the reduction of the eyes and the loss of ocelli, which seem to be sequels to the loss of the power of flight.[5]

Brachypteromyia fimbriata (Waterhouse)

Anapera fimbriata Waterhouse, 1887, Proc. Zool. Soc. London, p. 164, fig. (on p. 163) (Fort Wingate, New Mexico, off "*Cypselus melanoleucus*" = *Aëronautes saxatilis* Woodhouse; no sex given, but evidently ♀). Shufeldt, 1887, The Ibis, (5) V, p. 157, footnote; 1894, The Auk, XI, p. 186. Aldrich, 1923, Insec. Insc. Menstr., XI, p. 78.

Brachypteromyia fimbriata Speiser, 1899, Wien. Ent. Zeitg., XVIII, p. 202, footnote; 1900, Ann. Mus. Civ. Genova, XL, p. 555. Bezzi, 1916, Natura, Riv. Sc. Nat., VII, p. 179. Austen, 1926, Parasitology, XVIII, pt. 3, p. 359 (♀ type, at the British Museum).

Brachyptomyia fimbriata Speiser, 1907, Ent. News, XVIII, p. 104.

Brachypteromia fimbriata Aldrich, 1907, Jl. New York Ent. Soc., XV, p. 6.

Myiophthiria fimbriata Ferris, 1928, Pan-Pacific Entom., IV, p. 140, figs. 1–2 (♀ ♂; Tuba, Arizona; off *Aëronautes melanoleucus*" = *Aëronautes saxatilis*).

Brachypteromyia femorata Williston, 1896, Ent. News, VII, p. 185 (♂; Wyoming; off "*Macropis melanoleucus*" = *Aëronautes saxatilis*). Bezzi, 1900, Rendic, Ist. Lombardo Sc. Lett., (2) XXXIII, p. 522. Aldrich, 1905, Cat. North Amer. Dipt., p. 656.

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the return of the host. Both swallows and swifts often seek the same nest several years in succession.

[5] I am indebted to my friend Dr. James P. Chapin for valuable information concerning the habits and adaptive features of swallows and swifts, in so far as they may have influenced the evolution of their parasitic flies.

Specimens Examined. — NEW MEXICO: Fort Wingate, 2 ♀, one the holotype at the British Museum, off *Aëronautes saxatilis* (R. W. Shufeldt Coll.). — COLORADO: 1 ♂ off *Aëronautes saxatilis*, without more definite locality (collected in May 1882 by Joel Allen. — M. C. Z.). — UTAH: Kanab, Kane Co., 1 ♂ off *Aëronautes saxatilis* (July 1934; W. J. Breckenridge Coll. — Univ. of Minnesota). — The collection of the M. C. Z. also contains two specimens (♀ ♂) received from Osten Sacken, without locality, but with the host record, "off *Nephoecetes niger* (Gmelin)." This is a swift, a race of which (*borealis* Kennerly) occurs in western North America from southeastern Alaska to southern Mexico. Most probably Osten Sacken's specimens came from California. The species is also known from Wyoming.

The following differences have been noted between *B. fimbriata* and the new South American species described in this paper. Head relatively broader, more nearly elliptical, scarcely longer than its greatest width. Inner orbit narrower, about as wide as mediovertex before the postvertex; frontal bristles spread over a wider area, which expands both at the upper and lower ends; 2 to 4 vertical bristles in the upper corner, which is somewhat set off from the remainder of the side of the frons. Postvertex shorter and broader, more semi-elliptical, much shorter than mediovertex. Appendage of second antennal segment longer and narrower, about two and one-half times as long as greatest width, widened about mid-length, bluntly rounded off at tip. No trace of median notal suture. Metapleural ("pleurotergal") protuberance barely indicated. Wing much longer and narrower, more elliptical, about one and one-half times as long as wide; rudimentary venation more distinct. A much smaller fly: total length in dried condition, 6 mm.; from tips of fronto-clypeus to hind margin of scutellum, 3.2 mm.; of wing, 1 mm. In the male the parameres are present and shaped almost exactly as in the Neotropical species.

Brachypteromyia neotropica, new species. Fig. 1

Male. — Head broadly oval, about one and one-fourth times as long (from tips of fronto-clypeus to occipital margin) as greatest width. Frons at its narrowest nearly six times as wide as the eye; inner orbits (parafrontalia) very wide (before the postvertex slightly wider than mediovertex), conspicuously

but gradually narrowed anteriorly, the inner margins strongly diverging anteriorly; frontal bristles many, in two or three irregular rows, crowded in a regular narrow strip near the inner margin and extending over the anterior three-fourths of the inner orbit; a fringe of long bristles at the edge of the outer orbit, near and behind the eye; 6 or 7 very long vertical bristles in the upper corner of each inner orbit. Postvertex (vertical triangle) triangular with obtuse and somewhat ogival anterior angle and laterally produced side angles, the hind margin nearly straight; slightly shorter than mediovertex, flat, smooth, without rudimentary ocelli, pits or depressions. Fronto-clypeus long and broad, slightly shorter than its distance from the occipital margin, fused laterally with the base of the antenna; fronto-clypeal suture barely indicated; base of clypeus very broad and short, its antero-lateral arms short, separated by a broad but shallow inward curve; frons proper with a minute and shallow median pit close to the fronto-clypeal suture. Mediovertex well developed, much broader anteriorly, with wide antero-lateral extensions separating the genæ from the fronto-clypeus. Eye of many facets, small, nearly elliptical, occupying a little over one-third of the upper side of the head, seen from above about twice as long as wide, about twice as far from the postvertex as from the fronto-clypeus. Palpi about as long as clypeus, but mostly retracted within the buccal cavity; only the short tips visible from above. Antenna large; first segment with a group of 3 to 6 long bristles in the inner anterior corner; appendage of second segment nearly twice as long as wide, flat, broadly rounded off at apex, densely covered with many long bristles; protruding arista of third segment (beneath the appendage of the second) much flattened, elongate paddle-shaped. Ventrally, the latero-anterior areas of the head (corresponding to the parafacialia and facialia) bear many long bristles (vibrissæ) in several rows, crowded along the inner (buccal) margin; the latero-posterior areas (cheeks) bear two long setæ on each side. Thorax wider before the wings than long from tip of humeral angle to base of abdomen; humeral margin very deeply, but broadly curved inward. Humeral callosity broad, flat, obtusely rounded off, separated by a shallow inward curve from the more prominent preälar angle. Promesonotal suture distinct, but in dorsal view visible only medially behind the occipital margin; scuto-scutellar suture

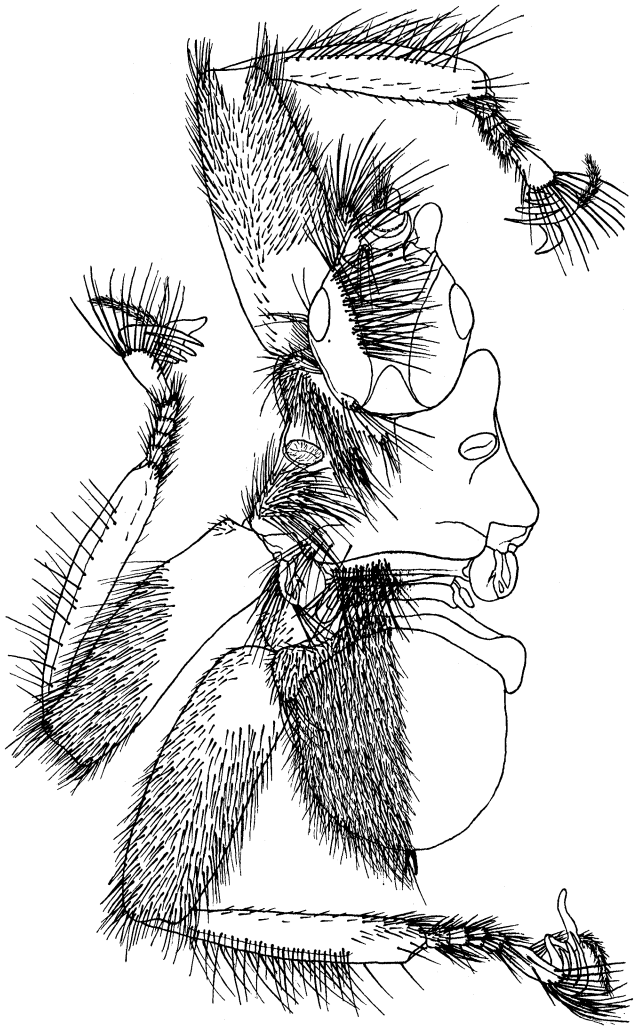

FIG. 1. *Brachypteromyia neotropica* J. Bequaert n. sp. Male holotype in dorsal view. Pilosity omitted over right half.

deep; a distinct suture divides the notopleuron from the epipleurites at the base of the wing; posthumeral suture marked on the sides only, behind and close to the spiracle; transverse mesonotal suture placed far back and weakly marked only over the lateral third; notal suture weakly indicated anteriorly; other dorsal sutures obsolete, the humeral callosities and notopleura fused with the mesoscutum medially. Scutellum very wide and short, with nearly parallel anterior and posterior margins, superficially divided by a transverse depression. Metapleuron with a short, conical, blunt, so-called "pleurotergal" protuberance, hidden in dorsal view by the wing. Mesothoracic spiracle very large, entirely dorsal; metathoracic spiracle large, between the metapleural protuberance and the hind coxa. Dorsal chætotaxy of patches of long bristles, scarcely corresponding to the customary grouping: a dense oblique patch on the humeral callosity to beyond the spiracle, ending far from the middle of the mesoscutum, but with a narrow extension across its anterior part (somewhat behind the humeral margin); a dense patch over most of the notopleuron; 6 or 7 long bristles (postalars) close to the wing, behind the transverse mesonotal suture, and more medially a row of 3 bristles (prescutellars); many long scutellars in several irregular rows on the disk and a row of similar bristles on the hind slope of the scutellum. Prosternum divided by a deep triangular notch into two broad lobes, bluntly rounded at apex, bare. Mesosternum broader than long, with a longitudinal furca, bare except for a narrow patch of setæ on each side before the mid coxa. Metasternum divided into an anterior basisternum (before the hind legs) and a narrower, posterior sternellum (between the hind coxæ); basisternum with a longitudinal furca ending posteriorly in a deep pit, with only a narrow cross-patch of setæ (broadly interrupted medially) near the hind margin; sternellum deeply depressed medially, saddle-like, bare. Legs very long and stout; fore and mid pairs about alike, hind pair slightly longer. Coxæ short, with many short setæ and several long bristles. Trochanters short, with a few short setæ near apex. Femora fairly evenly swollen throughout, bare ventrally, covered dorsally with many stiff hairs and bristles, leaving bare a broad basal area (more extensive on mid and less so on hind pair). Tibiæ flattened, dorsally with a superficial longitudinal groove bearing a row of erect bristles; a similar row of bristles near the

outer lower edge; a few short setæ elsewhere; apices ventrally with a patch of strong bristles, but without spurs proper. Tarsi short and broad; basal segments with many short stiff bristles; apical segment much longer and broader than the others, with very long setæ, mostly in a transverse dorsal row at the apex. Claws symmetrical, unusually long, very deeply divided into three slender teeth, the basal "heel" being long and narrow; two broad, pad-like, bare pulvilli; one long, slender, feathered empodium. Wing very short, pad-like, about twice as long as scutellum, scarcely longer than wide; venation crowded over the anterior or outer half, of 2 or 3 thick longitudinal veins (probably formed by fusion of several veins); costa very thick, with many long bristles on basal two-thirds and at apex; other veins bare; membrane bare. The venation is decidedly more reduced than in *B. fimbriata*. Halteres well developed, borne on long stalks. Abdomen (in dried, contracted condition) short, densely hairy both above and below. A short, moderately broad basal tergite (next to the thorax), covered with minute setæ; behind this a much wider sclerotized tergite, with incurved hind margin and broad side lobes, covered with short, stiff setæ, with a row of long bristles at the hind margin and a patch of even stronger ones at the tips of the side lobes. A short, setulose basal sternite. No other sclerotized tergal or sternal plates can be made out on the membranous abdomen. Parameres of terminalia straight, slender, rod-like, very gradually widened toward base, blunt at apex.

Length: total, in dried condition, 9 mm.; from tips of frontoclypeus to hind margin of scutellum, 5.6 mm.; of wing, 0.8 mm.

VENEZUELA: Galipan, close to Pico del Avila, Estado Miranda, at about 2,000 m. altitude; male *holotype*, off a square-tailed swift, *Aëronautes montivagus* (d'Orbigny and Lafresnaye). Mus. Comp. Zöol., Cambridge, Mass.

The differences between *B. neotropica* and the only other known species have been given under *B. fimbriata*.