

1-1-1913

Die Pollensammelapparate der beinsammelnden Bienen

A. Braue

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Recommended Citation

Braue, A., "Die Pollensammelapparate der beinsammelnden Bienen" (1913). *Bo*. Paper 175.
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"Die Pollensammelapparate der beinsammelnden Bienen"

Jenaische Zeitschr. f. Naturwiss. 50 (1): 1-96
4 plates, 26 text figures

Author introduces his paper by making some historical references to earlier classifications of bees and points out that, with few unsatisfactory exceptions, the morphology of the pollen-collecting apparatus has played a minor role in these earlier evaluations of the relationships of bees. He proposes to present a complete comparative morphological treatment of this apparatus, by examining a series of representative types of bees from simple to complex, and by comparing the hindleg of ♀♀ with that of ♂♂ of the same species, and by using the mid-leg when feasible.

He describes the technique used in making study preparations of the legs.

He was not always able to obtain both sexes of all species studied.

The term "femoral collectors" (Schenkelsammler) is used to designate those types of bees in which the tibia, 1st tarsus, femur, and even coxa enter in totthe makeup of the collecting apparatus; "tibial collectors" (Schienensammler) refers to those in which the apparatus is largely concentrated on the tibia and 1st tarsus.

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Part I) Descriptive presentation of the pollen-collecting apparatus according to ascending phylogenetic development.

Detailed descriptions with illustrations of the pollen-gathering apparatus in a series of 21 different species beginning with Prosopis confusa Nyl. and ending with Apis mellifica L.. 63 pages packed with detail. Corresponding legs (hind) of the two sexes compared when possible. Mid leg of ♀ described and depicted in some cases.

Part II- Secondary Involutions of the pollen-collecting apparatus in Parasitic bees and in Systropha

A similar treatment of the conditions found in Sphecodes reticulatus Thoms. (♀), Nomada rufipes Fabr. (♀), and Systropha curvicornis Scop. (♀ & ♂).

Part III- General Summary of the Results.

There seems to be a tendency through the entire series to separate the collecting apparatus proper and the brush and to concentrate each on a single segment. This is fulfilled most completely in the case of the honeybee in which the tibia functions exclusively as collecting apparatus, and the metatarsus as brush structure.

Author recapitulates some of his findings and attempts to point out various stages in the phylogenetic development of the structures under consideration. His observations lead to the following general pattern of the approximate course of development of the pollen-gathering apparatus in these bees:

"The lowest forms were simple femoral-collectors having general hirsutism of equally strong development on both the front and hind sides of the legs. Gradually separation of collecting hairs and brush hairs was accomplished, and this was accompanied by a steadily increasing flattening of the segments. When, very gradually, there appears

a concentration of the collecting apparatus on the femur and tibia (that is best expressed in the highest degree in Halictus where there is a sabrelike bend in the femur and an accompanying peculiar arrangement of the hairs on its lower side) the most highly developed femoral-collecting groups have been reached (Halictus, Andrena). In addition, there have been manifestations of an endeavour to concentrate the collecting apparatus on the tibia alone as far as possible, and thus have arisen the simplest tibial-collectors - the so-called "dry collectors" (Camptopoeum, Panurginus). These tibial-collectors then attain the preponderance, and the femoral-collectors are gradually supplanted (while coxa, trochanter, and especially femur are eliminated from the job of carrying pollen, by means of gradual evolution of their strongly expressed hirsutism and through a dying away of the sabrelike bending in the latter) until finally the summit of the phylogenetic series of the solitary bees is made up only of downright tibial-collectors. These have concentrated the collecting apparatus almost exclusively on the tibia (thanks to the practice of wetting and balling-up pollen) (Eucera, Melitta, Macropis, and Anthophora). There is a lacuna between Anthophora and the highly developed Basket type of construction found in Bombus and Apis."

Author discusses some possible causes for the development of the apparatus. He discounts Lamarckianism and appears to favor Natural Selection.

With regard to phylogeny, the author feels that, with few exceptions, the series based on comparative development of the pollen-collecting apparatus corresponds with the series based largely on structure of mouthparts. Notable apparent exceptions are Ceratina, and Andrena. Suggests that possibly discrepancy tied up with type of larval feeding.

Suggests that Sphecodes derived directly from Andrena.

Part IV- The various forms of hair in the collecting apparatus.

Feels that special feathered hairs on the tibia of ?? so characteristic as to support the idea of relationship between Ceratina, Halictoides, Halictus, and Colletes. This further supported in cases of the last 3 of these by presence of bilateral feathering.

In parasitic form degree of reduction of complication in hairs parallels degree of reduction in collecting apparatus, and this favors idea that parasites arose from collecting forms.

In general the most primitive bees had simple hairs and there arose complicated types as higher forms appeared. Degree of hair complexity seems tied up with whether or not there were ancillary factors involved in the job of transporting pollen. Most complicated hairs found among the "dry-collectors", return to simplicity among the "wet-collectors".

Author presents Saunders' table of hair types (9 types), and a classification of his own (10 types with subdivisions).

j.m.

Braue
 1913