

## TWO MORE PHILIPPINE ANOPHELES IN THE MYZORHYNCHUS SERIES <sup>a</sup>

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### INTRODUCTION

I take it as an honor as well as a privilege to name one of the two anophelines presented in this article, *A. ejercitoi*<sup>b</sup>, as a humble tribute to Dr. Antonio Ejercito, presently ranking Filipino malariologist, for his leading rôle in anti-malaria control work in the Philippines and the other, *A. balerensis*<sup>b</sup>, to the town of Baler where the mosquito was first identified. These mosquitoes were caught in the same month of October 1941 in Baler, Quezon (formerly Tayabas). *A. ejercitoi* was caught in barrio Suclayin just at the outskirts of the town proper, one and one-half kilometers from the periphery of a swampy jungle and four kilometers from the seashore. The other, *A. balerensis*, was caught from a carabao-baited trap at barrio Cemento, a virgin forest along the seashore and four kilometers from the town proper.

### ANOPHELES EJERCITOI <sup>c</sup>

(Female)

General appearance: Large and dark

Head: Antenna—dark, first flagellar segment (third antennal) heavily bushy, scales dark and more numerous towards the basal segments whereas the terminal 2 or 3 segments are devoid of scales.

Palpi—as long as proboscis, all dark, very shaggy, scales long at base and gradually becoming less so toward the tip.

Proboscis—slightly shaggy and dark except the labella.

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<sup>a</sup> This was read before the weekly seminar of the Section of Malaria Control at Manila on 9 November, 1946.

<sup>b</sup> *A. ejercitoi* and *A. balerensis* were identified by the author from batches of imagines caught from different carabao-baited traps by Messrs. Beato Laureles and the late Dominador Untivero, ex-malaria technicians in the course of their routine activities in connection with the anti-malaria operations of Malaria Control Unit 3c of the Bureau of Health at Baler, Quezon which was headed by the author. To whatever honor this article may achieve, Messrs. Laureles and Untivero are entitled to their corresponding shares and to the memory of the latter this article is dedicated.

<sup>c</sup> See illustration at end of this article.

Thorax: Mesonotum—dark without scales except setæ.

Propleural setæ—4

Spiracular setæ—3

Prealar setæ—6

Sternopleural, upper setæ—6

Sternopleural, lower setæ—6

Subalar (upper mesepimeral) setæ—10

Mesepimeral (lower) setæ—1-2

Wing: Costa—dark with only two pale areas, namely, the apical pale which extends as far as opposite the tip of the first longitudinal vein and a narrow subcostal pale which involves also the first longitudinal vein.

Humeral—with dark scales.

Subcosta—dark except for two or three pale scales at tip and a few pale scales opposite the root of the second longitudinal vein.

First longitudinal vein—three small pale areas, namely, the apical pale, a few pale scales opposite the subcostal pale but not involving the whole and a small pale area opposite the origin of second longitudinal vein.

Second longitudinal vein—stem dark except for a few pale scales mixed with a majority of dark scales towards the distal end. Bifurcation dark. Anterior branch dark except for a small pale area proximal to a terminal dark. This pale area is aligned to the apical pale of the costa and the apical pale of the first longitudinal vein. Posterior branch—distal half and proximal end dark, the intervening area pale. This pale spot is a little over one fourth the whole length of vein 2.2.

Third longitudinal vein—distal and proximal ends dark, the wide intervening area is an admixture of pale and dark scales.

Fourth longitudinal vein—proximal two-thirds of stem dark, distal one-third a mixture of pale and dark scales with the dark predominating. Anterior branch divided into almost five equal portions with the proximal, middle and distal fifths dark while the intervening areas are pale. Proximal and distal thirds of posterior branch dark, the middle third pale.

Fifth longitudinal vein—proximal end of stem a mixture of pale and dark scales followed by a small area of purely dark scales, the dark predominating. Bifurcation pale. Anterior branch—a small proximal dark area, a small middle dark at the curvature and an apical dark. Between the proximal and the middle dark is a narrow intervening pale, the long intervening area between the middle and apical dark is a mixture of pale and dark scales.

Sixth longitudinal vein—proximal half is a mixture of pale and dark scales. The middle area and the distal end are of purely dark scales while the intervening portion is a long stretch of purely pale scales.

Fringe—dark except for a narrow pale fringe slightly above the tip of the third longitudinal vein. The fringe is composed of three rows of scales. The longest ones line up the posterior border of the wing continuous to the tip of the costa. The middle row is only one-half as long as the former and also follow the same align-

ment as the longest scales. The last row is composed of very short scales that align the posterior rim of the wing from the tip of the sixth longitudinal vein to the tip of the wing.

Legs: Forelegs—dark except for very narrow pale apical rings to the first, second, and third tarsal segments, the more proximal, more distinct. Base of femur markedly swollen.

Midlegs—dark without pale rings whatsoever.

Hindlegs—femur, tibia, first and second tarsal segments dark except for narrow pale rings to the apices of the tibia, first and second tarsal segments. Distal fifth of third tarsal segment entirely pale while the proximal four-fifths is dark. Proximal and distal fourth of fourth tarsal segment white leaving a mid portion entirely dark. The fifth tarsal segment is entirely white. These broad white patches on the segments will produce in effect two broad white bands of the hindlegs.

Abdomen: Pleura covered with brownish white scales. Dorsum and ventrum with many brownish setæ (hairs) and fewer brownish white scales. These scales are progressively scarce towards the posterior segments. The prominent tuft of dark scales on the median posterior of sternum VII which is common to the *myzorhynchus* series is absent.

#### ANOPHELES BALERENSIS <sup>2</sup>

(Female)

General appearance: Large and dark

Head: Antenna—dark, first flagellar segment, third antennal)

heavily bushy, dark scales limited to the first flagellar segment and a few on the second.

Palpi—as long as proboscis, all dark, very shaggy, scales long at base and becoming gradually shorter towards the tip.

Proboscis—slightly shaggy and dark except the labella.

Thorax: Mesonotum—dark without scales but only setæ.

Propleural setæ—6

Spiracular setæ—4

Prealar setæ—12 or more

Sternopleural, upper—6

Sternopleural, lower—5

Subalar (upper mesepimeral)—10

Mesepimeral (lower) wanting

Wing: Costa—dark with only two pale areas, the apical pale which involves the tip of the first longitudinal vein and narrow subcostal pale, the latter not involving the first longitudinal vein.

Humeral—with dark scales.

Subcosta—two or three pale scales near its origin, few pale scales opposite origin of second longitudinal vein and one or two pale scales at tip. The rest is dark.

First longitudinal vein—dark with two small pale areas, an apical pale and another proximal to origin of second longitudinal vein. Distal to humeral vein is a small area of a mixture of pale and dark scales.

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<sup>2</sup> See illustration at end of this article.

Second longitudinal vein—stem is divided into four equal portions of alternating dark and pale patches, dark at the bifurcation, anterior branch (vein 2.1) dark except for one small pale area situated opposite apical pale of first longitudinal vein, posterior branch (vein 2.2) dark except for one small pale area distal to bifurcation.

Third longitudinal vein—tip and proximal ends covered with dark scales while the long intervening part is covered with an admixture of pale and dark scales.

Fourth longitudinal vein—stem covered with dark scales, anterior branch (vein 4.1) dark except for a small area of few pale scales mixed with dark ones just below its proximal end and another small pale spot just above its distal end, posterior branch (vein 4.2) tip and proximal end entirely dark while the intervening area is an admixture of pale and dark scales, pale scales less numerous than dark ones.

Fifth longitudinal vein—dark patch at proximal end of stem, followed by a similar area of a mixture of pale and dark scales and still distal to this is a bigger area of dark scales while the rest up to but not reaching the bifurcation is an admixture of pale and dark scales, the bifurcation is pale, anterior branch (vein 5.1) with three dark areas, namely, a small dark immediately following the bifurcation, another small dark at the curvature and a distal long area of dark scales, the intervening portions between the dark ones are mixtures of pale and dark scales, the posterior branch (vein 5.2) is divided into a proximal half of pale and dark scales and a distal half of purely dark scales.

Sixth longitudinal vein—with only two purely dark areas, the apical dark at the tip and a proximal dark at the mid portion. Between these dark areas is an area of purely pale scales but the rest up to its origin is a mixture of pale and dark scales.

Fringe—all dark except for a narrow pale spot opposite tip of third longitudinal vein. In contrast to *A. ejercitoi*, *A. balerensis* has only one row of long scales lining the posterior border of the wing in addition to the usual short scales lining the posterior rim of the wing from the tip of the sixth longitudinal vein to tip of the wing.

Legs: Foreleg—all dark except for very narrow pale apical rings to the first, second and third tarsal segments, the latter less distinct. Base of femur markedly swollen.

Midleg—all dark without a trace of pale rings.

Hindleg—femur, tibia, first and second tarsal segments dark except for narrow pale apical rings to tibia, first and second tarsal segments. Proximal half of third tarsal segment dark, the distal half and the rest of fourth and fifth tarsal segments entirely white.

Abdomen: Dark and no scales but setæ. The prominent tuft of black scales on the venter of abdominal segment VII which is common to the *myzorhynchus* series is absent.

#### COMPARISON WITH SIMILAR ANOPHELINES

Comparison and contrast will be complete and vivid if type specimens are actually examined but this is a very expensive procedure and too difficult if not impossible. Literature affords

the most practical aid. If available, trouble arises when the description is meager or even wanting on a point where one is closely observing, while description of older writers is often too broad and at times so vague as to be good for two or more species or varieties. The cropping up of many literatures in different languages from different parts of the globe is so steady as to render their procurement immensely expensive and not always easy while older ones are gradually disappearing. In the presentation of this paper, the author is unfortunately handicapped by lack of literatures most desired. World War II has not only destroyed the Philippine Bureau of Science Library, once considered the biggest scientific library in the Orient, but also shut the Philippines from latest literatures. The following description is based from those of foreign authors. Only those found in the Philippines bearing resemblance to the two anophelines presented in this paper have been compared with actual specimens.

1. *A. hyrcanus* Pallas 1771. Under this species, several varieties have been recognized:

(a) *A. hyrcanus sinensis* Wiedemann 1828. F. V. Theobald (1910) sank *A. plümiger* Döenitz and *A. jesoensis* Tsuzuki. Based from the description of S. R. Christophers (1926), F. W. Edwards (1932), N. H. Swellengrebel and E. Rodenwaldt (1932), and B. A. R. Gater (1935), this variety is distinguished from the two anophelines presented in this article by possessing the following characteristics:

Palpi—marked

Wings—subcostal pale area broad involving vein coathine

1 equally. Vein 6 posterior border of proximal half may have 2-3 dark scales. Broad pale fringe at wing tip and a small one opposite vein 5.2.

Leg—narrow pale apical bands except the fourth and fifth tarsals of midlegs and fifth of fore and hindlegs.

C. Strickland (1913) noted the variability of the tuft of black scales on the venter of abdominal segment VII. Pale scales on the basal half of the costa are also variable, absent in those of Ch'i Ho (1931), Li and Wu (1934), and B. A. R. Gater (1935) but present in those of S. Yamada (1924) and F. E. Baisas and S. M. K. Hu (1936). Caution must therefore be observed in the use of these characteristics.

(b) *A. hyrcanus nigerrimus* Giles (1900). F. W. Edwards (1932) sank the following under this variety:

*A. indiensis* Theobald 1901.

*A. plümiger* Doenitz 1901.

- A. bentleyi* Bentley 1902.  
*A. minutus* Theobald 1903.  
*A. peditaeniatus* Leicester 1908.

N. H. Swellengrebel and E. Rodenwaldt (1932) treated *A. peditaeniatus* as a distinct variety of *hyrcanus* but B. A. R. Gater (1935) sank it under *nigerrimus* with the following:

- A. vanus* Theobald of Swellengrebel 1921.  
*A. mauritianus* Grandpre 1900.  
*A. pseudopictus* Grassi of Swellengrebel and Rodenwaldt 1932.  
*A. argyropus* Swellengrebel 1914.

*A. hyrcanus nigerrimus* Giles 1900 maybe distinguished for possessing the following characteristics:

Palpi—banded at joints 2-3, 3-4, 4-5 and at tip of segment 5. These bands may appear indistinct as to be represented merely by a few white scales mixed with dark ones.

Wings—vein 6 with two dark areas, distal one smaller than proximal, the rest pale although few dark scales are invariably found. Broad pale fringe at wing tip and unusual narrow pale fringe opposite vein 5.2.

Legs—all tarsi 1-3 banded apically, fore and mid tarsi 4 with apical rings only while hind tarsi 4 broadly banded basally and apically and hind tarsi 5 basally banded, thus forming in effect two broader hind tarsal white banding. The tip of hind tarsal 5 remains constantly dark.

Abdomen—a tuft of black scales on the venter of segment VII.

I hate to disturb those anophelines already sank or buried under the banner of the variety *nigerrimus* for fear of complicating a problem that is sufficiently complex in itself, but because a few of them bear a good resemblance to the two anophelines herein presented, I could not help but exhume them from the manuscripts. Only those bearing close resemblance and whose characteristics have not been carried by Giles *nigerrimus* will be considered. Basing from description of foreign authors (the specimens are not available locally), the following are picked up for review:

(i) *A. mauritianus* Grandpre 1900. F. V. Theobald (1903-12a) described it as possessing last 2 hind tarsal segments entirely white, thus bringing it closer to *A. balerensis* but it can be distinguished by possessing banded palpi and entirely dark wing fringe.

(ii) *A. hyrcanus nigerrimus* form *argyropus* Swellengrebel 1914. N. H. Swellengrebel and E. Rodenwaldt (1932-11a) believed it identical to *A. mauritianus* Grandpre but B. A. R. Gater (1935-4a) took it as a form of *nigerrimus*. Basing from the description of the foregoing authors, it is closely resembling *A. balerensis* for having the last 2-1/4 hind tarsal segments white but distinguishable

for having banded palpi and a tuft of black scales on the venter of abdominal segment VII.

(iii) *A. peditaeniatus* Leicester 1908. N. H. Swellengrebel and E. Rodenwaldt (1932-11b) considered it a distinct variety of *hyrcanus* but F. W. Edwards (1932) sank it under *nigerrimus* whereas B. A. R. Gater (1935-4b) sank it under the banner of *A. montanus* of Stanton and Hacker 1917. It is unlike *nigerrimus* for possessing narrow pale fringe at wing tip but may be distinguished, basing from G. F. Leicester (1908), and N. H. Swellengrebel and E. Rodenwaldt (1932) for possessing banded or with pale scales on palpi, last hind tarsal segment dark and a tuft of black scales on the venter of abdominal segment VII.

(iv) *A. minutus* Theobald 1903. F. V. Theobald (1903) described it as resembling the Giles *nigerrimus* in all respects except for the black distal half of vein 6. It can be distinguished in the same manner as the Giles *nigerrimus* in addition to the dark distal half of vein 6.

N. H. Swellengrebel (1932) dropped his *A. sinensis v. vanus* Theobald under *nigerrimus* and for lack of reference, it is not discussed. Likewise, *A. plümiger* and *A. bentleyi* have been omitted.

(c) *A. hyrcanus pseudopictus* Grassi 1899. N. H. Swellengrebel and E. Rodenwaldt (1932-11a) identified it with form *argyropus* and *mauritanus*. F. V. Theobald (1901) has noted the similarity of his *indiensis* to *pseudopictus* Grassi and probably it must have been sunk under the latter for in the succeeding publication of his monograph, *indiensis* has been dropped. F. V. Theobald (1901-12e) noted apical rings on all tarsal segments except the last. On the other hand, F. W. Edwards (1929-3b) and P. F. Russell *et al* (1943) in following the key of P. A. Buxton and T. T. Macan, described the hind tarsal segment 4 entirely white. *A. flerowi* Portschinsky 1911 was sunk under *pseudopictus* by F. W. Edwards (1932-3a). The following are characteristic marks of *A. pseudopictus* Grassi as based from the keys of P. F. Russell (1943) to distinguish it from the 2 anopheles:

Palpi—banded.

Wing fringe—all dark except a small one opposite vein 5.2.

Legs—mid tarsal segments except last one possess apical pale rings, hind tarsal segment 5 all dark.

(d) *A. hyrcanus pseudosinensis* Baisas 1935 and *A. hyrcanus lesteri* Baisas and Hu 1936 are two distinct varieties of *hyrcanus* whose imagines are hardly distinguishable from one another. The papers of F. E. Baisas (1935) and F. E. Baisas and Hu (1936) present a beautiful discussion of the distinguishing fea-

tures of these varieties together with *A. hyrcanus sinensis*. These varieties can easily be separated from the two imagines being presented for possessing:

Palpi—banded.

Wing fringe—wide pale fringe at wing tip.

Vein 6—proximal half entirely pale.

Hind legs—no bands but narrow pale rings.

(e) *A. hyrcanus pictus* Loew. F. W. Edwards (1929-3b) noted the following distinctive features:

Wing—no admixture of light and dark scales over dark areas, dark spot over base of vein 5 long.

Legs—hind tarsi with narrow pale rings at apices of segments only.

(f) *A. hyrcanus mesopotamiae* Christophers. F. W. Edwards 1929-3b) noted the following distinguishing marks:

Wing—dark mark near base of vein 5 long.

Legs—as in *A. hyrcanus pictus*.

*A. hyrcanus mahmuti*, *A. hyrcanus marzinowski* and *A. hyrcanus popovi* have been omitted for lack of reference.

2. *A. coustani coustani* Laveran 1900. F. V. Theobald (1907-12c) and (1910-12d) believed it probably *A. mauritanus* Grandpre whereas F. W. Edwards (1932-3a) put a question mark in his attempt to bury it under *mauritanus*. P. F. Russell *et al* (1943-8a), in the preparation of their keys to anophelines of Europe, Africa and the Near East, as based from the keys of P. A. Buxton *et al*, have dropped the *mauritanus* whereas *coustani* acquired a distinct position as *A. coustani coustani* Laveran 1900. The latter maybe mistaken with the two anophelines under discussion for having the two last hind tarsal segments entirely white, basing from P. F. Russell (1943-8a) but can be distinguished for having banded palpi, hind tibia with pale patch 4 times the apical tibial diameter and basal ring of the 1st hind tarsal segment.

Two varieties have been considered under the species *coustani* and need be distinguished:

(a) *A. coustani tenebrosus* Döenitz 1902. F. V. Theobald (1903-12a) buried it under *mauritanus* while F. W. Edwards (1932-3a) took it to be a variety of *mauritanus*. In the keys of P. F. Russell *et al* (1943-8a), *tenebrosus* became a variety of *coustani*. Like *A. coustani coustani*, *A. coustani tenebrosus* has the last two hind tarsal segments entirely white but can be distinguished from the two anophelines under discussion in the same way as *A. coustani coustani*.



(b) *A. coustani ziemanni* Grünberg 1902. F. V. Theobald (1910-12d) believed it to be identical to *A. mauritanus* Grandpre but F. W. Edwards (1932-3a) considered it a variety of *mauritanus*. On the other hand, *ziemanni* comes out a variety of *A. coustani* in the keys of P. F. Russell *et al* (1943-8a). *A. coustani ziemanni* can be distinguished in the same way as *A. coustani coustani*.

3. *A. paludis* Theobald 1900. F. W. Edwards (1932-3a) considered it a distinct variety of *mauritanus* but it is treated as a distinct species in the keys of P. F. Russell (1943-8a). Extracted from the aforementioned key, hind tarsal segments 3, 4, and 5 are all white, thus bringing it closer to *A. balerensis*, although it can be distinguished from the latter and from *A. ejercitoi* for having banded palpi, broad pale fringe at wing tip, mid tarsi 1 and 2 with pale apical rings and the last three hind tarsal segments all white.

4. *A. koreicus* Yamada and Watanabe 1918. F. W. Edwards (1921-3c) sank his *punctibasis* under this species. Basing from the original article, it can be distinguished for possessing some pale scales on the antenna, costa with 4 pale patches, 6th vein with three dark patches, broad pale fringe extending from tip of vein 2.1 to tip of vein 4.1 and mid tarsal segments 1 to 4 with narrow pale apical rings.

5. *A. sineroides* Yamada 1924. From the report of M. Yamada<sup>1</sup> (1937), the following are extracted as distinguishing characteristics:

Palpi—banded.

Wings—distinctly mottled, costa with four pale patches, sixth long vein with three dark areas and broad pale fringe at wing tip extending from vein 2.1 to vein 4.1.

6. *A. montanus* Stanton and Hacker 1917. It was originally believed to be a variety of *albotaeniatus* by A. T. Stanton and H. P. Hacker (1917) but F. W. Edwards (1932-3a) and B. A. R. Gater (1935-4b) considered it a species. The latter sank *A. peditæniatus* Leicester of Walch 1930 under this species. The following distinctive features are extracted from B. A. R. Gater (1935-4b):

Wings—pale fringe at wing tip extends from vein 2.2 to vein 3, vein 6 with three dark spots.

Legs—tibia and tarsi of foreleg with minute apical rings, these are present but not well marked in mid legs, pale basal and apical bands on hind tibia, basal and apical pale bands on hind tarsi 2

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<sup>1</sup> S. Yamada was the first to report *A. sineroides* in 1924.

to 4 and hind tarsal 5 all pale. The hind tarsi will display two broad pale bands in effect and a third one formed by segment 5 and the distal end of segment 4.

7. *A. albotaeniatus* Theobald 1903 closely resembles *A. ejercitoi* but basing from the description of F. V. Theobald (1903-12f) and B. A. R. Gater (1935-4c), the following are extracted as distinguishing features:

Legs—mid tarsi with narrow basal and apical rings, hind tibia and 1st tarsal segment of hind leg with basal and apical pale rings, hind 2nd tarsal with narrow basal and apical pale bands, hind 3rd and 4th tarsal segments with broad basal and apical pale bands leaving a narrow jet in each segment, hind tarsal 5 entirely white. In effect, three broad white bands are displayed on the hind legs.

Abdomen—entirely without scales.

Wing fringe—unspotted in that of F. V. Theobald (1903-12f) but B. A. R. Gater (1935-4c) describes a narrow area opposite vein 3.

8. *A. symesi* Edwards 1928. Based from the keys of P. F. Russell *et al* (1943), the most significant distinguishing features are the hind tarsal segment 4 entirely white and hind tarsal 5 dark.

The rest of the species and varieties under the *myzorhynchus* and possibly *anopheles* series can hardly be mistaken from the two anophelines presented in this paper on account of the 5th hind tarsal segment entirely white, palpi all dark, a very narrow pale fringe at wing tip and possibly the absence of black tuft of scales on the venter of abdominal segment VII. Trouble arises when the hind legs are detached or badly damaged but a closer inspection of the wings and mid legs as well as the scales on the abdomen will afford fairly good aid in the identification.

*A. balerensis* can be isolated from *A. ejercitoi* in that the former has two broad white bands on the hind legs and no scales on the abdomen whereas the latter has only one but broader white band on the hind legs and very minute pale scales distributed all over the abdomen.

#### SUMMARY

*A. ejercitoi* and *A. balerensis* are anopheles caught in carabao-baited traps in Baler, Tayabas (Quezon), a coastal town in the Philippines in October 1941. Both are distinctly black and big with black very shaggy palpi, front femora markedly swollen at base, mid legs entirely dark without any trace of pale rings, wing costa with two narrow pale spots otherwise black, wing fringe black except for a very narrow pale spot opposite third vein, proximal half of vein 6 is an admixture of pale and dark

scales and abdomen devoid of tuft of scales on the venter of segment VII. Aside from these characteristics in common, *A. ejercitoi* has a very broad white band on the hind tarsi involving the last 2-1/5 segments and minute pale scales distributed all over the abdomen while *A. balerensis* has two broad white bands on the hind tarsi but devoid of abdominal scales.

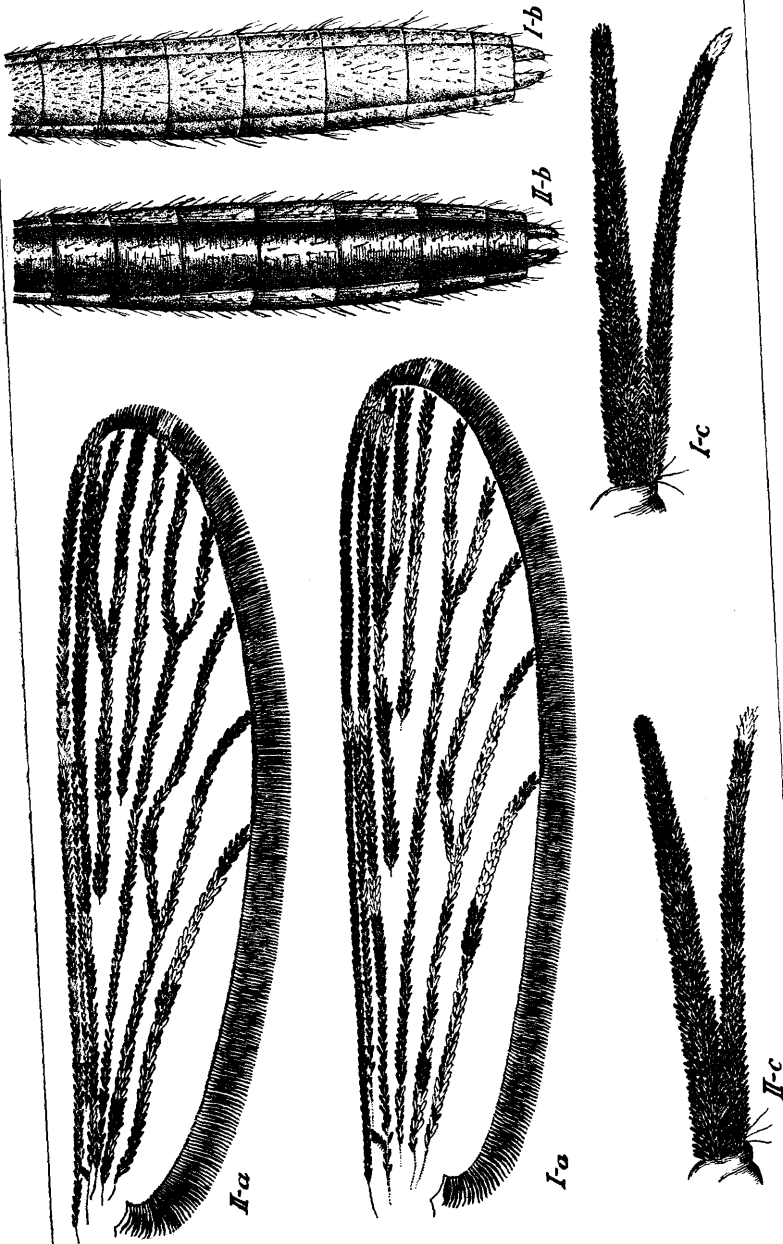
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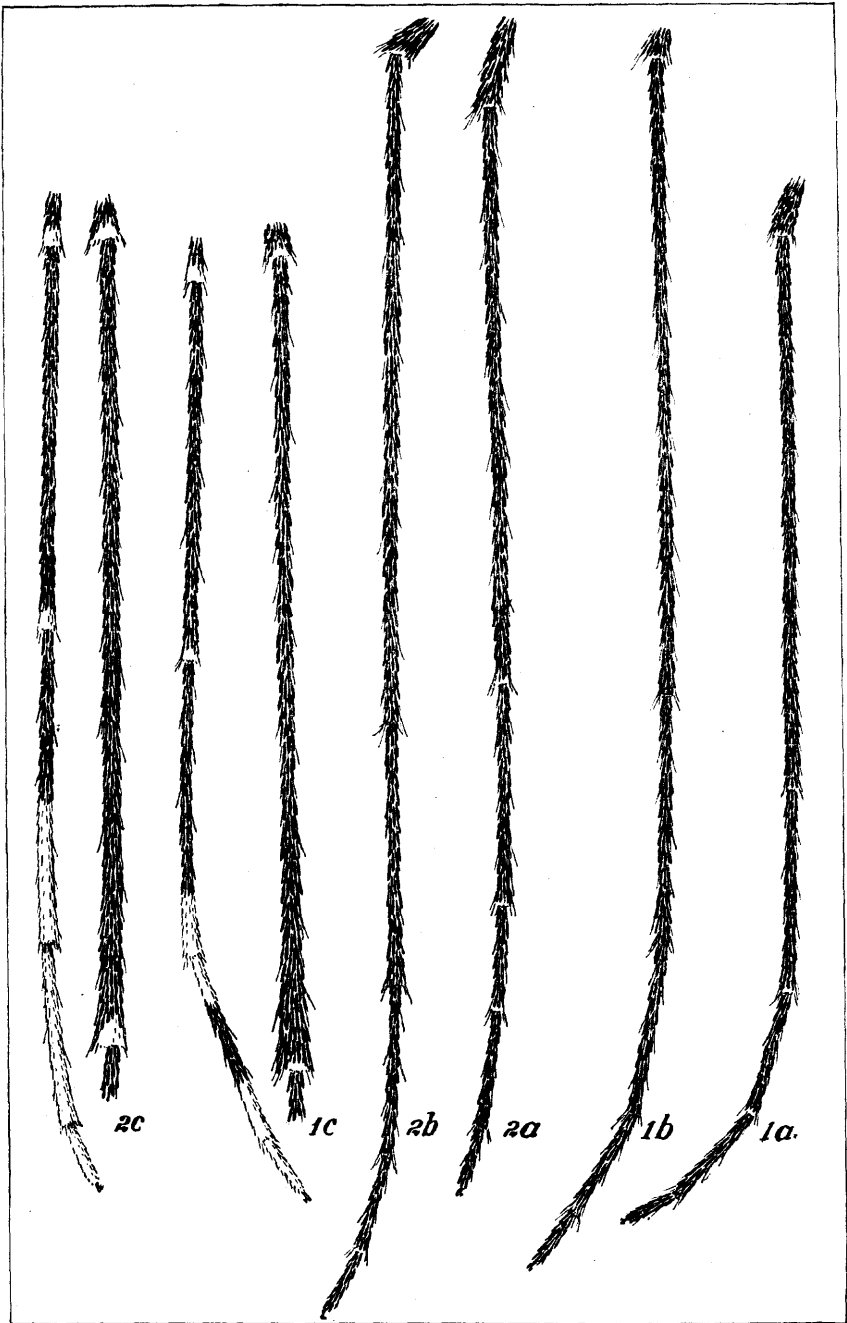


**A. balerensis:**

- II-a—wing  
II-b—abdomen  
II-c—palpi and proboscis

**A. ejercitai:**

- I-a—wing  
I-b—abdomen  
I-c—palpi and proboscis

***A. ejercitoi*:**

1a—foreleg  
1b—midleg  
1c—hind tarsi

***A. balerensis*:**

2a—foreleg  
2b—midleg  
2c—hind tarsi