# *A.* (*MYZOMYIA*) *PATTONI*, A NEW ANOPHELES FROM SHAN-TUNG, NORTH CHINA; WITH NOTES ON SOME OTHER SPECIES OF ANOPHELES FROM THE SAME LOCALITY.

BY

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AMONG some *Culicidæ* sent to me by Major W. S. Patton, I.M.S., from Tsi-nan-fu (Province of Shan-tung, North China) were two females and a male of what was evidently a new species of Anopheles. I have named this species *A. pattoni*. A description is given below.

Of the three specimens sent by Major Patton, the male and one female specimen have been preserved as the types respectively of the two sexes. For the minute description of certain parts that required dissection, the remaining female has been utilised. The photographs and parts of the description relating to measurements, thoracic pilotaxy, etc., are taken from this latter specimen, except those relating to the male hypopygial parts which are from the dissected hypopygium of the male type.

*A. pattoni* falls naturally into the group Neocellia of the subgenus *Myzomyia*, coming near *A. karwari* James from India, but differing conspicuously from this species in the palpal markings.

Accompanying the above were a female and two male specimens of *A. hyrcanus* var. *sinensis* Wied. and a male and female specimen of *A. lindesaii* var. *japonicus* Yamada, notes on which follow the description of *A. pattoni*.

I am much indebted to Major Patton for his kindness in sending me this material.

*Anopheles* (*Myzomyia*) *pattoni* n.sp.

*Diagnostic points.*—An easily identified species characterised by :

(1) Wings spotted with typical *Myzomyia* ornamentation.

(2) Tips of tarsi of hind legs pure white, only the last segment being wholly white, the others being ornamented to form broad white bands.

(3) Femora and tibiæ not spotted.

(4) Palpi of female with 3 pale bands, a broad band involving the apex, an almost equally broad one following this and a narrow basal band. In this it differs from *A. karwari* which has 4 pale bands with a characteristic arrangement.

*Detailed description.*—FEMALE. A medium-sized mosquito: length of wing 3·3 mm. General appearance that of the Neocellia group of *Myzomyia*, and most nearly approaching that of the species *A. karwari* James.

*Antennæ* with basal segment (*torus*) devoid of scales; the second segment with small scales not forming a definite tuft internally; remaining segments without scales. *Palpi* 1·9 mm., 1·6 of thorax, ·58 of wing. The five segments commencing with the rudimentary basal one measuring respectively ·06, ·28, ·36, ·22 and ·08 of the whole organ. Palpal index * ·36, i.e., heterodactylous. The whole organ including the rudimentary basal segment (except the inner surfaces of all segments but the last) covered with scales, those on the rudimentary segment and second segment being long and semi-erect, those on the remainder of the organ more appressed, but the general effect of the palp moderately rough. Scales towards base long and plume-like, more or less truncated, length ·11 mm., breadth index † 12 or more, striations 7, those on apical portion mostly truncated squames, length ·07 mm., breadth index 7, striations 7. The scaling is black except where pale scales form the bands. The most apical pale band includes the apical segment which is entirely pale scaled and the apex of the penultimate segment; the second pale band includes about the basal third of the penultimate segment and the apex of the preceding one; the narrow basal band is formed mostly by pale scales on the apex of the second segment. *Labium* with black scales; labella lighter. *Clypeus* without scales. Head scales of the usual type, length ·08 mm., breadth index 4, striations about 12 extending to base. Scales over the vertex creamy white forming the usual frontal tuft, dark scales over the occiput and genæ.

*Thorax* 1·2 mm. *Prothoracic lobes* with chætæ and sometimes an odd scale. *Prosternal hairs* absent. *Mesonotum* dark, ashy, uniformly coloured; with a vestiture of white oblanceolate true scales (length ·05 mm., breadth index about 7, striations about 6). Mesonotal chætæ inconspicuous, pale in colour. On the anterior promontory in the middle the white scales are longer and more erect and form a tuft; at the sides are some darkish scales, but these do not form a very definite or conspicuous tuft. *Scutellum* with chætæ and some rather narrow scales (denuded in type). *Pleuræ* devoid of scales. *Upper mesepimeral* (sub-alar) with about 7 hairs. *Pre-alar* hairs 5-6 small; *spiracular* about 3 minute; *upper* and *lower sterno-pleural* each about 4 arranged in line.

*Wings* 3·3 mm., 2·8 of thorax. Width at junction of lower branch of fifth with border (excluding scaling) ·78 mm. or ·24 of length. Base to subcostal junction

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* Length of apical segment divided by that of the penultimate segment.

† Length divided by greatest breadth.

·64, anterior forked cell ·24,* and posterior forked cell ·16 † of the length of the wing respectively. Forked cell index 1·47.‡

*Wing veins* rather lightly scaled. Median scales for the most part ·04 mm. in length, breadth index 4-6, striations 5-7, lateral scales ·05-·07 in length, breadth index 3-5, striations 6-10, plume scales ·08-·09 mm. in length, breadth index 9 or over, striations 5-7. The laterals on the subcosta are ·06 mm. in length, breadth index somewhat under 4, striations 8-9 and the scales representing the plumes are relatively squame-like, broad and truncated, length ·06 mm., breadth index 4, striations 11. These and the scales on the first longitudinal in the region of the large middle dark costal spot and the spot internal to this are the broadest scales on the wing.

The wing markings are distinct, velvety black and cream, the dark areas on the wing field being somewhat reduced. The pale costal areas are relatively extended, those in the apical half of the wing being distinctly longer than the dark portions. There are six dark spots on the *costa*, two accessory spots at the base not involving the first longitudinal, but represented on the subcosta and four main dark spots involving also the first longitudinal of which the second is the largest and the first next in size. Of the accessory dark spots one occupies the extreme base of the costa internal to the humeral cross vein, the other, much smaller, is distal to the humeral cross vein and is not shown at all in the wing of the paratype from which the photograph in the plate has been taken. The main dark spots are separated from the accessory dark spots and each other respectively by the usual pale areas, viz., the sub-basal, sector, subcostal, preapical and apical. The preapical and subcostal pale spots are about equal in length and the sector and sub-basal considerably shorter (about half). On the *first* longitudinal the basal portion is pale; otherwise the markings are as on the costa except that there is an accessory sector pale spot under the second main dark costal separated by a few dark scales from the sector pale spot (confluent with the sector spot in the wing photographed) and a further pale interruption external to this. The *second* longitudinal has two dark spots on the stem, the more basal opposite the middle of the largest dark costal spot, the more distal opposite the subcostal pale area; the extreme base of the vein is pale scaled. There is a small dark spot on the upper branch under the terminal dark costal spot and two on the lower branch, one about the middle and one (small) at its termination in the edge of the wing. The *third* longitudinal is pale except for three small dark spots, two situated basally and one near the termination of the vein in the edge of the wing. The stem of the *fourth* longitudinal is pale scaled in the basal portion, followed by a dark scaled area opposite the inner half of the largest dark-costal spot, a pale area of about the same extent and a longer dark one extending to the fork and lying in the main opposite the subcostal pale spot. The branches are pale except for two dark spots on the upper branch and one on the

* Measured along posterior branch.

† Measured along posterior branch.

‡ Length of anterior cell measured along posterior branch divided by length of posterior cell measured along posterior branch.

lower, the former towards the two ends of the branch, the latter towards the distal end. The *fifth* longitudinal is pale scaled throughout its extent except for a small dark spot near its origin, three dark spots on the upper branch and one on the lower at its termination. The *sixth* longitudinal is pale scaled except for three dark spots, one towards the base, one about the middle of the vein and one near its termination in the edge of the wing. The innermost of these is missing in the wing of the paratype which has been photographed. The *fringe* has distinct and broad pale spots opposite the ends of veins 6, 5·1, 5·2, 4·1 and 4·2. The *apex* is broadly pale from above the junction of vein 1 to the junction of the upper branch of vein 2, and also from vein 2·2 to vein 3, leaving a single narrow dark spot between. The markings of the upper and under surface correspond except for those places where there are no scales on the under surface of the veins.

*Coxæ* for the most part bare; some dark scales anteriorly on the front pair. Trochanters with some narrow scales and dark scales behind the first pair. *Legs* with the front femora slightly swollen towards base. Covered with truncated squames shorter on the femora and tibiæ and becoming longer on the tarsus, striations about 6. Femora and tibiæ unicolorous, somewhat lighter in colour than the tarsus, the tibiæ with a pale stripe beneath. The femoro-tibial and tibio-tarsal joint narrowly pale with a somewhat broader pale spot at the apex of the tibiæ. Front legs with the first tarsal segment with a pale apical band, segments 2 and 3 with apical and narrow basal bands, segment 4 with narrow basal band only and segment 5 all dark. Middle legs with narrower tarsal banding than in the front legs, tarsal segments 1, 2 and 3 with narrow pale bands apically. Hind legs with the first and second tarsal segments with pale bands at the apex, the pale bands constituting about one-twentieth and one-fifth respectively of the segment; the third and fourth segments with pale bands apically, about one quarter and one-third the length of the segment respectively, and also basally about one-sixth and one-third of the segment respectively; the fifth segment entirely pale.

*Abdomen* dark in colour with vestiture of hairs and devoid of scales except a very few on the eighth segment dorsally and on the cerci.

*Female hypopygium* of the ordinary anopheline type. *Insula* with a group of 10-13 hairs on either side.

Male. In general similar to the female. *Antenna* with the basal segment (*torus*) devoid of scales, a few white scales on inner side of second segment. *Palpi* 2·4 mm. (approx.*), 1·8 of thorax, ·65 of wing; the segments commencing with the basal rudimentary segment measuring respectively ·07, ·32, ·34, ·17 and ·11 of the whole organ. Dark scaled except for a pale area on the dorsal and outer aspect of the apical segment, not extending to the base of the segment, a similar larger area on the penultimate segment also not extending to the base, a small pale spot on the dorsal and outer aspect of the apex of the third segment and a slight lightening of colour at the junction of the third and second segment (pseudo-joint).

* Measurements are from unmounted parts.

Chætæ on the club poorly developed, most conspicuous being a tuft on the inner aspect of the apex of the third segment of the organ. *Labium* 2·4 mm., dark scaled except the labella.

*Thorax* 1·34 mm., with vestiture as in the female.

*Wing* 3·67 mm. Width excluding scaling ·65 mm., or ·18 of length. Base to subcostal junction ·62, anterior forked cell ·22, posterior forked cell ·11 respectively of the whole organ. Scaling similar to the female but somewhat less developed. Markings as in the female.

*Legs* with the femora of the first pair very slightly swollen towards the base and apically, the tibiæ of this pair also somewhat swollen towards the base. Markings of the legs (except that the hind pair are missing) as in the female. *Male ungues* of ordinary anopheline type.

*Hypopygium.* Side-piece and clasper of normal *Myzomyia* character (sidepiece ·29 mm., clasper, measured on the straight, ·34 mm. in length). No parabasal lobe. Parabasal spines 5 in number, of the usual *Myzomyia* character and arising close together (*vide* Plate XLIII, fig. 5), internal to these about nine minute accessory hairs. Harpago of the usual *Myzomyia* type, slightly bilobar, the outer lobe consisting of a chitinised shoulder carrying the usual well marked club, the length of the club being slightly greater than the depth of the lobe. The inner lobe sub-conical, the apical hair a little longer than the club (*vide* Plate XLIII, fig. 7), a smaller hair about half the length of the larger one and a little shorter than the club, lying between the apical hair and the club. Minute hairs over inner membranous portion of lobe with one somewhat larger hair towards junction with opposite harpago. In the specimen examined, one harpago showed the club and apical hair duplicated (a monstrosity not infrequently seen in anopheles). Phallosome, excluding leaflets, ·12 mm., of usual *Myzomyia* type, with about five leaflets on either side. Leaflets smooth, examined under a low power, the inner large and sabre-shaped when seen on the flat, slightly less than half length of phallosome, the others appearing more spicular and of the usual decreasing sizes. Under a high power the large inner leaflet, at least, shows some feathering of the edge, especially on the concave border. Penis cavity chitinisations of the usual *Myzomyia* type. Ninth tergite with broad blunt projections, but no definite prolongation. Anal segment with the usual indefinite chitinisations.

*Type.* One male and one female type specimen with the dissected hypopygium of the male type and parts of a dissected female (paratype) mounted in balsam have been sent to the British Museum.

*Locality.* Tsi-nan-fu, Shan-tung Province, North China.

*A. lindesaii* var. *japonicus* Yamada.

Two specimens, a male and a female, of this variety were sent by Major Patton, collected as larvæ and afterwards bred out by him from the Tai-shan Hills, 2,000 feet, in the neighbourhood of Tsi-nan-fu, in September.

As previously noted by me (1924*a*), *A. pleccau* Koidzumi from Formosa (considered synonymous by Yamada with the above form) appeared to have the wing markings of the type form of *A. lindesaii* as distinct from those of var. *nilgiricus*

from Southern India. From Yamada's recently published description (Yamada, 1924) with which the specimens now received conform, it is evident that var. *japonicus*, whilst more resembling the Himalayan form as regards the wing markings is distinct from this in the ornamentation of the base of the hind femora.

The difference in the wing scales referred to by Yamada is more marked as between var. *japonicus* and the type form, than between var. *japonicus* and var. *nilgiricus*, but is quite distinct as seen in the scaling, more especially of the stem of the fifth vein and on the branches of the second vein. According to Yamada, the parabasal spines in var. *japonicus* are much more slender than in the type form. In the specimen now examined, the parabasal spines were almost identical in length with those in specimens of *A. lindesaii* type with which they were compared, but they certainly appear, especially the shorter of the two spines, as stated by Yamada, to be less stout, as is also the case as compared with those of var. *nilgiricus*. The harpago of var. *japonicus* is seemingly identical with that of the type form, whilst as regards var. *nilgiricus* there may be a slight difference in the general shape but not otherwise. There appears to be no recognisable difference in the phallosome in the three forms.

The distinction between the two Indian forms is based on a large number of specimens collected at different times and is quite precise and definite. In var. *japonicus*, there would seem to be a third quite distinct local variety. Whether these forms are to be treated as species, sub-species or varieties must at present be a matter of opinion, but in any case the differences are not of the order of the gross distinctions between the well recognised species of Anopheles. For the present I prefer to regard such forms as true local varieties, i.e., as species in the making. Holding this view, I have given the form here dealt with as a variety of *A. lindesaii* and not as *A. japonicus* as given by Yamada in his revision of Japanese species.

The three varieties may be differentiated as follows :—

Base of hind femora extensively pale, the pale area reaching on the under surface to, or nearly to, the pale band on the femur .. .. *A. lindesaii* type form.

Base of hind femora dark to coxa or nearly so—

With no pale spot at termination of vein 3 or 4·2. Wing scales more pointed. Parabasal spines stouter .. .. var. *nilgiricus*.

With or without a pale spot at the termination of veins 3 and 4·2. Wing scales more rounded, giving broader effect especially on the stem of vein 5 and the branches of vein 2. Parabasal spines somewhat thinner .. .. var. *japonicus*.

It is perhaps desirable to state that the differences in the wing markings referred to by me in a former note (1924*a*) and in my catalogue (1924*b*) are only given with reference to the female. In the male in this group the wings are altogether more light scaled and allowance must be made for this fact.

### *A. hyrcanus* var. *sinensis* Wied.

The specimens sent by Major Patton consisted of two males and a female from Tsi-nan-fu caught in September.

In the female, there is an indistinct light area on the costa at the base and the subcostal pale area on the costa is broad (about one-seventeenth of the wing length), scales are also confined to the first two flagellar segments of the antenna. The markings are perhaps not so distinct as they should be for *A. sineroides* Yamada (*A. punctibasis* var. Edwards), and the subcostal pale spot though broad is not one-tenth of the wing length as given by Yamada. There are also two dark spots only on the sixth vein as against three described by Yamada as present in *A. sineroides*.

The specimen has the pale bands on the palpi well marked, but the third band from the apex is not nearly so developed as in those specimens of *A. hyrcanus* that I have so far examined from Palestine and Mesopotamia (western or *hyrcanus* form). The broad subcostal pale spot on the other hand distinguishes it clearly from the Indian and more strictly Oriental form, var. *nigerrimus* Giles. The specimen would seem, therefore, to conform to the characters of var. *sinensis* as given by me in my catalogue (one of the eastern or *sinensis* forms). As appears to be usual in this form (as contrasted with var. *nigerrimus*), a pale fringe spot is present opposite the posterior branch of the fifth vein. The males have pale markings on the palpi and appear to be of the same type as the female.

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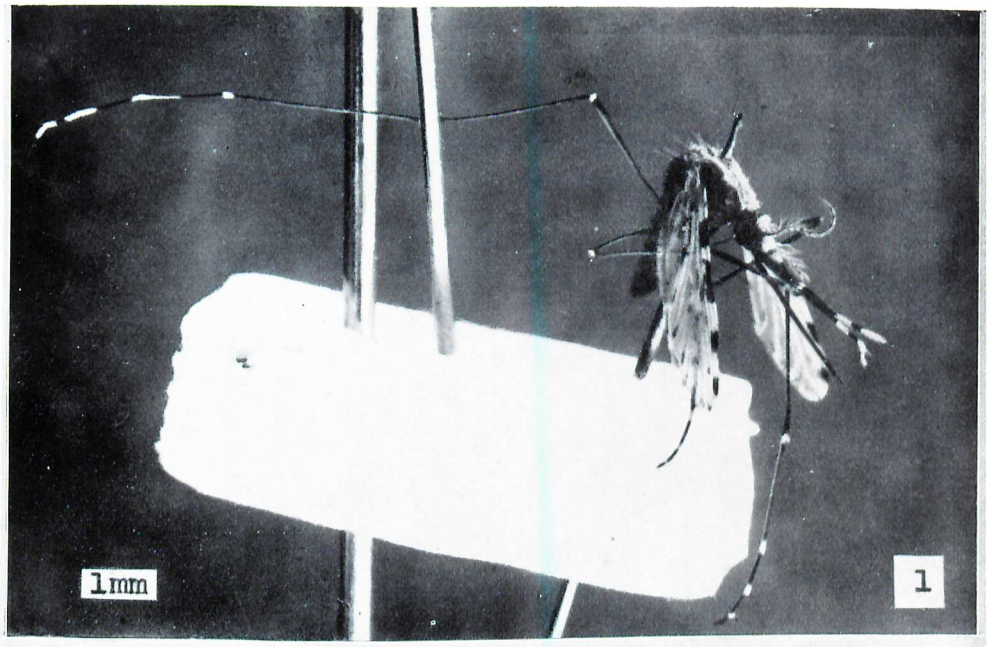
## Explanation of Plate XLIII.

Fig. 1. Photograph of female *A. pattoni* (paratype), × 10.
,, 2. Left wing of same, × 29.
,, 3. Dorsal view of thorax of same, × 29.
,, 4. Female hypopygium (paratype), × 230.
,, 5. Base of side piece showing points of origin of parabasal spines (male type), × 260.
,, 6. Phallosome. Same scale.
,, 7. Harpago. Same scale.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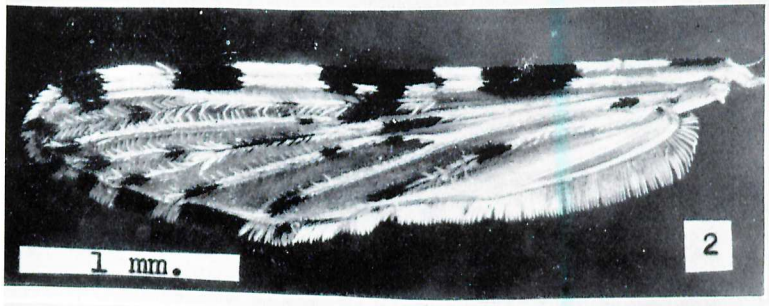
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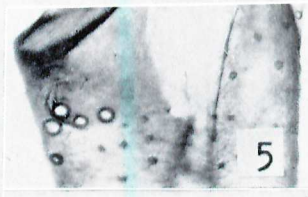
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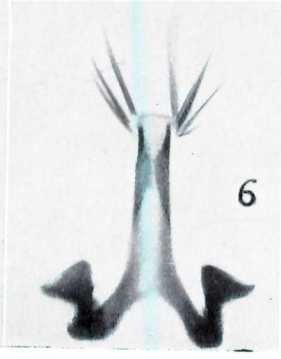
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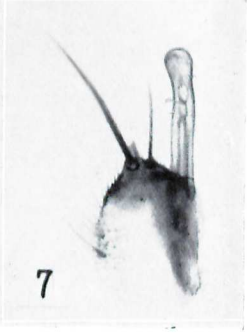
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