

Anopheles (Cellia) deaconi n. sp., from South Africa
(Diptera: Culicidae)¹

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ABSTRACT. The pupa and larva of *Anopheles (Cellia) deaconi* n. sp., are described from the Upper Karoo of South Africa. The male and female remain inseparable from *An. listeri* de Meillon 1931.

INTRODUCTION

Mr. J. Deacon, Malaria Field Technician, State Health Services at Upington, Cape Province, South Africa, sent in some adult *Anopheles listeri* de Meillon, a very common species in that area. He had noticed that some of these specimens appeared to differ slightly from local *listeri* and also from the description in Gillies and de Meillon (1968). This difference has since proved to be a common variation in *listeri* and is of no value in separating *deaconi* n. sp., from *listeri*. He was, however, asked by us to send larvae, which on being identified by Miss Maureen Wilson of this Institute, were found to consist of a large number of *listeri* and 6 specimens which she could not name. These 6 larvae were handed to us and it was immediately obvious that they represented a hitherto unknown species.

Following this discovery, Mr. Deacon was informed of the peculiarities of the new larva and asked to revisit the site, collect immatures and rear adults from isolated larvae. This he promptly did and sent us 6 females with associated larval and pupal skins. This new material confirmed our earlier findings concerning the larva and also showed that the pupa is quite outstanding in having seta 9 on V-VII very long (Fig. 1). The 5 females bred out from these larvae, alas, showed no clear-cut differences from *listeri*. Later a second lot of bred adults, with their respective larval and pupal skins, was received from Mr. Deacon. These confirmed earlier observations and furthermore it was found that the female cibarial armature of the 2 species did not differ. In 2 males examined, the only apparent difference lay in the width of the phallosome leaflets which appeared to be narrower in *deaconi*. However, there was not enough material to confirm if this difference is stable. One of us (Gideon van Eeden) has since visited the area where the specimens were originally found and by rearing adults from isolated larvae confirmed the fact that they did not differ from *listeri*, whereas the larvae and pupae are distinct. An interesting observation made at the time was that 2 of Mr. Deacon's field assistants could,

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by naked eye, distinguish between the larvae of the 2 species which lived in the same pool.

Anopheles (Cellia) deaconi n. sp.

(Figs. 1,2)

ADULT - MALE AND FEMALE. The adult is medium-sized with brightly ornamented wings, legs mainly dark, female palp with 3 narrow white bands and the tip black, the male palp largely yellowish but variable. The male and female cannot, as yet, be separated from *An. listeri* de Meillon 1931 (see Gillies and de Meillon 1968: 231).

PUPA. The pupa is not strongly marked but specimens show variable degrees of pigmentation. *Cephalothorax*. Trumpet slightly or distinctly pigmented at tip. Setae 1, 2, 4, 5, 6 similar, branched; 3 slightly larger, 4-7 branched; 7 longer, 3-4 branched; 8 single or double; 9, 3-7 branched. *Metanotum*. Seta 10 single or double; 11, 4-5 branched; 12 longer, 2-5 branched. *Abdomen* (Fig. 1). *Segment I*. Seta 1 large, much branched, dendritic; 2, 4-6 branched; 3 small, single; 4, 5-8 branched; 5 long, single; 6 longer, single; 7, 5-9 branched; 9 as 6, long and single. *Segment II*. Seta 0 on II-VIII minute, single; 1, 4-7 branched; 2 on segments II-VII very similar, 7-10 branched; 3 long, 1-3 branched, with tip frayed; 4 on II-VIII similar, branches decreasing towards apex from 7 on II to 0-2 on VIII; 5 very similar on II-VII, gradually increasing in length caudally; 6 very long, single; 7, 7-9 branched, large; 8 small, 3-4 branched; 9 short sharp spine; 10, 1-4 branched. *Segment III*. Seta 1, 4-9 branched; 3 long, 3-5 branched; 6 smaller than on II, 5-9 branched; 7 smaller than on II, 4-6 branched; 8 as on I; 9 small sharp spine as on II; 10, 2-5 branched; 11 very small, single; 14 on III-VII minute, single. *Segment IV*. Seta 1 longer than on II or III, 5-7 branched; 3 shorter than on III, 4-8 branched; 6 on IV-VII 4-7 branched; 7 as on III; 8 as on III; 9 as on II and III; 10 longer, single; 11 as on III. *Segment V*. Seta 1 long, 5-6 branched; 3 longer than on IV, 2-3 branched; 7 longer, 5-7 branched; 8 as on IV; 9 long thin sharply pointed spine, reaching beyond the middle of VI; 10 as on IV; 11 as on IV. *Segment VI*. Seta 1 long, reaching to apex of VII, 1-3 branched; 3 single or split; 7 longer than on V, single; 8 as on V; 9 as on V, reaching almost to the apex of VII; 10, 2-4 branched; 11 as on V. *Segment VII*. Seta 1 long, single; 3 small, 3-6 branched; 7 long, reaching posterior border of VIII, single; 9 as on VII, reaching posterior border of VIII; 10, 3-4 branched; 11 small, bifid or trifid. *Segment VIII*. Seta 4 long, single; 9 large, with up to 25 branches. *Paddle*. Seta 1 long and slender, straight or hooked; 2 small, branched; outer fringe with hooked spines basally followed by straight but increasingly narrow sharp spines to P-1; inner border bare.

LARVA (Fig. 2). The general body and thorax color is greyish but the head jet black, so much so that difficulty is experienced in determining the nature of the head setae. The larval skin is tough and leathery but the pupal skin is as usual. Setae are all pale and difficult to see. *Head*. Very heavily pigmented, black especially dorsal apotome (Fig. 2 B). *Antenna* (Fig. 2 A). Sparsely

spiculate; seta 1 on the outside and about 0.4 from base: 4 branched. *Dorsal apotome* (Fig. 2 B). Seta 1 colorless spine, tapering slightly to apex; 2 long, single. Distance between inner and outer clypeals slightly more than between inner clypeals; seta 3 single, about half the length of 2; 4 placed far back, single with apex reaching just beyond base of 2; 5, 6, 7 poorly developed, single or with variable number of short branches; 8 single; 9, 1-3 branched; 10 bifid; 11 sparsely branched; 12 and 13, 2-3 branched; 14 small, branching variable; 15 with variable branching. *Thorax* (Fig. 2). *Prothorax*. Setae 1-3 poorly developed, widely separated basally and without basal tubercles; 1, 2-6 branched; 2 with 4-7 barbs; 3 single; 4-8 as usually seen; 9-12 all long and plumose, 11 slightly shorter with variable branching sometimes appearing single; 13 small, usually 2-branched; 14, 3-4 branched. *Mesothorax*. Seta 1 with variable number of side branches, sometimes appearing single; 2 small, single; 3, 4 longer, single or bifid; 5 short, 1-4 branched; 6 long, branching variable; 7 shorter, single; 8 as usually seen; 9, 10 both plumose; 11 small, single; 12 longer, single; 13 small, 4 branched; 14, 6-12 branched. *Metathorax*. Seta 1 very small, single; 2 longer, single; 3, 2-3 branched; 4, 2-3 branched; 5, 7, 8 large and plumose; 6 smaller, single or double; 9-12 as usual; 13, 3 branched. *Abdomen*. *Tergal plates*. Abdominal tergal plates are small, width about 0.10-0.14 of width of segment I-VII. No accessory plates present on I and II; plates on III-VII similar, each segment with one accessory plate; plate on VIII larger than any of the others, about 0.25 width of segment, VIII without an accessory plate. *Segment I*. Setae 1, 2, 3 single, 2 sometimes bifid; 4, 3-4 branched; 5 large, 2-3 branched; 6, 7 plumose; 9 large, 3 branched; 10 single; 11 large, 2-3 branched; 12, 13 small, 2-3 branched. *Segment II*. Seta 1 as on I; 2 longer, 3 branched; 3, 4 as on I; 5 smaller than on I, 2-3 branched; 6, 7 as usual; 8 small, single or double; 9, 3-5 branched, smaller than on I; 11, 12 long, single; 10, 13 small, 1-3 branched. *Segment III*. Seta 1 small, 3 branched; 2-5 single, 2, 5 longer; 6 plumose; 7 small, branched; 8 small, 1-2 branched; 9 long, 1-3 branched; 10-13, 1-3 branched. *Segment IV*. Seta 1 branched; 2 as on III; 3, 3 branched; 4, 2 branched; 5, 1-3 branched; 6 very long, 3 branched; 7, 8 as on III; 9 long, split at end or double; 11, 12, 13 as on III; 10, 2 branched. *Segment V*. Setae 1, 2, 3, 5, 8 as on IV; 6, 2-4 branched; 4 larger than on IV, 3-4 branched; 7, 9, 11, 12, 13 as on IV; 10 longer than on IV, single. *Segment VI*. Setae 1, 2, 5, 6 as on V; 3 as on V; 4 single; 7 single; 9, 10, 11, 12 as on V; 13 smaller than on III-V, 4 branched. *Segment VII*. Seta 1 as on III-VI; 2, 3, 4, 5, 7, 9, 11, 12 single; 6 small, branched; 8, 10 double; 13 large, double. *Segment VIII*. Setae 1, 3, 4 single, 3 very long; 2, 3 branched; 5 long, double. *Pecten plate* with 6-9 large teeth and 1-2 smaller ones. *Spiracular lobe* with seta 1 long, single. *Segment X*. Seta 1 long, 1-2 branched; 2, 3, 4 as figured.

TYPE-DATA. Holotype ♀ with associated larval and pupal skins No. SA.47. 1.75 and whole paratype larvae are in South African Institute for Medical Research, Johannesburg, South Africa. Paratypes: 1 ♂, 1 ♀ plus associated larval and pupal skins Nos. 47.4.75, 47.2.75 in Department of Entomology, Smithsonian Institution, Washington, D.C., U.S.A.; 1 ♂, 1 ♀ plus associated larval and pupal skins Nos. Male 47.18.75 and Female 47.3.75 in British Museum (Natural History), London, England; 14 ♂, 9 ♀ with associated skins and 50 whole

larvae in Siegfried Annecke Institute, Tzaneen, South Africa. All the above material from Voorsorg, Upington, Cape Province, South Africa, 1975-76, collected by Mr. James Deacon and Mr. Gideon van Eeden.

BIOLOGY. Locality. The Sandriver, in which larvae of *An. deaconi* were found, is a small tributary of the Bakriver and is situated in the Voorsorg area ($28^{\circ}S$ and $20^{\circ}23'E$) about 100 km west of Upington. The area is sparsely populated and the inhabitants farm with sheep and goats of which a large flock was gathered within 200 meters from the breeding place every evening. Small game and baboons were also observed in the surrounding hills, their natural habitat. The area is subject to severe droughts with the result that the Sandriver may dry up completely for short spells during the winter months, leaving only isolated pools in the Bakriver. There are also signs of severe floods during the rainy season.

Larval breeding places. *Anopheles deaconi* together with *An. listeri* were found in small, shallow and unshaded seepage pools about 100 meters above the river junction. These pools averaged a surface area of 1 to 2 square meters and were 2.5 to 7.5 cm deep. Water was mainly replenished by seepage from the main stream which had no direct connection with any of the breeding places. These pools contained silt and traces of algae. The water was brackish and white deposits of salt were visible on the damp sand along the river bed.

Water specimens were submitted for chemical analysis, the results of which are detailed as follows:

Free and saline ammonia	0.40 mg/l
Nitrates	1.00 "
Nitrites	0.05 "
Fluorides	8.00 "
Chlorides	8,300 "
Sulphates	1,200 "
Bicarbonates	3,750 "
Total hardness	2,462 "
Calcium	410 "
Magnesium	355 "
Potassium	85 "
Sodium	5,800 "
pH -	9.0

The breeding places may be summed up as being brackish, unshaded, still-water habitats of a temporary nature maintained by seepage from an adjacent small stream (Mattingly 1969).

Adults. It appears that there is no marked difference between *deaconi* and *listeri* adults. Nothing is yet known about behavior at this stage and further studies are to be carried out in the near future. We have, however, captured insects at a site 100 meters from the river the results of which are detailed below. It is, of course, not known if any of the *listeri* below were

actually *deaconi*.

Biting man outside (4 men from sunset to 10 pm)

44 *An. listeri*
1 *An. rufipes*
2 *An. squamosus*
1 culicine

Trap net (goat baited from sunset to sunrise)

497 *An. listeri*
7 *An. squamosus*

DISCUSSION. Among African species, *deaconi* larvae differ in having the palmate setae quite undeveloped. On some posterior segments the branches of seta 1 could be slightly flattened but even this is doubtful. In *maculipalpis* Giles and *dancalicus* Corradetti seta 1 is tassel-like but the leaflets are definitely flattened. Elsewhere in the Oriental region some members of the *umbrosus* species group of the subgenus *Anopheles* have undeveloped palmate hairs on all segments (Harrison and Scanlon 1975). The new species is a *Paramyzomyia*, but does not fall precisely into either of the 2 sections, namely, *cinereus* and *listeri* as defined by Gillies and de Meillon (1968). Both long mesoplurals of the larva are feathered as in the *cinereus* section, but the mouth brushes and shoulder hairs are as in the *listeri* section, nevertheless the pupa does run down to the *listeri* and *cinereus* couplet in the key. It is of course, easily separated by the great length of seta 9 on V-VIII. Such a clear-cut case where larvae and pupae differ so widely from anything in the region and the adults cannot be separated from another species (*listeri*), is rare in Africa south of the Sahara. The separation of *cydippis* de Meillon and *squamosus* Theobald is based on the larva but the differences do not in any way approach those seen in *listeri* and *deaconi*. Paucity of material of the new species makes it impossible at the present time to investigate chromosomes or attempt cross-mating of the 2 species.

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Fig. 1

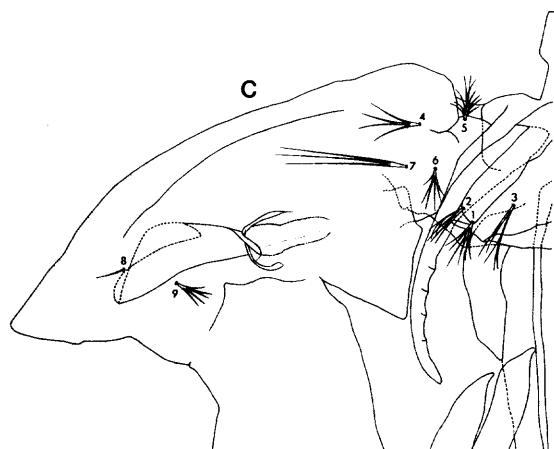
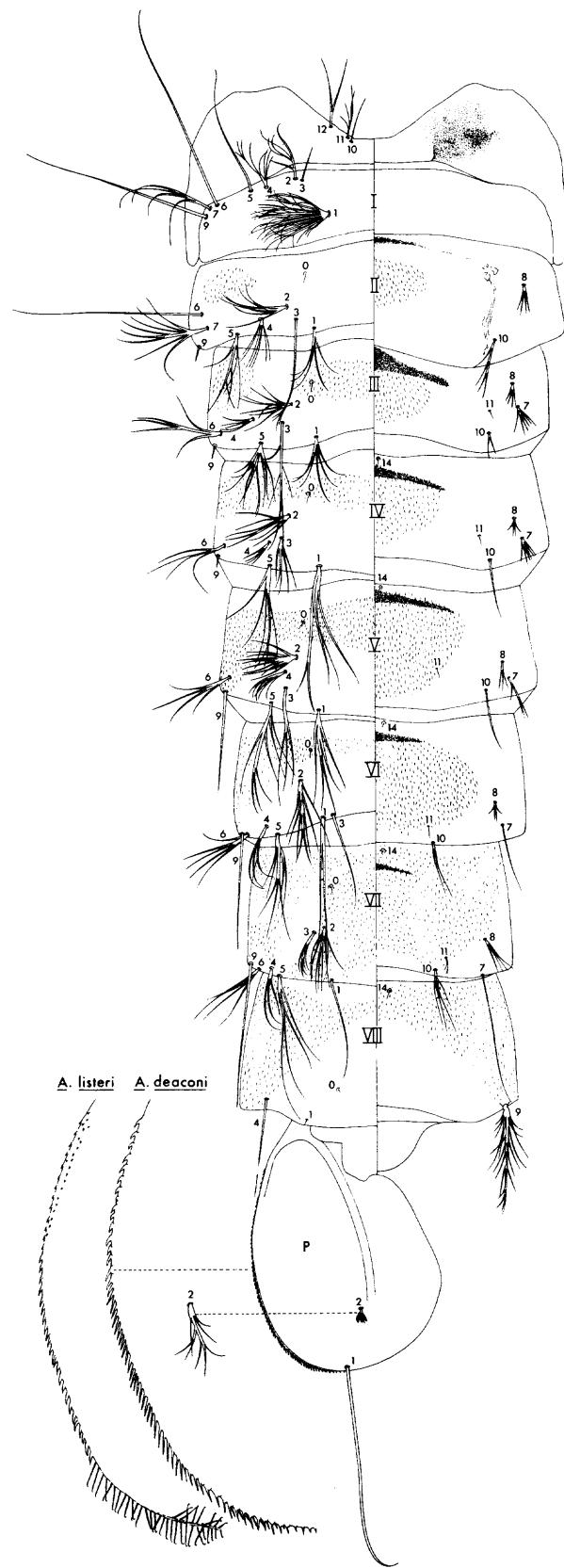
Anopheles (Cellia)deaconi

Fig. 2

Anopheles (Cellia)