

Indian Agricultural Research Institute
Division of Entomology
New Delhi (India)

B. R. SUBBA RAO & P. S. RAI

Studies on the Indian species of the genus *Anagyrus* HOWARD, 1896

(Hymenoptera: Encyrtidae)

With 5 plates

The genus *Anagyrus* was erected by HOWARD in 1896 to receive a single species *greeni* reared from *Maskellia zonata* in Ceylon. This genus is considered to be of great economic importance as several species are known to keep the mealy bugs under check in nature. TIMBERLAKE (1924) while reviewing the American species of the genus *Anagyrus* felt that there could be hundreds of species yet to be discovered and described, especially from the tropics. He also suggested that since many species show great plasticity in structure particularly, in sculpture, pilosity, shape of the head, position of antennae, venation etc., the genus might be considerably subdivided into more or less natural sections or subgenera. However, this cannot be done at this juncture with our limited knowledge of the genus. The genus *Anagyrus* consists of a complex group of species, probably many of the described species are aggregate species, sibling species or biological forms. As KERRICH (1960) pointed out the encyrtid genus *Anagyrus* is so complicated that an investigator failed to construct a key to even the few European species.

COMPÈRE (1939) while providing a key for the separation of species considered the length of the head and thorax combined with the length of the abdomen as an important character. During the course of the present studies COMPÈRE's findings were applied and found to be very stable. A careful study of the shape and colouration of the prothoracic tergum was also made and it was observed that the shape of the tergum varied in different species. The pattern of colouration and shape of the paratergites also varied in the species examined. Therefore, these characters, should be deemed as very stable and should be taken into consideration while separating the species. New species have been deposited in the "National Pusa Collection".

Anagyrus HOWARD

Anagyrus HOWARD Proc. U.S. Nat. Mus. 18, 638; 1896.

Type: *Anagyrus greeni* HOWARD.

Epidinocarsis GIRAULT Archiv f. Naturgesch., **79** A (6), 83; 1913.

Type: *Epidinocarsis tricolor* GIRAULT.

Revisions: TIMBERLAKE Univ. Calif. Pubs. Ent. **3**, 224–231; 1924.

COMPÈRE Univ. Calif. Pubs. Ent. **8**, 20–22; 1947.

TACHIKAWA Mem. Ehime Univ. (6), **1**, 138, 147–152; 1956.

TACHIKAWA Mem. Ehime Univ. (6), **9**, 41–51; 1963.

Key to indian species of *Anagyrus* HOWARD

Females

- 1 Frontoververtex narrower than the transverse diameter of the eyes. Abdomen as long as or shorter than head and thorax combined **5**
- Frontoververtex as wide as or wider than transverse diameter of the eyes. Abdomen longer than head and thorax combined **2**
- 2 Scape moderately expanded (3:1), length of scape three times the greatest width, first funicle joint black, second and third whitish, others with blackish shade. Abdomen twice as long as broad, conical in shape *swezeyi* TIMBERLAKE
- Scape well expanded (2:1), length of scape twice the greatest width **3**
- 3 Scape, pedicel and first funicle joint black, the following joints whitish, scape with a narrow oblique bands across the apical third of the pedicel white. Pedicel thrice as long as thick, distinctly longer than the following joint. Head and thorax ferruginous. Notum of thorax depressed after drying *saccharicola* TIMBERLAKE
- Scape white at base and below apex, centre blackish. Notum of thorax diluted with black or yellow **4**
- 4 Scape narrowly white at base with a distinct prebasal white spot, first funicle joint entirely black, rest whitish. Notum of thorax extensively diluted with black. Post-marginal vein tapering at apex *kivuensis* COMPÈRE
- Space distinctly white at base without a prebasal white spot, first funicle joint with blackish shade at base only, rest yellowish uniformly. Notum of thorax reddish yellow. Post-marginal vein broad at apex *comperei* spec. nov.
- 5 First funicle joint longer than pedicel **6**
- First funicle joint shorter than pedicel **7**
- 6 First funicle joint one and a half times as long as pedicel, all funicle joints subequal. Ocelli in a right-angled triangle. General colour reddish yellow; scape and pedicel black, whitish at tips, first funicle joint black and the others and the club white. Ovipositor shortly but distinctly protruded *greeni* HOWARD
- First funicle joint about four times as long as wide, pedicel, club and funicle uniformly light brown, segments at base narrow, increasing in width towards apex. Post-marginal vein longer than stigmal. Middle femur with distinct black marking at the outer aspect. Anterior margin of prothoracic tergum with a depression at the centre. Ovipositor hardly protruding *delhiensis* spec. nov.
- 7 Abdomen about as long as head and thorax combined. Marginal vein about as long as wide. Postmarginal vestigial. Second funicle joint longer than the first. Head and thorax orange yellow with the mesonotum often more or less dusky or entirely blackish *pseudococci* GIRAULT
- 8 Base of scape with a narrow black ring with white patch above and below, first funicle joint completely black, rest white. Anterior margin of prothoracic tergum almost

straight. Ovipositor sheaths slightly exerted. First funicle joint three-fourth of pedicel. Sub-marginal vein half the length of wing. Tibial spur three-fourth of basitarsus. The last tarsal segment blackish *amoenus* COMPERE

Base of scape with only a white spot without a black ring at the centre; pedicel black at base and white at the apex; first funicle joint suffused with black, rest of the funicle joints light yellowish, first funicle joint twice as long as broad. Post-marginal vein shorter than stigmal. Anterior margin of prothoracic tergum without a depression at the centre *nigroradictatus* spec. nov.

Anagyrus amoenus COMPERE

(Plate I, Figures A to E)

COMPERE Bull. Ent. Res. 30, 1—13; 1939.

COMPERE stated that this species closely resembles *Anagyrus kivuensis*. Full description of the species has not been given by COMPERE. The description of the species based on the specimens bred is given below.

Female: Fronto vertex orange yellow with blackish tinge near the occipital margin; face and cheeks blackish. Thorax dirty brown with minute silvery hairs; abdomen black.

Fronto vertex wider than long, orange yellow. Lower portion of face and cheeks somewhat blackish. Ocelli located at equidistances, the lateral pair about their own diameter from the eye margin.

Antennal scape (Figure A) well expanded with stout bristles on the outer margin. Base of scape with a narrow black ring with white patch above and below. Upper one-third or so of scape whitish with slight blackish tinge at the joint. Basal one-third of pedicel black, rest whitish. First funicle joint three-fourth the pedicel length, narrow, blackish in colour and the smallest. The succeeding funicle joints are longer and slightly wider towards the apex and white in colour. Club 3 jointed, dull white, shorter than the last three funicle joints combined. Radicle black.

Mandibles (Figure D) long, dark brown and bidentate, maxillary and labial palpi (Figure E) 4 and 3 jointed.

Thorax and scutellum uniformly coloured, dull yellowish completely covered with small hairs with two bristles and without any blackish colouration. Prothoracic tergum (Figure C) whitish at anterior margin with a black patch at the centre extending to posterior margin. Anterior margin straight, posterior margin with a deep groove.

Abdomen (Figure B) shorter than head and thorax combined, broad at base and tapering broadly at apex. Ovipositor sheaths slightly exerted. Wings reaching beyond apex of abdomen. Abdomen depressed in dry specimens.

Wings hyaline, submarginal vein about half the length of the wing. Marginal vein short, post-marginal vestigial, stigmal vein narrow and slightly expanded at tip. A clear spot extending to middle of the wing from base of stigmal vein present.

Middle legs whitish or light yellow with slight dark shades on the margin of femur and tibia which are not so conspicuous. Tibial spur about three-fourth the length of basitarsus. The last tarsal segment blackish.

Length: 1.260 mm
Host: unidentified
Host plant: Casuarina
Locality: Nangloi, Delhi
Date of collection: 9. 11. 1963
Collected by: P.S. RAI

This species has not been recorded from India earlier.

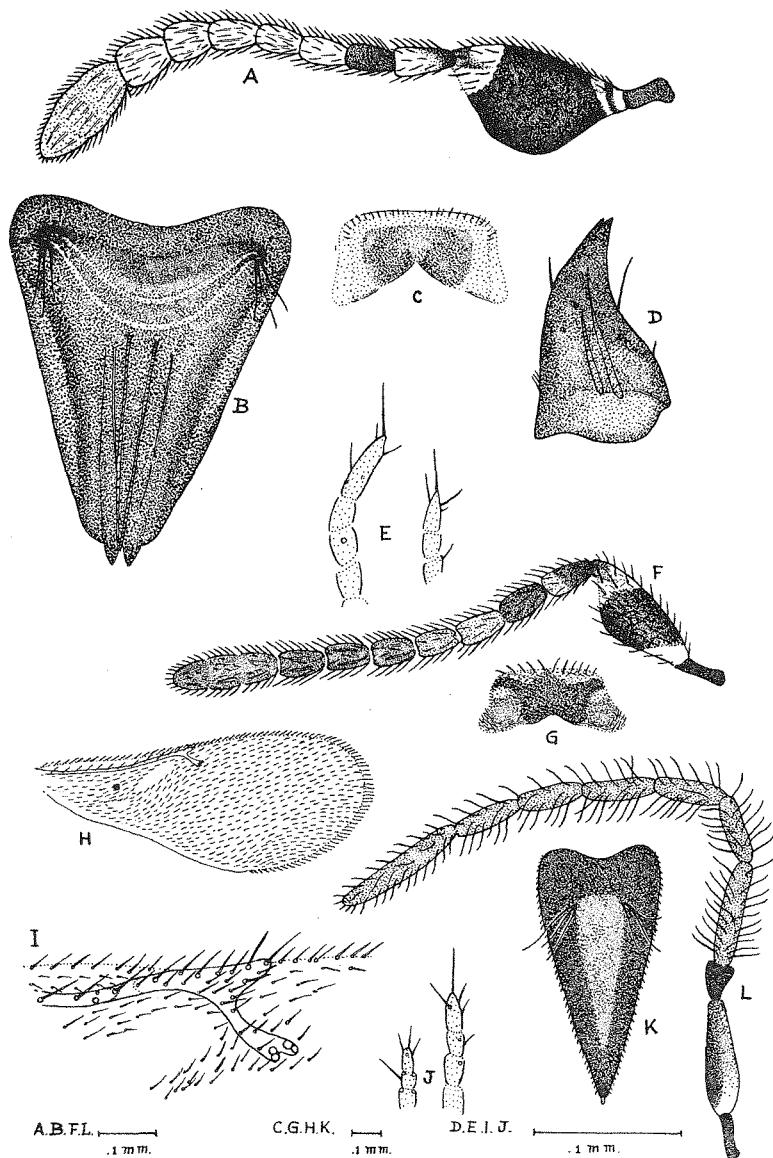


PLATE I. *Anagyrus amoenus* COMPERE, female: A. Antenna, B. Abdomen, C. Prothoracic tergum, D. Mandible, E. Maxillary and labial palpus *Anagyrus swezeyi* TIMBERLAKE, female: F. Antenna, G. Prothoracic tergum, H. Forewing, I. Wing venation, J. Maxillary and labial palpus, K. Abdomen, L. Antenna of male

Anagyrus swezeyi TIMBERLAKE

(Plate I, Figures F to L)

TIMBERLAKE Proc. Hawaiian Ent. Soc. 4 (1), 199–201; 1918.

This species was first described by TIMBERLAKE (1918) from Hawaii. The specimens were reared from *Trionymus insularis* EHRHORN or swept from Bermuda grass. Following additional characters are given for the species.

Female: Frontoververtex brownish with black suffusions in the centre upto occipital margin. Thorax blackish with brownish suffusions on the lateral sides. Abdomen clove brown.

Scape with a narrow white patch at base and a broader white patch below the apex. The apex and middle portion black. Basal half of pedicel black, the other half white (Figure F). First funicle joint black succeeding two whitish and the rest light brown.

Maxillary and labial palpi (Figure J) 4 and 3 segmented. Prothoracic tergum (Figure G) broad, whitish at sides with smoky cloudings at the middle portion. Posterior depression broad and shallow and posterior side expanded into two lobes.

Stigmal vein (Figure I) narrow at base, expanded at apex. Legs whitish, tibial spur of middle leg shorter than basitarsus with teethlike projections on the inner aspect of tarsal joints.

Length:	Female — 1.848 mm Male — 1.092 mm
Host:	<i>Saccharicoccus sacchari</i> COCKRELL
Host plant:	Sugarcane
Locality:	Delhi and Karnal
Date of collection:	26. 12. 1963 and 2. 1. 1964
Collected by:	P. S. RAI

It has been reported that *Anagyrus greeni* HOWARD and *Anagyrus saccharicola* TIMBERLAKE have been reared from the sugarcane pink mealy bug in India. The species examined by us agree entirely with the description of *swezeyi* and not with the other two species mentioned above. It would be worthwhile to examine the identified material of *saccharicola* and *greeni* and decide the authenticity of the identifications made earlier.

Anagyrus delhiensis spec. nov.

(Plate II)

Female: Frontoververtex yellowish. Thorax yellowish with blackish suffusions at the sides. Abdomen dark brown. Frontoververtex narrow and long. Face above clypeal margin yellow. Ocelli prominent. The lateral pair closely situated. Ocelloocular space about the diameter of ocelli. Eyes round, prominent. Head slightly wider than thorax.

Antennae (Figure D) comparatively long, the pedicel, funicle and club uniformly light brown in colour. Segments at the base are narrow, gradually increasing in width and decreasing in length towards apex. First funicle joint about 4 times as long as wide, narrow and longest. Pedicel shorter than first funicle joint about two-third, slightly expanding at tip. Scape flattened and dark brown in colour. The basal portion of scape with a white ring and the upper portion below the joint with a similar but wider white ring. Sixth funicle joint as long as the width at tip. Club wider than funicle, distinctly three segmented, rounded at tip.

Maxillary and labial palpi (Figure B), with four and three segments respectively. Mandible (Figure C) brownish, broad and widely bidentate.

Notum of thorax dominantly yellow. Prothoracic tergum (Figure H) arched at anterior margin, the lobes at the posterior margin with a deep cut. Anterior border whitish followed

by light yellow and the central portion brownish. Scutellum yellowish with three pairs of prominent bristles.

Abdomen (Figure A) depressed in dry specimens. Wings reaching beyond tip of abdomen. Ovipositor hardly protruding. Abdomen tapering towards apex, approximately 1:4. Three pairs of hairs protruding out of the depression at the basal portion.

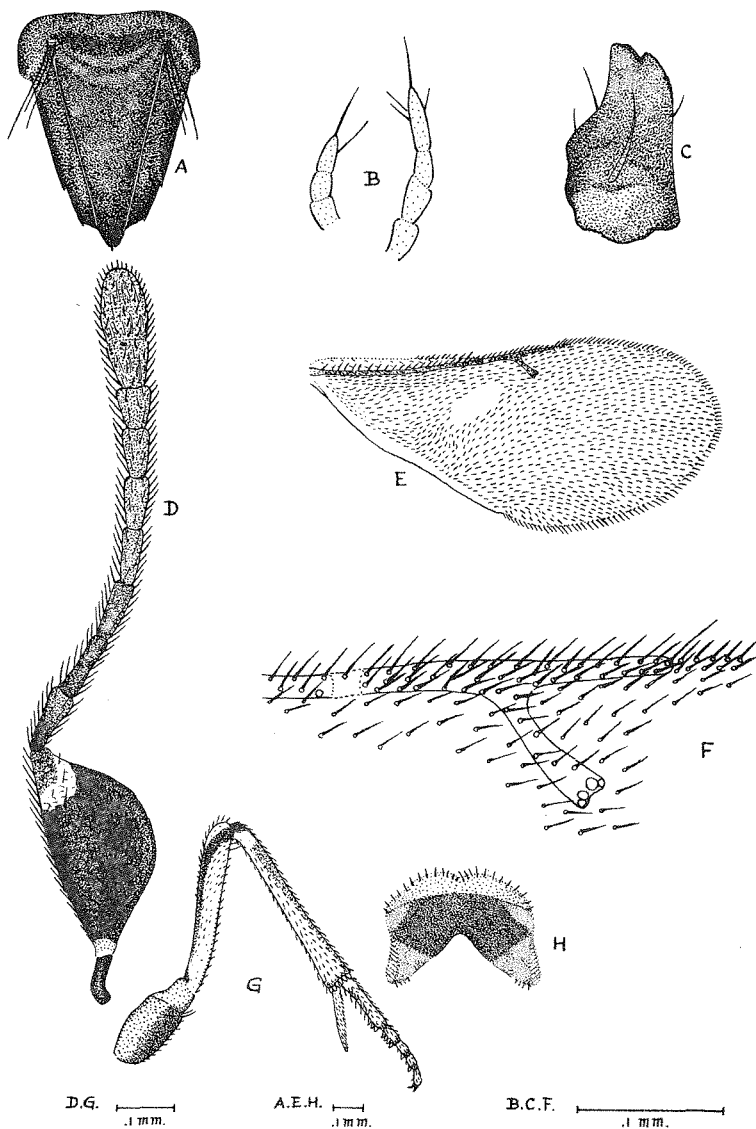


PLATE II. *Anagyrs delhiensis* new species, female: A. Abdomen, B. Maxillary and labial palpus, C. Mandible, D. Antenna, E. Forewing, F. Wing venation, G. Middle leg, H. Prothoracic tergum

Forewing (Figure E) hyaline, longer than broad with a small oval area without cilia. Submarginal vein (Figure F) about one-half the length of the wing, marginal vein short and post-marginal long, stigmal vein narrow and shorter than post-marginal.

Coxae of all legs brownish. Femur and tibia yellowish-white with brownish markings on the femur and tibia. Tibial spur of middle leg slightly less than the length of basitarsus (Figure G).

Holotype: Female on card mount
 Length: Female 1.68 mm
 Host: *Ferrisiana virgata* COCKRELL
 Host plant: *Acacia* sp.
 Locality: Ridge Road, Delhi
 Date of collection: 30. 12. 1963
 Collected by: P. S. RAI

***Anagyrus kivuensis* COMPERE**

(Plate III)

COMPERE Bull. Ent. Res. 30, 1–13; 1939.

COMPERE (1939) described this species which was bred from *Pseudococcus* sp. from Belgian Congo.

Following characters not included in the original description are given.

Female: Frontovertex orange yellow. Thorax yellowish with blackish suffusions at the margin of mesonotum and centre of scutellum. Abdomen blackish.

Mandibles (Figure F) brownish, bidentate. Maxillary palpi four segmented and labial palpi three segmented (Figure E). Club broader than the funicle joints, broadly rounded at tip (Figure C).

Prothoracic tergum (Figure D) with anterior portion silvery white and a dark patch in the centre. Scutellum triangular with a black line upto two-third the length in the centre.

Abdomen (Figure G) slightly longer than head and thorax combined, tip almost pointed, longer than broad. Ovipositor slightly exserted. Wings reaching beyond the apex of abdomen.

Sub-marginal vein about half the length of the wing (Figures A and B). Coxa and femur whitish, tinged with some black colouring at the apices. Tibia white, tibial spur three-fourth of basitarsus.

Length: 1.512 mm
 Host: *Ferrisiana virgata* COCKRELL
 Host plant: *Acacia* sp.
 Locality: Delhi
 Date of collection: 30. 12. 1963
 Collected by: P. S. RAI

This species is not reported from India so far.

***Anagyrus comperei* spec. nov.**

(Platte IV)

Female: Frontovertex yellow with mixture of ferruginous. Eyes whitish. Lateral ocelli near the occipital margin. Body robust. Head wider than thorax. Notum of thorax reddish yellow. Posterior margin of mesonotum and centre of scutellum with black linings. Abdomen black, longer than head and thorax combined.

Mandibles bidentate (Figure C). Maxillary and labial palpi four and three segmented (Figure F).

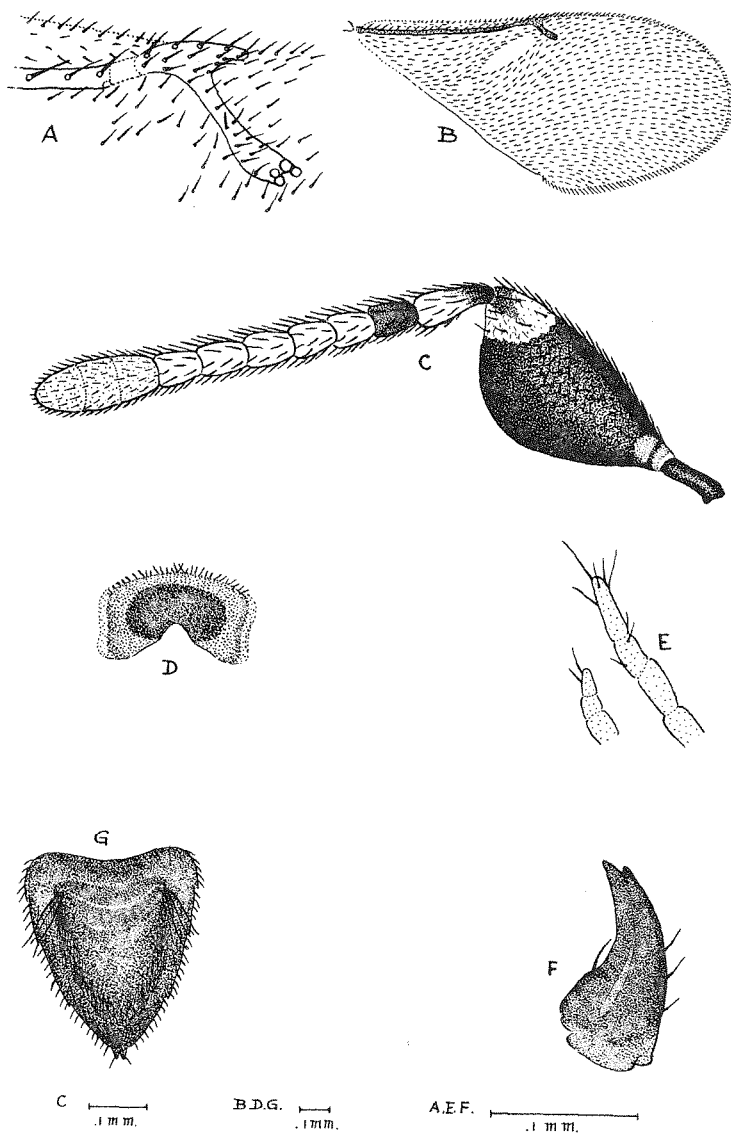


PLATE III. *Anagyrys kivuensis* COMPERE, female: A. Wing venation, B. Forewing, C. Antenna of female, D. Prothoracic tergum, E. Maxillary and labial palpus, F. Mandible, G. Abdomen

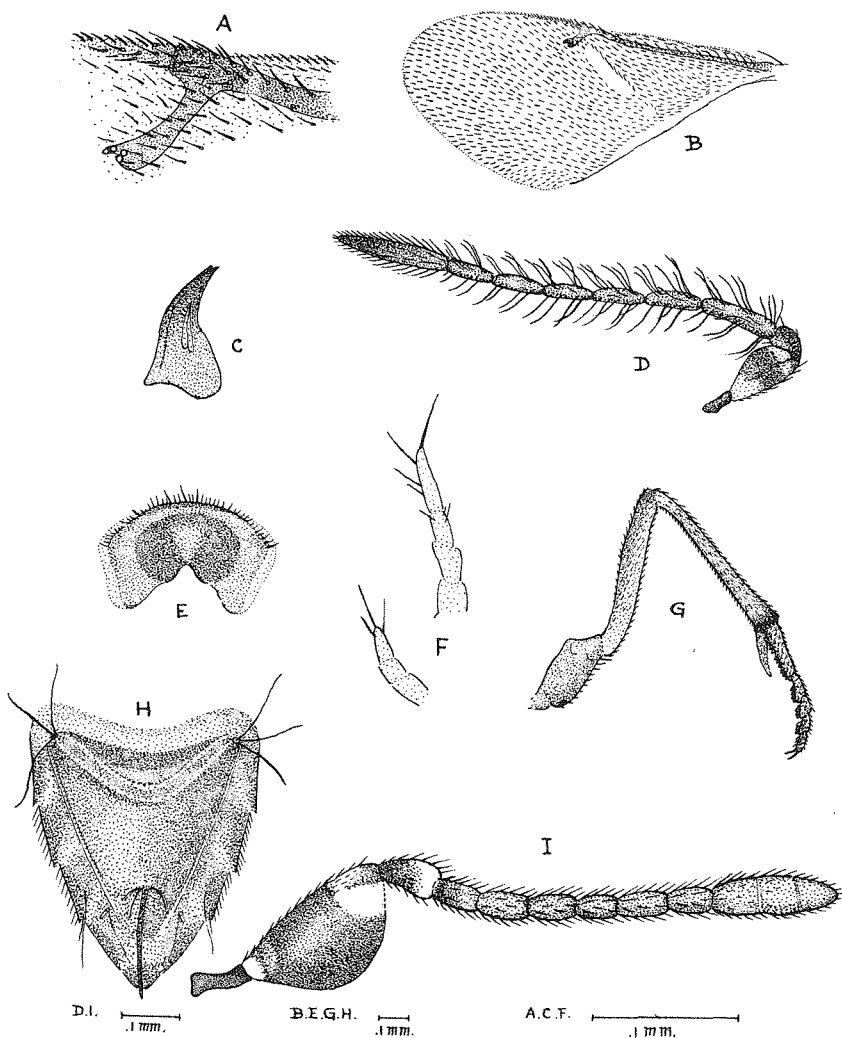


PLATE IV. *Anagyrus comperei* new species, female: A. Venation, B. Forewing, C. Mandible, D. Antenna, Male, E. Prothoracic tergite, F. Maxillary and labial palpus, G. Middle leg, H. Abdomen, I. Antenna

Antennal scape (Figure I), slightly expanded with a white patch at base and below the joint. Rest of the portion is black. Pedicel black at basal half and white at apex. First funicle joint slightly shorter than pedicel and suffused with black colouration. Second, third and fourth funicle joints almost equal in size. Fifth and sixth slightly broader and longer. Club faintly three jointed, light brown in colour. Rest of the funicle joints are light yellowish in colour. Club oblong and tapering at the end.

Scutellum with number of prominent bristles, the last pair being prominent. Scutellum slightly depressed in dry specimens. Thorax prominently convex. Prothoracic tergite (Figure E) with convex anterior margin with a deep fissure at the posterior part, light brown in the centre and yellowish at sides.

Abdomen (Figure H) heart shaped broad at base and tapering at apex. Ovipositor slightly protruding.

Forewings (Figure B) hyaline with a white patch about half the width of wing at that place below the stigmal vein. Marginal vein short. Stigmal vein long (Figure A). Post-marginal short.

Middle leg (Figure G) light yellowish in colour, a darker shade of yellow at the coxa. Tibial spur as long as the basitarsus.

Length: 1.932 mm

Male: Shorter than female. Frontovortex yellowish broader than long, wider than transverse diameter of eyes. Ocelli in an obtuse angle.

Antennae (Figure D) slender and long, scape expanded, whitish, with a black patch at the centre. Pedicel brownish, as long as wide, one-third the length of the first funicle joint, first funicle joint longest, one and one-half times as long as the second, second to sixth segments almost of equal size, brownish, with whorls of long hairs throughout; club slightly longer than last two funicle joints, dark brown at tip and pointed.

Thorax convex, mesoscutum blackish at centre, yellow at sides covered with white hairs. Scutellum blackish, as long as broad. Abdomen brownish, shorter than thorax.

Holo- et Allotypes: On card mounts

Paratypes: On slides

Length: 0.98 mm

Host: *Ferrisia* sp.

Host plant: Avenue tree

Date of collection: 11. 10. 1963

Collected by: P. S. RAI

This species is nearer to *Anagyrus abyssinicus* described by COMPERE Bull. Ent. Res. 30, 1—13; 1939. The new species described differs from *A. abyssinicus* by the following characters.

Notum of thorax is not black and flattened; silvery hairs are not present. The pronounced dilution of blackish or brown is not evident in parts of coxae and dorsal and ventral aspects of femora and tibiae. First funicle joint is not as long as pedicel.

It gives us great pleasure to name the species after Mr. HAROLD COMPERE whose works should be a great source of inspiration to all students of Hymenoptera, particularly that of Encyrtidae.

Anagyrus nigroradiclatus spec. nov.

This species is similar to *A. comperei* new species. The following differences are found. Abdomen is shorter than head and thorax combined. Frontovortex yellowish.

Prothoracic tergite with a fuscous patch in the centre and banded at the lower margin as shown in the figure.

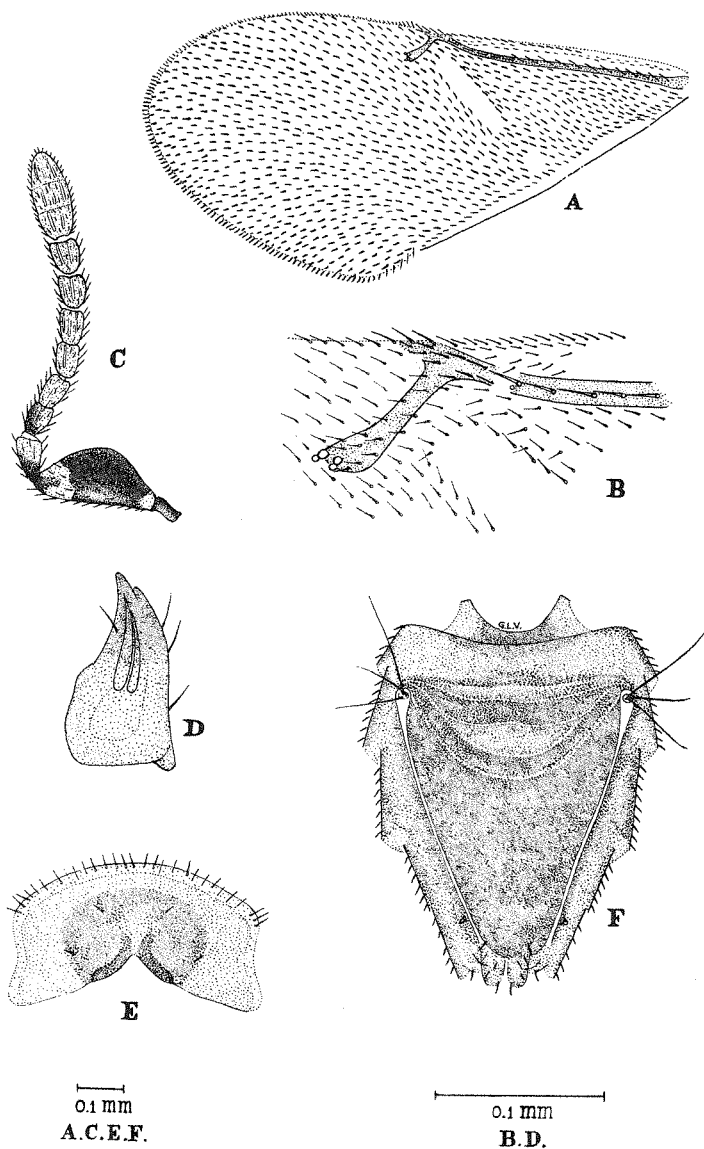


PLATE V. *Anagyrs nigroradclatus* new species, female: A. Forewing, B. Venation, C. Antenna, D. Mandible, E. Prothoracic tergum, F. Abdomen

Marginal vein punctiform, a hyaline space intervening between the marginal and the submarginal vein. Post marginal vein almost absent.

Length: Female 1.512 mm Male 0.84 mm
 Holotype: Female on card mount
 Paratypes: On slides
 Host plant: Avenue tree
 Host insect: *Ferrisia virgata* COCKRELL
 Locality: I.A.R.I., New Delhi
 Collected by: P. S. RAI. 14. 10. 1963

Acknowledgement

The authors are grateful to Dr. S. PRADHAN for facilities.

Summary

The genus *Anagyrus* was established by HOWARD in 1896. So far only a couple of species were known from India. Therefore a systematic collection of scale pests was made, and their rearing resulted in the recording of several species known or new to science. In this paper a table of keys is given to distinguish the known and new species so far recorded in India. Three new species are described, i.e. *comperei*, *delhiensis* and *nigroradclatus*; *amoenus*, *pseudococci* and *kivuensis* are recorded for the first time in India.

Zusammenfassung

Die Gattung *Anagyrus* wurde 1896 von HOWARD aufgestellt. Bisher waren nur einige Arten aus Indien bekannt. Deshalb wurde eine systematische Sammlung von Schildlaus-schädlingen vorgenommen, und ihre Aufzucht erbrachte Angaben über verschiedene bekannte und neue Arten. In diesem Artikel wird ein Tabellenschlüssel zur Unterscheidung der bisher in Indien bekannten oder neuen Arten mitgeteilt. Drei neue Arten, nämlich *comperei*, *delhiensis* und *nigroradclatus*, werden beschrieben; *amoenus*, *pseudococci* und *kivuensis* werden zum erstenmal für Indien verzeichnet.

Резюме

Род *Anagyrus* установлен 1896 HOWARD-ом. До сих пор из Индии были известны только мало видов. Поэтому делался систематическое собирание вредных черепашек, выращивание которых дало данные о различных знакомых и новых видов. В настоящей статье даётся определительная таблица для до сих пор из Индии известных видов. Три новых вида, *comperei*, *delhiensis* и *nigroradclatus* описываются; *amoenus*, *pseudococci* и *kivuensis* впервые отмечаются для Индии.

References

- COMPERE, H. A second report on some miscellaneous African Encyrtidae in British Museum. Bull. ent. Res., London, **30**, 1—26; 1939.
 HOWARD, L. O. & ASHMEAD, Wm. H. On some reared parasitic hymenopterous insects from Ceylon. Proc. U.S. nat. Mus. **18**, 638; 1896.
 KERRICH, G. J. The state of our knowledge of the systematics of the Hymenoptera parasitica, with particular reference to British fauna. Trans. Soc. Brit. Ent. **14**, 1—18; 1960.
 TIMBERLAKE, P. H. & CLAUSEN, C. P. The parasites of *Pseudococcus maritimus* (EHRHORN) in California. (Hymenoptera, Chalcidoidea) Part I & II. Univ. California Pubus. Ent. Berkeley **3**, 223—292; 1924.