

THE IDENTITY AND GEOGRAPHICAL DISTRIBUTION OF THE
INDIAN SPECIES OF THE GENUS *DYSDERCUS* BOISDUVAL
(HEMIPTERA : PYRRHOCORIDAE)

By

A. P. KAPUR and T. G. VAZIRANI

Zoological Survey of India, Calcutta

(With 5 Text-figures and 1 Map)

CONTENTS	PAGE
I—Introduction	159
II—Key to the Indian species of <i>Dysdercus</i>	160
III—Systematic Account	161
1. <i>Dysdercus koenigii</i> (Fabricius)	161
2. <i>D. evanescens</i> Distant	164
3. <i>D. olivaceus</i> (Fabricius)	166
4. <i>D. sirialis</i> Freeman	168
5. <i>D. poecilus</i> (Herrich-Schaffer)	168
6. <i>D. cingulatus</i> (Fabricius)	169
7. <i>D. mesiostigma</i> Distant	170
8. <i>D. decussatus</i> Boisduval	171
IV—Geographical Distribution	172
V—Summary	174
VI—References	174

I—INTRODUCTION

Several species of the genus *Dysdercus* Boisduval are well known for their association with cotton crop in many parts of the world. On account of this association as well as for the generally red colour of the body, these bugs have been called the Red Cotton Bugs. There are some eight species of the genus recorded from India but only one of these is

well known, being widely distributed in the country and, at times, occurring in very large numbers on cotton plants. The species commonly known as *Dysdercus cingulatus* (Fabr.) in India should, as recently shown by Freeman (1947), be called *Dysdercus koenigii* (Fabr.). The type-locality of the former is Australia and of the latter is Tranquebar, South India. As observed by Freeman, while *D. cingulatus* is widely distributed from Assam eastwards to the Pacific Islands, China and Australia, *D. koenigii* occurs in Ceylon, throughout India and in Burma. The only area of common occurrence between these two species, therefore, lies in Assam eastwards and except for the material coming from there, the two species could be easily distinguished on geographical basis. Freeman was able to examine some 50 examples of *D. koenigii* from India, Ceylon and Burma and some 20 of *D. cingulatus* from the same countries. Since he has made a very significant observation on the identity and geographical distribution of these species and since at least one of the species is of economic importance in India, it was thought desirable to examine, revise and rearrange the large collection of the genus *Dysdercus* deposited in the Indian Museum (Zoological Survey of India). It was also hoped that this collection would add to our knowledge of the geographical distribution of the species in India. In this connection use was also made of the named and un-named collections of the genus, with the Bombay Natural History Society, the Indian Agricultural Research Institute, New Delhi, and the Forest Research Institute, Dehra Dun, indicated in the paper as B.N.H.S., I.A.R.I. and F.R.I., respectively. Our sincere thanks are due to the authorities concerned for the loan of the material.

Since it appeared that even after several years of the publication of Freeman's paper, the name *D. cingulatus* is being applied in certain quarters to what is referable to *D. koenigii* and since the economic status of certain other Indian species was not adequately known, we have given in this paper diagnostic characters as well as a key to all the Indian species for purposes of easy identification. Further collecting would also be of great interest for a study of their geographical distribution which has been reviewed at the end of the paper.

II—KEY TO THE INDIAN SPECIES OF *Dysdercus*

- | | |
|---|---------------------------|
| 1. Corial markings always in the form of black spots or transverse lines, except in some varieties of <i>D. poecilus</i> in which they are lacking; scutellum never punctured or pubescent; second conjunctiva appendage of male simple | 2 |
| Corial markings never in the form of black spots or transverse lines, often absent; scutellum basally with strong, sparse punctures or scutellum and prothoracic fold finely pubescent; second conjunctiva appendage forked | 7 |
| 2. Corial spots touching or nearly touching inner margin (Text-fig. 2b); if spots absent, the first (true) ventral abdominal segment also without white fascia. (India, S. E. Asia) | <i>poecilus</i> (H. & S.) |
| Corial spots placed centrally, never absent; white fascia on the abdomen always present on the first ventral segment | 3 |

3. Hemelytra with the membrane pale; corial spots very small for the size of the insect (Text-fig. 2a). (India, Burma, Indo-China) *evanescens* Dist.
- Hemelytra with the membrane black; corial spots not very small 4
4. Thorax much narrowed anteriorly (Text-fig. 1d); white ventral abdominal fasciae usually bifid 5
- Thorax moderately narrowed anteriorly; white abdominal fasciae never bifid 6
5. White abdominal fasciae varying from slightly to strongly bifid; vertical processes of the ninth segment broad (Text-fig. 4h). (S. India and Ceylon) *olivaceus* Fabr.)
- White abdominal fasciae usually not bifid sometimes very slightly bifid, never strongly so; vertical processes (Text-fig. 4c) narrower. (S. India, Ceylon) *similis* Freeman
6. Femora red, only very occasionally dark; parameres (Text-fig. 3d) double crest type apically; spermathecal duct short, accessory gland narrow, long, much coiled (Text-fig. 5b). (Throughout India, Burma & Ceylon) *koenigii* (Fabr.)
- Femora usually at least apically dark; parameres single crested (Text-fig. 3a) spermathecal duct long, accessory gland wider and relatively short with a simple coil near the apex. (Assam, Burma, S. E. Asia & Australia) *cingulatus* (Fabr.)
7. Hemelytral membrane pale with black spot basally across the anal angle; prothoracic fold and scutellum finely pubescent. (China, S. E. Asia & Ceylon) *mesio stigma* Dist.
- Hemelytral membrane uniformly black, without pubescence on the dorsal surface. (Ceylon, Sikkim, Andaman Is., S.-E. Asia, Queensland, etc.) *decussatus* Boisd.

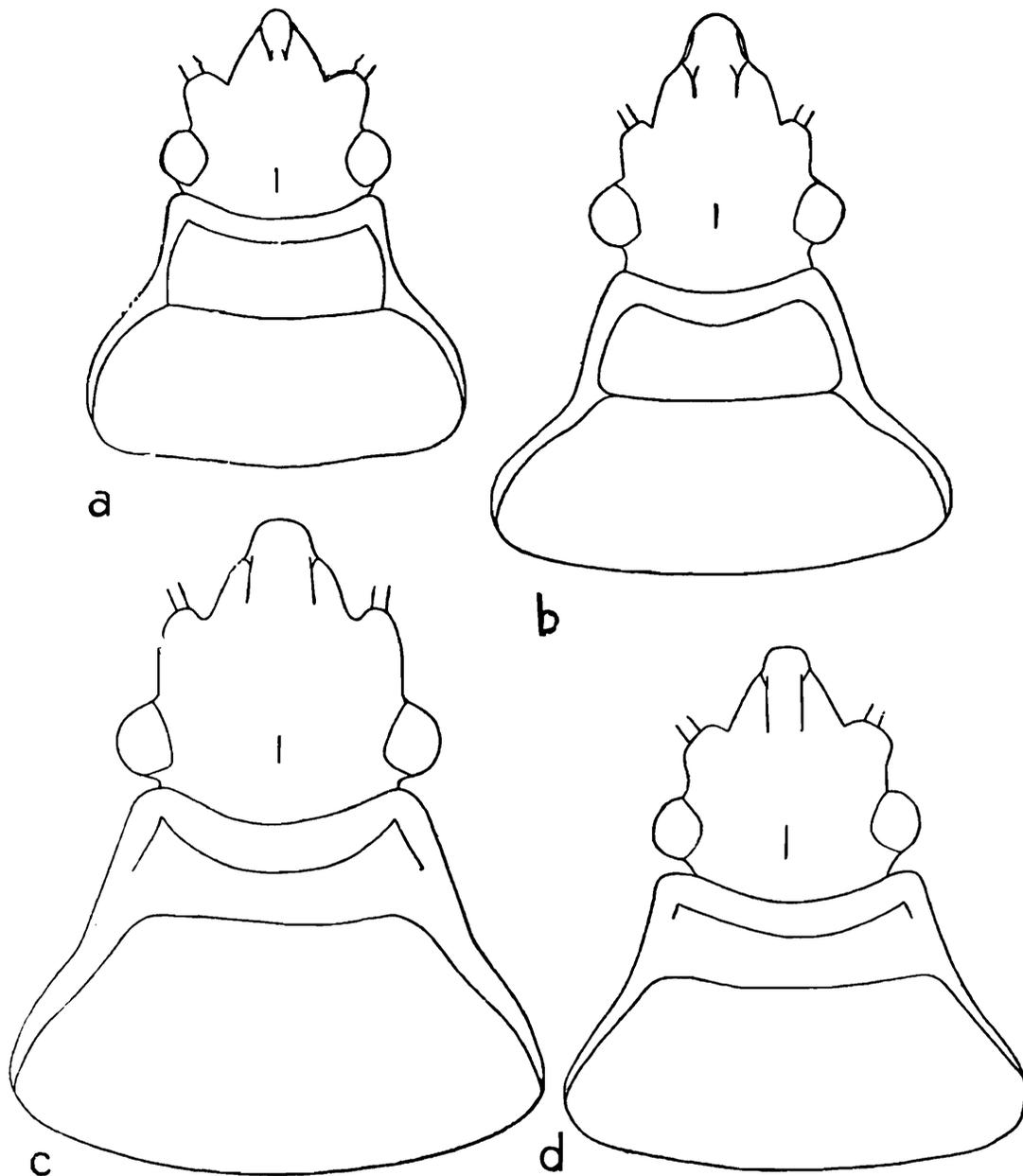
III.—SYSTEMATIC ACCOUNT

1. *Dysdercus koenigii* (Fabricius)

1774. *Cimex koenigii* Fabricius, *Systema Entomologia*, p. 720.
1794. *Lygaeus koenigii* Fabricius, *Entomologia Systematica*, 4, p. 155.
1833. *Astemma koenigii*, Laporte, *Mag. Zool.*, 2, No. 52-55, p. 37.
1834. *Pyrrhocoris koenigii*, Hahn, *Die Wanzenartigen Insekten*, 2, p. 12.
1843. *Dysdercus koenigii*, Amyot and Serville, *Histoire naturelle des Insectes. Hemipteres*, p. 272.
1866. *Dysdercus superstitiosus*, Stal, *Hemiptera Africana*, 3, p. 15. (*in part*)
1904. *Dysdercus cingulatus*, Distant, *Fauna Brit. India*, Rhynchota, 2, p. 118. (*in part*).
1909. *Dysdercus micropygus*, Eredin, *Ann. Soc. ent. Belg.*, 35, p. 99.
1910. *Dysdercus cingulatus*, Distant, *Fauna Brit. India*, Rhynchota, 5, p. 100 (*in part*).
1947. *Dysdercus koenigii*, Freeman, *Trans. R. ent. Soc. Lond.*, 98, pp. 400-401.

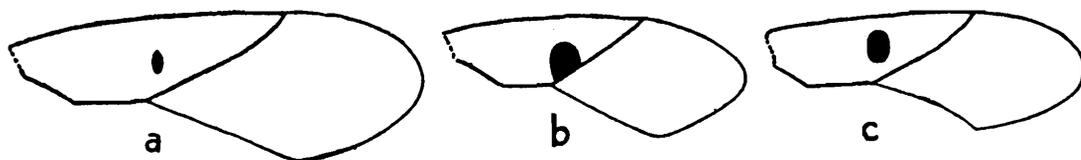
Diagnostic characters.—Prothorax only moderately narrowed anteriorly (Text-fig. 1c), crescentic collar white, anterior angles and lateral

margins red, pronotal disc and posterior margin variable in colour, yellowish or reddish. Corium with centrally placed, oval, black spot (Text-fig. 2c), variable in size but never touching either margin ;



TEXT-FIG. 1.—Head and prothorax of : (a). *Dysdercus poecilus*. (b). *D. decussatus*. (c). *D. koenigii*. (d). *D. olivaceus*.

membrane black. White abdominal fasciae on segments 1-6 rather narrow, usually less than half the width of the segment. Male genitalia with parameres (Text-fig. 3d) double crested apically, somewhat variable ;



TEXT-FIG. 2.—Hemelytron of : (a). *Dysdercus evanescens*. (b). *D. poecilus*. (c). *D. koenigii*.

vertical processes (Text-fig. 4a), gradually narrowed anteriorly and separated along about half the length of the processes ; second conjunctiva apendages simple. Spermathecal duct very short, accessory gland

moderately wide and much coiled (Text-fig. 5*b*). Length 11.0–15.5mm. ; breadth 2.5–5.0mm.

Material examined.—189 examples from the following localities :—

INDIA : MADRAS : Shevaroy Hills, 4500 ft., Yercaud, 6.III.1932, 1 ex. (*Narayana*) (I.A.R.I.).

MYSORE : Bangalore, 3000 ft., 12.X.1910, 1♀ (*N. Annandale*); 1♂, 7♀ (M. Cameron).

MADHYA PRADESH : Jubbulpore, 3.VI.1922. 2♂, 2♀ (*S. Ribeiro*).

BOMBAY : Poona 29.II.1924, 1♀ (*V. S. Laperson*) (B.N.H.S.). *Andheri*, Salsette, 28.IV. 1908, 1♀ (B.N.H.).

PANJAB : Rawalpindi, VI—VII. 1917, 1♀ (*R.A. Hodgart*); 16.VII.1944, 7 ex. (*B.M. Bhatia*) (F.R.I.). Karar, East Rawalpindi, 22. III. 1931, 1 ex. (*B.M. Bhatia*) (F.R.I.). Khewra Salt Range, IX-X. 1930, 1♀ (*H.S. Pruthi*). Kalar Kahar Salt Range, 10-21.X. 1930, 31♂, 40♀ (*S. L. Hora* and *H. S. Pruthi*).

P.E.P.S.U. : Pinjaro (Patiala State), base of Simla Hills, 17.VII.1911, 1♂ (*Mus. Collr.*).

HIMACHAL PRADESH : Dharampur, 5000 ft., Simla Hills, 6-8.V.1907, 1♂ (*N. Annandale*). Phagu, 9000 ft., Simla Hills, 14-15. V. 1909, 1♀ (*N. Annandale*).

UTTAR PRADESH : Meerut, 1♂, 2♀; 13.19.VI. 1905, 1♀ (*E. Brunetti*). Almora, Kumaon, 5500 ft., XII. 1911, 1♀ (*C. Paiva*). Dehra Dun, 2♀; 19.V.1947, 1♀ X-XI.1938, 3 ex. (*B. N. Chatterjee*) (F.R.I.); 16. V. 1928, 1 ex. (*P. L. N.*; *F. Z. Colln.*) (F.R.I.); 7.IX.1929, 1 ex. (*G. D. Pant*) (F.R.I.); 30. X. 1937, 1 ex. (*G. D. Bhasin*) (F.R.I.); 12. XII. 1939, 1 ex. (*S. L. Mark*) (F.R.I.); III. 1930, 1 ex. (*B. M. Bhatia*) (I.A.R.I.); New Forest, Dehra Dun, 4. XI. 1938, 11 ex. (*ex Dalbergia sissoo*. Ent. Survey) (F.R.I.). Anwarganj, Kanpur dist., 1-13. X. 1911, 1♀ (*J.W.C.*). Between Amausi and Harawni, 25-26. X. 1911, 1♂ (*J. W. C.*). Sahelwa, Bahraich dist., 12. III. 1909, 1♂. Shahzadpur, Allahabad, 22. V. 1908, 1♂ (*Mus. Collr.*). Banaras, 30. VII. 1947, 1♂; 10. VI. 1947, 1♀ (*T. N.* and *V. N.*). BIHAR : Pusa, 26-30. VIII. 1925, 1♂ (*H. S. Pruthi*); 12. V. 1932, 1 ex. (*C. K. Samuel*) (I.A.R.I.). Olo Anqua, Singhbhum dist., 13. II. 1955, 7♂, 7♀ (*A. P. Kapur*). Chiria, Singhbhum dist., 18. II. 1955, 3♂ (*A. P. Kapur*). Manoharpur, Singhbhum dist., 2. II. 1954, 1♀, 3♂, (*A. P. Kapur*) from vegetable garden. BENGAL : Darjeeling, 29. V. 1917, 1♀ (*E. Brunetti*). Siliguri, 29.VI. 1906. 1♀. Calcutta, 1♀; 1. 21. V. 1909 1♀; 13. II. 1904, 1♀, 1♂, (*E. Brunetti*); 6. XII. 1925, 1♀ (*R. B. S. Sewell*); 1930, 2♀; 1929, 1♂ (*S. Ribeiro*); V. 1949, 1♂, 1♀ (*G. K. Manna*). Chennia, 24-Parganas, Sunderbans, 11. XI. 1909, 1♂ (*J. T. Jenkins*). Basanti F. S., 24-Parganas, Sunderbans, 16. XI. 1909, 1♀ (*J. T. Jenkins*). Kankandigee, 24 Parganas, Sunderbans, 18. XI.1909, 2♂, 3♀ (*J. T. Jenkins*). ORISSA : Barkul, 1-3.VIII.1914, 1♀ (*F. H. Gravelly*) ASSAM : Silonibar, North Lakhimpur, 15-30. VI. 1911, 1♀ (*S. Stevens*).; Gauhati, 25 VI.—4. V. 1919, 1 ex. (*T. B. Fletcher*) (I.A.R.I.).

NEPAL : Maho, 17. III. 1909, 1 ex. Tiruani, 25. XII. 1909, 2♂, 4♀ (*B. Warren*); Butal, 12. XI. 1908, 2♂ (*Mus. Collr.*).

Distribution.—Ceylon, India (type-locality : Tranquebar), West Pakistan and Burma. Distant (1904, 1910) has not reported this species name from India. Breddin (1909) described *D. micropygus* from Ceylon. Freeman (1947) has mentioned the following localities from India and West Pakistan—Mysore : Bangalore ; Bombay ; Rajputana ; Suajgarh ; Punjab : Multan ; Uttar Pradesh (United Provinces) : Merut, Kumaon, Agra, Dehra Dun ; Bihar ; Bengal : Darjeeling, Calcutta. Burma : Shw-egyin, N. Pegu. Ceylon : Galle, Tala, Trincomalee. The species is recorded here for the first time from Assam, Nepal and Orissa.

Remarks.—As stated in the introduction, this species has been more often than not confused with *D. cingulatus* in India and Pakistan. The two species may overlap in N. E. India and Burma only. The species are very variable in external characters and coloration but can be distinguished from each other by the following characters :—

D. koenigii

D. cingulatus

i. Usually clear red femora.

Usually dark femora, at least apically black.

ii. Size 11.0--15.5 mm.

Size 12.0—18.0 mm

*D. koenigii**D. cingulatus*

- | | |
|--|--|
| <p>iii. Male genitalia with parameres of double crest type apically.</p> <p>v. Vertical processes of the ninth segment in male moderately broad, gradually and slightly narrowed apically, and separated for about half the length of processes.</p> <p>v. Spermathecal duct short, accessory gland narrow and much coiled at the apex.</p> <p>vi. Distributed in India, Burma and Ceylon.</p> | <p>Male genitalia with parameres of single crest type ; hooked.</p> <p>Vertical processes of the ninth segment in male broad, closely oppressed, narrowed at the apex.</p> <p>Spermathecal duct long, accessory gland broad and less coiled.</p> <p>Distributed mainly in S. E. Asia and Australia, overlapping with <i>koenigii</i> in N. E. India and Burma.</p> |
|--|--|

2. *Dysdercus evanescens* Distant

1902. *Dysdercus evanescens* Distant, *Ann. Mag. nat. Hist.* (7) 9, p. 43.
1902. *Astemma evanescens*, Kirkaldy and Edwards, *Wien. ent. Ztg.*, 21, p. 172.
1904. *Dysdercus evanescens*, Distant, *Fauna Brit. India*, Rhynchota, 2, p. 120.
1947. *Dysdercus evanescens*, Freeman, *Trans. R. ent. Soc. Lond.*, 98, p. 402.

Diagnostic characters.—Pronotal collar either white or concolorous (in darker forms) with the pronotum ; pronotal disc, anterior angles and posterior margin concolorous, varying from light greyish-ochraceous to deep red. Corium with small transverse spot, centrally placed, much smaller for the size of the insect (Text-fig. 2a) ; membrane pale. Male genitalia with the parameres (Text-fig. 3b) double crested apically ; the vertical processes (Text-fig. 4b) broad, separated along about half the length of the processes and rounded apically. Spermathecal duct (Text-fig. 5a) short, as in *koenigii*, but the accessory gland broader and less coiled. *Length* 15.0–19.5 mm., *breadth* 5.0–6.5 mm.

Material examined.—35 examples from the following localities :—

INDIA : UTTAR PRADESH : Banaras, 2.V.1945, 2♀ (*T.B. Sinha*), under cotton and 'gular' (*Ficus racemosa* Linn.) trees. Bhimtal, 4500 ft., Kumaon, 22-27.IX.1906, 1♂ (*N. Annandale*). PUNJAB : Above Kufri, Simla hills, 8000 ft., 20-30. IX.1921, 1♀ (*S. W. Kemp*). BENGAL : Kurseong, 1♀ ; 21.VI.1910, 1♀ (*N. Annandale*). Darjiling, 8.VI.1917, 1♂, 1♀. (*E. Brunetti*), 12.V.1928. 1 ex. (*Bose*) (I.A.R.I.) ; 1 ex. (*Carmichael*) (I.A.R.I.). Pashok, 26. V.-14. VI. 1916, 3♀ (*F.H. Gravelly*) ; 23.11-11. V. 1915, 2♀, 2♀ (*F.H. Gravelly*). Kalimpong, 24.IV-10. V.1915, 2♂, 4♀ (*F. H. Gravelly*). Calcutta, 14. VI.1950, 1♀ (*A.P. Kapur*). Dist. Purneah, 1♂, 5♀.

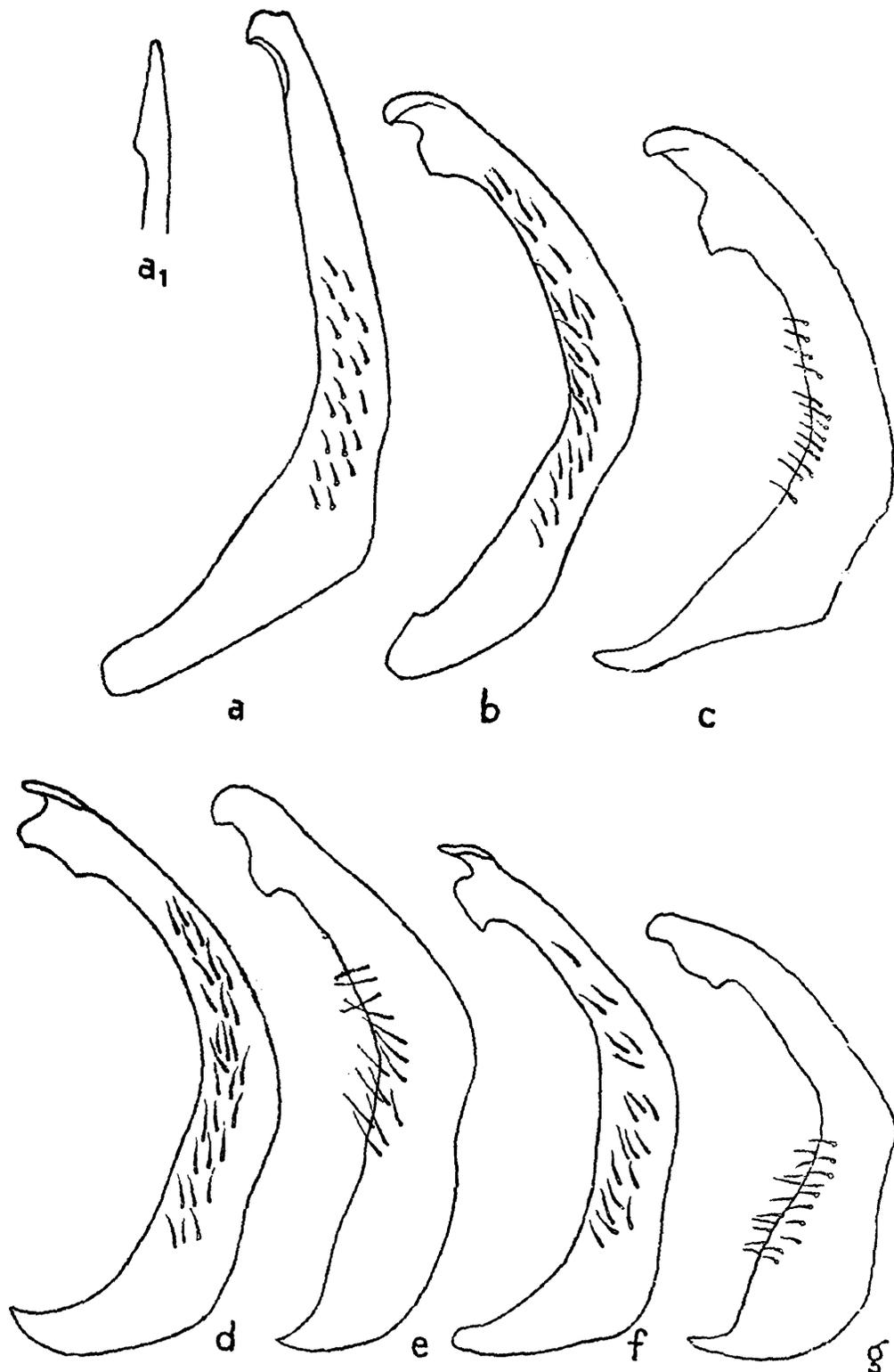
SIKKIM : Sikkim, 1♀

NEPAL : Chitlong, 1♀. Above Nah, 15500 ft., 15.V. 1955, 1♀ (*B. Biswas*).

BURMA : Saden, Myitkyina dist. V.1911, 1♀ (*E. Colenso*). Misty Hollow, W. side of Dawna hills, 2200 ft., 22-30.XI. 1911, 1♂ (*F.H. Gravelly*).

Distribution.—India, Sikkim, Burma, Indo-China. Distant (1904) recorded this species from Assam and Burma. Freeman (1947) further recorded it from Indo-China, Sikkim, Kumaon Hills (U.P.) and N. Konkan (Bombay State). It is here recorded for the first time from two places in Nepal, namely, Chitlong and above Nah, at 15,500 ft. The high altitude from which the latter specimen has been collected may perhaps be the highest altitudinal record of the occurrence of the genus. As the species is generally found in mountainous tracts the present record from Banaras is also of interest since the latter is situated in the Indo-Gangetic plain.

Remarks.—This species has many distinctive characters and can be easily distinguished from other species by its large size, the pale hemelytral membrane, and by having a corial spot which is small for the size of the insect. It may also be mentioned that the specimens from Banaras were

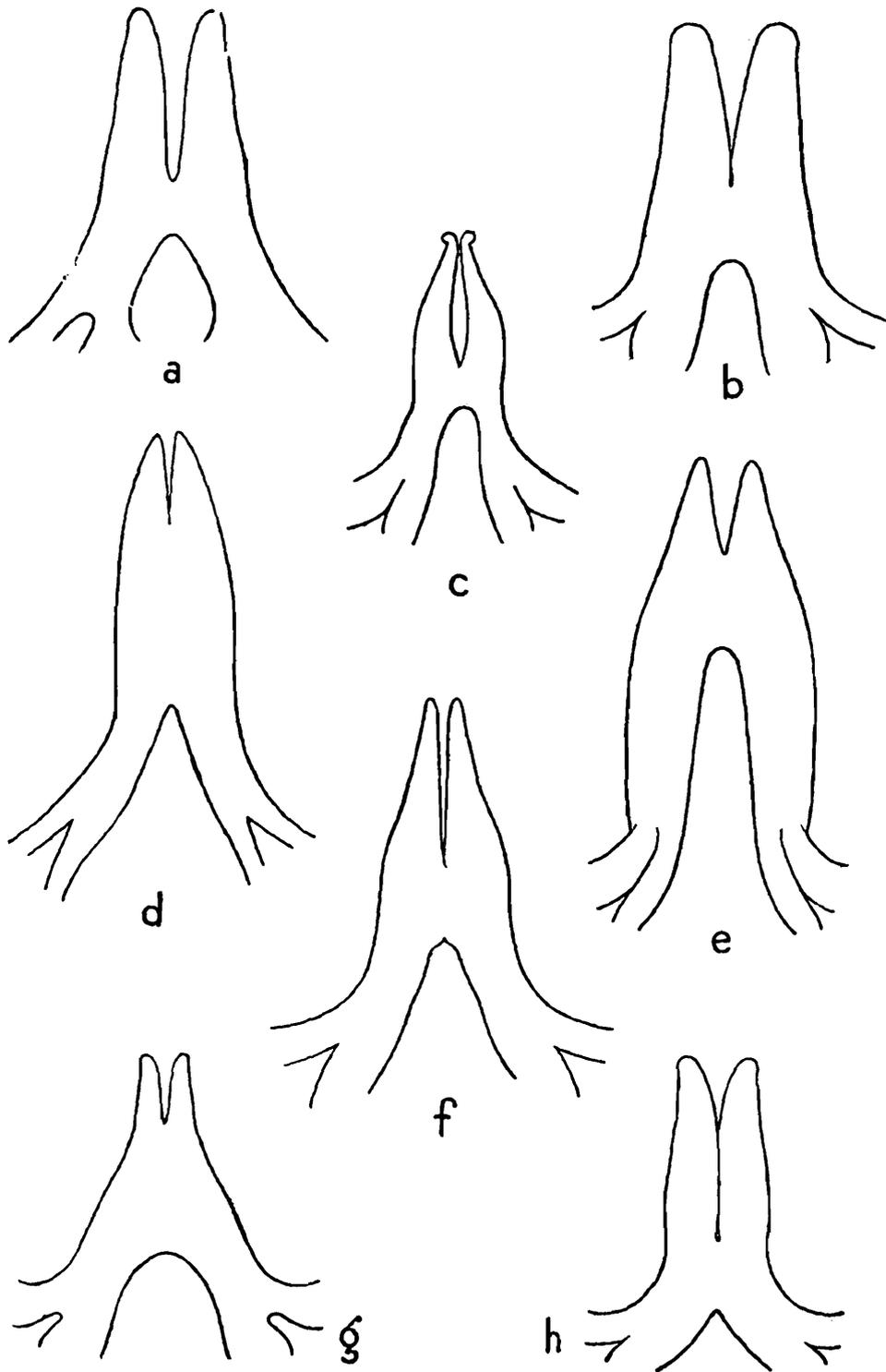


TEXT-FIG. 3.—Lateral view of right parameres of: (a). *Dysdercus cingulatus*. (a₁). *D. cingulatus*, front view. (b). *D. evanescens*. (c). *D. olivaceus*. (d). *D. koenigii*. (e). *D. mesiostigma*. (f). *D. poecilus*. (g). *D. decussatus*.

collected from underneath cotton plants and gular (*F. racemosa*) tree although the economic status of this species in relation to the forms remains unknown.

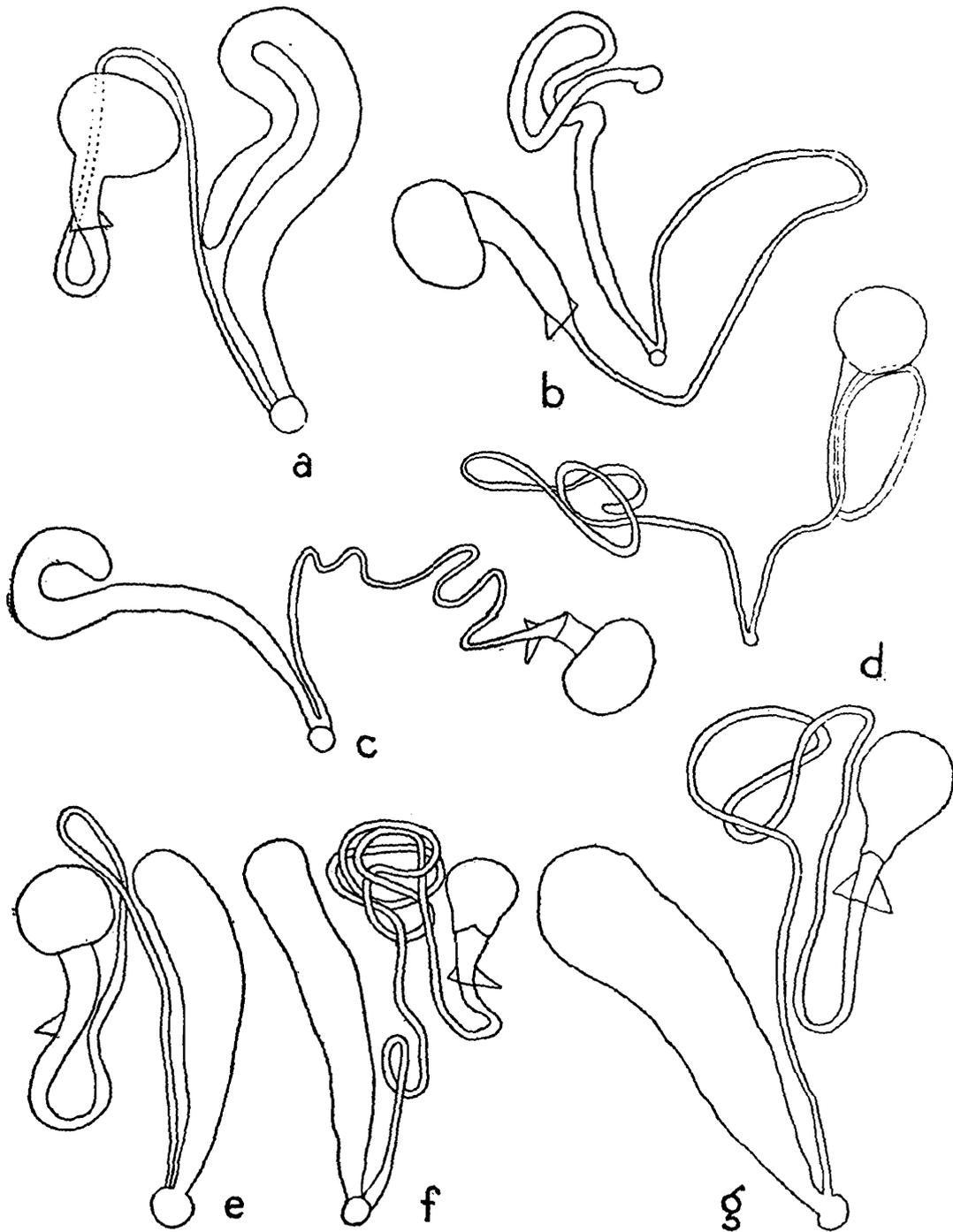
3. *Dysdercus olivaceus* (Fabricius)

1798. *Lygaeus olivaceus* Fabricius, *Entomologia Systematica* 4, *Supplementum*, p. 540.
 1868. *Dysdercus olivaceus*, Stal, *K. svenska Vetensk Akad. Handl.*, 7, p. 84.
 1904. *Dysdercus olivaceus*, Distant, *Fauna Brit. India*, Rhynchota, 2, p. 119.
 1904. *Dysdercus cingulatus*, Distant, *ibid.*, 2, p. 119 (*in part*).
 1809. *Dysdercus luteolus* Breddin, *Ann. Soc. ent. Belg.*, 53, p. 300.
 1910. *Dysdercus cingulatus*, Distant, *ibid.*, 5, p. 100 (*in part*).
 1947. *Dysdercus olivaceus*, Freeman, *Trans. R. ent. Soc. Lond.*, 98, pp. 403-404.



TEXT FIG. 4.—Posterior view of the vertical processes of the ninth abdominal segment of male of : (a). *Dysdercus koenigii*. (b). *D. evanescens*. (c). *D. similis*. (d). *D. cingulatus*. (e). *D. mesiostigma*. (f). *D. poecilus*. (g). *D. decussatus*. (h). *D. Olivaceus*.

Diagnostic characters.—Prothorax (Text-fig. 1*d*) narrow anteriorly; pronotal collar white; disc and posterior margin pale dull yellow; lateral margins pale or reddish. Corium with the centrally placed black spot, usually rounded but variable in size, never touching either margin. The white abdominal fasciae (on segments 2-3 and sometimes 4-5, forked). Male genitalia with the parameres (Text-fig. 3*e*) of double crest type;



TEXT-FIG. 5.—Spermatheca and accessory gland of : (a). *Dysdercus evanescens*. (b). *D. koenigii*. (c). *D. cingulatus*. (d). *D. olivaceus*. (e). *D. poecilus*. (f). *D. decussatus*. (g). *D. mesiostigma*.

vertical processes (Text-fig. 4*h*) moderately broad, bluntly pointed and a little bent apically on the outer side. Second conjunctiva appendages simple. Spermathecal duct (Text-fig. 5*d*) narrow, long, a little longer than in *koenigii*; the accessory gland is narrow and much coiled. Length 11.0-15.5 mm., breadth 4.0-5.5 mm.

Material examined.—16 examples from the following localities :—

INDIA : MADRAS : Tope, foot of Palni Hills, 2♂, 2♀ (S. W. Kemp). COCHIN : Parambikulam, 10-15.IX.1914, 2♂, 4♀ (F. H. Gravelly).

CEYLON : Peradeniya, 18.V.1910, 5♂, 1♀.

Distribution.—South India (type-locality : India) and Ceylon. Distant (1904) gave its distribution as “Indie orientalis” Freeman (1947) recorded it from S. India and Ceylon which are also the areas from where our material comes.

Remarks.—All the specimens except those from Tope have the white abdominal fasciae strongly forked. This character of the fasciae is, however, variable. In the examples from Tope, the forked shape of the abdominal fasciae though not so well marked is never quite absent. By the forked shape of the fasciae this species can be distinguished from the allied species *Dysdercus similis* in which the fasciae are simple. For some of the specimens of *D. similis* which may somewhat approach the forked condition of fasciae as in *olivaceus*, the structure of the male genitalia alone affords the reliable distinguishing character. Cumman (1931) has doubtfully recorded this species from Indo-China, on cotton.

4. *Dysdercus similis* Freeman

1947. *Dysdercus similis* Freeman, *Trans. R. ent. Soc. Lond.*, **98**, p. 404.

Diagnostic characters.—Prothorax much narrowed anteriorly as in *olivaceus*, corium also as in *olivaceus*. White abdominal fasciae often simple and narrow or may be pointed anteriorly but never truly bifid. Male genitalia distinctly different from *olivaceus*, parameres of double crest type, vertical processes (Text-fig. 4c) very much narrowed anteriorly and close together at the apex though separated in the middle; second conjunctiva appendages simple. *Length* 8.0-15.0 mm., *breadth* 2.5-5.0 mm.

Remarks.—Unfortunately it has not been possible to examine any specimen of this species which has been recently described by Freeman (1947) from Wayalar, South India, and whose distribution extends southwards to Ceylon. As stated earlier the species is allied to *D. olivaceus*, being similar to it in the anteriorly much narrowed prothorax, in general colouration, spots on the corium, etc. The differences in the character of the abdominal fasciae have already been referred to under *olivaceus*. The two species may be separated by the shape of vertical processes which are here much narrower and closer together at the apex (Text-fig. 4c) than is the case in *olivaceus*.

5. *Dysdercus poecilus* (Herrich-Schaffer)

1844. *Pyrrhocoris poecilus* Herrich-Schaffer, *Wanzenartigen Insekten*, **7**, p. 17.

1853. *Dysdercus poecilus*, Herrich-Schaffer, *ibid.*, **9**, p. 177.

1901. *Dysdercus poecilus* var. *semifuscus* Breddin, *Wien. ent. Ztg.*, **20**, p. 85.

1901. *Dysdercus poecilus* var. *simplex* Breddin (*nec.* Walker), *ibid.*, **23**, p. 85.

1927. *Dysdercus poecilus* var. *semifuscus*, Taeuber, *Konowia*, **6**, pp. 193-195.

1929. *Dysdercus vacillans* Hussey, *General Catalogue of the Hemiptera*, **3**, p. 99 (*nom. nov.* for *D. poecilus* var. *simplex* Breddin).

1947. *Dysdercus poecilus*, Freeman, *Trans. R. ent. Soc. Lond.*, **98**, pp. 405-406.

Diagnostic characters.—Pronotum with white colour of the crescentic collar extending to the lateral margins ; pronotal disc and posterior margin red or orange. Corium with roundish spot (Text-fig. 2b) touching the inner margin only. In the forms without corial spots, the white fasciae on the (true) first abdominal segment present. Male genitalia with parameres (Text-fig. 3b) of double crested type, vertical processes (Text-fig. 4f) much narrowed towards the apices. Spermathecal duct (Text-fig. 5e) as in *cingulatus*, accessory gland sufficiently broad, small and not coiled. Length 8.5-13.0 mm., breadth 2.5-4.5 mm.

Material examined.—7 examples from the following localities :—

INDIA : BENGAL : Darjiling, 26.X.1955, 2♀ (*G. K. Manna*). ASSAM : Assam-Bhutan Frontier, 26.XI.1910, 2♂ (*S. W. Kemp*) ; Mangaldai Dist., 16.X. 1910, 1♂, 1♀ (*S. W. Kemp*) ; Sylhet, 12.X.1930, 1♀ (*M. Bose*) (F.R.I.).

Distribution.—Sikkim, India (Assam and N. Bengal), Burma, Siam, Indo-China, China (Hainan, Hongkong), Formosa, Malay States, Sumatra, Borneo, Java (type-locality : Java), Philippine Is. and Sulu Is. Distant (1904, 1910) does not record this species from India, Burma or Ceylon. Freeman (1946) has recorded this species from Sikkim ; Naga Hills, Khasia Hills, N. Lakhimpur in Assam, and from Bhamo in Burma.

Remarks.—On account of their general similarity in appearance, *D. poecilus* is likely to be confused with *D. koenigii* and *D. cingulatus*. It is, however, smaller than *D. cingulatus*. Invariably it may be separated by the white colour of the prothoracic collar extending to the lateral margins. A few specimens of *D. cingulatus* also slightly approach this condition but these could be distinguished further by the corial spot, which, when present, touches the inner margin and by the absence of a clear, white fascia on the first abdominal segment. Otaness and Butac (1939) record this species as a pest of minor importance on cotton. In view of its economic importance, it might be useful to keep a watch on it in the area of its occurrence in India.

6. *Dysdercus cingulatus* (Fabricius)

1775. *Cimex cingulatus* Fabricius, *Systema Entomologia*, p. 719.

1794. *Lygaeus cingulatus*, Fabricius, *Entomologia Systematica*, 4, p. 153.

1835. *Pyrrhocoris koenigii*, Burmeister, *Handbuch der Entomologie*, 2, p. 285.

1840. *Astemma koenigii*, Blanchard, *Histoire Naturelle des Animaux articulés*, 3, p. 128.

1853. *Dysdercus cingulatus*, Herrich-Schäffer, *Die Wanzenartigen Insekten*, 9, p. 177.

1904. *Dysdercus cingulatus*, Distant, *Fauna Brit. India*, Rhynchota, 2, p. 118 (*in part*).

1909. *Dysdercus megalopygus* Breddin, *Ann. Soc. ent. Belg.*, 53, p. 300.

1910. *Dysdercus cingulatus*, Distant, *ibid.*, 5, p. 100 (*in part*).

1929. *Dysdercus megalopygus* var. *ornatus* Hussey, *General Catalogue of the Hemiptera*, 3, p. 94.

1947. *Dysdercus cingulatus*, Freeman, *Trans. R. ent. Soc. Lond.*, 98, pp. 409-411.

Diagnostic characters.—Prothorax as in *koenigii*, with the collar white, white colour of the collar, however, rarely extending on to the lateral angles, disc and posterior margin usually orange. Corium concolorous with the disc of pronotum ; the spot black, usually slightly oval, centrally placed, usually fairly large, sometimes much reduced ; membrane

black. White abdominal fasciae on segments 1-6 always present though variable in size, the fasciae on segments 2-4 often quite narrow, sometimes broadened laterally to half or more of the width of segment. Male genitalia with parameres hooked (Text-fig. 3a, 3a1), single crested, characteristic and constant for the species; vertical processes (Text-fig. 4d) broad basally and narrowed apically, closely appressed and separated only at the apex. Spermathecal duct (Text-fig. 5c) long (longer than in *koenigii*), accessory gland moderately broad and coiled at the apex in the form of a question mark. Length 12.0-18.0 mm., breadth 3.5-5.5 mm.

Material examined.—29 examples from the following localities :—

INDIA : ASSAM : Mazbat, Mangaldai dist., 11-15.X.1910, 1♂ : 1♀ (*S. W. Kemp*). Shillong, 5♂, 3♀. Sylhet, 1♀ (*M. Bose*) (*F. R. I.*).

BURMA : Tenasserim, 1♂. Hopin, Myitkyina dist., 12-13.X. 1926, 1♂ (*B. N. Chopra*). Tavoy, 1♀.

SUMATRA : Batavia, 17.VI.1906, 1♂ (*F. Brunetti*).

BORNEO : Sibuluan, Sarawak, 2. VII.1910, 6♂, 6♀ (*Beebe*).

PHILIPPINES : Manilla, 10-16.III.1906, 2♀ (*E. Brunetti*).

Distribution.—India (Assam), East Pakistan (Chittagong), Burma, Siam, Indo-China, Hainan, Formosa, Canton, Malaya States, Sumatra, Borneo, Philippine Is., Celebes, Moluccas, Tenimber, New Guinea, New Ireland, Solomon Is., Australia (type-locality : Australia).

Remarks.—In literature on the Indian species of *Dysdercus* the name *D. cingulatus* has been most commonly employed for over half a century *vide* Atkinson (1888), Cotes (1888, 1891, 1892, 1896), Stebbing (1903), Lefroy (1909), Misra (1920, 1923), Pruthi (1922), Singh (1923), Fletcher (1930), Mehta (1930), Ayyar (1936), Beeson (1941), Banerjee and Basu (1955). The material seems actually to have belonged to *D. koenigii*, which is the most widely distributed species in India and the type-locality of which is Tranquebar, South India. The type-locality of *D. cingulatus* is Australia. As revealed by the studies of Freeman (1947) and confirmed by the present observations based on extensive material of the genus, *D. cingulatus* is, as far as known, confined to N. E. India (Assam) and East Pakistan (Chittagong), although it is widely distributed in the Australasian Region (*vide* map on p. 173) and causes serious damage to cotton. The characters distinguishing this species from *D. koenigii* have already been dealt with (p. 163). Since the latter species is more common in India and is invariably used in class-room dissections in agricultural colleges and elsewhere, and has also been employed recently for testing the efficacy of insecticides (Banerjee and Basu, 1955), it is only proper that the correct name, *D. koenigii*, is employed for it.

7. *Dysdercus mesiostigma* Distant

1888. *Dysdercus mesiostigma* Distant, *Trans. ent. Soc. Lond.*, p. 484.

1902. *Astemma mesiostigma*, Kirkaldy and Edwards, *Wien. ent. Ztg.*, 21, p.172.

1904. *Dysdercus mesiostigma*, Distant, *Fauna Brit. India*, Rhynchota, 2, p. 120.

1947. *Dysdercus mesiostigma*, Freeman, *Trans. R. ent. Soc. Lond.*, 98, pp. 415-416.

Diagnostic characters.—Prothorax moderately and finely punctured; prothoracic fold and scutellum closely and finely pubescent; the remaining of the dorsal surface sparsely pubescent. Corium without any dark spots or markings; membrane pale with black basal spot. Rostrum very long, reaching at least the base of the fifth and apex of the sixth abdominal segment. Male genitalia with second conjunctiva appendages forked; parameres (Text-fig. 3e) intermediate between *koenigii* and *decussatus*; vertical processes (Text-fig. 4e) broad, rather pointed and slightly separated apically. Spermathecal duct (Text-fig. 5g) long, but shorter than that of *D. decussatus*, accessory gland very broad and uncoiled. Length 17.0-24.0 mm., breadth 5.5-7.5 mm.

Distribution.—Distant (1904) recorded this species from Ceylon and New Guinea. Freeman (1947) mentions the following localities: Ceylon, China, Malay States, Borneo (Sarawak), Saalayar Is., Amboina, New Guinea (Type-locality), Solomon Is. and Leti Is.

Remarks.—The species is characterised by the pubescence on the dorsal surface and may be further recognized by the absence of any markings on the corium, and by the pale membrane with a black basal spot. This species comes close to *D. decussatus* in respect of the second conjunctiva appendages of the aedeagus being forked, but can be easily distinguished by the presence of pubescence on the dorsal surface and by very long rostrum which reaches at least the base of the fifth abdominal segment.

8. *Dysdercus decussatus* Boisduval

1835. *Dysdercus decussatus* Boisduval, *Voyage de l' Astrolabe etc. Paris*, p. 640.
 1855. *Lygaeus fabricii* Montrouzier, *Ann. Soc. Agric. Lyon*, (2) 7, p. 106.
 1855. *Lygaeus cruciatus* Montrouzier, *ibid.*, (2) 7, p. 106.
 1870. *Dysdercus decussatus* Stal, *K. svenska Vetensk Akad. Handl.*, 9, p. 124.
 1870. *Dysdercus crucifer* Stal, *ibid.*, 9, 118.
 1873. *Dindymus simplex* Walker, *Catalogue of the specimens of Heteropterous Hemiptera in the collection of British Museum, London*, 6, p. 6.
 1888. *Dysdercus papuensis* Distant, *Trans. ent. Soc. Lond.*, p. 484.
 1901. *Dysdercus decorus* Breddin, *Abh. naturf. Ges. Halle*, 24, pp. 19, 82.
 1927. *Dysdercus simon* Taeuber, *Konowia*, 6, pp. 190, 195.
 1931. *Dysdercus jacobsoni* Blote, *Zool. Meded.*, 14, p. 121.
 1932. *Dysdercus sumatranus* Schmidt, *Wien. ent. Ztg.*, 49, p. 263.
 1932. *Dysdercus sauteri* Schmidt, *ibid.*, 49, pp. 263-264.
 1947. *Dysdercus decussatus* Freeman, *Trans. R. ent. Soc. Lond.*, 98, pp. 417-419.

Diagnostic characters.—Prothorax with lateral margins strongly sinuate (Text-fig. 1 b), anterior margin less than half as wide as posterior margin. Corium without any transverse markings, variable in colour, in *decussatus* proper it is black, while var. *simplex* Walker is characterised by red colour with a clear white cross. Examples with intermediate colouration are also stated to be present. The species is also characterised by the anterior femora being provided with spines along the ventral surface in addition to the subapical group of spines which are of common occurrence in other species also. Male genitalia with the second conjunctiva appendages forked; the parameres (Text-fig.

3g) apically double crested but without transverse fold. Spermathecal duct very long (longest among the Indian species), accessory gland broad and uncoiled. *Length* 11.0-15.5 mm., *breadth* 3.0-5.5 mm.

Material examined.—2 examples from the following locality :—

INDIA : NICOBAR ISLANDS, 2 ♂♂ (no further data).

Distribution.—Distant (1904) recorded this species from Nicobar Islands under the name *Dysdercus simplex* Walker which was synonymised with *decussatus* by Freeman (1947), who mentions it from the following localities : Ceylon ; Sikkim ; Nicobar and Andaman Is., Malay Peninsula, Sumatra, Borneo, China, Formosa, Celebes, Moluccas, New Guinea, Bismarck Archipelago, Solomon Is. (type-locality : Carteret Is., Solomon Is.), New Hebrides, Queensland, Philippine Is.

Remarks.—This is one of the most variable species in regard to colour pattern of the dorsal surface. In the past, many names have been based on differences in the colour pattern. Freeman (1947) has stated that all these names based on coloration are linked by intermediates and he was thus able to state the synonymy mentioned above. The two specimens mentioned here belong to the variety *simplex* Walker. This is also a predominantly Austro-Malayan species like *mesio stigma*.

IV—GEOGRAPHICAL DISTRIBUTION

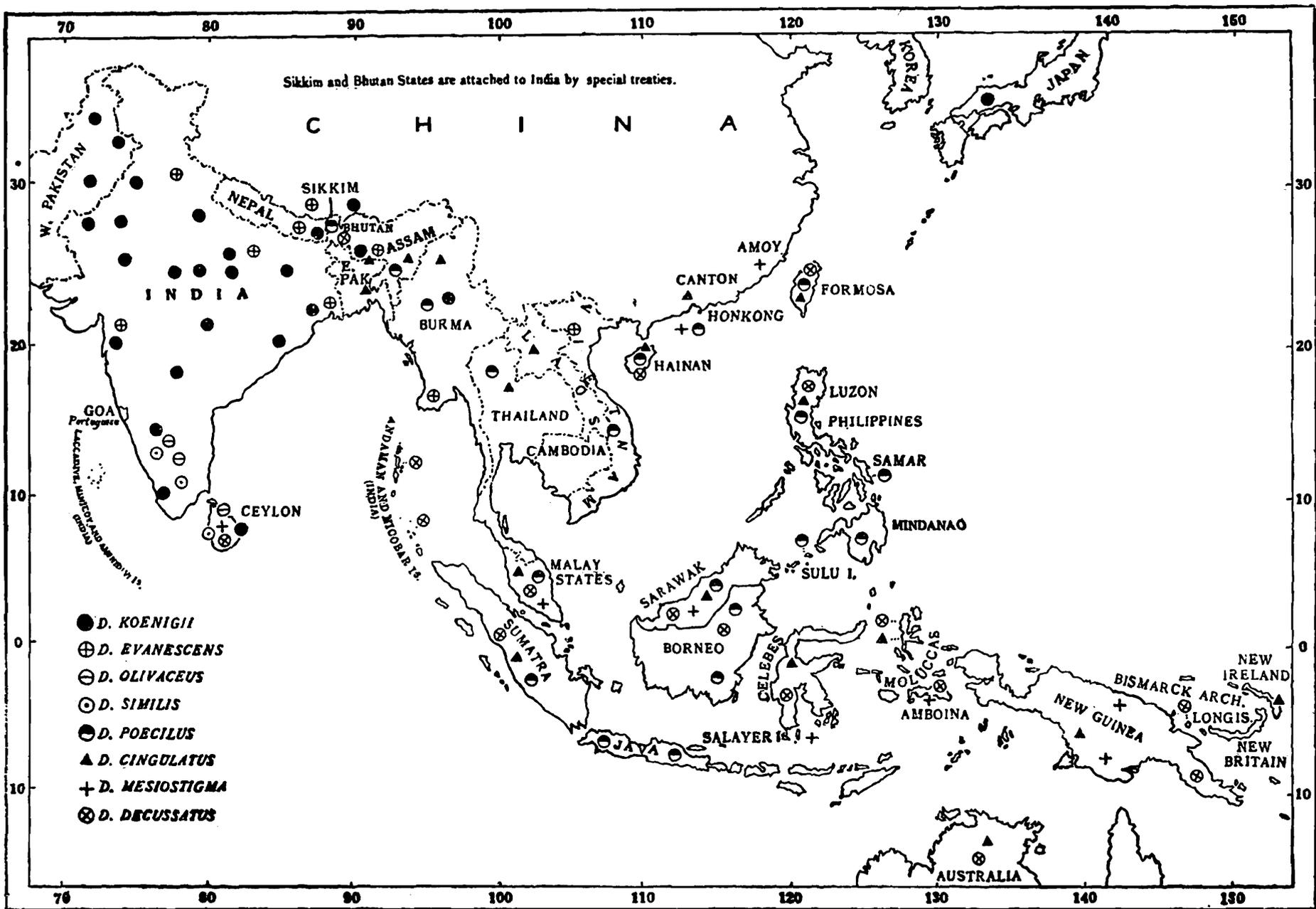
The genus *Dysdercus* Boisduval has world wide distribution. Recent revision of the old world species of the genus shows that the species fall into two rather distinct groups occurring in the Aethiopian and the Oriental-Australian regions.* While in the latter there are a number of widely distributed species, certain other species are endemic in a few zoogeographical subregions. Out of the eight species of the genus (see map) that have been dealt with in this paper, three species viz., *D. koenigii*, *D. olivaceus* and *D. similis* are confined to the limits of India, Burma and Ceylon. Of these, *D. olivaceus* and *D. similis* occur in the Ceylonese subregion, while *D. koenigii* is widely distributed in the Indian subregion, though at the same time it extends to the Ceylonese subregion and to Assam and Burma in the Indo-Chinese subregion.

D. evanescens is distributed in the Indian and Indo-Chinese subregions, having been recorded from Simla Hills, North and North-East India, Kumaon, Bombay, Burma (Rangoon) and Indo-China (Tongking).

Out of the remaining four species, *D. cingulatus*, *D. mesio stigma* and *D. decussatus* are predominantly Indo-Malayan and Austro-Malayan in distribution. *D. cingulatus* is the most widely distributed species, extending to Assam and Chittagong in the west ; to Canton, Formosa and Japan in the north and to Australian and New Zealand subregions in the south-east. It is an important pest of cotton in these regions and does not extend to the Indian and Ceylonese subregions of the Oriental region. *D. decussatus* is nearly as widely distributed as *D. cingulatus*. The western limits of its distribution are Assam in India,

*The zoogeographical divisions followed here are those given in Bartholomew, Eagle Clarke, Grinshaw's Atlas of Zoogeography, *Physical Atlas*, Vol. 5, 1911.

Map, showing the Geographical distribution of the Indian species of *Dysdercus*.



Ceylon and the Andaman and Nicobar Islands. In the North it is reported from Formosa and in the south-east it occurs in the Australian and New Zealand subregions of the Australian region. This is the only species *Dysdercus* so far reported from the Andaman and Nicobar Island.

D. mesiostigma has its northern known limit up to Amoy and Hongkong, and though it is not reported from Assam, Burma, Siam and Indo-China, it is recorded from Ceylon, the south-eastern limits of its distribution are almost the same as those of *cingulatus* and *decussatus* except that it is absent from Australia.

D. poecilus is predominantly Indo-Malayan in distribution. It does not occur in the Indian or the Ceylonese subregions and its western limit is up to Assam and Sikkim which lie in the Indo-Chinese subregion. Its northern limit is up to Honkong and Formosa and in the south it is not distributed beyond Java, Borneo and the Philippine Islands.

V—SUMMARY

The paper deals with all the eight Indian species of the genus *Dysdercus*, namely, *D. koenigii*, (Fabr.), *D. evanescens* Dist. *D. olivaceus* (Fabr.), *D. similis* Freeman, *D. poecilus* (H. & S.), *D. cingulatus* (Fabr.), *D. mesiostigma* Dist and *D. decussatus* Boisd. A key for the identification of the species is given. Besides enumerating the large collections examined from various museums and Institutions in India, diagnostic characters and notes on the distribution of each species are also added. *D. koenigii* is the most common Indian species while *D. cingulatus* is distributed in India from Assam eastwards to the Pacific Is., China and Australia. *D. koenigii*, as recognised in the paper, is recorded for the first time from Assam and Nepal. *D. evanescens*, also recorded for the first time from Nepal, was collected at an altitude of 15,500 ft.

VI—REFERENCES

- ATKINSON, E. T. 1888. Notes on Rhynchota.—*Indian Mus. Notes*, Calcutta, 1, p. 127.
- AYYAR, T. V. R. 1936. *Handbook of Economic Entomology for South India*, Madras, p. 248.
- BANERJEE, S. N. and BASU, A. C. 1955. Effect of Tetrax-1, a systemic insecticide on Red Cotton Bug, *Dysdercus cingulatus* Fabr. in West Bengal.—*Sci. & Cult.*, Calcutta, 20, pp. 599-600.
- BEESON, C. F. C. 1941. *The Ecology and Control of Forest Insects*, Dehra Dun, p. 782.
- COTES, E. C. 1888. Entomology notes, X. Miscellaneous Pests.—*Indian Mus. Notes*, Calcutta, 1, p. 111.
- COTES, E. C. 1891. Miscellaneous notes from the Entomological Section of the Indian Museum.—*Indian Mus. Notes*, Calcutta, 2, p. 33.

- COTES, E. C. 1892. A conspectus of the Insects which affect crops in India.—*Indian Mus. Notes*, Calcutta, **2**, p. 166.
- COTES, E. C. 1896. Miscellaneous notes from the Entomological Section.—*Indian Mus. Notes*, Calcutta, **3**, pt. 5, p. 57.
- CUMMAN, R. 1931. Etudes de la Division de Phytopathologie 1930.—*Bull. econ. Indochine*, **34**, pp. 771B-779B.
- FLETCHER, T. B. 1930. *Some South Indian Insects*, Madras, p. 484.
- FREEMAN, P. 1947. A revision of the genus *Dysdercus* Boisduval (Hemiptera : Pyrrhocoridae) excluding the American species.—*Trans. R. ent. Soc. Lond.*, London, **98**, pp. 417-419.
- LEFROY, H. M. 1909. *Indian Insect Life*, Calcutta, pp. 690-691, pl. 77.
- MEHTA, D. R. 1930. Observations on the influence of temperature and humidity on the bionomics of *Dysdercus cingulatus* Fabr.—*Bull. ent. Res.*, London, **2**, pp. 547-562.
- MISRA, C. S. 1920. Some pests of cotton in North Bihar.—*Proc. ent. Mtgs Pusa*, Calcutta, 1919, p. 548.
- MISRA, C. S. 1923. *Oxycarenus laetus* ; the dusky cotton bug.—*Proc. ent. Mtgs Pusa*, Calcutta, pp. 86, 91.
- OTANESS, F. Q. and BUTAC, F. L. 1939. Cotton pest in the Philippines.—*Philipp. J Agric.*, Manila, **10**, pp. 341-371.
- PRUTHI, H. S. 1922. Morphology and Biology of the Red Cotton Bug, *Dysdercus cingulatus* (Fabr.). *J. Asiat. Soc. Beng.*, Calcutta, **17** [1921], Appendix pp. 148-149.
- SINGH, HEM. 1924. Morphology and Biology of the Red Cotton Bug, *Dysdercus cingulatus* (Fabr.).—*J. Asiat. Soc. Beng.*, Calcutta, **19** [1923], pp. 15-42.
- STEBBING, E.P. 1903. Notes on insect pest from the entomological section, Indian Museum.—*Indian Mus. Notes*, Calcutta, **6**, p. 83.