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XVI DESCRIPTIONS OF SOME ORIENTAL DIPLOPODA POLYDESMOIDEA OF THE SUBFAMILY PYRGODESMINAE

By F. SILVESTRI.

The subfamily Pyrgodesminae of the Diplopoda Polydesmoidea comprise small species which are peculiar on account of the processes, tubercles or granules on the dorsum: because the head is concealed, or almost concealed, dorsally by the collum and the cauda by the preceding segment; because the dorsal surface of the trunk is provided with setae or papillae that often become so encrusted with dirt as to mask the form of the body and to make the apparent colour the same as that of the ground.

Some species are myrmecophilous or termitophilous.

The Oriental Region is certainly rich in genera and species of this group, but until to-day we have short descriptions of only two genera: *Pyrgodesmus* Poc. and *Lophodesmus* Poc. I should like, by kind permission of Dr. N. Annandale, to call the attention of collectors of Oriental Myriopods to this group and I give here descriptions and figures of *Pyrgodesmus* and five new genera.

Gen. **Pyrgodesmus** Poc.

(Figs. I-III).

Pocock, *J. Bombay Nat. Hist. Soc.* VII, 1892, p. 155, pl. ii, fig. 1-1b; Silvestri, *Ann. Mus. Genova* (2) XVI (XXXVI), 1896, p. 192.

Corpus capite, collo, segmento anali et segmentis aliis 19 compositum, lateribus subparallelis, postica aliquantum attenuatum nec in globum nec in spiram, sed tantum arcuatim aliquantum contractile.

Caput omnino obtectum antice spatio brevi, lateraliter spatio parum longiore a collo separatum, fronte ad verticem transverse parum elevata, media usque ad torulorum libellam etiam elevata, lateraliter praesertim a torulis ad marginem valde depressa, clypeo ante incisuram posticam lateralem incrassato elevato, antrorsum aliquantum angustato, margine antico medio tridentato, superficie setis brevioribus numerosis et seriebus duabus anticis setarum parum brevium aucta.

Antennae articulo quinto quam ceteri longiore et crassiore setis et sensillis vide fig. III, 2.

Mandibulae dente apicali, dente minimo proximali supero aucto, lamina 5-dentata et laminis pectinatis 6 bene evolutis instructae.

Hypostoma vide fig. III, 3.

Collum parte praemarginali brevi subhorizontali, margina antico ipso late rotundato et sat profunde 10-lobato, superficie supera convexa processibus duobus submedianis sat longis et robustis armata.

Trunci segmenta 1-18 dorso convexo processibus duobus submedianis sursum et parum extrorsum directis in apice divisis instructa; processus segmenti 17^{i} quam praecedentes inter sese magis approximati et segmenti 18^{i} quam 17^{i} magis etiam approximati, basi connati. Carinae laterales sat magnae subhorizontales, deorsum parum vergentes, parum supra sternorum libellam orientes, margine antico ad basim lobato, margine laterali profunde trilo-

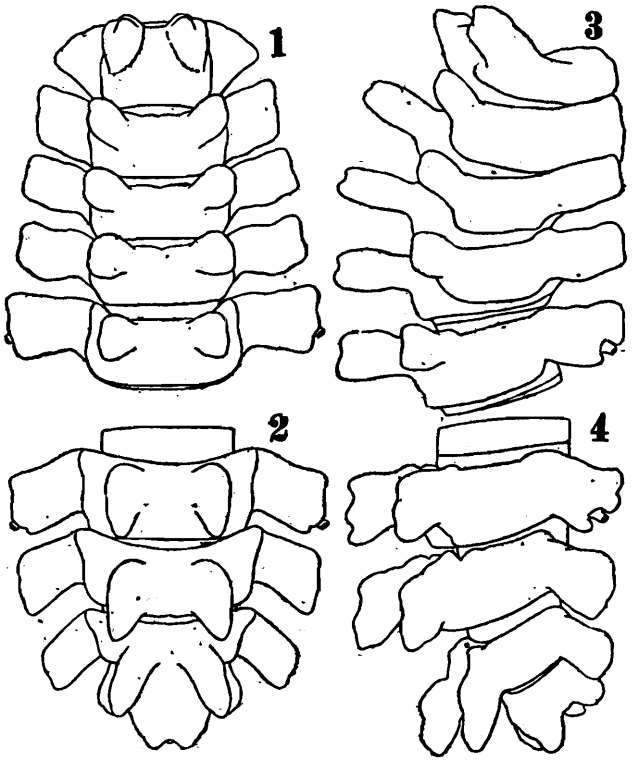


FIG. I.—*Pyrgodesmus obscurus*, corpore humo induto: 1. corporis pars antica et 2. pars postica pronae; 3. corporis pars antica et 4. pars postica lateraliter inspectae.

bato, lobo secundo in segmentis secundo et segmentibus haud porigeris parum sinuato, lobo tertio laterali postico et in segmentis 2-3 omnino postico.

Segmentum 19^{um} breve a segmento 18° obtectum, postice subtriangulare, lobatum apice mediano infero breviore setis consuetis 4 instructo.

Segmentorum superficies dorsualis areis sat numerosis, subrotundatis papillis brevibus nonnullis instructis, transverse subseriatis, praesertim postice signata, marginibus postico et antico papillis brevibus numerosis, processibus dorsualibus et carinarum marginibus papillis numerosis minus brevibus auctis.

Pori repugnatorii in segmentis 4,6,8,9,11,12,14 to 18 (=5,7,9, 10,12,13,15-19 Auctorum) siti et in segmentis 4,6,8,9,11,12,14 et

15 a tuberculo brevi subcylindraceo, in lobo laterali secundo carinarum sito, gesti, in segmentis 16-18 super carinarum superficiem sublateralem subposticam sese aperientes.

Pedes breves, sat robusti, articulo primo breviore seta infera sat longa, robusta (sed facile caduca), articulo secundo quam tertius aliquantum breviore et seta infera praeapicali robusta longa instructo, articulo quarto breviore, quinto quam quartus parum longiore et parum angustiore, trichobothrio apicali supero sat longo aucto, articulo sexto attenuato infra seta sat longa ante medium instructo, ungue terminali robusto.

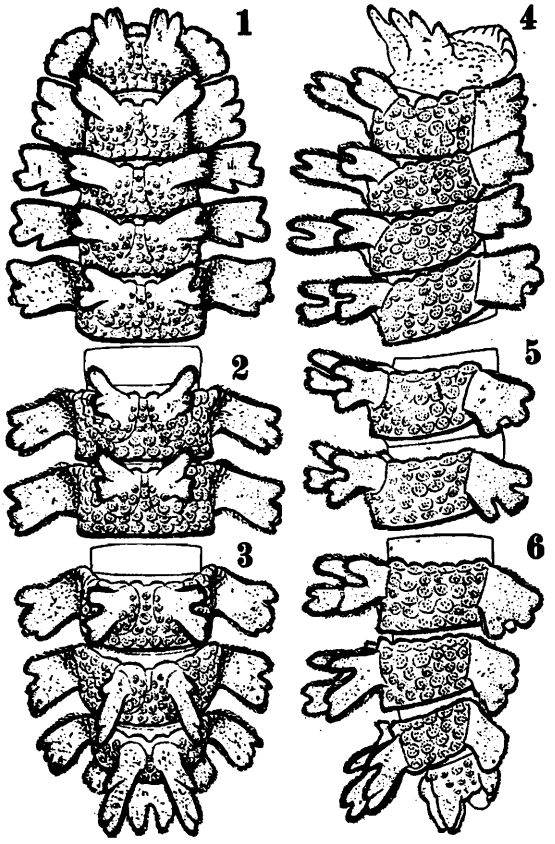


FIG. II.—*Pyrgodesmus obscurus*, corpore humo denudato: 1. corporis pars antica; 2. segmenta octavum et nonum et 3. corporis pars postica prona; 4. corporis pars antica; 5. segmenta nonum et decimum; 6. corporis pars postica lateraliter inspecta.

Organum copulativum biarticulatum, articulo primo magno, lato et brevi, interne aliquantum excavatum unco consueto sat longo, articulo secundo hasta una simplici crassiuscula aliquantum arcuata constituto.

Typus: *Pyrgodesmus obscurus* Poc.

Observatio.—Genus hoc ad genera *Urodesmus* Por. et *Stilodesmus* O. F. Cook proximum est, sed ab ambobus carinis trilobatis, nec non maris organi copulativi articulo secundo hasta simplici constituto bene distinctum est.

Pyrgodesmus obscurus Poc.

Pocock, *Op. cit.* VII, p. 155.

Corpus humo indutum nigro-castaneum, humo denudatum nigro-castaneum, clypeo, maxima pro parte, antennis, tuberculis porigeris, praezonis, pedibus, valvulis analibus et processu mediano caudali stramineis.

Antennae articulo quinto c. 2/5 longiore quam latiore (55 : 32).

Collum antice late rotundatum sat profunde lobatum, caput antice mm. 0,195 superans, processibus dorsualibus submedianis,

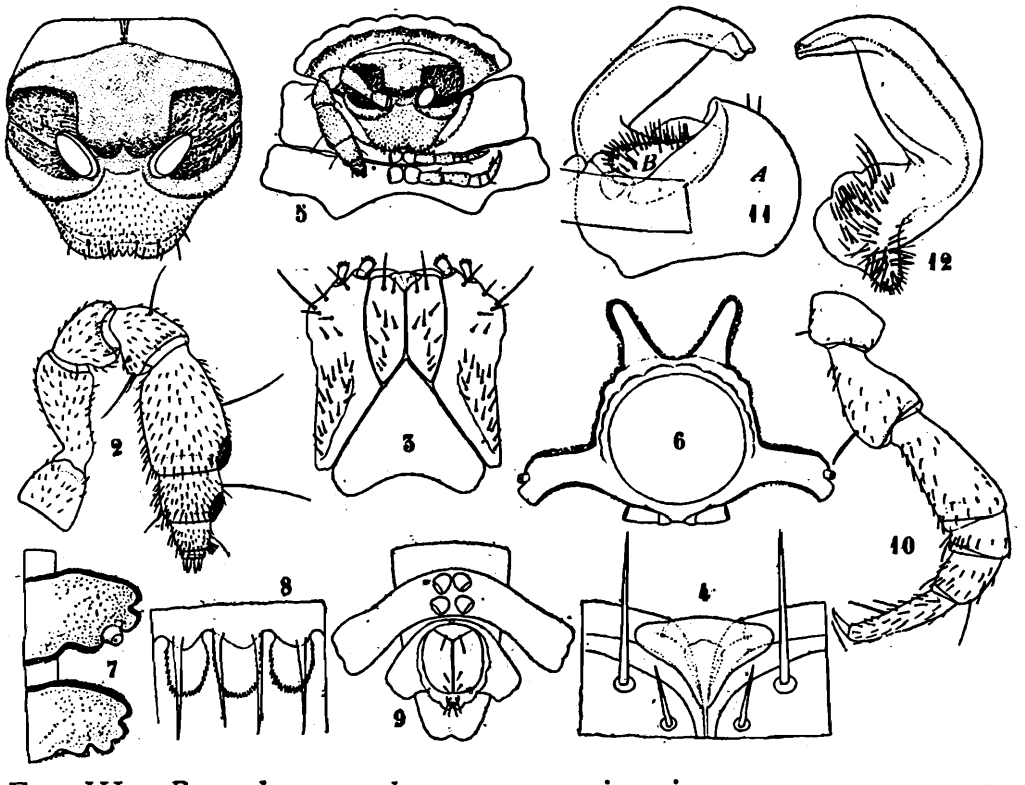


FIG. III.—*Pyrgodesmus obscurus*, 1. epicranium pronum; 2. antenna; 3. hypostoma ab infra maxillari; 4. ejusdem pars mediana antica magis ampliata; 5. corporis pars antica supina; 6. segmentum nonum postice inspectum; 7. segmentorum 12^i et 13^i latera; 8. segmenti noni marginis dorsualis postici particula; 9. corporis pars postica supina; 10. segmenti noni pes; 11. organi copulativi pars altera alteraliter inspecta; *A*. articulus primus, *B*. articulus secundus; 12. ejusdem articulus secundus.

a colli margina postice mensis, long. 0,65, in apice tripartitis et antice tuberculatis.

Trunci segmenta bene convexa metazonarum superficie areis numerosis subrotundis vix elevatis papillis brevibus nonnullis instructa, processibus dorsualibus submedianis longis (in segmento nono long. 0,40) in segmentis 1-3 in apice bifidis, in segmentis ceteris in apice profundiore bifidis et parte postica parum profunde etiam bifida, papillis piliformibus brevibus instructis, processibus dorsualibus segmenti 17^i quam ceteri parum longioribus, retrorsum aliquantum directis et basi approximatis, processibus segmenti 18^i quam praecedentes brevioribus basi connatis retrorsum directis vix

trituberculatis, basi segmentum 19^{um} medium obtegentibus et mm. 0,20 superantibus. Carinae laterales sat magnae parum supra sternorum libellam orientibus extrorsum et parum deorsum vergentibus, segmenti primi lateraliter trilobatae, lobo antico majore, segmentorum ceterorum usque ad 17^{um} profunde trilobatae lobo porigero mediano aliquantum crassiore; carinae segmenti 18^{i} perparvae et subintegrae. Metazonarum margo dorsualis adiectus in laminis brevibus subovalibus serratis divisus et serie setarum robustarum, quam laminae longiorum ante laminarum basim auctus.

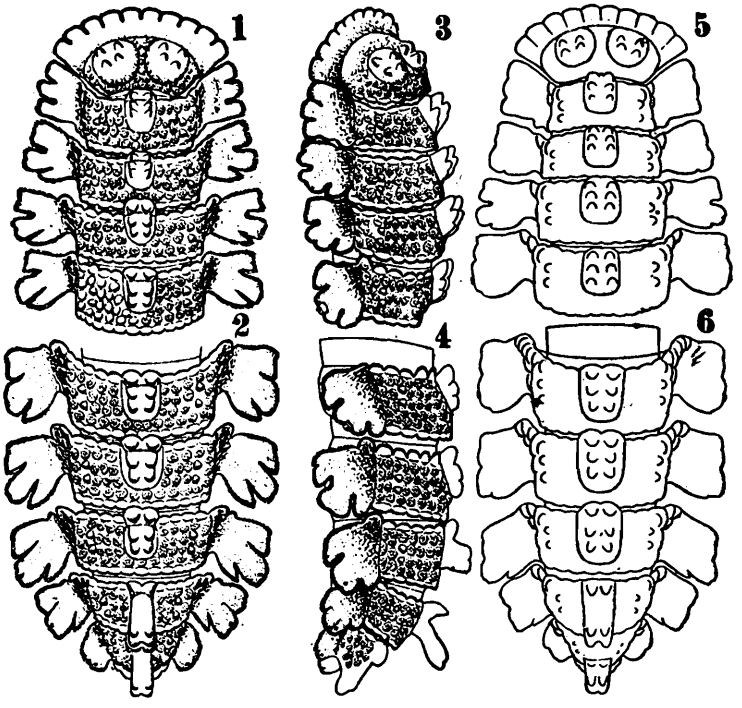


FIG. IV.—*Propyrgodesmus lobulatus*, 1. corporis humo denudati pars antica et 2. pars postica pronae; 3-4. eaedem lateraliter inspectae; 5. corporis humo induti pars antica et 6. pars postica pronae.

Pori repugnatorii usque ad segmentum 15^{um} a tuberculo brevi subcylindraceo gesti, in segmentis 16-18 super carinarum partis lateralis subposticae superficiem sese aperientes.

Pedes vide fig. III, 10.

Organum copulativum articulo secundo simplici, crassiusculo arcuato ut fig. III, 11 et 12 demonstrat.

Long. corp. mm. 11,5, lat. segmenti noni cum carinis 2,4, sine carinis 1; long. antennarum 1,20, pedum segmenti noni 1,22.

Habitat.—Ceylan: exemplum typicum a Pocock descriptum ex *Punduloya*, exempla duo masculina a me inspecta ex Peradenyia mihi benignissime cl. E. Green dedit.

Gen. **Propyrgodesmus** nov.

(Figs. IV, V).

♀ Corpus, capite, collo, segmento anali et segmentis aliis 19 compositum, antice et postice parum angustatum, nec in globum nec in spiram sed tantum arcuatim parum contractile.

Caput omnino obtectum, antice spatio sat brevi, lateraliter spatio parum longiore a collo superatum, fronte ad verticem transverse parum elevata, per partem medianam usque ad torulorum libellam etiam elevata tuberculis parvis, lateraliter praesertim a torulis ad marginem lateralem depressa, media ad torulorum libellam tuberculis nonnullis parvis, clypeo ante inci-

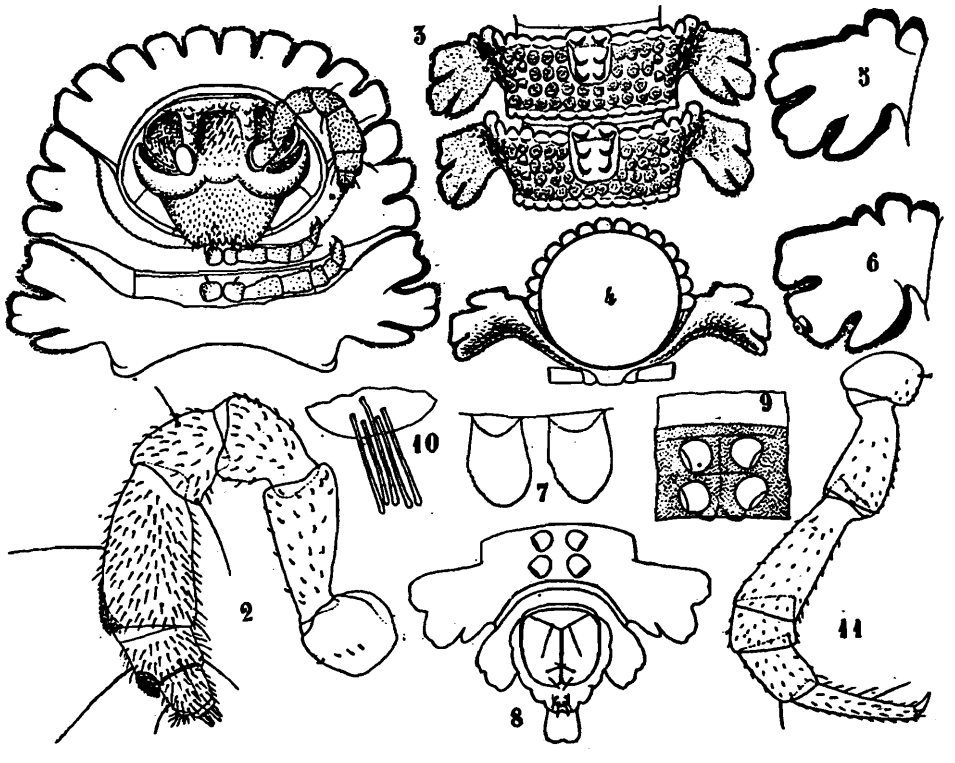


FIG. V.—*Propyrgodesmus lobulatus*, 1. corporis pars antica supina; 2. antenna; 3. segmenta decimum et undecimum prona; 4. segmentum nonum postice inspectum; 5. carina lateralis segmenti decimi; 6. carina lateralis segmenti undecimi; 7. segmenti noni marginis dorsualis postici particula; 8. corporis pars postica supina; 9. segmenti noni pars mediana ventralis; 10. segmenti noni lobi dorsualis postici particula; 11. segmenti noni pes.

suram posticam lateralem valde incrassato elevato, lateribus anticis convergentibus, margine antico profunde tridentato, superficie supera setarum parum brevium seriebus duabus anticis et setis aliis brevioribus posticis instructa.

Antennae articulo quinto quam ceteri longiore et crassiore, setis et sensillis vide fig. V, 2.

Collum parte praemarginali sat brevi subhorizontali, margine antico ipso late rotundato, sat profunde 10-lobato, cetera superficie supera convexa areis duabus submedianis parum elevatis, tuberculis quatuor parvis auctis, instructa

Trunci segmenta dorso sat convexo, 1-15 area antica mediana parum elevata, supra tuberculis quatuor longitudinaliter biseriatis et in segmentis 1-2 tuberculis dictis inter sese confusis, superficie sublaterali tuberculis duobus parvis, superficie cetera areis parvis subrotundis papillis brevioribus instructis et per metazonarum marginem anticum et posticum lobulata, lobulis, medianis ante aream tubercularem setis, quam ceteri majoribus et antrorsum magis quam ceteri aliquantum productis. Area tubercularis in segmento 16^0 aliquantum longiore, in segmento 17^0 quam segmenti 16^i longiore et retrorsum aliquantum producta, in segmento 18^0

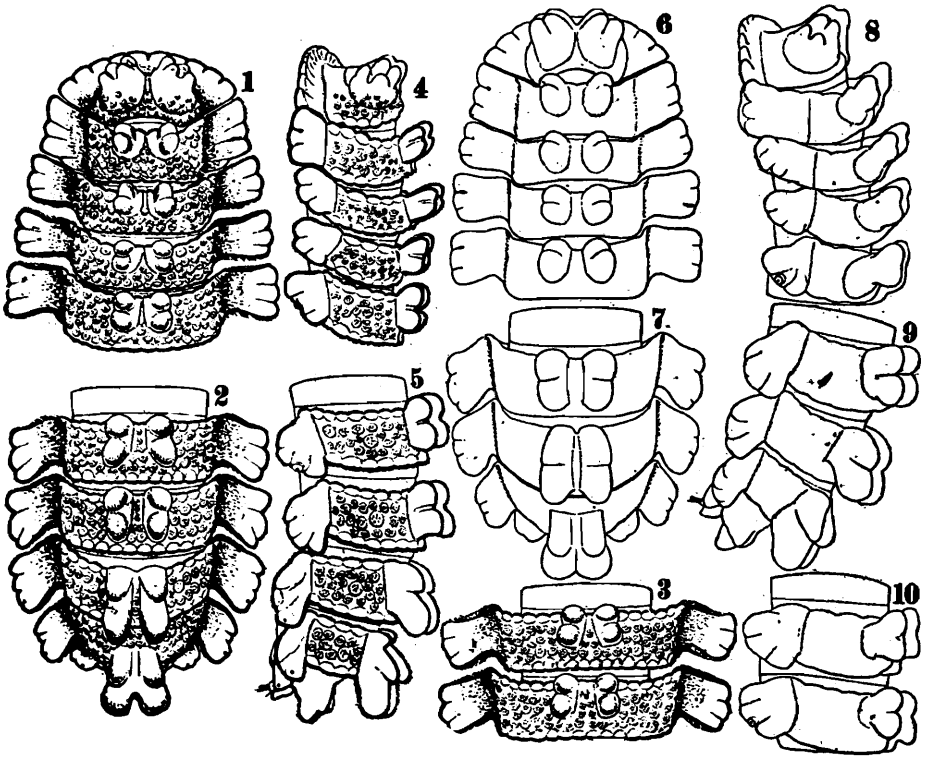


FIG. VI.—*Catapyrgodesmus ceylonicus*, 1. corporis humo denudati pars antica et 2. pars postica pronae; 3. segmenta octavum et nonum prona; 4. corporis humo denudati pars antica et 5. pars postica lateraliter inspectae; 6. corporis humo induti pars antica et 7. pars postica pronae; 8-9. eaedem lateraliter inspectae; 10. segmenta decimum et undecimum humo induta lateraliter inspecta.

retrorsum producta et segmenti 19^i partem medianam obtegente et aliquantum superante. Segmentum 19^{um} posticē lobulatum, cauda ipsa mediana breviore setis consuetis.

Carinae laterales magnae extrorsum et aliquantum deorsum directae basi angustata, margine laterali profundiore tripartito, lobis primo et secundo majoribus et externe paullum sinuatis; carinae segmenti 17^i quam ceterae parum minores, segmenti 18^i perparvae, subintegrae.

Metazonarum superficies dorsualis praeter lobos marginales et tuberculos etiam areis parvis subrotundatis plus minusve distinctis et papillis brevibus nonnullis instructis signata.

Tuberculorum, loborum marginalium et carinarum margines papillis piliformibus vix clavatis instructi.

Pori repugnatorii in segmentis 4, 8, 11, 14, 16-18 (=5, 9, 12; 15, 17-19 Auctorum) siti et in segmentis 4,8, 11, et 14 a tuberculo brevissimo subcylindraceo in carinarum parte laterali mediana lobi secundi sito gesti et in segmentis 16-18 super superficiem sublateralem carinarum lobi secundi sese aperientes.

Sterna inter pedum basim angustiora.

Pedes breves, sat robusti, articulo primo breviore seta infera sat brevi, robusta (sed facile caduca), articulo secundo quam tertius aliquantum breviore, articulo quarto breviore, articulo quinto quam quartus parum longiore et parum angustiore, trichobotrio

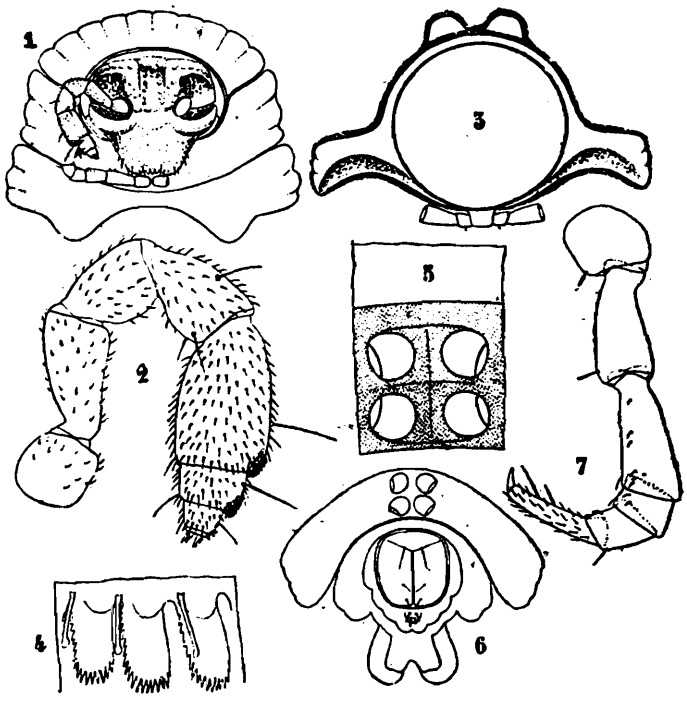


FIG. VII.—*Catapyrgodesmus ceylonicus*, 1. corporis pars antica supina; 2. antenna; 3. segmentum nonum postice inspectum; 4. segmenti noni marginis dorsualis postici particula; 5. segmenti noni pars ventralis mediana; 6. corporis pars postica supina; 7. segmenti noni pes.

apicali supero sat brevi instructo, articulo sexto attenuato infra seta sat longa ante medium instructo, ungue terminali robusto.

♂ Ignotus.

Typus: *Propyrgodesmus lobulatus* sp. n.

Observatio.—Genus hoc ad gen. *Pyrgodesmus* Poc. proximum est, sed metazonarum armatura et pororum formula praesertim distinctissimum est, a gen. *Catapyrgodesmus* mihi etiam metazonarum marginis antici et postici lobulis et segmento sexto poris repugnatoriis destituto distinctum est.

Propyrgodesmus lobulatus sp. n.

♀ Corpus humo indutum nigro-castaneum, humo denudatum fulvo-castaneum, clypeo, maxima pro parte, antennis, tuberculis

porigeris, praezonis, pedibus, apice caudali et segmento anali stramineis.

Antennae articulo quinto parum minus quam duplo longiore quam latiore (62 : 33).

Metazonarum limbus adiectus in laminis aliquantum longioribus quam latioribus, postice rotundatis et per marginem ipsum rotundatum minute serratis divisus.

Characteres ceteri vide generis descriptionem et figuras.

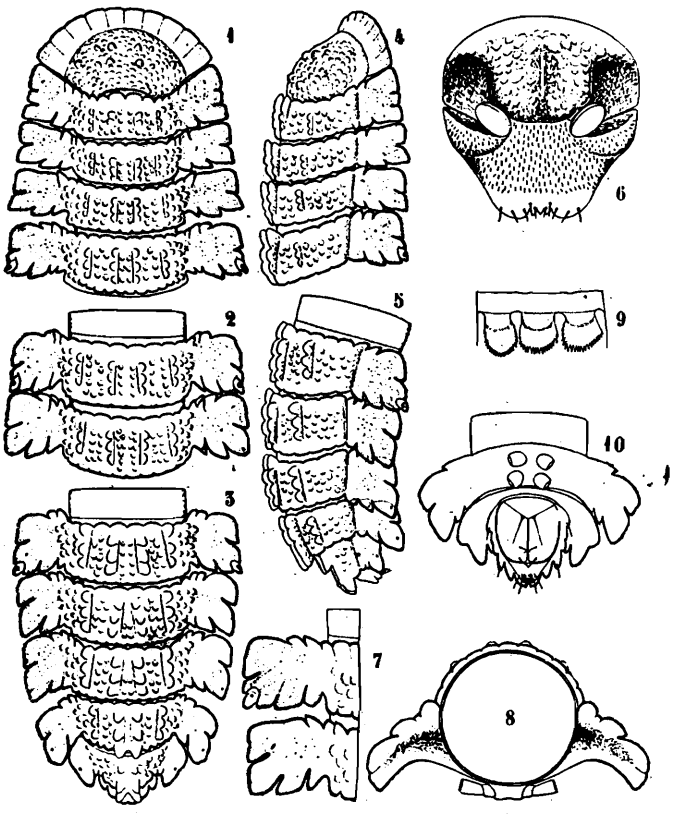


FIG. VIII.—*Lobiferodesmus papuasicus*, 1. corporis pars antica, 2. segmenta octavum et nonum et 3. corporis pars postica prona; 4. corporis pars antica et 5. pars postica lateraliter inspectae; 6. epicranium pronum; 7. segmenti octavi et noni latera; 8. segmentum nonum postice inspectum; 9. segmenti noni marginis dorsualis postici particula; 10. corporis pars postica supina.

Long. corp. mm. 17,5, lat. segmenti noni cum carinis 3, sine carinis 1,3; long. antennarum 1,50, pedum segmenti noni 1,75.

Habitat.—Cochin State; Forest Tramway, mile 10 to 14, alt. 0-300 ft. (F. H. Gravely legit).

Gen. **Catapyrgodesmus** nov.

(Figs. VI, VII).

♀ Corpus capite, collo, segmento anali et segmentis allis 19 compositum, lateribus subparallelis antice vix, postice parum angustatum, nec in globum nec in spiram sed tantum arcuatim aliquantum contractile.

Caput omnino obtectum antice spatio brevi, lateraliter spatio parum longiore a collo superatum, fronte ad verticem lateraliter serie transversali tuberculorum parvorum, media usque ad torulorum libellam tuberculis parvis per partem submedianam aliquantum majoribus instructa, lateraliter a torulis ad marginem lateralem valde depressa, clypeo ante incisuram posticam lateralem incrassato elevato, lateribus antrorsum aliquantum convergentibus, margine antico medio tridentato, superficie supera setis brevibus sat numerosis et seriebus duabus anticis setarum parum brevium instructa.

Antennae articulo quinto quam ceteri longiore et crassiore, setis et sensillis vide fig. VII, 2.

Collum parte praemarginali antica sat brevi subhorizontali

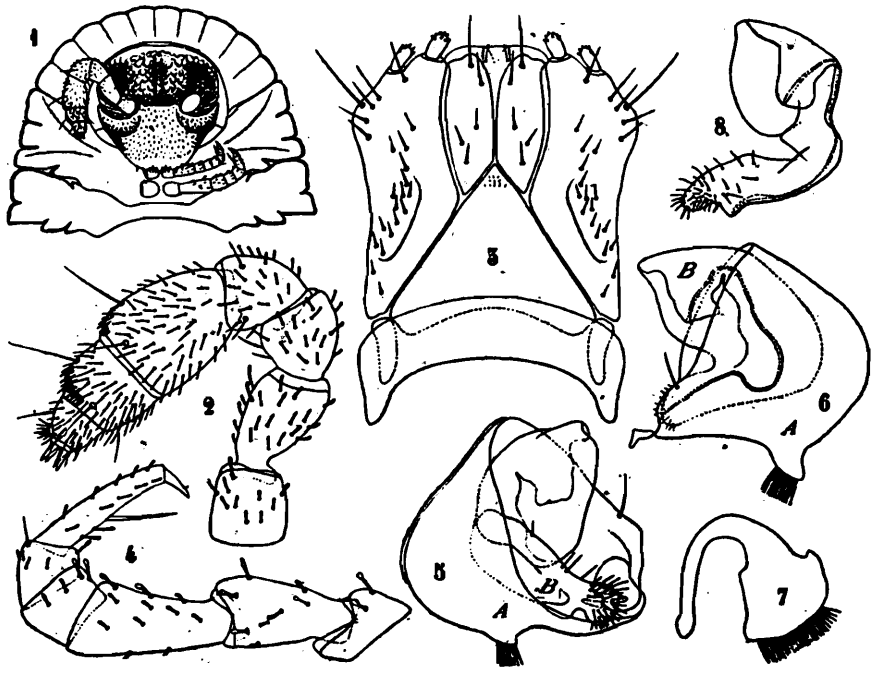


FIG. IX.—*Lobiferodesmus papuasicus*, 1. corporis pars antica supina; 2. antenna; 3. hypostoma; 4. segmenti noni pes; 5. organi copulativi pars altera postice inspecta et 6. antice inspecta; *A.* articulus primus, *B.* articulus secundus; 7. organi copulativi uncus; 8. organi copulativi articulus secundus.

margine ipso late rotundato, paullum profunde 10-lobato, cetera superficie supera convexa, areis duabus submedianis latis, elevatis in apice 4-tuberculatis aucta.

Trunci segmenta dorso bene convexo, 1-15 area mediana antica parum elevata 4-tuberculata, tuberculis longitudinaliter biseriatis crassis, superficie cetera areis parvis subrotundis numerosis, transverse subseriatis praesertim per marginem anticum et posticum. Area tubercularis segmenti 16^{i} quam segmentorum praecedentium tuberculis majoribus et posticis retrorsum vergentibus et segmenti marginem posticum superantibus; area tubercularis segmenti 17^{i} quam eadem 16^{i} aliquantum majore et supra inspecta segmenti 18^{i} et 19^{i} partem medianam obtegens; area tubercularis segmenti 18^{i} segmentum 19^{um} parum superans. Carinae laterales magnae, extrorsum et paullum deorsum vergentes

basi quam latus externum parum angustiore, marginibus antico et postico integris, latere externo parum profunde trilobato; carinae segmenti 17^{i} quam ceterae aliquantum minores, segmenti 18^{i} perparvae, subintegrae.

Metazonarum superficies dorsualis per marginem anticum et posticum, per tuberculorum et carinarum margines papillis piliformibus subclavatis brevibus numerosis instructis et supra areas subrotundas etiam papillis nonnullis brevioribus instructa.

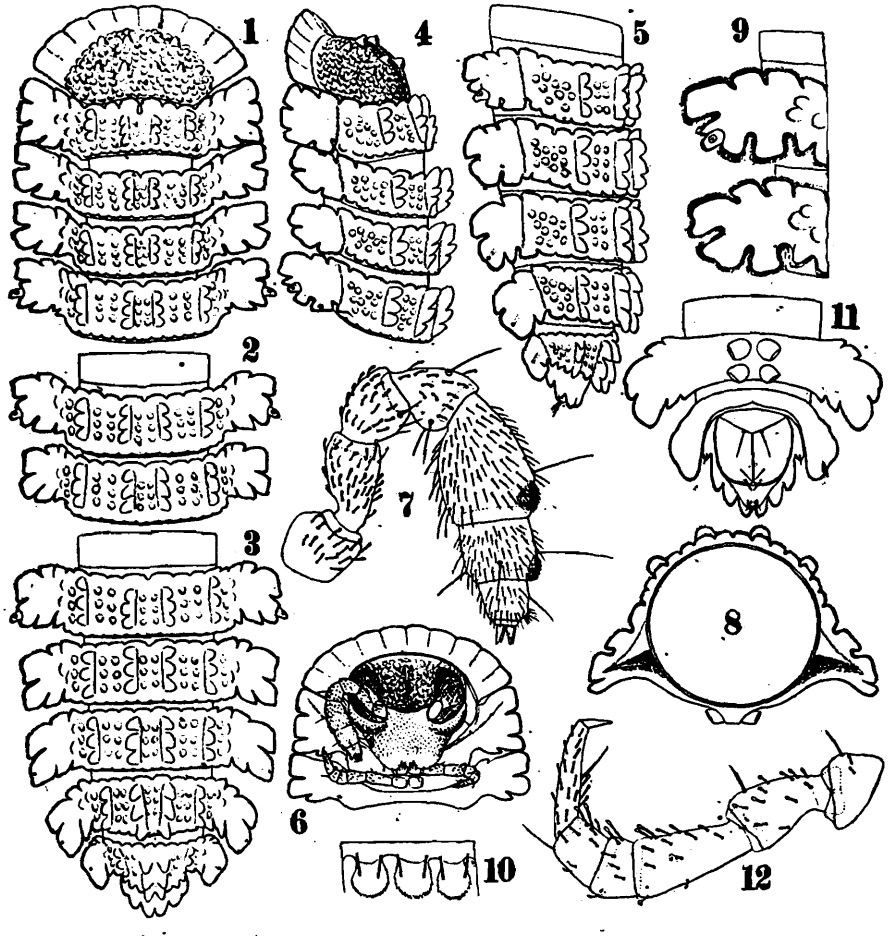


FIG. X.—*Lobiferodesmus superans*, 1. corporis pars antica; 2. segmenta octavum et nonum et 3. corporis pars postica prona; 4. corporis pars antica et 5. pars postica lateraliter inspecta; 6. corporis pars antica supina; 7. antenna; 8. segmentum nonum postice inspectum; 9. segmenti octavi et noni latera; 10. segmenti noni marginis dorsualis postici particula; 11. corporis pars postica supina; 12. segmenti noni pes.

Pori repugnatori in segmentis 4, 6, 8, 11, 14, 16-18 (=5, 7, 9, 12, 15, 17-19 Auctorum) siti et in segmentis 4, 6, 8, 11, 14 a tuberculo brevissimo subcylindraceo in carinarum parte laterali postica lobi secundi sito gesti et in segmentis 16-18 super carinarum superficiem lateralem posticam sese aperientes.

Sterna inter pedum basim angustiora.

Pedes breves, sat robusti, articulo primo breviore seta infera sat brevi robusta (sed facile caduca), articulo secundo quam

tertius parum breviore et seta infera apicali etiam sat brevi, robusta instructo, articulo quarto breviore et parum angustiore, trichobotrio apicali supero brevi instructo, articulo sexto attenuato, infra seta sat longa subdistali instructo, ungue terminali robusto.

♂ Ignotus.

Typus : *Catapyrgodesmus ceylonicus* sp. n.

Observatio.—Genus hoc a gen. *Pyrgodesmus* Poc. area tuberculari parva mediana in plerisque segmentis sistente et pororum formula bene distinctum est.

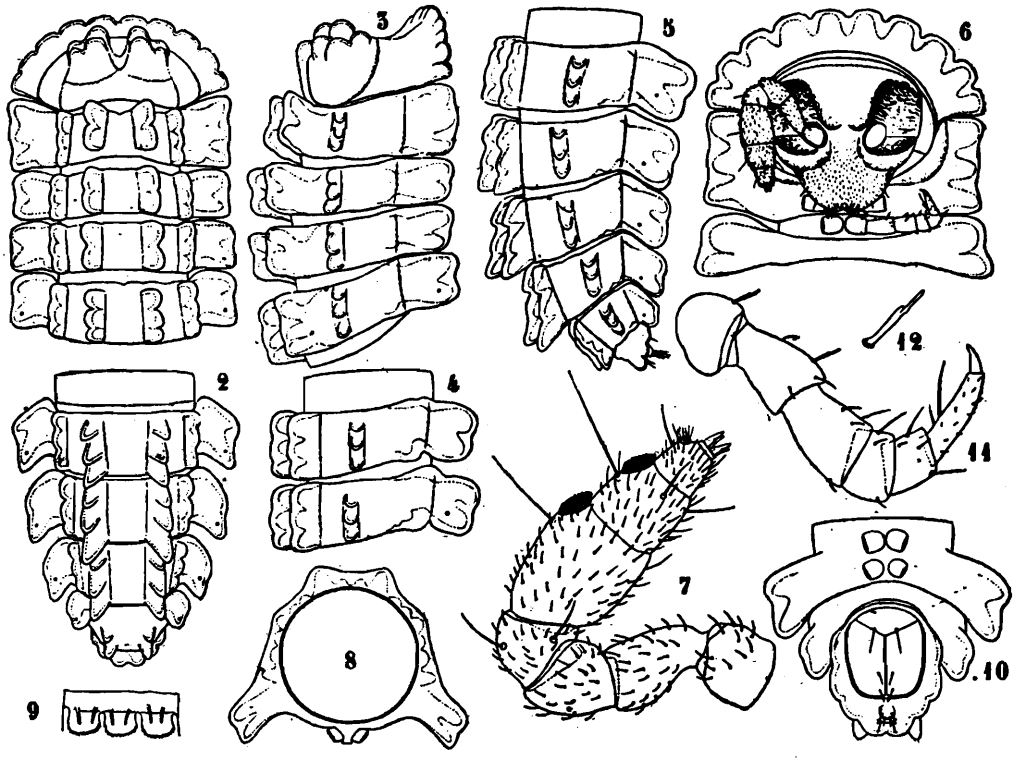


Fig. XI.—*Eustaledesmus parvus*, 1. corporis pars antica et 2. pars postica prona ; 3. corporis pars antica ; 4. segmenta decimum et undecimum et 5, corporis pars postica lateraliter inspecta ; 6. corporis pars antica supina ; 7. antenna ; 8. segmentum nonum postice inspectum ; 9. segmenti noni marginis dorsualis postici particula ; 10. corporis pars postica supina ; 11. segmenti noni pes ; 12. ejusdem pedis articuli primi seta infera.

Catapyrgodesmus ceylonicus sp. n.

Corpus humo indutum nigro-castaneum, humo denudatum fulvo-castaneum, clypeo, maxima pro parte, antennis, tuberculis porigeris, praezonis, pedibus, apice caudali et segmento anali stramineis.

Antennae articulo quinto parum minus quam duplo longiore quam latiore (65 : 37).

Collum antice paullum profunde lobatum, areis tuberculariibus dorsualibus submedianis a colli margine postico mensis long. mm. 0,73.

Trunci segmenti 17^{i} area tuberculariis ab ejusdem segmenti margine antico mensa long. mm. 1,15.

Metazonarum limbus adiectus in laminis longioribus quam latioribus subrectangularibus per marginem posticum et externum serratis divisus et papilla piliformi clavata supra laminam quamquam instructus.

Characteres ceteri vide generis descriptionem et figuras VI-VII.

Long. corp. mm. 16, lat. segmenti noni cum carinis 2,8, sine carinis 1,56; long. antennarum 1,42, pedum segmenti noni 1,70.

Habitat.—Ceylon: Namunakuli. Exemplum typicum cl. E. Green legit et mihi dedit.

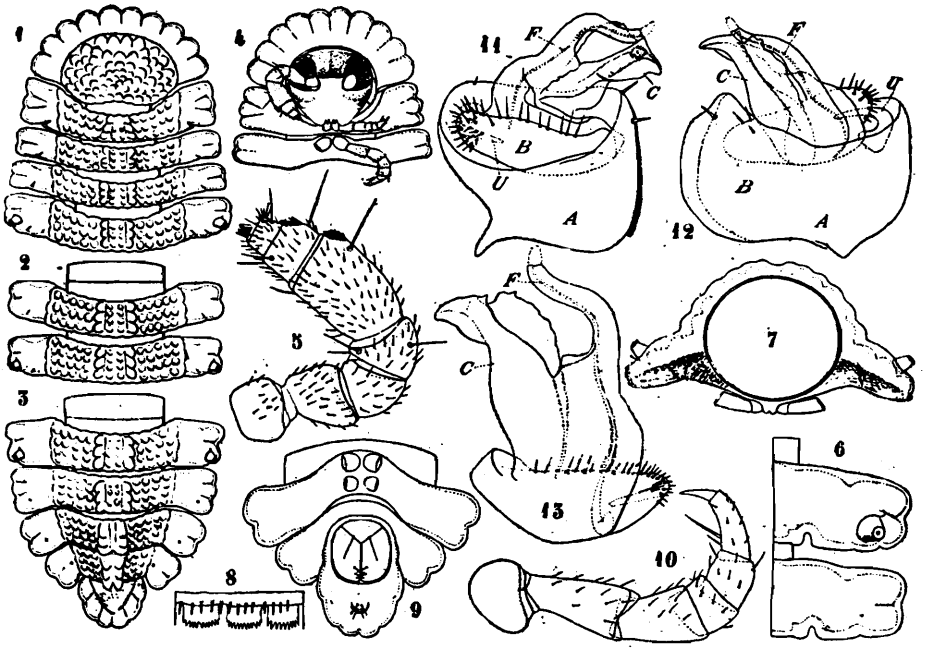


FIG. XII.—*Evurodesmus Biroi*, 1. corporis pars antica; 2. segmenta septimum et octavum et 3. corporis pars postica prona; 4. corporis pars antica supina; 5. antenna; 6. segmentorum nonum et decimum latera; 7. segmentum nonum postice inspectum; 8. segmenti noni marginis dorsualis postici particula; 9. corporis pars postica supina; 10. segmenti noni pes; 11. organi copulativi pars altera postice et 12. antice inspecta. *A.* articulus primus, *B.* articulus secundus, *C.* hasta postica, *F.* pseudoflagellum canaliferum, *U.* uncus; 13. organi copulativi articulus secundus.

Gen. **Lobiferodesmus** nov.

(Fgs. VIII-X).

♀ Corpus capite, collo, segmento anali et segmentis aliis 19 compositum, antice paullum postice parum angustatum, nec in globum nec in spiram, sed tantum arcuatim parum contractile.

Caput omnino obtectum antice spatio brevi, lateraliter spatio parum longiore a collo separatum, fronte ad verticem lateraliter serie transversa granulorum instructa, media usque ad torulorum libellam aliquantum granulosa, lateraliter a torulis ad marginem lateralem valde depressa, clypeo ante incisuram posticam lateralem

incrassato, margine antico medio tridentato, superficie supera serie transversali setarum submarginalium et setis duabus submedianis subanticis sat brevibus acutis, superficie cetera setis numerosis brevissimis clavatis instructa.

Mandibulae dente apicali dente minimo proximali supero aucto, lamina 5-dentata et laminis pectinatis 6 bene evolutis instructae.

Hypostoma vide fig. IX, 3 ; praesertim notandum est (saltem in genotypo) superficie interna submediana longitudinaliter aliquantum introrsum et deorsum producta.

Antennae articulo quinto quam ceteri longiore et crassiore setis et sensillis vide fig. IX, 2.

Collum parte praemarginali antica sat brevi, antrorsum et deorsum vergente margine ipso rotundato, parum profunde 10-lobato, cetera superficie supera granulis subaequalibus parvis obsessa et tuberculis plus minusve parvis 2+2 submedianis et 2+2 sublateralibus in serie longitudinali inter sese aliquantum remotis et dispositis instructa.

Trunci segmenta dorso bene convexo, 1-16 seriebus duabus longitudinalibus tuberculis tribus plus minusve evolutis et seriebus duabus sublateralibus tuberculis tribus quam submediani minoribus, metazonarum marginibus antico et postico paullum profunde lobulatis et superficie cetera areis vel granulis sat magnis, vix convexis instructa. Tuberculi segmenti 17^{i} et 18^{i} quam idem praecedentes aliquantum majores et postici retrorsum aliquantum vergentes.

Carinae laterales sat magnae, parum supra sternorum libellam orientes, extrorsum et parum deorsum directae margine antico lobis parvis basalibus, margine externo profunde bilobato et lobo antico segmenti primi in lobis duobus a sulco sat profundo diviso, segmentorum ceterorum sinu minimo signato, margine postico profunde bilobato ; carinae segmenti 17^{i} quam praecedentes minores, segmenti 18^{i} etiam quam 17^{i} minores, perparvae.

Segmentum 19^{um} supra manifestum, medium a tuberculis posticis segmenti 18^{i} haud obtectum, margine postico subsemiovali 3+3—lobulato, processu caudali infero breviore a marginis lobis submedianis vix superato.

Metazonarum superficies dorsualis per tuberculos et granulos et praesertim per margines anticum et posticum papillis brevissimis clavatis instructa.

Pori repugnatorii in segmentis 4,6,8,11,14, 16-18 (=5, 7,9, 12, 15, 17-19 Auctorum) siti et in segmentis 4, 6, 8, 11 et 14 a tuberculo longiusculo horizontali, apice oblique truncato, in carinarum parte laterali postica lobi secundi siti, aliquantum ante apicem supra gesti et in segmentis 16-18 super carinarum superficiem sublateralem subposticam sese aperientes.

Sterna inter pedum basim angustiora.

Pedes breves, sat robusti, articulo primo breviore seta infera quam ceterae plus mimusve longiore, articulo secundo quam tertius parum breviore, seta apicali infera quam ceterae plus

minusve longiore, articulo quinto quam quartus paullum longiore et angustiore, trichobothrio supero instructo, articulo sexto elongato, seta longa infera submediana aucto, ungue terminali sat robusto.

Segmentum anale forma consueta.

♂ Organum copulativum biarticulatum, articulo primo magno interne excavato articulum secundum magna pro parte obtegente, unco consueto bene evoluto, articulo secundo brevi, simplici, aliquantum arcuato.

Typus: *Lobiferodesmus papuasicus* sp. n.

Observatio.—Genus hoc ad gen. *Catapyrgodesmus* Silv. proximum sed dorso seriebus quatuor (utrimque duabus) tuberculorum majorum, carinis antice, postice et lateraliter lobatis bene distinctum est.

Lobiferodesmus papuasicus sp. n.

Corpus fulvescens, clypeo, antennis, pedibus et segmento anali alutaceis.

Antennae articulo quinto parum minus quam 1/3 longiore quam latiore.

Collum tuberculis submedianis quam granuli superficiei ceterae parum majoribus et sublateralibus vix vel paullum majoribus instructum, margine antico bene rotundato, parum profunde lobato.

Trunci segmenta metazonarum tuberculis serierum longitudinalium in segmentis anticis parvis, a segmento octavo parum majoribus, in segmento 17^0 tuberculis posticis seriei submedianae quam praecedentes majoribus et eiusdem segmenti marginis postici libellam parum superantibus, in segmento 18^0 tuberculis posticis quam idem segmenti 17^i paullum longioribus et supra inspectis segmenti 19^i marginem posticum vix superantibus. Carinae laterales margine laterali profunde bilobato, lobo antico medio vix sinuato lobo postico in segmentis haud porigeris angulo postico subacuto.

Tuberculus porigerus segmentorum 4, 6, 8, 11 et 14 in angulo laterali postico carinarum situs.

Metazonarum limbus adiectus in laminis microscopicis parum longioribus quam latioribus postice serratis divisus.

Pedes setis subclavatis ut fig. IX, 4 demonstrat instructi.

♂ Organum copulativum vide fig. IX, 5-8.

Long. corp. mm. 9, lat. segmenti noni cum carinis 1,90, sine carinis 0,92 ; long. antennarum 0,84, pedum segmenti noni 0,90.

Habitat.—Nova Guinea ; Sattelberg (L. Biro legit).

Lobiferodesmus superans sp. n.

♀ Corpus fulvescens, clypeo, antennis, pedibus et segmento anali alutaceis.

Antennae articulo quinto c. 1/3 longiore quam latiore.

Collum tuberculis submedianis quam granulis superficiei ceterae aliquantum majoribus, tuberculis sublateralibus quam

submediani parum minoribus, margine antico late rotundato parum profunde lobato.

Trunci segmenta metazonarum tuberculis serierum longitudinalibus sat magnis et in segmentis 17^0 et 18^0 quam praecedentes parum majoribus et posticis retrorsum parum vergentibus. Carinae laterales margine laterali profunde bilobato, lobo antico et lobo postico medio parum sinuatis.

Tuberculus porigerus segmentorum 4, 6, 8, 11 et 14 in parte laterali subpostica carinarum lobi postici situs est.

Metazonarum limbus adiectus in laminis microscopicis parum longioribus quam latioribus postice aliquantum rotundatis et serratis divisus.

Pedes setis vide fig. X, 12.

♂ Ignotus.

Long. corp. mm. 10, lat. segmenti noni cum carinis 1,96, sine carinis 1,18, long. antennarum 1,16, pedum segmenti noni 1,10.

Habitat.—Nova Guinea : Sattelberg (L. Biro legit).

Observatio.—Species haec a *L. papuasicus* Silv. tuberculis serierum submedianae et sublateralis parum majoribus, carinarum lobis marginis antici latioribus, marginis lateralis aliquantum diversis (cfr. fig. VIII, 7 et fig. X, 9), tuberculis porigeris posticis bene distincta est.

Gen. **Eustaledesmus** nov.

(Fig. XI).

♀ Corpus capite, collo, segmento anali et segmentis aliis 19 compositum, antice paullum, postice aliquantum angustatum, nec in globum nec in spiram sed tantum arcuatim paullum contractile.

Caput omnino obtectum spatio sat brevi a collo superatum, fronte ad verticem parum elevata lateraliter brevissime, media usque ad torulorum libellam, externe inter torulos et marginem lateralem depressa; clypeo ante incisuram posticam lateralem parum incrassato et elevato, margine antico tridentato, superficie antice setis brevibus transverse biseriatis et cetera setis brevioribus instructa.

Antennae articulo quinto quam ceteri longiore et crassiore, setis et sensillis vide fig. XI, 7.

Collum parte praemarginali sat brevi subhorizontali, margine antico late rotundato, profunde 10-lobato, superficie cetera supra areis duabus latis, 4-tuberculatis, sursum et antrorsum vergentibus instructa.

Trunci segmenta dorso multo convexo, 1-3 processibus submedianis duobus brevibus bituberculatis et tuberculis tribus minoribus sublateralibus, 4-14 processibus submedianis duobus brevibus trituberculatis et tuberculis tribus minoribus sublateralibus, segmentum 15^{um} tuberculis posticis submedianis quam idem segmentorum praecedentium longioribus tuberculis lateralibus minoribus, segmenta 16^i et 17^i tuberculis posticis submedianis quam idem segmenti 15^i aliquantum longioribus et retrorsum ali-

quantum vergentibus, tuberculis sublateralibus minoribus, segmentum 18^{um} tuberculis parvis supra inspectis segmenti 19^{i} latera vix superantibus; segmentum 19^{um} postice subovali, margine ipso parum profunde lobato, processu caudali infero, breviore marginem lobatum haud attingente. Carinae laterales sat parvae extrorsum et deorsum directae, lateraliter primi segmenti profunde trilobatae, ceterae, praeter easdem segmenti 18^{i} perparvas, profunde bilobatae, sed margines, praesertim antici et postici, papillis piliformibus sat longis obsessis ita ut inspectione superficiali vix lobatae appareant. Metazonarum superficies praesertim per tuberculorum superficies et margines anticum et posticum papillis piliformibus clavatis brevibus vestita.

Pori repugnatorii perparvi in segmentis 4,6,8,9,11,12 14-18 (=5,7,9,10,12,13,15-19 Auctorum) siti et super carinarum lobi postici basis superficiem sese aperientes.

Pedes breviores articulo primo quam ceteri breviore infra seta crassiuscula et longiuscula instructo, articulo secundo tertium longitudine aequante et seta infera apicali crassiuscula et longiuscula etiam instructo, articulo quarto breviore, quinto quam quartus parum longiore et angustiore, trichobothrio supero apicali longiusculo instructo, articulo sexto seta proximali longa aucto, ungue terminali robusto.

Lamina subanalis triangularis setis duabus posticis sat longis; valvulae anales lateraliter vix convexae.

♂ Ignotus.

Typus : *Eustaledesmus parvus* sp. n.

Observatio.—Genus hoc ad *Lophodesmus* Poc. aliquantum proximum est, sed pororum positione praesertim distinctum est.

Eustaledesmus parvus sp. n.

♀ Corpus fulvo-castaneum antennis, clypei parte distali, segmento anali umbrinis.

Antennae articulo quinto parum minus quam 1/3 longiore quam latiore (55 : 40).

Metazonarum limbus adiectus in laminis parum latioribus quam longioribus postice serratis divisus.

Characteres ceteri vide generis descriptionem et figuras XI.

Long. corp. mm. 5,6, lat. segmenti noni cum carinis 1,05, sine carinis 0,60, long. antennarum 0,70, pedum segmenti noni 0,55.

Habitat.—Ceylon : Namunakuli. Exemplum typicum cl. E. Green legit et mihi dedit.

Gen. **Evurodesmus** nov.

(Fig. XII).

♂ Corpus capite, collo, segmento anali et segmentis aliis 19 compositum, antice vix postice parum angustatum, nec in globum nec in spiram sed tantum arcuatim parum contractile.

Caput omnino obtectum antice spatio sat longo a collo superatum, fronte ad verticem lateraliter tuberculis nonnullis perparvis, media usque ad torulorum libellam granulis parvis instructa, lateraliter a torulis ad marginem lateralem valde depressa, clypeo ante incisuram posticam lateralem incrassato elevato, margine antico medio tridentato, superficie supera setis brevissimis sat numerosis et seriebus duabus anticis setarum brevium instructa.

Antennae articulo quinto quam ceteri longiore et crassiore, setis et sensillis vide fig. XII, 5.

Collum parte praemarginali antica longiuscula margine ipso late rotundato et sat profunde 10-lobato, cetera superficie serie transversali tuberculorum convexorum antice et tuberculis perparvis latiusculis parum convexis obsessa.

Trunci segmenta dorso convexiusculo 1-16 seriebus duabus submedianis tuberculis tribus parvis instructa et cetera superficie tuberculis perparvis longitudinaliter subseriatis instructa; segmentum 17^{um} tuberculis submedianis inter sese approximatis et quam idem segmenti 16^{i} parum majoribus; segmentum 18^{um} tuberculis submedianis etiam inter sese approximatis et quam idem segmenti 17^{i} parum longioribus. Carinae laterales sat magnae, parum supra sternorum libellam orientes, extrorsum et parum deorsum directae margine antico sinu submediano, margine carinarum 1^{ae} et 16^{ae} trilobato, margine laterali ceterarum bilobato et in carinis porigeris incisione postica laterali etiam affecto; margine postico ad basim sinuato; carinarum marginibus papillis brevissimis, per sinum anticum et posticum aliquantum longioribus, obsessis.

Segmentum 19^{um} manifestum subsemiellipticum margine utrimque trilobato, processu caudali perparvo infero ab ejusdem segmenti parte dorsuali spatio longo superato.

Metazonae per margines anticum et posticum papillis piliformibus brevissimis numerosis auctae et per tuberculorum superficiem etiam papillis brevissimis instructae. Carinarum margines, ut dixi, papillis obsessis et earumdem superficies papillis sat numerosis brevissimis aucta.

Pori repugnatorii in segmentis 4,6,8,9,11,12, 14-18 (=5,7,9, 10,12,13,15-19 Auctorum) siti et in segmentis 4,6,8,9,11,12,14 et 15 a tuberculo subconico truncato, in parte sublaterali carinarum lobo postico sito, gesti et in segmentis 16-18 super superficiem subposticam, a margine laterali gradatim magis remoti sese aperientes.

Pedes breves, sat robusti articulo primo breviore articulo secundo quam tertius paullum longiore, articulo quinto quam quartus parum longiore et angustiore, trichobothrio apicali supero sat brevi instructo, ungue terminali longo et sat robusto.

Organum copulativum biarticulatum, articulo primo magno excavata, partem proximalem articuli secundi complectente, articulo

secundo aliquantum longe a basi in hastis duabus diviso, quarum altera subtiliore ductum spermaticum gerit.

Species typica : *Evurodesmus Biroi* sp. n.

Observatio.—Genus hoc a ceteris subfamiliae hucusque notis segmento 19^{o} postice longiore praesertim distinctum est.

Evurodesmus Biroi sp. n.

♂ Corpus luride fulvum, colli margine antico et carinis maxima pro parte, clypeo, antennis, ventre pedibusque avellaneis.

Antennae articulo quinto c. 2/5 longiore quam latiore.

Metazonarum limbus adiectus in laminis transverse rectangularibus, postice serratis divisus.

Characteres ceteri vide generis descriptionem et figuras XII.

Long. corp. mm. 4,55, lat. segmenti noni cum carinis 1,06, sine carinis 0,50, long. antennarum 0,54, pedum segmenti noni 0,52.

Habitat.—Nova Guinea : Sattelberg (Clar. L. Biro, cui speciem dico, exemplum typicum legit).

XVII NOTES ON CRUSTACEA DECAPODA IN THE INDIAN MUSEUM

XIV. On the occurrence of the Caridean genus *Discias* in Indian Waters.

By Stanley Kemp, *Sc.D., Superintendent, Zoological Survey of India.*

(Plate VIII).

Among a collection of Decapod Crustacea which I made during a short visit to Port Blair in the Andaman Is. in the spring of 1915, there occur five specimens of a small prawn of rather unusual interest. The marine fauna of Port Blair proved so extremely rich that, in the time at my disposal, it was not possible to examine all the forms obtained with any degree of thoroughness and the remarkable nature of the specimens was thus not noticed at the time of their capture.

The specimens prove to belong to the little known genus *Discias*, described by Miss Rathbun in 1902 from three specimens obtained by the Hopkins Stanford Galapagos Expedition at Albermarle Id. in the Galapagos group. *Discias* shows little affinity with any other genus of Caridea and Miss Rathbun referred it to a new family, the Discidae, which hitherto has been known only from her original description. It is not a little remarkable that the genus should reappear in Indian waters, for the Andamans are separated from the Galapagos Is. by almost exactly half the circumference of the globe.

In the family Discidae, or, as I would prefer to call it, the Disciadidae, we find characters which appear to be primitive combined with others which indicate a high degree of specialization. The persistence of exopods on all five pairs of legs would seem to be a very primitive feature and the second maxillipeds are also less highly organized than in most Caridea. On the other hand the mandibles and maxillae are not primitive and the legs of the first pair, in the extreme reduction of the carpus and in the remarkable structure of the fingers, present characters which are without parallel in the Macrura and afford clear evidence of specialization.

Miss Rathbun considers that the family is related to the Atyidae and Hoplophoridae but, except for the exopods on the legs, I can find little to recommend this view. The molar and incisor processes of the mandible are separated in *Discias* by a deep cleft and the proximal endite of the maxilla is reduced.

In both these features the family differs from the Atyidae and Hoplophoridae and resembles more specialized forms which do not possess exopods.

The families of Caridea in which exopods exist on two or more pairs of peraeopods do not, for the most part, show any very close agreement with one another in other respects, and this fact points to the conclusion that exopods persisted among ancestral forms while considerable modifications in other directions were effected.

The possibility that exopods in some instances may actually have reappeared cannot be dismissed as altogether improbable. They are of frequent occurrence in the larvae of Caridean families that do not posses them when adult, and it is not difficult to imagine that their occasional reappearance might be caused by a persistence of larval characters into the adult stage.

The presence of a series of exopods on the legs is thus by itself insufficient to determine true relationship among the Caridea and it appears probable that better indications of affinity are afforded by the structure of the mouth-parts, especially of the mandible and maxilla. In the latter characters *Discias* shows a marked resemblance to the Hippolytidae and Palaemonidae and, notwithstanding the differences in the first two pairs of peraeopods, it is in these families, I believe, that the Disciadidae find their nearest surviving allies. *Discias* is without doubt the most specialized Caridean genus that possesses a full series of exopods.

The species obtained in the Andamans is distinguished from that found in the Galapagos Is. by characters which are clearly not more than specific. Miss Rathbun's specimens were all females; in the collection from the Andamans both males and females occur, the former differing from the latter only in the normal modifications of the first two pairs of pleopods.

The specimens were all found together on a yellow sponge. In the absence of precise field observations it is not possible to say whether the association was fortuitous or whether the prawn and sponge are synoecious, though the remarkable chelae of the prawn suggest that it must have some peculiar mode of life.

Family DISCIADIDAE.

1902. Discidae, Rathbun, *Proc. Washington Acad. Sci.*, IV, p. 289.

Genus **Discias**, Rathbun.

1902. *Discias*, Rathbun, *l.c.*, p. 290.

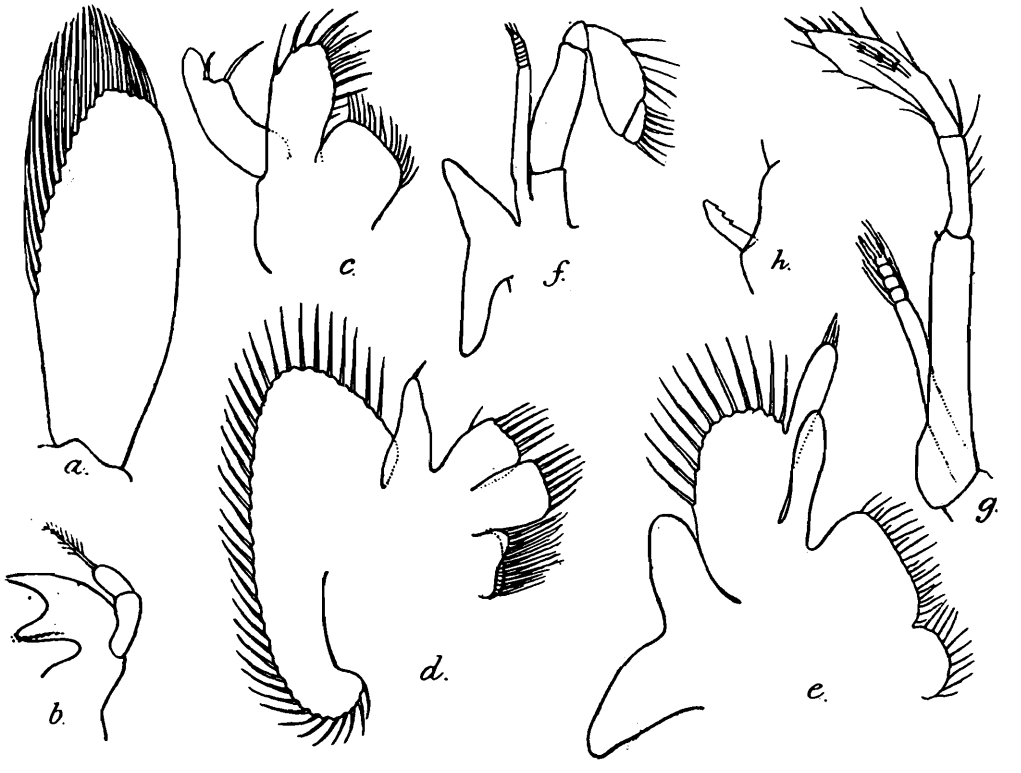
Discias exul, sp. nov.

Plate VIII.

In general appearance the species bears some resemblance to small Pasiphaeids belonging to the genus *Leptochela*, but is immediately distinguished by the remarkable character of the first two pairs of legs.

The rostrum consists of a horizontal triangular plate, rather strongly depressed and reaching almost to the end of the second segment of the antennular peduncle. In dorsal view it is nearly twice as long as its basal breadth. It bears a blunt median ridge, not continued backwards on to the carapace, with a shallow groove on either side. Near the base the lateral margin is reflected upwards and in the distal two-thirds of its length it bears a series of minute teeth or serrations, some 10 to 15 in number.

The carapace is smooth and rounded; its breadth is about equal to its height and about two-thirds its length. The anterior



TEXT-FIG. 1.—*Discias exul*, sp. nov.

a. Antennal scale.
b. Mandible.
c. Maxillula.
d. Maxilla.
e. First maxilliped.
f. Second maxilliped.
g. Third maxilliped.
h. Barbed spinule at end of ante-penultimate segment of third maxilliped.

border on either side of the rostrum is occupied mainly by the very large semicircular orbit which is defined below by a strong antennal spine. The antero-lateral angles are broadly rounded.

The eyes are very large and nearly globular; the breadth of the hemispherical cornea is greater than the length of the stalk. The black ocular spot, found near the cornea in many Caridea, is not visible.

The antennular peduncle reaches almost to the end of the antennal scale and is stout, with a lanceolate lateral process which reaches a little beyond the middle point of the basal segment. The outer margin of this segment is not provided with a distal

spine, it is, however, somewhat produced and carries a few long setae. The second segment is broader than long and a little shorter than the third. The outer flagellum is thickened at the base where, on its outer side, it bears tufts of long setae. The flagella seem to have been broken at the tips, but both were certainly longer than the peduncle.

The basal segment of the antenna does not possess an external spine. The antennal scale (text-fig. 1*a*) is oval with convex inner and outer margins and with a blunt apex; it is about three times as long as wide. The outer margin is not thickened in the usual fashion and does not end in a spine. The midrib described by Miss Rathbun is not evident, though there is a slight median swelling due to the presence of the longitudinal muscle. The basal segment of the flagellum reaches almost to the middle of the scale. The flagellum itself is long, extending to the end of the fourth abdominal somite when reflected backwards.

The mandible (text-fig. 1*b*) is deeply cleft into two processes. The anterior or incisor process is pointed, not apically truncate as in Miss Rathbun's figure of the allied species. The posterior or molar process does not possess the grinding surface found in most Caridea, but is narrow and acute with a series of sharp teeth that extend backwards in a single row on the inner side. The mandibular palp is composed of two segments, the distal scarcely half the length of the proximal and bearing a single long feathered seta at the apex.

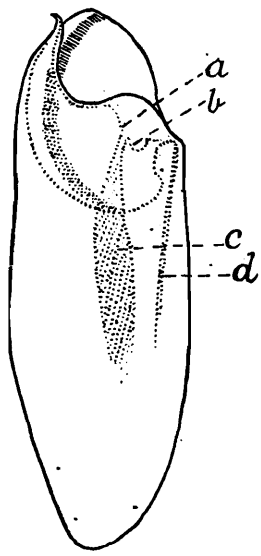
The proximal endite of the maxillula (text-fig. 1*c*) is broad-ended and the palp bears two long setae behind the apex. In the maxilla (text-fig. 1*d*) the proximal endite is greatly reduced and does not reach nearly to the level of the two lobes of the distal endite. The first maxilliped (text-fig. 1*e*) bears a bilobed epipod. The second maxilliped (text-fig. 1*f*) has a bilobed epipod and the exopod reaches beyond the end of the merus. The endopod is slender; the basis and ischium are fused, the merus long and narrow and the carpus very short; the dactylus is attached obliquely to the end of the propodus.

The third maxilliped (text-fig. 1*g*)[1] reaches almost to the end of the antennular peduncle. There is a small epipod (not shown in the figure) and the exopod reaches to the end of the antepenultimate segment. At the end of this segment on the inner side there is a small stout spinule with three barbs on its inner aspect (text-fig. 1*h*). The penultimate segment is a little more than two-fifths the length of the antepenultimate. The terminal segment is spatulate in form and one and three quarter times the length of the penultimate; it has transverse rows of plumose setae on its surface and spinules on its margins.

The first peraeopod (text-fig. 3*a*) does not reach quite as far forwards as the third maxilliped. The exopod extends beyond

[1] The exopod in this figure is displaced to the left, the outer edge of the endopod being on the right.

the end of the merus. The basis and ischium appear to be fused. The merus is widest at its distal end and is about twice as long as its greatest breadth; on the inner side the distal margin is deeply hollowed to receive the hinder end of the chela, which projects backwards beyond the carpus. The carpus is exceedingly small and inconspicuous, consisting merely of a thin plate, oval when seen from below, lying between the merus and the chela. The chela itself is thick and heavy, less than three times as long as broad and fully one and a half times as long as the merus. As noted above, the posterior end of the chela, when the limb is straightened, fits into a cavity in the distal end of the merus. The structure of the fingers is difficult to make out satisfactorily. When seen from below the chela presents the appearance shown in text-fig. 3*b*. Text-fig. 2 is a dorsal view of a chela which has been cleared in Eau de Javelle. The dactylus is a thin plate or disc, more or less circular in outline which, when it is closed, is ensheathed by more than half its total extent within the propodus. The dactylus is not flat, but saucer-shaped, and the cutting edge is semicircular, at the actual margin thin and transparent and with a band of closely-set striae parallel with the edge.



TEXT-FIG. 2.—*Discias exul*, sp. nov.
Chela of 1st peraeopod in dorsal view.
a. Distal end of palm on lower side of chela.
b. Axis on which dactylus rotates.
c. Protractor muscle.
d. Retractor muscle.

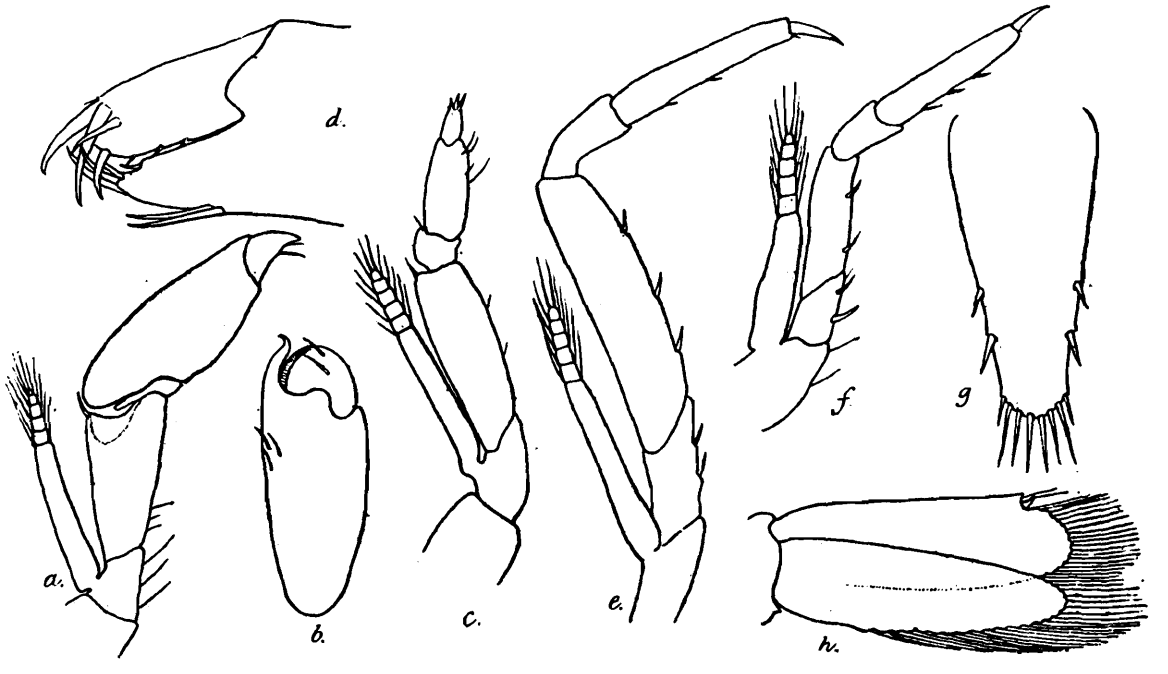
The second peraeopod (text-fig. 3*c*) reaches to the middle of the propodus of the first pair, with exopod extending beyond the end of the merus. The basis and ischium are fused, the merus is little more than three times as long as broad and the carpus is very short and more or less quadrate in outline. The chela is about three quarters the length of the merus and the dactylus about half the length of the palm. On the outer side of the fixed finger there are two long spines. There are two or three small spinules on the cutting edge of the dactylus and one in a similar position on the fixed finger. At the tip each finger bears three or four long, curved, interlocking spines (text-fig. 3*d*).

The last three pairs of peraeopods decrease successively in length; the third (text-fig. 3*e*) reach about to the end of the antennal scale, the fifth (text-fig. 3*f*) scarcely to the distal end of the merus of the first pair. The exopod in the third pair reaches a little beyond the middle of the merus, in the fifth pair to the end of

the merus. There are large spines on the inferior margins of the ischium, merus and propodus, usually two on the ischium and two, three or four on the merus and propodus. The propodus is about twice the length of the carpus and three and a quarter to nearly four times the length of the dactylus, which is simple and sharp-pointed.

There are no epipods on the legs. The series of gills consists of five pleurobranchs, one situated above each peraeopod.

The abdominal somites are smooth and dorsally rounded; measured dorsally, the sixth is about one quarter longer than the fifth. In the male the endopod of the first pair of pleopods is oblong in shape with four long setae at its distal end. The



TEXT-FIG. 3.—*Discias exul*, sp. nov.

a. First peraeopod.
b. Chela of first peraeopod, from below.
c. Second peraeopod.
d. Fingers of second peraeopod.
e. Third peraeopod.
f. Fifth peraeopod.
g. Telson.
h. Uropods.

remaining pairs of pleopods are provided with an appendix interna and, in the male, there is an appendix masculina on the second pair.

The telson (text-fig. 3*g*) is rather broad. It bears two pairs of dorsal spinules, both situated in the distal half of its length. At the apex it is armed with four pairs of slender spines; of these the outermost are the shortest and the next pair the longest. The variation noticed by Miss Rathbun in the number of terminal spines does not seem to occur in this species. The outer uropod (text-fig. 3*h*) is about three and a half times as long as wide; the outer margin terminates in two short spines, the inner of which is movable.

The largest specimen is only 7½ mm. in total length. The eggs are large for so small an animal; they are rather shrunken

in the single ovigerous female, but appear to have been about 0·85 by 0·7 mm. in longer and shorter diameter. In life the specimens were colourless and semitransparent; the eggs borne by the female were green.

Discias exul differs from Miss Rathbun's *D. serrifer* in a number of particulars. *D. serrifer* is a much larger species, 15 mm. in length, with a punctate carapace and with the antennal scale projecting further beyond the end of the antennular peduncle. The palmar portion of the chela of the first peraeopods is less than twice as long as broad in *D. serrifer*, but more than twice in *D. exul* and whereas the postero-inferior angles of the fifth and sixth abdominal pleura are rounded in the latter species, they are subacute in the former. In the tail-fan there are striking differences. The telson bears ten or twelve terminal spines in *D. serrifer* and there is a series of ten to twelve teeth on the external margin of the outer uropod; in *D. exul* there are only eight spines at the apex of the telson and the margin of the outer uropod is unarmed.

The five specimens of *D. exul* were found on a yellow sponge; they were obtained at low water on March 1st, 1915, at Port Blair in the Andaman Is., on the reef at the N. end of Ross I.

EXPLANATION OF PLATE VIII.

Discias exul, sp. nov.

Ovigerous female in lateral view.

REC IND MUS. VOL XIX, 1920

DISCIAS EXUL SP. NOV.

Photogravure.

Survey of India Offices, Calcutta, 1920.

XVIII A LIST OF THE DRAGONFLIES RECORDED FROM THE INDIAN EMPIRE WITH SPECIAL REFERENCE TO THE COLLECTION OF THE INDIAN MUSEUM

PART III.—THE GENUS LESTES AND ITS ALLIES.

By F. F. LAIDLAW, *M.A.*

(With Plate V).

The present part concludes my account of Indian dragonflies belonging to the sub-order Zygoptera. I have deliberately headed it "the genus *Lestes* and its allies," because at the present moment the precise status of the several sections into which the Zygoptera naturally fall is a matter of debate; and it is better on the whole to leave the exact rank to which this very distinct group is entitled, an open question.

As the number of species is not great, and as the group is fairly homogeneous, I have dealt with the systematic arrangement of the species on a somewhat different plan to that adopted in my previous papers. With regard to geographical distribution I have noted records under the heading of the several species.

I need scarcely point out that the Indian Lestine fauna is of exceptional interest, and is in all probability very imperfectly known. I list here some seventeen or eighteen recorded species, of which the museum collection contains twelve.

The following table will, I hope, be of assistance in identifying the Indian species of the group. At the same time it will serve to express my views on the classification of its members. Putting on one side *Megalestes*, which stands apart from the rest, I am inclined to the opinion that the genera proposed for certain aberrant species have probably not more than sub-generic value.

I regard the character afforded by the similarity or dissimilarity of the quadrangle of fore and hinder wings as of the first importance, following of course de Selys' main sub-division of the genus. Tillyard's genus *Austrolestes* is evidently nearly equivalent to Selys' "Deuxième section," but it should be noted that it can scarcely be separated on venational grounds from *Sympycna*. The only feature separating at least some of the Australian Lestines (*L. cingulata* Selys, *e.g.*) is the position of *Ac* at level of Ax_1; whereas in all the Indian forms of de Selys' second section (but not in *Sympycna*

paedisca Eversm.) *Ac* lies about half-way between level of Ax_1 and Ax_2.

But the position of *Ac* is variable in the first section of the genus, though not so far as I know in Indian species. Thus in *L. unguiculata*, Hagen from N. America it occupies precisely the same level as in *L. cingulata*, Selys. And therefore I am in some doubt as to the advisability of using this character in defining a genus, and as a matter of fact Tillyard does not so employ it.

As to the termination of the specific names. The generic name *Lestes* is a term not necessarily I think of the masculine gender. The specific name of the type-species *L. sponsa* Hansem, is definitely feminine; therefore I believe it correct to follow de Selys in employing for the specific names the feminine termination.

For venation I employ Tillyard's modification of the Comstock-Needham nomenclature; Ax_1 and Ax_2 for antenodal nerves, *Ms.* for the sector usually denoted by *Rs.*

I. Petiolation of wing ceasing *before* the level of *Ac*. No supplementary sectors between *Ms* and M_3. *Ac* distinctly nearer the level of Ax_1 than of Ax_2. — *MEGALESTES.*

II. Petiolation of wing commences *at* level of *Ac*. Supplementary sectors developed between *Ms* and M_3.

(α) M_2 rises 8-8½ cells distal to nodus on forewing. *Ac* lies nearer level of Ax_1 than of Ax_2 Wings coloured (in males of Indian species). — *OROLESTES.*

(β) M_2 rises not more than 6 cells distal to nodus in forewing.

A. Quadrangle of fore and hinder wings equal. *Inner* side of quadrangle of hinder wing at least two thirds length of upper side.

* *Ms only slightly angled, in its distal half. Pterostigma at least twice as long as broad.*

i. Synthorax without metallic markings.

Colour russet-brown, pterostigma unicoloured, yellow or brown ... ... — *Lestes umbrina*, Selys.

Thorax green, pterostigma dark, gray brown, its outer quarter paler ... ... — *Lestes thoracica*, sp. n.

Thorax brown, pterostigma longitudinally bicoloured (yellow and black), margin of wing sharply decurved beyond the pterostigma ... — *Lestes nodalis*, Selys.

ii. Synthorax with metallic green bands.

Bands very narrow; no black on head, pterostigma brown, three times as long as broad ... ... — *Lestes viridula*, Ramb.

Bands broader, about one-third width of mesepisternite, or more; securiform above. Head with black markings. Pterostigma about two and a half times as long as broad, black in adult. ... ... — *Lestes elata*, Selys.

Bands trilobed, about one-third width of mesepisternite. Head with black markings. Pterostigma about two and a half times as long as broad, black in adult ... ... *Lestes praemorsa*, Selys.

[In the last two species the colouring of the adult is largely black. *L. decipiens*, Kirby, a form I have not seen, appears to me to be a local race of *L. praemorsa*].

iii. Synthorax almost entirely bronze-green above. Pterostigma transversely bicoloured, basal half brown, distal half whitish. Palaearctic species from Kashmir ... ... *Lestes barbara* (Fabr.)

Dorsum of synthorax with dorsal and humeral bands of yellowish colour. Pterostigma yellow. Very large species. Hinder-wing ♂38 mm. ... ... *Lestes orientalis*, Hagen.

** *Pterostigma not twice as long as broad.*

Colouring grayish-white, marked with black, or dark cinnamon brown ... ... *Lestes sp.* ♂ (?=*Platylestes platystyla* (Ramb.))

Ms angled ("*sous-nodal anguleux*").

"*Pterostigma scarcely two and a half times as long as it is broad.*"

Colouring grayish yellow, almost without markings, segments 8-9 of abdomen black. ♀ Annal appendages ovoid, very depressed, as long as the last segment. *Platylestes platystyla* (Ramb.)

B. Quadrangle of hinder-wing distinctly longer than that of fore-wing; its *inner* side not more than one-third the length of its *upper* side; its lower outer angle very acute.

a. Spines of legs relatively short, those of the posterior tibia scarcely as long as tarsal claws of the same legs.

Colouring blue and bronze-black.

Ratio of greatest breadth of wing to length 1 : 6. *Lestes cyanea*, Selys.

b. Spines of tibiae relatively long, those of the posterior pair longer than tarsal claws of same leg.

* Colouring blue and bronze-black.

Ratio of greatest breadth of wing to length about 1 : 5; upper surface of head black (noirâtre) ... ... *Lestes gracilis*, Selys.

Upper surface of head bronze. ... *Lestes divisa*, Selys.

** Colouring brown marked with green-bronze or bronze-black.

† Posterior prothoracic margin simple.

Pterostigma not inflated, its outer margin not oblique, only twice as long as broad; uncoloured ... ... *Lestes? bilineata*, Selys.

Pterostigma scarcely inflated, its outer margin not oblique, three times as long as broad ... ... *Lestes* sp. ♀.

†† Posterior prothoracic margin trilobed.

Pterostigma a little inflated, its outer margin oblique. *Ac.* nearly at level of Ax_1... *Lestes* (*Sympyena*) *paedisca* (Eversm.)

1. **Megalestes major**, Selys.† [1]

Megalestes major, Kirby, *Cat. Odonata*, p. 159.
,, ,, M'Lachlan, *Ann. Mag. Nat.* Hist. (6) XVI, p. 20 (1895).
,, ,, Martin, *Mission Pavie* (sep.), p. 18.
,, ,, Ris, *Supplementa Entomologica*, No. 5, June 1916. p. 11.

This species, the only representative of its genus, was for long supposed to be confined to the southern slopes of the Himalayan range (see M'Lachlan, loc. cit.) Martin, however, has recorded it from Tonkin and Ris from Formosa.

The Museum collection contains 2 ♀ ♀ in spirit from Pashok, 5,000 ft., Darjiling District, 14.vi.16, scarcely adult ($\frac{3458}{H_1}$); and one ♂ from Bhim Tal, Kumaon, 19—22. ix. 06 ($\frac{9787}{51}$) (*N.A.*). I have seen also 3 ♂ ♂ from the Indian Forestry Zool. Col. from Binsar, Kumaon, and one ♂ from Gopaldhara, Darjiling district, collected by Mr. H. Stevens.

The immature females have a large yellow mark occupying the middle of the dorsum of the prothorax; and on the synthorax there is a yellow stripe along each side of the mid-dorsal carina, and another along the line of the first lateral suture: whilst from the second lateral suture ventralwards the thorax is yellowish white. The dimensions of the female specimens are:

Length of hinder-wing 37·5 mm., of abdomen 44 mm.

2. **Orolestes selysi**, M'Lachlan.

Orolestes selysi, M'Lachlan, *Ann. Mag. Nat. Hist.* (6) XVI, pp. 21-23 (1895).
,, ,, Martin, *Mission Pavie* (sep.), p. 18.

I have not seen an example of this rare and splendid Lestine. I quote form M'Lachlan's account, "wings *for the greater part* "*opaque blackish* in the male, *petiolated up to the first basal post-*"*costal nervule*, which latter is placed nearer the level of the second "than of the first antenodal nervule. Nodal sector commencing "8½ cellules after the nodus in anterior wings (7-7½ after in the "posterior); ultra nodal sector commencing 3-4 cells after the "nodal. None of the sectors distinctly broken (angulose) except-"ing the inferior of the triangle at its apex (the ultra nodal and "short sectors very slightly broken); one supplementary "sector (and rudiment of another) interposed between nodal "sector and median; *pterostigma very large*, dilated, more than "four times as long as broad, surmounting 5-6 cellules. Quadri-"lateral broad, lower side twice the length of the inner, the outer "angle somewhat acute.

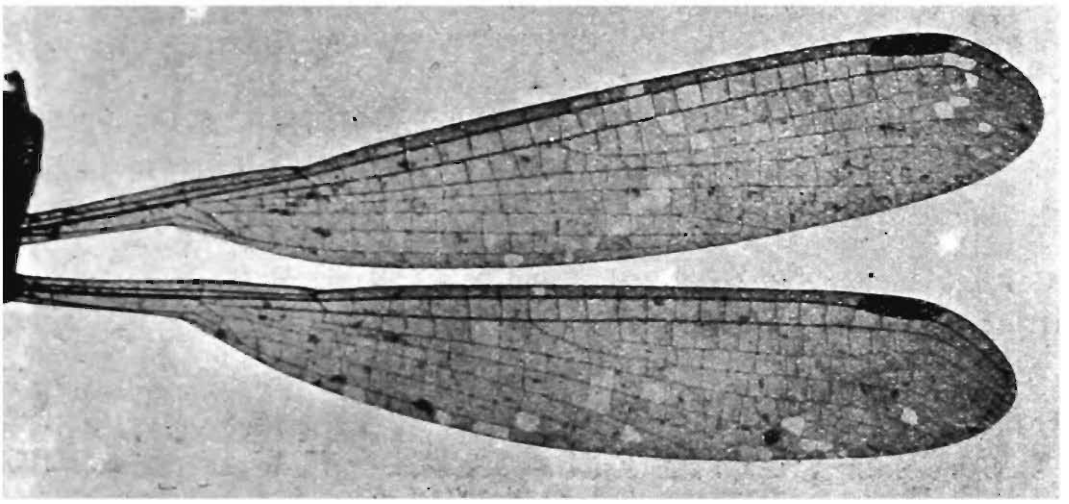
"Abdomen slender, spines of legs moderate.

"Head black above—prothorax olivaceous green.—Thorax above "bronzy green, not metallic, somewhat paler (yellowish?) on

[1] Species so marked are in the Indian Museum, Calcutta.

" either side of the dorsal crest; sides of thorax pale olivaceous " green.—The olivaceous colour of the sides of the thorax is " continued broadly on the sides of the first and second abdominal " segments, and narrowly along the sides of the third to the fifth " and part of the sixth segments; abdomen above with a large spot " occupying most of the first segment bronzy green, and the " second wholly of this colour; from the third to the tenth " bronze black, but there is a long bluish space on the third and " fourth, which are black only at base and apex. Legs black; " the femora brownish beneath.

" ♂ Superior appendages black, quite one-half longer than the " tenth segment, slender, forcipate, the tips regularly incurved, " finely denticulate externally in the apical half; internally a " basal tooth, the usual dilatation commences in an obtuse and " ends below the apex in a large triangular tooth, inferior appen-



TEXT-FIG. 1.—Venation *Lestes*? sp. from Borneo (Coll. Sarawak Mus.).

" dages scarcely one-fourth length of superior. Length of abdomen " 57 mm., of hind-wing 36-39 mm."

I am enabled by the kindness of Messrs. H. and F. E. Campion to give a figure of a Bornean Lestine, undescribed I believe; a male in bad condition. This specimen agrees in venation with MacLachlan's account of *Orolestes selysi* very closely as may be seen by an examination of text-figure 1. The only differences are: (i) the absence of opaque colouring, and (ii) the shape of the quadrangle. MacLachlan's definition of the genus gives, " lower side twice the length of *inner*." (The italics here are mine.)

Not having seen an authentic specimen of *Orolestes* I cannot speak with certainty on the matter, but I think it possible that for *inner* we should read *upper*. In that case the Bornean specimen would, except for wing-colour, fall into the definition of the genus *Orolestes*. In any case it seems to me that we may regard the species as intermediate between the true *Lestes* and *Orolestes*.

The markedly rectangular character of the venation should be noted. Like *Megalestes* this Himalayan form, with an allied species, has been recorded by Martin (*loc. cit.*) from Tonkin.

3. Lestes umbrina, Selys † (?).

(Pl. V, fig. 1).

Lestes umbrina, Selys, "Odonates de Birmanie." *Ann. Mus. Cw. Genova.* X (XXX), p. 497-498 (1890-91).

1 ♀ (Head, thorax and wings only). Cutch, W. India (*F. Stoliczka*) $^{63\frac{2}{20}}$; Labelled by Selys "*Lestes umbrina.* Selys, Cutch. ♀ "

1 ♂ Allahabad (*A.D. Imms*);—1907, $^{64\frac{8}{20}2}$.

1 ♂ 1 ♀ Nagpur, C.P. (dry specimens), 1,000 ft., 10-v-15 (*E. D'Abreu*).

4 ♂ ♂ 2 ♀ ♀ Nagpur, C.P. (in spirit), N.C.M., 10-v-95 (*E. D'Abreu*).

1(♂?) imperfect. Waltair, Madras Presidency., 23-iv-10 (*S.W Kemp*) $^{65\frac{0}{20}3}$.

1 ♂ Allahabad (*A D. Imms*).

Recorded by de Selys also from Hainan. I have identified the specimens listed above as *L. umbrina*, Selys with some misgivings. The ♀ specimen in the collection named by de Selys himself has largely influenced me in so doing; but unfortunately the specimen is very imperfect. I would point out, however, that there is a considerable resemblance between these specimens and the description of the species *L. concinna*, Selys (*Bull. Acad. Belg.* (2) xiii, p. 321; 1862), a resemblance to which de Selys has not called attention in his account of *L. umbrina*. Further, there are specimens in the British Museum of a *Lestes* apparently identical with the examples before me, collected by Everett in the Philippines, which have been labelled *L. concinna* by Kirby. So that it seems to me at least on the evidence available that the two names may be synonyms. On the other hand Selys' measurements of the hind-wing of his *L. concinna* show discrepancies, possibly due to a misprint. He gives the length of the hind-wing ♂ 28-31 mm., of the ♀ 19-22 mm.; and states that the colour of the pterostigma in the adult male is black, paler at the side and end. The specimen described was from Batavia. All the Indian Museum specimens have the pterostigma yellowish-brown except a very adult and imperfect specimen (? sex) from Waltair in which it is dark brown.

Unfortunately the accounts of the two species given by Selys are neither of them at all detailed.

The following description is based on spirit specimens from Nagpur, C.P.:—♂ *Head*: Under surfaces, bases of mandibles, and genae yellowish-white; the rest of the head and the eyes sandy yellow. In dried specimens the eyes have a dark brown colour.

Prothorax and *synthorax* almost uniformly sandy yellow, distinctly paler on the ventral surfaces, and in the most mature

specimens there is a distinct darkening of the mesepisternite near the mid-dorsal carina, where the colouring is of a more olive hue (this is more obvious in old pinned specimens than in spirit material).

Legs yellowish-white, with black spines and tarsal claws. The first pair of femora and tibiae have each a fine black externo-lateral line, of which only a trace is visible on the second pair of femora, none on the third pair.

Abdomen: Segments 1-8 sandy yellow, a slightly olive tinge dorsally, paler beneath. Except for the first segment, which is rather paler than the rest, the mid-dorsal line of each of these segments is marked with a very fine blackish line, and the basal and apical margins of each segment are also very narrowly marked with dark brown. On each segment from 2 to 7 the apex for a length of about a millimetre is a little paler than the rest, and lacks the olive shade; this paler area is separated from the remainder of the segment by a pair of minute, transverse, black dots lying on either side of the mid-dorsal carina, but not touching it. On segment 8 the mid-dorsal line is widened, and the sub-apical spots can scarcely be distinguished; 9-10 show progressive paling of colour distally, the apex of 10 and the anal appendages being of a creamy white colour. These segments are each marked with a fairly broad, black line dorsally.

Anal appendages: Upper part longer than segment 10 of abdomen, regularly incurved apically, with four or five fine black external denticles. Inwardly each carries a fairly stout spur, followed by a rounded shelf-like projection, lower pair barely one-half length of upper pair, triangular. The upper pair are a little darkened on the apices (see pl. V, fig. 1). The veins of the *wings* are brown in both sexes.

4. **Lestes nodalis**, Selys. †

(Pl. V, fig. 2).

Lestes nodalis, Selys, "Odonates de Birmanie." *Ann. Mus. Civ. Genova* X (XXX), pp. 496-497 (1890-91).

1 ♂ (Head, thorax and parts of wings only). Assam-Bhutan Frontier. "Deshroi, River and jungle" (*S. W Kemp*) 25-xii-10. $^{6\,4\,3\,3}_{2\,0}$.

In addition to the points noted by Selys as serving to characterize this species, the black nodal point and the longitudinally bicoloured pterostigma, the sharp deflexion of the wing margin beyond the pterostigma is worth noting.

I am able to supply a figure of the anal appendages of the male (missing in the present specimen) from an example in the British Museum from Assam. De Selys (*loc. cit.*) has recorded a specimen from Yunnan.

5. **Lestes thoracica**[1], sp. n. †

(Pl. V, fig. 3).

1 ♂ 1 ♀ (type and allotype). Agra, United Provinces of Agra and Oudh (*E.J Hankin*) 1916 (from bottles labelled 7 and 9).

Type ♂ and allotype ♀ to be returned to the Indian Museum. Dr. Hankin remarks that the male has a green thorax, and slightly green eyes; whilst the female has the thorax sage-green and eyes blue.

In the preserved specimen the green colouring has faded to a dull gray-brown.

Both sexes have the pterostigma dark grayish-brown, with its outermost quarter grayish-white. The dark area has also a fine lighter border. The veins of the wings are dark brown.

♂ Length of abdomen 30+1 mm., of hind-wing 20 mm.

Head: Upper lip and genae dull yellowish-brown (probably green in life), the rest of the anterior and upper surface black, save for a small yellow triangle enclosing the ocelli.

Posterior surfaces pale yellowish-white.

Prothorax: Upper surface jet black, lower surfaces yellowish-white.

Synthorax: Entirely gray-brown (green, non-metallic during life), save that the mid-dorsal carina is black, as are also the alar sinuses. The ventral surface is paler than the dorsal.

Abdomen: Segments 1, 2 pale yellow at the sides and underneath; marked with a bronze-black band above. Segments 3-7 bluish-white underneath, each with a longitudinal, bronze-black band occupying the whole length of the segment dorsally. Segments 8, 9, 10 entirely bronze, the last two slightly black, pulverulescent.

Anal appendages (Pl. V, fig. 3): Upper pair half as long again as the last segment, white in colour with black apices, which overlap each other. Each appendage has an inner basal tooth at about one-third of its total length, followed by a rounded projection, which carries fine black denticulations.

Legs white with black bands on the anterior surfaces of the femora and tibiae, tarsi black.

♀ Length of abdomen 28 mm., of hinder-wing 20 mm.

Head: Upper surface yellowish brown (probably sage-green in life) with small black markings on either side of the ocelli.

Prothorax: Yellowish-brown (when alive sage-green).

Synthorax: Sage-green above, paler at the sides and below, without a black line on the mid-dorsal carina.

Abdomen: Segments 1-7 with upper surface covered by bronze-black band, the colouring of this band is not very intense. Seg-

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[1] I have lately received specimens of *L. thoracica* from Lake Chilka; and a long series of *L. nodalis* from Lower Burma.

ments 1 and 2 are pale yellow at the sides underneath; whilst 3-7 have the same parts greenish-white. Segment 7 has indications of a black median dorsal line, and 2-7 each have a fine pair of transversely placed black spots on either side of the mid-dorsal line, about one millimetre proximal to the apex of the segment. On 8, 9 and 10 the dorsal colouring becomes paler fading almost to white on segment 10, but each of these segments has a well-marked longitudinal black line above. Anal appendages white.

Legs as in the male.

This species is closely allied to *Lestes umbrina*, Selys, both in the general wing structure, and in the colour pattern of the female, as well as by the structure of the anal appendages of the male.

6. **Lestes viridula**, Ramb. †

(Pl. V, fig. 4).

Lestes viridulus, Kirby, *Cat. Odonata*, p. 163.

1 ♂ For. Zool. Coll. Gondumri, Bhandara, C. P., 1-xii-12 (*A. D. Imms*), "in jungle."

1 ♀ (imperfect). Mowai, Bara Banki, United Prov., 2-x-10 (*M. M Khan*) $\frac{6488}{20}$.

The species is characterized by the *narrow* green band on either side of the mid-dorsal carina of the synthorax, and by the angular 'elbow' of the anal appendage of the male (Pl. V, fig. 4),

7. **Lestes elata**, Selys. †

(Pl. V, fig. 5 and text-fig. 2).

Lestes elatus, Kirby, *Cat. Odonata*, p. 162.
" " *id. Proc. Zool. Soc. Lond.* 1891, p. 203.
" " *id. Journ. Linn. Soc. Zool.* XXIV, p. 565 (1893).

1 ♀ Barkul, Orissa, 100 ft. 1-3—viii-14, *F.H.G.* $\frac{8223}{20}$.

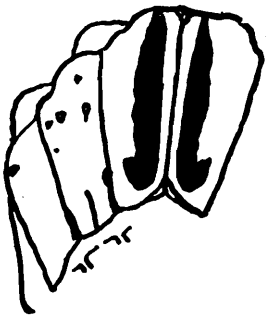
1 ♂ ad. 1 ♀ juv. Bangalore, Mysore, ca. 3000 ft., 4-6-x-16, *N.A.*

1 ♂ 3 ♀ ♀ immature, 2 larvae, Bangalore, Mysore, ca. 3,000 ft. 4-6-x-16. *N.A.*

"Adults from edge of small ditch, larvae from ditch; no other species seen in vicinity."

Recorded from Ceylon (Kirby) and Tranquebar, Madras Presidency (Selys). Apparently widely distributed in peninsular India.

I have been able to examine Kirby's specimens in the British Museum. They agree closely with those now before me. The variation of which Kirby speaks (*loc. cit.* 93) is evidently a mat-



TEXT-FIG. 2.—Thoracic colour pattern of *L. elata*, Selys ♀, Bangalore.

ter of age, and perhaps of sex; the females that I have seen are all very similar, as are the young males, whose thoracic colouring is identical with that of the females. The adult male, as in the species *L. praemorsa*, Selys, develops much black colouring.

The shape of the metallic-green bands of the thorax, which are, as Kirby remarks, securiform behind, are characteristic of the species, whilst the deeply angled margin of segment 10 also distinguishes it from *L. praemorsa* (see text-fig. 2 and Pl. V, fig. 5).

Since the above was writen, I have received a young male of this species from Karachi, kindly sent me by Major F. C. Fraser.

8. **Lestes decipiens**, Kirby.

Lestes decipiens, Kirby, *Journ. Linn. Soc. Zool.* XXIV, pp. 565-566 (1893).

I could not find examples of this species in the British Museum. It is evidently very closely allied to *L. praemorsa*, Selys, and may be a local race. The British Museum has several examples of the latter species from Ceylon.

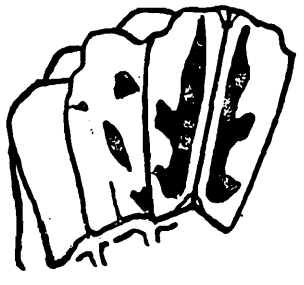
9. **Lestes praemorsa**, Selys. †

(Pl. V, fig. 6 and text-fig. 3).

Lestes praemorsus, Kirby, *Cat. Odonata*, p. 162.
" " Selys, *Odonates de Birmanie.*
" " Krüger, *Stettin Entomol. Zeit.* 1898, p. 130.
" " Laidlaw, *Proc. Zool. Soc. Lond.* 1902, p. 382.

1 ♂ ad. Sibsagar (*S. E. Peal*) $\frac{6327}{20}$ (labelled by de Selys),
1 ♀ imperfect, Sibsagar, N.E. Assam (*S.E. Peal*) $\frac{6328}{20}$ (labelled by de Selys).
2 ♂♂ 1 ♀ Sitong, *ca.* 4000 ft., near Mangphu, Darjiling district (*S. Kemp*) 6-vii-18. $\frac{1809}{42}$.

This species is I think closely allied to L. *elata*, Selys. Both of them agree in that the adult males undergo melanotic development, and in both the anal appendages are much alike.



TEXT-FIG. 3.—Thoracic colour pattern of *L. praemorsa*, Selys ♀ Darjiling district, 4,000 ft.

L. praemorsa, however, appears on our present knowledge to have a much wider range than its relative; and when better known I have no doubt that it will be possible to distinguish local races for it.

I have been able to examine specimens at the British Museum from the Celebes and Ceylon. Those from the former locality are at once distinguishable from the N. Indian examples by the difference in the thoracic pattern, which seems constant. The British Museum examples from Celebes seem to be distinct from the form for which de Selys pro-

posed the name *quercifolia*, but this form is also represented in the same collection. The thoracic pattern in the Sitong specimens, which are in better preservation than those from Sibsagar, is distinctly serrate. In an example from Ceylon the pattern is more irregular, this applies also to specimens from the Malay Peninsula (Skeat expedition), whilst in the British Museum material from the Celebes it is decidedly reduced.

10. **Lestes barbara** (Fabr.). †

Lestes barbarus, Kirby, *Cat. Odonata*, p. 162.
,, ,, Calvert, *Proc. Acad. Nat. Sci. Philadelphia*, 1898, p. 147.

1 ♂ Jhelum Valley, 5,200 ft., Kashmir, N. W. Himalayas, 6-x-16 (*H. T Pease*). $\frac{4318}{H1}$.

A widely ranging Palaearctic species.

11. **Lestes orientalis**, Selys.

Lestes orientalis, Kirby, *Cat. Odonata*, p. 163.
,, ,, *id.*, *Journ. Linn. Soc. Zool.* XXIV, p. 566.

This fine species, equalling the largest members of the group in size, appears to be especially characteristic of Ceylon and S. India. I have not seen an example.

12. **Lestes** sp. (?=**Platylestes platystyla** (Ramb.). †

(Pl. V, fig. 7 and text-figs. 4, 5).

1 ♂ "Found in collapsed condition on stairs of Museum building, Calcutta," 13-xi-17.

The type of *Platylestes platystyla* (Ramb.) is a unique female specimen described by de Selys. It is also the genotype.

The Museum specimen agrees fairly well in the important character of the short, squarish pterostigma with the genotype, save that in the male the pterostigma is distinctly less than twice as long as broad (the generic definition, based of course on a female, states that the pterostigma is *a peine deux fois et demie aussi long que large*").[1] Further in general the dimensions agree fairly well:—

Platylestes platystyla ♀ abd. 33 mm., hind-wing 23 mm.
Museum specimen ♂ abd. 32 + 1·5 mm., hind-wing 21 mm.

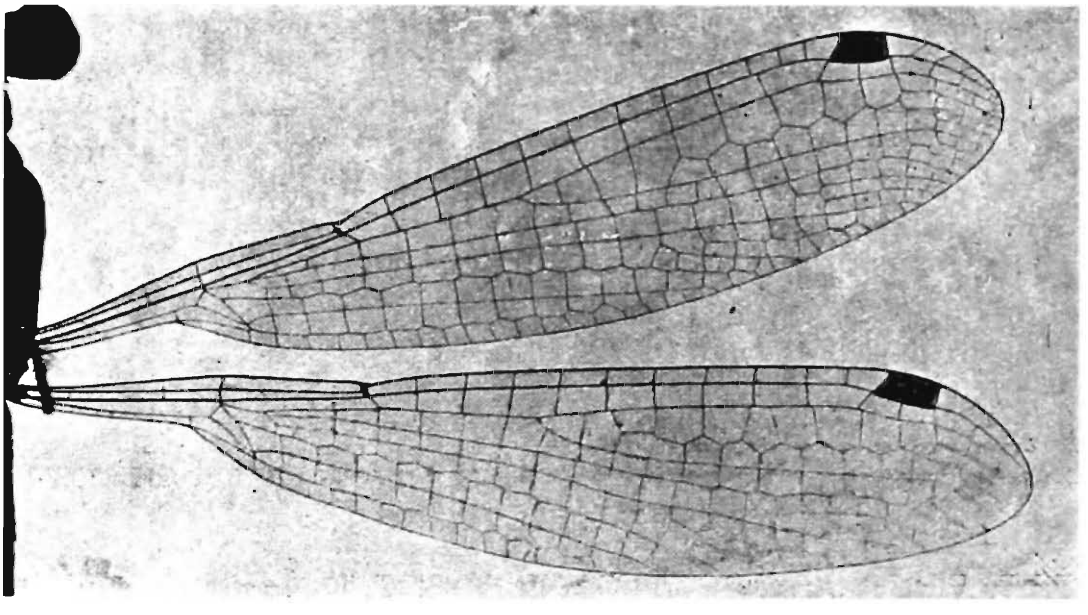
Lastly the colouring is not dissimilar though the male has black spots on the thorax not present in the type, and in general the male is not very unlike a *Platycnemis* in colouring and in the shape of the pterostigma.

This comparison with the type is made by de Selys. In the generic definition, however, he emphasises the point that the sub-nodal sector (*Ms*) is angulated, evidently in contrast with the non-

[1] I think Selys must have meant one and a half times.

angulated character of the same sector noted in his definition of *Sympycna* where it is said "le sous-nodal non anguleux ou à peine ondulé;" and of *Lestes* concerning which he makes the same remark.

Now an examination of the venation of the male specimen in question shows that the sub-nodal section (*Ms*) can scarcely be sharply contrasted with that of species of *Lestes* in that respect. Hence if the male be really conspecific with the type female the strongest character distinguishing the genus is anulled; the shape of the pterostigma alone is I think scarcely to be reckoned a generic character even though backed by certain sexual characters. Hence I prefer to leave the question of the identity of this fine specimen open, and hope that as it occurs in the neighbourhood of Calcutta examples of both sexes may soon be available for examination. I am, however, of the opinion that it is really the male of



TEXT-FIG. 4.—Venation of *Lestes* sp.(=?♂ *Platylestes platystyla* (Ramb.) from Calcutta.

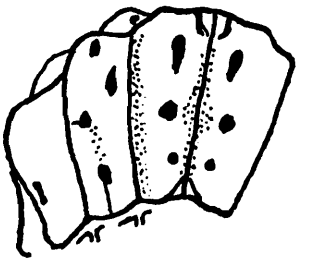
Platylestes platystyla. The following is a short account of the specimen:—

Wing petiolated to *Ac*, which lies about midway between level of Ax_1 and Ax_2. Pterostigma short, its inner margin more oblique than its outer, not twice as long as broad, a little inflated at the middle of its length, black, its outer and inner margins paler; covering two cells, and with a well-marked brace vein. Quadrangles of fore and hinder-wings similar, inner side nearly equal in length to upper. *Ms* becoming somewhat angled from the level of a point midway between nodus and pterostigma (scarcely more so than in other species of *Lestes*).

Head: Upper lip and eyes olive-green; the rest of the head a light grayish-yellow, with three small black spots on the post-clypeus, and black marks at the base of the antennae and immediately in front of the anterior ocellus.

Prothorax grayish white below.

Synthorax of the same colour, becoming milky white on the sides and below. On either side of the mid-dorsal carina lies a row of three small black spots, and on the side of the synthorax between the humeral and the second lateral sutures there are some four irregularly placed black spots; in addition a band of colour darker than the ground colour is found along the mid-dorsal carina, and a similar band lies in front of the humeral suture.



TEXT-FIG. 5.—Thoracic colour-pattern of *Lestes* sp. ♂ from Calcutta.

Legs gray-white. The articulations, cilia and a line along the posterior sides of the femurs black.

Abdomen olive gray, passing on the hinder segments gradually to a warm dark cinnamon brown. Segment 2 has an anterior and posterior pair of very small, black spots on either of the mid-dorsal carina.

Segments 2-6 have an apical narrow black ring, 3-6 have also a pale basal ring incomplete dorsally, and a second pale ring, likewise incomplete above, near the distal end of the segment. Between this second ring and the black apical ring there lies a pair of minute black spots, one on either side of the mid-dorsal carina.

Segment 7 has a basal pale ring and deepens gradually in colour to its apex, which has a narrow black ring; 8-10 are progressively darker in colour, each has, about at its middle, on either side of the dorsal carina, a fine white spot, and each is marked with a black apical ring.

Anal appendages: Upper pair nearly as long as segment 8. Basal fourth velvety black, the rest of their length milky white. Gently and regularly curving inwards to meet at their apices. On the inner side, at the end of the first third of their length, is a blunt projection, and at the end of the second third is a sharply pointed tooth directed backwards and inwards. The apex is bluntly rounded. Lower pair more than half the length of upper pair, meeting each other apically where they are upturned; rather spatulate. Each carries at its base on the inner side a somewhat tubercular projection extending for over one-third of its length.

It is evident that the anal appendages of this species differ strongly from other Indian species referred to the first Selysian section of the genus. This supports my belief that the specimen belong to a distinct sub-genus.

13. **Platylestes platystyla** (Ramb.).

Platylestes platystylus, Kirby, *Cat. Odonata*, p. 164.
See also remarks by de Selys in his paper "Odonates de Birmanie." *Ann. Mus. Civ. Genova.* X (XXX), p. 499 (1890—91).

14. **Lestes gracilis**, Selys.

Lestes gracilis, Kirby, *Cat. Odonata*, p. 163.
,, ,, *id.*, *Proc. Zool. Soc. Lond.*, 1891. p. 206.
,, ,, *id.*, *Journ. Linn. Soc. Zool.*, XXIV, p. 566.
,, ,, Ris, *Supplementa Entomol.*, No. 5, 1916, pl. i, fig. 4.

Dr. Ris has described (*loc. cit.*) three races of this species, viz. *L. gracilis birmanus*, Selys, described by de Selys very briefly in his *Odonates de Birmanie* under the heading of *L. divisa* (p. 495) and recorded by Ris also from Madura in S. India; secondly *L. gracilis gracilis*, Selys, from Ceylon, and lastly *L. gracilis peregrinus*, Ris, from Japan. He gives figures of the venation of the species. The anal appendages bear a fairly close general resemblance to those of *L. cyanea*, Selys.

15. **Lestes divisa**, Selys.

Lestes divisus, Kirby, *Cat. Odonata*, p. 163.
,, ,, *id.*, *Journ. Linn. Soc., Zool.*, XXIV, p. 566.
Nec Lestes divisa, Selys, *Ann. Mus. Civ. Genova* X (XXX), p. 495 (1890-91), (*fide* Ris).

Not in the Museum collection. I have not seen an example of this or of the preceding species.

16. **Lestes cyanea**, Selys. †

(Pl. V, fig. 8 and text-figs. 6, 7).

Lestes cyaneus, Kirby, *Cat. Odonata*, p. 163.

A. 5 ♂ ♂ 8 ♀ ♀ Kufri to Phagu, 8,000-9,000 ft., Simla Hills, 18-v-16, $\frac{2883}{H1}$

1 ♀ Same date and locality, $\frac{2885}{H1}$

1 ♂ Kufri, Simla Hills, May 1917, 8,000 ft. $\frac{7231}{H1}$

2 ♀ ♀ near pool on Tiger Hill, Darjiling dist., 3,300 ft. 26-vi-18, $\frac{1313}{H1}$

1 ♀ immature, with exuviae. Nam Ting Pokhri, Sending Spur, 4,600 ft., no date, $\frac{1315}{H2}$

1 ♂ Darjiling, 7,000 ft. (labelled by de Selys), $\frac{5667}{5}$

2 ♂ ♂ For. Zool. Coll. Chahullia, Takula, Kumaon, May and June 1912 (*D. Imms*).

B. 2 ♂ ♂ Sitong Ridge, Darjiling, alt. *circ.* 4,700 ft., 22—28-x-17, $\frac{8033}{H1}$

2 ♂ ♂ 2 ♀ ♀ 3 larvae. Nam Ting Pokhri, Sending Spur, 4,600 ft., 22-x-17, $\frac{8011}{H1}$

I have grouped these specimens in two series, the reason for which action I will explain in the sequel.

Dealing with series A in the first place. These specimens are all evidently typical examples of *L. cyanea.*

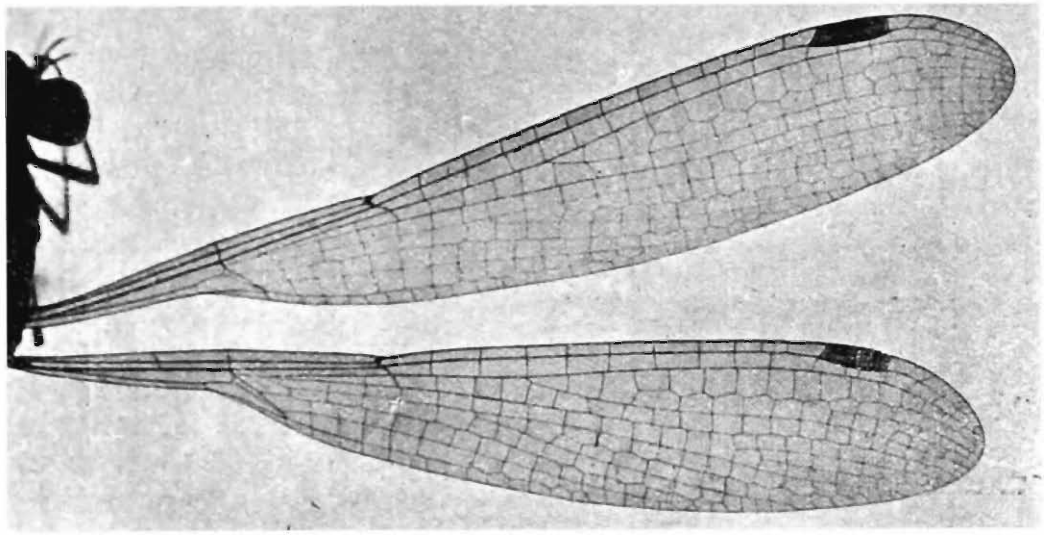
Below I give a short account of a male and female from the Simla Hills ($\frac{2884}{H_1}$) taken in May.

Pterostigma black, antenodals on front wing 12-13.

♂ *Head*: Upper lip and anteclypeus with bases of mandibles and genae pale bright blue, othewise dorsal surfaces black. Eyes gray-blue above passing to pale olive colour below.

Prothorax: Black dorsally, with a small median spot of bright blue, and a pair of lateral spots of the same colour. Ventrally greenish-white.

Synthorax: The dorsum is bronze-black with violet reflex. The mid-dorsal carina is finely marked with greenish-blue.



TEXT-FIG. 6.—Venation of *Lestes cyanea* ♂ from Sitong Ridge, Darjiling.

There is a narrow ante-humeral band of bright blue, limited externally by the humeral suture, and incomplete above. Laterally the colour is blue marked with a bronze-black band running upwards obliquely from the anterior half of the mesinfraepisternite, bounded anteriorly by the humeral suture. At its summit this band turns backward past the wing bases giving off a fine branch, which descends as a narrow black blue along the second lateral suture. The black band also encloses a small blue mark immediately behind the top of the humeral suture.

The wing bases themselves are marked with spots of blue; the under surfaces are pale greenish white.

Abdomen: Segments 1-6 vivid blue above, paler beneath, and marked with black as follows:—

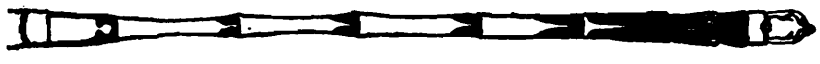
Segment 1 has a transverse basal line dorsally, and a pair of black lateral lines incomplete posteriorly; separating the bright blue of the dorsum from the paler ventral colouring.

Segment 2 has lateral bands of black meeting a fine black apical ring. These bands enclose the blue of the dorsum and are widened suddenly towards the hinder end of the segment so as nearly to cut off a small circular area of the blue from the rest of the blue colour.

Segments 3-6 have a very fine apical ring of black and apical lateral triangles, with their bases resting on the apical ring. These triangles are progressively longer from 3, where they occupy about one-sixth of the length of the segment to 6, where they occupy very nearly one-half. Segment 7 has the blue colouring so encroached on by the black lateral triangles that the blue is reduced to a basal ring from which a blue line runs black along the mid-dorsal carina. In 8 only the carina is left blue, and 9 is entirely black save for indication of a fine blue line at the base of the carina, 10 is blue, its marginal denticulations black.

Legs black anteriorly, greenish-brown posteriorly; tarsi and spines black.

Anal appendages: Upper pair about equal in length to segment 9 of abdomen; curved gently towards each other but at the apices curved outwards again, and rather acutely pointed. Each has at the end of its basal third a small internal blunt projection, and at about the junction of the middle and distal thirds a sharply pointed, backwardly directed spur. Lower pair one-quarter length of upper pair or less, bluntly conical, with rounded apices. (See pl. V, fig. 8.)



TEXT-FIG. 7.—Abdominal colour-pattern of *L. cyanea* Selys ♂. Not drawn to scale, Kufri 8,000 ft., May.

♀ *Head, prothorax* and *synthorax* with colour pattern identical with that of male, but the blue is replaced by a yellowish-green ground colour.

Abdomen: Segments 1-9 bronze-black above, greenish-white at the sides. Segment 1 has a median dorsal, squarish mark of light blue, 2 has a narrow median line of the same colour running along the dorsal carina, not quite attaining either end of the segment. Segments 3-7 have each of them a basal ring of blue immediately behind the basal margin of the segment, which is fairly ringed with black. The blue ring on 3 is very narrow, scarcely wider than the marginal ring of black. In the mid-dorsal line this blue ring is continuous with a very narrow blue line which runs along on either side of the mid-dorsal carina, which itself is exceedingly finely marked with black. On 4-6 the blue ring is progressively wider, in 6 it occupies the anterior fifth of the segment, and in each case it gives off a short median projection backwards, and is divided by the black blue of the mid-dorsal carina. In segment 7 the ring is rather of a bluish green colour, and it is narrower, equal only to about one-third of the width of that on segment 6.

Segments 8-9 are entirely bronze-black, and segment 10 is blue, its posterior margin with a deep angular incision (as also in the male) with a small basal spot of black, and small lateral spots of the same colour.

Legs as in the male, *anal appendages* white, shorter than the last segment.

Length of hinder-wing ♂ ♀ 24 mm., of abdomen ♂ 35+1·5 mm., ♀ 33 mm.

The specimens grouped under heading B have puzzled me greatly. They are all very immature, so much so that a specimen pinned for examination has shrivelled and has the abdomen hopelessly contorted. So far as I can make out they are all identical in structure, venation, and colour pattern with *L. cyanea*. But the *colouring* is different, the blue of *L. cyanea* being replaced by a shade of brown, which in the more nearly mature specimens is fairly dark.

Lastly as will be seen from the measurements given below the size is smaller. The pterostigma is brown.

Again the time of year when these specimens were taken was later than that on which the specimens of series A were caught for the most part, and the elevation less; October as against May, June, and 4,600 ft. as against 8,000 ft.

However, lately I have received from Dr. Annandale ♀ ♀ $(\frac{1313}{H2})$ from Tiger Hill, Darjiling, which are typical *L. cyanea* from a height of only 3,300 ft. and a very immature ♀ $(\frac{1315}{H2})$ probably taken about the same date (June) which in colouring shows little difference from the immature females of series B. Hence I conclude on present evidence, that probably the B series are merely young examples of *L. cyanea* that have not attained the adult pigmentation; and that the smaller size of the single ♂ fit for measurement is possibly due to incomplete expansion of the wings.

But it would be well worth while for collectors on the spot to determine whether or not there exists any seasonal form such as is possibly indicated by these specimens.

The wing figured and the anal appendages of the male are both taken from the least immature male of series B. As already stated I can find no structural differences separating them from series A.

Length of hinder-wing ♂ 22 mm., of abdomen *c.* 33 mm.

17. **Lestes** sp. †

(Text-fig. 8.)

2 ♀ ♀ Cherrapunji, Assam, 4,400 ft., 8-x-14, $\frac{8204}{20}$.

Length of abdomen 23·5 mm., of hinder-wing 19 mm.

These interesting little specimens are exceeding like a *Sympycna* in appearance. Mr. H. Campion, who was kind enough to

examine one of them for me, expressed the opinion that it bore a strong resemblance to that genus. This is in fact the case; the simple posterior margin of the prothorax and the shape of the pterostigma being the most important structural characters which separate it. The specimens are I think certainly very closely related to *L. bilineata*, Selys, but show some differences in detail.

Wings: Very narrow, hyaline with an uniform brown tinge, and with dark brown venation. Pterostigma bicoloured, its inner three-quarters dark brown, the outer quarter and the distal marginal vein yellowish white. This vein is much less oblique than is the inner marginal vein. The pterostigma is about three times as long as it is broad.

Ratio of greatest breadth of wing to greatest length about 1 : 5.

Head: Anterior surfaces yellow, dorsal surfaces including the post clypeus bronze-black, margin of occiput finely lined with yellow, posterior surface bronze-black.

Prothorax: Anterior lobe yellow, middle lobe yellow with a large bronze-black spot on either side, posterior lobe bronze-black, yellowish-white below.

Synthorax: Pale brownish-yellow, almost white below. On the dorsum is a broad bronze-black band with violet reflex, not separated so far as colour goes from its fellow of the opposite side by the mid-dorsal carina. This band is widened a little at about the middle of its height, and again at its upper end, where it lies against the ante-alar sinus. There are also three small isolated black spots on either side on the mesepimerite.

Abdomen: Pale brown passing to yellowish-white below.

Segment 1 has a square dorsal patch of bronze-black; 2 has a bilobed band of the same colour, contracted at its middle, and with its hinder lobe bifid. Segments 3-5 have each a pair of antero-latera and postero-lateral bronze-black spots, the anterior pair on 5 being very small.

TEXT-FIG. 8.—Colour pattern of segments 2-3 of abdomen of *Lestes* sp. ♀ from Cherrapunji.

Segments 6-9 are without definite markings, but the brown colour of the dorsum is definitely darker than in the preceding segments and has a slightly metallic lustre. Segment 10 is yellowish white as are the anal appendages, which are cylindrical and a little shorter than the last segment. This latter has its posterior margin very shallowly angulate

Legs: Long, the third femur when adpressed reaching to the base of the first abdominal segment. Colour pale brown, the anterior surface of the tibia, the distal half of the anterior surface of the femur, and the tarsal claws brownish black. Tibial spines exceeding in length the tarsal claws.

18. **Lestes ? bilineata,** Selys.

Lestes ? bilineata, Selys, *Ann. Mus. Civ. Genova.* X (XXX), pp. 498—499. (1890—91).

A ♀ specimen in the British Museum labelled as *Lestes ? bilineatus*, Selys is evidently closely allied to the species last described. Unfortunately I have not had time to make a full examination of this individual, which is from Burma.

19. **Lestes (Sympycna) paedisca,** Everson. race. †

Sympycna paedisca, Kirby, *Cat. Odonata*, p. 164.
,, ,, Förster, *Wien Entomol. Zeit.* XIX, p. 256—267, pl. iii, figs. 1-7 (1900).
,, ,, Barteneff, *Ann. Mus. Zool. St. Petersburg*, XVI (1912-13).
Lestes paedisca, Ris, *Supplement. Entomol.*, No. 5, 1916.

4 ♂ ♂ 6 ♀ ♀ Jhelum Valley, Kashmir, 5,000 ft. (*H. T Pease*) 1916, Zool. S. Ind.

These specimens all agree very closely with the form described by Barteneff as *S. paedisia*, approximating to *S. gobica*, Förster.

Ris (*loc. cit.*) makes some observations on the sections of the genus *Lestes*, which I have not yet had an opportunity of studying.

EXPLANATION OF PLATE V.

Anal appendages and terminal segments of abdomen of males viewed from above. All the figures are × 7½.

FIG. 1.—*Lestes umbrina*, Selys, from Chota Nagpur.

,, 2.—*Lestes nodalis*, Selys, from Burma (from specimen in British Museum).

,, 3.—*Lestes thoracica*, n. sp., type-specimen collected by Dr. Hankin at Agra.

,, 4.—*Lestes viridula*, Ramb., specimen from Gomdumri, Bhandara, C. P., collected by Dr. Imms. (Ind. For. Zool. Coll.)

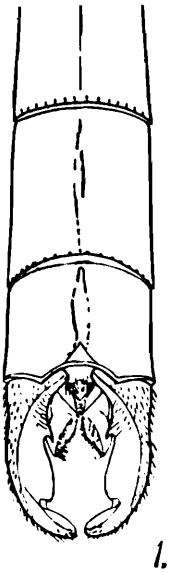
,, 5.—*Lestes elata*, Selys, specimen from Bangalore.

,, 6.—*Lestes praemorsa*, Selys, from Sibsagar.

,, 7.—*Lestes* sp. (?=*Platylestes platystyla* (Ramb.), specimen from Calcutta.

,, 8.—*Lestes cyanea*, Selys, specimen from Darjiling (B).

(For the photographs of venation in the text I am indebted to Messrs. H. and F. E. Campion to whom I wish to express my obligation. The other text-figures are diagrammatic. For the figures in the plate I am obliged to Mr. Highley of the British Museum.).



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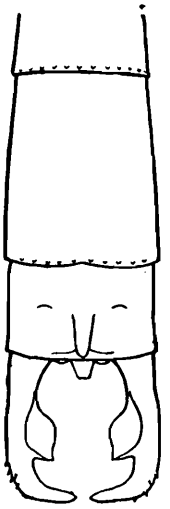

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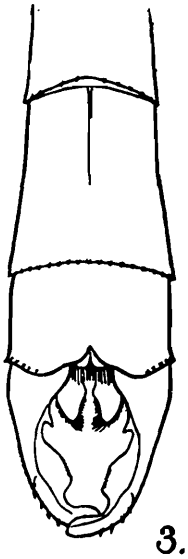

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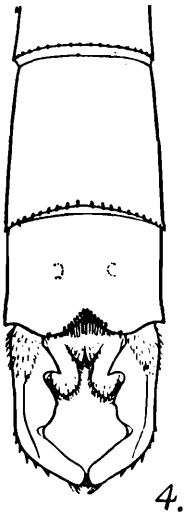

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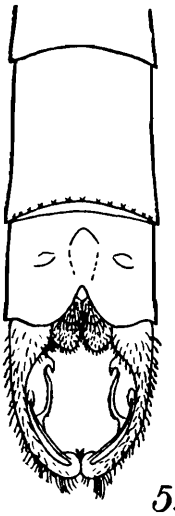

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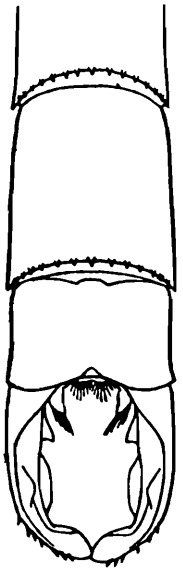

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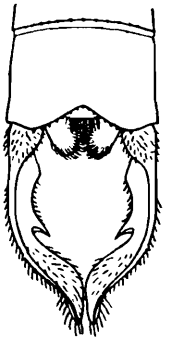

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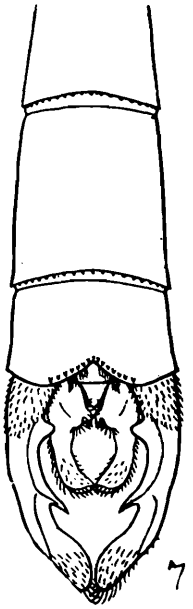

7

XIX. NOTES ON LAMELLIBRANCHS IN THE INDIAN MUSEUM.

(Plate IX.)

By B. PRASHAD, *D.Sc., Assistant Superintendent, Zoological Survey of India.*

1. *ARCIDOPSIS FOOTEI* (THEOBALD).

Theobald in 1876 [1] described a peculiar species of Unionid from the Gutparba Falls, Kistna River, under the name *Unio footei*. His Latin description, drawn up from two specimens with much decayed beaks, is incomplete in many respects. The existence of the type-specimens is very doubtful, and Theobald's incomplete description was all that was available to Simpson [2] at the time of the preparation of his synopsis of the Naiadae. The peculiarities of shell-structure mentioned in Theobald's description led Simpson to create a new genus (*Arcidopsis*) for this species, but he added the following qualifying foot-note:—"Unfortunately Theobald's Latin description is not at all complete. No laterals are mentioned and he says nothing of the color of the epidermis or of the nacre. The beaks were too much worn in his specimens to give any characters. The shell resembles some of the Arcas of the *Barbatia* group, and may not belong to the Unionidae at all." The concluding remark seems to be due to Theobald making a casual comparison between the shape of this species and that of *Arca subtorta* in the note following his description. Preston's [3] description is merely a verbatim copy of the accounts in Theobald's and Simpson's works; he even ignored two more recent memoirs that refer to this species. The first of these is the incomplete monograph of Unionidae by Haas,[4] in which the author, besides reproducing the description and the two figures in Theobald's paper, gives a full description with three figures of a shell from Mysore, preserved in the Frankfürt Museum. This specimen Haas assigns doubtfully to Theobald's species. It is, however, clear from this description and the rather poor figures of the hinge, that the specimen does not belong to this species but is probably an *Indonaia*. The second work is an elaboration by Simpson[5] of his "Synopsis." In this monograph he gives

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[1] *Journ. As. Soc. Bengal*, XV, p. 187, pl. xiv, figs. 9, 9a (1876).
[2] *Proc. U. S. Nat. Mus.* XXII, p. 861 (1900).
[3] *Faun. Brit. Ind. Freshw. Moll.*, p. 196 (1915).
[4] Mart. and Chemn., *Conch. Cab.* ed. Küster, *Die Unioniden*, pp. 119-121, pl. xi, figs. 2-4 (1910-1914).
[5] *Desc. Cat. Naiades*, III, pp. 1191-1192 (Michigan, 1914).

as complete an account of *A. footei* as can be adduced from Theobald's description and figures. He also includes in the references (without any comment, however,) the monograph by Haas cited above.

It is, therefore, of interest to be able to record the discovery of two complete young shells and the left valve of a full-grown specimen in the collections of the Zoological Survey of India. These can be assigned definitely to this species and may, owing to uncertainty as to the existence of the original types, be taken as the *neotypes* of *A. footei*.

The specimens were collected by Dr. F. H. Gravely in April, 1912, at Taloshi in the Koyna valley, Satara District, Bombay Presidency, at an altitude of about 2,000 feet.

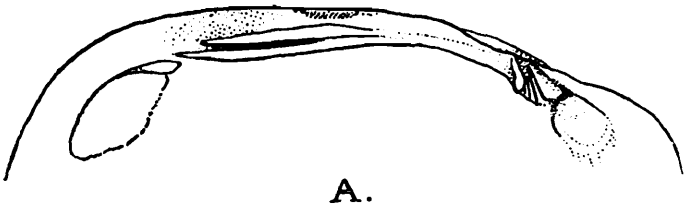
The locality "Gutparba falls" may be considered here. No falls of this name are known on the Kistna River, but a tributary of the Kistna is known as the Ghatprabha and it is evident that the name Gutparba is only an old way of spelling Ghatprabha. The course of this stream is described in the Gazetteer[1] of the Bijapur District as follows:—"The Ghatprabha rises near the edge of the Sahyádris almost twenty-five miles west of the town of Belgaum. After an easterly course of about 140 miles through Belgaum and the Southern Marátha states, it enters Bagálkot three miles north of Kaládgi. Through Bagálkot it runs nearly east for about twenty miles, and then immediately below the town of Bagálkot turns suddenly north. Between Bagálkot and Yerkal, about five miles north of Bagálkot, it forces its way through two chains of hills, a pretty country with picturesque views of hills and water. Beyond the second range it enters the Krishna valley and falls into the Krishna about fifteen miles to the north-east opposite Chimalgi." The Koyna valley lies to the north-west of the Ghatprabha valley, and the Koyna, another tributary of the Kistna, flows through it. Dr. Gravely's specimens therefore extend the range of the species, but not beyond the river-system from which it was originally described.

Theobald's description of the shell of *A. footei* is incomplete, and the following description, based on the Koyna valley specimens, is therefore given:—

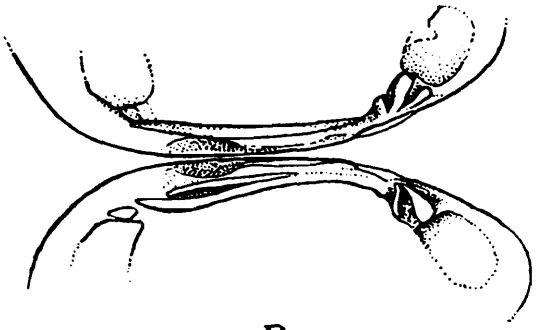
Shell moderately large and thick; elongate, subrhomboidal, very inequilateral. The dorsal and ventral outlines are nearly straight and parallel in the young, but owing to an antero-downward slope of the dorsal side become greatly inclined in the adult thereby greatly reducing the length of the anterior margin. Anterior margin strongly truncated above, rounded below; posterior margin truncated above and also truncated below in the young, but evenly rounded in the adult. A small but distinct posterior wing, better marked in the young than in the full-grown specimens. Umbonal region prominent, slightly swollen and

[1] *Gazetteer of the Bombay Presidency—Bijapur*, by J. M. Campbell (Bombay, 1884).

opposed in the young, becoming depressed and less marked in older specimens; sculptured with numerous low corrugated ridges arising from an eccentrically situated nucleus, and radiating outwards on the two sides but more or less parallel in the middle region; a few very minute striae also run transversely in this region. Older specimens with the beak much eroded and bleached and showing barely any striations. Shells swollen in the middle but depressed in front, below and behind. Periostracum coarse, with strong vertical ridges in the young radiating outwards, some with a well marked **V**-shaped course. In adult shells the striations less marked but distinct; a few minute transverse concentric ridges



A.



B.

FIG. 1.—*Arcidopsis footei* (Theobald).

A. Hinge of the left valve of adult specimen, $\times 1\frac{1}{2}$.
B. Hinges and scars of the young specimen, $\times 2$.

also visible in both young and adults; regions of growth well marked. Periostracum of a yellowish brown colour with a few light green striae along the vertical striae, specially distinct in the young specimens. Nacre pearly white, iridescent. Hinge strongly developed; pseudocardinals three in the right valve with the middle tooth best developed, two in the left, the outer being much the larger; all these teeth vertically striate in adult shells. Laterals lamellar, nearly straight, one in the right, two in the left valve, in which the lower ridge is better developed, being longer and stouter than the upper. Muscular scars moderately impressed; anterior scars confluent, posterior scars distinct. Pallial line distinct though not deeply marked.

Measurements of Shells (in millimetres).

	A.	B.	C. (Single left valve).
Length	17·1	25·2	43·4
Breadth	10·2	13·8	23·2
Height	7	8·5	7·1

Shells. No. M $\frac{7673}{1}$, M $\frac{7675-6}{1}$, Zoological Survey of India (*Ind. Mus.*).

Relationships. Simpson's remark quoted already regarding the mollusc being doubtfully a Unionid is not justified in view of the specimens now discovered. The genus *Arcidopsis* has a superficial resemblance to another Indian genus, *Trapezoideus*, Simpson, but there does not seem to be any true relationship. It is, however, impossible to discuss its true position until the anatomy has been investigated. I do not agree with Haas (*loc. cit.*) in considering *A. footei* as probably being congeneric with species like *Trapezoideus misellus* (Morelet), for the specimens before me more distinctly show that they do not belong to the genus *Trapezoideus*, the resemblance with this genus being purely superficial.

2. *LAMELLIDENS JENKINSIANUS* (BENSON) AND ITS SUBSPECIES.

In his catalogue of the Asiatic Naiades in the Indian Museum[1] Preston described a new species of the genus *Parreyssia*, Conrad, from a single dead shell from Dacca, Eastern Bengal. This form he named *P daccaensis*. His description of the species is very short, being only a comparison with *P. jeddeni* (Theobald), to which he considered it to be closely allied. In his later work[2] in the "Fauna" series he did not add anything to his original description, but published figures of the type-shell. In Simpson's "Catalogue,"[3] which was published before the "Fauna" volume, Preston's original description is included without comment.

Whilst identifying a small collection of Unionids made by myself and Babu D. N. Sen, of the Bengal Fisheries Department, at Dacca and other places in the vicinity, I found on examining the type-specimen of *P. daccaensis* that the shell did not belong to the genus *Parreyssia* and that Preston was certainly mistaken in describing it as a new species of that genus. With the above-mentioned collection from the type-locality and other places in the district of Dacca, as also the large collections in the Indian Museum, I have been led to the following conclusions :— (1) Preston's *P. daccaensis* is a young shell of a highly peculiar but hitherto unrecognized form of Benson's *Unio jenkinsianus*,[4] (2) Benson's *Unio jenkinsianus* is not a distinct species of the genus *Lamellidens*, as Simpson doubtfully believed, nor is it an abnormal form of *L. marginalis*

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[1] *Rec. Ind. Mus.* VII, p. 300 (1912).
[2] *Faun. Brit. Ind. Freshw.-Moll.* pp. 65, 66, figs. 16, 1—3 (1915).
[3] *Descr. Cat. Naiades*, p. 1114 (Detroit, Michigan, 1914).
[4] *Ann. Mag. Nat. Hist.* X, p. 185 (1862).

or *L. corrianus* as Hanley and Theobald[1] considered the unique type before them to be. It is indeed a form closely allied to *L. marginalis* through Hanley and Theobald's var. *obesa*. I cannot agree with Preston in regarding *L. jenkinsianus* as a subspecies of *L. marginalis*, and (3) the form *Unio marginalis* var. *obesa* of Hanley and Theobald must be considered as a species distinct from *L. marginalis* on both anatomical and malacological grounds. It is a large, rather thick-shelled form which appears to be very like the ancestral form, from which the thick-shelled forms *obesa*, *jenkinsianus* and *daccaensis* have been evolved. It shows only a slight modification from the closely allied *L. marginalis*, with which it has up to now been confused.

The ancestral type of shell in this group of series is the form to which Hanley and Theobald gave the name *obesa* in 1876. They did not properly describe the form but published the following note in the explanation of their plate;— "A giant form, which does not exhibit the ochraceous band, and is peculiarly swollen. It comes between the var. *lata* and the typical form. The upper anterior tooth is almost linear; the lateral are not bent at the extremity and the upper one in the left valve is scarcely developed." Their figure of the shell imperfectly shows the hinge in the right valve only, but this and the outline and form of the shell as shown in the full-size figure of the left valve are quite enough for distinguishing the form. Neither Preston nor Simpson added anything to the above meagre description. Benson's name *jenkinsianus* was given fourteen years earlier, but the form to which he assigned this name is only subspecifically distinct from Hanley and Theobald's *obesa*. Under the circumstances our only course is to describe *obesa* as a subspecies of *jenkinsianus*, which, owing to the priority of Benson's name, has to be taken as the name of this group of forms. Preston's name *daccaensis* is retained for the rather peculiar subspecies noted already, as a young shell of it was given this name. The relationships of these forms with one another and of the group as a whole with *L. marginalis* may be expressed as follows:—

L. jenkinsianus subsp. *daccaensis*.

|

L. jenkinsianus.

|

L. jenkinsianus subsp. *obesa*.

|

L. marginalis.

In a recent paper[2] Dr. Annandale and I described a Unionid from Seistan under the name *L. marginalis* subsp. *rhadinaeus*.

[1] *Conch. Ind.* p. 19, pl. xli, fig. 4 (1876).

[2] *Rec. Ind. Mus.* XVIII, pp. 59—62, fig. 9 (A,B), pl. iii, figs. 9, 10; pl, viii, figs. 7—11 (1919).

We remarked on the resemblance of the hinge of this form to that of *L. jenkinsianus*. This resemblance is, however, superficial only, for the pseudocardinal teeth in *rhadinaeus* are much thinner and broader than in *L. jenkinsianus* and the laterals are not so well developed. The shape of the shell also is different resembling more the true *L. marginalis* than any of the forms of *L. jenkinsianus*.

Photographs of typical specimens of different forms of the latter are given on pl. IX, and of the hinge-teeth of the three forms in text-fig. 2.

Lamellidens jenkinsianus (Benson) subsp. **obesa** (Hanley and Theobald).

(Pl. IX, figs. 1, 2.)

1877. *Unio marginalis* var. *obesa*, Hanley and Theobald, *op. cit*, p. 20, pl. xliii, fig. 3.

I describe this subspecies before the typical form of the species since the shell is of a more central type and this treatment of the species makes it easier to understand the relationships of the different forms.

The shell in this species is elongate, subelliptical, posteriorly produced into a spatulate process about the middle line of the shell; rather thick, convex and greatly inflated; beaks rather small but swollen, incurved and meeting in the middle line above, with low somewhat curved corrugations in the young but eroded in full-grown specimens; surface marked with low concentric ridges corresponding to the regions of growth. Dorsal slope nearly straight in young but truncated anteriorly in adults, ventral margin straight or only slightly sinuate in its anterior part, curving up in a regular slope posteriorly to form the lower border of the spatulate process; anterior margin broad, regularly curved; posterior margin narrow, rounded; posterior ridge straight or slightly curved and with a narrow post-dorsal wing. Epidermis yellowish to dark brown in the young, becoming dark brown or even black sometimes intersparsed with yellowish-brown concentric bars in the adult. Right valve with two lamellar pseudocardinals, of which the lower is well developed, strong and rugose, in some specimens more so than in others, and a single lamellar lateral, which is rather long, originates from just below the beak and is only slightly arched. Left valve with a well developed pseudocardinal, thick and more ragged than those of the right valve and lying in front of the beak, another pad-like tooth originating from underneath the beak itself is also present, and two blade-like slightly arched laterals of which the upper does not extend to the beak. Muscle-scars shallow, but more impressed than in *L. marginalis*; anterior ones separate, posterior confluent. Ligament very long and strongly developed. Nacre bluish tinged with salmon, in young specimens showing a purple band along the edge, iridescent.

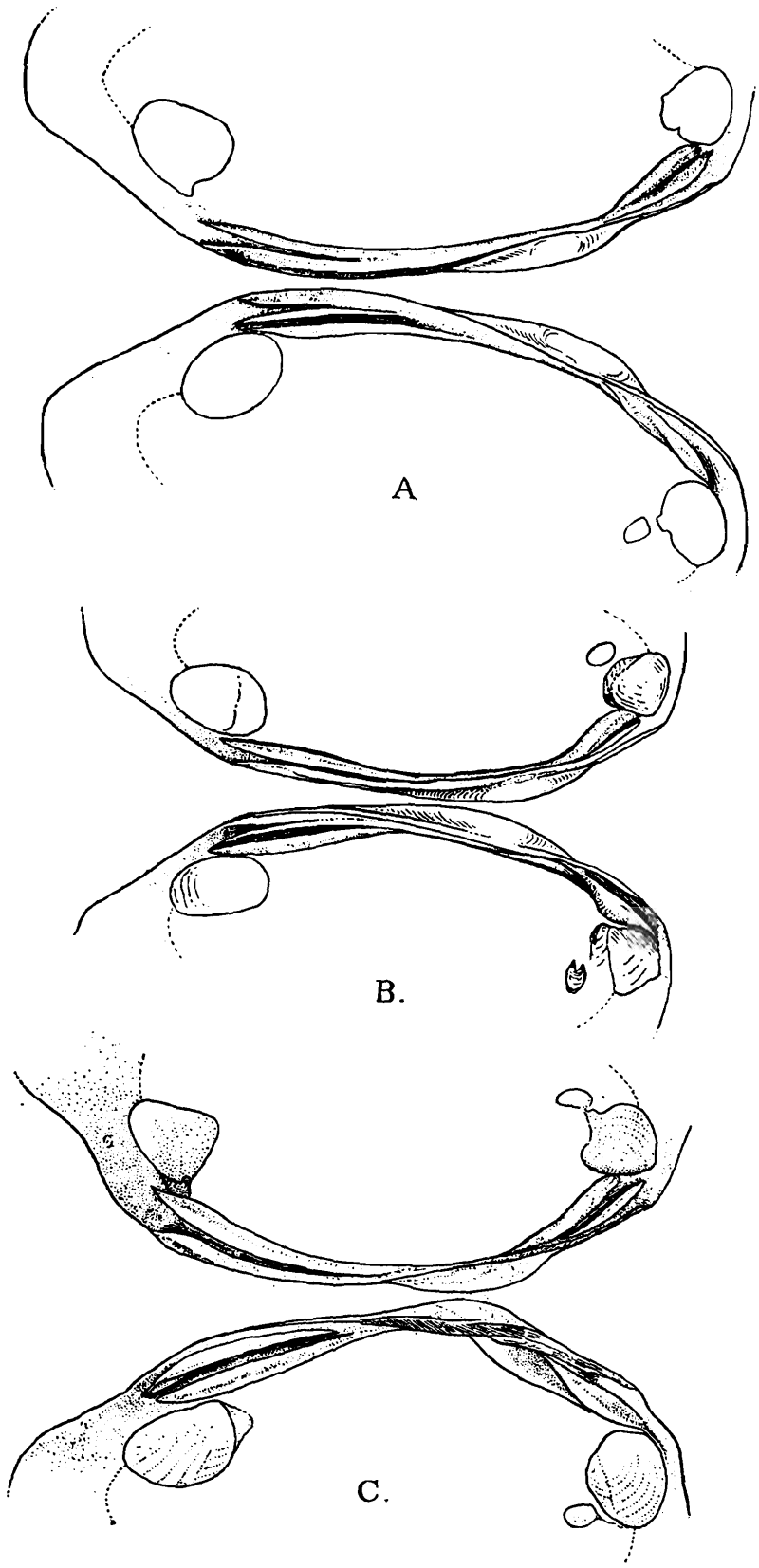

FIG. 2.—Hinge-teeth of *Lamellidens jenkinsianus* and its subspecies.
A. *L. jenkinsianus* subsp. *obesa*, shells from Upper Assam,
B. *L. jenkinsianus* (s.s.), shells from Upper Brahmaputra, Assam.
C. *L. jenkinsianus*, subsp. *daccaensis*, shells from Mirpur, Dacca District.

In a previous paper[1] I referred to the soft-parts of this form and included a description and drawing of its glochidium. A few further notes are here included. The inner pair of gills are much broader than the outer, and the outer pair of gills alone is marsupial. The palpi are elongate but rather shorter than in *L. marginalis*. The foot and the adductor and retractor muscles are very well developed. The branchial is double the size of the anal, which is of about the same size as the supra-anal. The animal on the whole has a much heavier build than that of *L. marginalis* and differs from it fundamentally in the outer pair of gills alone being marsupial.

The species though closely allied to *L. marginalis* differs from it in the heavier build of the shell, in the umbones being larger, more prominent and swollen, and in the hinge being more highly developed.

Hanley and Theobald's specimens of this form were obtained from the Irrawady river in Burma, but the species has a much wider range in Burma, Assam and Eastern Bengal. In the Indian Museum collection it is represented by specimens from Tonghoo, Burma; Silchar, Cachar and Sylhet, Assam; and from Chittagong and Dacca, Eastern Bengal.

Lamellidens jenkinsianus (Benson).

(Pl. IX, figs. 3, 4.)

1862. *Unio jenkinsianus*, Benson, *Ann. Mag. Nat. Hist.* X, p. 185.
1876. *Unio jenkinsianus*, Hanley and Theobald, *op. cit.* p. 19, pl. xli, fig. 4.
1900. *Lamellidens jenkinsianus*, Simpson, *Proc. U. S. Nat. Mus.* XXII, p. 857.
1914. *Lamellidens jenkinsianus*, Simpson, *Descr. Cat. Naiades*, pp. 1176, 1177.
1915. *Lamellidens marginalis*, subsp. *jenkinsianus*, Preston, *op. cit.* p. 184.

Benson's and Simpson's descriptions are fairly complete so far as the form of the shell is concerned, but as the peculiarities of the hinge have not been noticed by either author they are described here. Right valve with two pseudocardinals, of which the lower is rather long, extending from close above the scar of the anterior adductor muscle to the middle of the beak; it is very thick and heavily built, sometimes a little curved and very ragged; the upper one is usually thin and does not extend so far. There is a single blade-like lateral, rather shorter in the typical form but thicker and a little more arched. Left valve with a single pseudocardinal and a small pad-like tooth arising from the inner margin of the beak, and two lamellar teeth of the same type as in the typical form but thicker.

This form differs from the subsp. *obesa* in being less inflated and less deep but more solid and relatively more elongate, in the muscle-scars being more impressed and the hinge much more strongly developed.

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[1] *Rec. Ind. Mus.* XV, p. 145, fig. 1*a* (1918).

The specimens which I assign to this form are from the Upper Brahmaputra (Tezpur), Assam, and a few from Dacca, Eastern Bengal in the district in which the Ganges and the Brahmaputra are closely adjacent.

Subsp. **daccaensis** (Preston).

(Pl. IX, figs. 5-8.)

1912. *Parreyssia daccaensis*, Preston, *Rec. Ind. Mus.* VII, p. 300.
1914. *Parreyssia daccaensis*, Simpson, *op. cit.* p. 1114.
1915. *Parreyssia daccaensis*, Preston, *op. cit.* pp. 165, 166, figs. 16 (1-3).

Preston's species was founded on a single young shell, but in the Indian Museum collection there are now a large number of specimens of this species from Dacca and Mirpur, Eastern Bengal, a young shell from Bhagalpur, Bengal, and many shells from Sylhet, Assam.

The species resembles the typical form but is much shorter, broader, more convex, much more swollen, with the umbones more distinct and convex, with the upper margin very much more arched and the hinge still more strongly developed. The pseudocardinals and the lateral teeth are both much stouter and thicker, and the former are in many cases so striate and ragged as to recall the condition in the genus *Parreyssia*. The second or posterior pseudocardinal of the left valve, which projects from the margin of the beak about its middle, has become larger, somewhat subtriangular in outline and has assumed a real tooth-like shape. In some shells the spout or the spatulate process on the posterior margin described in the subsp. *obesa* is more marked than in others, but in this form it is situated a little below the middle line.

It may be pointed out here that the system of hinge-teeth of this form is not at all like that of *Parreyssia feddeni* (Theobald) as Preston thought. Unfortunately Theobald's original description of the hinge of *P. feddeni* is incomplete in that he describes the pseudocardinal as "in valve dextro singulo," whereas there is a second much thinner ridge above the thick and larger lower pseudocardinal. Preston did not point out this inaccuracy in describing the teeth of his species as similar to those of *P. feddeni*.

It is also of interest to note in connection with the thick-shelled Unionids of the group of *L. jenkinsianus* and its subspecies considered above, that their shells are of great economic importance in the provinces of Bengal and Assam. They form the greater part of the raw material for the pearl-button industry and are also burnt in large quantities for making lime.

EXPLANATION OF PLATE IX.

Photographs of *L. jenkinsianus*, and its subspecies.

Lamellidens jenkinsianus, subsp. *obesa* (Hanley and Theobald).

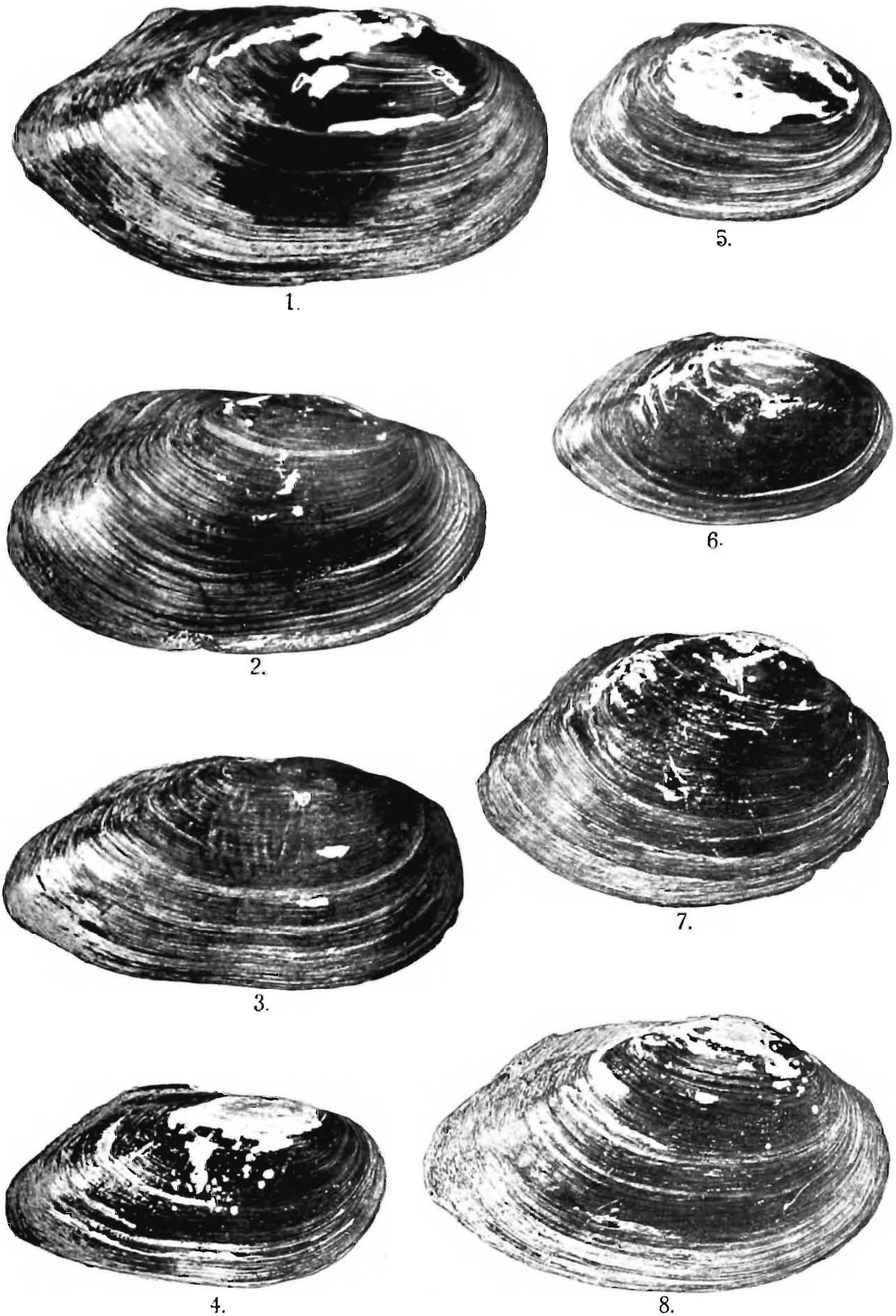
FIG. 1.—Adult shell from Tonghoo, Burma.
,, 2.—Adult shell from Sylhet *Bhils*, Assam.

Lamellidens jenkinsianus (Benson).

FIG. 3.—Adult shell from Upper Brahmaputra, Assam.
,, 4.—Adult shell from Dacca, Eastern Bengal.

Lamellidens jenkinsianus, subsp. *daccaensis* (Preston).

FIG. 5.—Young shell from Dacca, Eastern Bengal; type of *Parreyssia daccaensis*, Preston.
,, 6.—Young shell from Bhagalpur, Bengal.
,, 7.—Adult shell from Sylhet *Bhils*, Assam.
,, 8.—Adult shell of an elongate type from Dacca district, Eastern Bengal.



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2.

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3.

4.

8.

S. C. Mondul, photo.

LAMELLIDENS JENKINSIANUS
and its subspecies.

XX NOTES ON VIVERRIDAE.

By H. C. ROBINSON AND C. BODEN KLOSS.

The Director of the Zoological Survey of India has submitted to us a series of this family, mainly from the immediate vicinity of Calcutta, and we have therefore examined the whole of the material in our collection. The Indian and Indo-Malayan forms we are able to recognize are:—

Genus **Viverra** Linn.

Viverra zibetha zibetha, Linn.	North Peninsular India, Himalayas.
Viverra zibetha pruinosa, Wroughton.	Burma, Tenasserim, S.W and S. E. Siam.
Viverra zibetha sigillata, subsp. nov.	South Malay Peninsula.
Viverra megaspila megaspila, Blyth.	Burma, Siam, Malay Peninsula.
Viverra megaspila civettina, Blyth.	South India.
Viverra tangalunga tangalunga, Gray.	Malay Peninsula, Borneo, Sumatra.
Viverra tangalunga lancavensis, subsp. nov.	Langkawi Id., Straits of Malacca.

The races may be recognised by the following key:—

1.	White tail rings unbroken above	2
	White tail rings interrupted above	4
2.	Pattern distinct	*V. z. sigillata.*
	Pattern indistinct	3
3.	General colour greyer	*V. z. zibetha.*
	General colour yellower	*V. z. pruinosa.*
4.	Dark bars on tail less than ten	5
	Dark bars on tail more than ten	6
5.	Markings on flanks and haunches confluent; black on tail less extensive	*V. m. megaspila.*
	Markings on flanks and haunches discrete; black on tail more extensive	*V. m. civettina.*
6.	Spots on body and rings on tail more conspicuous; general colour darker	*V. t. tangalunga.*
	Spots on body and rings on tail less conspicuous; general colour paler	*V. t. lancavensis.*

Viverra zibetha zibetha, Linn.

There are three recent specimens from Calcutta which are typical of the form inhabiting the plains of Northern India.

Another from Darjiling has the pelage softer and more woolly as might be expected from the climatological conditions: it represents *V undulata*, Gray (*Spic. Zool.* pl. 8, p. 9) which, however, we are not at present prepared to recognize. The same type of animal is found in the Abor Hills. Another specimen without locality (Zool. Survey India No. 10,391) is indeterminable subspecifically: the flanks are distinctly marked, but there is a tendency to interruption of the white tail bands.

V z. picta described by Wroughton on the same page, but before *V z. pruinosa* (*postea*), and based on animals from Khamti, Upper Chindwin, Burma, has since been withdrawn by that author (*op. cit.*, XXVI, 1918, p. 46). It must, presumably, be regarded as synonymous with *V z. zibetha*.

Viverra zibetha pruinosa, Wroughton.

Journ. Bombay, Nat. Hist. Soc. XXIV, 1915, p. 64 (Tenasserim).

Mr. Wroughton appears to have inadvertently reversed the characters of this subspecies. So far from being greyer and less yellowish than the typical race, specimens from Tenasserim and neighbouring districts are invariably more yellow and less grey. We are in possession of two paratypes; also an example from Koh Lak, S.W Siam, in the same latitude, and another from Sriracha, S.E. Siam, a little to the north on the opposite side of the Gulf of Siam.

Viverra zibetha sigillata subsp. nov.

Viverra zibetha pruinosa, Kloss (*nec* Wroughton), *Journ. Nat. Hist. Soc. Siam*, II, 1917, p. 292

Type. Adult male (skin and skull): Bang Nara, Patani, Peninsular Siam, collected by Messrs. W J F. Williamson and M. A. Smith's native collector. 16th July, 1916. No. 2477/C.B.K.

Differs from the two other races in having the pattern above clearly defined; the forelimbs with a distinct tendency to bars and the under surface with dark blotches and markings more defined on the flanks. External measurements (taken in the flesh):—Head and body, 818; tail, 435; hindfoot (without claw) 121; ear, 51mm. Skull measurements:—greatest length, 142; basal length, 130; zygomatic breadth, 67·5; breadth of brain case, 39; maxillary tooth row exclusive of incisors (alveoli) 53; greatest length of upper sectorial, 14·7 mm.

Specimens examined. The type; one from Pelarit, Perlis; two from Perak (Temangoh and Taiping) and two from Selangor (Kuala Lumpur).

Viverra megaspila megaspila, Blyth.

Two adults from Taiping and Kuala Lumpur. The black spots on the sides and haunches stand out with great distinction

on a deep buff ground. The type, which is no longer in existence, came from near Prome, North Pegu, Burma.

Viverra megaspila civettina, Blyth.

We have examined the skull of the type and a flat skin with no exact provenance (Zool. Survey India. No. 10,394). The latter differs from *M megaspila* only in having the marks on the haunches more confluent, the spots on the sides smaller, the erectile mane carried further up the neck and the tail rings much larger.

In the type skull the posterior upper premolar is larger than in either *V zibetha* or *V m. megaspila* and the anterior upper molar is also larger and more quadrate in outline than in other species: the bullae are highly compressed. All these characters, however, may be purely individual and series of the south Indian animal are highly desirable.

Viverra tangalunga lancavensis subsp. nov.

Type. Adult female (skin and skull) from Batu Puteh, Langkawi Id., Straits of Malacca, 8th December, 1912. Collected by H.C. Robinson and C. Boden Kloss. F.M.S. No. 542/12.

Differs from Peninsular Malayan and Bornean animals in having the ground colour distinctly paler and less buffy and in having the spots on the body and rings on the tail reduced in size and less conspicuous. External measurements taken in the flesh:—Head and body, 650; tail, 342; hindfoot, 103; ear, 30;

Skull measurements:—greatest length, 130; basal length, 111; zygomatic breadth, 61; maxillary tooth-row exclusive of incisors (alveoli), 47; greatest length of upper sectorial, 12·5mm. Specimens examined: One, the type.

Genus Viverricula Hodgson.

The series of this genus available to us shows that the original genotype founded on specimens and figures of animals obtained by Sonnerat in Malacca is easily separable from Peninsular Indian races by several characters of the tail, which in *Viverricula malaccensis malaccensis* (Gm.) is much paler towards the tip and has only seven dark rings against the eight of the Indian animals.

Specimens from Calcutta sufficiently agree with Gray's figure of *Viverra bengalensis* inhabiting "most part of Bengal" (*Ill. Ind. Zool.* I, 1830-2, pl. 4) and must be known as *Viverricula malaccensis bengalensis* (Gray and Hardw.). The Calcutta specimens are greyish buff, quite without any rufous tinge, and have the stripes and spots clear black and sharply defined.

Specimens from the neighbourhood of the Chilka Lake, on the borders of Orissa and Madras, are more reddish; but one from

Dharwar, South Mahratta country, resembles in colour one from Calcutta. All the skulls, however, differ from the Calcutta examples in their small size and much smaller bullae which are both shorter, lower and more compressed than in the northern form: greatest lengths:–Chilka, 94–95; Dharwar, 95 mm. against Calcutta, 104–105 mm. (one subadult example 103 mm.).

For the present we regard Chilka and Dharwar animals as representative of *Viverricula malaccensis indica* (Desmarest, *Nouv. Dict. d'Hist. Nat.*, VII, 1817, p. 170).

We have not seen *Viverricula malaccensis deserti*, Bonhote (*Ann. and Mag. Nat. Hist.* (7), I, 1898, p. 120) from Rajputana which is probably well entitled to subspecific rank.

A specimen from Cachar is impossible to identify subspecifically: it is boldly marked but the number of rings on the tail ally it to eastern rather than to Indian forms.

Kloss has recently described from South Central Siam as *Viverricula malaccensis thai* (*Journ. Nat. Hist. Soc. Siam* III, 1919, p. 352) a subspecies rather paler and duller than *V. m. malaccensis* and with skull characters approximating towards *V m. rasse* (Horsfield) of Java. This probably extends into Southern Burma.

Genus **Paradoxurus** F. Cuv.

Dr. Annandale has submitted to us photographs of Buchanan-Hamilton's original paintings of *Ichneumen prehensilis* and *Ichneumen bondar* which formed the basis for the descriptions of Desmarest's *Viverra prehensilis* and *Viverra bondar* (Mammalogie, 1820, pp. 207, 210).

We have received specimens from the vicinity of Calcutta which quite agree with Buchanan-Hamilton's figures and with the descriptions based on them by Desmarest.

Viverra prehensilis is the first name applied to any Indian *Paradoxurus* and the Bengal form would bear the name *P. hermaphroditus prehensilis* were it not that Desmarest's name is preoccupied by *Viverra prehensilis*, Kerr (*Animal Kingdom*, 1792, p. 169= *Cercoleptes caudivolvulus*, the Kinkajou, fide Blanford, *P.Z.S.* 1885, p. 784). The name, therefore, of the Bengal subspecies must be *Paradoxurus hermaphroditus bondar* (Desm.) to the figure of which many Calcutta specimens closely approximate. So, indeed, do others to the figure of *Viverra prehensilis*: but all races of *Paradoxurus* show a good deal of variation within themselves due principally to age and we are not prepared to admit, on the existing material, the occurrence of two forms or species in Bengal.

In addition we have a specimen from Dharwar obtained by the Mammal Survey of the Bombay Natural History Society which has been listed by Wroughton as *Paradoxurus niger* (*Viverra nigra* Desmarest, *op. cit.* p. 208, Pondicherry) and which, allowing for certain individual abnormalities, agrees with Desmarest's description.

On the other hand the specimen will not fit in with Wroughton's synopsis of the genus as given later (*Journ. Bombay Nat. Hist. Soc.* XXV, 1917, pp. 48-51; XXVI, 1918, p. 49) and we cannot but think that some topographical confusion has taken place.

The Zoological Survey also possesses a specimen from the Dafla Hills which agrees, so far as its condition permits to say, with the form described as *Paradoxurus vicinus* Schwarz (*Ann. and Mag. Nat. Hist.* (8) VI, 1910, p. 230) from Assam which Wroughton has identified with *Paradoxurus hermaphroditus strictus*, Horsfield (*Ann. and Mag. Nat. Hist.* (2) XVI, 1837, p. 105. Nepal plains).

It appears that *Paradoxurus birmanicus*, Wroughton (*op. cit.* XXIV, 20th March 1917, p. 51), from Sagaing, Upper Burma, is antedated by *Paradoxurus hermaphroditus laotum* Gyldenstolpe (*Kungl. Sv. Vet. Akad. Handl.*, 57, No. 2, 2nd Feb. 1917, p. 26, pl. iv, figs. 2, 4) from Chiengmai, North Siam, since Wroughton himself says that this race extends throughout Burma eastwards into Siam and south to meet in Tenasserim *P. h. ravus* Miller, which is the North Malayan form. More recently Gyldenstolpe, who has presumably examined Burmese material, states (*Journ. Nat. Hist. Soc. Siam*, III, 1919, p. 147, note) that *P. birmanicus* is absolutely identical with *P. h. laotum*.

A specimen in the Zoological Survey recorded as from Rangoon but obtained from a Menagerie is not this race but belongs to the *bondar* section and can be matched by examples from Calcutta. Its locality is probably wrong.

MISCELLANEA

BIRDS.

A further note on the Red Jungle Fowl.

In our paper "On the proper name of the Red Jungle Fowl from Peninsular India," [1] Mr. H. C. Robinson and I expressed doubt as to the wildness of the birds of Pulo Condore which Linnaeus cited under *Phasianus gallus* (*Syst. Nat.*, ed. 12,1758, p 270) because Mr. W. J F. Williamson's bird-collectors, who visited the island last year, obtained no specimens.

I have, however, recently been looking up accounts of Pulo Condore and the following two passages show quite clearly that there is, or was, a Jungle Fowl on the island.

The first is from Dampier's "Voyage round the World." He visited the group in 1687 and wrote :—

"Here are many sorts of birds, as Parrots, Parakites, Doves and Pigeons. Here are also a sort of wild Cocks and Hens. They are much like our tame Fowl of that kind; but a great deal less, for they are about the bigness of a Crow. The Cocks do crow like ours, but much more small and shrill; and by their crowing we do first find them out in the Woods where we shoot them. Their flesh is very white and sweet."

The other is from the "Voyage of Discovery to the Pacific Ocean" (Captain Cook's Third Voyage), Vol. III, 1874, by Captain King, LL.D., F.R S. He wrote (p. 463) of his visit in 1780:—

"Our sportsmen were very unsuccessful in their pursuit of the feathered game, with which the woods are well stocked. One of our gentlemen had the good fortune to shoot a wild hen; and all the shooting parties agreed that they heard the crowing of the cocks on every side, which they described to be like that of our common cock, but shriller; that they saw several of them on the wing, but that they were exceedingly shy. The hen that was shot was of a speckled colour, and of the same shape, though not quite so large, as a full grown pullet of this country. Monsieur Sonnerat has entered into a long dissertation, to prove that he was the first person to determine the country to which this most beautiful and useful bird belongs, and denies that Dampier met with it here." [2]

So there can be no objection to accepting Linnaeus' Pulo Condore birds as Jungle Fowl.

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[1] *Rec. Ind. Mus.* XIX, pp 13-15 (1920).

[2] Sonnerat, however, though writing about Jungle Fowl, was really dealing with another species—his "Coq Sauvage des Indes" (*Gallus sonnerati* Temm.) and not with the present one.

Nevertheless we cannot accept the *Phasianus gallus* of the "*Systema Naturae*" as the name for the Red Jungle Fowl for he had used it previously in the *Fauna Svecica* for domesticated European birds and it cannot be employed again for something else. This contention must hold whether names based on domesticated races are accepted or not. It refers to a domestic breed or is not available. There are several species of Jungle Fowl and, as Mr. Stuart Baker points out in his latest remarks on a form of *Gallus* (*Journ. Nat. Hist. Soc.*, Siam IV, 1920, p. 33), there is nothing to prove that Linnaeus' domestic fowl was unquestionably the direct descendant of the Red Jungle Fowl. The name *Phasianus gallus* therefore cannot properly be applied to this last: we cannot even regard it as a subspecies of *Ph. gallus*.

While our paper was being printed Messrs. Bangs and Penard published an article on "The name of the Common Jungle Fowl."[1] They discuss the synonomy of the species and, considering that *Phasianus gallus* is adequately described and can apply to none other than the Red Jungle Fowl, select Bengal as the "terra typica" restricted.

This finding I cannot accept, even if I accepted for a wild bird the *Phasianus gallus* of the 12th Edition. Even then it would not be available for the western race since the distribution given by Linnaeus is "India Orientali: Pouli candor, etc." India orientali merely means the East Indies as contrasted with the West Indies, not the eastern part of India, and we cannot regard Pulo Condore as other than a "terra typica" restricted by Linnaeus himself. Messrs. Bangs and Penard's selection of Bengal comes therefore too late.

There is no question as to the application of *Tetrao ferrugineus*, Gmelin (vide also Hartert, *Nov. Zool.*, IX, 1902, p. 218) so that the specific name of the Red Jungle Fowl is *Gallus ferrugineus* (Gm.), "terra typica" countries east of the Bay of Bengal, the eastern subspecies being thus *Gallus ferrugineus ferrugineus*. The western race was without a name until recently (a point on which Messrs. Bangs and Penard are in agreement) and this we have supplied by proposing as popular a name as possible: *murghi* (fowl) is perhaps one of the best known words in the Indian vernacular.

Mr. Stuart Baker is quite out of order in using *bankiva* as the specific name (*l.c.s.* and *Journ. Bombay Nat. Hist. Soc.* XXV, 1917 pp. 1-21) the more so in that he employs *ferrugineus* as a subspecific one (though crediting it to Blyth instead of Gmelin). *Tetrao ferrugineus* was proposed by Gmelin in 1788 (*Syst. Nat.*, ed. 13, p. 761), whereas *Gallus bankiva* was not published until 1813 (Temminck, Hist. des Pigeons et des Gallinaces, II, p. 87; Java and Sumatra: not, fide Baker, *Phasianus bankiva* Raffles, *Trans. Linn. Soc.*, XIII, 1822, p. 319; Sumatra).[2]

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[1] *Proceedings of the New England Zoölogical Club*, VII, pp. 23-25 (1919).

[2] Mr. Baker commits another error, as what Raffles recorded was *Phasianus gallus*, Linn.

Messrs. Bangs and Penard also give Sumatra as the type locality of *bankiva* but Java must be taken, as the specific name is merely a slightly altered Javanese one. It is quite true, however, that the race occurs in Sumatra as well. I have lately seen in the Zoological Museum at Buitenzorg specimens from the south-west of that island though *f. ferrugineus* is found in the north-east.

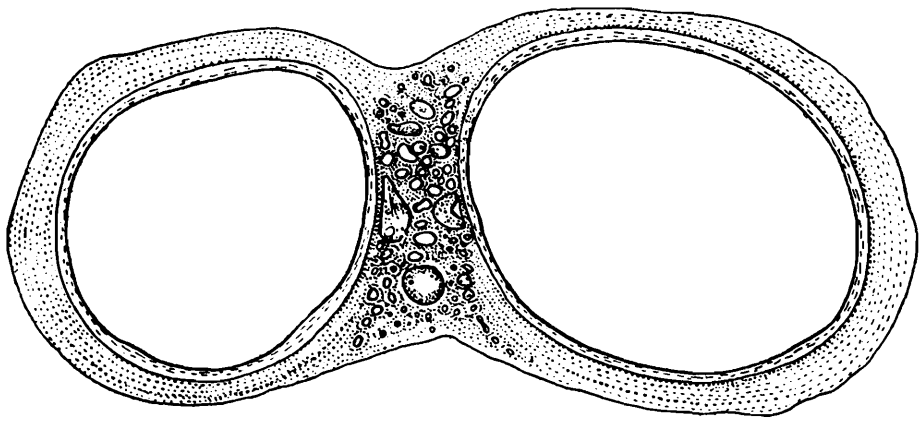
C. Boden Kloss,
M.B.O.U., C.M.A.O.U.

Batrachia.

A short note on the structure of the Compound limb bones of Rana.

This short note is published with a view to record an observation on the structure of the bone of the common large frog of Lahore (*Rana tigrina*) that I made sometime ago. Owing to the pressure of other work, not having as yet a chance to elaborate the problem in detail, I wish to bring this observation to the notice of other workers.

In all accounts of the histological structure of the bone of frogs, the bony substance is described as compact, consisting of very thin lamellae superimposed on one another, and without any Haversian system of canals intersecting or passing through them.



Transverse section of the tibio-fibula of the frog *Rana tigrina*, × 16.

For example, one may refer to the description given in Parker and Parker's "An elementary course of practical Zoology," pp. 116-117 and 125.

In one of the sections of the tibio-fibula prepared by me by the ordinary grinding method, however, I found a different state of things. The structure of the outer walls of the two component elements of this bone was similar to that of any other bone of the frog, but in the middle, where the two bones have fused together, one finds instead of the compact structure, a regular system of canals traversing this area as seen in the figure. Seen with a

microscope this system appears identical with the Haversian canal system in the bones of higher vertebrates.

Numerous other sections of this region and of other bones similarly prepared yielded the following results :—That a system of canals of the type described above is present also in the region of the union between the radius and the ulna, the tibia and the fibula and in the ridge on the proximal end of tibio-fibula.

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