

Order AMBLYPYGI.

Carapace much wider than long, transversely reniform, with convex anterior and lateral and concave posterior border; furnished in front with a pair of median eyes, and a cluster of lateral eyes on each side. *Sternal area* broad, subcircular; membranous,

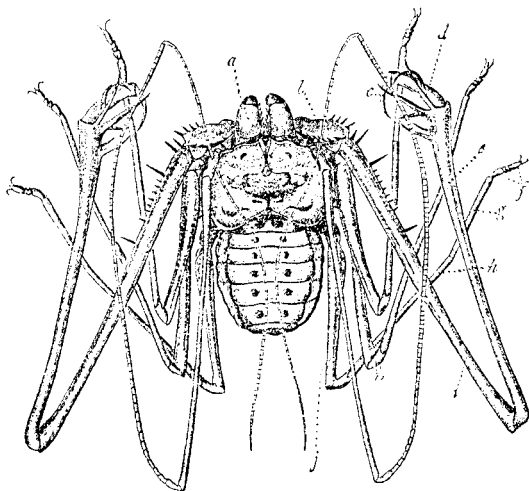


Fig. 40.—*Phrymichus phipsoni*, ♂.

a, mandible; *l*, trochanter; *i*, femur; *e*, tibia; *d*, hand; *c*, claw of chela; *j*, femur; *k*, patella; *h*, tibia; *g*, protarsus; *f*, tarsus of leg.

but strengthened with four median sclerites, the anterior (*labium* or *prosternum*) long and pointed, projecting between the bases of the chelæ, the posterior (*metasternum*) lodged between the coxæ of the 4th pair of legs. Coxæ of *chela* and *legs* arranged radially round the sternum, those of the 2nd and 3rd pairs widely separated. Chelæ prehensile, subchelate, closing in a horizontal plane, their basal segments freely articulated to the membrane at the sides of the anterior sternal sclerite (*prosternum*, *labium*); 3rd (*femur*) and 4th (*tibia*) segments long and strong, strongly spined; 5th segment (*hand*) small, spined above and below; 6th segment (*finger*) hairy, short, and ending in a long smooth claw,

which is usually united to it without trace of suture. *Legs* of 1st pair very long and antenniform; the segments on the distal side of the femur forming a long, many-jointed flagellum. Remaining legs long and slender; 4th segment (*patella*) very short, 5th (*tibia*) long and slender, often segmented; tarsi consisting of four or five segments; the apical segment armed with two claws, and often provided beneath with a membranous sucker (*pulvillus*). *Abdomen* oval, segmented, covered above by 12 terga, and below by 11 sterna as in the *Uropygi*, but much shorter than in that group, the posterior segments very small, the last tergum forming a movable flap over the anus; no postanal sclerite. *Generative organs* opening behind the sternum of the 2nd abdominal somite as in the *Uropygi*, that is to say, behind what is described as the 1st sternum. Two pairs of *breathing-organs*, consisting of pulmonary sacs, the anterior pair placed in the same transverse line as the generative aperture, the posterior pair opening behind the 2nd abdominal sternum.

Habits. These Arachnida, which are in many respects intermediate between the Whip-Scorpions and the true Spiders, much resemble the former in habits, being found under stones, fallen tree-trunks, or in the crevices of rocks, of termites' nests, &c. They do not, however, dig burrows for themselves. Many of the species of *Charontidæ* are to be met with in caves, on the walls and roofs of which the sucker-like pulvillus enables them to maintain a secure hold. The eggs are carried attached to the underside of the abdomen, as in the Whip-Scorpions.

Distribution. Africa south of the Sahara, S. Arabia, and the Seychelles; Oriental Region from India, Ceylon, and Siam eastwards over the whole of the Indo- and Austro-Malayan area as far as Fiji; South and Central America northwards into Texas and Lower California.

The Indian genera are referable to two families, which may be tabulated as follows:—

- a. Sternal plates large; no pulvillus on tarsus **Phrynichidæ.**
 b. Sternal plates small; a distinct pulvillus on tarsus. **Charontidæ.**

Family PHRYNICHIDÆ.

Sternal plates of large size, much wider than long, the labial process of the anterior plate rising abruptly from the middle of its anterior border. Tibia of 4th leg composed of one or two segments; two in the African genus *Damon*, one in the Indian

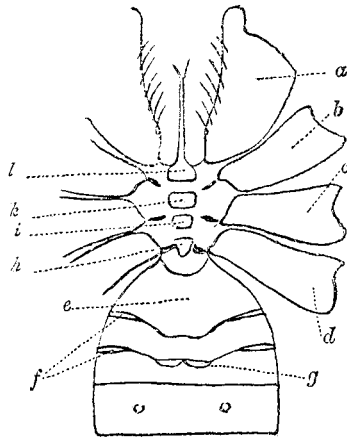


Fig. 41.—Lower side of cephalothorax and of anterior end of abdomen of *Phrynichus lunatus*.

a, coxa of chela; *b*, *c*, *d*, coxæ of 2nd, 3rd, and 4th legs; *e*, first abdominal sternum; *f*, apertures of pulmonary organs; *g*, semilunar lobes on 2nd abdominal sternum; *h*, metasternal, *i*, *k*, mesosternal, *l*, prosternal plates.

genus *Phrynichus*. Distal spines on upper side of tibia of *chela* directed obliquely forwards, and overlapping the base of the hand. No *pulvillus* or sucker beneath claws. *Tarsi* consisting of three segments.

Distribution. Africa south of the Sahara; South Arabia, India, Ceylon, and Siam.

Genus PHRYNICHUS, Karsch.

Phalangium, *Linn. Syst. Nat.* ed. x, p. 618, 1758 (in part).

Tarantula, *Fabr. Ent. Syst.* ii, p. 432, 1793 (in part); *Kraep. Abh.*

Ver. Hamb. xiii, p. 9, 1895.

Phrynus, *Lamarck, Syst. Anim.* p. 175, 1801 (in part); *Lutreille, Hist. Nat. Crust. Ins.* iii, p. 48, 1812; *C. Koch, Arachn.* x, p. 35, 1843 (in part).

Phrynichus, *Karsch*, *Arch. Nat.* xlv, p. 195, 1879; *Pocock*, *A. M. N. II.* (6) xiv, p. 294, 1894; *Kraep. Tierr.*, *Scorp. etc.* p. 236, 1899.

Phrynichus, *Simon*, *Ann. Soc. Ent. Fr.* lxi, p. 50, 1892.

Characters as under the heading *Phrynichidæ*. Recognizable from the African genus *Damon* by the presence of only one long spine on the upper side of the hand and by having the tibia of the 4th leg undivided.

Type, *P. lunatus*, Pallas.

Distribution. East Africa, Arabia, Western India and Siam.

Synopsis of Indian Species.

- a. Adult with three long spines at distal end of tibia of chela; under side of hand smooth *P. phipsoni*, p. 127.
 b. Adult with two long spines at distal end of chela above; under side of hand with irregular rows of granules.
 a¹. Of large size (25 to 35 mm. long); second sternum of abdomen with pair of lobes *P. lunatus*, p. 126.
 b¹. Of small size (up to 15 mm.); second sternum without pair of lobes *P. pusillus*, p. 128.

105. *Phrynichus lunatus*, *Pallas*, *Spic. Zool.* ix, p. 35, t. iii, figs. 3-6, 1772 (Phalangium); *Fabr. Ent. Syst.* ii, p. 433, 1793 (Tarantula); ceylonicus, *C. Koch*, *Arachn.* x, p. 35, fig. 776, 1843 (Phrynus); reniformis, *Linn. Syst. Nat.* ed. x, p. 619, 1758, in part (Phalangium); *Karsch*, *Arch. Nat.* xlv, p. 195, 1879; *Kraep. Abh. Ver. Hamb.* xiii, p. 10, 1895 (Tarantula); *id. Tierr.*, *Scorp. etc.* p. 237, 1899 (Phrynichus).

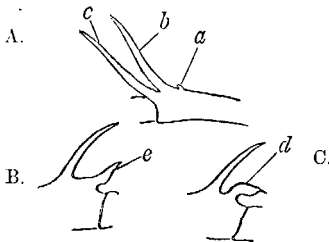


Fig. 42.—A. Extremity of tibia of chela of *Phrynichus lunatus*: a, rudiment of first spine; b, second, c, third spine.
 B. Extremity of tibia of chela of *P. lunatus* from below: e, distal spine.
 C. Ditto of *P. phipsoni*: d, distal spine.

♀. *Colour* nearly black or reddish brown, with three grey spots on the upper side of the femora of the legs; much paler in recently-moulted specimens. *Carapace* and *terga* granular throughout; *sterna* smooth, obsolete punctured; 1st furnished with a pair of longitudinally subrescentic depressions, the middle of its posterior border lightly concave and fringed with red hairs; middle of posterior border of 2nd also lightly concave and furnished with a pair of chitinous lobes which meet in the middle line. *Chelæ* with coxal segment granular below, smooth in the middle; *trochanter* with upper surface bordered behind with a crest of

spines two or more rows deep, three of the spines of the front row much larger than the rest; *femur* long, cylindrical, a little more than three times the median length of the carapace, but less than twice its width, coarsely granular above, spined in front above and below; *tibia* about as long as the femur, coarsely granular, armed at the distal end above with two long spines in the adult, three in the young, and on the underside at the apex with two smaller spines, the distal the smaller of the two, dentiform and directed obliquely downwards and forwards; *hand* smooth externally and internally, granular above and below, the lower edge being furnished throughout its length with two irregular rows of coarse granules, armed above and below with a single long spine, and also with a tubercle on its upper side at the base of the spine. Second abdominal *sternum* furnished with a pair of semilunar lobes: first sternum transversely truncate in the middle of its posterior border and furnished with a fringe of red hairs.

♂. First *abdominal sternum* widely rounded posteriorly and not hairy. *Chela* much longer than in ♀; the trochanter and femur generally much more hairy and much less strongly spined; the femur nearly four times the median length of the carapace.

Young much smoother than adult, more varied in colouring: the chela considerably shorter, the tibia armed distally above with three long spines, the first becoming gradually smaller with successive moults until it is ultimately reduced to a mere tubercle.

Total length up to about 30–35 mm.

Loc. Ceylon: Kandy (*Ferbury & Green*).

106. *Phrynichus phipsoni*, *Pocock, A. M. N. II.* (6) xiv, p. 295, pl. viii, fig. 4, 1894.

♀. Size, colour, and general characters as in *P. lunatus*, from which this principally differs in the permanent retention of characters which appear in the young but are lost in the adult of that species. For example, the first of the three large spines on the upper side of the apex of the tibia of the chela is found in adult individuals of *P. phipsoni*, and is about half the length of the others; on the lower side of the tibia in the distal fourth of its length behind the two apical spines there is another spine, which is always longer and sometimes considerably longer than the rest; the granulation of the chela is coarser and less close-set; the underside of the hand is smooth or almost smooth, with at most the merest trace of a few granules; and the distal inferior tibial spine is differently shaped and less erect, its inferior edge being very decidedly convex from base to tip, not straight with a median sinuosity as in *P. lunatus*, and its upper edge lightly concave, without any basal convexity.

Total length 28 mm

Loc. Bombay (*Moore & Phipson*); Trivandrum in Travancore (*Ferguson*).

107. *Phrynichus pusillus*, Pocock, *A. M. N. II.* (6) xiv, p. 296, 1894.

Closely allied to *P. lunatus*, but much smaller and much more coarsely granular than the adults of that species, the carapace being beset with large granules and the terga sparsely covered with them, about twenty being scattered over the surface and twenty arranged along the posterior edge, the interstices being very visibly and finely granulated. The integumental folds of the 2nd abdominal sternum obsolete.

Total length of ♂ and ♀ up to 15 mm.

This species is assumed by Kraepelin to be based upon young examples of *P. lunatus*. Young specimens of the latter, however, resembling *P. pusillus* in size, may be at once recognized by the much finer granulation of the integument, the presence and large size of the third tibial spine of the chela, the much shorter chelæ, and the presence of the semilunar lobes on the 2nd abdominal sternum.

Loc. Ceylon: Punduloya (*Green*).

Family CHARONTIDÆ.

Anterior *sternal plate* lanceolate, evenly narrow from base to point, without any basal plate-like expansion; median and posterior sternal plates small, subcircular. Tibia of the 4th *leg* consisting of four or three segments. Distal spines on upper side of tibia of *chela* directed inwards and scarcely overlapping the base of the hand. *Tarsi* consisting of five segments; the distal with pulvillus beneath the two claws.

Distribution. Seychelles; Burma, Andaman Islands, Philippine Islands; and over the whole of the Indo- and Austro-Malayan area as far as the Solomon Islands.

Synopsis of Indian Genera.

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|--|-----------------------|
| a. Tibia of chela slender; hand armed above and below with one long basal spine; that on the upper side double and with a few small spines between it and the finger | STYGOPHRYNUS, p. 129. |
| b. Tibia of chela wide; upper side of hand with two long spines, under side with one long distal spine; no smaller spines. | |
| a'. Tibia of 4th leg consisting of three segments | CATAGEUS, p. 130. |
| b'. Tibia of 4th leg consisting of four segments | SARAX, p. 131. |

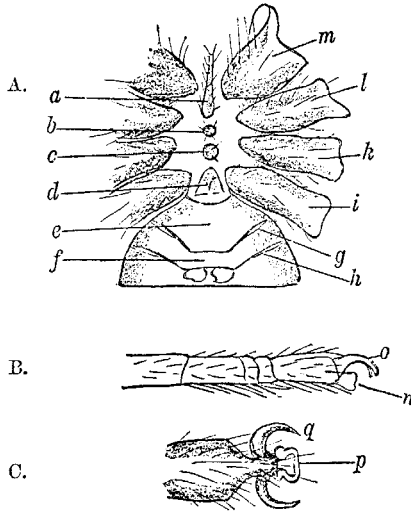


Fig. 43.—*Sarax sarawakensis*.

- A. Lower side of cephalothorax and of anterior end of abdomen : *a*, prosternal, *b*, *c*, mesosternal, and *d*, metasternal plates ; *e*, 1st, and *f*, 2nd abdominal sternum ; *g* & *h*, apertures of pulmonary sacs ; *i*, coxa of 4th, *k*, coxa of 3rd, *l*, coxa of 2nd leg ; *m*, coxa of chela.
- B. Tarsus of 4th leg : *o*, claws ; *n*, pulvillus.
- C. Upper view of extremity of tarsus : *q*, claw ; *p*, pulvillus.

Genus **STYGOPHRYNUS**, Kraepelin.

Charon, *Thorell, Ann. Mus. Genova*, xxvii, p. 538, 1889 (not Charon of Karsch).

Stygophrynus, *Kraepelin, Abh. Ver. Hamb.* xiii, p. 44, 1895 ; *id. Tierr., Scorp. etc.* p. 248, 1889.

Only one long spine on the upper and lower side of the *hand*, but the spine on the upper side with a slender supplementary spine rising from the base of its posterior surface ; distal to the long spine, both above and below, are a few, about three, small spines. Claw not fused with finger, but separated by a distinct sutural joint. Tibia of chela moderately wide ; its upper edge furnished with seven spines, of which the 4th, 5th, and 6th from the distal end are subequal, very long and slender and longer than the width of the tibia (fig. 44 A, B). Tibia of 4th *leg* consisting of four segments. Second abdominal *sternum* with distinct semicircular lobes.

Type (and only known species), *S. cavernicola*.

Distribution. Burma.

108. *Stygophrynus cavernicola*, Thorell, *Ann. Mus. Genova*, xxvii, p. 538, 1889 (Charon); Kraepelin, *Abh. Ver. Hamb.* xiii, p. 44, 1895; *id. Tierr., Scorp. etc.* p. 248, 1899 (Stygophrynus).

Colour yellowish. *Carapace* smooth, not granular; frontal spine projecting forwards; median ocular tubercle close to the anterior edge of the carapace. Femur of *chela* armed on its upper border with 6-7 spines, with granules between them; underside also with 6-7 spines, of which the basal two are the longest; spines on upper side of tibia of chela very long, the sixth from the apex the longest; the under surface of the tibia with about 7 spines and 3 or 4 spinules between them. Length up to 24 mm.

Loc. Moulmein. Specimens taken in the Farm Caves (*Fea*).

Genus CATAGEUS, Thorell.

Catageus, Thorell, *Ann. Mus. Genova*, xxvii, p. 530, 1889.

Catagæus, Kraepelin, *Abh. Ver. Hamb.* xiii, p. 47, 1895.

Catagijs, *id. Tierr., Scorp. etc.* p. 251, 1899.

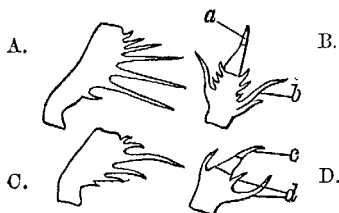


Fig. 44.—A. Tibia of chela of *Stygophrynus cavernicola*.

B. Lower side of hand of same: a, articulated claw; b, spine on upper side of hand.

C. Tibia of chela of *Catageus pusillus*.

D. Lower side of hand of same: c, claw; d, spines on upper side of hand.

Upper side of *hand* with two separated spines, of which the distal is the shorter; no spines distal to them; lower side of hand with one spine at the distal end. Tibia of *chela* very wide, its upper edge with 5 long or moderately long spines, two short spines distal to the longest, which is thus the median spine of the series. Tibia of 4th leg consisting of only three segments. Second abdominal *sternum* without pair of semicircular marginal lobes.

Type (and only known species),

C. pusillus.

Distribution. Burma.

109. *Catageus pusillus*, Thorell, *Ann. Mus. Genova*, xxvii, p. 531, 1889; Kraepelin, *Abh. Ver. Hamb.* xiii, p. 47, 1895 (Catagæus); *id. Tierr., Scorp. etc.* p. 251, 1899 (Catagijs).

Colour: carapace reddish brown; abdomen brownish grey, with clearer spots. *Carapace* rounded, finely granular. *Terga* finely granular. Femur of *chela* armed above and below with 3 spines; tibia with 5 spines above and 2 below, of which the distal is the longest. *Legs* smooth; proximal tarsal segment much longer than the remaining four segments taken together. Total length up to about 8 mm.

Loc. Burma: Moulmein (*Fea*). Specimen captured in the Farm Caves.

Genus SARAX, Simon.

Charon, *Thorell, Ann. Mus. Genova*, xxvi, p. 354, 1888 (*nec Karsch*).
 Sarax, *Simon, Ann. Soc. Ent. Fr.* lxi, pp. 43 & 48, 1892; *Kraepelin, Abh. Ver. Hamb.* xiii, p. 45, 1894; *id. Terr., Scorp. etc.* p. 250, 1899.

Head armed above with two separated long spines, of which the distal is the longest; no small spines distal to them. *Tibia* of *chela* wide, armed above with 8 spines, of which the 2nd from the distal end is the longest. *Tibia* of *4th leg* consisting of four segments. Second abdominal *sternum* with two subspherical lobes on its hinder border.

Type, *S. brachydactylus*, Sim. Two species known.

Distribution. Andaman Islands, Singapore, Borneo, Philippine and Solomon Islands.

110. *Sarax sarawakensis*, *Thorell, Ann. Mus. Genova*, xxvi, p. 354, 1888 (Charon); *Kraepelin, Abh. Ver. Hamb.* xiii, p. 45, 1895 (in part); *id. Terr., Scorp. etc.* p. 251, 1899 (Sarax).

Colour a tolerably uniform reddish brown, sometimes marked with black; legs and abdomen paler. *Carapace* rounded in front, the sulci deep, finely granular. *Terga* finely granular. *Femur* of *chela* armed with 3 or 4 spines above, the basal the longest, the distal the smallest, minute; on the under side with 4 spines, the basal small and directed inwards, the 2nd the longest; *tibia* armed above with 5 spines, below with 4, of which the proximal and distal are minute. Length up to about 9 mm.

Loc. Table Island, Andamans (*Oates*); also occurring in Singapore, Borneo, New Guinea, and the Solomon Islands.

Specimens (♂ ♀) from the Andaman Islands were captured by Mr. E. W. Oates beneath stones at low water on the coast of Table Island.

Order SOLIFUGÆ.

Integument richly clothed with hairs which are mostly soft and silky on the abdomen, stiff and erect elsewhere, many of them taking the form of long tactile bristles or of longer or shorter spines.

Carapace segmented, consisting of a large anterior head-shield (the head), behind which on each side are two narrow skeletal pieces representing the tergal elements of the somites bearing the 1st and 2nd legs, and of two large subquadrate plates, which are the terga of the somites bearing the 3rd and 4th pairs of legs.

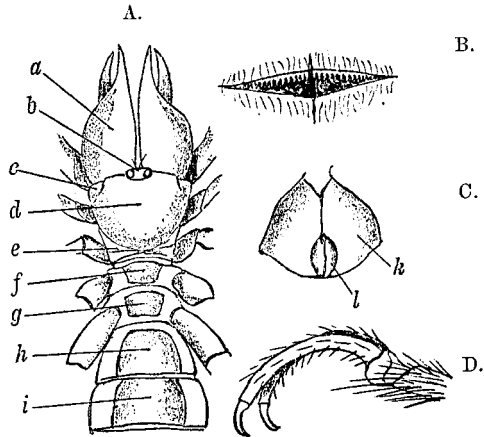


Fig. 45.—A. Anterior extremity of *Galeodes* (♀) from above. *a*, mandible; *b*, ocular tubercle; *c*, buttness to which mandible is articulated; *d*, head; *e*, remains of terga of 3rd and 4th somites, bearing 1st and 2nd pairs of legs; *f*, *g*, terga of somites bearing 3rd and 4th pairs of legs; *h*, *i*, 1st and 2nd abdominal terga.
 B. Abdominal stigma showing *serrulae*.
 C. First abdominal sternum of ♂, showing *k* lateral and *l* median plates.
 D. Extremity of tarsus and claws of 4th leg.

In the middle of the anterior border of the head is the ocular tubercle bearing a pair of large eyes; lateral eyes obsolete*. On each side of the head there is a distinct buttness to which the mandible is articulated. *Mandibles* projecting forwards, very large, consisting of two segments; the basal segment is swollen and bears in front a compressed but strong, toothed process, the *upper jaw*,

* Traces of the lateral eyes have been found at the sides of the head. These organs, however, are neglected in systematic description.

which ends in an apically pointed *fang*. The distal segment or *lower jaw*, also toothed and terminating in a fang, is articulated to the under side of the basal segment and moves in a vertical plane, so as to constitute with the upper jaw a pair of powerful nippers. On the inner side of the basal segment there is frequently a series of hard ridges which, by being rubbed against the corresponding ridges of the other jaw, give rise to a harsh grating sound. These are the *stridulating-ridges*. Projecting forwards from the lower half of the fore part of the head between the mandibles there is a horny, hair-tipped *rostrum*, which bears the mouth at its extremity. The sternal elements of the cephalothorax are practically absent, their place being taken by the basal segments or *coxæ* of the appendages, which meet each other in the median ventral line and are immovably welded together. The *palpi* are long, pediform, and consist of six segments, named *coxa*, *trochanter*, *femur*, *patella*, *tibia*, and *tarsus*. The coxa is furnished with a maxillary process; the trochanter is very short; the tarsus, also short, is sometimes freely movable, but is generally

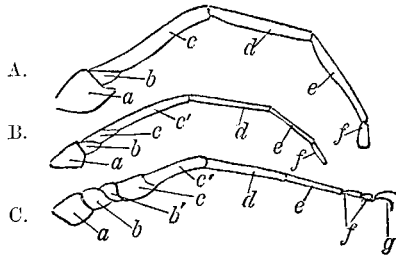


Fig. 46.—A, Palpus; B, 1st leg; and C, 3rd leg of *Galeodes*. *a*, coxa; *b*, trochanter; *b'*, trochantella; *c*, femur of palp and trochantin of 1st and 3rd leg; *c'*, distal end of femur of 1st and 3rd leg; *d*, patella; *e*, tibia; *f*, tarsus; *g*, claws.

united to the tibia, with a mere sutural line between the two. The 1st leg much resembles the palpus, to which it is fused at the base, but is shorter and weaker and has an additional small segment, the *trochantin*, cut off from the base of the femur; the tarsus may or may not be furnished with a claw. The 2nd, 3rd, and 4th legs are the organs of progression. They differ structurally from those of the 1st pair in having the trochanters divided into two distinct segments, so that between the coxa and the femur three segments are intercalated, namely the *trochanter*, the *trochantella*, and *trochantin*. This multiplication of basal segments confers exceptional flexibility upon the legs, and more than compensates for the rigidity of the coxæ. The patella and tibia are unsegmented; the tarsi are segmented or not, and to the apex is articulated a pair of long claws, which differ from those of all other Arachnids in being pediculated or borne upon long stalks. Attached to the

base of the 4th leg there are five sensory organs, the *malleoli*—two on the coxa, two on the trochanter, and one on the trochantella. Each consists of a slender basal piece or *stalk*, and an expanded distal piece, the *blade*. There is no distinct waist between the cephalothorax and abdomen such as exists in the *Uropygi* and *Amblypygi*. The *abdomen* consists of ten segments, each of which, with exception of the last, bears a tergal plate above and a sternal plate below; the last or anal segment is represented by a single plate marked with a vertical slit, the *anal aperture*.

Generative organs open upon or behind the sternum of the 1st abdominal segment, the plate showing modifications in structure according to sex and age.

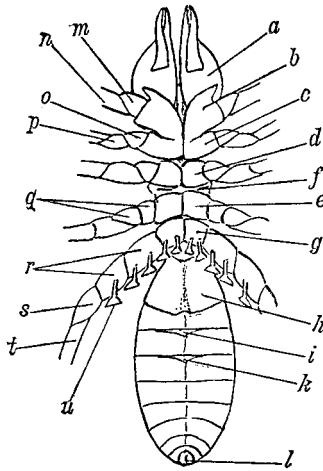


Fig. 47.—Lower side of trunk and of bases of appendages of *Galcodes*. *a*, mandibles; *b, c, d, e, g*, coxae of palp and of 1st, 2nd, 3rd, and 4th legs; *f*, thoracic stigma; *h*, 1st abdominal sternum; *i, k*, abdominal stigmata; *l*, anal segment; *m*, trochanter, and *n*, base of femur of palp; *o*, trochanter; *p*, trochantin of 1st leg; *q*, trochanter and trochantella of 3rd leg; *r*, trochanter and trochantella, *s*, trochantin, and *t*, base of femur of 4th leg; *u*, external malleolus.

The *respiratory organs* are in the form of tubular tracheæ, the stigmata of which open upon or behind the sterna of the 2nd and 3rd, rarely also of the 4th, abdominal segment. There is, moreover, a pair of large stigmata situated upon the ventral side of the 4th segment of the cephalothorax, one on each side behind the coxa of the appendage.

Sexual characters. Male with mandibles less strongly toothed and (except in one American genus) furnished above at the base of the upper jaw with an organ of unknown function, the *flagellum*. The *first abdominal sternum* in the adult female consists of a single plate marked with a median longitudinal groove. In the adult

males and the young females, on the contrary, the right and left halves of this plate remain distinct, and protruding between them, in the middle line, there is a pair of lip-like valves covering the generative aperture.

Habits. These Arachnida are remarkable for their amazing agility. Though principally desert forms, they are also met with in forests, at least in India. They are nocturnal and strictly carnivorous. Some of the species at all events dig holes in the ground, and the females at the breeding-season live in burrows for the protection of themselves and their young. The latter are born in the egg-stage.

Distribution. Spain, Greece, and S. Russia in Europe; over the whole of Africa and South-western Asia from Turkestan to Arabia and Baluchistan, thence throughout India and into Ceylon; also in Siam and (?) the Moluccas; America from the Southern States of the Union to the Andean chain in Chili and the Argentine Republic.

The families and subfamilies represented in the fauna of British India may be diagnosed as follows:—

- | | |
|---|------------|
| <i>a.</i> Tarsus of palp narrow at base and freely articulated to tibia; stalk of claws hairy | Galeodidæ. |
| <i>b.</i> Tarsus of palp broad at base and immovably fused to tibia; stalk of claws not hairy | Solpugidæ. |
| <i>a</i> ¹ . Anal segment small, the aperture extending almost up to its superior edge | DÆSIINÆ. |
| <i>b</i> ¹ . Anal segment large, the aperture scarcely surpassing its middle | RHAGODINÆ. |

Family GALEODIDÆ.

Stigmata upon the 2nd and 3rd abdominal segments opening beneath the posterior edge of the sterna and protected by a pair of transversely elongated finely toothed plates, the *serrulæ*.

Tarsus of palp narrowed at the base and movably articulated to the tibia.

Claws of legs, in the adult, with several rows of hairs upon the stalk.

Anal segment small, the aperture extending almost to its upper edge.

Distribution. Africa north of the Sahara and southwards into Somaliland; South-eastern Europe, Greece and South Russia; South-western Asia, Turkestan, Asia Minor, Arabia, Persia, Afghanistan and Baluchistan, thence over the whole of Western and Southern India. Absent from Ceylon and Burma.

Genus GALEODES, Oliv.

- Galeodes, *Olivier, Encycl. Method.* vi, p. 579, 1791 (in part); *C. Koch, Arch. Nat.* 1842, pt. i, p. 350; *Simon, Ann. Soc. Ent. Fr.* 1879, p. 96; *Karsch, Arch. Nat.* 1880, p. 229; *Pocock, A. M. N. H.* (6) xx, p. 251, 1897; *Kracpelin, Jb. Hamb. wiss. Anst.* xvi, p. 201, 1899.
- Rhax, *Hermann, Mém. Ins. Apt.* pp. 13 & 15, 1804 (nec *Rhax* of *C. Koch* and subsequent authors).
- Zerbina, *Karsch, Arch. Nat.* 1880, p. 233.
- Zombis, *Simon, Ann. Mus. Genova*, xviii, p. 253, 1883.

Ocular tubercle furnished in front with a pair of symmetrically disposed bristles, one on each side of the middle line. *Mandible* with very weak stridulating-ridges. *Flagellum* of male erectile; consisting of a slender subcylindrical basal portion or stem and of a gradually expanded but apically pointed distal portion or blade, the edges of which are incurved to form a narrow hair-lined hollow. Tarsus of 1st *leg* armed with two small claws concealed amongst the hairs; tarsi of 2nd and 3rd legs spined beneath, consisting of two segments, of 4th of three segments; tibia of 2nd and 3rd legs strongly spined above.

Male with head narrower than in female; mandibles weak, studded above with long erect spines for the protection of the flagellum; distal teeth of upper jaw weak or almost obsolete. Palpi longer and stronger. *Legs* longer; tarsus of 4th clothed below with a pad of variously modified bristles. A row of reddish bristles upon the posterior border of the 5th abdominal sternum.

Type, *G. araneoides*, Pallas. S. Russia and Transcaspia.

Distribution. As above under family.

*Synopsis of Indian Species.**Males.*

- a. Pad on 4th tarsus consisting of a few stout bacilliform bristles *G. bacillifer*, p. 144.
- b. Pad on 4th tarsus consisting of many not clavate bristles.
- a¹. Lower side of tibia of palp without cylindrical bristles and with only a few small setiferous tubercles *G. nigripalpis*, p. 144.
- . Tibia of palp studded below with setiferous tubercles bearing stiff cylindrical or fusiform bristles.
- a². Cylindrical bristles on tibia of palp very slender, sparsely set, rising from small tubercles which scarcely extend to the apex of the segment. . . . *G. indicus*, p. 142.
- b². Bristles on lower side of tibia of palp thick, numerous, rising from large tubercles which extend to the apex of the segment.

- a*³. Proximal tarsal segment of 2nd and 3rd legs with a posterior basal spine, 3 minor teeth on lower jaw of mandible *G. afghanus*, p. 140.
- b*³. Proximal tarsal segment of 2nd and 3rd legs without posterior basal spine; 2 minor teeth on lower jaw.
- a*⁴. Tibia and tarsus of palp entirely pale yellow; bristles on lower side of tibia fusiform *G. macmahoni*, p. 141.
- b*⁴. Tibia of palp fuscous, as dark as patella or darker; bristles on its lower side subcylindrical.
- a*⁵. Large (over 40 mm.); yellow; patella of palp twice width of head *G. agilis*, p. 140.
- b*⁵. Smaller (about 30 mm.); brown-or; patella of palp less than twice width of head *G. orientalis*, p. 138.

Females.

- a*. Tarsus of legs scantily clothed below with stout hairs; 9 pairs of strong short spines on tibia of palp *G. afghanus*, p. 140.
- b*. Tarsi thickly clothed below with thin hairs; tibia of palp without 9 pairs of short spines.
- a*¹. Tibia of palp armed beneath with 6-7 pairs of short spines, none of which exceed the height of the segment.
- a*². Lower jaw of mandible with 3 minor teeth *G. sabulosus*, p. 139.
- b*². Lower jaw of mandible with 2 minor teeth.
- a*³. Larger; legs and palpi flavous *G. fatalis*, p. 137.
- b*³. Smaller; legs and palpi partially infusate *G. orientalis*, p. 138.
- b*¹. Tibia of palp armed with long and slender spines, some or most of which exceed the height of the segment.
- a*⁴. Patella of palp fuscous, tibia entirely pale; 2 minor teeth on lower jaw .. *G. macmahoni*, p. 141.
- b*⁴. Patella and tibia of palp approximately of the same colour; 3 minor teeth on lower jaw.
- b*⁵. A posterior basal spine on tarsus of 2nd and 3rd legs *G. bacillifer*, p. 144.
- b*⁵. No posterior basal spine on tarsus of 2nd and 3rd legs *G. indicus*, p. 142.

111. *Galeodes fatalis*, *Lichtenstein & Herbst, Nat. ungefl. Ins.* pt. i, p. 32, t. i, fig. 1, 1797 (♀) (*Solpuga*); *Pocock, Jour. Bom. N. H. Soc.* ix. p. 441, 1895 (in part ♀): *Galeodes vorax*, *Hutton, J. A. S. B.* xi, pt. 2, p. 857, 1842: *Galeodes bengalensis*, *Butler, Tr. Ent. Soc.* 1873, p. 419.

Colour mostly pale yellow, head with black tubercle, and lightly infuscate at the sides; dorsal plates of abdomen lightly infuscate. *Head* wide, in adult wider than length of tibia, nearly or quite equal to patella of palp; exceeding tibia and nearly or quite equal to patella of 4th leg. *Mandible* with the 3rd and 5th teeth of the upper jaw large, there being normally only *one* minor tooth behind the third; lower fang with two minor teeth. *Palpi* short; patella armed externally beneath with from 3 to 4 short spines, which are shorter than the diameter of the segment, and internally with corresponding longer and thinner spines; stout bristles arranged at regular intervals and symmetrically on the two sides; tibia armed below with six pairs of short stout spines, the apical the longest, the basal the shortest, all of them shorter than the diameter of the segment. *Legs* with tarsi of 2nd and 3rd armed with 7 spines, there being no posterior basal spine; *tarsus* of 4th with 5 pairs of spines. *Malleoli* small; blade of external a little exceeding width of ocular tubercle.

Measurements in mm.—Total length 46, width of head 13·5, of palp 41·5, 1st leg 29, 4th leg 54.

Distribution. Central and North India (*Hutton*); Bengal; Gwalior (*Maries*); Karaghora in Kathiawar (*Bulkeley*).

112. *Galeodes orientalis*. *Stoliczka, J. A. S. B.* xxxviii, p. 209, t. xviii, figs. 4–5, 1869; *Pocock, Jour. Bom. N. H. Soc.* ix, p. 444, 1895 (*nec G. orientalis, Simon, Bull. Soc. Zool. Fr.* x, pp. 1–2, 1885).

♀. Structurally resembling *G. futilis*, but smaller and darker, the ground-tint being reddish yellow, not sandy yellow; mandibles ornamented with thin palely fuscous lines; patella of palp infuscate,

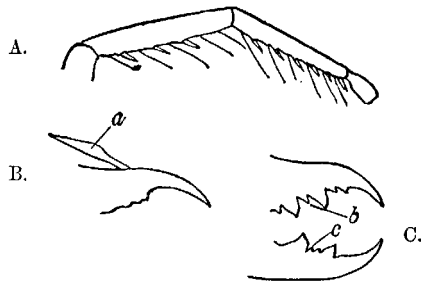


Fig. 48.—*Galeodes orientalis*.

A. Extremity of palpus.

B. Upper jaw and flagellum (*a*) of ♂.

C. Upper and lower jaw of ♀: *b*, minor tooth of upper jaw; *c*, minor teeth of lower jaw.

pale at the extremities; tibia more strongly infuscate than patella, the base pale; tarsus paler than tibia; tibia and tarsi of legs clear

yellow; the femur and patella of the 4th pair, and to a lesser extent of the 3rd, infusate.

♂. Resembling the female in colour, size, and spine-armature of legs, but with longer, stronger legs and palpi, and narrower head and mandibles. Width of *head* equal to about half the length of the patella of the palp and nearly three-quarters its tibia, a little less than two-thirds the length of the patella and about three-quarters the tibia of the 4th leg. *Mandible* with *flagellum* short, the stalk not much shorter than the blade; the blade lanceolate, much broader than the stalk, broadest across the basal half and evenly narrowed to the point; distal five teeth of the upper jaw small and forming a lobulate crest; lower jaw with two minor teeth. *Palp* with patella armed below with about twelve spines arranged in three rows, the spines exceeding the height of the segment; tibia armed with six pairs of spines, these spines much longer than in the female, but not exceeding the height of the segment; inferior area of segment between the spines studded from base to distal end with setiferous tubercles, the setæ they bear are short, erect, cylindrical, slightly narrower at the base, truncate at apex and not so long as the spines. Pad on tarsus of 4th *leg* consisting of whitish but opaque, basally narrowed and apically acuminate but not filiform bristles. A transverse row of about half a dozen reddish-coloured bristles on the posterior border of the 5th abdominal *sternum*. Large blade of the external *malleolus* at least as wide as half the width of the head-plate.

Measurements in mm.—

	Total length.	Width of head.	Length of palpus.	Length of 1st leg.	Length of 4th leg.	Length of patella of palp.
♀	30	8	28	20	39	
♂	27	7.5	41	29	51	13.5

Loc. Northern India; Birbhum and Delhi (*Stoliczka*); Mussoorie (*Rothney*); Gwalior (*Maries*); Gya (*Phipson*); and Karaghora in Kathiawar (*Bulkeley*).

Subspecies *rufulus*, nov.

♀. Closely allied to the typical form, but with the *palpi* darker; the whole of the patella, tibia, and tarsus being uniformly infusate, distal extremity of femur of palp, and femur and patella of legs, infusate. *Tarsus* of 4th leg with normally only 4 pairs of spines, the apical segment rarely armed with 1 spine. Total length up to about 30 mm.

Loc. E. Khandesh (*Madan*); Pimpalner in E. Khandesh and Shirpur in W. Khandesh (*Pearson*); Eastern Poona (*Wroughton*).

113. *Galeodes sabulosus*, sp. n.

Allied to both the preceding in structure, and approaching *G. orientalis* in size and *G. fatalis* in colour, though the tibia of the palp is infusate in the basal half; differing from both

in having three distinct minor teeth on the lower jaw of the mandible.

Measurements in mm.—Total length 32, width of head 7, length of palp 27, of 1st leg 19, of 4th leg 37.

Distribution. Kohat in the Punjab (*Batten*).

114. *Galeodes agilis*, *Pocock, Jour. Bom. N. H. Soc.* ix, p. 445, t. A, figs. 1-1 c.

♂. Nearly allied to *G. orientalis*, but much larger. Prevailing colour paler yellow than in *G. orientalis*; head infuscate anteriorly, mandibles pale above; patella of palp deeply or slightly infuscate; tibia and tarsus deeply and uniformly infuscate, sometimes almost black; legs pale or with femur and patella of 4th infuscate. *Palpi* with patella twice as long as width of head, tibia longer than width of head by one-third of its length.

Measurements in mm.—Total length 44, width of head 11, length of palpus 65, of 1st leg 47, of 4th leg 76, tibia of palp 22.

Loc. North-western India: Bikanir in Rajputana (*Talbot*); Jacobabad (*Bombay N. H. Soc.*); Khost in Baluchistan (*Smith*).

115. *Galeodes afghanus*, *Pocock, A. M. N. H.* (6) xvi, p. 82, 1895.

♀. *Colour*: head fuscous; mandibles yellow, obscurely banded; palpus with distal half of femur and greater part of patella fuscous with pale extremities, tibia and tarsus entirely flavous; legs yellow, with femora of 3rd and 4th and to a less extent the patellæ infuscate in the middle. Abdominal terga greyish black, sides of abdomen covered with silky greyish-yellow hairs.

Width of *head* about two-thirds the length of the patella and as long as the tibia of the palp and of 4th leg. *Mandibles* with upper jaw armed with two large and widely separated minor teeth behind the 3rd tooth; lower jaw armed with three minor teeth. Patella of *palp* armed beneath externally with about 4 shorter spines and internally with longer spines; *tibia* armed below with 9 pairs of longer and shorter strong spines, the longest of which only exceed the height of the segment at its narrowest part. *Legs* longer than in *G. fatalis*, but with the same spine-armature, except that there is a posterior basal spine on tarsus of 2nd and 3rd legs; tarsi much more scantily clothed beneath than in *G. fatalis*, the hairs being much fewer, short, and subspiniform. *Malleoli* long; blade of external malleolus about twice the width of the ocular tubercle.

♂. Resembling the female in colour. *Mandibles* and flagellum practically as in *G. macmahoni*, but with three minor teeth on the lower jaw. *Palpi* shorter than in *G. macmahoni*; the patella barely twice the width of the head-plate, which is distinctly less than half the length of tibia and tarsus taken together. Spine-armature of tarsi of 2nd and 3rd legs as in ♀. Blade of external *malleolus* less than half the width of the head-plate.

Measurements in mm. :—

	Total length.	Width of head.	Length of palpus.	Length of 1st leg.	Length of 4th leg.	Length of patella of palp.	Length of tibia and tarsus.
♀ ..	46	1.4	5.8	42	71	19	18
♂ ..	34	9	54.6	41	?	18.5	16.5

Loc. Between Quetta and Kandahar (*Godwin-Austin*); Omāra on the Mekran coast, 130 miles W. of Karāchi (*Townsend*).

116. *Galeodes macmahoni*, sp. n.

♀. Closely resembling the female of *G. afghanus* in colour, but much yellower, the head only lightly infusate in front; mandibles scarcely visibly banded above; femur of palp uniformly yellow; legs also uniformly yellow, only the femur of the 4th lightly infusate distally. *Mandibles* with only two minor teeth on lower jaw as in *G. fatalis*, but with two behind the 3rd tooth of the upper jaw as in *G. afghanus*; the posterior of the two, however, is much smaller than in that species and tuberculiform. *Palpi* longer than in *G. afghanus*; the width of the head about two-thirds the length of the tibia, and much less than two-thirds that of the patella; spines on patella of palp all long and slender, considerably exceeding the height of the segment and only a little thicker at the base than the bristles; the six pairs of spines on the tibia much thinner than in *G. fatalis* and *G. afghanus* and a little longer than in the latter, the bristles that project between them long and slender at the base, much as in *G. fatalis*. Spine-armature of tarsi and hairy clothing on under side of these segments as in *G. fatalis*. External *malleolus* with blade a little exceeding the ocular tubercle.

♂. Resembling the female in colour, and like the males of *G. agilis* and *orientalis* in spine-armature of legs and palpi and dentition of mandible. At once recognizable from the latter by the colour of the palpi. *Flagellum* with the blade narrower and longer in proportion to its width than in *G. agilis*. *Legs* and *palpi* longer than in the latter, the patella of the palp being a little more than twice the width of the head-plate, and the tibia and tarsus taken together are also a little more, whereas in *G. orientalis* and *G. agilis* the width of the head is always more than half the length of these segments. Again, the patella of the 4th leg is twice and the tibia nearly twice the width of the head. Spines on under side of tibia of palp less cylindrical than in *G. agilis* and *G. orientalis*, mesially incrassate, then narrowed basally and apically. Spines composing pad on 4th tarsus shorter, thicker, and more abruptly acuminate than in *G. orientalis* and *G. agilis*. Blade of external *malleolus* as large as in *G. agilis*.

Measurements in mm. :—

	Total length.	Width of head.	Length of palpus.	Length of 1st leg.	Length of 4th leg.	Length of patella of palp.	Length of tibia and tarsus.
♂ . .	38	11	52	37	65	17	16
♀ . .	33	85	60	?	71	19.5	17

Loc. Northern Baluchistan (*Maynard & MacMahon*).

117. *Galeodes indicus*, sp. n.

[= *Galeodes fatalis*, Pocock, Jour. Bom. N. H. Soc. ix, p. 441, pl. A, fig. 2. & pl. B, fig. 1 a, in part (♂), 1895; not *fatalis*, Herbst: *G. orientalis*, Simon, Bull. Soc. Zool. Fr. x, p. 1, 1885; not *orientalis*, Stol.]

♀. *Colour*: head infuscate, paler in the middle line; mandibles yellower than the head and marked with fuscous lines; upper side of abdomen infuscate, the dorsal plates darker; legs and palpi a tolerably uniform yellowish brown, patella and basal half of tibia of palp and femur and patella of 4th leg at most lightly infuscate. *Head* about two-thirds the length of the patella of the palp and of 4th leg, shorter than the tibia of palp by about one-fifth of its length, and not quite so long as tibia of 4th leg. Dentition of *mandible* as in *G. afghanus*. Patella of *palp* armed below with about eight pairs of long setiform spines, of subequal thickness and alternating in length, but considerably exceeding the height of the segment; tibia similarly armed below with about ten or eleven pairs of longer and shorter spines, half of them on each side being very long and setiform, and slightly stouter than the others, which are short but for the most part exceed the height of the segment. Tarsi of legs armed as in *G. fatalis*, except that the distal tarsal segment of the 4th is spined. Blade of external *malleolus* slightly exceeding the ocular tubercle.

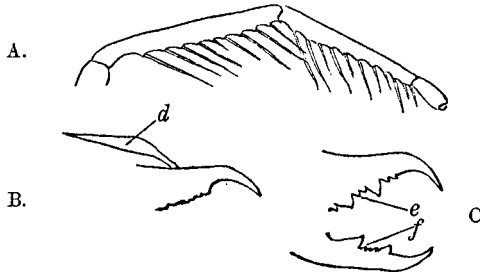


Fig. 49.—*Galeodes indicus*. A. Extremity of palpus of ♀. B. Upper jaw of ♂ with *d*, flagellum. C. Upper and lower jaws of ♀: *e*, minor teeth of upper jaw; *f*, ditto of lower jaw.

♂. Like the female in colour, spine-armature of tarsi, dentition of lower mandibular fang, &c. *Flagellum* long, not quite straight; blade much longer than the handle. *Palpi* very long, as in *G. macmahoni*, the patella more than twice the width of the head, which is also less than half the length of patella and tarsus taken together; head scarcely half the length of the patella of the 4th leg and not

quite two-thirds its tibia; tibia of palp differing from that of the previously described species in that the cylindrical setæ on the underside are very slender, few in number, and rarely extend to the distal end of the segment; the tubercles that bear them, moreover, are much smaller than in other species. *Tarsus* of 4th leg covered below with a pad of black or brown setæ, which, however, do not spread on to the apical segment. Blade of external *malleolus* less than half the width of the head. 5th abdominal *sternum* with marginal row of reddish bristles.

Measurements in mm. :—

	Total length.	Width of head.	Length of palp.	Length of 1st leg.	Length of 4th leg.	Length of patella of palp.	Length of tibia and tarsus of palp.
♀ . . 30	7.5	38	24	48	12	12	
♂ . . 28	7	54	37	62	18.5	16.5	

Loc. Ranging over the whole of India from Bengal in the north to Cape Comorin in the south.

Three subspecies of this species seem to be recognizable:—

a. The typical form (= *G. fatalis*, Pocock, Jour. Bom. N. H. Soc. p. 441, 1895, ♂), as described above, is the Northern form, with legs and palpi paler and almost uniformly yellowish brown or at most only slightly infusate.

Loc. Gwalior (*Maries*) and Gya (*Phipson*); Bilaspur in the Central Provinces (type); Thana, north of Bombay.

It is this northern form, then known only from a young female and an adult male from Gwalior, that I originally referred to *G. fatalis*, in conjunction with an adult ♀ of the genuine *fatalis* from the same locality. The male of the latter is still unknown; but seeing how closely the female resembles that of *G. orientalis*, there can be no doubt that the male will prove to be like the male of that species, and not like the male of *G. indicus*.

b. Subspecies **obscurior**, nov.

Resembling the typical form in spine-armature of tarsi and other structural points, but much darker in colour; palpi infusate, with the tarsus, base of femur, and a narrow area adjacent to the joints of tibia and patella pale; in the 4th leg the femur, patella, and at all events the base of the tibia infusate; the 2nd and 3rd legs also infusate, but less so than the 4th; even the upper side of the trochanters are clouded with fuscous. Length up to 41 mm., width of head 11.5, length of palp 45.

Loc. East Khandesh, Pimpalner &c. (*Pearson, Madan*); Násik (*Millett*).

c. Subspecies **australis**, nov. (= *orientalis*, Simon).

Southern form, with legs and palpi more infusate than in the typical *G. indicus*, but certainly less so than in *G. indicus* subsp. *obscurior*. Further differing from both the northern forms in the spine-armature of the tarsi of the 2nd and 3rd legs, which are armed posteriorly with only 1 or 2 spines. Male with pad on the 4th tarsus

composed of hairs which are paler in colour, more numerous, longer and sharper apically than in the male of the typical *G. indicus*.

Loc. Madras (*Jerdon*); Secunderabad (*Ricardo*, type); Tinnevely (*Barber*), and Kanara (*Bell*).

118. *Galeodes nigripalpis*, sp. n.

♂. Colour as in *G. agilis*, but with legs darker, the distal end of the femur, the patella, and tibia being infuscate; 1st leg with patella, tibia, and tarsus infuscate. Flagellum of mandible shorter than in the other species, its inferior (posterior) edge straight from base to tip, upper edge of blade evenly convex, rather abruptly narrowed to a point, the widest portion of the blade being about in the middle; one minor tooth on lower jaw. Palpi armed with spines as in *G. agilis* and other species, but the under surface of the tibia not thickly studded with tubercles bearing stiff short bristles, but nearly smooth with only a few tubercles bearing long setæ and covered with short slender silky hairs; palpi a little longer than in *G. agilis*; patella more than twice the width of the head, which is half the length of the tibia and tarsus taken together. Tarsi of 2nd and 3rd legs armed with the normal 4 anterior spines, but with only 2 posterior spines on tarsus of 2nd, 1 on the apical segment, the others on the distal end of the basal segment; tarsus of 4th with apical segment unspined. Length of patella of 4th leg twice the width of head; tibia longer than the width of the head by one-fourth of its length. Malleoli large; blade of the external malleolus exceeding half the width of the head.

Measurements in mm.—Total length 29, width of head 7.5, length of palp 52, length of 1st leg 38, length of 4th leg 62, patella of palp 17, tibia of palp 15.5.

Loc. Omāra on the Mekran coast, Baluchistan (*Townsend*).

119. *Galeodes bacillifer*, sp. n.

♀. Allied to *G. indicus*, but a uniform pale yellow, the ocular tubercle alone being black. Width of head a little more than half the length of the patella of the palp. Mandibles with two bluntly rounded minor teeth on the lower jaw, the posterior of them separated by a widish space from the posterior major tooth, and two behind the third tooth on the upper jaw. Palpi armed as in *G. indicus*, the spines on the patella all long and setiform; also on the tibia long setiform spines alternate with shorter thinner spines. Legs spined as in *G. indicus*, but the first tarsal segment of 2nd and 3rd legs armed with a posterior basal spine; tarsus of 4th armed with 4 pairs of spines; the apical segment unspined.

♂. Like the female in colour, and allied to the male of *G. indicus*. Mandibles with flagellum and tooth-armature as in that species. Palpi very long, patella two and a half times as long as the width of the head, tibia and tarsus a little more than twice as long; patella of 4th leg also about two and a half times as long, tibia nearly twice as long; tibia of palp scantily clothed beneath with long, slender, cylindrical bristles as in *G. indicus*. Tarsi of 2nd

and 3rd legs with posterior basal spine; tarsus of 4th clothed beneath with short distally expanded clavate bristles*. Width of blade of external malleolus equal to half the width of the head.

Measurements in mm.:—

	Total length.	Width of head.	Length of palpus.	Length of 4th leg.	Length of patella of palp.	Length of tibia and tarsus of palp.
♀.	30	6	33	44	11	11
♂.	22	6	46	59	15	14

Loc. Northern Baluchistan (*Maynard & MacMahon*).

Family SOLPUGIDÆ.

Apertures of the abdominal respiratory organs not protected by a pair of *serrulae*. *Tarsus* of palp not narrowed at its base, immovably united to tibia, from which it is separated by a sutural line. Basal portion of *claws* smooth, hairless. *Anal segment* large or small.

Distribution. As stated above under Order Solifugæ.

Subfamily DÆSIINÆ.

Kraepelin, Jb. Hamb. wiss. Anst. xvi, p. 221, 1899.

Anal segment small, roundish, almost completely divided into a right and left half by the anal aperture, which extends nearly to its upper edge. Anterior border of *head* not transverse, lightly produced. *Mandible* with stridulating-ridges highly developed. *Flagellum* membranous, with incurved edge or edges, longish, subovate, rounded at one extremity, pointed at the other, movably articulated to the inner side of the upper jaw by a single point of attachment somewhat resembling a pin-head. *Tarsus* of 1st leg without claw, of remaining legs spined beneath. *Tibiae* of 2nd and 3rd legs spined above.

Distribution. Mediterranean, Ethiopian, and Western Oriental Regions; America from Texas to the Argentine Republic.

One Indian genus.

* Apical tarsal segment considerably longer than the second, spine-armature also very abnormal; the basal segment armed with 5 spines behind and 10 spines in front, 4 being situated close together, 2 above and 2 below at the base, and 6 in a row; second segment with a pair of spines, apical segment with a single posterior spine. The 4th leg is present only on one side of the body, so it is not possible to judge of the constancy of this peculiar spine-armature nor of the value of the unusual inequality in length between the second and third tarsal segments.

Genus **GLUVIOPSIS**, Kraepelin.

Gluviopsis, Kraepelin, *Jb. Hamb. wiss. Anst.* xvi, p. 235, 1899.

♀. Anterior border of head lightly convex. Ocular tubercle furnished with numerous short stout bristles; similar bristles scattered over the head, being longest near the margins, and also on the thoracic and at least on the anterior abdominal terga. Upper jaw of mandible with 1st, 2nd, and 4th teeth large, 3rd small; lower jaw with 1 minor tooth. Patella and tibia of *palpus* armed below with two rows of spines and studded with short, erect, cylindrical bristles above and below; only a few tactile hairs on the palpus. *Legs* with tarsi one-jointed, tarsus of the 4th about five times as long as high; femur of 4th about five times as long as high; tibia of 2nd and 3rd with 5 posterior and dorsal spines.

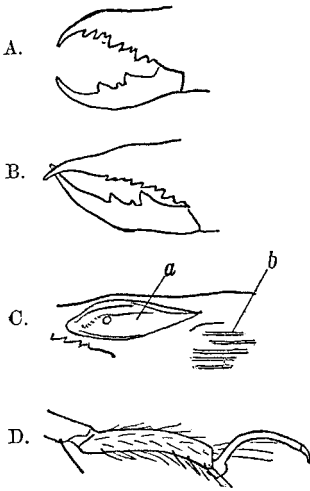


Fig. 50.—*Gluviopsis atratus*. A. Jaws of ♀. B. Jaws of ♂. C. Upper jaw of ♂ from inner side, showing flagellum (a) and some of the stridulating-ridges (b). D. Tarsus of 4th leg.

♂. With dorsal surface of head, thorax, and abdomen much more strongly spined than in female; upper jaw weakly toothed; *flagellum* membranous, fusiform, rounded in front and pointed behind when lying at rest, its upper edge folded over,

its anterior extremity not projecting so far as the 1st mandibular tooth, hinged to the jaw by a swivel joint, which is visible as a rounded chitinous button.

Type, *G. rufescens*, Pocock; N. Africa and Arabia.

Distribution. Countries south and east of the Mediterranean (Algiers, Asia Minor), Arabia, Somaliland, Socotra, and Western India.

120. *Gluviopsis atratus*, Pocock, *A. M. N. H.* (7) v, p. 303, 1900.

♀. Colour blackish, body covered with yellowish bristles and spines; 1st and 2nd legs mostly pale, base of palp and base and apex of 3rd and 4th legs pale. Width of head about equal to length of patella or to tibia and tarsus of palp, shorter than patella and longer than tibia of 4th leg. *Palpus* about three times as long as width of head.

♂. Much more coarsely and closely spined than female; terminal fangs of mandible long and slender, the upper nearly straight,

bent slightly downwards. *Palpi* longer, patella as long as tibia and tarsus and about one and a half times as long as width of head; patella of 4th leg nearly twice as long as, and tibia about one-fifth longer than, width of head. Modified hairs of 2nd abdominal *sternum* long, slender, incrassate, with apex acuminate.

Measurements in mm. :—

	Total length.	Width of head.	Length of palpus.	Length of 4th leg.
♀	14	3·5	11·5	17·8
♂	13	3	13	20

Loc. Western India: Poona Ghats (*Irani*); Pimpalner in Western Khandesh (*Pearson*).

Subfamily RHAGODINÆ.

Pocock, A. M. N. H. (6) xx, p. 250, 1897; *Kraepelin, Jb. Hamb. wiss. Anst.* xvi, p. 207.

Anal segment very large, the anal aperture situated in its lower half and scarcely extending to its centre. Anterior border of *head* straight and transverse. *Mandibles* with stridulating-ridges scarcely developed. *Flagellum* horny. *Legs* with tarsi spined beneath, and tibiæ of 2nd and 3rd legs strongly spined above.

Distribution. North Africa from Senegambia to Masailand; Syria, Arabia, Persia; India and Ceylon; Siam, Moluccas.

Genus RHAGODES, Pocock.

Rhax, *C. Koch, Arch. Nat.* 1842, p. 354, and of subsequent authors up to 1897 (*nec Rhax, Hermann*).

Rhagodes, *Pocock, A. M. N. H.* (6) xx, p. 252, 1897; *Kraepelin, Jb. Hamb. wiss. Anst.* xvi, p. 209, 1899.

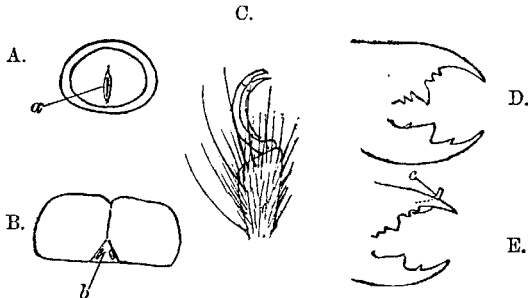


Fig. 51.—*Rhagodes brevipes*. A. Anal segment, showing anal aperture (*a*). B. Second abdominal sternum with stigmata (*b*). C. Tarsus of 4th leg. D. Jaws of female. E. Jaws of male with flagellum (*c*).

Ocular tubercle with a pair of setæ. *Mandibles* large, the 3rd

tooth of the upper jaw very large; lower jaw armed with one large tooth and two small teeth. *Flagellum* consisting of two closely applied pieces forming an apparently single organ fixed to the inner side of the base of the upper jaw, the basal half broad and directed forwards, the apex narrow and upturned, projecting vertically above the edge of the jaw. *Legs* short, tarsus of 1st tipped with claws: each tarsus consisting of a single segment. Male smaller than female and with legs longer; teeth of mandible smaller, 3rd tooth of upper jaw not projecting so strongly.

Type, *R. melanus*, Oliv.

Distribution. As above under *Rhagodinæ*, but not occurring in Siam and the Moluccas.

Synopsis of Indian Species.

- a. Legs and palpi ornamented with black rings and spots.
- a*¹. Antero-lateral angles of head yellow; femur of palp black beneath; a black spot on the lower surface of the femur and patella of 1st leg and on posterior surface of patella of 4th leg *R. nigrocinctus*, p. 151.
- b*¹. Antero-lateral angles of head not yellow; lower side of femur of palp, of legs of first pair, and tibia of 4th pair uniformly yellow (according to Simon) *R. annulatus*, p. 152.
- b. Legs and palpi uniformly yellowish or reddish brown, with the tibia and tarsus of palpus and of 1st leg either partially or entirely deep brown.
- a*². Mandibles yellow, head black. *R. nigriceps*, p. 150.
- b*². Mandibles and head of the same colour, black or deep brown.
- a*³. Abdomen entirely black above and at the sides; tibia of 4th leg furnished in front beneath with only one spine on the proximal side of the inferior apical spine *R. brevipes*, p. 149.
- b*³. Abdomen not entirely black; tibia of 4th leg with 2 spines on the proximal side of the inferior apical spine in front.
- a*⁴. Upper side of abdomen black in its anterior, yellow in its posterior half, the last somite quite black . . . *R. semiflavus*, p. 149.
- b*⁴. Upper side of abdomen mesially flavous; anal somite uniformly flavous.
- a*⁵. Sides of abdomen ornamented with a broad black band; only 1 stout spine at distal end of patella of 2nd and 3rd legs. *R. vittatus*, p. 150.
- b*⁵. No black band on sides of abdomen; at least 2 spines on apex of patella of 2nd and 3rd legs . . . *R. phipsoni*, p. 152.

121. *Rhagodes semiflavus*, *Pocock, A. M. N. II.* (6) iv. p. 473, 1889; *id. Jour. Bom. N. H. Soc.* ix, p. 450, t. B, fig. 2 (Rhax).

Colour. Head and mandibles a uniform deep brown; thoracic terga pale: anterior four terga of abdomen and anterior portion of the 5th blackish, posterior portion of 5th and the whole of the 6th, 7th, 8th, and 9th pale yellow, the last or anal segment black; sides of abdomen yellowish brown in front opposite the black terga, a deeper more chocolate brown behind opposite the pale terga; ventral surface of abdomen yellowish, covered with reddish-golden hairs; palpi flavous, with tibia and tarsus deep brown; first leg flavous, with tarsus and distal end of tibia deep brown and tibia clothed with reddish hairs; remaining legs uniformly flavous, with deep brown spines; malleoli uniformly flavous. Width of *head* about equal to patella and half the tibia of the palp, to tibia and two-thirds of the patella of the 4th leg, and to patella, tibia, and half the tarsus of the 3rd leg. *Palp* scarcely exceeding twice the width of the head. 2nd *leg* with patella armed above with one stout median apical spine, and below with one pair of setiform spines at the distal end and some stout setæ behind them; tibia armed with 6-7 stout spines above in an irregular row, also with a pair of spines below at the distal end and two spiniform setæ in a row on the underside in front, the distal of these much the stouter of the two; tarsus armed with three pairs of spines in addition to numerous stiff bristles; 3rd leg armed like the 2nd, the inferior pair of setiform spines on patella stouter, the proximal of the two spiniform setæ on the front of the underside of tibia thinner as compared with the distal; patella of 4th with a pair of distal spiniform setæ, the anterior the stouter and shorter of the two; tibia not spined above, but armed with a pair below at the distal end, one in front at the distal end and two on the under surface in front.

Measurements in mm.—♀. Total length 33, width of head 9, length of palp 21, of 4th leg 27, patella, tibia, and tarsus of palp 14.

Loc. Kohat in the Punjab (*Batten*).

122. *Rhagodes brevipes*, *Gervais, L'Institut*, x, 1842, p. 76; *id. Ins. Apt.* iii, p. 87, 1844 (Solpuga); *Pocock, Jour. Bom. N. H. Soc.* ix, p. 450, t. A, fig. 4, and t. B, fig. 3, 1895 (Rhax).

♀. *Colour.* Head black, mandibles deep blackish brown; thoracic segments yellow, lightly infuscate; upper and lateral surface of abdomen coal-black, lower surface deep brown; legs and palpi uniform clear reddish yellow, the tibia, except for a narrow pale ring at the base, and the tarsus of the palp almost black, and the tarsus and distal half of tibia of 1st leg deep brown; malleoli with fuscous border. *Legs* and *palpi* rather shorter than in *R. semiflavus*; width of head equal to patella and three-fourths of tibia of palpus, almost as long as patella and tibia of 4th leg, and as long as patella, tibia, and tarsus of 3rd; palpus not so much as twice the width of the

head. Spines and spiniform setæ of legs and palpi thinner than in *R. semiflavus*.

♂. Resembling female in colour. *Palpus* twice and a half as long as the width of the head, the latter as long as its patella and one-third of the tibia of the palpus and of 4th leg, or as the patella and about three-quarters of the tibia of the 3rd leg.

Measurements in mm.:—

	Total length.	Width of head.	Length of palp.	Length of 4th leg.	Length of patella, tibia, and tarsus of palp.
♀	33	10	19·5	23	13·3
♂	20	6	16	23	10

Loc. N.W. India: Umballah; Dharmśāla (*Fulton*); Dera Ghāzi Khan (*Watts*); Nepal (*Hardwicke*, type)*.

123. *Rhagodes vittatus*, *Pocock, Jour. Bom. N. H. Soc.* xii, p. 746, 1899.

♂. *Colour* of head, mandibles, legs, palpi, thoracic terga, and under side as in *R. semiflavus*, but differing from the latter in the colour of the upper and lateral surface of the abdomen; the tergal plates, with exception of the 1st, which is black at the sides, are a uniform clear yellow, the last or anal segment being at most faintly clouded with fuscous below, the sides of the upper surface ornamented by a broad deep black band, which extends from the first tergite to the posterior end of the abdomen, narrowing posteriorly and stopping short before reaching the anal somite. *Head* thickly clothed, especially behind, with long reddish hairs; mandibles as in the male of *R. brevipes*, but with the third tooth of the upper jaw and the large tooth of the lower distinctly smaller. Width of head equal to patella and half the tibia of the palp, to patella and one-fourth the tibia of the 4th leg, and to patella and half the tibia of the 3rd. *Legs* and *palpi* spined as in the preceding species, but the coxæ of the 1st, 2nd, and 3rd legs furnished with long, slender, cylindrical, dark-coloured spines.

Measurements in mm.—♂. Total length 22, width of head 6·5, length of palp 16, length of 4th leg 26, patella, tibia, and tarsus of palp 9·5.

Loc. Karaghora in Kathiawar (*Bulkeley*).

124. *Rhagodes nigriceps*, *Pocock, Jour. Bom. N. H. Soc.* ix, p. 451, 1895 (Rhax): persicus, *Kraepelin, Jb. Hamb. wiss. Anst.* xvi, p. 211, 1899 (*Rhagodes*).

♀. *Colour.* Head and upper side of abdomen uniformly deep black, as in *R. brevipes*, with rarely a pale patch on the posterior extremity of the upper side of the abdomen; mandibles clear yellow; legs and palpi coloured as in *R. brevipes*, but with only the tarsus of the palp and 1st leg deep brown, the tibia at most lightly browned.

* *Hardwicke's* localities are not to be trusted. In the present instance, Nepal is probably erroneous.

Width of *head* equal to patella and three-fourths the tibia of the palpus, almost as long as these segments of the 4th leg, and as long as the patella, tibia, and tarsus of the 3rd leg. Spine-armature of *legs* and *palpi* as in *R. brevipes*, but the tibia of the 4th leg armed in front beneath with two distinct spines in addition to the two at the apex of this segment as in *R. semiflavus*, but the two spines closer together.

♂. With terminal fangs of *mandible* very long, slender, and curved, very noticeably more so than in the males of *R. brevipes* and *R. vittatus*; *flagellum* larger, its terminal portion thicker than in the previously described males. Width of *head* about equal to patella and one-third of tibia of palpus and of 4th leg. *Coxæ* bearing numerous cylindrical spines.

	Total length.	Width of head.	Length of palpus.	Length of 4th leg.	Length of patella, tibia, and tarsus of palp.
♀ ..	26	6.3	13	16.5	9
♂ ..	21	6	16	23	10.2

Loc. East India (type): Northern Baluchistan (*Maynard & MacMahon*); Persia (*Kraepelin*).

125. *Rhagodes nigrocinctus*, *Bernard, Jour. Linn. Soc., Zool.* xxiv, p. 361, pl. xxvi, fig. 2, 1894; *Pocock, Jour. Bom. N. H. Soc.* ix, p. 451, 1895 (Rhax).

♀. *Colour* of upper side of trunk as in *R. vittatus*, the head and mandibles being blackish brown, but there is a conspicuous yellow patch on each antero-lateral angle of the head; terga of thorax yellow, lightly clouded with fuscous; terga of abdomen yellow, the anterior portion of the 1st and 9th black, and the antero-lateral angles of the 6th, 7th, and 8th, and to a lesser degree of the others, blackish; anal somite and sides of abdomen black, lower surface of abdomen deep blackish brown, the median area of the 1st sternum, and the area around the stigmata on the 2nd and 3rd, yellow; malleoli flavous; coxæ of legs and palpi and first trochanter segment of 3rd and 4th legs clouded with dull brown; palpi yellow, with the trochanter and inferior edge of femur black, a black ring round the middle of the patella occupying about one-third of its length, and the distal half of the tibia and the tarsus black; 1st leg yellow, with a black spot on the under side of the femur and patella; tarsus deep brown; 2nd leg with a complete black ring round the femur; 3rd leg with complete femoral ring and a black ring round distal half of patella, but separated by about its own width from the apex of the segment; 4th leg with a broad black femoral ring, incomplete in the middle line above, and a black spot on the posterior side of the patella; there is also a black patch on the upper side of the 3rd and 4th legs, marking their point of attachment to the thorax. Width of head as compared with length of legs and palpi, dentition of mandibles, and spine-armature of legs as in *R. nigriceps*.

Measurements in mm.—♀. Total length 23, width of head 6, length of palpus 13, length of 4th leg 16, patella, tibia, and tarsus of 4th 8.

Loc. Southern India: Vellore.

126. *Rhagodes annulatus*, *Simon, Bull. Soc. Zool. Fr.* x, p. 2, 1885; *Pocock, Jour. Bom. N. H. Soc.* ix, p. 452, 1895 (Rhx).

This species is unknown to me, but, judging from the description, it is closely related to *R. nigrocinctus*. It may, however, be provisionally regarded as distinct on the grounds that Simon does not mention the presence of a yellow patch on each anterior lateral angle of the head, nor the blackness of the lower side of the femur of the palp, nor the black spot on the lower side of the femur and patella of the 1st leg, nor on the posterior side of the patella of the 4th leg.

Loc. Wagra-Korur, near Guntakal in the Bellary District.

127. *Rhagodes piphsoni*, *Pocock, Jour. Bom. N. H. Soc.* ix, p. 448, t. A, fig. 3, and t. B, fig. 4, 1895 (Rhx).

♀. *Colour* much like that of *R. vittatus*; head and mandibles deep reddish brown; abdomen tolerably uniform whitish yellow, the terga a little darker than the lateral surface, but there is no black lateral band such as is present in *R. vittatus*; legs and palpi yellow, with tibia and tarsus of palp and 1st leg brown and becoming browner towards the distal extremity. *Palpi* and *legs* shorter than in any of the Indian species; width of head equal to length of patella and tibia of palp, very slightly longer than these segments of the 4th leg, and longer than patella, tibia, and tarsus of the 3rd; palpus much less than twice as long as the width of the head. Spine-armature of legs as in the other species, but with one additional stout brown spine (rarely two) at the apex of the patella of the 2nd and 3rd legs, behind and below the normal superior spine. Spines on tibia of 4th as in *R. nigriceps*, but with an additional spine on the posterior side of the segment on the proximal side of the normal posterior apical spine; the two spiniform setæ on the apex of the tibia beneath long, but the anterior much thicker than the posterior.

♂. Resembling the female in *colour*, except that the base of the tibia of the palpus and the whole of the segment of the 1st leg is yellow; spine-armature of legs as in female. Width of *head* equal to tibia and about one-third of patella of palpus, and to tibia and about one-sixth of patella of 4th leg, and to tibia and two-thirds of patella of 3rd leg.

Measurements in mm.—

	Total length.	Width of head.	Length of palpus.	Length of 4th leg.	Length of patella, tibia, and tarsus of palp.
♀ ..	64*	14.5	25.5	36	17
♂ ..	32	8.5	21	32	12

Loc. Ceylon: Trincomali (*Bombay N. H. Soc.*).

* Abdomen much distended.