

- of cephalothoracic limbs; coxæ of posterior four thoracic limbs in contact.
- a*<sup>3</sup>. Carapace distinctly segmented; mandible articulated to the sides of its anterior plate; appendages of 2nd pair leg-like and tactile. Of large size . . . . . *SOLIFUGÆ.*
- b*<sup>3</sup>. Carapace not segmented, merely transversely grooved; mandibles not articulated to the carapace; appendages of the 2nd pair chelate, like those of the Scorpions. Of small size. { *PSEUDO-*  
*SCORPIONES.*
- b*<sup>4</sup>. Body short; abdomen either unsegmented or consisting of only five somites: generative aperture thrust forwards between the coxæ of the cephalothoracic limbs.
- a*<sup>6</sup>. Abdomen segmented; mouth-parts not modified to form a suctorial proboscis . . . . . *OPILIONES.*
- b*<sup>6</sup>. Abdomen not segmented; mouth-parts usually modified to form a suctorial proboscis. . . . . *ACARI.*

The present volume deals with the Scorpiones, Uropygi, Amblypygi, Solifugæ, and with the larger or otherwise conspicuous species of Araneæ (Spiders).

The Acari (Mites and Ticks) are not likely to be mistaken for any other order. The Opiliones (Harvest Spiders), sometimes called Phalangidea, are, however, frequently confounded with the true Spiders; and the Pseudoscorpiones (False or Book-Scorpions) are often similarly regarded as diminutive Scorpions. Nevertheless, the key to the orders given above will enable naturalists and collectors to refer any Indian arachnid to its proper systematic position in the Class.

## Order SCORPIONES.

*Integument* horny, smooth or granular, usually scantily clothed in parts with short tactile hairs, which are generally longer on the legs and tail than on the trunk. On the segments of the chelæ the hairs are often long and bristle-like, and emerge from circular integumental pits with a thickened rim. The number and position of these pits, known as *setal*, *setiferous*, or *bristle pores*, are often of systematic importance.

*Carapace* unsegmented and furnished near its centre with a

pair of median eyes, and on each of its antero-lateral angles with two or three large eyes, and sometimes one or two small eyes as well; the triangular area between the eye-groups is termed the *frontal area* or the *antecular triangle*. The anterior border of the carapace is often notched in the middle, forming a right and left *frontal lobe*. *Mandibles* chelate, consisting of three segments, the

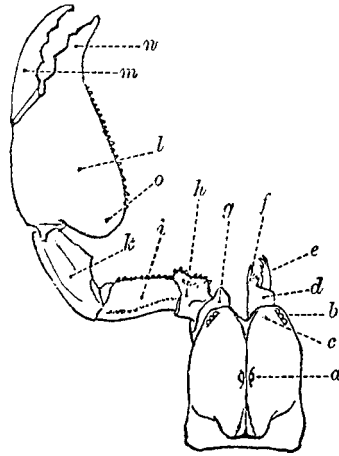


Fig. 1.—Carapace, chela, and mandible of *Palamneus swammerdami*.

*a*, median eyes; *b*, lateral eyes; *c*, frontal lobe of carapace; *d*, second segment of mandible; *e*, movable, and *f*, immovable finger of mandible; *g*, coxa; *h*, trochanter; *i*, humerus; *k*, brachium; *l*, hand; *m*, movable finger, *n*, immovable finger of chela; *o*, lobe of hand.

basal small and concealed; the second, larger and swollen, furnished in front with a strong process, the *immovable finger*, which is armed with an upper, and sometimes also with a lower, set of teeth; the third segment, the *movable finger*, which works in a horizontal plane, is also furnished with one or two rows of teeth, an upper and a lower, along its biting-edge.

The appendages of the 2nd pair (*chela*) are pincer-like and move for the most part in a horizontal plane; the segments are named as follows from base to tip—*coxa*, *trochanter*, *humerus*, *brachium*, *hand*, *movable finger*. The coxa is freely articulated to the membrane on each side of the mouth and acts as a jaw or maxilla; the humerus and brachium are generally furnished with granular *crests* or *keels*. For descriptive purposes the humerus is regarded as set at right angles to the long axis of the body, hence it has an anterior and a posterior surface; whereas the brachium and hand are regarded as resting in a line parallel to the long axis of the body, hence they have an outer and an inner surface. The hand

is very variable in form: the flattish area of it that lies immediately behind the joint of the movable finger, and usually rests upon the ground, is called the *underhand*. This underhand is generally separated externally from the upper side of the hand by a strong crest or keel, the keel of the underhand. The upper side is sometimes evenly convex; sometimes, however, its outer portion above the keel of the underhand is flat and vertical, and its inner portion flat and horizontal, the two areas cutting each other at right angles and separated by a ridge or keel, called the *finger-keel*, because it runs forwards on to the immovable finger. Frequently additional keels are developed both upon the outer and upon the inner portion of the upper surface. The upper surface is generally bordered internally by a sharp edge, known as the inner edge or border, and the area beneath this edge and between it and the underhand is called the inner or inferior surface of the hand.

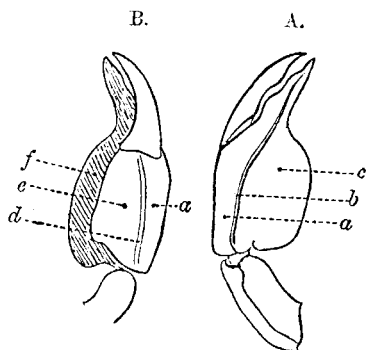


Fig. 2.—A, upper, and B, under side of hand of *Scorpiops crassimanus*.

a, outer portion of upper surface; b, finger-keel; c, inner portion of upper surface; d, keel of underhand; e, underhand; f, inner surface of hand.

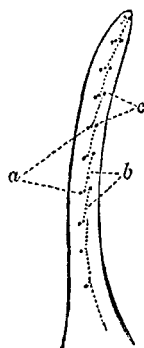


Fig. 3.—Movable finger of chela of *Lychas scutillus*.

a, external; b, median; c, internal series of teeth.

according to its position when the hand is normally at rest, and according to the shape of the particular hand under description. The movable and immovable fingers are provided with teeth along their biting-edges. The arrangement of these teeth furnishes valuable specific and generic characters. The armature usually consists of several rows of small teeth arranged longitudinally and partly obliquely along the middle line of the finger, sometimes set end to end, sometimes overlapping to a greater or less extent. These constitute the *median series* of teeth. Moreover, the anterior tooth of each row of the median series is often enlarged and separated from the rest of the row to which it belongs. This series of anterior teeth thus enlarged and often isolated constitutes

the *inner series*. An *outer series* similarly results from the enlargement of one or two of the posterior teeth of the median rows.

The four *legs* are practically alike in structure and act as locomotor organs. The coxæ of both 1st and 2nd pairs are furnished with a forwardly-directed *maxillary process*, which underlies the area immediately below the mouth. The coxæ of the 2nd pair

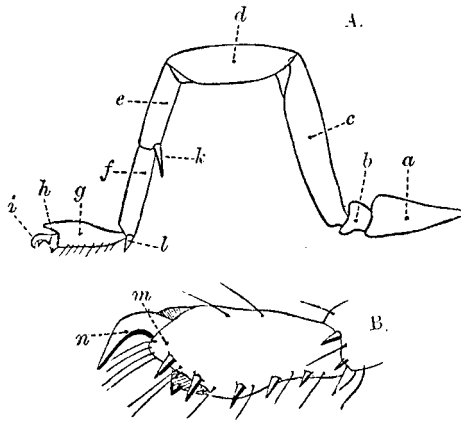


Fig. 4.—A. Diagram of Scorpion's leg. *a*, coxa; *b*, trochanter; *c*, femur; *d*, patella; *e*, tibia; *f*, protarsus; *g*, tarsus; *h*, claw-lobe; *i*, superior claw; *k*, tibial spur; *l*, pedal spur.  
B. Side view of posterior tarsus of *Palamneus swammerdami*. *m*, lateral lobe overlapping base of claw (*n*).

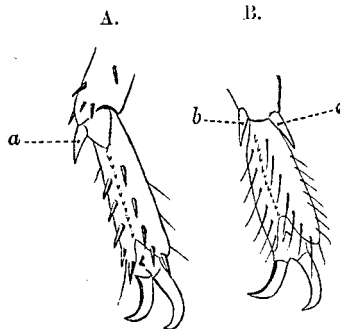


Fig. 5.—A. Lower side of tarsus of *Hemiscorpius*, showing (*a*) single anterior pedal spur; and B, of *Cherilus*, showing (*b*) anterior and (*c*) posterior pedal spur.

meet each other in the middle line. The coxæ of the 3rd and 4th pairs are welded together; they do not meet across the middle line of the body, but are separated from each other by the *sternum* of the cephalothorax, which has the form of a triangular or pentagonal plate, and anteriorly abuts against the coxæ of the legs of the 2nd pair.

None of the seven segments of the legs are subdivided. The seventh or apical segment (*tarsus*) is furnished on its lower side with hairs or spines. Three claws are articulated to the membrane at its distal end, two superior and one inferior, the latter being often partially or wholly worn down. The upper side of the tarsus is generally produced at its distal end into a process (the *claw-lobe*) overhanging the base of the claws, and the claws are sometimes overlapped laterally by a lobate expansion of the side of the tarsus. Attached to the articular membrane which unites the base of the tarsus to the adjacent extremity of the segment that precedes it (the *protarsus*) there are one or two pale but dark-tipped claw-like spurs (the *pedal spurs*)\*. In many cases there is a similar spur (the *tibial spur*) between the protarsus and the tibia.

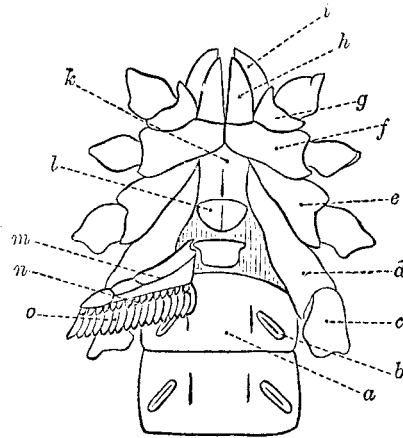


Fig. 6.—Ventral surface of cephalothorax and of anterior end of abdomen of *Palamneus*.

*a*, 1st abdominal sternum (=sternum of 3rd abdominal somite); *b*, respiratory stigma; *c*, trochanter of 4th leg; *d*, coxa of 4th, *e* of 3rd, *f* of 2nd, *g* of 1st leg; *h*, maxillary lobe of 2nd leg; *i*, maxillary lobe of 1st leg; *k*, pentagonal cephalothoracic sternum; *l*, genital operculum; *m*, segmented shaft of pecten; *n*, fulcra; *o*, teeth of pecten.

The *abdomen* is anteriorly as broad as the cephalothorax. It consists of twelve distinct somites, the last five of which are narrow, tubular, flexibly jointed together, and constitute, with the postanal skeletal piece, the *tail*. This postanal skeletal piece consists of two distinct parts—an enlarged, usually globular basal portion (the *vesicle*), which contains a pair of poison-glands, and a spiniform distal portion (the *aculeus*). Beneath the latter, on the vesicle, there is frequently a tooth-like process, the *vesicular spine*. For purposes of description and measurement, the vesicle and aculeus are regarded as extended in the same straight line as the tail, the

\* These spurs must not be confounded with the thinner blacker spines most frequently seen in their vicinity upon the extremity of the protarsus.

aculeus pointing backward. The *anus* is placed beneath the vesicle, at the end of the 5th tail-segment; the edge of the latter adjacent to the anus is termed the anal border. All the caudal or tail-segments are as a rule carinate, crested or keeled at the sides and below; the keels, when fully developed, being eight or ten in number on the first four segments, whereas the 5th has only five complete keels, one of which occupies the middle line of its lower side. From above downward on each side the keels of the first four segments bear the following names—superior, superior lateral, median lateral, inferior lateral, inferior median. The keels of the 5th caudal segment are named superior lateral, inferior lateral, and inferior median (see fig. 8, p. 17).

Although the tail is in reality part of the *abdomen*, the latter term is, for descriptive purposes, restricted to the seven somites that precede the tail. The last abdominal somite is narrowed posteriorly, and is usually crested both on its tergum and sternum after the manner of the tail-segments, each being furnished with four keels. Each of the four sternal plates that precede the last is provided with a pair of elongate or circular respiratory *stigmata*; on the inner side of the stigma there is a distinct groove, the muscular impression. The sternum of the 2nd abdominal somite is very small, but bears a pair of comb-like appendages (the *pectines*). These consist of a handle or *shaft* and a series of movable *teeth*. Between the bases of the teeth there are small rounded skeletal pieces called the *fulcra*. The shaft is usually segmented. Between the sternum that bears the pectines and that of the cephalothorax, already described, is situated the generative orifice: this is covered by a single or double movable lid, the *genital operculum*.

*Measurements*.—In the specific descriptions the measurements are taken as follows:—Total length is taken from the anterior border of the carapace, not including mandibles, to the tip of the aculeus when the vesicle is depressed so as to lie in the same line as the caudal segments; the carapace is measured from the side of its anterior border to a corresponding spot on the posterior border, and not along the middle line. The tail-segments are measured laterally along the carinate portion, the measurements not including the short unkeeled cylindrical portion situated at the anterior extremity of the segments, and frequently covered by the posterior extremity of the segment in front. Humerus and brachium of chela are measured along the upper surface; the underhand along the keel that borders it above or externally, and the movable digit along its outer edge.

*Sexual differences*.—The male is, as a rule, a little smaller than the female and has a narrower abdomen. Moreover the chelæ are frequently longer and the hand is either broader or narrower: when broader, the fingers are, as a rule, separated at the base, the movable being furnished with a lobe-like tooth which fits into a corresponding notch on the immovable. The tail is generally longer, sometimes very much longer, less commonly stouter at its posterior end; the vesicle may be longer and thinner, or more globular or otherwise modified. The pectinal teeth are either

larger or more numerous, sometimes both. Lastly, the genital operculum is always formed of two movable halves, whereas in the female the two halves are frequently united.

The young are born alive.

*Distribution.* Scorpions are found almost all over the world to the south of a line represented roughly by the 40th or 45th parallels of North latitude. None, however, occur in New Zealand or in Oceanic islands, unless artificially introduced, or in the extreme south of South America. They are strictly carnivorous, feeding for the most part on insects, and live under stones, fallen tree-trunks, the bark of dead trees, in deep burrows that they dig in the soil, or in shallow depressions excavated in the loose sand.

The Scorpions of British India are referable to five families, the characters of which may be tabulated as follows:—

- a.* Legs furnished with a pair of pedal spurs, one in front and one behind.
  - a*<sup>1</sup>. Sternum almost invariably triangular, narrowed in front; 3rd and 4th legs usually furnished with tibial spurs ..... **Buthidæ.**
  - b*<sup>1</sup>. Sternum pentagonal, parallel-sided, tibial spurs never present.
    - a*<sup>2</sup>. Maxillary process of 1st leg anteriorly expanded, with broadly truncate border; two lateral eyes on each side; stigmata circular; shaft of pecten scarcely segmented ..... **Chærilidæ.**
    - b*<sup>2</sup>. Maxillary process of 1st leg anteriorly narrowed, apically pointed; three lateral eyes on each side; stigmata narrow, elongate; shaft of pecten distinctly segmented ..... **Vejovidæ.**
- b.* Legs furnished with a single anterior pedal spur, the posterior always absent; sternum pentagonal.
  - a*<sup>3</sup>. Distal lateral edges of tarsi not produced into a lobate prominence overlapping the base of the claw, but straight and forming a right angle with the claw-lobe; body and chelæ flat; hand with strong finger-keel; tail weak, compressed ..... **Ischnuridæ.**
  - b*<sup>3</sup>. Distal lateral edges of tarsi produced into a rounded lobe overlapping base of claws and forming a very acute angle with the base of the claw-lobe; body and chelæ not flat; hand without strong finger-keel; tail strong, not compressed ..... **Scorpionidæ.**

NOTE.—The following species, belonging to the family Chactidæ, which, with the exception of the Mediterranean genus *Scorpius* (= *Euscorpius*, Thor.), is confined to Central and South America, were originally recorded from India, but certainly erroneously:—*Chactas quinque-dentatus*, Karsch, Zeits. Naturw. liii, p. 405, 1880. *Chactas schaumii*, id. ibid. p. 406.

The generic position and specific validity of the first-named is still a matter of doubt. The second, however, which is possibly identical with it, is, according to Kraepelin, specifically the same as a species from British Guiana which I described in 1893 as *Hadrurochactas sclateri*.

## Family BUTHIDÆ.

Cephalothoracic sternum small, nearly always narrowed in front to a point, and hence triangular in shape. In two of the genera that occur in India, namely, *Butheolus* and, more especially, *Charmus*, it is more parallel-sided and pentagonal in form, as in the rest of the families of Scorpions; but the true position of these genera in the Buthidæ is shown by the sum total of their characters, more especially by the presence on the legs of the 3rd and 4th pairs of the tibial spurs, which are never found outside the limits of the Buthidæ. Legs with a pair of pedal spurs, of which the anterior is often double, being furnished with a secondary branch. Very frequently a spine beneath the aculeus on the caudal vesicle.

*Distribution.* Temperate and tropical regions of the world south of the 45th parallel of North latitude.

The Indian genera may be arranged under two subfamilies:—

- a. 3rd and 4th legs furnished with tibial spurs . . . . . *Buthinæ*, p. 12.  
 b. 3rd and 4th legs without tibial spurs . . . . . *Centrurinæ*, p. 42.

## Subfamily BUTHINÆ.

Buthini (sensu stricto), *Pocock, A. M. N. H.* (6) xvii, p. 428, 1896;  
*Kraep. Tierr., Scorp. etc.* p. 6, 1899 (Buthinæ, in part).

Characters as above.

*Distribution.* Confined to the Old World\*.

*Synopsis of Indian Genera.*

- a. A strong triangular spine on the caudal vesicle beneath the aculeus . . . . . *LYCHAS*, p. 35.  
 b. No triangular spine, at most a small tubercle beneath the aculeus on the vesicle.  
 a'. Frontal area of carapace sloped downwards from the ocular tubercle to the anterior edge; area of carapace behind the eyes impressed with a strong transverse groove; sternum of cephalothorax much smaller than genital operculum . . . . . *BUTHEOLUS*, p. 28.  
 b'. Frontal area of carapace horizontal; area behind eyes without distinct transverse groove; sternum about as long as genital operculum.

\* I propose to eliminate from this subfamily the isolated Neotropical genus *Ananteris*, which differs strikingly from the rest of the family in the structure of the pectines. The subfamily *Ananterinæ* may be created for its reception.



- a*<sup>2</sup>. Abdominal terga with three crests: all the caudal segments keeled.
- a*<sup>1</sup>. Immovable finger of mandible with two teeth below; carapace with conspicuous keels; not variegated . . . . . BUTHUS, p. 13.
- b*<sup>1</sup>. Immovable finger of mandible with only one tooth below; carapace without keels; variegated yellow and black . . . . . HEMBUTHUS, p. 34.
- b*<sup>2</sup>. Abdominal terga with only one median keel; tail scarcely keeled.
- a*<sup>1</sup>. Sternum pentagonal; median rows of teeth on fingers of chela scarcely overlapping; trunk and tail thickly granular . . . . . CHARMUS, p. 31.
- b*<sup>1</sup>. Sternum triangular; median rows of teeth on fingers of chela largely overlapping; tail and body smooth, polished, scarcely granular . . . . . STENOCHIRUS, p. 32.

Genus **BUTHUS**. Leach.

*Buthus*, *Leach, Tr. Linn. Soc.* xi, p. 391, 1815 (and of most subsequent authors except C. Koch).  
*Androctonus* + *Liurus* + *Prionurus*, *Hempr. & Ehr. Symb. Phys., Scorpiones*, pp. 3-5, 1829.  
*Androctonus*, *Thorell, A. M. N. H.* (4) xvii, p. 7, 1876; *Kraepelin, Jb. Hamb. wiss. Anst.* viii, p. 173, 1891.  
*Prionurus*, *Peters, M.B. Akad. Berlin*, 1861, p. 513; *Pocock, P. Z. S.* 1890, p. 126.

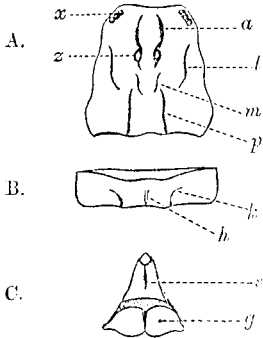


Fig. 7.—A. Diagram of carapace of *Buthus*. *a*, anterior, *m*, median, *p*, posterior, *l*, lateral keel; *x*, lateral, and *z*, median eyes.  
 B. Abdominal tergum of same. *h*, median, *k*, lateral keel.  
 C. Triangular sternum (*s*) of cephalothorax, and (*g*) genital operculum of same.

Two teeth on the under edge of the immovable *mandibular finger*. *Terga* with a median and two lateral granular keels. *Carapace* with strong keels (at least in all the Indian species), an anterior pair in front of the ocular tubercle, a shorter median and a longer posterior pair behind it, also a single lateral keel on each side. *Tail* keeled; no spine beneath aculeus. *Sternum* triangular, not shorter than the genital operculum. Armature of *digit of chela* consisting of numerous median rows of teeth, an outer series consisting of couplets of large teeth, and an inner of single teeth, set in advance of those of the outer series.

Type, *B. occitanus*, Amor., S. Europe, &c.

*Distribution*. Mediterranean area of Palearctic Region; China; Ethiopian Region down to Zambesi; India, but absent from Ceylon and Burma.

*Synopsis of Indian Species.*

- a.* Dorsal surface of 5th segment of tail with compressed, elevated lateral keels; the area between these keels strongly concave . . . . . *B. australis*, p. 15.
- b.* Dorsal surface of 5th segment of tail with rounded or at most slightly elevated and granular lateral edges; the area between the edges flat or lightly convex, with a median longitudinal depression.
- a*<sup>1</sup>. Inferior median keels of 2nd and 3rd caudal segments and the anterior border of lower side of 4th furnished with large paired lobate teeth; anterior terga of abdomen with a transverse granular crest . . . . . *B. doræ*, p. 16.
- b*<sup>1</sup>. Inferior median caudal keels evenly or almost evenly granular; anterior terga of abdomen without transverse granular crest.
- a*<sup>2</sup>. Inferior lateral keels of 5th caudal segment not evenly granular, the granules increasing in size and becoming denticuliform or lobate posteriorly.
- a*<sup>3</sup>. Median and posterior keels of carapace in contact and forming a pair of converging, nearly continuous ridges; distance between posterior ends of these keels less than distance between posterior margin of carapace and ocular tubercle; hairs on underside of tarsi longer, not spiniform . . . . . *B. macmahoni*, p. 18.
- b*<sup>3</sup>. Median and posterior keels of carapace forming a pair of irregular interrupted crests; distance between their posterior ends about equal to distance between posterior edge of carapace and ocular tubercle; hairs on underside of tarsi short and spiniform.
- a*<sup>4</sup>. Intercarinal spaces of tail smooth; granules of inferior keels of 2nd and 3rd caudal segments increasing in size posteriorly; inferior lateral keels of 5th more strongly lobate . . . . . *B. caucasius*, p. 19.
- b*<sup>4</sup>. Intercarinal spaces of tail finely granular; granules of inferior median keels of 2nd and 3rd caudal segments not increasing posteriorly; inferior keels of 5th caudal segment less strongly lobate . . . . . *B. atrostriatus*, p. 20.
- b*<sup>5</sup>. Inferior lateral keels of 5th caudal segment evenly and finely granular throughout.
- a*<sup>5</sup>. Hand granular and furnished with finely granular keels; abdominal sterna finely and closely granular; median and posterior keels of carapace forming an unbroken line . . . . . [p. 20.  
*B. acute-carnatus*,

- b*<sup>5</sup>. Hand smooth, not granular; sterna, except the last, smooth; median and posterior keels of carapace not forming a continuous unbroken crest.
- a*<sup>6</sup>. Brachium of chela with two distinct keels on the upper side.
- a*<sup>7</sup>. Carapace and terga, except the last, blackish green; posterior end of tail not darker than the rest; hands yellow . . . . . *B. alticola*, p. 21.
- b*<sup>7</sup>. Median portion of terga and carapace blackish green, lateral portions yellow; posterior end of tail deep brown, much darker than anterior portion; hands and fingers, excepting their tips, black. *B. nigrifrons*, p. 22.
- b*<sup>8</sup>. Brachium not crested above, or furnished merely with a weak crest in front.
- a*<sup>8</sup>. Tail thinner, 2nd and 3rd segments usually distinctly longer than wide; total length of adult from about 65 to over 80 mm.; pectinal teeth from as low as 28 (♀) up to 39 (♂) . . . . . *B. tamulus*, p. 23
- b*<sup>8</sup>. Tail thicker, 2nd segment as broad or broader than long, 3rd almost as broad or broader than long; total length of adult less than 60 mm., average about 50; pectinal teeth from 18 (♀) up to 29 (♂).
- a*<sup>9</sup>. Tail thinner; movable finger longer, as long as carapace, furnished with 14-15 rows of teeth as in *tamulus*; pectinal teeth 23-24 (♀), 24-26 (♂) . . . . . *B. hendersoni*, p. 26.
- b*<sup>9</sup>. Tail thicker; movable finger shorter, with 12 rows of teeth; pectinal teeth 18-24.
- a*<sup>10</sup>. Colour yellowish brown to blackish on body; legs, chelæ, and tail never dark . . . . . *B. rugiscutis*, p. 26.
- b*<sup>10</sup>. Colour black, blackish green, or very deep brown on body and limbs. . . . . *B. pachyurus*, p. 27.
1. *Buthus australis*, *Linn. Syst. Nat.* ed. x, i, p. 625, 1758 (Scorpio); *Lönnerberg, A. M. N. H.* (7) i, pp. 87-88 (Androctonus); *priamus*, *C. Koch, Arachn.* v, p. 45, 1839 (Androctonus); *hector*, *id. ibid.* vi, p. 6, 1839 (Androctonus); *australis priamus*, *Pocock, Journ. Linn. Soc., Zool.* xxv, p. 305, 1895 (Prionurus); *Kraep. Tierr., Scorp.* etc. p. 15, 1899 (Buthus).

*Loc.* Algeria and Tunisia (of typical form); Egypt; Syria.

Subspecies *finitimus*, *Pocock, Jour. Bom. N. H. Soc.* xi, p. 103, 1897 (Prionurus); *Kraep. Tierr., Scorp. etc.* p. 16, 1899 (Buthus).

*Colour* a tolerably uniform yellow, the legs and chelæ clearer than the trunk; tail with its 5th segment and vesicle pale greenish or brownish black, the dark pigment spreading on to the sides and lower surface of the 4th. *Carapace* coarsely granular, the area between the anterior and posterior keels smoother than the sides; anterior keels and superciliary crests granular, posterior keels running in the same direction as the median keels but not quite meeting them. *Terga* coarsely granular; lateral keels obsolete on the anterior segments. *Sterna* weakly granular laterally, the last with four granular crests. *Tail* powerful, with strongly elevated dorsal keels, increasing in width to the middle of the 3rd segment (which is as wide as long), the 4th either slightly narrower than the 3rd (♀) or equalling it in width (♂); normal keels well developed and granular, the superior keels of segments 1-4 ending in a dentiform tubercle; median lateral keel represented by only a few granules on the 2nd segment; inferior and lateral intercarinal spaces finely but not closely granular; 5th segment with superior keels high and compressed, granules of inferior lateral keels becoming gradually dentiform posteriorly; *vesicle* small, granular. *Chelæ* with granular crests and granular intercarinal spaces on humerus and brachium: hand smooth, its width in adult equal to length of underhand, which is about half the length of the movable digit; the latter basally lobate, about as long as the carapace and furnished with 13 rows of teeth. *Legs* distally hairy; lower side of tarsi naked or furnished with a single row of bristles. *Pectinal teeth* (♀) about 23, (♂) about 30. Length up to 80 mm.

*Loc. Sind*: Hyderabad, Kotri, Kashmir Bund, and the Kelat frontier (*Raja, Kemball, Corbett, Dewan Kaseram*).

Subspecies *baluchicus*, nov.

Closely resembling the preceding in colour and structure, but with much more black round the ocular tubercle and in the middle of the depression behind it; the anterior surface, too, of the brachium is infuscate above, and the superior crest of the anterior surface of the humerus also; the extremity of the femur of the legs and the front of the patella usually lightly infuscate.

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

2. *Buthus doriæ*, *Thorell, Atti Soc. Ital.* xix, p. 107, 1877; *Kraep. Jb. Hamb. wiss. Anst.* xi, p. 57, 1891; *Pocock, Jour. Bom. N. H. Soc.* xi, p. 104, 1897; *Kraep. Tierr., Scorp. etc.* p. 27, 1899.

*Loc. Persia*: Teheran.

Subspecies *odonturus*, *Pocock, Jour. Bom. N. H. Soc.* xi, 1897, p. 104; *Kraep. Tierr., Scorp. etc.* p. 27, 1899 (Buthus).

*Colour*: carapace yellow, with anterior border and ocular tubercle

black, and sometimes the area both behind and in front of the tubercle infuscate: dorsal area of abdomen yellow or lightly infuscate, with clear posterior border; tail entirely clear yellow; chela and legs either entirely clear yellow or slightly infuscate in parts. (♀) *Carapace* as long as the 1st and half the 2nd caudal segments or as the 5th; anterior keels granular, abbreviated in front; ocular tubercle very wide; the superciliary crests granular and continued behind the eyes by a pair of converging series of granules; posterior keels granular, very widely separated, their

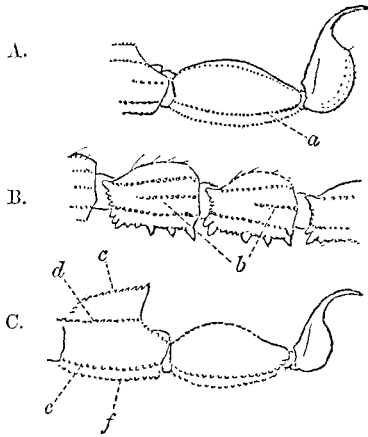


Fig. 8.—A. Vesicle, 5th caudal segment, and part of the 4th caudal segment of *Buthus tanulus*.  
 B. 2nd and 3rd with part of 1st and 4th caudal segments of *Buthus dorice*, subsp. *odonturus*.  
 C. 4th and 5th caudal segments and vesicle of *Buthus australis*, subsp. *funitimus*.

(Anterior to the left, posterior to the right.)

*a*, inferior lateral keel of 5th segment; *b*, median lateral of 2nd and 3rd segments; *c*, superior; *d*, superior lateral; *e*, inferior lateral; *f*, inferior median.

anterior extremities turned externally in the direction of the lateral keels; intercarinal spaces weakly and sparsely granular. *Terga* weakly granular mesially, more strongly and closely at the sides; the three keels distinct and granular, the laterals diverging and on the anterior terga passing in front into a curved transverse crest; external keel on the 7th tergum weak and not united to the internal. *Sterna* smooth, the last with four subequal granular keels. *Tail* (fig. 8 B) about five times as long as the carapace, 1st segment wider than long, 4th less than twice as long as wide, 1st and 2nd segments with 10 keels; median lateral keel weak on 3rd, absent on 4th, inferior median keels weak and posteriorly abbreviated on 4th; inferior median keels of 2nd furnished with

about 6 dentiform tubercles, of which the posterior three are large and triangular, but unequal in size, becoming progressively longer towards the posterior end of the segment; lower surface of 3rd segment also furnished with 6 large dentiform tubercles on its median keels, and a transverse row of 6 becoming smaller externally on its anterior edge; anterior edge of lower side of 4th also furnished with a transverse row of 6 similar but rather smaller tubercles; granules of inferior lateral crests of 2nd and 3rd segments increasing in size and becoming tuberculiform posteriorly; inferior lateral crests of 5th segment strongly tuberculate, three of the tubercles being especially large and dentiform and close together, anal rim of this segment elevated and lobate, the upper lateral lobe large and bifid; upper surface of tail smooth, lower surface of 1st, 2nd, and 3rd segments smooth, lower and lateral surface of 4th granular. *Cheleæ* with humerus and brachium granularly crested; elsewhere smooth; hand smooth, about as wide as brachium; underhand considerably exceeding the width of hand, and less than half the movable digit; digits not lobate, rather strongly curved, furnished with 12 rows of teeth. *Leys* with granularly crested femora; distal segments of 1st, 2nd, and 3rd legs thickly hairy; lower side of tarsi sparsely hairy. *Pectinal teeth* 19.

♂. Differing from the ♀ in having the tail longer and thinner, being about six times the length of the carapace, which is shorter than its 5th segment and only as long as the 1st and  $\frac{1}{4}$  of the 2nd; 1st caudal segment longer than wide, 4th twice as long as wide. Coxæ of cephalothorax and abdominal sterna finely and closely granular, the 4th and 5th sterna furnished with four finely-granular keels; the tuberculiform teeth on the tail are the same in number as in the female, but are smaller and more widely separated, and the upper lobe of the anal border of the 5th segment is more deeply bifid. *Pectinal teeth* 28-29.

*Measurements in mm.*—♂. Total length 58, carapace 6, tail 37, movable digit 8.

*Lac.* Sind: Kelat Frontier (*Kemball*); Karáchi; Ormára, on the Mekran coast, 130 miles west of Karáchi (*Townsend*).

The typical form of this species occurs in Persia at Teheran. The female only is known. *B. odonturus* was based upon a male; but the subsequent discovery of the female at Karáchi shows that the differences between *B. odonturus* and *B. doriae* should probably be regarded merely as of subspecific importance. In *B. doriae* the inferior surface of the 4th caudal segment has four large and two much smaller teeth on its anterior border, is much less granular, with more complete median keels; on the 5th segment the infero-lateral teeth are more widely separated and less acute, and the upper half of the anal lobe is undivided.

### 3. *Buthus macmahoni*, sp. n.

*Colour* yellow, keels of carapace and of upper side of humerus black, those of terga slightly darkened; inferior keels of 2nd-4th caudal segments and the three inferior crests of the 5th black.

*Carapace* with anterior border scarcely emarginate, the intercarinal spaces finely granular; anterior crests complete and granular, superciliary ridges granular, some coarse granules between the lateral eyes and the ends of the anterior crests; posterior and median crests in contact, forming a pair of slightly converging, nearly continuous ridges; distance between the posterior ends of these keels less than distance between ocular tubercle and posterior border of carapace; carapace about as long as the 5th caudal segment, and as the 1st +  $\frac{1}{2}$  the 2nd. *Terga* granular, the crests strong and granular, subequal, and nearly parallel, posteriorly spiniform. *Sterna* almost smooth, the last with four finely-granular crests. *Tail* slender, about five times as long as the carapace; 1st segment longer than wide, 4th twice as long as wide; the intercarinal spaces scarcely granular; keels evenly granular, except the inferior lateral of the 5th, which posteriorly becomes gradually but not strongly dentate; median lateral keel traceable, but anteriorly incomplete on 2nd segment; *vesicle* weakly granular, about as wide as high, narrower than the 5th caudal segment. *Chelæ* with upper side of brachium smooth, scarcely crested except for the anterior granular crest; hand smooth, not crested, about as wide as the brachium, about two-thirds the length of the underhand, which is about half the length of the movable digit; movable digit longer than carapace, weakly lobate at base, furnished with 11 rows of teeth. *Legs* with hairs on the underside of the tarsi. *Pectinal teeth* 17-19 (♀), 20-21 (♂).

*Measurements in mm.*—Total length 46, carapace 5.2, tail 27, movable digit 58.

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

Allied to *B. parthorum*, Poc., from Northern Afghanistan, but much smaller, tail thinner, &c.

4. *Buthus caucasius*, *Fischer, Zoogn.* i, p. 401, pl. iv, fig. 1, 1813 (Scorpio): *eupes*, *C. Koch, Arachn.* v, p. 127, fig. 419, 1839 (Androctonus); *Birula, Ann. Mus. St. Pétersb.* i, p. 238, 1896; *Kraep. Terr., Scorp. etc.* p. 23, 1899 (Buthus): *ornatus, Nordman in Demidoff, Voy. Russie*, iii, p. 732, *Arachn.* i, fig. 2, 1840 (Androctonus).

Subspecies *persicus*, *Pocock, Journ. Linn. Soc., Zool.* xxvii, p. 404, 1899.

Resembling the following species, *B. atrostriatus*, in colour and most structural features, but with the intercarinal spaces of the carapace and tail smooth, the sides of the terga only granular, the median intercarinal spaces being smooth, the inferior median keels of the 2nd and 3rd caudal segments with the granules posteriorly increasing in size, the tubercles on the inferior lateral keels of the 5th caudal segment much larger, and the tubercles on the lower surface of the segment between the keels also much coarser; intercarinal spaces of humerus and brachium also smooth. *Pectinal teeth* 18-21.

*Measurements in mm.*—Total length 51, carapace 5·5, tail 30, back of hand 4, movable digit 5·5, width of hand 3.

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

Originally recorded from Seir on Lake Urmi in Persia (*R. T. Günther*).

5. *Buthus astrostriatus*, *Pocock, Jour. Bom. N. H. Soc.* xi, p. 105, 1897.

♀. *Colour* yellow, variegated with black bands and spots; carapace with the anterior border, ocular tubercle, and keels black; keels of terga black, usually an additional black spot on each side; keels on lower side of tail irregularly fuscous, the dark pigment spreading on to the sides of the 4th and 5th segments; vesicle lightly infuscate at the sides; chelæ yellow, the upper and posterior sides of brachium and of hand irregularly lined with fuscous, patches of the same colour being also present upon the upper side of the trochanter and humerus and upon the femora and tibiæ of the legs. *Carapace* granular, with the anterior keels complete and granular, the area on each side between them and the lateral eyes more coarsely granular; median and posterior keels forming an irregular series, distance between their posterior ends about equal to that between ocular tubercle and posterior border of carapace. *Terga* granular throughout, crests granular and parallel. *Sterna* smooth, the last granular at the sides and marked with four finely granular crests. *Tail* of medium thickness, about five times the length of the carapace; 1st segment wider than long, 4th one-third longer than wide; the keels well developed and granular; median lateral crest almost absent on the 3rd segment, occupying the posterior half of the area on the 2nd; intercarinal spaces of the sides and lower surface of tail finely granular; inferior lateral keels of the 5th segment furnished posteriorly with small lobate or dentiform tubercles; anal lobe quadrituberculate; *vesicle* subglobular and granular. *Chelæ* with normal granular keels and finely granular intercarinal spaces; hand smooth, punctured, hairy, considerably wider than brachium; movable digit about one-third longer than underhand; both digits lobate, furnished with 11 rows of teeth. *Legs* granular and granularly crested; tarsi furnished with two rows of setiform spines. *Pectinal teeth* 18–20.

♂. Smaller than ♀; digits more strongly lobate; tail five and a half times as long as the carapace. *Pectinal teeth* 22–26.

*Measurements in mm.*—♀. Total length 48, carapace 5, tail 27.

*Loc.* Kashmir Bund in Upper Sind (*Kemball, Dewan Kasaram*).

6. *Buthus acute-carinatus*, *Simon, Ann. Mus. Genova*, xviii, p. 245, pl. viii, fig. 18, 1883; *Thorell, Bull. Soc. ent. Ital.* xxv, p. 364, 1894; *Pocock, Jour. Linn. Soc., Zool.* xxv, p. 292, 1895; *Kraep. Terr., Scorp. etc.* p. 18, 1899.

Subspecies *rugosulus*, nov.

*Colour* a uniform ochre-yellow throughout; keels of the body sometimes darker. *Carapace* as long as the 5th or as the 1st and



half the 2nd caudal segment; entirely covered with fine close granulation; anterior crests complete and granular; posterior crests joining the median crests and forming almost a straight line with them, posteriorly spiniform. *Terga* closely granular throughout; keels long, granular, subparallel, and posteriorly spiniform. *Sterna* and *coxae* closely granular, the last sternum with four long granular keels, the 4th also subcarinate. *Tail* about five times as long as the carapace, 1st segment scarcely longer than wide, 4th not twice as long as wide; finely granular throughout; keels complete, evenly granular, inferior lateral of 5th evenly granular to

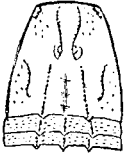


Fig. 9.—Carapace and anterior abdominal terga of *Buthus aculeatus*.

posterior end, and passing without interruption into anal lobe: median lateral keel traceable on the 4th segment, strong on 2nd; *vesicle* coarsely granular, subangulate near base of aculeus, about as high as wide. *Chelæ* closely granular throughout; brachium granularly crested above; hand with distinct granular crests above and externally, slightly wider than the brachium; underhand barely half the length of the movable digit, which is basally sublobate (more strongly so in ♂) and furnished with 11 rows of teeth. *Legs* with femora and patellæ closely granular and granularly crested; tarsi armed beneath with short bristles. *Pectinal teeth* 15-17 (♀ ♂).

*Measurements in mm.*—Total length 50, carapace 5.5, tail 27, movable digit 6, back of hand 3.2, width of hand 2.2, of brachium 2.

*Loc.* Hyderabad in Sind (*Ryan*); Gwalior in Central India (type).

Differs from the typical Arabian form in having the 5th caudal segment entirely pale yellow and the hand larger.

7. *Buthus alticola*, *Pocock, Jour. Linn. Soc., Zool.* xxv, p. 302, pl. ix, fig. 3, 1895; *Birula, Ann. Mus. St. Pétersb.* ii, p. 377, 1897; *Kraep. Tierr., Scorp. etc.* p. 21, 1899.

♂. *Colour*: Carapace and anterior six terga blackish green; 7th tergum, tail, legs, and chelæ flavous, with the exception of the digits which are brown with clear yellow tips, and the lower side of the tail which is subolivaceous. *Carapace* coarsely granular and carinate, as long as the 4th caudal segment or as the 1st and  $\frac{1}{2}$  of the 2nd. *Terga* coarsely granular and strongly carinate, the three keels on all the segments except the 1st strongly denticiform posteriorly; the granules on the sides of the terga subserially arranged. *Sterna* smooth; median crests of the 5th smooth, lateral crests weakly granular. *Tail* long, slender and low, nearly six times as long as the carapace; 4th segment twice as long as wide; median lateral keel complete on segments 1, 2,

and 3, represented by a few granules on the 4th; all the keels granular, the inferior medians on the 1st and 2nd segments almost smooth; intervening spaces of segments weakly granular, granules on the lower surface of 5th forming two subsidiary crests; *vesicle* globular, wider than high, granular below. *Chelæ* (in ♂) long; humerus as long as carapace; brachium three times as long as wide, with two superior crests well developed and granular, upper crest of posterior surface also present; hand long and wide, much wider than brachium, smooth and punctured, its width about two-thirds the length of the underhand, the latter about two-thirds the length of the movable digit; digits separated at the base, lobate and sinuate, furnished with 14-15 rows of teeth. *Legs* with granularly crested femora; tarsi with two rows of black spinules beneath. *Pectinal teeth* 29.

*Measurements in mm.*—Total length 81, carapace 9, tail 52.5, length of movable digit 12, width of hand 4.8, of brachium 4.5.

*Loc.* Chitral in the Hindu Kush, 5000 ft. (*Younghusband*).

Subspecies *penjabensis*, *Birula, Ann. Mus. St. Pétersb.* ii, p. 382, 1897; *Kraep. Tierr., Scorp. etc.* p. 21, 1890 (*B. alticola penjabensis*).

Described as differing from the typical form in having the tail not more than five times as long as the carapace; with the 1st, 2nd, and 3rd segments convex at the sides, the 1st segment by one-half wider than long, the 4th only by half longer than wide; the hand narrower than the brachium, with the underhand scarcely half the length of the movable digit, and the humerus shorter than the carapace. *Pectinal teeth* 24-25.

*Measurements in mm.*—Total length 86.5, carapace 9.

*Loc.* Punjab.

The diagnostic characters of this subspecies may prove to have nothing but a sexual significance, the only known example of *B. penjabensis* being a female, and the type of *B. alticola* a male.

### 8. *Buthus nigrifrons*, sp. n.

♀. *Colour*: anterior portion of carapace and median area of posterior portion blackish, median portion of anterior six terga also blackish, lateral portion of carapace and anterior terga and the whole of the 7th tergum yellowish; caudal segments 1-3 and anterior end of 4th yellow, posterior half of 4th, the whole of the 5th, and the vesicle deep brown; mandibles deep brown; hand and fingers of chelæ, with the exception of the yellow tips of the latter, black; ventral surface and legs entirely yellow. *Carapace* crested as in *B. alticola*, but with the intercarinal spaces almost entirely smooth; longer than the 4th and nearly as long as the 1st and half the 2nd caudal segments. *Terga* with the crests granular but scarcely spiniform posteriorly; area between them smooth; sides of terga sparsely granular; intercarinal spaces of 7th smooth. *Sterna* smooth, the last with four granular crests. *Tail*

thickly hairy, about five and a half times as long as the carapace; 4th segment about twice as long as wide, 1st a little longer than wide; intercarinal spaces smooth except on the lower surface of the 5th; all keels finely granular; inferior lateral on 5th continued up to anal border without interruption and without enlargement of granules; median lateral keel incomplete anteriorly on 2nd, practically absent on 3rd. *Vesicle* about as wide as 5th segment, as high as wide, granular below. *Chelæ* long and slender: upper surface of brachium bounded in front and behind by a granular keel, a weakly granular keel also present upon the upper portion of the posterior surface; hand small, scarcely as wide as brachium, not crested, smooth, punctured; length of underhand much exceeding its width, less than one-third the length of the movable digit, which is very long and slender, not lobate, and furnished with 16-17 rows of teeth. *Tarsi* furnished beneath with two rows of fine spines. *Pectinal teeth* 26.

*Measurements in mm.*—Total length 58, carapace 6.5, tail 35, back of hand 3, movable finger 11.

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

9. *Buthus tamulus*, *Fabr. Ent. Syst. Suppl.* p. 294, 1798 (*Scorpio*): *nigro-lineatus*, *Dufour, Mém. prés. Ac. France*, xiv, p. 570, 1856 (*Scorpio*): *martensii*, *Pocock, A. M. N. H.* (6) iii, p. 335, 1889; *id. Jour. Bom. N. H. Soc.* vii, p. 303, 1893 (*nec martensii*, *Karsch*, 1879) (*Buthus*): *grammurus*, *Thorell, Ann. Mus. Genova*, xxvii, p. 567, 1889; *Kraep. Tierr., Scorp.* p. 20, 1899 (*Buthus*).

♀. *Colour* variable; upper side of trunk blackish, reddish or yellow, with ocular tubercle and keels on the carapace black, the adjacent areas also sometimes tinted with black, also keels on terga and adjacent tubercles black, the black of the lateral keels often extending forwards and forming a large patch on each side of the fore part of the terga; tail yellow or reddish yellow, the inferior keels and to a less extent the lateral keels black; sterna entirely pale except for the black keels of the last; chelæ and legs entirely yellow, reddish yellow, or partially infuscate; mandible with faint or deep reticulation of pigment and pigmented granular crest above. *Carapace* scarcely as long as 5th caudal segment, finely and closely granular throughout, with more or fewer coarser granules on its sides and many on the anterior portion both between and outside the anterior keels; the keels granular; sides of tubercle just above eyes smooth; posterior keels forming an irregular line with median keels. *Terga* with three keels, the keels smooth or coarsely granular; the laterals curving outward at their distal ends, and dividing to form two smooth or granular irregular transverse crests; the rest of the terga finely or coarsely, closely or rather sparsely granular; the anterior marginal ledge of the terga smooth or finely and closely granular; keels of the last tergum strong and granular. *Sterna* smooth and polished, the last finely granular at the sides, weakly or scarcely granular in the middle; with 4 nearly smooth

or granular keels. *Tail* robust; 1st segment wider than long, 2nd very slightly or scarcely longer than wide, 3rd one-fourth longer than wide, 5th twice as long as wide; intercarinal spaces granular, the upper very sparsely so; keels evenly granular or nearly smooth, the inferior sometimes quite smooth; median lateral keel traceable on the 4th segment; inferior lateral keel of 5th evenly granular throughout and passing without interruption into the anal lobe; *vesicle* large, granular below, as high as wide, a little narrower on the 5th caudal segment, often subgeniculate below the aculeus. *Chelæ*: humerus finely granular above, with granular crests; brachium, hand, and digits rather thickly hairy and without crests, except for one subdenticulate crest on the anterior surface of the brachium; hand narrow, about as wide as brachium; digits long, movable, more than twice as long as the underhand and furnished with 14-15 rows of teeth. *Legs* finely granular; tarsi with two rows of spinules beneath. *Pectinal teeth* from about 28-39.

♂. Differing from ♀ in having the tail longer (that is to say, about six times as long as the carapace), the hand rounded, thick, considerably thicker than the brachium, the length of the underhand about three quarters that of the movable digit, and the digits lobate and separated at the base when closed.

Length of adult from about 65 up to 90 mm.

*Distribution*. India, from Sind in the North-west and Dehra Dun throughout the whole of Western, Central, and Southern India at least as far south as Madura. Certainly absent from Burma and Ceylon, and apparently also from the Malabar coast below the Western Ghats in Southern India, though occurring below the Ghats in the Southern Konkan. There are no data to show the limits of range of the species in Eastern Bengal. Several subspecies are recognizable.

Subspecies *Buthus tamulus typicus* (= ? *grammurus*).

Southern form: usually pale yellowish red in colour, with the keels of trunk and areas adjacent often infuscate; frequently the median area of the terga is as a whole darker than the lateral portion. *Terga* very finely and closely granular, both laterally and mesially, a few coarser granules at the sides, but scarcely any between the keels; keels nearly smooth, running externally into a pair of irregular and obsolete granular, sometimes nearly smooth crests; keels of last abdominal sternum and of lower side of anterior caudal segments weakly granular. *Pectinal teeth* 28-30 (♀), 30-34 (♂). Length up to about 80 mm.

*Distribution*. Southern India: Satara (*Doria*); Kolhápúr State (*Wray*), and Belgaum above Ghats; Dowlaisweram on the Godávari (*Wybrow*); Secunderabad (*Roberts, Ricardo*); Madras (*Henderson, Thurston*); Nellore, Tanjore, Trichinopoly (*Popert*); Madura.

Fabricius cites merely "East Indies" as the locality for *B. tamulus*. I have here restricted the term *tamulus* to the southern

form of the species, because its name appears to have been derived from the Tamil race of South India, and Fabricius is known to have received specimens of other Arthropods, e. g. *Polydesmus stigma* and *Heteropoda regia*, from Tranquebar on the Coromandel coast.

Subspecies *concanensis*, nov.

Darker in colour and smoother than typical form. Upper side of trunk greenish or reddish brown, approaching black, paler at the sides. Legs, chelæ, and tail, with the exception of the inferior keels, flavous or reddish yellow. *Terga* finely granular at sides, anterior marginal ledge smooth throughout; keels quite smooth, shining, the laterals passing externally into a pair of irregular smooth crests resembling a dried stream of tar; inferior keels of last abdominal sternum smooth, also of 1st and 2nd and sometimes also of 3rd caudal segment; all the caudal keels and intercarinal spaces of tail less granular than in typical form. *Pectinal teeth* 29-32 in ♀, 30-35 in ♂. Length up to 91 mm. ♀; 77 mm. ♂.

*Loc.* Ratnágiri in the South Konkan (*Drew*).

Subspecies *sindicus*, nov.

Paler yellow than the average *B. tamulus* typicus, the keels of the abdomen, carapace, and underside of tail blackish; an indistinct dark spot on each side of the terga in front of the lateral keel. *Terga* much more coarsely granular than in the typical form, the keels distinctly granular, the laterals breaking up anteriorly in coarse granules, which become lost amongst the general coarse granulation of the dorsal surface. *Pectinal teeth* more numerous than in the typical form: 31-34 in ♀; 34-39 in ♂. Length up to 93 mm. ♀; rather smaller in ♂.

*Loc.* Valley of Lower Indus: Kelat frontier in Upper Sind (*Kemball*); Hyderabad and Kotri (*Ryan*); Sujáwal and Játi in the Karáchi district (*Kemball*).

Subspecies *gujaratensis*, nov.

Replacing *B. indicus* to the south. Coarsely granular as in that subspecies and in *B. gangeticus*, darker in colour than the former, the trunk being often nearly black; tail thinner and less thickly hairy than in *B. gangeticus*. *Pectinal teeth* fewer in number than in *B. indicus*: 27-33 in ♀; 31-36 in ♂.

*Distribution.* Karaghora in Kattywar (*Bulkley*); Páñch Máhals in North Guzerat (*Wallinger*), thence spreading south-eastwards as far as Khandes (*Madan*).

Subspecies *gangeticus*, nov.

Represented by both dark and light forms; the former deep reddish brown with black keels; the hand and brachium of chela and also femora and patellæ of legs partially infusate; paler form coloured like *B. tamulus* typicus. *Terga* coarsely and closely

granular throughout, the anterior marginal ledge closely granular, except in the middle; keels coarsely granular, the laterals breaking up into granules which become lost in the general granulation of the plate. *Tail* and its crests coarsely granular and thickly hairy, the segments broader and with sides more convex than in the other subspecies. *Pectinal teeth* 26-32 ♀; 31-36 ♂. Length up to about 90 mm.

*Distribution.* The area drained by the Upper Ganges and its tributaries; Dehra Dun (type, *Gleadow*); Bareilly (*Cambridge*); Allahabad (*Oates*); Gwalior; also Bhopal and Satna in Central India (*Dane*).

#### 10. *Buthus hendersoni*, sp. n.

♀. Nearly intermediate in characters between *B. tamulus* and *B. rugiscutis*. Resembling the typical form of the latter in size, granulation, etc., but with the tail a little thinner; fingers longer and furnished with a larger number of rows of teeth. Chelæ and legs uniformly yellow; terga infusate, with paler posterior border; inferior caudal keels black. *Carapace* shorter than 1st and 2nd caudal segments taken together, as long as the 5th. *Tail* with 2nd segment as long as wide, 3rd the merest fraction longer than wide, width of 1st equal to length of 3rd, less than length of 5th; height of 2nd less than its width; 5th not twice as long as broad. *Chela* with rugulose brachium; hand as wide as brachium, its width about three-fourths the length of the underhand, which is half the length of the movable finger; movable finger a little longer than carapace and furnished with 14 rows of teeth as in *B. tamulus*. *Pectinal teeth* ranging from 21-26, usually 24.

♂. With similar sexual characters to those of *B. tamulus*; pectinal teeth ranging from 23-29, usually 24-26.

Total length averaging about 50 mm.; male usually less than 50, large females rarely exceeding 55, in one case up to 59.

*Distribution.* Madras Presidency; Madras, Yercaud in Shevaroy Hills (*Henderson*), Cuddapah, Trichinopoly, and Tanjore (*Popert*).

Though nearly allied to *B. tamulus*, *B. hendersoni* cannot be regarded as a subspecies or variety of the former, seeing that it co-exists in the same locality, without blending.

#### 11. *Buthus rugiscutis*, *Pocock*, *Jour. Bom. N. H. Soc.* xi, p. 106, 1897; *Kraep. Tierr., Scorpi. etc.* p. 20, 1899.

Allied to the preceding, but smaller, rougher, with thicker tail, fewer pectinal teeth, and fewer rows of teeth on digits.

♀. *Colour* varying from reddish yellow to yellowish brown, the keels of trunk and underside of tail usually black. Upper surface of body entirely covered with coarse granules, amongst which the normal keels stand up as granular ridges; anterior keels of carapace not traceable for more than halfway across the frontal area. *Tail* short, about five times the length of the carapace, thickly and coarsely granular below and at the sides; the inferior intercarinal

spaces of the anterior segments sometimes smooth, especially in male; upper surface also granular, but less so than the sides; the segments wider and higher as compared with their length than in *B. tamulus*; 1st, 2nd, and 3rd segments wider than long, 4th very slightly longer than wide, 5th about one-third longer than wide; width of 1st exceeding length of 3rd and almost equal to that of 4th; 1st, 2nd, and 3rd approximately equal in width; height of 2nd equal to its length (in *B. tamulus* the length of the 2nd far exceeds its height, and the length of the 3rd exceeds the width of the 1st). *Chelæ* with brachium finely granular above; movable finger only about as long as the carapace, less than twice the length of the underhand, furnished with 12 rows of teeth. *Pectinal teeth* 18-21.

♂ with the same sexual features as in *B. tamulus*; pectinal teeth 21-24.

*Measurements in mm.*—♀. Total length 53, length of carapace 5.5, of tail 27. ♂. Total length 44, carapace 5, tail 25.8.

*Loc.* Mahableshwar (*Wroughton*) and Satára (*Wilkins*) in the South Deccan.

Subspecies *nigritus*, nov.

Allied to the typical form of *B. rugiscutis*, but with the upper side of the body black: *chelæ* yellow; upper side of tail yellow, lower side with the keels very strongly infuscate, the black from the inferior median keels spreading over the intermediate area and giving rise to a broad median longitudinal band, which is especially distinct on the 4th segment; legs infuscate, with the *tibæ*, *pro-tarsi*, and *tarsi* pale; *sterna* clouded with black. *Pectinal teeth* (♀) 19-20.

*Loc.* Panchgani in Satára District, South Deccan (*Phipson*).

12. *Buthus pachyurus*, *Pocock*, *Jour. Bom. N. II. Soc.* xi, p. 107, 1897; *Kraep. Tierr., Scorp. etc.* p. 20, 1899.

Most nearly allied to *B. rugiscutis*, but recognizable by being of a tolerably uniform black or brownish-black colour; the vesicle, hand and fingers, and extremity of legs inclining to reddish brown. Upper side of body granular, as in *B. rugiscutis*. Tail also as in that species, but distinctly thicker; segments 1, 2, and 3 considerably wider than long; the segments, when viewed from above, much more parallel-sided than in *B. rugiscutis*; the 4th segment is almost a square, its anterior and posterior ends being almost as wide as its middle, whereas in *B. rugiscutis* the sides of this and of the other segments are distinctly convex, the segments being wider in the middle than at the ends. In sexual characters, numbers of pectinal teeth, and of teeth on digits approximately as in *B. rugiscutis*.

Total length up to about 46 mm.

*Loc.* Mandla and Kamptee in the Central Provinces (*Caccia*); Násik (*Millard*), and Satára (*Wilkins*), in the Bombay Presidency.

Genus **BUTHEOLUS**, Simon.

Orthodactylus, *Karsch, Berl. ent. Zeits.* xxv, p. 90, 1881; *Kraep. Jb. Hamb. wiss. Anst.* vii, p. 215, 1891 (nom. præocc.).  
 Butheolus, *Simon, Ann. Mus. Genova*, xviii, p. 248, 1883; *Pocock, P. Z. S.* 1890, p. 121; *Kraep. Tierr., Scorp. etc.* p. 34, 1899.  
 Orthochirus, *Karsch, Berl. ent. Zeits.* xxxvi, p. 306, 1891.

One or two teeth on the underside of the immovable mandibular finger. *Carapace* without granular keels; its frontal area sloped downwards from the tubercle to the anterior edge; area behind the eyes with deep transverse groove. *Tail* very powerful, generally posteriorly incrassate; the vesicle very small, much narrower than the 1st caudal segment. *Sternum* subpentagonal, wider than long, shorter than the genital operculum. *Chelæ* very slender; armature of fingers consisting of median rows of teeth which do not overlap, an inner series consisting of single teeth, and an outer of teeth arranged in couplets.

Type, *B. thalassinus*, Simon.

*Distribution.* Eastern Mediterranean area of Palearctic Region; shores of Red Sea; Sokotra; Western and North-western India.

*Synopsis of Indian Species.*

- a. Tail not uniformly coloured, terga with lateral as well as median crest . . . . . *B. bicolor*, p. 31.  
 b. Tail uniformly coloured; terga with only a single median crest.  
 a'. Tail deep bluish green throughout; trunk usually the same tint as the tail, or, at all events, very deep brown . . . . . *B. melanurus*, p. 28.  
 b'. Tail uniformly pale yellow; trunk at most lightly infuscate.  
 a<sup>2</sup>. 4th segment of tail granular below, 5th granular below posteriorly, 2nd and 3rd granular and crested laterally (♂) . . . . . *B. pallidus*, p. 30.  
 b<sup>2</sup>. 4th and 5th caudal segments smooth below; 2nd and 3rd smooth, neither crested nor granular laterally (♂) . . . . . *B. flavescens*, p. 30.

13. **Butheolus melanurus**, *Kessler, Trudni Russkago Ent.* viii, p. 16, 1876 (Androctonus); *Pocock, P. Z. S.* 1890, p. 121; *Kraep. Tierr., Scorp. etc.* p. 35, 1899 (Butheolus); *Birula, Ann. Mus. St. Pétersb.* 1898, p. 281 (Orthochirus): *schneideri, L. Koch in Schneider, Nat. Beitr. Kaukasus*, p. 61, pl. ii, fig. 4, 1878 (Buthus); *Pocock, Tr. Linn. Soc.* (2) *Zool.* v, p. 117, pl. xiii, fig. 2, 1889 (Orthodactylus); *Kraep. Jb. Hamb. wiss. Anst.* viii, p. 215, 1891 (Orthodactylus).

*Colour:* trunk and tail varying from blackish or deep reddish brown to deep green; lower side of trunk paler; chelæ and legs flavous, or with humerus and femora black; brachium and patella infuscate, pale flavous distally; hands flavous, infuscate at the base of the fingers; pectines flavous. *Carapace* and *terga* thickly granular, ocular tubercle and area just in front of each median



eye smooth; a single median crest on terga; last tergum strongly keeled, nearly smooth between the keels. *Tail* very thick, posteriorly incrassate, the 4th segment about as wide as long, 3rd wider than long, 1st segment with 10 granular keels, 2nd and

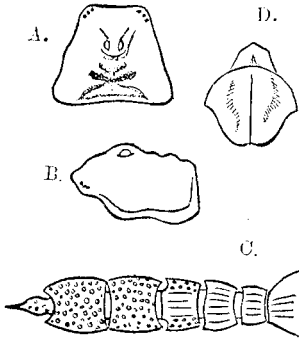


Fig. 10.—*Butheolus melanurus*.

A. Carapace from above. B. Carapace from the side. C. Lower side of tail. D. Sternum and genital operculum.

3rd with the superior and 4 inferior keels distinct and granular, the median lateral and superior lateral obsolete; 3rd segment partially pitted; 4th much more distinctly pitted than the 3rd, but less granular and almost keelless, the median lateral keels being complete only in front, the superior keel also traceable; 5th segment with inferior lateral keel complete, but weak in front, the rest of the segment deeply and closely pitted, but scarcely granular; dorsal surface of all the segments weakly granular, of the posterior segments pitted; lateral surface of the 1st, 2nd, and 3rd segments, and in a lesser degree of the 4th granular; inferior surface sparsely granular in the intercarinal spaces; *vesicle* small, pyriform, pitted. *Sterna* finely granular, smooth, and polished in the middle of the posterior half, more coarsely granular at the sides; the last with four closely granular crests, the first punctured and bristly in the middle. *Chelæ*: humerus with granular crests; brachium with smooth crests; hand smooth, punctured, narrow, narrower than brachium, underhand about half the length of the movable digit, excelling width of hand; movable finger as long as carapace, furnished with 8–9 rows of teeth, the basal row long; the large teeth arranged in pairs, the inner of each pair being distinctly in front of the outer, which is merely the enlarged posterior tooth of one of the median series. *Legs* with granularly crested coxæ and femora. *Pectinal teeth* about 20.

*Distribution*. Eastern Mediterranean Region; Punjab.

Two subspecies of this Scorpion are represented in the fauna of British India:—

1. *B. melanurus typicus*; characterized by having the legs and chelæ uniformly clear yellow.

*Loc.* Punjab (according to Kraepelin); also occurring in the Transcaspian area and Northern Afghanistan.

2. *B. melanurus*, subspecies *fuscipes*, nov.; characterized by having the humerus and the femora black, and the brachium and patellæ infuscate.

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

14. *Butheolus pallidus*, Pocock, *Jour. Bom. N. H. Soc.* xi, p. 109, 1897  
*Kraep. Tierr., Scorp. etc.* p. 36, 1899.

♀. *Colour* entirely yellow throughout, with exception of the eyes which are black. *Carapace* granular throughout except for the ocular tubercle and a ridge on each side of the median frontal depression, which are smooth; groove surrounding ocular tubercle behind not so deep as in *B. melanurus*. *Terga* granular throughout, with a single median keel, the last not smooth on the inner side of the median keels as in *B. melanurus*. *Sterna* and *coxæ* smoother than in *B. melanurus*, the former finely granular both externally and on the inner side of the pulmonary area; the last granular throughout, the granular crests much less distinct than in *B. melanurus*. *Tail* of much the same form as in *B. melanurus*; segments 1-3 carinate as in that species, 4th segment covered with granules below and at the sides, not so conspicuously pitted as in *B. melanurus*; the inferior lateral crests developed, and the inferior medians also traceable; 5th segment covered with granules below, with a median granular keel; lateral keel more irregularly dentate posteriorly than in *B. melanurus*, and more noticeably concave before the anal lobe; *vesicle* larger, *aculeus* thinner, and pits on vesicle and 5th caudal segment fewer than in *B. melanurus*. *Chelæ* with upper surface of brachium more granular, and movable finger shorter than in *B. melanurus*, the latter being distinctly shorter than the carapace, furnished with 8 rows of teeth, the basal of which is shorter than in *B. melanurus*; the enlarged teeth represented by transverse rows of three each, the inner of these not in advance of the enlarged posterior tooth of the median rows; external to the latter and behind it there is a second tooth, so that the external series consists of two teeth, and not of one as in *B. melanurus*.

♂. Differs from ♀ in having the median keels and adjacent parts of the last abdominal sternum and of the 1st caudal segment smooth, and the lower side of the 4th and 5th segments less granular and scarcely mesially carinate. *Pectinal teeth* 16-17 in ♀, 21-29 in ♂.

Length up to 35 mm.

*Loc.* Sind; Kashmor Bund and the Kelat Frontier (*Kemball*).

15. *Butheolus flavescens*, Pocock, *Jour. Bom. N. H. Soc.* xi, p. 110, 1897; *Kraep. Tierr., Scorp. etc.* p. 36, 1899.

♂. *Colour* as in *B. pallidus*, but the terga slightly infuscate. Very closely allied to that species in all structural characters, but with the tail less coarsely granular: for example the sides of the 2nd segment just external to the supero-lateral keel are furnished with only a few small granules and a few pits, the corresponding area of the 3rd and 4th is smooth and distinctly pitted, and the lower side of the 4th is furnished with a very few granules. In ♂ of *B. pallidus*, on the contrary, the upper portion of the lateral surface of the 2nd segment is covered with tubercles, of the 3rd it is granular and rugose, and of the 4th distinctly though not

closely granular, and the lower surface of the 4th is somewhat thickly granular both in the middle and at the sides. Moreover in *B. pallidus* the median lateral keel extends as a granular crest at least throughout the posterior half of the 2nd and 3rd segments; in *B. flavescens* it is practically absent on all the segments except the 1st; lastly the vesicle is relatively smaller in *B. flavescens*.

Length 27 mm.

Loc. Karaghora in Kattywar (*Bulkley*).

16. *Buthcolus bicolor*, *Pocock, Jour. Bon. N. II. Soc. xi*, p. 108, 1897; *Kraep. Tierr., Scorp. etc.* p. 36, 1899.

*Colour*: upper side of trunk deep bluish green, sometimes inclining to deep brown; ventral surface yellowish or yellowish green; 4th and 5th segments and vesicle of tail also deep bluish green, but the 1st, 2nd, and usually also the 3rd, yellowish brown, the 3rd sometimes as dark as the 4th, and the 1st and 2nd sometimes very dark brown; legs mostly clear yellow, with greenish femora; humerus and brachium of chela also tinted with greenish black, hand and fingers usually paler. *Carapace* coarsely granular throughout, the ridges over the eyes smooth above, groove defining tubercle behind shallow as in *B. pallidus*. *Terga* coarsely granular throughout, and with the exception of the anterior two distinctly tricostate. *Sterna* smooth in the middle; 5th mostly granular, with a pair of smooth median keels; lateral keels nearly absent. *Tail* much expanded posteriorly; upper surface of all the segments finely granular in the middle, the superior lateral crests present and granular only on the 1st, evanescent on the 2nd; sides of segments 1-3 pitted, these segments with the four inferior keels strong, granular, and the spaces between them granular; 4th and 5th segments smooth, without crests, but coarsely pitted below and at the sides; the inferior lateral keel, however, present and tubercular on the posterior half of the 5th segment; *vesicle* as in *B. melanurus*, but aculeus not so stout at base. *Chelae* with humerus granular above; brachium smooth with crenulate crests, the anterior of the upper surface sometimes granular: teeth on digit much as in *B. pallidus*. In ♂ the inferior keels of segments 1-3 and the spaces between them are much smoother than in ♀. *Pectinal teeth* 17-19 (♀) 19-21 (♂).

Length up to about 38 mm.

Loc. Western Ghats of India: Kandala Tal and Wai Tal in Satára (*Wilkins*), and Poona (*Wroughton*).

#### Genus CHARMUS, Karsch.

*Charmus*, *Karsch, MT. Münch. ent. Ver.* iii, p. 104, 1879; *id. Berl. ent. Zeits.* xxxvi, p. 306, 1891; *Kraep. Tierr., Scorp. etc.* p. 39, 1899.

*Heterocharmum*, *Pocock, A. M. N. II.* (6) ix, p. 47, 1892.

*Carapace* without keels; anteocular area horizontal, not sloped as in *Buthcolus*. *Terga* with single median keel; no lateral keels.

*Sternum* small, pentagonal, wider than long, about equal in length to the genital operculum. *Pectines* normal. *Mandible* with movable and immovable finger armed below with two teeth. Finger of *chela* furnished along the middle line with numerous not overlapping rows of teeth; the internal series formed of single larger teeth lying close to the apices of the median rows; external series of small paired teeth. *Tail* weakly keeled, 4th and 5th segments punctured below; no spine beneath aculeus on vesicle.

Type, *C. laneus*, Karsch.

*Distribution*. Ceylon. One species only known up to the present time.

Presumably on the strength of its pentagonal sternum—a feature which isolates the genus from the rest of the Buthidæ—Karsch referred *Charmus* to the subfamily *Iurini* (= *Vejoivide*), placing it alongside *Scorpiops* and *Cherilus*. The rest of its organization, however, points unmistakably to its belonging to the Buthidæ.

17. *Charmus laneus*, Karsch, *MT. Münch. ent. Ver.* iii, p. 104, 1879; *Kraepelin, Tierr., Scorp. etc.* p. 39, 1899: cinctipes, Pocock, *A. M. N. H.* (6) ix, p. 47, pl. iii b, figs. 2, 2 a, 2 b, 1892 (*Heterocharmus*).

*Colour*: upper side of trunk blackish, variegated with yellow markings; tail blackish; vesicle ferruginous; chelæ yellowish, brachium marked with a black band, hand blackish; legs blackish, yellowish at the junction of the segments. *Carapace* nearly as long as the 1st and 2nd caudal segments, weakly but closely granular throughout. *Terga* more coarsely granular than the carapace. *Sterna* smooth and shining, the last beset posteriorly with coarse granules. *Tail* with segments 1-3 coarsely and thickly granular below and at the sides, upper surface much more feebly granular, 3rd segment without keels, its margins rounded; 4th and 5th segments without keels, 4th finely granular only in the excavation of the upper side; 5th granular on the posterior portion of its lower and upper surface; anal border granular beneath, lobate at the sides; *vesicle* coarsely punctured; tail and vesicle thickly hairy beneath. *Chelæ* weakly granular and carinate; hand rounded, narrower than brachium, smooth, not crested; fingers long, the movable nearly twice as long as the underhand. *Legs* with weakly granular femora; coxæ smooth. *Pectines* with 14-17 teeth.

*Measurements in mm.*—Total length 30, carapace 2.5, tail 11.5, 5th segment 3, underhand 1.2, movable finger 2.5.

*Loc.* Ceylon.

#### Genus **STENOCHIRUS**, Karsch.

*Stenochirus*, Karsch, *Berlin. ent. Zeits.* xxxvi, p. 306, 1891; *Kraepelin, Tierr., Scorp. etc.* p. 39, 1899.

Two teeth on lower side of immovable finger of *mandible*. *Carapace* with frontal area horizontal, almost smooth, not keeled,

at most weakly granular. *Terga* also almost smooth, at most finely granular at the sides and in the dorsal impressions, furnished with a single smooth median keel. Cephalothoracic *sternum* triangular, a little longer than wide, as long as the genital operculum. *Tail* robust, not keeled below; no spine on vesicle beneath aculeus. *Hand* narrow; fingers long, the median rows of teeth overlapping each other by nearly half their length, ending posteriorly in 5 or 6 teeth.

Type, *S. sarasinorum*, Karsch.

*Distribution.* Malabar coast of India and hills of Ceylon.

*Synopsis of Indian Species.*

- a. Dorsal plates of abdomen finely granular laterally and in the depression on each side of the median keel, the last finely granular posteriorly; humerus granular and weakly crested in front. . . . . *S. politus*, p. 33.
- b. Dorsal plates of abdomen entirely smooth; humerus of chela smooth, rounded in front (according to Kraepelin). . . . . *S. sarasinorum*, p. 33.

18. *Stenochirus politus*, Pocock, *Jour. Bom. N. H. Soc.* xii, p. 262, 1899

*Colour* a deep shining blackish brown on the tail and the upper side of the body; legs, mandibles, chela, and lower side of body a little paler than its upper side, the three distal segments of the legs quite pale; fingers also pale, but brownish at the base. *Carapace* smooth, finely granular in the depression laterally and posteriorly. *Terga* smooth, finely granular at the sides and in the depression on each side of the median keel; last tergal plate closely granular throughout in its posterior half. *Tail* a little more than six times as long as the carapace, and slightly increasing in width posteriorly to the middle of the 4th segment, which is a little longer than broad (3:2.5); length of 2nd segment equal to the width of the 4th; the upper side of the segments mesially granular: the rest of the tail smooth and polished above and below, entirely without keels, but distinctly though not coarsely punctured; *vesicle* smooth, punctured; *aculeus* thick at base. *Chela* slender and elongate; humerus weakly crested and weakly granular in front; brachium smooth, without crests or granules; hand also much narrower than brachium; fingers smooth, movable more than twice the length of the underhand, and armed with 10 median rows of teeth. *Pectinal teeth* 15.

*Measurements in mm.*—Total length 33, carapace 3, tail 20. width of 1st caudal segment 2.3, of 4th 2.6.

*Loc.* Kanara (Bell).

19. *Stenochirus sarasinorum*, Karsch, *Berl. ent. Zeits.* xxxvi, p. 306. pl. xii, fig. 30, 1892; *Kraep. Tierr., Scorp. etc.* p. 39, 1899.

Resembling the preceding in colour, but, judging from Kraepelin's description, differing in having the carapace finely granular only in

the dorsal groove behind the ocular tubercle, and the tergal plates smooth and shining, not granular. Last sternal plate thickly and finely punctured. Also the humerus is smooth and rounded in front, not weakly crested and granular as in *S. politus*. Moreover, judging by the figures published by Karsch, the length of the 2nd caudal segment is much less than the width of the 4th. Length up to about 40 mm.

*Loc.* Ceylon: Peradeniya (*Sarasin*).

#### Genus **HEMIBUTHUS**, nov.

Intermediate in characters between *Buthus* and *Lychas*; resembling the latter in the absence of keels from the carapace and the presence of a single tooth on the under side of the immovable finger of the mandible, and the former in the absence of a spine beneath the aculeus of the caudal vesicle and in that the teeth of the inner row on the fingers of the chelæ alternate with those of the outer row, being situated opposite the middle of the corresponding rows of the median series.

Type, *H. crassimanus*.

*Distribution.* India.

20. **Hemibuthus crassimanus**, *Pocock*, *Jour. Bom. N. H. Soc.* xi, p. 110, 1897; *Kraep. Tierr., Scorp. etc.* p. 44, 1899 (Archisometrus).

*Colour* blackish brown, without distinct yellow pattern; tail paler; vesicle, hands, and distal segments of legs clear yellow. *Carapace* somewhat finely granular, more coarsely so on the anterior border, its posterior border, like those of the anterior terga, tri-emarginate; nearly as long as the 1st and 2nd caudal segments, and slightly longer than the 5th. *Terga* distinctly though not very coarsely granular posteriorly; with conspicuous lateral crests. *Sterna* smooth and punctured, the last almost without crests and granules. *Tail* of medium length and thickness, barely five times as long as the carapace; 1st segment as wide as long, 4th one-fourth longer than wide; intercarinal spaces sparsely granular, punctured, keels strongly granular, median lateral represented on the posterior half of the 2nd and 3rd by a series of granules, weak on the 1st; *vesicle* nearly smooth, only sparsely granular, punctured; angulate beneath the aculeus. *Chelæ* with hand smooth, rounded, large, much wider than brachium; fingers short, the movable about equal to the carapace and to the underhand in length; with 8 rows of teeth. *Pectinal teeth* 12.

♂. With larger hand, and tail posteriorly incrassate; pectinal teeth 14-15.

*Measurements in mm.*—(♀) Total length 28, carapace 3, tail 14.5, width of hand 2.

*Loc.* Western India: Páñch Máhals in Guzerat (*Wallinger*).

Genus **LYCHAS**, C. Koch.

Lychas, C. Koch, *Arachn.* xii, p. 3, 1845 (in part).

Archisometrus, Kraepelin, *Jb. Hamb. wiss. Anst.* viii, p. 217, 1891;

*id.* *Tierr., Scorp. etc.* p. 41, 1899.

Carapace without posterior and lateral keels; antecular area horizontal. Terga with two or three crests. Tail carinate; a conspicuous triangular tooth on vesicle beneath the aculeus. Mandible with one inferior tooth on the immovable finger. Chela with movable finger armed with numerous rows of teeth set end to end, not overlapping; also with an inner set of larger teeth, each set close to the distal end of the rows of the median series, and with an outer set composed of pairs of larger teeth, set close to the posterior ends of the median rows. Sternum triangular, longer than wide.

Type, *L. scutillus*, C. Koch.

Distribution. Tropical Africa; India to Australia.

The genus *Lychas* was based upon two species, *L. maculatus* and *L. scutillus*. The first had already been made the type of the genus *Isometrus* by Hemprich and Ehrenberg. Hence *scutillus* becomes the type of *Lychas*.

*Synopsis of Indian Species.*

- a.* Abdominal sterna coriaceous, the 4th and 5th granular throughout; pectinal teeth 12; tarsi bearing two rows of bristles beneath. . . . . *L. rugosus*, p. 39.
- b.* Abdominal sterna, with the exception of the 5th, smooth and polished; pectinal teeth 15-25; tarsi with pad of bristles.
- a*<sup>1</sup>. Tibial spurs of 3rd and 4th legs very long, much longer than the hairs on the segments.
- a*<sup>2</sup>. Carapace evenly granular throughout.
- a*<sup>3</sup>. Terga with three distinct keels; underhand nearly as long as the movable finger . . . . . *L. tricarinatus* p. 40.
- b*<sup>1</sup>. Terga with a single median keel; underhand only about half the length of the movable finger . . . . . *L. hendersoni*, p. 40.
- b*<sup>2</sup>. Frontal area of carapace nearly smooth or studded in front with a few large granules.
- a*<sup>1</sup>. Terga with large tubercle on each side, forming a small lateral crest; legs and chela uniformly yellow . . . *L. shoplandi*, p. 41.
- b*<sup>1</sup>. Terga without trace of lateral crest; legs variegated with black.
- a*<sup>3</sup>. Chela yellow; tail mostly yellow. . . *L. laevifrons*, p. 41.
- b*<sup>5</sup>. Chela with hand entirely black, brachium black above; tail almost wholly black . . . . . *L. fae*, p. 42.

- b*<sup>3</sup>. Tibial spurs of 3rd and 4th legs short, scarcely longer than the hairs of the tibia.
- a*<sup>6</sup>. Abdominal sterna thickly marbled with black . . . . . *L. nigristeris*, p. 38.
- b*<sup>6</sup>. Abdominal sterna, with exception of the 5th, uniformly pale yellow.
- a*<sup>7</sup>. Last abdominal sternum with four granular keels; hand with two granular finger-keels . . . . . *L. scutilus*, p. 37.
- b*<sup>7</sup>. Last abdominal sternum with only a pair of distinct keels; hand only obsoletely keeled
- a*<sup>8</sup>. Chelæ and legs uniformly yellowish brown; movable finger much longer than carapace; fingers scarcely sinuate in ♂ . . . . . *L. scaber*, p. 38.
- b*<sup>8</sup>. Chelæ and legs variegated black and yellow; movable finger only slightly exceeding carapace; fingers strongly sinuate in ♂ . . . . *L. mucronatus*, p. 36.

21. **Lychas mucronatus**, *Fabr. Ent. Syst. Suppl.* p. 294, 1798 (Scorpio); *Thorell, Ann. Mus. Genova*, xxvii. p. 566, 1889 (Isometrus); *Pocock, in Weber, Reise Niederl. O.-Ind.* iii, p. 85, pl. vi, fig. 1, 1893; *Thorell, Bull. Soc. ent. Ital.* xxv. p. 368, 1894; *Kraep. Tierr., Scorp. etc.* p. 46, 1899 (Archisometrus); *Kraep. Jb. Hamb. wiss. Anst.* viii, p. 223, 1891 (Archisometrus); *varius*, *C. Koch, Arachn.* xi, p. 29, fig. 864, 1845 (Tityus); *Simon, Ann. Mus. Genova*, xx, p. 362, 1884; *Oates, Jour. Bom. N. H. Soc.* iii, p. 245, 1888 (Isometrus); *atomarius*, *Oates, Jour. Bom. N. H. Soc.* iii, p. 245, 1888 (?atomarius, *Simon, Ann. Mus. Genova*, xx, p. 363, 1884) (Isometrus).

*Colour* yellow varied with black: carapace with ocular tubercle and interocular triangle black, the rest of it marked with irregular greyish-black lines; terga black in the middle along the keel, a black patch interrupted by a yellow >-shaped mark on each side, and six yellow spots separated by black spaces; sterna yellow, with a blackish patch on each side; tail darker posteriorly, the lower surface lined with black, the posterior ends of the segments blacker than the anterior; vesicle uniformly deep brown; mandibles black; humerus of chela mottled with black above; brachium mostly black above, yellow at the base; hand yellow, with a few small spots; basal half of fingers black, distal end yellow.

♀. *Carapace* a little shorter than 5th caudal segment, as long as 1st and half the 2nd, granular throughout. *Terga* granular throughout, with single median granular keel. *Sterna* smooth, except the last, which is closely granular and furnished with a pair of median granular keels, the lateral keels obsolete. *Tail* about five times as long as the carapace, finely granular; 2nd segment almost as wide as long, 4th not twice as long as wide; median lateral keel present, but weak on the 2nd segment; *vesicle* granular below; spine beneath aculeus triangular, pointed. *Chelæ* finely granular, with granular crests; hand almost smooth, with obsolete



finger-keel, a little narrower than brachium, width a little less than length of underhand: digits in contact, not sinuate; the movable longer than carapace, at least twice the length of the underhand, armed with 6 rows of teeth, the basal very long, extending over half the length of the finger; the outer row of teeth 9 (8-10) in number: the inner row only 5, situated in the distal half. *Legs* externally granular, with short tibial spurs. *Pectinal teeth* about 21.

♂ with tail a little longer than in ♀ and stouter, the 5th segment and vesicle being scarcely granular and the former not carinate. *Chelæ* with hand much inflated, considerably wider than brachium; the underhand more than half the length of the movable digit, which is slightly sinuate and armed with a large tubercle at the base; immovable finger with its basal half strongly arched, so that when closed at the tip a wide space is left between the basal ends of the two fingers.

*Measurements in mm.*—♀. Total length 58, carapace 6, tail 32, underhand 3, movable finger 6.5, width of hand 2. ♂. Total length 53, carapace 6, tail 33, underhand 4, movable finger 6.5, width of hand 3.

*Distribution.* Occurring in abundance in both Upper and Lower Burma and Tenasserim (*Outes & Flea*), thence spreading eastwards into China and Siam, and southwards over the islands of the Indo-Malayan area as far as Flores.

22. *Lychas scutulus*, *C. Koch, Arachn.* xii, p. 3, fig. 962, 1845 (*Lychas*); *Thorell, Ann. Mus. Genova*, xxvii, p. 525, 1889-1890; *Pocock, Jour. Linn. Soc., Zool.* xxiii, p. 435, 1890 (*Isometrus*); *scutatus*, *C. Koch, Arachn.* xii, p. 163 (index), 1845 (*Lychas*); *Thorell, Bull. Soc. ent. Ital.* xxv, p. 367, 1894; *Kraep. Tierr., Scorp. etc.* p. 44, 1899 (*Archisometrus*): *weberi*, *Karsch, Berlin. ent. Zeits.* xxvi, p. 184, 1882 (*Isometrus*); *Kraep. Jb. Hamb. wiss. Anst.* viii, p. 221, 1891 (*Archisometrus*): *mesor*, *Simon, Ann. Mus. Genova*, xx, p. 371, 1884 (*Isometrus*): *phipsoui*, *Oates, Jour. Bom. N. H. Soc.* iii, p. 248, figs. 1, 2, 1888 (*Isometrus*).

♀. *Colour*: trunk much more uniformly fuscous above than in *mucronatus*, the terga, however, marked with a pair of circular yellow spots near the middle, and one on the posterior lateral angles; the last tergum mostly yellow, blackish only in front; anterior four caudal segments yellowish red above, last segment and vesicle blackish; *chelæ* mostly yellow; the extremity of the brachium, the hand, and the basal half of the fingers blackish; *legs* yellowish, or blackish with yellow tarsi. *Carapace* and *terga* a little more coarsely granular than in *L. mucronatus*. Last *sternum* with 4 granular keels; 3rd with rounded punctured spot in the middle of its hinder portion. *Tail* much longer and thinner, about six times as long as the carapace; 2nd segment more than twice, 4th about three times as long as wide; keels stronger than in *mucronatus*; the inferior lateral edges of the 5th carinate. *Chelæ* with hand granular and distinctly carinate above, but

narrower than in *L. mucronatus*, the width about half the length of the underhand, the latter less than half the movable finger, which is toothed as in *L. mucronatus*. *Tibial spurs* quite short. *Pectinal teeth* 16 and upwards.

♂. With sexual features very different from those of *L. mucronatus*; no yellow spot on 3rd sternum. *Tail* very long and slender, more than nine times as long as the carapace. *Chelæ* also longer than in ♀, but otherwise of the same form. *Pectinal teeth* up to 20.

*Measurements in mm.*—♀. Total length 65, carapace 6, tail 37, underhand 3, movable finger 7.8. ♂. Total length 81, carapace 6, tail 57, movable finger 8.

*Distribution.* Southern Tenasserim (*Oates*), thence throughout the Malay Peninsula into Sumatra, Java, and adjacent islands.

23. *Lychas scaber*, *Pocock, Jour. Bom. N. H. Soc.* vii. p. 300, 1893; *Kraep. Jb. Hamb. wiss. Anst.* xii, p. 86, 1895; *id. Tierr., Scorp. etc.* p. 51, 1899 (*Archisometrus*).

*Colour*: carapace yellow; antecular triangle and lateral margin, as well as ocular tubercle and an obscure stripe on each side, blackish; terga yellowish or brownish, with six yellow spots separated by black intervals on the posterior border; sterna, tail, legs, and palpi yellowish or yellowish brown, scarcely mottled; the tail darker beneath posteriorly, the fingers darker in their basal half. *Carapace* coarsely and evenly granular throughout except on the tubercle, as long as the 1st +  $\frac{1}{2}$  the 2nd caudal segments, shorter than the 5th. *Terga* also coarsely and closely granular throughout. *Sterna* smooth, 2nd with median sensory area in ♀; last granular throughout, with 4 granular crests, the external short. *Tail* nearly five times as long as carapace, granular; 1st and 2nd segments with 10 keels. *Chelæ* granular and crested as in *L. mucronatus*; hand weakly keeled, small, narrower than brachium, its width a little more than half the length of the underhand, which is less than half the movable digit, the latter longer than carapace, armed almost as in *L. mucronatus*, with 8 external, 6 internal, and 6 median rows. *Legs* with short spurs. *Pectinal teeth* 17–19 (♀), 19–21 (♂).

♂. Smaller than ♀; tail longer and thinner, about six times as long as the carapace, which is only as long as its 3rd segment, 5th segment practically smooth and keelless; chelæ with hand as wide as brachium, underhand quite half the length of the movable digit; immovable digit slightly sinuate at base, movable not lobate.

*Measurements in mm.*—♀. Total length 36, carapace 4.5, tail 22. ♂. Total length 37, carapace 3.5, tail 25.

*Loc.* S. India: Madras (*Thurston*), Secunderabad (*Ricardo*).

24. *Lychas nigristernis*, *Pocock, Jour. Bom. N. H. Soc.* xii, p. 265, 1899 (*Archisometrus*).

Allied to *L. mucronatus*, *weberi*, and *scaber*.

*Colour* varied black and yellow; antecular area of carapace and

mandibles black; tail spotted and lined with black, sterna marbled with black; legs black and yellow; chelæ with humerus black and yellow, brachium entirely black; hand and fingers yellow, with a few spots of black on the outer surface of the hands. *Carapace* and *terga* evenly granular throughout; the latter with a single median crest; *sterna* smooth, the last granular and furnished with four keels. *Tail* about five times as long as the carapace. 1st segment as wide as long, 4th twice as long as wide, intercarinal spaces granular, keels strong and granular; terminal granule of the upper keels of the 3rd and 4th segments, and in a lesser degree of the 1st and 2nd, spiniform but small, median lateral crest absent on the 3rd, weak and anteriorly abbreviated on the 2nd; *vesicle* coarsely granular below. *Chelæ* with hand slender, narrower than brachium; underhand less than half the length of movable finger, which is longer than the carapace and furnished with 6 rows of teeth as in *mucronatus*. *Tibial spurs* short. *Pectinal teeth* 15-16. *Sternum* with shallow indentation along middle line.

*Measurements in mm.*—Total length 37, carapace 4, tail 21, movable finger 4·3.

*Loc.* Western Himalaya, Dehra Dun, 8000 ft. (*Gleadlow*).

25. *Lychas rugosus*, *Pocock, Jour. Bom. N. H. Soc.* xi, p. 111, 1897: *Kraep. Terr., Scorp. etc.* p. 48, 1899 (Archisometrus).

*Colour* black, varied with yellow; frontal region of carapace black; *terga* with four yellow marginal spots, an anterior median yellow patch, yellow > <-shaped marks, and submarginal yellow band; tail yellow, marked with black lines which posteriorly fuse together; humerus and brachium black, spotted with yellow; hand clear yellow; fingers black with yellowish tips; legs yellow banded with black; sterna pale, the 4th with a few spots on its posterior border, the last indistinctly lined with black. *Carapace* and *terga* much more coarsely granular than in the other species. carapace almost as long as the 1st and 2nd caudal segments, or as the 5th. *Terga* without lateral keels. *Sterna* coriaceous, 3rd and 4th distinctly granular throughout; the last with 4 granular crests. *Tail* short and slender, about four and a half times as long as the carapace: 1st, 2nd, and 3rd segments with median lateral keel complete: the intercarinal spaces granular, the keels strong and granular, the superior subspiniform apically; 1st segment about as wide as long, 4th scarcely twice as long as wide; *vesicle* smooth below. *Chelæ* with hand about as wide as brachium, smooth: movable digit not twice as long as the underhand, shorter than the carapace, armed with 8 rows of teeth, basal row quite short. *Tibial spurs* short. *Pectinal teeth* 12. *Tarsi* with two rows of bristles beneath.

*Measurements in mm.*—Total length 22, carapace 2·8, tail 12, movable finger 2·5.

*Loc.* Raipur, Central Provinces (*Phipson*).

26. *Lychas tricarinatus*, Simon, *Ann. Mus. Genova*, xx, p. 371, 1884; Pocock, *Jour. Linn. Soc., Zool.* xxiii, p. 433, 1890 (Iso-metrus); Kraep. *Jb. Hamb. wiss. Aust.* viii, p. 227, 1891; Pocock, *Jour. Bom. N. H. Soc.* vii, p. 301, 1892; Kraep. *Tierr., Scorp.* etc. p. 50, 1899 (Archisometrus).

*Colour* variable, sometimes tolerably uniformly brownish yellow throughout, sometimes blackish varied with yellow, but not so strongly as in *L. mucronatus*, no black anteoocular triangle as in that species. *Carapace* with its anterior border less emarginate than in *L. mucronatus* and *L. scutillus*. *Terga* 3-6 with distinct though short lateral crests. Last *sternum* with 4 finely granular crests. *Tail* of much the same form as in *L. mucronatus*, about five times as long as the carapace; the sides of the segments more convex, the median lateral keel on the 2nd stronger, and a distinct supero-lateral granular keel on the 5th; *vesicle* very small, much smaller than in *L. mucronatus*, but more coarsely and more serially granular below. *Chelæ* with crests on brachium weaker; hand without keels, narrow; fingers very short, movable much shorter than carapace, longer than the underhand by only one-fourth of its length, furnished with 6 rows of teeth, the basal row long, but not half the length of the finger. *Legs* with very long tibial spurs. *Pectinal teeth* 21-25 (♀, ♂).

♂ differs from ♀ in having the *tail* much longer, six or more times the length of the carapace, the width of 1st segment about two-thirds of its length; *carapace* only slightly longer than the 1st caudal segment, and much shorter than the 4th. *Hand* a little wider than the brachium; *fingers* not quite in contact at the base, the movable furnished with a lobe which fits into a situation of the immovable.

*Measurements in mm.* (specimen from Madras).—♀. Total length 37, carapace 6, tail 32, finger 4.5. ♂. Total length 54, carapace 5, tail 35.

*Distribution.* Central and South India; Bhopal (*Dane*) and Kamptee (*Caccia*), Belgaum, Kanara (*Bell*), Mangalore (*Battie*), and Trivandrum (*Ferguson*), Tanjore and Nellore (*Peper*), Madras (*Henderson*) and Pondicherry; Yercaud in the Shevaroy Hills (*Henderson*), Nilgiri Hills (*Daly*).

Representatives of this species from the lowlands of the Madras Presidency (*i. e.* Madras, Nellore, and Tanjore) are paler in colour than those that are met with in the Deccan, Central India, the Malabar coast, and the hilly areas of the Carnatic.

27. *Lychas hendersoni*, Pocock, *Jour. Bom. N. H. Soc.* xi, p. 111, 1897; Kraep. *Tierr., Scorp.* etc. p. 51, 1899 (Archisometrus).

Allied to *L. tricarinatus* in having the tibial spurs long and the cephalothoracic sternum small and indented throughout its length.

*Colour*: carapace black and yellow in about equal proportions; two pale spots on the front border as in *L. tricarinatus*; *terga* with median yellow patch, yellow ><-shaped marking, yellow

spot on each side of middle line, and submarginal yellow stripe; last tergum densely varied with black and yellow; sterna black at the sides, the last black on the keels; tail ornamented with black patches above, below, and at the sides; vesicle lined with black below; chelæ with humerus and brachium black, spotted with yellow; hands and fingers entirely yellow; legs also black, spotted with yellow, yellower distally. *Trunk and tail* granular and carinate as in *L. tricarinatus*, but no lateral keels on terga; keels on tail rather stronger, the median lateral on the 3rd being more distinct, the superior lateral on the 1st stronger, with the dorsal area of the segment rising considerably above it; *vesicle* small as in *L. tricarinatus*. *Chelæ* with fingers much longer than in *L. tricarinatus*, the movable more than twice the length of the hand-back, toothed as in *L. tricarinatus*. *Pectinal teeth* 17-18.

*Measurements in mm.*—Total length 34, carapace 3.5, tail 18.5, movable digit 4.

*Loc.* S. India: Yercaud in the Shevaroy Hills (*Henderson*).

28. *Lychas shoplandi*, *Oates, Jour. Bom. N. H. Soc.* iii, p. 246, fig. 7, 1888; *Thoroll, Ann. Mus. Genova*, xxvii, p. 562, 1889; *Pocock, Jour. Linn. Soc., Zool.* xxiii, p. 434, 1890 (Isometrus); *Kraep. Jb. Hamb. wiss. Anst.* viii, p. 225, 1891; *Pocock, Jour. Bom. N. H. Soc.* vii, p. 303, 1892 (Archisometrus).

Nearly allied to *L. tricarinatus*, but with upper side of trunk either entirely black or with faint yellow marks; legs, chelæ, and upper side of tail reddish yellow; lower side of caudal segments with keels, area between median keels and posterior half of area between median and lateral keels black. Upper side of trunk more coarsely granular than in *L. tricarinatus*; some large granules along the front edge of the carapace and in front of the median eyes; lateral crests on terga represented by one or two larger granules. Terminal granules of superior caudal keels not so large; no distinct supero-lateral granular crest on the 5th segment; vesicle distinctly larger. In the chelæ the hand is more globular and the fingers more curved, the movable being about twice or less than twice the length of the underhand.

*Measurements in mm.*—Total length 58, carapace 5.8, tail 31, movable finger 5.

*Loc.* Lower Burma: Palone 53 miles north of Rangoon; Entagaw near Pegu (*Oates*); Prome (*Fra*).

29. *Lychas lævifrons*, *Pocock, Jour. Bom. N. H. Soc.* xi, p. 113, 1897; *Kraep. Tierr., Scorp.* p. 50, 1899 (Archisometrus); *shoplandi*, *Pocock, Jour. Linn. Soc., Zool.* xxiii, p. 435, 1891; *id.* *Jour. Bom. N. H. Soc.* vii, p. 301, 1892 (Isometrus) (nec *shoplandi*, *Oates*).

Nearly allied to *L. shoplandi*, but the legs marbled with black; the terga marked with a yellow median keel, a patch of the same on the postero-lateral angle, and yellow ><-shaped marks. The

frontal area of the carapace is still smoother, the large granules noticeable in *L. shoplandi* being practically absent, the anterior border being polished and glossy; the supero-lateral keel on the 5th caudal segment and that on the upper side of the brachium are stronger and more granular, and the fingers of the hand are longer, the movable being more than twice the length of the underhand, the two together being considerably longer than the 1st, 2nd, and 5th caudal segments. In *L. shoplandi* they are subequal. *Pectinal teeth* 22.

*Measurements in mm.*—Total length 32, carapace 4, tail 20, movable finger 4.

*Loc.* Calcutta.

30. *Lychas feæ*, Thorell, *Ann. Mus. Genova*, xxvii, p. 569, 1889 (Isometrus); *Kraep. Tierr., Scorp.* p. 51, 1899 (Archismetrus).

Allied to *L. shoplandi* and *levifrons*, with long tibial spurs and deeply impressed sternum. *Colour* of carapace and terga black; sterna marginally black, the last almost entirely black, yellowish along the lateral and posterior margin, and marked with a crescentic yellow stripe in front; tail nearly black, the segments yellow in front; vesicle yellow; humerus of chela yellow, with a few small spots at its distal end; brachium yellow, with its upper surface mostly black; hand black all over, fingers yellow, also a black spot on upper side of trochanter of chela; coxa of chela black apically and externally; legs almost entirely black externally. *Carapace and terga* granular as in *L. shoplandi*, but no large isolated granule representing lateral crest such as is seen in both adults and young of *L. shoplandi*. *Tail* as in the latter, but more closely granular. *Pectinal teeth* 20.

*Measurements in mm.*—Total length 26, carapace 3, tail 15.

*Loc.* Burma: Shwegoo, near Bhamo (Pea).

Although the only known specimen of this species is certainly young, it represents a form differing in the blackness of its appendages and tail from the young of *L. shoplandi*, which resemble the adults in colour.

### Subfamily CENTRURINÆ.

Centrurini, *Pocock, A. M. N. H.* (6) xvii, p. 428, 1896; *Kraep. Tierr., Scorp. etc.* p. 64, 1899 (= Isometrini and Centrurini, *Kraep. Jb. Hamb. wiss. Anst.* viii, p. 149, 1891).

Legs of 3rd and 4th pairs without tibial spurs.

*Distribution.* Eastern Mediterranean area (*Plesiobuthus*); Oriental Region, thence eastwards as far as Australia (*Isometrus*); Sonoran and Neotropical Regions (*Zabius*, *Tityus*, and *Centrurus*).

The two known British Indian genera\* may be tabulated as follows:—

- a. No vesicular spine beneath aculeus; terga tricostate; protarsi of anterior legs depressed and thickly fringed with hairs. . . . PLESIOBUTHUS, p. 43.
- b. A strong vesicular spine beneath aculeus; terga with only one median crest, protarsi of anterior legs not depressed and not fringed with hairs . . . . . ISOMETRUS, p. 44.

### PLESIOBUTHUS, gen. nov.

Superficially closely resembling *Buthus*.

Anterior *pedal spur* very long, stout, undivided but hairy, much larger than the posterior spur; a conspicuous spiniform process from the protarsus projecting downwards alongside the posterior spur, so that there appear to be three pedal spurs. *Protarsus* of 1st, 2nd, and 3rd legs strongly depressed, with sharp fringed posterior edge; tarsi also depressed though to a lesser extent, and hairy; claw-lobe very short and tuberculiform; claws very long, nearly as long as the tarsus and nearly straight. Immovable fang of *mandible* armed below with 1 or 2 teeth. Finger of *chela* armed with many rows of teeth, the enlarged teeth of the inner series placed near the middle of the rows of the median series. *Carapace* with straight anterior border, four lateral eyes on each side and carinate ocular tubercle, but without other keels. *Terga* tricostate, lateral crests weak. *Tail* as in *Buthus*, but somewhat depressed, the supero-lateral keels very strong on segments 1-3; vesicle without spine beneath aculeus. *Sternum* triangular.

Type and only known species, *P. paradoxus*.

*Distribution.* Northern Baluchistan.

This genus so closely resembles *Buthus* in a general way, and particularly that species, inhabiting the same area, which Birula has recently made the type of his subgenus (? genus) *Liobuthus*, that it is hard to believe the likeness is not due to actual affinity. The resemblance, however, is exactly paralleled by that which obtains between *Isometrus* and *Lychas*; and this, in the present state of our knowledge touching the constancy of the tibial spurs, is assumed to be due to similarity of surroundings and mode of life; and since the resemblance in the latter case is attributed to the causes named, there appears to be no logical ground for doubting their efficacy in producing the similarity observable between *Plesiobuthus* and *Liobuthus*. But if in the future it be shown that the tibial spurs have been lost indepen-

\* In the British Museum there is an example of a Central-American species of *Centrurus* (*C. infamatus*) ticketed Ceylon. This locality is probably erroneous, and due to the misplacement of a label. If accurate the specimens must have been artificially introduced, and need not be considered in the present work.

dently by *Plesiobuthus* and *Isometrus*, the former being a descendant of *Buthus* and the latter of *Lychas*, it will be difficult to find valid reasons for upholding the groups *Buthinæ* and *Centrurinæ*.

31. *Plesiobuthus paradoxus*, sp. n.

*Colour* mostly a fairly uniform yellow; ocular tubercle and frontal area of carapace infuscate; middle line of tail and its superior and supero-lateral crests, as well as the sides of the

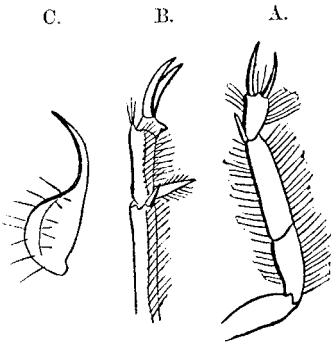


Fig. 11.—*Plesiobuthus paradoxus*.

- A. Extremity of 3rd leg, from above.  
B. Ditto, from the side. C. Vesicle and aculeus.

vesicle and the three inferior keels of the 5th caudal segment, infuscate; chelæ and legs yellow, with keels infuscate. *Carapace* as long as the 5th caudal segment; finely granular. *Terga* closely granular. *Sterna* smooth, finely granular at the sides; the last with two granular crests, the median pair being obsolete. *Tail* about five and a half times as long as the carapace, the first three segments subequal in width, 4th much narrower than 3rd and 5th than 4th; median lateral keel present only on the posterior half of the 1st segment, absent on the rest;

inferior median keels smooth on segments 1 and 2, scarcely granular on 3 and 4; the rest of the keels granular; intercarinal spaces of tail smooth, or at most finely granular; *vesicle* narrower than 5th segment, smooth, punctured below; *aculeus* long and lightly curved. *Chelæ* with humerus, brachium, and hand granularly crested; hand wider than brachium; underhand about half the length of the movable digit; movable digit much longer than carapace, armed with 11 rows of teeth. *Legs* with femora and patellæ armed with granular crests. *Pectines* long, furnished with 37 teeth.

*Measurements in mm.*—Total length 56, carapace 6, tail 34, movable digit 6.5.

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

Genus **ISOMETRUS**, Hempr. & Ehrenb.

*Isometrus*, Hempr. & Ehr. *Symb. Phys.*, *Scorp.* p. 3, 1828; also of Thorell, Karsch, Simon, Pocock, etc. (in part) prior to 1891; Kraepelin, *Jb. Hamb. wiss. Anst.* viii, p. 244, 1891, and of subsequent authors.

*Terga* of *carapace* with only a median keel. *Tail* with a large



spine or vesicle beneath the aculeus. Immovable finger of *mandible* armed beneath with 1 tooth. Finger of *chela* armed with only about five or six median rows of teeth set end to end without overlapping, also with an inner series consisting of six large teeth set close to the apices of the median rows, and an outer series of large teeth corresponding to those of the inner series, and placed in a straight transverse line with them. Protarsal segments of legs cylindrical, sparsely and irregularly hairy.

Type, *I. europæus*, Linn.

*Distribution.* Oriental Region, from India as far east as Queensland. (The typical species, *I. europæus*, has been transported all over the tropics and even to Europe in connection with shipping.)

*Synopsis of Indian Species.*

- a.* Posterior surface of brachium rounded, without crests; 5th caudal segment wide and high . . . . . *I. rigidulus*, p. 52.
- b.* Posterior surface of brachium distinctly carinate; 5th caudal segment low and narrow.
- a*<sup>1</sup>. Aculeus short, not more than half the length of the vesicle; tarsi furnished with two rows of bristles; pectinal teeth 12-16.
- a*<sup>2</sup>. Dorsal keels of 2nd and 3rd caudal segments armed posteriorly with an upstanding spine; pectinal teeth 16 . . . . . *I. acanthurus*, p. 51.
- b*<sup>2</sup>. Dorsal keels of caudal segments not furnished with posterior upstanding spine; pectinal teeth 12-14.
- a*<sup>3</sup>. Vesicular spine acutely angular; dorsal surface of abdomen ornamented with a pair of complete longitudinal pale bands . . . . . *I. vittatus*, p. 50.
- b*<sup>3</sup>. Vesicular spine with rounded apex; dorsal surface of abdomen not ornamented with two complete longitudinal yellow bands.
- a*<sup>4</sup>. Colour black, variegated with yellow; tail and hand thinner . . . . . *I. brachycentrus*,
- b*<sup>4</sup>. Colour yellow, variegated with black; tail and hand thicker . . . . . *I. basilicus*, p. 49.
- b*<sup>4</sup>. Aculeus long, nearly as long as vesicle; tarsi thickly hairy beneath.
- a*<sup>5</sup>. Superior keels of 2nd and 3rd caudal segments ending in an acute upstanding spine; last abdominal sternum with only a pair of crests. . . . . *I. assamensis*, p. 48.
- b*<sup>5</sup>. Superior keels of 2nd and 3rd caudal segments not spined; last abdominal sternum with four crests.
- a*<sup>6</sup>. Pectines in ♀ furnished at base with rounded expansion above first tooth. . . . . *I. thwaitesi*, p. 48.
- b*<sup>6</sup>. Pectines in ♀ without lobate basal expansion.
- a*<sup>7</sup>. Pectinal teeth 15-16; ante-ocular

- area with a median elongate yellow patch; hand in ♂ thick . . . . . *I. thurstoni*, p. 47.  
*b7*. Pectinal teeth 17-19; ante-ocular area with a large triangular yellow patch; hand in ♂ thin . . . . . *I. europæus*, p. 46.

32. *Isometrus europæus*, *Linn.Syst. Nat.* ed. 10, p. 625, 1758 (Scorpio); *Lönnberg, A. M. N. H.* (7) i, p. 86, 1897 (Isometrus): *maculatus*, *De Geer, Mém. Hist. Ins.* vii, p. 346, pl. xli, figs. 9 & 10, 1778 (Scorpio); *C. L. Koch, Arachn.* xii, p. 1, fig. 960, 1845 (Lychas); *Thorell, A. M. N. H.* (4) xvii, p. 8, 1876; *Simon, Ann. Mus. Genov.* xx, p. 370, 1884; *Oates, Jour. Bom. N. H. Soc.* iii, p. 250, figs. 3, 4, 1888; *Kraep. Jb. Hamb. wiss. Anst.* viii, p. 245, 1891 (Isometrus): *dentatus* & *americanus*, *Herbst, Nat. Ungeflügelt. Ins.* iv, pp. 55 & 60, pl. vi, figs. 2, 3, 1800 (Scorpio): *filum*, *Hempr. & Ehrenb. Symb. Phys., Scorp.* p. 3, t. i, fig. 3, 1828 (Bathus (Isometrus)).

*Colour* yellow with black; carapace marked in front with an anteriorly-expanding triangular yellow patch reaching the anterior border. *Terga* ornamented along the posterior border with five black spots, separated by six spots of a clear yellow tint. *Sterna* yellow, the last obsoletely lined with black. On the *tail* the black on the upper side is represented mostly by small spots along the keels; on the under side, the black forms a network; *hand* externally spotted; fingers brown, black at base, yellow at tips.

♀. *Carapace* evenly granular throughout; about as long as the 1st and half the 2nd caudal segments or as the 4th. *Terga* evenly granular. *Sterna* smooth, the last granular throughout, with four granular crests. *Tail* slender, about five and a half times the length of the carapace, evenly granular; 1st segment longer than wide, 4th about three times as long as wide; median lateral keel practically absent on the 2nd; vesicle (fig. 12, A) granular below; the spine triangular-pointed, furnished with a single anterior denticle, separated at its origin from the aculeus by a space equal to the thickness of its own base or of that of the aculeus. *Chelæ* finely granular and granularly crested; brachium with an upper and a median crest on its posterior side; hand smooth, keelless, scarcely as wide as brachium; underhand less than half the length of the movable finger, which is longer than the carapace. *Pectinal teeth* 17-19 (♂, ♀).

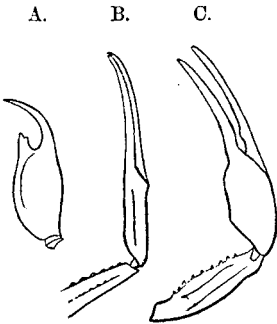


Fig. 12.—A. *Isometrus europæus*: vesicle and aculeus.  
 B. Ditto: extremity of chela of male.  
 C. *Isometrus thurstoni*: extremity of chela.

♂ with well-marked secondary sexual characters. *Tail* exceedingly long, eight times as long as carapace; 1st caudal segment more than twice as long as wide, 4th about one and a half times as long as carapace and five times as long as wide. *Chelæ* also very long and slender; hand (fig. 12, B) slender, parallel-sided, not wider than brachium, its width about one-third the length of the underhand, which is at least two-thirds the length of the movable finger.

*Measurements in mm.* (specimens from Bombay).—♀. Total length 49, carapace 5, tail 28, underhand 2.5, movable finger 6.

♂. Total length 62, carapace 5, tail 42, underhand 4.5, movable finger 7.

*Loc.* Introduced in connection with shipping from the Oriental Region all over the tropical and subtropical parts of Asia, Africa, and America. So far as British India is concerned, the species has been found in Bombay, Karachi, Ceylon (Trincomali and Peradeniya), Burma (Rangoon, Akyab, &c.), and the Andaman Islands.

The wide distribution and sexual variability of this species account, to a great extent, for its long list of synonyms.

33. *Isometrus thurstoni*, Pocock, *Jour. Bom. N. H. Soc.* vii, p. 297, 1893; *Kraep. Tierr., Scorp. etc.* p. 67, 1899.

Allied to the preceding.

♀. Coloured very much as in *I. europæus*, but the yellow triangle in front of the ocular tubercle reduced to a small spot, which is slightly broader behind than in front and does not quite reach the anterior margin; the ground-colour of the body and its appendages is darker, the median longitudinal band on the terga more conspicuous, whereas the tail, legs, and chelæ are not so variegated, being of a more uniform yellowish-brown tint. Structurally the ♀ much resembles that of *I. europæus*, but the vesicle is very noticeably stouter; the spine smaller and farther removed from the base of the aculeus. Hand larger than in *I. europæus*, as wide as brachium; length of underhand at least half that of movable digit. *Pectinal teeth* 14-16.

♂. Differing from ♂ of *I. europæus* in the same characters of colour and form of vesicle as the ♀, and sexually modified in much the same way, with tail and chelæ long. The tail, however, is not so long as in *I. europæus*, about  $7\frac{1}{2}$  times as long as the carapace; 4th segment not four times as long as wide. Chelæ differing from those of *I. europæus* in having the brachium only about four times as long as wide, the hand (fig. 12, C) inflated, much wider than the brachium, its width at least half the length of the underhand, and the immovable finger sinuous in the proximal half, so that when closed the two are not in contact at base.

*Measurements in mm.* of ♂ (type) from Shevaroy Hills.—Total length 67, carapace 6, tail 45, underhand 5, width of hand 2.5.

*Loc.* From Central India (Bhopal, *Dane*) southwards through Belgaum and the Kolhapur State (*Wray*), into the Madras Presidency: Cuddapah (*Popert*), Coonoor, Yercaud in the Shevaroy Hills (*Henderson*), Trichinopoly (*Popert*), and Tinnevely (*Barber*). There are also two specimens in the British Museum labelled Ceylon.

Immature examples of this species are difficult to distinguish from those of the preceding. Moreover, the sexual characters of the male seldom attain the development presented by the type. Nevertheless, the chelæ never approach the form characteristic of the male of *europæus*.

34. *Isometrus assamensis*, *Oates, Jour. Bom. N. H. Soc.* iii, p. 250, 1888; *Pocock, in Weber's Reise Niederl. O.-Ind.* iii, p. 90, 1893.

♀. Coloured almost as in *I. europæus*, but with the yellow ante-ocular triangle practically obliterated and the tail much less spotted, the 5th segment being a deep uniform brown all over and the brown on the others restricted to the under surface and to the posterior end of the lateral surface. Chelæ and legs less spotted than in *I. maculatus*; patellæ of legs with only two black bands. Much smaller than *I. europæus*; *carapace* more deeply emarginate in front. Last *sternum* of abdomen with a pair of keels only, the median pair obsolete. *Tail* about five times as long as the *carapace*, granular and carinate as in *I. europæus*, but the superior keels of the 2nd and 3rd segments each ending in a distinct spiniform tubercle; *vesicle* almost as in *I. europæus*, but neither the spine nor the aculeus so long as in that species. *Chelæ* with brachium broader as compared with its length and finger shorter than in *I. europæus*, the finger as long as the *carapace* and about twice the length of the underhand. *Pectinal teeth* 14-16 (♂, ♀).

♂. Tail about six times as long as *carapace*; spiniform tubercles on 2nd and 3rd segments larger than in ♀; vesicle more parallel-sided than in *I. europæus*, the posterior (inferior) border of the spine and vesicle in the same straight line, whereas in *I. maculatus* the vesicle diverges at an obtuse angle. *Chelæ* practically resembling those of the ♀, and not strikingly modified as in *I. europæus* and *I. thurstoni*.

*Measurements in mm.*—♀. Total length 36, *carapace* 4, tail 22.

♂. Total length 35, *carapace* 3.2, tail 22.

*Loc.* N.E. India: Dhubri in Assam (*Smart*).

35. *Isometrus thwaitesi*, *Pocock, Jour. Bom. N. H. Soc.* xi, p. 114, 1897; *Kraep. Tierr., Scorp. etc.* p. 67, 1899.

Much resembling *I. europæus* in colour; but the ocular tubercle marked with a median yellow stripe, and the anterior black patch gives off an obliquely longitudinal black stripe, which runs forwards and inwards to meet its fellow of the opposite side in the middle

of the anterior border; the black on the tail forms a more distinct network, surrounding circular or oval yellow spots; vesicle black, with round yellow spots: the chelæ, too, including the hands and fingers, are black with round yellow spots. Structural features practically as in *I. europæus*, though the brachium is a little broader as compared with its length, being very perceptibly broader than the hand. Differing from the rest of the species in possessing a semicircular lobate expansion at the base of the shaft of the pectines, such as is found in the allied American genus *Tityus*, where it is confined to the female.

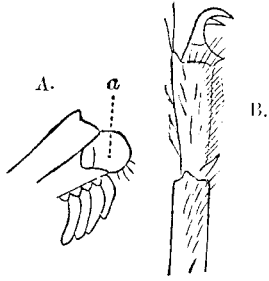


Fig. 13.—A. Base of pecten showing lobe (a) of *Isometrus thwaitesii*.  
B. Tarsus and extremity of protarsus of 4th leg of *Isometrus europæus*.

Measurements in mm.—Total length 34, carapace 3.8, tail 22.  
Loc. Ceylon (*Thwaites*).

36. *Isometrus basilicus*, Karsch, *MT. Münch. ent. Ver.* iii, p. 113, 1879; *Simon, Ann. Mus. Genov.* xx, p. 370, 1884; *Kraep. Jb. Hamb. Wiss. Anst.* xiii, p. 127, 1896; *id. Tierr., Scorp. etc.* p. 68, 1899.

Colour variegated yellow and black, yellow predominating; ante-ocular area of carapace mostly yellow; terga with median keel, lateral border, ><-shaped marks, and a round spot on each side of the middle line yellow; sterna yellow, marbled with black; tail yellow, darker posteriorly, slightly spotted laterally, more strongly lined beneath with black, vesicle slightly spotted below; chelæ yellow, a few black spots on humerus, brachium, and hand; hand at base of immovable finger black; fingers black, with yellow tips; legs yellow, with a few black spots.

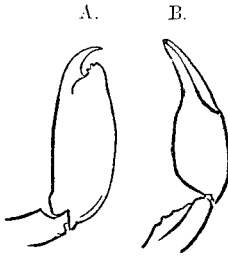


Fig. 14.—*Isometrus basilicus*, ♂.  
A. Vesicle and aculeus.  
B. Extremity of chela.

♀. Carapace granular throughout, only a little shorter than the 1st and 2nd caudal segments and quite as long as the 5th. Terga granular, like the carapace. Last sternum with the median pair of keels obsolete, the laterals complete. Tail short, only a little more than four times as long as the carapace; 1st segment about as long as wide, 4th less than 5th, a little more than twice as long as wide:

intercarinal spaces scarcely granular; keels evenly granular; vesicle with spine not acute, wide at the base, its free edge semi-circularly rounded, armed in front with four small denticles, close to aculeus, the intervening distance less than half the thickness of the base of the aculeus; aculeus very short, barely half the length of the vesicle. *Chelæ* weakly granular; brachium armed in front with some half-dozen tooth-like tubercles; hand keeled, distinctly wider than brachium, width more than half the underhand; the latter nearly as long as the movable digit, which is about equal to the carapace and furnished with 6 rows of teeth. *Tarsi* furnished beneath with two rows of hairs. *Pectinal teeth* 13-14.

♂. Tail very long, more than six times the length of the carapace, which is equal to its 2nd segment; 1st segment about twice, 4th about three times as long as wide; keels and intercarinal spaces smoother than in ♀, superior keels of 2nd and 3rd segments each ending in a triangular tooth; *chelæ* with hand smoother and a little thicker and longer than in ♀, the length of the underhand being equal to that of the movable finger.

*Measurements in mm.*—♀. Total length 40, carapace 4.5, tail 23.

♂. Total length 56, carapace 5, tail 38.

*Loc.* Ceylon: Peradeniya (*Sarasin*), Haldumullah (*Green*).

37. *Isometrus brachycentrus*, Pocock, *Jour. Bom. N. II. Soc.* xii, p. 263, 1899.

♀. Nearly allied to the preceding, but much darker in colour. Upper side of trunk deep blackish brown, anteocular area of carapace black; terga with a clear circular spot on each side of the middle line, also a paler lateral submarginal band; tail reddish brown, the median inferior intercarinal space marked with a black stripe; 5th segment, with exception of its anterior part, entirely black; *chelæ* mostly a uniform reddish brown or clearer reddish yellow; legs strongly infusate externally, the femur and patella of the posterior legs being almost wholly black with only one or two yellow spots; abdominal sterna, except the 5th, not infusate. Structurally almost as in *I. basilicus*, but the tail thinner, about six times as long as the carapace, the 1st segment longer than wide, the 4th a little more than twice as long as wide. *Chelæ* also as in *I. basilicus*, but hand a little smaller, scarcely exceeding brachium in width. *Pectinal teeth* 12.

*Measurements in mm.*—Total length 42, carapace 4, tail 24.

*Loc.* Mangalore (*Battie*) and Kanara (*Bell*), on the Malabar coast.

38. *Isometrus vittatus*, sp. n.

♀. *Colour*: carapace varied with yellow and brown; upper side of abdomen with two complete yellow bands, separated from each other by a complete median brown band about equal to them in width, and from the external margin by a similar brown band; sterna pale; tail uniformly yellowish brown, a little darker posteriorly; *chelæ* with humerus and hand pale; brachium, except for its pale

basal portion, and base of digits infusate; legs externally variegated. Upper side of *body* closely and entirely covered with larger and smaller granules; a row of coarser granules along posterior border of *terga*; last *sternum* closely granular throughout, and furnished with four granular keels. *Tail* slender, about four times as long as carapace, closely granular, normally keeled; median lateral keel present only on 1st segment, merely represented on the 2nd posteriorly by about three granules; *vesicle* smooth, long, about twice as long as aculeus; spine large, triangularly pointed, its inferior edge continuous with the corresponding edge of the vesicle, its upper edge furnished with a pair of tubercles; distance between spine and base of aculeus scarcely equal to diameter of base of aculeus; aculeus moderately long. *Chelæ* with humerus and brachium granular and normally keeled: brachium wide, only twice as long as wide, and furnished in front with about half-a-dozen denticles; hand large, wider than brachium, smooth, not crested: fingers short, in contact, movable only slightly longer than underhand, furnished with 7 rows of teeth. *Pectinal teeth* 12-13. *Tarsi* furnished below with a few setæ, arranged in two rows.

*Measurements in mm.*—Total length 23, tail 13, carapace 3.

*Loc.* Madras (*Henderson*).

A single female example.

39. *Isometrus acanthurus*, *Poco* †, *Jour. Bom. N. H. Soc.* xii, p. 264, 1899.

♂. Allied to the preceding species, and most nearly resembling *I. basilicus* in colour. Carapace lined with black: antecular region black, with a few small yellow spots; *terga* with six yellow and five black longitudinal bands; 4th and 5th sternal plates lined with black; tail delicately lined with black; *chelæ* and legs yellow spotted with black, black on brachium predominating and circumscribing definite yellow spots; hand almost entirely yellow, not black at base of fingers; fingers not black, but yellow and spotted with black. Upper side of *trunk* granular, and crested as in the preceding species; *carapace* as long as the 2nd caudal segment; 5th abdominal *sternum* marked with four complete and equal granular keels. *Tail* long and slender, about seven times the length of the carapace; keels stronger than in *I. basilicus*, and the terminal granule on the superior keels on 2nd and 3rd segments long, erect, and spiniform; *vesicle* with coarsely granular crests below; spine not so thick as in the preceding species, triangular, but with blunt, not rounded or sharp apex, armed with only two denticles; aculeus short and curved. *Chelæ* much as in *I. basilicus*, but the front of the brachium normally crested and subdenticulate, not furnished with a few large teeth; hand smooth, wider than brachium, its width about half the length of the underhand; movable digit as long as underhand, not so long as carapace, furnished with 7 rows of teeth. *Pectinal teeth* 16.

*Measurements in mm.*—Total length 39, carapace 4, tail 27.  
*Loc.* Matheran (*Phipsou*).  
*Female* unknown.

40. *Isometrus rigidulus*, *Pocock, Journ. Bom. N. H. Soc.* xi, p. 113, 1897; *Kraep. Tierr., Scorp. etc.* p. 66, 1899.

*Colour* varied yellow and black: antecular area of carapace black, with two small yellow spots in front of the black tubercle; terga yellowish round the margins, and with yellow ><-shaped marks; sterna weakly infuscate at the margins, the 4th and 5th also infuscate mesially; tail weakly lined with black below, black increasing in amount on the posterior segments, the 5th being almost entirely black; vesicle variegated; chelæ with humerus and brachium black, yellow-spotted; hand and fingers yellow, black-spotted. *Carapace* and *terga* coarsely and evenly granular throughout; carapace as long as 5th caudal segment, longer than 1st and half the 2nd. *Sterna* smooth, the last granular throughout, with four granular keels. *Tail* about five times as long as carapace, 1st segment about as long as wide, 4th about twice as long as wide; intercarinal spaces closely and rather coarsely granular throughout; keels strong, coarsely granular, dorsal keel of 3rd ending in a long and strong upstanding spine; 5th segment dorsally much elevated, so that the height of the segment is greater than the width and nearly half the length; *vesicle* coarsely granular below, the spine triangular, pointed, armed with one tooth, and separated from the aculeus by a space which nearly equals the width of the latter; aculeus more than half the length of the vesicle. *Chelæ*: brachium without crests on its posterior surface, which is rounded, upper crests granular; hand smooth, about as wide as the brachium; movable finger about as long as the carapace and one fourth longer than the underhand, furnished with 7 rows of teeth. *Tarsi* furnished beneath with 2 rows of long setæ. *Pectinal teeth* 13-15.

*Measurements in mm.*—Total length 29, carapace 3, tail 15.  
*Loc.* Central India: Bhopal (*Dane*).

The following species belonging to the family Buthidæ is of doubtful generic position, though probably referable to *Lychas* or *Isometrus*, and very possibly specifically identical with *Isometrus europæus*:—

*Scorpio* (*Atreus*) *spinax*, *Gervais. Arch. Mus. Paris*, iv, p. 225, 1844.

Total length 53 mm., tail 30. A single dorsal keel. Pectinal teeth 19.

*Loc.* India.