

sometimes the disc also towards the apex, obscurely testaceous or rufescent; the antennæ black, except at the base and tip, much shorter in ♀ than in ♂, joints 2 and 3 small in both sexes; the head long; the eyes smaller; the posterior femora much less thickened. The sexual characters were not noticed by Pic.

Xylophilus laticornis.

Xylophilus laticornis, Pic, Ann. Soc. Ent. Fr. 1912, pp. 278, 280.

Hab. CEYLON, Kandy [type]; TENASSERIM, Mergui (*Doherty*).

The three specimens of *X. laticornis* in Mr. Bryant's collection are almost certainly females, and there is an example from Mergui in the British Museum exactly agreeing with them. In this insect the head is much prolonged behind the eyes, the eyes are small, and the elytra are short, broad, convex, and somewhat coarsely, densely punctate, and rather variable in colour, according to the predominance of the testaceous or blackish markings.

XXVIII.—*On the Species of Lucifer and their Distribution.*

By L. A. BORRADAILE, M.A., Lecturer in Zoology in the University of Cambridge; Fellow, Dean, and Lecturer of Selwyn College.

OUR knowledge of the species of *Lucifer* is at present in a confusion which is regrettable, not only from the point of view of the systematist but also because it prevents the drawing of conclusions as to the distribution of a characteristic constituent of the pelagic fauna. The difficulties of the subject are due to the very insufficient descriptions given by Milne-Edwards, who named the first two species, the genus having been founded by Vaughan Thompson for an unnamed form. Milne-Edwards's obscurity has led subsequent writers to confound under each of his names quite distinct species. It seems probable, indeed, from an examination of the descriptions and drawings given by various authors, that the species of *Lucifer* are far more numerous than has hitherto been suspected. The only alternative to this conclusion is to attribute to authorities who are usually quite trustworthy an extraordinarily high proportion of error in their diagnoses and figures. This I am the less inclined to do as I have been able in some cases to confirm the accuracy of the published descriptions by the examination

of specimens, and as it is, in any case, wiser to emphasize than to ignore possible differences. The most valuable contributions to the subject have been made by Dana and by Kemp, and I have in the main accepted their decisions in the following synonymic list:—

1. *Lucifer typus*, H. M.-Edw., 1837.

Lucifer, J. V. Thompson, Zool. Researches, iv. p. 58, pl. vii. fig. 2 (1829).

Leucifer typus, H. Milne-Edwards, Hist. Nat. Crust. ii. p. 469 (1837).

Kemp thinks that this species is probably identical with the *L. ancestra* of Dana. The two are undoubtedly related, but there are marked differences between Thompson's figure and Dana's in respect of the sixth abdominal segment and its limb. It seems best at present to maintain the specific distinctness of *L. typus* until further research has rendered it unlikely that there exists a species which corresponds with Thompson's figure. In any case, the identification cannot be sufficiently certain to justify the supersession of Dana's name.

Tropical N. Atlantic.

2. *Lucifer reynaudi*, H. M.-Edw., 1837.

Leucifer reynaudii, H. Milne-Edwards, Hist. Nat. Crust. ii. p. 469, pl. xxvi. fig. 10 (1837).

Lucifer reynaudi, Dana, U.S. Expl. Exped., Crust. i. p. 672 (1852); Atlas, pl. xlv. fig. 1 (1855).

Lucifer reynaudii, Kemp, Trans. Linn. Soc. Lond., Zool. (2) xvi. 1, p. 58 (1913).

Indian Ocean. Sooloo Sea.

3. *Lucifer ancestra*, Dana, 1852.

Lucifer ancestra, Dana, U.S. Expl. Exped., Crust. i. p. 671 (1852); Atlas, pl. xlv. fig. 9 (1855); Streets, Bull. U.S. Mus. vii. p. 122 (1877); Faxon, Mem. Mus. Harvard, xviii. p. 214 (1895); Kemp, Trans. Linn. Soc. Lond., Zool. (2) xvi. 1, p. 58 (1913).

Throughout the warmer parts of the Pacific and Indian Oceans from Mexico to Mauritius.

4. *Lucifer pacificus*, Dana, 1852.

Lucifer pacificus, Dana, U.S. Expl. Exped., Crust. i. p. 673 (1852); Atlas, pl. xlv. fig. 2 (1855).

Tropical Pacific.

5. *Lucifer acicularis*, Dana, 1852.

Lucifer acicularis, Dana, U.S. Expl. Exped., Crust. i. p. 674 (1852); Atlas, pl. xlv. fig. 3 (1855).

Harbour of Rio Janeiro.

6. *Lucifer bonitensis*, sp. n.

Lucifer typus, Eydoux & Souleyet, Voy. de la 'Bonite,' Zool. i. p. 249, pl. iv. figs. 1-12 (1841).

Habitat ?

7. *Lucifer clausi*, sp. n.

Lucifer typus?, Claus, Zeit. f. wiss. Zool. xiii. p. 435, pl. xxviii. figs. 21-26 (1863).

Lucifer typus, Carus, Prodr. Faun. Medit. i. p. 470 (1885).

This species is closely related to *L. batei* (= *L. reynaudii*, Bate), but differs in the shorter neck and longer sixth abdominal segment, and also, probably, in the petasma. Carus's definition of it seems to be derived from a misreading of Milne-Edwards's diagnosis of *L. typus*.

Messina.

8. *Lucifer faxoni*, sp. n.

Lucifer typus?, Faxon, Stud. Biol. Lab. Joh. Hopkins Univ. 3, p. 113, pl. vii. (1878).

Lucifer sp., Brooks, Phil. Trans. Roy. Soc. 1882, i. p. 87, pl. vii.

? *Lucifer*, sp. n.?, Semper, Zeit. f. wiss. Zool. xxii. p. 305, pl. xxii. (1872).

In Semper's figure of the end of the abdomen of the male, the tip of the exopodite of the uropod is either incorrectly drawn or indicates that the individual from which it was taken represents a species different from any hitherto described. The female seems to differ in no important respect from *L. faxoni*, but, in view of the locality in which Semper's specimens were taken, it is at least doubtful whether they belong to Faxon's species.

N.W. Atlantic. E. Subtropical Atlantic (Brit. Antarc. Exped.). ? Near Philippine Is.

9. *Lucifer affinis*, sp. n.

Lucifer typus, Bate, 'Challenger' Report, Zool. xxiv. p. 464, pl. lxxxiii. (1888); Ortmann, Ergebn. Plankton-Exp. ii. G, b, p. 40 (1893); Nobili, Mem. Ac. Torino, (2) lvii. p. 352, pl. i. fig. 1 (1903).

Various localities in the Tropical and Subtropical Atlantic, Pacific, and Indian Oceans, generally near land.

10. *Lucifer batei*, sp. n.

Lucifer reynaudii, Bate, 'Challenger' Report, Zool. xxiv. p. 466, pl. lxxxiv. (1888); Ortmann, Ergebn. Plankton-Exp. ii. G, b, p. 40 (1893).

? *Lucifer reynaudi*, Dohrn. Zeit. f. wiss. Zool. xxi. p. 357, pl. xxvii. figs. 1-10 (1871).

In Dohrn's figure the legs are considerably longer than in Bate's, with which specimens in my hands agree. Dohrn, however, is certainly wrong in his representation of the antennules, and may be also inaccurate in regard to the legs.

This species is related to Dana's *acestra*, but differs from it in the following respects:—(i.) the rostrum is present; (ii.) the legs of the last two pairs are longer; (iii.) the dorsal spine of the sixth abdominal segment is terminal and projecting, not subterminal; (iv.) the exopodite of the uropod is blunt-ended, with the terminal spine at one side, instead of diminishing gradually into the spine; (v.) the ventral tubercle of the telson of the male is subrectangular, and directed very slightly forward.

Throughout the warmer parts of the Atlantic and Central Pacific, near land or on the high seas.

11. *Lucifer inermis*, sp. n. *

Diagnosis: A *Lucifer* with the neck about twice as long as the rest of the cephalothorax, the eye with stout stalk, rather more than one-third the length of the neck, the last leg just reaching the end of the neck, the preceding leg slightly shorter, the sixth abdominal segment rather shorter than the fourth and fifth together and rather longer than the uropod, the latter with pointed exopodite bearing very small spine removed from end, the telson about half the length of the uropod, and the hinder ventral spine of the sixth abdominal segment in the male stronger than the spine before it and sharp-pointed.

Melbourne Harbour (Brit. Antarc. Exped.).

Doubtful Species.

L. reynaudi, Dohrn, and the form recorded by Semper have been provisionally assigned in this list to *L. batei* and *L. faxoni* respectively, but it is quite possible that each of them represents a distinct species.

The characters by which the species of the foregoing list may be separated are shown in the following key:—

1. Neck shorter than rest of cephalothorax. Sixth abdominal segment more than half as long again as uropod. Telson and uropod subequal. [Eye-stalk stout. Legs short.] *L. acicularis*, Dana, 1852.

* I am kindly permitted to include in the present paper a preliminary diagnosis of this species. It is founded on specimens in the 'Terra Nova' collection of Decapoda, which has been placed in my hands for examination.

- II. Neck longer than rest of cephalothorax. Sixth abdominal segment shorter or not much longer than uropod. Telson shorter than uropod.
- A. Eye not more than half length of neck.
1. Eye-stalk stout. Hinder ventral spine of sixth abdominal segment of male sharp.
 - a. Exopodite of uropod more than five times as long as wide. Hinder ventral tooth of sixth abdominal segment of male followed by a pair of spinules. *L. reynaudi*, H. M.-Edw., [1837.]
 - b. Exopodite of uropod less than five times as long as wide. Hinder ventral tooth of sixth abdominal segment of male not followed by a pair of spinules.
 - i. Last leg does not reach end of neck. Eye less than one-third length of neck. [Spine on exopodite of uropod nearly or quite reaches end.] *L. affinis*, sp. n.
 - ii. Last leg reaches or exceeds end of neck. Eye rather more than one-third length of neck.
 - α. Spine on exopodite of uropod projects well beyond end, which is rounded. *L. faxoni*, sp. n.
 - β. Spine on exopodite of uropod does not nearly reach end, which is pointed *L. inermis*, sp. n.
 2. Eye-stalk slender. Hinder ventral spine of sixth abdominal segment blunt *L. bonitensis*, sp. n.
- B. Eye more than half length of neck.
1. Neck only slightly longer than rest of cephalothorax. Sixth abdominal segment longer than uropod.
 - a. Eye-stalk stout. Sixth abdominal segment longer than fourth and fifth together *L. pacificus*, Dana, [1852.]
 - b. Eye-stalk slender. Sixth abdominal segment only as long as fourth and fifth together *L. clausi*, sp. n.
 2. Neck a good deal longer than rest of cephalothorax. Sixth abdominal segment not longer than uropod [or than fourth and fifth segments together].
 - a. Rostrum present. Last leg nearly or quite reaches end of neck. Exopodite of uropod blunt-ended, with terminal spine at end of outer side *L. batei*, sp. n.
 - b. Rostrum wanting. Last leg does not nearly reach end of neck. Exopodite of uropod diminishes to a point [where the spine stands, ? in *L. typus*].
 - i. Hinder ventral spine of sixth abdominal segment swollen at the end. Spine of exopodite of uropod well developed *L. ancestra*, Dana, 1852.
 - ii. Hinder ventral spine of sixth abdominal segment sharp-pointed. Spine of exopodite of uropod obsolete? *L. typus*, H. M.-Edw., [1837.]

If my conclusions as to the species of *Lucifer* be correct, it will appear that most of them have a distribution which, whether it be wide or restricted, is limited, and not world-wide. Two species alone seem at present to break this rule,

L. affinis and *L. batei*, which are stated to occur both in the Atlantic and in the Pacific Oceans. It may be that differences will eventually be found between the eastern and western specimens which have been referred to these species. The genus is represented in all the warmer seas of the world, and in some of moderate warmth, but not, it would seem, in cold waters. There is some indication that certain species belong normally to coastal waters, others to the high seas, and yet others indifferently to both these kinds of habitat, but conclusions upon this question cannot safely be drawn until many more captures have been recorded. It will, of course, be necessary to distinguish between stray individuals and those which have been taken in their normal habitat.

XXIX.—*Note on the Nomenclature of certain Species of Ruteline Coleoptera.* By GILBERT J. ARROW.

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HAVING, with inexcusable carelessness, introduced as new several preoccupied names in the great genera *Anomala* and *Adoretus*, I here substitute fresh ones for them, and I have at the same time renamed various other species of the same genera whose present names are inadmissible for the same reason. The species are :—

- Anomala peninsularis*, Arrow, Ann. & Mag. Nat. Hist. (8) viii. 1911, p. 483 (preoccupied by Schaeffer, 1906), to be called *fulvohirta*, n. n.
- A. phylloperthoides*, Nonfr. Ent. Nachr. xx. 1894, p. 122 (preoccupied by Fairmaire, whose *Popillia phylloperthoides*, 1888, is an *Anomala* closely related to *A. erythroptera*, Kraatz), to be called *alterata*, n. n.
- A. mimeloides*, Reitt. Verh. Ver. Brünn. xli. 1903, p. 71 (preoccupied by Ohaus, 1902), to be called *sinica*, n. n.
- A. whiteheadi*, Ohaus, Philipp. Journ. Sci. v. 1910 (October), p. 243 (preoccupied by Arrow, July 1910), to be called *albaya*, n. n.