

Crangon sculptus and *fasciatus*.

I am surprised at Mr. Bate's suggestion that *Crangon sculptus* and *Crangon fasciatus* are the same species. In my humble judgment, no two Crangons belonging to the same section of the genus can have stronger distinctive features. Can it be that Mr. Bate has not met with the true *C. fasciatus*? The differences are not confined to the number of spines: there are other characters; and of far more consequence is the fact that, whereas in *C. sculptus* the abdomen is elaborately ornamented with beautiful sculpturing, in *C. fasciatus* it is quite smooth. Dr. Kinahan's figures and description of this latter species are very good (Trans. Royal Irish Acad. vol. xxiv. (1861) p. 76; and Proc. Royal Irish Acad. 1862, p. 362, pl. 12). *Crangon nanus*, Kröyer (= *C. bispinosus* of Hailstone) appears to me to be the species most closely related to *C. fasciatus**.

P.S. As though to confirm what I have just said—among some shrimps dredged during the past month in Shetland by Mr. Jeffreys, and received from him this morning, I find several *C. fasciatus*, but there are no *C. sculptus*; nor is that species known to inhabit the Shetland seas. I have never found these two species in company, nor seen a specimen intermediate in character. *Crangon fasciatus* I have dredged off the Northumberland coast (where *C. sculptus* has not been found at all), at Falmouth, and off Guernsey; and *C. sculptus* I have procured in the Minch, Lamplash Bay, and Guernsey.

XVI.—Contributions to the Study of the Entomostraca.

By GEORGE STEWARDSON BRADY, C.M.Z.S. &c.

No. II. Marine Ostracoda from the Mauritius.

[Plates XII. & XIII.]

THE species here described have been found in mud brought from the Mauritius, and kindly placed in my hands by my friends Messrs. Thomas Blain and E. C. Davison, of Sunderland. It is interesting to note that two of the species, *Cythere Darwinii* and *C. Hodgii*, occur also in the Malay archipelago, and that the specimens from the Mauritius exhibit slight, but decided differences; while *Macrocypris maculata*, *Xestoleberis margaritea*, and *Cytheridea punctillata* have a still wider range

* Judging from Kröyer's figures of *C. boreas*, Phipps, in the 'Naturhistorisk Tidsskrift,' vol. iv. (1842) p. 218, pl. iv. figs. 1-14, I should conclude that it is distinct from all our British species.

of distribution, extending even into the European seas. Some additional species from the same locality will be described in a future Number of 'Les Fonds de la Mer.'

List of Species.

Pontocypris attenuata, nov. sp.	Cythere hamigera, nov. sp.
— Davisoni, nov. sp.	— bispinosa, nov. sp.
Macrocypris maculata, Brady.	— convoluta, nov. sp.
Cythere demissa, nov. sp.	Cytheridea punctillata, Brady.
— plana, nov. sp.	— spinulosa, nov. sp.
— fumata, nov. sp.	Loxocochea Lilljeborgii, nov. sp.
— Hodgii, Brady.	Xestoleberis margaritea, Brady.
— Darwinii, Brady*.	

Pontocypris attenuata, nov. sp. (Plate IV. figs. 11-14.)

Carapace, as seen from the side, subtriangular or siliquose, highest in front of the middle, and tapering to a point behind; greatest height scarcely equalling half the length: anterior extremity broadly rounded; posterior subacutely pointed: superior margin obtusely angular at its highest point, from which it slopes steeply backwards with a gentle curve; inferior slightly sinuated about the middle: outline, as seen from above, compressed, somewhat clavate, widest at the anterior third, rounded and slightly mucronate in front, pointed behind; greatest width equal to rather more than a third of the length. End view oval, widest in the middle. Surface of the shell smooth, slightly punctate, and clothed with numerous exceedingly short and fine hairs. Colour pale yellowish brown. Length $\frac{3}{8}$ inch. Animal unknown.

This pretty species approaches very closely to the European *P. mytiloides*, but is paler in colour, less distinctly pubescent, has a more shining surface, a more angular dorsal margin, and is also destitute of serratures at the posterior extremity.

Pontocypris Davisoni, nov. sp. (Plate XIII. figs. 9, 10.)

Carapace of the female (?) somewhat tumid, as seen from the side subreniform, highest in the middle; greatest height fully equal to half the length; rounded in front: posterior extremity rounded off below, scarcely angular; superior margin boldly arched, highest in the middle, inferior sinuated in front of the middle. Seen from above, the outline is ovate, widest near the middle, pointed in front, rounded behind; width much less than the height. The surface of the shell is granular or very finely punctate, and quite devoid

* Described in 'Les Fonds de la Mer.'

of hairs: colour whitish, semitransparent, with an opaque milk-white central patch and marginal belt. Length $\frac{1}{3}$ inch.

I have much pleasure in inscribing this species to my friend Mr. E. C. Davison, whose untiring diligence in collecting and general interest in all subjects connected with marine zoology have materially helped my own studies in this department.

Cythere demissa, nov. sp. (Plate XII. figs. 1, 2.)

Somewhat similar to *C. pellucida*, but much smaller. Seen from the side, oblong, rather higher in front than behind; greatest height equal to about half the length: anterior extremity broadly rounded, posterior subtruncate, and armed below the middle with four small teeth: superior margin straight, or very slightly curved; inferior deeply sinuated in front of the middle. Viewed from above, the shell is oblong-ovate, slightly constricted in the middle, broader behind than in front; extremities obtuse; width less than the height. Surface covered with closely set rather coarse punctations. Length $\frac{1}{6}$ inch.

Cythere plana, nov. sp. (Pl. XIII. figs. 7, 8.)

Valves, seen from the side, elongated, subquadrangular, nearly equal in height throughout; height considerably less than half the length: anterior extremity evenly rounded; posterior rounded above, obsoletely angular below: superior margin straight; inferior also nearly straight, but distinctly sinuated in front. Outline, as seen from above, compressed ovate. Surface of the shell smooth and polished, bearing numerous small, distant, rounded papillæ, and round the margins several long radiating hair-like lines. Colour dull brown. Length $\frac{1}{3}$ inch.

Three or four separated valves only of this species were obtained.

Cythere fumata, nov. sp. (Plate XII. figs. 13, 14.)

Carapace compressed. Seen from the side, angular, subreniform, highest in front of the middle; greatest height equal to more than half the length: anterior extremity broadly and obliquely rounded, posterior subtruncate, slightly produced below: superior margin sloping steeply and in a slightly waved line from before backwards, and terminating in a somewhat produced obtuse angle; inferior margin deeply sinuated in the middle. Seen from above, compressed, subhexagonal, widest in the middle, and tapering evenly to the extremities, which are obtusely pointed; width equal to less

than half the length. Surface of the valves covered with closely set angular excavations, arranged in a subradiate manner, and bearing just within and parallel to the anterior margin a prominent raised ridge. Colour smoky brown. Length $\frac{1}{8}$ inch.

Cythere Darwinii, Brady. (Plate XII. figs. 11, 12.)

Cythere Darwinii, Brady, Les Fonds de la Mer.

The specimens found in the Mauritius mud differ somewhat in shape and surface-markings from the type specimens, which were collected in the sea of Java. I have therefore thought it desirable to give a figure. It will be seen that the outline here is less flexuous; but the essential characters of the species appear to be the same.

Cythere hamigera, nov. sp. (Plate XII. figs. 5-7.)

Carapace tumid, densely spinous. Seen from the side, subquadrangular, highest over the anterior hinge-joint; greatest height equal to more than half the length: anterior extremity broad and well rounded; posterior narrow, scarcely rounded: superior margin straight, rather steeply sloping, with a slight sinuation in front of the middle; inferior nearly straight. Seen from above, the outline is ovate, widest behind the middle, broadly rounded behind, obtusely pointed or subtruncate in front; greatest width scarcely equal to the height. Surface densely clothed with short tubercular spines, which towards the dorsal margin are often developed into sharp, reflexed, hook-like processes. Length $\frac{1}{5}$ inch.

Cythere bispinosa, nov. sp. (Plate XII. figs. 8-10.)

Shell tumid. Seen from the side, subtrapezoid; greatest height in front of the middle, and equal to more than half the length: anterior extremity obliquely rounded, bordered with a thin squamous lamina; posterior emarginate above, produced below the middle into a prominent subdentate beak: superior margin sinuated in the middle, suddenly sloping at each extremity; inferior slightly convex in the middle, and sinuated toward the extremities. Seen from above, ovate, widest behind the middle; extremities broadly rounded, mucronate. End view almost rectangular, with irregularly jagged margins. Surface of the valves uneven, beset with numerous small tubercles, and bearing three sharply cut longitudinal crests, that within the ventral margin terminating behind the middle in a sharp projecting spine. Length $\frac{1}{5}$ inch.

Cythere convoluta, nov. sp. (Plate XII. figs. 3, 4.)

Carapace of the *female* (?), seen from the side, subquadrangular, highest in front of the middle; greatest height equal to about two-thirds of the length: anterior extremity broadly rounded; posterior produced below the middle into a broad slightly dentate process, emarginate above: superior margin slightly arched in front, excavated behind the middle; inferior almost straight, bending upwards behind. Seen from above, the outline is irregularly ovate or subhexagonal, constricted in the middle, broadly mucronate before and behind; greatest width near the middle, equal to more than half the length. Surface of the valves sculptured with prominent, flexuous, reticulating ridges, and with a prominent sharp crest running entirely round and a little within the margins, but less conspicuous posteriorly. Length $\frac{1}{2}$ inch.

Cytheridea punctillata, Brady.

Cytheridea punctillata, Brady, Ann. & Mag. Nat. Hist. 1865, vol. xvi. p. 189, pl. 9. figs. 9-11.

Carapace of the *female* (?), seen from the side, subreniform, highest in front of the middle; greatest height equal to half the length: anterior extremity well and evenly, posterior obtusely rounded: superior margin gently arched, inferior nearly straight. Seen from above, ovate, pointed in front, broadly rounded behind, scarcely constricted in the middle; greatest width near the posterior extremity, equal to about half the length. Surface marked with closely set rounded puncta, and a few minute round papillæ.

I cannot distinguish the examples here described from the European species *Cytheridea punctillata*, which occurs abundantly in some parts of the British and Scandinavian seas, and also, as a fossil, in the posttertiary clays. There are, indeed, some slight differences of form and sculpturing; but these seem subject to much variation, and are certainly not of sufficient importance to warrant our regarding them as indices of specific rank.

Cytheridea spinulosa, nov. sp. (Plate XIII. figs. 1-6.)

Structure of the shell very robust and thick; valves tumid. As seen from the side, almost elliptical, highest near the middle; greatest height equal to more than half the length; extremities broadly and obtusely rounded, and bearing below the middle a series of (about twelve on the anterior and six on the posterior) short rounded marginal teeth: superior margin feebly arched, highest in the middle; inferior almost

straight. Outline, as seen from above, subcuneiform, widest behind the middle, obtusely mucronate in front, broadly rounded and centrally emarginate behind; greatest width equal to half the length. End view broadly ovate. Shell covered with large, distant, subcircular or obscurely angular pittings, and raised behind the middle into a rounded eminence. Colour white. Length $\frac{1}{4}$ inch.

Loxoconcha Lilljeborgii, nov. sp. (Plate XIII. figs. 11-15.)

Carapace of the *female*, as seen from the side, subrhomboidal, highest in the middle; greatest height equal to nearly two-thirds of the length: anterior extremity obliquely rounded; posterior produced above the middle into a short (often bidentate) process: superior margin arched, highest near the middle, behind which it is gently sinuated; inferior sinuated in front, protuberant behind. Outline, as seen from above, subovate or obscurely pentagonal, widest about the middle, pointed in front, strongly mucronate behind; greatest width much less than the height. Shell marked throughout with large oblong pittings, which are arranged in concentric rows, and tend to form furrows by their coalescence on the ventral surface: a conspicuous angular protuberance near the postero-dorsal angle of each valve. Length $\frac{1}{3}$ inch.

L. Lilljeborgii is in general appearance not very unlike a West-Indian species (*L. avellana*) described by me in Trans. Zool. Soc. vol. v.; but the present species is well characterized by the posterior dorsal protuberance, and is, moreover, of very different outline when seen from above or below. *L. affinis*, a Mediterranean species, is also a nearly allied form.

EXPLANATION OF THE PLATES.

PLATE XII.

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|---|---------|
| Fig. 1. <i>Cythere demissa</i> , seen from left side. | } × 40. |
| Fig. 2. The same, from above. | |
| Fig. 3. <i>Cythere convoluta</i> , seen from left side. | |
| Fig. 4. The same, from above. | |
| Fig. 5. <i>Cythere hamigera</i> , seen from right side. | } × 50. |
| Fig. 6. The same, from above. | |
| Fig. 7. The same, from front. | |
| Fig. 8. <i>Cythere bispinosa</i> , seen from left side. | |
| Fig. 9. The same, seen from below. | } × 40. |
| Fig. 10. The same, from front. | |
| Fig. 11. <i>Cythere Darwinii</i> , from left side. | |
| Fig. 12. The same, from below. | |
| Fig. 13. <i>Cythere fumata</i> , from left side. | |
| Fig. 14. The same, from below. | |

PLATE XIII.

- | | |
|---|---------|
| Fig. 1. <i>Cytheridea spinulosa</i> , from left side. | } × 40. |
| Fig. 2. The same, from above. | |
| Fig. 3. The same, from below. | |
| Fig. 4. The same, from front. | } × 84. |
| Fig. 5. The same, hinge-margins. | |
| Fig. 6. The same, ventral contact margins. | |
| Fig. 7. <i>Cythere plana</i> , left valve, from side. | } × 40. |
| Fig. 8. The same, from above. | |
| Fig. 9. <i>Pontocypris Davisoni</i> , from left side. | |
| Fig. 10. The same, from below. | } × 40. |
| Fig. 11. <i>Loxococoncha Lilljeborgii</i> , from left side. | |
| Fig. 12. The same, from above. | |
| Fig. 13. The same, from below. | |
| Fig. 14. The same, from front. | |
| Fig. 15. The same, from behind. | |

XVII.—On the existence of Capillary Arterial Vessels in Insects. By JULES KÜNCKEL*.

ZOOLOGISTS supposed that the circulation of the blood in insects was limited to certain currents detected by Carus in transparent larvæ, when in 1847 M. Blanchard proved that the tracheæ of these animals fulfilled the function of arteries, by conveying, in a peripheral space, the nutritive fluids to all the organs. He ascertained, by means of delicate injections, the existence of a free space between the two membranes composing the tracheæ: the injected fluid expelled the blood and replaced it.

After having verified and confirmed M. Blanchard's discovery, M. Agassiz insisted upon the evidence of the demonstration. Seeking afterwards to complete this discovery, he paid particular attention to the termination of the tracheæ. In a memoir published in 1849†, this naturalist distinguished the ordinary tracheæ terminating in little ampullæ and the tracheæ terminated by little tubes destitute of a spiral filament, which he named the *capillaries of the tracheæ*. M. Agassiz expresses himself as follows:—"In the grasshoppers which I injected by the dorsal vessel I found in the legs the muscles elegantly covered with dendritic tufts of these vessels (the capillaries of the tracheæ) all injected with coloured matter; and in a portion of a muscle of the leg of an *Acridium flavovittatum*, submitted to a high magnifying-power, I observed the distribution of these little vessels, which has a striking resemblance to the

* Translated from the 'Comptes Rendus,' July 27, 1868, tome lxxvii. pp. 242-244.

† Proc. American Association, 1849, pp. 140-143; translated in Ann. des Sci. Nat. 3^e sér. xv. pp. 358-362.

distribution of the blood-vessels in the bodies of the higher animals."

Nearly twenty years have passed since the period when M. Agassiz announced these facts, which appear to have been but little understood; for the authors who have written on the anatomy and physiology of insects have not even mentioned them.

The direct observation of the phenomenon of circulation was wanting: no one had succeeded in detecting the movement of the blood either in the peritracheal space or in the capillaries; and M. Milne-Edwards indicated as a fact to be regretted that "the existence of currents in the tubiform lacunæ had not yet been ascertained." Having been led, by general researches upon the organization of the Diptera, to study the apparatus of circulation and respiration, I have frequently examined the tracheæ. I always saw, without difficulty, the globules between the two coats; but, the animals being dead, the blood was motionless. In pursuing my investigations of the distribution of the tracheæ in the muscles, I was too much struck by the character of this distribution not to dwell upon it. Having succeeded in removing a muscular bundle from a living *Eristalis*, without tearing it, and brought it quickly into the focus of a powerful microscope, I had the surprise of seeing the blood imprisoned between the two membranes of the tracheæ running in this peritracheal space, and penetrating into the finest arterioles. I observed the course of the blood-globules with the same facility as in the capillaries of the mesentery or the membrane uniting the digits of a frog. I was, therefore, fortunate enough to see the circulation of the blood in the capillaries of insects.

I have been able to convince myself of the existence of a system of arterial capillaries in all insects: the most delicate arterioles creep not only through the muscles, but also over the other organs. In general the blood thus observed by transmitted light presents a rosy tint very favourable for observation. When the blood abandons the tracheæ and its arterioles, which I have frequently seen, they lose their coloration. The trachea, recognizable by its spiral filament, may always be perceived; but it is very difficult to distinguish the arterioles, so delicate and transparent are their walls.

The difficulties of the experiment are great. The insect must be quickly opened, a muscular bundle must be taken from the living animal, and this bundle conveyed under the microscope; and then, under favourable conditions, the blood is seen flowing rapidly through the arterioles. For these investigations a considerable magnifying-power is necessary. I



