A communication was read from Mr. L. W. Wiglesworth, entitled "Theories of the Origin of Secondary Sexual Characters," which contained arguments in favour of the theory of the stimulation of parts to higher development through use or external violence or irritation, as observed in birds.

The following papers were read:

1. On some Crustaceans from the South Pacific.—Part II. 

   [Received April 28, 1898.]

   (Plate XXXVI.)

   The collections with which the present paper deals were made in the islands of Funafuti (Ellice group) and Rotuma by Mr. J. Stanley Gardiner, to whom I am much indebted for information respecting the habits &c. of several of the species. The facts with which Mr. Gardiner has furnished me will be given, in his own words, under the species they refer to.

   The Funafuti collection comprised examples of the following species:

1. Birgus latro (Linn.). 2♂, 5♀.
2. Coenobita perlatus H. M.-Edw. 2♂.
   Var. pulscher Dana. 4♂, 4♀.
5. Pagurus ecopsis Dana. 1♀.
6. Aniculus typicus Dana. 1♂, 1♀.
7. Calcinus elegans (H. M.-Edw.). 1♂, 4♀.
   Var. lividus (H. M.-Edw.). 2♂.
11. Clibanarius aquabilis Dana. 3♂.
12. Clibanarius zebra Dana. 2♂.
13. Diogenes pallescens Whitelegg. 2♂.
15. Petrolisthes tamareki (Leach). 2♂, 5♀.
   Var. asiaticus (Leach). 2♀.
   Var. rufescens (Heller). 4♂, 3♀.
   Var. fimbriatus, nov. 1♂, 1♀.
16. Remipes pacificus Dana. 30♂, 12♀.

1 For Part I., see P. Z. S. 1898, p. 32.
The collection from Rotuma contained examples of:

1. *Coenobita spinosus* H. M.-Edw. 1♂, 2♀.
   Var. pulcher Dana. 1♂, 5♀.
5. *Pagurus punculatus* Olivier. 1♂, 3♀.
   Var. lividus (H. M.-Edw.). 1♂, 3♀.
11. *Galathea afinity* Ortman. 3♂.
   Var. rufescens (Heller). 5♂, 7♀.
   Var. asiaticus (Leach). 8♂, 4♀.
   Var. jimbruatus, nov. 1♂, 2♀.

I proceed to remarks on the several species.

Subtribe PAGURINEA.

Family COENOBITIDÆ.

Genus BIRGUS Leach, 1815.

1. *Birgus latro* (Linn.), 1766.

*Birgus latro*, Leach, Tr. Linn. Soc. Lond. xi. p. 337 (1815);
H. Milne-Edwards, H. N. Crust. ii. p. 246 (1837); Atlas to
Cuvier’s R. An. 3rd ed. pl. xiii. fig. 1 (no date); Dana, U.S. Expl.
Exped., Crust. i. p. 474, pl. xxx. fig. 2 (1852).
   (Juv.). *Birgus laticauda*, Latreille, R. An. 2nd ed. iv. pl. xii.
   fig. 2 (1829).

The tree-climbing habits of this species have been a subject of
so much discussion that I have asked Mr. Gardiner for a special
note on the point. He says:—“The robber crab is very commonly
found in the tops both of Pandanus and of coconut-trees, from
which latter I have had it thrown down to me by the natives. It
is stated by them to break off the nuts and often to fall with them,
never killing itself, as the coconut is underneath. I have seen
them constantly clinging to the fruit of the Pandanus, the fallen
segments of which, after they have been chewed by the crab, cover
the ground. Although all the specimens are from Funafuti, the
 crab is also very common at Rotuma.”

Two males and five females from Funafuti.
Genus *Cœnobia* Latreille, 1826.


*Cœnobia brunnea*, Dana, U.S. Expl. Exped., Crust. i. p. 470, pl. xxix. fig. 10 (1852).


*Cœnobia spinosa*, Dana, U.S. Expl. Exped., Crust. i. p. 470, pl. xxix. fig. 10 (1852).

Mr. Gardiner says: "All three specimens were obtained between the stones of a built-up graveyard on the top of Sol-Hoi, Rotuma (about 600 feet above the sea-level)."


Two males from Rotuma. Two males from Funafuti, in shells of *Turho* and *Ranella*.

With reference to this and the succeeding species, Mr. Gardiner says:—"*Cœnobia perlatus* and *C. clypeatus* are found in all the islands of Funafuti, often on the Pandanus-trees. During the daytime they hide under the heaps of coconut-shells and in holes, but at night they swarm in every direction. They are used by the natives as bait for fishing. *C. perlatus* occurs also in Rotuma, where it is found on the beach sand-flats, but is not very numerous."


Three males and one female from Funafuti, one in a *Turbo* shell.


This species is "very common along the lagoon shores of Funafuti, and along the shore between tide-marks at Rotuma."

Four males from Funafuti, in shells of a *Turbo* and of two species of *Nerita*. Twenty-two males and seventeen females from Rotuma, one in a *Turbo* shell.

Var. PULCHER Dana, 1852 (*loc. cit.*).

Four male specimens and four females from Funafuti, in *Nerita* shells. One male and five females from Rotuma.

**Family Paguroidea.**

Subfamily Pagurinae.

Genus *Pagurus* Fabr., 1798, restrictum.


Hilgendorf (*loc. cit.*) and Ortmann (Zool. Jahrb. *loc. cit.*) have both remarked that the males of this species show the female openings on the second pair of walking-legs. I have attempted to dissect a spirit-specimen in order to discover the condition of the internal generative organs, but the preservation was so bad as to render this useless. Another point of interest to determine would be whether *P. pedunculatus* and *P. asper*, species closely allied to the present, do or do not share this peculiarity with it. *P. gemmatus* does not, to judge from a male specimen in Dr. Willey's collection.

Of the two specimens of *P. deformis* in Mr. Gardiner's collection, both are males from Rotuma, and one is of interest in that it has the female opening of the left side only, that of the right side being completely absent.


This species is closely allied to _P. guttatus_ Olivier, so that it is just possible that the record of the latter species from Funafuti by Whitelegge (Funafuti Atoll, Crustacea, p. 143) may be a mistake.

Mr. Gardiner says that _P. setifer_ is "stated by the natives to be very rare, and found only on the southern islands of the atoll. It is caught on land at night."

One male specimen from Funafuti.

8. *Pagurus euposis* Dana, 1852.

_Pagurus euposis_, Dana, _U.S. Expl. Exped., Crust._ i. p. 452, pl. xxviii. fig. 6 (1852).

I am informed by Mr. Gardiner that this species is caught on land at night.

One female from Funafuti, two males from Rotuma.

9. *Pagurus punctulatus* Olivier.


One male and three females from Rotuma; the male in the shell of a *Malea ringens*.

Genus *Aniculus* Dana, 1852.

10. *Aniculus typicus* Dana, 1852.


_Aniculus typicus_, Dana, _U.S. Expl. Exped., Crust._ i. p. 461, pl. xxix. fig. 1 (1852).


One male from Rotuma. One male and one female from Funafuti, in *Turbo* shells.

Genus *Calcinus* Dana, 1852.


Calcinus elegans, Dana, U.S. Expl. Exped., Crust. i. p. 458, pl. xxviii. fig. 10 (1852).
One male and four females from Funafuti. Two males and two females from Rotuma.

12. Calcinus herbsti de Man, 1887.


Calcinus herbsti, de Man, Arch. f. Naturg. 53, i. p. 437 (1887).


Non Cancer tibicen, Herbst, Krabb. u. Krebs, ii. pl. xxiii, fig. 7 (1796).


There can, I think, be no doubt that the Pagurus lividus of Milne-Edwards is a mere colour-variety of this species. Beyond the absence of colour, the only difference given in the definition is that the legs are "finement pointillées," and this statement, as a matter of fact, applies equally well to the most brilliantly coloured specimens. On the other hand, I have Mr. Gardiner’s authority for stating that the specimens which I have considered to belong to the var. lividus were really colourless when alive, and have not been merely bleached by the alcohol. One of them shows faint traces of the characteristic brown patch on the left "hand."

One male and three females from Rotuma; eleven males and thirteen females from Funafuti. The Funafuti specimens are in shells of the following genera of Gastropoda:—Ricinula, Angina, Strigatella, Nerita, Purpura, Peristernia.

Var. lividus (H. M.-Edw.), 1848. One male specimen and one female from Rotuma. Two females from Funafuti in shells of Nerita.

13. Calcinus gaimardi (H. M.-Edw.), 1848.


Calcinus gaimardi, Dana, U.S. Expl. Exped., Crust. i. p. 457, pl. xxviii. fig. 9 (1852).


Two males from Rotuma.

*Calcinus latens*, Dana, U.S. Expl. Exped., Crust. i. p. 459, pl. xxvii. fig. 11 (1852).

Six males and five females from Funafuti; one in a *Cerithium* shell. Four males and one female from Rotuma.

**Genus Clibanarius** Dana, 1852.


*Clibanarius corallinus*, Dana, U.S. Expl. Exped., Crust. i. p. 464, pl. xxvii. figs. 4 a-f (1852).

Three males from Funafuti.


*Clibanarius aequabilis*, Dana, U.S. Expl. Exped., Crust. i. p. 465, pl. xxvii. figs. 5 a-d (1852).

Two males from Funafuti.

17. *Clibanarius zebra* Dana, 1852.

*Clibanarius zebra*, Dana, U.S. Expl. Exped., Crust. i. p. 466, pl. xxvii. figs. 6 a-e (1852).

Two males from Funafuti.

**Genus Diogenes** Dana, 1852.


*Diogenes pallescens*, Whitelegge, Funafuti Atoll, Crust. p. 141, pl. vi. figs. 2 a, b, e (1897).

Two males from Funafuti.

**Subtribe GALATHEINEA.**

**Family GALATHEIDÆ.**

**Genus Galathea** Fabricius, 1798.

19. *Galathea affinis* Ortmann, 1892.


Three males from Rotuma. Two males from Funafuti.
Subtribe PORCELLANINEA.

Family PORCELLANIDÆ.

Genus PETROLISTHES Stimpson, 1858.

20. PETROLISTHES LAMARCKI (Leach), 1820. (Plate XXXVI. figs. 1, 1a, 1b, 2.)

(1) Type.


Porcellana speciosa, Dana, U.S. Expl. Exped., Crust. i. p. 417, pl. xxvi. fig. 8 (1852) [in part].

Porcellana bellis, Heller, ‘Novara’ Crust. p. 76, pl. vii. fig. 4 (1865).


Porcellana (Petrolisthes) dentata, de Man, Arch. f. Naturg. 53, i. p. 409, pl. xviii. fig. 7 (1887).


(2) Var. ASIATICUS (Leach), 1820.


Porcellana armata, Gibbes, Proc. Am. Assoc. iii. p. 190 (1850); id. Proc. Elliot Soc. i. p. 11, pl. i. fig. 4 (1854); v. Martens, Arch. f. Naturg. 38, i. p. 121, pl. v. fig. 11 (1872).


Porcellana gundlachii, Guérin, de la Sagra’s Hist. Cuba, Anim. Artic. p. 39, pl. ii. fig. 6 (1857); v. Martens, Arch. Naturg. 38, i. p. 122, pl. v. fig. 12 (1872), juv.

Porcellana leporina, Heller, Verh. zool.-bot. Ges. Wien, p. 523 (1862); ‘Novara’ Crust. p. 78, pl. vi. fig. 7 (1865).


The full synonymy which I have felt obliged to give for this very variable species reveals the remarkable fact that it has been described under no fewer than twelve names. In default, however, of any reliable separating character of specific value, I am compelled to include all its various forms under one head.

Colour is of course useless to us as a specific character. It is here very variable, and its variations run counter to those of other characteristics. The extreme forms are on the one hand almost white, and on the other dark red blotched with dark purple. The P. speciosus of Dana comprised light-coloured forms with red or purple spots. Some of these varieties are extremely beautiful. Again the number, size, and arrangement of the teeth on the inner side of the wrist of the chelae show great variations. But the number increases with age, and the limbs of the two sides are often different, so that any distinctions founded on these must be abandoned. Extreme forms are:—(1) a wavy edge with a large hump at the near end, and (2) the same edge bearing a row of five well-defined teeth, with hints of a sixth. The teeth may be sharp or blunt in otherwise similar forms, or may become bicuspid, seemingly by two running together. Leach's original P. lamarckii had three teeth; P. asiaticus Leach, P. leporina Heller, P. leporinoides Ortmann, P. armatus Gibbes, and P. gundlachii Guérin,
resemble it in this respect. In *P. marginatus* Stimpson the number tends to increase. *P. bellis* Heller, *P. speciosus* Dana, *P. haswelli* Miers, *P. dentata* H. M.-Edw., and *P. rufescens* Heller, have at least four.

The spines on the upper edge of the merus of the walking-legs are another character which it has been attempted to use as specific. They are, however, so inconstant, and form such a complete series, from specimens with an almost straight edge (Plate XXXVI. fig. 1 a), through those with imbricating scales, to those with well-marked spines, that it seems impossible to make use of them. The best-marked of these spines is about a third of the length from the far end of the joint (fig. 1 b). Often this spine appears on one or a few legs only, and as often as not the legs of the two sides do not agree. In Leach's original specimen of *P. asiaticus* in the British Museum, the first two walking-legs on the left side alone show spines. The type specimen of *P. lamarcii* is without them.

Then there is the epibranchial spine, whose presence or absence would seem to afford an excellent criterion for our purposes. According to Ortmann, however (Semon's 'Forschungsreisen in Austral.' loc. cit.), this is not of specific value, since it occurs in specimens from the same locality as, and in other respects exactly resembling, forms without such spines.

The breadth of various joints of the limbs varies, but is not to be relied upon, since it appears to alter with age.

Lastly, I have ventured to name a new variety, *fimbriatus*, from the fact of its possessing a more or less plentiful fringe of hairs to the outer margin of the "hand" (Plate XXXVI. fig. 2).

The following key indicates the characters attaching to those varietal names which it appears advisable to retain:—

A. With an epibranchial spine. Colour tends to sprinkling of red spots on lighter ground.
   i. Without a fringe to the outer side of the chela.
      1. Without spines on the anterior margin of the merus of any walking-leg
         Type (Leach), 1820.
      2. With at least one spine on the anterior margin of the merus of at least one of the walking-legs. Usually with spines on several legs.
         *Var. asiaticus* (Leach), 1820.
   ii. With a scanty or plentiful fringe to the outer side of the chela. With or without spines on the anterior margins of the walking-legs.
      *Var. fimbriatus*, nov.

B. Without an epibranchial spine. Colour tends to red or white with large blotches of purple or blue. Attains a larger size than (A), has a greater average of teeth on the inner margin of the wrist, but none on the merus of any walking-leg. Exhibits its peculiarities in small specimens, and is therefore not merely a collection of older individuals. Possibly a distinct species
   *Var. rufescens* (Heller), 1861.

I should have used Milne-Edwards's name of *dentatus* for this latter form, since his definition would agree very well with the specimens, but de Man states very positively (Zool. Jahrb. ix. p. 374) that he has had the original specimens sent him from Paris and that they possess an epibranchial spine. Should there not be, as
Ortmann suspects (Semon's 'Forschungsreisen in Austral.' loc. cit.), a mistake about these specimens, *dentatus* thus becomes a synonym for *lamarchii* Leach, and *rufescens* Heller is next in order of priority among the names for forms without an epibranchial spine. The specimens of var. *simbriatus* nov. are all small (carapace 4–5 mm. long) and are of a white or yellow colour with red spots.

There is a very distinct difference in coloration between the Rotuma and Funafuti specimens of this species, the latter being much lighter in colour than the former. This difference runs through all the varieties, and I am informed by Mr. Gardiner that the specimens have not undergone much change of colour since they were collected.

Five males and two females from Rotuma; two males and five females from Funafuti.

Var. *asiaticus* (Leach), 1820. (Plate XXXVI. fig. 1 b.)

Eight males and four females from Rotuma; two females from Funafuti.

Var. *simbriatus*, nov. (Plate XXXVI. fig. 2.)

One male and two females from Rotuma; one male and one female from Funafuti.

Var. *rufescens* (Heller), 1861.

Five males and seven females from Rotuma; four males and three females from Funafuti.

Subtribe HIPPINEA.

Family HIPPIDÆ.

Genus Remipes Latr., 1806.

21. Remipes pacificus Dana, 1852. (Plate XXXVI. figs. 3 a–i.)


*Remipes testudinarus*, Miers, J. Linn. Soc. Lond., Zool. xiv. p. 318, pl. v. fig. 2 (1879).


Of forty-one specimens of this species from Funafuti all had the normal number of joints to the second antennae. Of seventy-six specimens from Rotuma no fewer than eight, or more than ten per cent., showed abnormalities. In one of this eight the two sides varied alike, both having a 3-jointed flagellum, as opposed to the two-jointed normal form. Five of the remaining seven had the flagellum of the left antenna normal, while, in the right, one specimen had the penultimate joint partially divided into two; two specimens had three joints, one had four joints, and one had five joints. The remaining two abnormal specimens had the right antenna normal, while in the left the flagellum was three-jointed. One of these latter was the only abnormal male, all the rest being
females, some bearing eggs. The length of the carapace varied from 12 to 20 mm., and there was no correspondence between the size of the individuals and the number of joints in their antennæ.

No two of the abnormal antennæ were exactly alike. Thanks to the excellent diagnoses given by de Man (loc. cit.) for the testudinaris-group of Remipes, I have been able to satisfy myself that all the above specimens, including the first-mentioned with three-jointed flagella on both the second antennæ, were true R. pacificus.

On Plate XXXVI. fig. 3 a represents a normal second antenna in this species; figs. 3 b–i show the abnormal specimens in the order in which I have alluded to them.

Twenty-nine males and eleven females from Funafuti; eighteen males and fifty-eight females from Rotuma.

EXPLANATION OF PLATE XXXVI.

Fig. 1. Petrolisthes lamarcki (Leach), x 14., p. 464.
1 a. " " right third leg.
1 b. " " var. asiaticus (Leach), right third leg, p. 467.
2. " " var. semibrassicus, nov., x 3, p. 467.
3 a–i. Remipes pacificus, Dana, second antennæ, x 7, p. 467.
 a, normal form; b–i, abnormal.
 b–g, right antennæ; h & i, left antennæ.
 a–h, 3; i, 3.

Note.—Errata in Part I. of this paper:—On pp. 33, l. 30, and 37, l. 4, for "Blanche Bay, Loyalty Islands," read "Blanche Bay, New Britain." On p. 34, l. 25, omit "smooth."


[Received May 13, 1898.]

(Plate XXXVII.)

The Gephyrea collected by Mr. J. Stanley Gardiner during his visits to Rotuma and Funafuti in the years 1896–97 comprise specimens of two species of the Echiuroidea and twelve of the Sipunculoidea. Of the latter, two species of Sipunculus are in my opinion new, whilst a third, Physcosoma varians Keî., is, so far as I know, recorded for the first time from the Pacific.

In nearly all the cases where species are common to the two localities, the specimens from Funafuti were considerably smaller than those from Rotuma.

1 The reason for adopting the generic name Physcosoma in place of Phymosoma (Phymosomum Quatrefages) is given by Selenka in the Zool. Anz. Band xx. No. 546, 1897, p. 460.

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