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# A REVISION OF THE GENUS *OVALIPES* RATHBUN, 1898 (CRUSTACEA, DECAPODA, PORTUNIDAE)

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Plates 35-42. Figures 1-4.

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## SUMMARY

Recent workers have recognized five species in the genus *Ovalipes*: *O. ocellatus* (Herbst, 1799), *O. punctatus* (de Haan, 1833), *O. guadulpensis* (Saussure, 1858), *O. iridescens* (Miers, 1886), and *O. molleri* (Ward, 1933). However, five species have been confused under the name of *O. punctatus* and these comprise: *O. punctatus* (de Haan, 1833), *O. trimaculatus* (de Haan, 1833), *O. catharus* (White, 1843), *O. australiensis* n.sp., and *O. elongatus* n.sp. A further new species, *O. georgei*, has appeared in recent collections from Western Australia, and it seems that there may be two forms of *O. guadulpensis*.

The new species are described and the remaining species redescribed. This has necessitated a redescription of the generic features and consideration of the possibility of either dividing the genus into several genera or erecting subgenera. Neither of these possibilities has been followed, but, instead, two groups have been designated (A and B), each with two subgroups. Thus the *O. punctatus* subgroup contains *O. punctatus*, *O. trimaculatus*, *O. catharus*, *O. australiensis*, and *O. elongatus*, and, with the *O. georgei* subgroup comprising only *O. georgei*, makes up Group A. The *O. iridescens* subgroup comprises *O. iridescens* and *O. molleri*, and with the *O. ocellatus* subgroup comprising *O. ocellatus* and *O. guadulpensis* makes up Group B.

The *O. punctatus* subgroup contains shallow-water species primarily from the Indo-West-Pacific area, including *O. punctatus* from Japanese and Chinese waters, and three species from Australasian waters (*O. catharus*, *O. australiensis*, and *O. elongatus*). It also contains one circum-Southern Hemisphere species (*O. trimaculatus*) which has not been recorded from Australasia. The species of the *O. iridescens* subgroup are deeper-water Indo-West-Pacific species, and those of the *O. ocellatus* subgroup are from shallow waters of the Western Atlantic.

Whereas previously only two species were known from Australasian waters, now six are recorded, viz: *O. catharus*, *O. australiensis*, *O. elongatus*, *O. georgei*, *O. iridescens*, and *O. molleri*.

The presence of stridulating structures is a feature of the genus, but it is difficult to understand why each of the subgroups either has a different striated structure or a different structural modification which acts as a plectrum.

## I. INTRODUCTION

This investigation commenced with the recognition of a new species of the genus kindly forwarded by Dr R. George, of the Western Australian Museum. Dr George also indicated his belief that specimens in his museum collection previously identified by the senior author as *Ovalipes punctatus* comprised more than one species. Re-examination of his material and specimens borrowed from numerous institutions confirmed that several closely related species had been synonymized by all recent workers, following Rathbun (1930). Sighting of South Atlantic material in American

institutions by the senior author, and examination of loaned specimens by both authors, showed that one species in this closely related group was common to the Indian, Pacific, and Atlantic Oceans.

As will be shown in a later section, while *Ovalipes* Rathbun (1898) is a valid genus, it is readily divisible into four sub-groups. The relationships between the species within each sub-group are very close, but the differences between the sub-groups are not great enough to merit subgeneric status. The sub-groups are as follows: *O. punctatus* sub-group, containing *O. punctatus*, *O. trimaculatus*, *O. australiensis*, *O. elongatus*, and *O. catharus*; *O. georgei* sub-group, containing only *O. georgei*; *O. iridescens* sub-group, containing *O. iridescens* and *O. molleri*; and *O. ocellatus* sub-group, containing *O. ocellatus* and *O. guadulpensis*. The order in which the descriptions of the species are presented below follows the order of sub-groups just given.

Detailed study of the various species has revealed several features of diagnostic importance which have not been used in previous studies on the genus. These include the details of the different segments of the three pairs of walking legs, in which the terminology of orientation presents problems. Because of their curvatures and different angles of attachment to the body, the terms "anterior" and "posterior", and "upper" and "lower", would cause confusion. Orientations are referred to the "outer border" which is the outer surface of curvature of the limb. The shapes and relative hirsuteness of the meri of the third maxillipeds are also of diagnostic importance, with obvious differences in the shape of the anterointernal angle. Within the genus there are three main kinds of stridulatory structures and the differences between them are important at subgroup and species levels. It is hoped to consider the functional morphology of these structures in a later paper, supplementing the work of Guinot-Dumortier and Dumortier (1960).

All carapace breadth measurements are to the nearest mm. In determining breadth/length ratios of the carapace, the measured length was the distance between the most posterior part of the frontal border (i.e., between median and lateral frontal teeth) and the centre of the posterior border of the carapace. All drawings are from camera lucida outlines.

The following abbreviations have been used in the text: AM—Australian Museum, Sydney; CM—Canterbury Museum, Christchurch; DMNZ—Dominion Museum, Wellington; MCZ—Museum of Comparative Zoology, Harvard; MM—Macleay Museum, University of Sydney; NM—National Museum of Melbourne; QM—Queensland Museum, Brisbane; QVM—Queen Victoria Museum, Launceston; S Afr M—South African Museum, Natal; S Aust M—South Australian Museum, Adelaide; USNM—United States National Museum, Smithsonian Institution, Washington; UZM—Universitetets Zoologiske Museum, Copenhagen; WAM—Western Australian Museum, Perth; ZMA—Zoologisch Museum, Amsterdam. In cases where the abbreviation is followed by a number, or letters and a number, these are the museum's registration numbers.

In the "Material Examined" sections, continents are arranged from west to east; within continents, countries and states are arranged from north to south; and within countries and states, the arrangement is chronological.

## II. GENERIC SYNONYMY

The synonymy below does not include all usages of the different names by which this genus has been known; for this, specific synonymies later in the paper should be consulted. It includes first usages and a selection of the more important later ones.

Genus **Ovalipes** Rathbun

- Platyonichus* Latreille, 1825, p. 151. (Type species: *Cancer ocellatus* Herbst, 1799).  
 non *Platyonichus* Latreille, 1818, p. 4. (emend pro *Portumnus* Leach, 1814).  
*Anisopus* de Haan, 1833, pp. 3, 12. (Type species: *Corystes (Anisopus) punctata* de Haan, 1833).  
 non *Anisopus* Meigen, 1803, p. 264. (Diptera).  
*Platyonychus* Voigt, 1836, p. 104. Dana, 1851, p. 130. Miers, 1886, pp. 201-2.  
*Ovalipes* Rathbun, 1898, p. 597; (Type species: *Cancer ocellatus* Herbst, 1799); 1930, pp. 18-19. Sakai, 1939, p. 374. Barnard, 1950, p. 150. Stephenson and Campbell, 1960, pp. 88-9. Crosnier, 1962, p. 20. Garth and Stephenson, 1966, p. 12.  
*Aeneacancer* Ward, 1933, p. 381. (Type species: *Aeneacancer mollerii* Ward, 1933).  
 McNeill, 1953. p. 93.

## III. GENERIC DESCRIPTION

The discovery of new species, and particularly *O. georgei*, necessitates redescription of the genus.

*Front*: Rather narrow, armed with three or four lobes or teeth (counting inner supraorbital angles as lateral frontal lobes.) In most species subsidiary lateral frontal lobes present, either beneath lateral frontal lobes or median to them forming incipient submedian lobes.

*Orbit*: Fairly widely open dorsally, with one or two supraorbital notches; one suborbital notch, and well developed suborbital tooth. Eyes moderately long.

*Basal joint of first antenna*: Short, not filling orbital hiatus, not fused distally with front.

*Basal joint of second antenna*: Often visible dorsally, frequently flat dorsally, sometimes flat area iridescent.

*Anterolateral teeth*: Five, approximately equal in size and spacing.

*Carapace*: Relatively narrow (breadth/length ratio from 1.2 to c. 1.35) (excluding specimens narrower than 18 mm breadth) and deep dorso-ventrally; anterolateral borders curved; dorsal surface convex, without tubercles (except *O. georgei* and to a lesser extent *O. punctatus*) and without transverse ridges (oblique postlateral ridges in *O. georgei*).

*Chelipeds*: Usually subequal. Arm—without spines on posterior border, boss on anterodistal margin. Wrist—with well developed internal spine. Hand—boss on proximal portion of upper surface at wrist articulation; upper surface with three carinae, innermost conspicuous and ending in a spine, outermost also conspicuous; outer surface carinate in most species; under surface in some species with conspicuous striae; inner surface dorsally with dense row of hairs, carinae generally visible in centre of palm. Moveable finger—carinate on inner and outer edges of upper surface with dense row of bristles just below inner carina.

*Walking legs*: First leg: dactyl in females long, sharp, with flattened grooved surfaces and carinate edges; this also applies to males, except those in Group A, which are triradiate in section. Propodus carinate on outer border (some species with bifurcate carina); carpus with two carinae or smooth ridges on outer border. Second leg: dactyl, as for first leg (except in *O. iridescens* subgroup); propodus with carina on outer border (some species with carina tending to be bifurcate); carpus carinate, bicarinate or with rounded ridge on outer border. Third leg: dactyl as for second leg; propodus and carpus with carinate outer border.

*Fifth leg:* Dactyl flattened, enlarged and oval shaped; propodus enlarged and flattened; carpus with anterior border sharp and either hirsute or forming a carina; merus broad.

*Third maxillipeds:* Large; ischium not produced at anterointernal angle; merus with upper surface bearing long hairs in most species and with raised ridge in postero-internal area, anterolateral angle rounded or obliquely angled, anterointernal angle distinctly produced (except in *O. catharus*).

*Male abdomen:* Ultimate segment broader than long, sometimes distinctly so, and indented into penultimate segment either slightly or extensively.

*Male pleopod:* Relatively short and robust; inner side smoothly curving; both sides abundantly beset with long, bipinnate hairs and bearing subterminal spinules; extreme tip bare.

*Stridulating ridges:* Present either on under surface of hand of chelipeds, or on pterygostomial region or postlateral region of the carapace.

*Colour:* In alcohol-preserved specimens which retain their colour, most species possess either two red postlateral marks or alternatively iridescence on some part of carapace (except for *O. elongatus* and *O. georgei*).

#### IV. KEY TO SPECIES OF THE GENUS OVALIPES

1	Striae present on under surface of hand of cheliped ( <i>O. punctatus</i> sub-group) .....	2
..	Striae present on mesobranchial area of carapace.....	<i>O. georgei</i>
..	Striae present on pterygostomial area of carapace .....	6
2	(1) Coarse granules on carinae on upper surface of hands.....	3
..	Fine granules on carinae on upper surface of hands .....	4
3	(2) Anterior surface of carapace finely granular .....	<i>O. punctatus</i>
..	Anterior surface of carapace coarsely granular .....	<i>O. australiensis</i>
4	(2) Striae on under surface of hand (excluding under surface of immovable finger) fine, typically 26 or more present .....	<i>O. trimaculatus</i>
..	Striae on under surface of hand (excluding under surface of immovable finger) only moderately fine, typically 26 or less present ..	5
5	(4) Carapace broad (B/L 1.37) .....	<i>O. catharus</i>
..	Carapace relatively elongate (B/L 1.23) .....	<i>O. elongatus</i>
6	(1) Posterior area of carapace with two conspicuously thin areas of cuticle ( <i>O. iridescens</i> sub-group) .....	7
..	Posterior area of carapace without conspicuously thin areas of cuticle ( <i>O. ocellatus</i> sub-group) .....	8
7	(6) Three frontal teeth .....	<i>O. iridescens</i>
..	Four frontal teeth .....	<i>O. molleri</i>
8	(6) Frontal teeth relatively blunt, carapace covered with small rings of pigment .....	<i>O. ocellatus</i>
..	Frontal teeth relatively sharp, carapace without small rings of pigment .....	9

- 9 (8) Upper surface of hand of cheliped between carinae densely granular,  
mostly fine, but with occasional large granules *O. guadulpensis*, form a.  
Upper surface of hand of cheliped moderately finely and densely  
granular ..... *O. guadulpensis*, form b.

## V. DESCRIPTIONS OF SPECIES

### *Ovalipes punctatus* (de Haan)

Pls 35A, 38A, 38B, 42A; figs 1A, 2A, 3A, 4A

*Corystes (Anisopus) punctata* de Haan, 1833, p. 13; 1835, p. 44; pl. 2, figs 1-1d.

*Anisopus punctatus* de Haan. Stimpson, 1858, p. 39; 1907, p. 86.

*Ovalipes punctatus* (de Haan). Sakai, 1939, pp. 374-5; pl. XLII, fig. 3 (coloured);  
1965, pp. 112-3; pl. 50, fig. 3 (coloured).

non *Ovalipes punctatus* Rathbun, 1930, pp. 24-7, pls 5-8. Porter, 1936a, p. 142;  
1936b, p. 337. Crane, 1937, p. 66. Barnard, 1950, pp. 150-2, figs 27a, 29a-d.  
Garth, 1957, p. 35. Fagetti, 1960, pp. 148-50; pl. III, figs 1-9. Crosnier,  
1962, p. 21, fig. 25. Garth and Stephenson, 1966, pp. 12-14; pl. I, figs A-D;  
pl. XII, fig. A.

= *O. trimaculatus* (de Haan).

non *Ovalipes punctatus* Stephenson and Campbell, 1960, pp. 89-90, figs 1C, 2E; pl. 2,  
fig. 2; pl. 5E.

= mostly *O. australiensis* n. sp.; Lord Howe I. specimens = *O. elongatus* n. sp.

#### Material examined:—

*Japan*: 3 ♂♂ (71, 74, 94 mm), off E. coast of Nippon (sic), North Pacific Exploring  
Exped., Capt. John Rogers, U.S.N., USNM 2038, ident. by W. Stimpson as *Anisopus*  
*punctatus* and by M. J. Rathbun as *Platyonychus bipustulatus* and then *Ovalipes punctatus*.  
2 ♂♂ (25, 31 mm), ♀ (fragmented) H. Loomis, USNM 17561. ♂ (84 mm), Same,  
Rikuoku, Jordan and Snyder, 1900, USNM 26256, ident. by M. J. Rathbun as *Ovalipes*  
*bipustulatus*. 2 ♂♂ (18, 24 mm), 5 ♀♀ (23-44 mm), Yenosima, USNM. ♂ (76  
mm), Sibushi, Osumi, Kiusiu I., coll. T. Urita, USNM 48327. 2 ♀♀ (29, 35 mm),  
Toyama Bay, Honshu, don. Hokkaido Imp. Univ., coll. Madoka Sasaki, 1925, USNM  
60248, ident. by M. J. Rathbun as *Ovalipes bipustulatus*. ♂ (82 mm)\*, Oshoro, don.  
Hokkaido Imp. Univ., coll. Madoka Sasaki, USNM. ♂ (95 mm), ♀ (69 mm),  
Japan, coll. I. Kubo, WAM 37-63. ♂ (50 mm), (damaged), Hayama Beach,  
Sagami Bay, 10/ix/1966, I. Bennett.

*China*: ♂ (86 mm), Foochow, coll. C. R. Kellogg, 1924, USNM 58727, ident. M. J.  
Rathbun as *Ovalipes bipustulatus*. ♂ (87 mm), Foochow, taken by Foochow fishermen,  
don. S. F. Light, USNM 61976, ident. M. J. Rathbun as *Ovalipes punctatus*.

*Japan or China*: ♂ (25 mm), U.S.S. "Palos" Sta. 2325, Dale and Jouy, USNM 5284.

*Japan*: Incomplete specimen, probably this species: ♀ (57 mm), Hakodate,  
"Albatross", 19/ix/1897, USNM 20178, prev. ident. as *Xaiva bipustulata*, and by M. J.  
Rathbun as *Ovalipes punctata*.

*Material illustrated*: ♂ (82 mm), see \* above.

*Description:—*

*Front:* Four toothed (including inner supraorbital lobes); teeth roughly equally spaced; medians moderately blunt and produced further forwards than laterals; median fissure deep; lateral teeth fairly sharp; subsidiary lateral lobe on lower plane than lateral tooth, relatively small, hirsute, with line of granules, and visible dorsally on inner side of lateral tooth.

*Orbit:* Upper border toothed; inner supraorbital notch deep; outer supraorbital notch present; suborbital border hairy.

*Basal joint of first antenna:* Without flattened dorsal area; clearly visible dorsally; upper surface sparsely hirsute.

*Basal joint of second antenna:* Without flattened dorsal area.

*Anterolateral teeth:* Five; distinctly large and robust; broad based and narrowly separated; bordered by coarse granules; first tooth blunter than second and stout, truncate with broad base; fourth the largest; fifth the smallest and sharpest.

*Carapace:* Broad (B/L 1.33); areas generally not distinct although with distinct cervical grooves; anterior granulation fairly coarse, posterior granulation fine, almost smooth in cardiac region; central protogastric area sometimes bearing one or two inconspicuous tubercles; pterygostomial area diffusely granular.

*Chelipeds:* Relatively short, robust, subequal. Arm—anterior border without spines or tubercles; anterodistal border with large boss; posterior border coarsely and densely granular and distinctly hairy; under surface finely granular tending squamiform. Wrist—with long, robust inner spine; upper surface with small sharp tubercle at hand articulation, covered with fine dense granules, and bearing two indistinct carinae; outer surface with indistinct finely granular carina. Hand—not swollen, upper surface with boss at wrist articulation and with three distinct carinae, the innermost ending in a small sharp spine; between carinae, sparsely scattered fine granules; inner surface generally smooth with two distinct, coarsely granular central carinae, and with upper border densely fringed with hairs; under surface with 13–20 coarse, deep striae; outer surface dorsally almost smooth with fine scattered granules, with below two distinct granular carinae, the more dorsal coarsely granular and the more central finely granular. Moveable finger—upper surface bearing three carinae of spiniform granules; inner surface with an almost smooth carina below dense fringe of hairs; outer surface with finely granular carina. Immobile finger—inner surface with two distinct granular carinae and two scattered rows of hairs; outer surface with two distinct granular carinae. Both fingers—robust, with fairly sharp tips and blunt teeth.

*Walking legs:* Males with first leg modified—dactyl triradiate in section, distal part of merus with conspicuous raised collar. First leg: propodus with granular carina on outer border; carpus with two granular carinae on outer border. Second leg: dactyl with flattened grooved surfaces and carinate edges; propodus with partly granular carina on outer border; carpus with two granular carinae on outer border and short granular carina near outer surface. Third leg: dactyl with flattened grooved surfaces and carinate edges; propodus with almost smooth carina on outer border; carpus with partly granular carina on outer border and distally a short rounded ridge near outer surface.

*Fifth leg:* Carpus with sharp hirsute anterior border; merus broad (L/B 1.76).

*Merus of third maxilliped:* Surface covered anteriorly with moderately dense long hairs and without conspicuous granules; anterointernal angle slightly produced; antero-external angle slightly produced laterally; posterointernal surface with distinct raised edge.

*Male abdomen:* Ultimate segment—broader than long, tip rounded; posterior border slightly curved not deeply indented into penultimate segment; penultimate segment—slightly broader than long, sides convex.

*Male first pleopod:* Evenly curving and tapering towards tip, without broad basal portion. Outer side—dense double row of bipinnate hairs on proximal two-thirds becoming scattered and terminating behind tip, also bearing narrow band of tubercles terminating almost at tip. Inner side—dense row of bipinnate hairs on proximal two-thirds and second scattered row closer to tip, row of microscopic spinules present beginning at level of second row of hairs and terminating behind tip.

#### Colour

(a) *Alcohol preserved material.* When after prolonged preservation reddish pigment is visible, it is distributed as follows: carapace—borders of frontal and anterolateral teeth, small spots on anterior half of carapace, metagastric area with transverse patch; chelipeds—general upper and inner surface of arm, boss on arm at wrist articulation, granules on upper surface of wrist, granules on upper surface of hand, tubercles on hand at wrist and outer finger articulations, ventral half inner surface hand, proximal granules on upper surface moveable finger, proximal two-thirds of inner surface of movable finger, ventral portion of outer surface movable finger, and proximal dorsal portion of inner surface of immovable finger.

(b) *Dried material* A male at the Smithsonian Institution (USNM 48327) differs from the above in: stronger pigmentation throughout, predominantly orange-red, conspicuous small spots over all carapace except H-shaped mark near cervical grooves; anterior branchial regions each with a concentration of spots and posterior branchial areas with distinct patches with diffuse borders.

(c) *Fresh material.* This species has not been seen alive by the authors. Sakai (1939, 1965) gives two distinctly different coloured plates of this species. The first (1939, pl. XLII, fig. 3) suggests a recently caught specimen and is predominantly deep-purple in colour with: darker edges to carapace, carapace generally with small dark spots on pale ground, spots concentrated on each anterior branchial region, H-shaped pale mark in region of cervical grooves surrounded by denser pigmentation. His second plate (1965, pl. 50 fig. 3), although stated in his preface to be from a living specimen, greatly resembles the general colour of the dried specimen described in (b) above. It differs from this mostly in having the outer borders of the pale H mark marked with denser pigment, and in having a row of small rings of pigment marking the anterior border of the branchial region.

Stimpson (1907, p. 86) gives colour in life as “reddish, from clouds of reddish-brown punctae. Carapax with a clear blue spot at each posterior corner; also a W-shaped blue spot, with a dark-red patch in front of it, at the middle.” This has similarities to Sakai’s (1939), pl. XLII, fig. 3.

#### Distribution

Japan (de Haan, 1833, 1835; Sakai, 1939, 1965), and now China.

#### Remarks

In its pigmentation the dried specimen of this species and Sakai’s (1965) plate show closest resemblance to *O. catharus* but differ in having much more feebly developed anterior carapace patches.

It is characterized by the coarse granulation of the carinae on the upper and outer surfaces of the hands of the chelipeds, and by the coarse, deep, striae on the under surfaces of the hands.

Dr L. B. Holthuis has kindly provided photographs of the lectotype of de Haan's *Corystes (Anisopus) punctata*. It is a male, Rijksmuseum van Natuurlijke Historie, Leiden, "Reg. No. Crust. D. 365, Japan, 1823-1830, leg. P. F. von Siebold, alcohol specimen". The breadth of the carapace from the natural-size photograph is 51 mm.

**Ovalipes trimaculatus** (de Haan)

Pls 35B, 38C, 38D, 42B; figs 1B, 2B, 3B, 4B

- Corystes (Anisopus) trimaculata* de Haan, 1833, p. 13.  
*Platyonichus bipustulatus* H. Milne Edwards, 1834, p. 437, pl. 17, figs 7-10. de Haan, 1835, p. 44. Milne Edwards and Lucas, 1844, p. 22. Nicolet, 1847, p. 148.  
*Anisopus trimaculatus* de Haan. Macleay, 1838, p. 62. Krauss, 1843, p. 27.  
*Platyonichus bipustulatus* H. Milne Edwards. White, 1847, p. 42. Bell, 1853, pp. 83-4. A. Milne Edwards, 1861, p. 413. Miers, 1881, p. 68. Pfeffer, 1890, p. 546. Ortmann, 1893, p. 65. Lenz, 1902, p. 757.  
*Platyonichus purpureus* Dana, 1852, p. 291; 1853, p. 1593; 1885, pl. 18, figs 3a, 3b. (fide Rathbun, 1930, p. 24, and her plate 5). Cunningham, 1871, p. 492.  
*Platyonichus africanus* A. Milne Edwards, 1861, p. 413, pl. 34, figs 2, 2a.  
*Ovalipes bipustulatus* (H. Milne Edwards). Rathbun, 1898, p. 597; 1910, p. 577. Porter, 1903, p. 149; 1905, p. 32; 1925, p. 317.  
non *Ovalipes bipustulatus* Hale, 1927, pp. 147-8, fig. 148 = *O. australiensis* n. sp.  
*Ovalipes trimaculatus* (de Haan). Stebbing, 1902, p. 23. Doflein and Balss, 1912, p. 38.  
non *Ovalipes trimaculatus* (sic) Fulton and Grant, 1906, p. 18 = *O. australiensis* n. sp.  
*Ovalipes punctatus* Rathbun, 1930, pp. 24-7 (in part), pls 5-8. Porter, 1936a, p. 142; 1936b, p. 337. Crane, 1937, p. 66. Barnard, 1950, pp. 150-2, figs 27a, 29a-d. Garth, 1957, p. 35. Fagetti, 1960, pp. 148-50, pl. iii, figs 1-9. Crosnier, 1962, p. 21, fig. 25. Garth and Stephenson, 1966, pp. 12-14, pl. I, figs A-D; pl. XII, fig. A.  
non *Ovalipes punctatus* Stephenson and Campbell, 1960, pp. 89-90, figs 1C, 2E, pl. 2, fig. 2, pl. 5E = mostly *O. australiensis* n. sp.

*Notes on Synonymy*

De Haan's (1833) original description states "COR. (ANISOPUS) PUNCTATA Faun. Jap.—TRIMACULATA n. sp. (Seba T. XVIII. fig. 9) *Dr Horstok a littore Promontorii Bona Spei.*—? OCELLATA Herbst T. XLIX. fig. 4". Rathbun (1930, p. 24) states that de Haan's *C. (Anisopus) trimaculata* is a *nomen nudum* because Seba's plate does not illustrate this species. It is here argued that de Haan's name is acceptable because:

- (a) *O. trimaculatus* is the only species of the genus known from the Cape of Good Hope.  
(b) de Haan (1835, p. 44) obviously refers to the same material as in his original description viz. "ex. *Promontorio Bonae Spei cura Clar. Horstok accepta*", and notes its difference from *O. punctatus* in: "thorace postice maculis duabus sanguineis notato". Unfortunately he assigned this material to *Platyonichus bipustulatus*, Milne Edwards.  
(c) Drs Holthuis and Sivertsen (in MS) have selected a lectotype for the species. Dr Holthuis has kindly provided photographs of this specimen of *Corystes (Anisodon) trimaculata*. It is a male, Rijksmuseum van Natuurlijke Historie, Leiden, "Reg. No. Crust. D. 18484, Cape of Good Hope, 1825-1833, H. B. van Horstok, dried specimen". The carapace breadth from the natural-size photograph is 49 mm.

In response to a request for Milne Edwards' type material Dr Danièle Guinot, of the Museum National d'Histoire Naturelle, has kindly lent a male (c. 48 mm) labelled "*Ovalipes bipustulatus* Edw. Ocean Indien ("*Platyonichus bipustulatus*")", Ancienne collection sèche, D. Guinot, nov. 1965". This specimen undoubtedly belongs to *O. trimaculatus* (de Haan). Although lacking any trace of pigment, it agrees with the present species in the following: the shape of the front, anterolateral teeth, carapace granulation, posterolateral borders, cheliped granulation, number and general appearance of striae beneath the hand of the cheliped. The merus of the third maxilliped is slightly damaged but appears to resemble most closely that of *O. trimaculatus*.

Milne Edwards' (1834) coloured plate shows the three characteristic large colour blotches of *O. trimaculatus*, but differs in a much narrower carapace, the form of the merus of the third maxilliped and in having a short stout spine on the inner border of the wrist. This last difference also applies to the present specimen, but the first two appear to be due to imperfections in the draughtsmanship of his figures.

*Material examined:*—

*South Africa. Cape of Good Hope:* Damaged specimen (c. 44 mm), Cape of Good Hope, MM.

*Capetown:* 5 ♂♂ (41–58 mm), 4 ♀♀ (34–48 mm), U.S. "Eclipse" Exped. no. 557, USNM 14882.

*Western America. Peru:* ♂ (99 mm), Independencia Bay, 1919 don. Brooklyn Mus., coll. Robert Cushman Murphy, USNM 54213, ident. by M. J. Rathbun as *Ovalipes bipustulatus*. ♂ (58 mm), Paraca Bay, "Haseler" Exped. MCZ no. 5455 USNM 80669, ident. by Walter Faxon as *Ovalipes punctatus*. Juv. (22 mm), U-02298, Chilca Bay, 76° 48' W., 12° 29' 30" S., 17/iii/1941, beach seine, USNM. 5 ♂♂ (42–72\* mm), 2 ♀♀ (60, 67 mm), U-02354, data as above. ♂ (99 mm), 2 ♀♀ (77, 87 mm), San Juan Bay, 21/iii/1941, southside, beach seine, USNM.

*Chile:* 4 ♂♂ (42–45 mm), 2 ♀♀ (53, 82 mm), Lota, Sta. Feb. 15, "Albatross", 1887–88, USNM, 22049, ident. by M. J. Rathbun as *Ovalipes bipustulatus*, then *Ovalipes punctatus*. 5 ♂♂ (45–62 mm), Tome, Feb. 20, "Albatross", 1887–88, USNM 22048, ident. by M. J. Rathbun, as *Ovalipes bipustulatus*, then *Ovalipes punctatus*. Ovig. ♀ (92 mm), Bahia Cumberland, Juan Fernandez Is., coll. W. L. Schmitt, don. Rathbone-Bacon Scholarship, 19/xii/1926, seine haul, beach, USNM 61020, ident. by M. J. Rathbun as *Ovalipes bipustulatus*. 4 ♂♂ (54–69 mm), 4 ♀♀ (59–64 mm), Juan Fernandez Is., coll. W. L. Schmitt, don. Rathbone-Bacon Scholarship, 1926, USNM 61021, ident. by M. J. Rathbun as *Ovalipes bipustulatus*. ♂ (100 mm), Lota, coll. W. L. Schmitt, don. Rathbone-Bacon Scholarship, 16/i/1927, USNM 61022, ident. M. J. Rathbun as *Ovalipes bipustulatus*. ♂ (54 mm), Chile, coll. Silvestri, don. Buenos Aires Museum, USNM 61073, ident. by M. J. Rathbun as *Ovalipes bipustulatus*. ♂ (110 mm), Chanaral I., 29° 2' S., 71° 34' W., coll. W. L. Schmitt, 14/x/1944, U-42-249, trawl net, "Jaira", USNM 81056. ♂ (37 mm), Guayacan Bay, Port Herradura, 29° 59' S., 71° 22' 30" W., 15/x/1944, U-42-264, beach seine, USNM 81054, ident. by W. L. Schmitt as *Ovalipes punctatus*. Ovig. ♀ (111 mm), Quellon, Chiloe I., 43° 8' S., 73° 31' W., 2/ii/1945, U-42-400, trammel net, "Jaivas", USNM 81055, ident. by W. L. Schmitt as *Ovalipes punctatus*.

Previously unrecorded specimens are listed in Garth and Stephenson (1966). They comprise: ♂ (25 mm), Papudo, R. Paessler, ex. Hamburg Museum, K. 2612. ♀ (35 mm), Antofagasta, 27/vii/1914, R. Paessler, ex. Hamburg Museum, K. 5244. *Eastern America. Uruguay:* ♂ (80 mm), Cabo Santa Maria, Rocha, coll. Florentino Felippone, USNM 54632, ident. by M. J. Rathbun as *Ovalipes punctatus*.

*Argentina*: ♂ (48 mm), Chubut, La Plata, exch. La Plata Museum, Feb. 1896, AM G 1331. ♂ (11 mm), Golfo Nuevo Chubut, coll. Independencia, don. Buenos Aires Museum, USNM 61019, ident. by M. J. Rathbun as *Ovalipes bipustulatus*. ♀ (56 mm), Mar del Plata R., coll. and don F. Felippone, 1928?, USNM 62365, ident. by M. J. Rathbun as *Ovalipes punctatus*. ♀ (28 mm), Mar del Plata, don F. Felippone, USNM 62475, ident. by M. J. Rathbun as *Ovalipes punctatus*.

*Patagonia*: ♂ (69 mm), ♀ (65 mm), Puerto Madryn, don. Buenos Aires Museum, 1915, USNM 61018, ident. by M. J. Rathbun as *Ovalipes bipustulatus*.

*Tristan da Cunha*: ♂ (86 mm), G. J. Broekhuysen, 1948, M. 186, Rijksmuseum van Natuurlijke Historie, Leiden. (Through the kindness of Dr L. B. Holthuis). ♀ (77 mm), Tristan da Cunha, University of Capetown, Ecological Survey, M. 186, Kgl. Norske Videnskabers Selskab. (Through the kindness of Dr E. Sivertsen.)

*Material illustrated*: ♂ (72 mm) Peru, U-02354, see \* above.

*Description*:—

*Front*: Four-toothed; median teeth close together, short, broadly separated from and produced further forwards than laterals; median fissure deep; lateral teeth fairly sharp; subsidiary lateral lobe on lower plane than lateral tooth, relatively large, hirsute, with few granules and visible dorsally on inner side of lateral tooth.

*Orbit*: Upper border toothed; inner supraorbital notch deep, outer supraorbital notch present; suborbital border hairy.

*Basal joint of first antenna*: Without flattened dorsal area, partly obscured dorsally by subsidiary lateral frontal lobe, upper surface hirsute.

*Basal joint of second antenna*: Without flattened dorsal area.

*Anterolateral teeth*: Five, distinctly large and robust, broad based and narrowly separated, bordered by moderately coarse granules; first tooth blunter than second, sharp with relatively narrow base; fourth the largest; fifth, the smallest and sharpest.

*Carapace*: Broad (B/L 1.36); areas generally not distinct, although with distinct cervical grooves; granulation fine throughout, but slightly coarser anteriorly; pterygostomial area diffusely granular.

*Chelipeds*: Relatively short, robust, subequal. Arm—anterior border without spines or tubercles; anterodistal border with large boss; posterior border coarsely and densely granular and distinctly hairy; under surface finely granular, tending squamiform. Wrist—with long, robust inner spine; upper surface with inconspicuous tubercle at hand articulation, covered with fine, moderately dense granules, and with traces of one carina; outer surface with indistinct finely granular carina. Hand—slightly swollen, upper surface with boss at wrist articulation and with three distinct carinae, the innermost ending in a spine, between carinae microscopically granular; inner surface generally smooth with two distinct finely granular central carinae and with upper border densely fringed with hairs; under surface with 26–31 fine striae; outer surface dorsally with fine dense granules tending to squamiform arrangement, with below two distinct finely granular carinae. Moveable finger—upper surface bearing three coarsely granular carinae; inner surface with almost smooth carinae below dense fringe of hairs; outer surface with finely granular carinae. Immobile finger—inner surface with two distinct finely granular carinae and two scattered rows of hairs; outer surface with two distinct almost smooth carinae. Both fingers—moderately robust, with sharp tips and blunt teeth.

*Walking legs:* Males with first leg modified—dactyl triradiate in section, distal part of merus with conspicuous raised collar. First leg: propodus with granular carina on outer border; carpus with two granular carinae on outer border. Second leg: dactyl with flattened grooved surfaces and carinate edges; propodus with granular carina on outer border; carpus with two granular carinae on outer border and short, smooth carina near outer surface. Third leg: dactyl with flattened grooved surfaces and carinate edges; propodus with finely granular carina on outer border; carpus with very finely granular carina on outer border and distally a rounded ridge near outer surface.

*Fifth leg:* Carpus with sharp hirsute anterior border; merus broad (L/B 1.95).

*Merus of third maxilliped:* Surface generally covered with moderately dense long hairs, sparser posteriorly, and without conspicuous granules; anterointernal angle produced; anteroexternal angle approximately a right angle; posterointernal surface with distinct raised edge.

*Male abdomen:* Ultimate segment—broader than long, tip rounded, posterior border slightly curved, not deeply indented into penultimate segment; penultimate segment—broader than long, sides very slightly convex.

*Male first pleopod:* Evenly curving and tapering towards tip, without broad basal portion. Outer side—double row of long bipinnate hairs extending almost to tip, also bearing band of tubercles, terminating behind tip. Inner side—row of bipinnate hairs terminating some distance behind tip and scattered row of microscopic spinules beginning where bipinnate hairs finish and terminating behind tip.

#### *Colour*

(a) *Alcohol-preserved material:* After prolonged preservation reddish pigment on: carapace—borders of frontal and near tips of anterolateral teeth, small spots over almost entire carapace apart from gastric region, metagastric area with transverse patch only slightly longer than broad; chelipeds—distal portions of upper and inner surfaces of arm, boss on arm at wrist articulation, some granules on upper surface of wrist, granules on two innermost carinae of upper surface of hand, tubercles on hand at wrist and outer finger articulations, general inner surface of hand, granules on proximal two-thirds of upper surface of movable finger, inner and outer surface of base of proximal tooth of movable finger.

(b) *Dried material:* A male at the Smithsonian Institution (USNM 54632) without chelae shows the same pattern as the alcohol-preserved material.

(c) *Fresh material:* Dana (1852, p. 292) describes the colour of his material as follows: "Colour purple, in fine close dottings over the surface, becoming deep purple along the posterior of the median region which is convex posteriorly and sublunate in outline; posterior to this for some distance yellowish and also yellowish near the anterolateral margin. Carpus reticulate with purple above. Other legs in part purple or reddish purple, tarsus of last pair having a middle of pale blue, a narrow border of purple, and the marginal hairs yellow and penult joint similar". Presumably fresh material is described by Barnard (1950, p. 151) as follows: "Creamy-grey or pale buff, speckled with reddish dots, a median crescentic red mark and an oval red spot near each postero-lateral corner, hands of chelipeds tinged with red or pink inside surface (K.H.B.)". This is essentially repeated by Crosnier (1962), in French.

#### *Distribution*

S. Atlantic, Southern Indian Ocean, both coasts of S. America, but not from Australasia.

*Remarks*

In its pigmentation this species is closest to *O. punctatus* but shows no trace of anterior branchial pigment concentrations, and the posterior branchial blotches remain after prolonged preservation.

It is characterized by the fine, almost even, granulation of the carapace, and the fine dense granules on the outer dorsal surface of the hand of the cheliped, which tend to a squamiform arrangement. It shares with *O. elongatus* relatively fine and numerous striae on the under surface of the hand of the cheliped.

**Ovalipes catharus** (White)

Pls 36A, 38E, 38F, 42C; figs 1C, 2C, 3C, 4C

*Portunus catharus* White, in White and Doubleday, 1843, p. 265.

*Platyonichus bipustulatus* Miers, 1874, p. 2; pl. 1, fig. 1 (figure of type); 1876, p. 32. Hector, 1877, p. 473. Filhol, 1885, p. 383.

non *Platyonichus bipustulatus* H. Milne Edwards, 1834, p. 437 = *O. trimaculatus* (de Haan).

*Ovalipes bipustulatus* Chilton, 1911a, p. 292. Thomson, 1913, p. 237. Chilton and Bennett, 1929, pp. 755-7. Powell, 1949, p. 38, fig. 187. Richardson, 1949, p. 31 (key), figs 2, 2a. Dell, 1960, p. 5.

*Ovalipes* cf. *punctatus* Glaessner, 1960, p. 22; pl. 3, fig. 8 (Pleistocene fossil).

non *Corystes* (*Anisopus*) *punctata* de Haan, 1833, p. 44.

*Ovalipes punctatus* Dell, 1963, p. 43, text fig. Bennett, 1964, p. 64.

*Notes on Synonymy*

When it was realized that colour patterns might have diagnostic importance, data upon these patterns in New Zealand records of *Ovalipes* spp. were sought, and both material and photographs of material were obtained through the kind offices of Dr John C. Yaldwyn. As a result it was concluded that White's description (1843, p. 265) applied to this material on the basis of the colour being: ". . . carapace is brownish yellow, spotted with minute brown dots; the dots forming a lunated line between the impressions on back the most distinct. . ."

Evidently there are colour changes between live specimens, those recently preserved, and those kept for a period either wet or dry. On the basis of these variable artefacts Miers' (1874) and Powell's (1949) records belong to the present species. Hector's (1877) reference is included because he refers to Miers' recordings.

If there is only a single species of *Ovalipes* in New Zealand, as the present records indicate, the records of Thomson (1913), Chilton and Bennett (1929), and Richardson (1949) also belong to this species.

Some of Chilton's (1911a) Chatham Is. material has been examined and it belongs to the present species.

*Material examined*:—

*Australia: Victoria*: ♂ (89 mm), Beaumaris, pres. S. W. Fulton, May, 1902, NM.

*South Australia*: ♂ (66.5 mm), from Henry Edwards (old collection, dried), NM.

*New Zealand: North Island*: The following four specimens were all collected off Day's Bay, Wellington Harbour, 5/x/1953; ♀ (54 mm), AM P 14161; ♂ (54 mm), AM P 14162; ♀ (72 mm\*), AM P 14163; ♂ (40 mm), AM P 14164. ♂ (72 mm), Wellington, NM, ex Colonial Museum of New Zealand. ♂ (68 mm), Point Howard,

Wellington, R. A. Falla, 10/viii/1963, DMNZ. 4 ♂♂ (damaged or fragmented), (c. 29–c. 54 mm), 4 ♀♀ (2 damaged), (c. 42–52 mm), Paraparaumu, M. Crozier, 13/iii/1965, drag net, DMNZ.

*New Zealand* (sic): ♀ (50 mm), Geodeffroy Collection, NM.

*Chatham Is.*: 3 ♂♂ (61–91 mm), 4 ♀♀ (63–101 mm), ♀ (ovig.) (86 mm), Chatham Is., "Nora Niven", N.Z. Govt. Trawling Exped., CM, ident. by Chilton and Bennett, 1927, as *Ovalipes bipustulatus* M. Edw.

*Material illustrated*: ♂ (72 mm) see \* above.

*Description*:—

*Front*: Four-toothed (including inner supraorbital lobes); median teeth close together, fairly sharp, broadly separated from laterals and produced slightly further forwards than laterals; median fissure shallow; lateral teeth fairly sharp; subsidiary lateral lobe on lower plane than lateral tooth, relatively small, hirsute, with line of granules, and visible dorsally on inner side of lateral tooth.

*Orbit*: Upper border toothed, inner supraorbital notch deep; outer supraorbital notch present; suborbital border hairy.

*Basal joint of first antenna*: With small flattened dorsal area, clearly visible dorsally, upper surface sparsely hirsute.

*Basal joint of second antenna*: Without flattened dorsal area.

*Anterolateral teeth*: Five; distinctly large and robust; broad based and narrowly separated, bordered by coarse granules; first tooth blunter than second, stout and truncate with broad base; fourth the largest; fifth the smallest and sharpest.

*Carapace*: Broad (B/L 1.37); areas generally not distinct, although with distinct but shallow cervical grooves; granulation fine throughout, but slightly coarser anteriorly; pterygostomial area diffusely granular.

*Chelipeds*: Relatively short, robust, subequal. Arm—anterior border without spines or tubercles; anterodistal border with large boss; posterior border coarsely and densely granular and distinctly hairy; under surface finely granular tending squamiform. Wrist—with long, robust inner spine; upper surface with spiniform tubercle at hand articulation, covered with fine and coarse granules, and with one distinct carina and traces of a second; outer surface with distinct carina bearing spiniform granules. Hand—not swollen, upper surface with boss at wrist articulation and with three distinct carinae, the innermost ending in a spine, between carinae very finely granular; inner surface with a few scattered small granules, with two distinct finely granular central carinae and with upper border densely fringed with hairs; under surface with 20–26 striae; outer surface with finely granular squamiform markings, with two distinct granular carinae. Movable finger—upper surface bearing three sharply granular carinae; inner surface with almost smooth carina below dense fringe of hairs; outer surface with finely granular carina. Immobile finger—inner surface with two distinct finely granular carinae and two scattered rows of hairs; outer surface with two distinct finely granular carinae. Both fingers—moderately robust, with sharp tips and blunt teeth.

*Walking legs*: Males with first leg modified—dactyl triradiate in section, distal part of merus with conspicuous raised collar. First leg: propodus with granular carina on outer border; carpus with two granular carinae on outer border. Second leg: dactyl with flattened grooved surfaces and carinate edges; propodus with partly granular

carina on outer border; carpus with two granular carinae on outer border and short, granular ridge near outer surface. Third leg: dactyl with flattened grooved surfaces and carinate edges; propodus with carina on outer border, proximally granular becoming more finely granular distally; carpus with partly granular carina on outer border and distally a short, rounded ridge near outer surface.

*Fifth leg*: Carpus with sharp, hirsute anterior border; merus broad (B/L 1.80).

*Merus of third maxilliped*: Surface generally partly covered with patches of hairs, sparser posteriorly; anterointernal angle rounded and bulging; anteroexternal angle very obtuse; posterointernal surface with distinct raised edge.

*Male abdomen*: Ultimate segment—broader than long, tip relatively pointed, posterior border almost straight and deeply indented into penultimate segment; penultimate segment—as broad as long, with distinctly convex sides.

*Male first pleopod*: Evenly curving and tapering towards tip, without broad basal portion. Outer side—double row of bipinnate hairs extending about two-thirds length of appendage, also bearing a broad band of tubercles extending almost to tip. Inner side—double row of bipinnate hairs terminating some distance behind tip, and band of microscopic spinules beginning where bipinnate hairs finish and terminating behind tip.

#### *Colour*

(a) *Alcohol-preserved material*: After a relatively short preservation, reddish pigment on: carapace—fairly dense border to entire carapace, particularly frontal and anterolateral teeth, small spots evenly and fairly densely distributed apart from lighter areas in gastric region and postlateral junction, and apart from distinct concentrations in each anterior branchial region; V-shaped metagastric mark, and distinct but relatively small blotches in posterior branchial region; chelipeds—general upper surface with concentrations on boss of arm at wrist articulation, proximal three-quarters of inner surface of movable finger, and dorsal proximal area of inner surface of movable finger.

The colour of this species evidently changes after preservation. Powell (1949) describes the colour as: "The general colouring is speckled bluish to sandy grey with two violet-coloured blotches near the bottom of the carapace." Dr John C. Yaldwyn (personal communication) confirms the two coloured blotches. Powell's (1949) figure (187) shows very indistinct postlateral blotches, and a slight concentration of colour in the gastric region.

As indicated above, after keeping for a relatively short while in alcohol, there are five main pigmented areas, with a conspicuous "butterfly mark" in the gastric region.

White's (1847) description mentions minute brown dots, concentrated in a "lunated line between the impressions on back", and evidently refers to the butterfly mark. This is clearly seen in another photograph from the Dominion Museum, New Zealand, in which, apart from this concentration, only traces remain of anterolateral and posterolateral pigment concentrations. Data on this specimen are: old, dried specimen, Wellington, N.Z., negative B. 4646.

Miers' (1874) plate of White's type shows only general speckling, and evidently the central mark had also faded in the interim.

(b) *Fresh material* (taken from a colour transparency of a fresh specimen, through the courtesy of Dr J. C. Yaldwyn, Australian Museum, Sydney). Data on the specimen from the Dominion Museum, Wellington are: ♂, Day's Bay, Wellington, R. A. Falla, May, 1959, DMNZ Cr. 853. Carapace—basically yellowish-brown,

with conspicuous white patches in the postlateral regions; generally overlaid with blackish purple pigment as follows: small, dense spots covering carapace except in white postlateral regions and white H-shaped cervical grooves; dense concentration along borders of anterior half of carapace; a small, but conspicuous, round patch in each anterior branchial region; dense butterfly-shaped mark in cervical grooves just anterior to white area; a large conspicuous oval patch in each postlateral region on median edge of white area. Chelipeds—generally reddish-orange on upper and inner surfaces with concentrations of blackish-purple on: distal inner border of arm; base of inner spine of wrist; upper, inner carina of hand. Under surfaces of chelipeds and tips of fingers white. Dell's (1963) figure shows markings identical to those of the above specimen.

#### *Distribution*

Previously known only from New Zealand and the Chatham Is. The present records are the only ones from Australia.

#### *Remarks*

In its pigmentation after recent preservation this species is close to *O. punctatus* but differs in having usually finer and more numerous striae on the under surface of the hand of the cheliped, and in having finely granular carinae on the upper surface of the hand.

In the Chatham Is. specimens, the carapace granulation tends to be finer than in New Zealand mainland material, but with overlap. In addition, the third maxillipeds tend to be more hirsute.

The cheliped fragment of a New Zealand Pleistocene fossil shown in Glaessner (1960, pl. 3, fig. 8) is much closer to *O. catharus* than any other species of the genus and, as far as can be judged from his plate, belongs to this species. On the other hand, his *Ovalipes* sp. a (p. 23, pl. 3, fig. 9) is clearly not *O. catharus*. It does not appear to belong to any of the known present-day species, but has resemblances to both *O. punctatus* and *O. australiensis*.

### ***Ovalipes australiensis* n. sp.**

Pls 35C, 35D, 39A, 39B, 41F, 41G, 42D; figs 1D, 2D, 3D, 4D

*Platyonichus bipustulatus* Haswell, 1882, pp. 84–5. Miers, 1886, p. 202.

non *Platyonichus bipustulatus* H. Milne Edwards, 1834, p. 437.

*Platyonichus bipustulosus* Whitelegge, 1900, p. 158.

*Ovailipes trimaculatus* Fulton and Grant, 1906, p. 18.

non *Corystes (Anisopus) trimaculata* de Haan, 1833, p. 13.

*Ovalipes bipustulatus* Hale, 1927, pp. 147–8, fig. 148.

*Ovalipes punctatus* Stephenson and Campbell, 1960, pp. 89–90, figs 1C, 2E; pl. 2, fig. 2; pl. 5E (excluding Lord Howe Is. specimens). McNeill, 1962, pp. 38 (plate), 41; 1964, pp. 2 (plate), 4–5.

non *Corystes (Anisopus) punctata* de Haan, 1833, p. 44.

*Holotype*: ♂ (97 mm), Lake Illawarra, New South Wales, pres. G. McAndrew before 1923, AM P 6265.

*Material examined*:—

*Pacific Ocean*: ♂ (51 mm), Pacific Ocean, MM.

*Australia. Queensland*: ♀ (38 mm), Wide Bay, AM P 15409 (Haswell collection). ♂ (24 mm), Southport, coll. R. Pohlman, QM W 2376. ♀ (38 mm), Point Lookout,

Stradbroke I., coll. W.S., 27/v/1953, fishing line, ocean sand beach, QM W 2377. ♀ (51 mm), Miami Beach, South Coast, coll. B. Winks, 22/viii/1953, low tide but still receding, swimming and burrowing, AM P 13468. 40 ♂♂ (26-97 mm), 19 ♀♀ (35-74 mm), trawled in shallow water off Southport, "Irene June", J. Laurence, 24/xi/1964, QM W 2669—W 2673. 50 ♂♂ (31-76 mm), 53 ♀♀ (32-63 mm), trawled in shallow water between Southport and Jumpin Pin Bar, "Irene June", J. Laurence, 16/xii/1964, QM W 2664—W 2668.

*New South Wales*: ♂ (98 mm), Port Jackson, QM W 2378. ♂ (55 mm), ♀ (56 mm), Port Jackson, USNM 17031, ident. M. J. Rathbun as *Platyonychus bipustulatus* then as *Ovalipes punctatus*. 2 ? sex (18.8, ? mm), Port Jackson, AM P 15410 (Haswell collection). ♀ (78 mm), Port Jackson, AM P 15407 (Haswell collection). 2 ? ♀♀ (14, 18 mm), Port Jackson, AM P 15408 (Haswell collection). 2 ♂♂ (18, 55 mm), Port Jackson, MM. 2 ♂♂ (60, 69 mm), ♀ (66 mm), Port Jackson, MM. ♂ (22 mm), Port Stephens, MM. 3 ? sex (29-31 mm), Port Stephens, MM. Juv. (damaged, c. 17 mm), Jervis Bay, T. Whitelegge, Oct. 1893, AM G 904. ♂ (39 mm), ovig. ♀ (69 mm), Newcastle Bight, coll. E. R. Waite, 1898, "Thetis" Sta. 23, 19-16 fm, AM G 2358. ♀ (58 mm), New South Wales, purchased Mrs F. E. Grant, Feb., 1907, AM G 5869. 2 ♂♂ (26, 54 mm), Port Jackson, Mar., 1908, AM P 225 (old collection). ♂ (74 mm), Broken Bay, Apr., 1908, AM P 316 (old collection). ♀ (67 mm), Broken Bay, Apr., 1908, AM P 317 (old collection). ♀ (24 mm), Port Jackson, Oct., 1908, AM P 1192 (old collection). ♂ (84 mm), AM P 3620; ♂ (68 mm), AM P 3621; ♂ (70 mm), AM P 3622; ♀ (47 mm), AM P 3623; ♀ (55 mm), AM P 3624; all La Perouse, Botany Bay, pres. R. J. Thorpe, Mar., 1913. ♂ (57 mm), Nelson's Bay, Port Stephens, exch. E. A. Briggs, Sydney University, Aug., 1920, AM P 4872. ♀ (59 mm), AM P 6536; ♀ (59 mm), AM P 6537; ♀ (53 mm), AM P 6583; ♂ (52 mm), AM P 6539 (third anterolateral tooth on right side, divided into two); ♀ (70 mm) AM P 6540; all Maroubra Bay, coll. F. A. McNeill and party, 1/ii/1923. ♀ (soft), (35 mm), Coogee Beach, pres. G. P. Whitley, 12/ii/1924, washed up, AM P 7080. ♀ (25 mm), beach at The Basin, Pittwater, Broken Bay, pres. H. O. Fletcher and party, Mar., 1924, AM P 7124. Juv. (18 mm), North Harbour, Manly, coll. J. R. Kinghorn and T. Campbell, 13/x/1924, burrowing in sand, AM P 7568. ♂ (33 mm), Gunnamatta Bay, Port Hacking, Oct., 1925, tidal flat, USNM G 4679, prev. ident. as *Ovalipes punctatus*. ♀ (55 mm), Ocean Beach, South West Rocks near Kempsey, pres. M. Ward, Nov., 1925, USNM 76539, ident. by M. Ward as *Ovalipes punctatus*. 4 ♂♂ (13-19 mm), ♀ (18 mm), dredged Sow and Pigs Reef, Port Jackson, 26/x/1926, c. 3 fm., sandy mud, USNM 64558. 5 juvs. (13-14 mm), off Balmoral, Port Jackson, coll. F. A. McNeill and party, Nov., 1926, c. 3 fm., AM P 8724. ♂ (28 mm), Gunnamatta Bay, Port Hacking, coll. F. A. McNeill and party, Mar., 1929, AM P 9338. ♂ (36 mm), AM P 12677; ♀ (13 mm), ovig. ♀ (27 mm), AM P 12678, near mouth Shoalhaven R., pres. CSIRO Fish. Div., 2/xi/1938, Agassiz trawl. ♂ (79 mm), Green Pt, Yamba, mouth Clarence R., pres. A. A. Cameron, 25/xii/1939, washed up, AM P 11253. 4 ♂♂ (34-41 mm), Lake Macquarie, coll. CSIRO Fish. Div., 1953, AM. ♀ (42 mm), Kurnell Peninsula, S. Sydney, coll. A. J. Coventry, 20/iv/1956, NM. ♀ (79 mm), Cronulla beach, coll. I. G. Filmer, 8/iv/1957, QM W 1978. Six dried carapaces, Arrawarra Sta. Univ. New England, 23/x/1965, strand line, coll. W. S. and M. R. (not kept).

*Victoria*: ♀ (35 mm), Port Phillip, pres. J. Bracebridge Wilson, Aug., 1892, AM G 623. 2 ♂♂ (24.5, 47 mm), on reef at Point Lonsdale, Feb., 1903, NM. 2 ♂♂ (c. 62, 76 mm), Queenscliffe, Melbourne, coll. Edgar L. White, Nov., 1905, AM G 5457. ♂ (60 mm), Port Phillip. ex. M. Ward, Sept., 1924, plentiful on sand flats in shallow water, AM P 7487. ♂ (69 mm), "taken out of bottle containing Victorian fish, no label attached", NM, ident. by M. Ward, 1929 as *Ovalipes bipustulatus* (sic). ♂ (61

mm), ♀ (67 mm), off Fisherman's Bend, Hobson Bay, II Aquarium, 2/v/1932, NM. ♂ (55.5 mm), Portsea, coll. O. White 5/iii/1936, NM. ♀ (33 mm), 44782; ♀ (63 mm), 44783; ♂ (64.5 mm), 44784; ♂ (108.5 mm), 44785; ♀ (69 mm); all Brighton, collections undated, NM.

*Tasmania*: ♂ (soft and fragmented), (c. 76 mm), Cowrie Pt, Brickmakers Bay, Stanley, coll. B. M. Wragg, Jan., 1948, QVM 1957-10-18. ♂ (38 mm), Seven Mile Beach, Frederick Henry Bay, coll. V. V. Hickman, 29/xii/1955, AM P 13466. 2 ♂ ♂ (42, 50 mm), 4 ♀ ♀ (49-57 mm), Waterhouse I., N.E Tasmania, coll. R. H. Green, 17/viii/1962, netted on beach at night, QVM 1965-10-2, previously ident. by R. H. G. as *Ovalipes bipustulatus*.

*South Australia*: ♂ (49 mm), 40 miles E. of Kingston, Kangaroo I., pres. Comm. Fish. Bureau, Sept., 1909, 30 fm., AM P 2303. ♂ (88 mm), Pt Willunga, coll. H. M. Hale, approx. 1926, S Aust M C 1203, previously ident. as *Ovalipes bipustulatus* M. Edw. presumably by H. M. Hale. ♂ (69 mm), ♀ (39 mm) St Vincent Gulf, coll. H. M. Hale, approx. 1926, S Aust M C 1204, previously ident. as *Ovalipes bipustulatus* presumably by H. M. Hale. ♂ (50 mm), West of Kingston, "Endeavour", WAM 39-60. ♂ (43 mm), mouth of Murray R., "Endeavour", 17/viii/1909, 20 fm., QM W 1530. 6 ♂ ♂ (41-71 mm), ovig. ♀ (70 mm), Gt Australian Bight, 36° 00' S., 138° 21' E., 6/xii/1951, ST 300 on sand, 64 metres "Galathea" Sta. 563, UZM. 16 ♂ ♂ (44-75 mm), 6 ♀ ♀ (44-71 mm), ovig. ♀ (59 mm), Gt Australian Bight, 36° 18' S., 138° 29' E., 6/xii/1951, HOT and ST 600, on sand, 60 m, "Galathea" Sta. 564, UZM. ♂ (31 mm), from W. Kershaw, NM. ♂ (69.5 mm), from Henry Edwards, old collection, NM.

*Western Australia*: ♂ (66 mm), Carnac I., Fremantle, pres. J. M. Sheridan, May, 1905, AM G 5307. 2 ♂ ♂ (74, 79 mm), Garden I., W. B. Alexander and Justin Burnside, Jan., 1914, WAM 90-12. ♂ (81 mm)\*, Cottesloe, L. Glauert, Dec., 1923, WAM 107-42. ♂ (71 mm), Albany, H. McKail, Mar., 1931, WAM 354-31. ♀ (25 mm), 10 miles E. of Hopetown, R. W. George, 10/i/1959, WAM 45-63. ♀ (61 mm), Esperance Bay, W. H. Butler, 20/ii/1959, jetty piles, WAM 47-63. 2 ♀ ♀ (70, 72 mm), Bunker Bay near Cape Naturaliste, R. W. George, 9/iii/1959, caught on fishing line from beach, WAM 40-63. ♂ (56 mm), Torbay, B. K. Bowen, on "Bluefin", 9-13/vi/1959, 20-25 fm., in craypot, fish bait, rock bottom, WAM 48-63. ♀ (45 mm), Esperance, W. H. Butler, Mar., 1960, WAM 43-63. ♀ (29 mm), 2 miles W.N.W. of Cottesloe, near buoy, 4 fm., R. W. George on "Davena", 5/v/1960, WAM 42-63. 2 ♂ ♂ (54, 85 mm), off Cottesloe in prawn trawl, D. Wright on "Peron", 20/vii/1961, WAM 38-63. ♀ (84 mm)‡, North Point, Rottnest I., J. Seabrook on "Lancelin", 25/x/1961, caught on beach, WAM 41-63. ♂ (33 mm), juv. (15 mm), Dunsborough, Barry Wilson, 25/xii/1961, dredged 2 fm., WAM 44-63. 2 ♀ ♀ (80, 89 mm), just inside bar, Mandurah Estuary, Mrs D. George, 12/vi/1962, in crab dragnet, WAM 39-63. 2 ♀ ♀ (both 45 mm), approx. 7 miles W. of City Beach, Perth, R. W. George, 15/viii/1962, trawled 16 fm, WAM 46-63.

*Material illustrated*: ♂ (81 mm), WAM 107-42, see \* above (line drawings, photographs of chelipeds and first walking leg), ♀ (84 mm), WAM 41-63 (see ‡ above) (dorsal view photograph).

*Description*:—

*Front*: Four toothed (including inner supraorbital lobes); median teeth close together, broadly separate from, and produced further forward than laterals; median fissure shallow; all teeth fairly sharp; subsidiary lateral lobe on lower plane than lateral tooth, relatively large, very hirsute, with few granules and visible dorsally on inner side of lateral tooth.

*Orbit*: Upper border toothed; inner supraorbital notch deep; outer supraorbital notch present; suborbital border hairy.

*Basal joint of first antenna*: Without flattened dorsal area; largely obscured dorsally by hirsute frontal border, upper surface with long dense hairs.

*Basal joint of second antenna*: Without flattened dorsal area.

*Anterolateral teeth*: Five; distinctly large and robust; broad based and narrowly separated, bordered by coarse granules; first tooth slightly blunter than second and with broad base, sharp tip, somewhat truncate; fourth the largest; fifth the smallest and sharpest.

*Carapace*: Broad (B/L 1.37); areas not generally distinct although with distinct cervical grooves; anterior granulation coarse; posterior granulation fine; pterygostomial area diffusely granular.

*Chelipeds*: Relatively short, robust, subequal. Arm—anterior border without spines or tubercles; anterodistal border with large boss; posterior border coarsely and densely granular and distinctly hairy; under surface finely granular, tending squamiform. Wrist—with long robust inner spine; upper surface with small sharp tubercle at hand articulation, covered with fairly dense coarse granules, without carinae; outer surface moderately finely granular and without carina. Hand—slightly swollen, upper surface with boss at wrist articulation, with three distinct carinae the innermost ending in a sharp spine, between carinae coarsely granular; inner surface with coarse scattered granules, with two distinct coarsely granular central carinae and with upper border densely fringed with hairs; under surface with 17–24 moderately coarse striae; outer surface generally coarsely granular, with two distinct carinae, the dorsal coarsely granular, the ventral moderately finely granular. Movable finger—upper surface bearing three carinae of spiniform granules; inner surface with finely granular carina below dense fringe of hairs, lower border with scattered row of hairs; outer surface with moderately finely granular carina. Immobile finger—inner surface with two granular carinae and two rows of hairs, dense proximally, scattered distally; outer surface with two distinct granular carinae. Both fingers—robust with fairly sharp tints and blunt teeth.

*Walking legs*: Males with first leg modified—dactyl triradiate in section, distal part of merus with conspicuous raised collar. First leg: propodus with granular carina on outer border; carpus with two granular carinae on outer border. Second leg: dactyl with flattened grooved surfaces and carinate edges; propodus with partly granular carina on outer border; carpus with two granular carinae on outer border and short, partly granular ridge near outer surface. Third leg: dactyl with flattened grooved surfaces and carinate edges; propodus with carina on outer border; carpus with partly granular carina on outer border and distally a short, rounded, partly granular ridge near outer surface.

*Fifth leg*: Carpus with sharp, hirsute anterior border; merus broad (L/B 1.77).

*Merus of third maxilliped*: Surface generally covered with moderately long hairs, dense anteriorly, sparse posteriorly, without conspicuous granules, and with a distinct oblique row of hairs; anterointernal angle slightly produced; anteroexternal angle almost a right angle; posterointernal surface with distinct raised edge.

*Male abdomen*: Ultimate segment—as broad as long, tip narrow but rounded, posterior border curved, not deeply indented into penultimate segment, sides concave. Penultimate segment—slightly broader than long.

*Male first pleopod*: Evenly curving and tapering towards tip, without broad basal portion. Outer side—dense double row of bipinnate hairs on proximal two-thirds terminating behind tip, also bearing band of tubercles terminating almost at tip. Inner side—dense row of bipinnate hairs apart from near tip, row of microscopic spinules present beginning within the row of hairs and terminating behind tip.

#### *Colour*

(a) *Alcohol-preserved material*: After prolonged preservation when reddish pigment is visible it is distributed as follows: carapace—borders of frontal teeth, just behind tips of anterolateral teeth, each posterior branchial area with discreet rounded oval patch; chelipeds—general upper surface and anterodistal portion of inner surface of arm, surrounding but not on boss on arm at wrist articulation, general upper and inner surfaces of wrist, granules on upper surface of hand, tubercle on hand at wrist articulation, dorsal half of inner surface of hand, granules on upper surface of movable finger, proximal two-thirds of inner surface of movable finger, and proximal half of dorsal portion of inner surface of immovable finger.

(b) *Fresh material*: (As noted by the authors.) Carapace—generally covered with small red dots, concentrated to form pigment lines behind orbits, and pigmented spots on tips of frontal and first four anterolateral teeth. Pigment absent from a narrow H-shaped area in region of cervical grooves and from a number of small circular areas marking anterior border of branchial region. Each posterior branchial region with a dense, discrete, oval, blood-red mark (Hale, 1927, describes these marks as violet and Dakin, 1952, as “blood-red to mauvish”). On wrist and inner surface of hand of cheliped pigment forms a squamiform pattern.

*Juveniles (pl. 35D)*—Identification of the following specimens caused initial difficulty: *South Australia*, 2 juvs (dried), (both c. 7 mm), St Vincent Gulf, coll. H. M. Hale, approx. 1926, S Aust M C 1203, previously ident. as *Ovalipes bipustulatus* M. Edw., presumably by H. M. Hale.

These specimens differ from large *O. australiensis* in: (1) median frontal teeth protruding well forwards; (2) all frontal teeth blunt; (3) subsidiary lateral frontal teeth not visible on inner side of lateral teeth; (4) inner supraorbital notch absent; (5) anterolateral teeth all narrow and sharp pointed, fourth tooth not distinctly larger than third; (6) carapace elongate (B/L 1.15, 1.12); (7) carapace areas very distinct; (8) granulations in central regions of carapace coarser than in lateral regions; (9) undersurface of palm of cheliped with 25 striae; (10) merus of fifth leg elongate (L/B 2.45–2.66); and (11) third maxilliped with more obtuse anteroexternal angle and with convex inner anterolateral border.

Three slightly larger dried specimens in the collections of the National Museum of Victoria (24.5 mm male, Point Lonsdale, Victoria; 33 mm female, Brighton, Victoria, No. 44782; and 31 mm male, S. Australia from W. Kershaw) are intermediate in their morphological features and link the above juveniles to the bulk of the collection.

#### *Distribution*

This species has only been recorded from the southern half of Australia ranging from Wide Bay, Queensland to Cape Naturaliste, Shark Bay, Western Australia. It has been extremely common near the northern known limit of its distribution on the eastern Australian coast. One specimen has been recorded from Lord Howe I. on the basis of a colour photograph seen by the authors.

*Remarks*

The pigmentation of fresh specimens is unique, with two discrete postlateral oval areas, but without trace of a metagastric pigmented area. It is also characterized by distinctly coarse granulation on the anterior surface of the carapace, and by the coarse granulation of the general upper surface of the chelipeds (excluding carinae).

***Ovalipes elongatus* n. sp.**

Pls 36B, 39C, 39D, 42E; fig. 1E

*Ovalipes bipustulatus* Chilton, 1911 b, p. 554.

non *Platyonichus bipustulatus* H. Milne Edwards, 1834, p. 437.

*Holotype*: Lord Howe I.: ♀ (33 mm), Blinkenthorpe Beach, May, 1964, rock, Isobel Bennett, AM P 15387.

*Material examined*. Paratypes as follows:

*Lord Howe I.*: (Tasman Sea) Juv. ♀ (18 mm), Oct., 1908, on reef, pres. A. R. McCulloch, AM P 1132. ♀ (38 mm), rec'd 6/vii/1915, coll. R. S. Bell, W. R. B. Oliver collection, DMNZ. ♀ (38 mm), (dried), Feb., 1938, pres. Dr Sweet, AM P 10936. ? ♀ (24.5 mm), Lagoon Beach, Sept., 1966, washed up on beach, Mrs F. Evans, AM P 15182. Carapace only (C. 27.5 mm), Lagoon Beach, Sept., 1966, washed up on beach, Mrs F. Evans, AM P 15183.

*Kermadec Is.*: (N. of New Zealand) ♀ (28 mm), 2 juvs. (both 13 mm), 1908, W. R. B. Oliver, CM, prev. ident. by C. Chilton as *Ovalipes bipustulatus*.

*Material illustrated*: Holotype.

*Description*:—

*Front*: Four toothed (including inner supraorbital lobes), median teeth close together, moderately sharp, broadly separated from laterals, and produced slightly further forwards than laterals; median fissure shallow; lateral teeth sharp; subsidiary lateral lobe on lower plane than lateral tooth, relatively large, sparsely hirsute, with line of granules, and visible dorsally on inner side of lateral tooth.

*Orbit*: Upper border toothed; inner supraorbital notch deep; outer supraorbital notch present; suborbital border hairy.

*Basal joint of first antenna*: With small flattened dorsal area; clearly visible dorsally; upper surface sparsely hirsute.

*Basal joint of second antenna*: With flattened dorsal area, visible in larger specimens only when antenna moved dorsally.

*Anterolateral teeth*: Five; distinctly large and robust; broad based and narrowly separated; bordered by moderately coarse granules; first tooth blunter than second and sharp with broad base; fourth the largest; fifth the smallest and sharpest.

*Carapace*: Relatively elongate (B/L 1.19–1.25); areas generally not distinct, although with distinct cervical grooves; granulation fairly coarse anteriorly, fine posteriorly; pterygostomial area diffusely granular.

*Chelipeds*: Relatively short, robust, subequal. Arm—anterior border without spines or tubercles; anterodistal border with large boss; posterior border granular and variably hirsute (varying from sparsely to densely hirsute); under surface finely granular tending squamiform. Wrist—with long, robust inner spine; upper surface covered with fine, moderately dense granules and traces of one carina; outer surface with indistinct, finely granular carina. Hand—swollen, upper surface with boss at wrist articulation and with three distinct carinae, the innermost ending in a spine, between carinae finely or microscopically granular; inner surface generally smooth

with two indistinct finely granular carinae, and with upper border densely fringed with hairs; under surface with typically 23–27 (in the largest Kermadec Is. specimen, 20) moderately fine striae extending to under surface of immovable finger; outer surface dorsally with dense granules, with below two finely granular carinae, the lowermost very inconspicuous. Movable finger—upper surface bearing three granular carinae; inner surface with smooth carina below dense fringe of hairs; outer surface with carina varying from smooth to finely granular. Immovable finger—inner surface with two distinct, smooth carinae and two scattered rows of hairs; outer surface with two distinct almost smooth carinae. Both fingers—moderately robust, with sharp tips and blunt teeth.

*Walking legs:* First leg: dactyl with flattened grooved surfaces and carinate edges; propodus with smooth carina on outer border; carpus with two inconspicuous carinae on outer border. Second leg: dactyl with flattened grooved surfaces and carinate edges; propodus with smooth carina on outer border; carpus with smooth carina on outer border and below this, a short smooth carina, distally a short, rounded ridge near outer surface. Third leg: dactyl with flattened grooved surfaces and carinate edges; propodus with carina on outer border; carpus with carina on outer border and distally an inconspicuous short rounded ridge near outer surface.

*Fifth leg:* Carpus with sharp, hirsute anterior border; merus fairly broad (L/B 2.22 in larger specimens, 2.05 in juveniles).

*Merus of third maxilliped:* Surface generally covered with moderately dense long hairs, sparser posteriorly, without conspicuous granules; anterointernal angle produced; anteroexternal angle rounded; posterointernal surface with distinct raised edge.

*Male abdomen and first pleopod:* There are no adult males in the present collection.

#### *Colour*

(a) *Alcohol-preserved material:* After 1½ years preservation: reddish orange pigment on: carapace—bases of frontal and anterior bases of anterolateral teeth, distantly spaced sinuous lines over most of carapace, metagastric area with relatively thin crescent-shaped mark, no distinct patch on posterior branchial area but here one of the carapace lines is thickened (this not recognizable in Kermadec Is. specimens); chelipeds—small patch on distal upper surface of arm, boss at wrist articulation, broken sinuous lines on upper surface of wrist, granules on two innermost carinae of upper surface of hand, tubercle on hand at wrist articulation, transverse band near proximal end of upper surface of movable finger.

(b) *Dried material:* This differs from the above only in having fainter carapace markings apart from those in the posterior branchial area, where the thickened lines approximate to a band.

#### *Distribution*

Known only from Lord Howe I. and Kermadec Is.

#### *Remarks*

Chilton (1911b), p. 554 describes the colour of his Kermadec Is. material as: “. . . carapace is light grey almost lavender, and the joints of the arms bright red, tinging near the claws to dark orange”. Bennett (1966, pl. 101(a)) has given photograph of the holotype which indicates the fresh colour pattern.

This species is characterized by its unique pigmentation and elongate carapace. It resembles *O. trimaculatus* in the fine and numerous striae on the under surface of the hand of the cheliped.

**Ovalipes georgei** n. sp.

Pls 36C, 39E, 39F, 40C, 42F; figs 1F, 2E, 3E, 4E

*Holotype*: West Australia: ♂ (46 mm), 5½ miles NW. off Rottneest I., P. Cawthorne on "Lancelin", 11/xi/1961, main light, in plankton net at surface, WAM 120-61.

*Material examined*: Paratype: ♂ (38 mm), just off Cottesloe, D. Wright on "Peron", 20/vii/1961, in prawn trawl, WAM 121-61.

*Material illustrated*: Holotype.

*Description*:—

*Front*: Four toothed (including inner supraorbital lobes); median teeth close together, moderately sharp, broadly separated from laterals, not produced further forwards than laterals; median fissure shallow; lateral teeth sharp; subsidiary lateral lobe directly below lateral tooth, bordered by hairs, granule on tip.

*Orbit*: Upper border toothed; inner supraorbital notch feebly developed; outer supraorbital notch present; suborbital border hairy.

*Basal joint of first antenna*: With flattened dorsal area.

*Basal joint of second antenna*: With flattened dorsal area.

*Anterolateral teeth*: Five, distinctly large and robust; fairly narrow based and narrowly separated, bordered by coarse granules; first tooth blunter than second, sharp with relatively narrow base; fourth tooth the largest; fifth the smallest and sharpest.

*Carapace*: Relatively elongate (B/L 1.20), areas distinct, covered by densely packed, conspicuous, tubercle-like granules except in the postlateral regions, where granules are fine. Protogastric region, with line of three inconspicuous granular elevations, mesogastric region with conspicuous almost spinous elevation. In each posterior branchial region a conspicuous granular ridge. Pterygostomial area diffusely granular.

*Chelipeds*: Relatively short, robust, left larger than right. Arm—anterior border without spines or tubercles; anterodistal border with large boss; posterior border coarsely and densely granular and distinctly hairy, under surface tending squamiform. Wrist—with long, very robust inner spine; upper surface without tubercle at hand articulation, covered with conspicuous granules, and without carinae; outer surface without carina. Hand—swollen, upper surface with boss at wrist articulation and with three distinct carinae, the innermost ending in a spine, between carinae coarsely granular; inner surface generally smooth, upper border densely fringed with hairs and on large cheliped, two distinct finely granular carinae; under surface tending squamiform and finely granular; outer surface coarsely granular, bearing two distinct granular carinae. Movable finger—upper surface bearing three almost spiniform granular carinae; inner surface with smooth carina below dense fringe of hairs, outer surface with finely granular carina. Immobile finger—inner surface with two microscopically granular carinae and two scattered rows of hairs; outer surface with two distinct finely granular carinae. Both fingers—robust, with sharp tips and blunt teeth.

*Walking legs*: Males with first leg modified—dactyl triradiate in section. First leg: propodus with smooth carina on outer border; carpus with two carinae on outer border, uppermost granular, lowermost smooth, line of granules near outer surface. Second leg: dactyl with flattened grooved surfaces and carinate edges; propodus with carina on outer border; carpus with smooth carina on outer border and below this a short smooth ridge, distally a line of granules near outer surface. Third leg: dactyl with flattened grooved surfaces and carinate edges; propodus and carpus with smooth carina on outer border.

*Fifth leg*: Carpus with strong, cornified carina along anterior edge; merus broad (L/B 1.94), and with boss at posterodistal extremity.

*Merus of third maxilliped*: Anterior surface densely covered with long hairs, posterior surface almost naked; without conspicuous granules; anterointernal angle produced; anteroexternal angle rounded; posterointernal surface with distinct raised edge.

*Male abdomen*: Ultimate segment broader than long, tip rounded, posterior border curved and indented into penultimate segment; penultimate segment broader than long, sides markedly convex.

*Male first pleopod*: Evenly curving and tapering towards tip, without broad basal portion. Outer side—sparse scattered row of bipinnate hairs ending some distance behind the tip, also bearing band of tubercles terminating behind tip. Inner side—row of bipinnate hairs becoming sparser distally, ending some distance behind tip, short row of microscopic spinules beginning within region of hairs and ending distinctly behind tip.

#### Colour

(a) *Alcohol-preserved material*: Carapace—greenish-grey ground colour on anterior half, fading to cream posteriorly; elevations on anterior half of carapace tinged with pink; chelipeds with red spot on boss of arm at wrist articulation; dactyl of fifth leg with pink suffusion distally.

(b) *Fresh material*: Shortly after collection the following notes were made on the holotype by Dr R. George: "Carapace pale grey anteriorly, fine orange spots posteriorly. Dactyl of fifth leg with blood red spot".

#### Remarks

This species possesses a unique stridulating apparatus involving movement of the modified fifth leg against the granular ridge in the posterior branchial area of the carapace. It is named after Dr Ray George, who sent the present specimens to us and also drew our attention to the probable existence of certain of the species previously synonymized under *O. punctatus*.

### **Ovalipes iridescens** (Miers)

Pls 36D, 40A, 41A, 42G; figs 1G, 2F, 3F, 4F

*Platyonychus iridescens* Miers, 1886, p. 202; pl. 17, fig. 2.

*Ovalipes iridescens* (Miers). Yokoya, 1933, p. 174. Leene, 1938, p. 2. Sakai, 1939, pp. 376-5; pl. XLII, fig. 4; 1965, p. 112 (in generic synonymy). Grindley, 1961, pp. 129-30, figs 2a-d.

#### *Material examined*:—

*South Africa*: ♂ (112 mm), trawled off Lourenco Marques, S Afr M A 12123.

*Indonesia. Banda Sea*: 2 ♂♂ (46\*, 50 mm), ♀ (47 mm), 5° 28' 4" S., 132° 0' 2" E., "Siboga" Sta. 251, depth 204 m, ZMA De. 102, 151.

*Japan*: ♀ (34 mm), ovig. ♀ (36 mm), Tosa Bay, S. Japan, 80-120 m, pres. Dr Sakai (forwarded to Australian Museum).

*Australia. Victoria*: ♂ (63 mm‡) juv. (16 mm), SSW. of Mt Cann, 40 miles, 27/viii/1914, 74 fm, AM P 15370-1 (in company with *O. molleri*).

*Material illustrated*: ♂ (46 mm), see \* above (dorsal view photograph). ♂ (63 mm), see ‡ above (line drawings, photographs of chelipeds and pterygostomial region).

*Description:—*

*Front:* Three toothed (including inner supraorbital lobes); median tooth produced much further forwards than laterals; all teeth sharp; subsidiary lateral lobe on general frontal border relatively feebly developed.

*Orbit:* Upper border not toothed; supraorbital notch fairly deep; suborbital border sparsely hirsute.

*Basal joint of first antenna:* Protruding well forwards, with flattened dorsal area, carrying small hairs.

*Basal joint of second antenna:* Without flattened dorsal area.

*Anterolateral teeth:* Five; generally small and sharp; narrow based and broadly separated; between teeth bordered by fine granules; first tooth largest, blunter than second; second tooth smallest.

*Carapace:* Moderately broad (B/L 1.28); areas generally distinct, without tubercular elevations and with two almost oval areas of very thin cuticle in posterior half; general granulation moderately fine throughout, but smooth in the two areas of thin cuticle, in indented areas posterolateral to them, and in central cardiac area; pterygostomial area with conspicuous but narrow striated ridge terminating medially in a granular patch.

*Chelipeds:* Relatively long, thin, subequal. Arm—anterior border proximally very finely granular, distally with 2–5 sharp spines; anterodistal border with large boss; posterior border sparsely and finely granular and without hairs; under surface finely to coarsely granular, tending squamiform in larger specimens. Wrist—with moderately robust inner spine, sharp in smaller specimens; upper surface with sharp, well-developed spine at hand articulation and two granular carinae, general upper surface finely and sparsely granular; outer surface with one indistinct granular carina terminating in a well-developed spine. Hand—slightly swollen; upper surface with distinct boss at wrist articulation, with three granular carinae, outermost very well-developed and separating upper and outer surfaces, central one distinct, innermost distally bearing four spines, between outer and central carina very sparsely granular, between central and inner, granular; inner surface with upper border fringed with hairs, with two inconspicuous central, very finely granular carinae and conspicuous lower carina moderately coarsely granular; under surface granular tending squamiform; outer surface dorsally sparsely granular, central granular carina, ventrally granules in squamiform pattern. Movable finger—upper surface outer margin bearing densely, moderately coarsely, granular carina, inner margin bearing 4–5 sharp well-developed spines increasing in size distally, between margins smooth; inner surface on upper border moderately dense fringe of hairs, below this general surface finely granular; outer surface very finely granular. Immobile finger—inner surface with two inconspicuous finely granular carinae, outer surface finely granular with one pitted groove. Both fingers—relatively long and slender with sharp tips and moderately blunt teeth.

*Walking legs:* First leg: dactyl very long, sharp, with slightly flattened, grooved surfaces and carinate edges; propodus with smooth carina on outer border and smooth ridge near outer surface; carpus with two smooth ridges on outer border, lowermost inconspicuous. Second leg: dactyl strongly carinate, almost quadradiate in section; propodus with smooth carina on outer border and smooth ridge near outer surface; carpus with smooth carina on outer border. Third leg: dactyl strongly carinate, almost quadradiate in section; propodus with partly granular carina on outer border; carpus with smooth carina on outer border.

*Fifth leg*: Carpus with carina on anterior border projecting slightly at distal end; merus moderately broad (L/B 2.17).

*Merus of third maxilliped*: Surface anteriorly hairy, posteriorly almost smooth; antero-internal angle slightly produced; anteroexternal angle very obtuse and barely recognizable as an angle; posterointernal surface without distinct raised edge.

*Male abdomen*: Ultimate segment much broader than long, tip rounded, narrower proximally than in centre and with sharply convex sides, posterior border straight, deeply indented into penultimate segment; penultimate segment slightly longer than broad.

*Male first pleopod*: Proximal half very broad then narrowing abruptly and tapering to tip. Outer side—bearing bipinnate hairs, commencing one third of the way up the appendage and terminating some distance behind tip, also bearing an irregular band of microscopic spinules, beginning in row of hairs and terminating almost at tip. Upper surface—densely hirsute in broader portion. Inner side—basally with very long bipinnate hairs, narrower portion of appendage with row of relatively short bipinnate hairs, also bearing narrow scattered band of microscopic spinules terminating behind tip.

#### *Colour*

*Alcohol-preserved material*: After prolonged preservation most of the smaller specimens without pigment, and largest with orange pigment as follows: Carapace— anterior gastric region, granules on anterior half; chelipeds—upper surfaces generally, inner surfaces of arm and wrist, inner surface of hand on boss at finger articulation and ventral carina, inner surface of immovable finger on proximal quarter of dorsal surface, outer surface of hand on boss at finger articulation. Iridescence present on: carapace—between frontal teeth, between anterolateral teeth, round anterior borders of areas of thin cuticle; chelipeds—general upper surface including movable finger; walking legs—general upper surface of carpus and propodus of all legs; fifth leg—upper surface of distal portion of merus and general upper surfaces of carpus and propodus. An ovigerous ♀ (36 mm, Tosa Bay, S. Japan, 80–120 m, pres. Dr Sakai), bears faint traces of orange pigment as follows: anterior half of carapace closely covered with small spots concentrated densely at edges of unpigmented areas of cervical grooves and of thin cuticle; borders between anterolateral teeth; anterodistal border of arm of cheliped; inner and upper wrist spines; anteroexternal border of wrist (between upper and outer spines); granules on upper surface of hand of larger cheliped; upper outer carina of movable finger. There appear to be no large areas of diffuse pigmentation as shown by the S. African specimen except for a small longitudinal patch behind frontal teeth. The pattern of iridescence differs only in the lack of iridescence from the following: between frontal teeth; round anterior borders of areas of thin cuticle; walking legs and most of fifth leg.

#### *Distribution*

Until recently only known from Indonesia and Japan, extended by Grindley (1961) to South Africa and now to Australia. Always from fairly deep water.

#### **Ovalipes molleri** (Ward)

Pls 37A, 40B, 41B, 42H; figs 1H, 2G, 3G, 4G

*Aeneacancer molleri* Ward, 1933, pp. 381–3; pl. XXIII, fig. 11. McNeill, 1953, p. 93; pl. 7, figs 1, 2.

*Ovalipes molleri* (Ward). Stephenson and Campbell, 1960, pp. 90–1, figs 1D, 2F; 9 pl. 2, fig. 3; pl. 5F.

*Material examined:*—

*Australia. New South Wales:* ♂ (54 mm), S. of Montague I., coll. K. Moller, Aug., 1929, AM P 10628 (holotype). ♂ (c. 24 mm), ♀ (c. 22 mm), off Tuggerah Lakes, coll. A. A. Racek, 18/vi/1959, 125–145 fm, trawled “Challenge”, bottom sand and mud, AM P 14195. 6 ♂♂ (23–31 mm), off Port Stephens, coll. A. A. Racek, 3/viii/1959, 125 fm, mud, otter trawl, AM P 13498. ♂ (33 mm), E. of Port Stephens, coll. A. A. Racek, 3/vii/1959, 110–125 fm, trawled “Challenge”, AM P 14185.

*Victoria:* ♂ (59 mm\*), 40 miles SSW. of Mt Cann, 27/viii/1914, 74 fm, AM E 6096 (in company with *O. iridescens*). ♂ (62 mm), c. 30 m W. Babel I., Bass Strait, pres. K. Moller, 80–85 fm, AM P 11415.

*Material illustrated:* ♂ (59 mm), see \* above.

*Description*

*Front:* Four toothed (including inner supraorbital lobes); median teeth close together, broadly separate from, and produced further forwards than laterals; median fissure shallow; all teeth sharp; subsidiary lateral lobe on general frontal border, relatively well developed.

*Orbit:* Upper border not toothed; supraorbital notch fairly deep; suborbital border slightly hairy.

*Basal joint of first antenna:* Protruding well forwards, with flattened, hirsute, dorsal area.

*Basal joint of second antenna:* Without flattened dorsal area.

*Anterolateral teeth:* Five; generally small and sharp, narrow based and broadly separated; between teeth bordered by very fine granules; first tooth largest, blunter than second; second tooth smallest and sharpest.

*Carapace:* Moderately broad (L/B 1.28); areas generally distinct, with a tubercular elevation on each protogastric region and two, large, reniform areas of very thin cuticle in posterior half; general granulation fine throughout, slightly coarser anteriorly and smooth in the two areas of thin cuticle, in indented areas, and postlateral to them; pterygostomial area with conspicuous, relatively broad striated ridge terminating mesially in rounded granular patch.

*Chelipeds:* Relatively long, thin, subequal. Arm—anterior border proximally with a few, small, rounded granules, distally with 3–5 sharp spines and 1–3 small sharp tubercles; anterodistal border with large boss; posterior border sparsely and moderately coarsely granular and sparsely hairy; under surface finely granular tending squamiform. Wrist—with short, moderately robust inner spine; upper surface with sharp, well-developed spine at hand articulation and two distinct granular carinae, general upper surface very finely granular; outer surface with two distinct granular carinae, one terminating in a well-developed spine. Hand—slightly swollen; upper surface with distinct boss at wrist articulation, with three granular carinae, outermost very well developed and separating upper and outer surfaces, central one inconspicuous and composed of a sparse line of granules, innermost distally bearing four spines, between outer and central carinae smooth, between central and inner sparsely granular; inner surface with upper border fringed with hairs, with two inconspicuous central, very finely granular carinae and conspicuous lower carina moderately coarsely granular; under surface granular tending squamiform; outer surface dorsally, moderately sparsely and finely granular, central granular carina, ventrally very fine granules in squamiform pattern. Movable finger—upper surface outer margin

bearing densely, moderately coarsely granular, carina, inner margin bearing four sharp well-developed spines increasing in size distally, small spiniform tubercle on inner proximal margin, between margins smooth; inner surface on upper border scattered row of granules and moderately dense fringe of hairs, below this general surface microscopically granular and pitted; outer surface very finely and moderately densely granular. Immovable finger—inner surface with two inconspicuous finely granular carinae, outer surface with two faintly pitted grooves, general surface very finely granular. Both fingers—relatively long and slender with sharp tips and moderately blunt teeth.

*Walking legs:* First leg: dactyl very long, sharp, with slightly flattened, grooved surfaces and carinate edges; propodus with smooth carina on outer border and smooth ridge near outer surface; carpus with two smooth rounded ridges on outer border. Second leg: dactyl strongly carinate, almost quadriradiate in section; propodus with almost smooth carina on outer border and smooth ridge near outer surface; carpus with smooth rounded ridge on outer border, and barely recognizable rounded ridge near outer surface. Third leg: dactyl strongly carinate, almost quadriradiate in section; propodus with granular carina on outer border; carpus with smooth carina on outer border.

*Fifth leg:* Carpus with carina on anterior border projecting slightly at distal end; merus moderately broad (L/B 2.07).

*Merus of third maxilliped:* Surface anteriorly sparsely covered with hairs, posteriorly almost smooth; anterointernal angle slightly produced; anteroexternal angle very obtuse and barely recognizable as an angle; posterointernal surface without distinct raised edge.

*Male abdomen:* Ultimate segment much broader than long, tip rounded, narrower proximally than in centre and with sharply convex sides, posterior border straight, deeply indented into penultimate segment; penultimate segment slightly longer than broad.

*Male first pleopod:* Proximal one-third very broad then narrowing abruptly and tapering to tip. Outer side—bearing bipinnate hairs, somewhat scattered and short proximally, then becoming denser and longer distally, terminating well behind tip; also bearing an irregular row of microscopic spinules, beginning in row of hairs and terminating almost at tip. Upper surface—not hirsute. Inner side—bearing bipinnate hairs somewhat scattered in proximal half, slightly denser distally, terminating well behind tip, also bearing narrow scattered band of microscopic spinules terminating behind tip.

#### *Colour*

*Alcohol-preserved material:* After prolonged preservation no pigment visible. Iridescence present on: carapace—between frontal teeth, across anterior portion of carapace, along anterolateral borders, in cervical grooves, around anterior borders of areas of thin cuticle; chelipeds—general upper surface including movable finger; walking legs—small patches on upper surface of merus and propodus of second and third walking legs; fifth leg—general upper surface of merus, carpus and propodus, borders of dactyl, patch also present on ventral surface of propodus.

#### *Distribution*

Southeast coast of Australia.

#### *Remarks*

Although Sakai (1965, p. 112) states that this species is synonymous with *O. iridescens*, this is not so. The species are immediately separable by the number of frontal teeth.

### The *O. ocellatus* complex

The three forms comprising this complex are very similar and merit re-investigation with more material than is available to us. Previously two forms had been described—*O. ocellatus* and *O. gadulpensis*, but in the present collection some of the specimens previously identified as *O. gadulpensis* possess features of both these species as well as some unique ones. The form of *O. gadulpensis* close to *O. ocellatus* is called *form a* and the other, *form b*.

Features common to all three forms are:

*Front*: Three toothed (including inner supraorbital lobes); median tooth produced further forwards than laterals; no subsidiary lateral lobe.

*Orbit*: Upper border not toothed; supraorbital notch deep, suborbital border not or sparsely hairy.

*Basal joint of first antenna*: Protruding well forwards, with flattened, iridescent, dorsal area.

*Basal joint of second antenna*: With flattened, iridescent, dorsal area.

*Anterolateral teeth*: Five; fairly large and robust; narrow based and broadly separated, bordered by moderately coarse granules; first tooth about as sharp as second; fourth the largest.

*Carapace*: Broad (B/L 1.30–1.31); areas generally not distinct, although with distinct cervical grooves; posterior half either smooth or microscopically granular, smooth in cardiac region; pterygostomial area with conspicuous striated ridge.

*Chelipeds*: Moderately long, robust, right larger than left. Arm—anterior border proximally striated, distally bearing irregular row of spines; anterodistal border with boss; posterior border densely and finely granular; under surface with rounded granules tending squamiform. Wrist—long with, robust, inner spine and sharp, well-developed outer spine; upper surface without tubercle at wrist articulation; outer surface with finely granular carina leading to spine. Hand—upper surface with boss at wrist articulation, three granular carinae, outermost very well developed and separating upper and outer surfaces, central more feebly developed, inner ending in spine, between carinae predominantly finely granular; inner surface with upper border densely fringed with hairs, bearing granules; under surface granular tending squamiform; outer surface with carina. Movable finger—upper surface with two granular carinae, between carinae granular, and with short granular proximal elevation; inner surface of upper border densely fringed with hairs. Immobile finger—inner surface bearing a row of hairs; outer surface grooved. Both fingers—robust with sharp tips and larger with blunt teeth.

*Walking legs*: First leg: dactyl long, with slightly flattened, grooved surfaces and carinate edges; propodus with bifurcated carina on outer border; carpus with two smooth ridges on outer border, distally with short ridge near outer surface. Second leg: dactyl with slightly flattened, grooved surfaces and carinate edges; propodus with carina on outer border tending to bifurcate proximally; carpus with smooth carina on outer border. Third leg: dactyl with slightly flattened, grooved surfaces and carinate edges; propodus and carpus with carina on outer border.

*Fifth leg*: Carpus with carina on anterior border projecting distally; merus broad (L/B 1.82–1.97).

*Merus of third maxilliped*: Surface generally hairless and bearing conspicuous rounded granules; anterointernal angle strongly produced; anteroexternal angle obtusely rounded; posterointernal surface with distinct raised edge.

*Male abdomen*: Ultimate segment broader than long, tip rounded, posterior border straight, narrower proximally than in centre and with sharply convex sides, deeply indented into penultimate segment; penultimate segment longer than broad.

*Male first pleopod*: Proximal two-thirds very broad then narrowing abruptly and tapering to tip. Basal section densely covered with hairs. Outer side—bearing bipinnate hairs becoming very long and dense in the region of narrowing of the pleopod then terminating well behind tip, also bearing band of microscopic granules or spinules beginning where bipinnate hairs finish and terminating well behind tip. Inner side—with dense bipinnate hairs extending from upper surface to edge and terminating some distance behind tip, short scattered irregular row of sharp microscopic spinules terminating just behind tip.

#### Colour

Hopkins (1963, p. 238) has noted that in both species the fingers of the male are reddish-brown but in the female they are pale yellow to clear white on the outer margins and clear white on the inner. This sexual dichromatism was not apparent in material examined by the authors.

*Iridescence*: After prolonged alcohol preservation iridescent areas as follows: carapace—the four spaces between anterolateral teeth; cheliped—indentation on posterodistal upper surface of arm, outer wrist spine, proximal elevation on upper surface of movable finger; walking legs—indentation on posterodistal upper surface of merus, anterior edge of carpus and propodus; third maxilliped—ventral surface of carpus, propodus and dactylus; dorsal surface of suborbital tooth; dorsal surfaces of basal joints of first and second antennae.

In dealing below with the three forms, there is little likelihood of confusion between *O. ocellatus* and the remainder, and this species is treated first. The two *O. guadalupeensis* forms are not distinguished in the synonymy, and are considered together. Throughout only diagnostic features are listed.

### **Ovalipes ocellatus** (Herbst)

Pls 37B, 40D, 41C, 42I; figs 1I, 2H, 3H, 4H

*Cancer ocellatus* Herbst, 1799, p. 61, pl. 49, fig. 4.

*Portunus pictus* Say, 1817, p. 62, pl. 4, fig. 4.

*Platyonichus ocellatus* (Herbst). Latreille, 1825, p. 152. H. Milne Edwards, 1834, p. 435. de Kay, 1844, p. 9, pl. 1, fig. 1, pl. 5, fig. 7, Smith, 1873, pp. 338 (44), 533 (253). R. Rathbun, 1893, p. 774, pl. 266. Gould, 1841, p. 324.

*Platyonichus ocellatus* (Herbst). Bell, 1853, p. 84. Milne Edwards, 1861, pp. 415–6; pl. 36, fig. 4. Hector, 1877, pp. 473–4; pl. XXVII, fig. 1. Filhol, 1885, p. 383. Chilton and Bennett, 1929, p. 757.

*Ovalipes ocellatus* (Herbst). Rathbun, 1898, p. 597; 1905, p. 9. Richardson, 1949, p. 31 (in key). Williams, 1962, pp. 39–40. Bennett, 1964, p. 14.

*Ovalipes ocellatus ocellatus* (Herbst). Hay and Shore, 1918, pp. 426–7; pl. 32, fig. 7. Rathbun, 1930, pp. 19–23, text fig. 5; pl. 2; pl. 3, figs 1, 2.

#### *Material examined*:—

*Eastern America*: United States: 10 juvs (10–22 mm), Cape Cod Bay, U.S.F.C., 1879, surface, AM P 7437. ♀ (68 mm), off Newport, Rhode I., 1880, USNM. 7 ♂♂ (18–67 mm), 8 ♀♀ (19–40 mm), Fire I., Great South Bay, Long I., 22/IX/1884, USNM. ♂ (85 mm), ♀ (52 mm), Provincetown, Mass., 1899, coll. J. E. Benedict, USNM. 2 ♀♀ (57–60 mm), Vineyard Sound, Mass., April, 1908, AM P 313. ♂

(87 mm\*), Edgartown Harbor, Mass., Nov., 1920, AM P 4972. ♀ (42 mm), data as previous specimen, AM P 5030. 5 ♂♂ (25–55 mm), Glynn Co., Georgia, r8/xi/1948, coll. and don. J. Oney, USNM. ♂ (54 mm), "Texas or Florida", coll. L. J. Baughman, USNM.

*Locality doubtful.* ♂ (48 mm), "Chili", NM.

*Material illustrated:* ♂ (87 mm), see \* above.

*Diagnostic features:*—

*Front:* Teeth relatively blunt.

*Carapace:* Granulation generally even (shared with *O. guadulpensis* form b), but with median longitudinal band of coarse granules extending from mesogastric to anterior cardiac regions (shared with *O. guadulpensis* form a), and with coarse granulations on elevated portions on front half of carapace (shared with *O. guadulpensis* form a).

*Chelipeds:* Wrist—upper surface finely and densely granular (shared with *O. guadulpensis* form a). Hand—swollen, upper surface between carinae very finely, densely and uniformly granular, inner surface smooth dorsally (shared with *O. guadulpensis* form a) and finely granular ventrally, outer surface smooth or microscopically granular with very finely granular carina. Movable finger—upper surface between carinae very finely and densely granular (shared with *O. guadulpensis* form a), inner surface smooth or microscopically pitted (shared with *O. guadulpensis* form a). Immobile finger—inner surface with relatively sparse row of hairs, and granular (shared with *O. guadulpensis* form b), outer surface smooth or microscopically pitted (shared with *O. guadulpensis* form a).

*Merus of third maxilliped:* Upper border distinctly curved, anterointernal projection moderately long and broad.

*Male pleopod:* Inner surface with bipinnate hairs terminating at region of greatest curvature, outer surface with sharp spinules.

*Colour*

(a) *Alcohol-preserved material.* After prolonged preservation, reddish-brown pigment on: carapace—closely covered by small irregular rings of spots (sometimes faded), smaller in anterior and larger in posterior half, generally fainter in anterior half, also mottled markings bordering frontal teeth and on anterolateral teeth; chelipeds—large scattered spots on upper surfaces of arm and wrist, inner wrist spine diffusely pigmented, upper surface of hand with spots concentrated on two innermost carinae, outermost carinae diffusely pigmented, tubercle at outer finger articulation and distal half of fingers diffusely pigmented.

Iridescence—on borders of frontal teeth (shared with *O. guadulpensis* form b), anterior border of wrist (shared with *O. guadulpensis* form b), general upper surfaces of hand and movable finger (shared with *O. guadulpensis* form b), patches between anterolateral teeth large and diffuse.

(b) *Fresh material:* Colour transparency examined by the authors, of fresh ovigerous ♀ from Wood's Hole, Mass., shows pigment on: carapace—closely covered with small irregular rings of dark brown spots, smaller and denser on anterior half. (The following areas without pigment: two patches in each anterior branchial area, cervical grooves.) Chelipeds—upper surfaces of arm, wrist and hand with large scattered black spots, with concentrations on two innermost carinae of hand, inner surface of hand and most of fingers with diffuse orange-red pigment; walking legs—upper surface of merus with scattered spots; fifth leg—merus with scattered spots, propodus and dactyl deep blue bordered by orange or yellow. No obvious iridescence.

*Distribution*

Rathbun (1930) gives the range from Nova Scotia to South Carolina, and this is repeated by Williams (1962). The present material extends the southern range to Georgia, and doubtfully into the Gulf of Mexico—based on the label “Texas or Florida”.

Bennett (1964) includes *O. ocellatus* in his list of species to be excluded from records of New Zealand marine fauna. He states that the recordings of this species by Hector (1877) and by Filhol (1885) repeated by Chilton and Bennett (1929) and by Richardson (1949), were based on incorrect labels, which belonged to specimens actually collected off the eastern coast of the United States of America.

There is no doubt that Filhol's specimen was *O. ocellatus*. Madame D. Guinot has confirmed the identification on our behalf from Filhol's specimen in the Museum National d'Histoire Naturelle, Paris. This specimen is labelled “*Platyonychus ocellatus* Latr. M. Filhol det. Nouvelle-Zealande. H. Filhol 3319-1885 (Mus. d'Otogo 1874)”. Madame Guinot has kindly provided photographs of the dried specimen which shows the characteristic pigmentation and larger granules in the midline of the carapace. The only minor difference compared with material examined is the slightly coarser general granulation of the carapace.

The specimen in the National Museum of Victoria, labelled “Chili”, is also almost certainly from an incorrect locality.

***Ovalipes guadulpensis* (Saussure)**

*Form a*—Pls 37C, 40E, 41D, 42J; figs 1J, 2I, 3I, 4I

*Form b*—Pls 37D, 40F, 41E, 42K; fig. 1K.

*Cancer Ciri Apoa, seu Aratii Pinima, Brasiliensis* Seba, 1758, p. 44; pl. 18, fig. 9.

*Portunus guadulpensis* Saussure, 1858, p. 433 (17); pl. 2, fig. 10.

*Platyonychus ocellatus* var. Smith, 1886, p. 632.

*Ovalipes ocellatus floridanus* Hay and Shore, 1918, p. 427; pl. 32, fig. 8.

*Ovalipes ocellatus guadulpensis* (Saussure). Rathbun, 1930, pp. 23-4, pl. 4. Gunter, 1950, p. 31. Hildebrand, 1954, p. 275.

*Ovalipes guadulpensis* (Saussure). Williams, 1962, pp. 39-41.

*Material examined*:—

*Form a*

*Eastern America*: 3 juvs (16-20 mm), off Beaufort, N. Carolina, May, 1907, dredged by “Fish Hawk”, USNM 51015, ident. by W. P. Hay as “*Ovalipes ocellatus floridanus* sub sp. nov.” 4 ♂♂ (56\*-65 mm), 3 ♀♀ (56-58 mm), 4 ovig. ♀♀ (57-62 mm), off Jacksonville, Florida, 30° 14' N., 80° 16' W., 9/iii/1956, “Bowers”, Sta. 32, 40 fm, USNM 99723, ident. F. A. Chace Jr as *O. ocellatus guadulpensis*. ♀ (63‡ mm), SE. off Charleston, S. Carolina, 32° 05' N., 79° 40' W., 7/x/1957, “Combat” Sta. 514, Fish and Wildlife, 22-25 fm, USNM 101685, ident. F. A. Chace Jr as *O. ocellatus guadulpensis*.

*Material illustrated*. ♂ (56 mm), see \* above, for line drawings; ♀ (63 mm), see ‡ above, for photographs.

*Form b*

2 ♂♂ (48, 84 mm), Gulf of Mexico, 30° 21' N., 87° 00' W., 13/vii/1957, “Silver Bay”, Sta. 24, Fish and Wildlife, 7-8 fm, USNM 101427, ident. F. A. Chace Jr as *O. ocellatus guadulpensis*.

*Material illustrated:* ♂ (84 mm), for all illustrations except photograph of front (♂ 48 mm).

*Diagnostic features:*—

*Form a*

*Front:* Teeth relatively sharp (shared with form b).

*Carapace:* Granulation relatively coarse behind frontal and inside anterolateral borders, median longitudinal band of slightly enlarged granules extending from mesogastric to anterior cardiac regions (shared with *O. ocellatus*).

*Chelipeds:* Wrist—upper surface finely and densely granular (shared with *O. ocellatus*). Hand—not swollen (shared with form b), upper surface between carinae densely granular, mostly fine but occasional large granules, inner surface typically smooth dorsally (shared with *O. ocellatus*) and microscopically granular ventrally, outer surface very finely granular with finely granular carina. Movable finger—upper surface between carinae very finely and densely granular (shared with *O. ocellatus*), general inner surface smooth or microscopically pitted (shared with *O. ocellatus*). Immovable finger—inner surface with relatively dense row of hairs, and partly granular, outer surface smooth or microscopically pitted (shared with *O. ocellatus*).

*Merus of third maxilliped:* Upper border either straight or very slightly curved, antero-internal projection relatively long and narrow.

*Male pleopod:* Inner surface with bipinnate hairs terminating just beyond region of greatest curvature, outer surface with sharp spinules.

*Colour*

*Alcohol-preserved material:* After prolonged preservation reddish-orange pigment as follows: frontal and anterolateral teeth; but tips of anterolateral teeth white; spines on arm and inside of wrist of cheliped; carinae and larger granules on upper surface of hand; carina on outer surface of hand; dorsal portion of inner surface of hand; variable extents of inner and outer surfaces of both fingers.

*Fresh Material*—see below

*Form b*

*Front:* Teeth relatively sharp (shared with form a).

*Carapace:* Granulation generally even (shared with *O. ocellatus*), without band of enlarged granules in midline.

*Chelipeds:* Wrist—upper surface smooth or sparsely granular. Hand—not swollen (shared with form a), upper surface between carinae moderately finely and fairly densely granular, inner surface dorsally with fine scattered granules and moderate to coarse granules ventrally, outer surface granular with inconspicuous granular carina. Movable finger—upper surface between carinae with fine sparse granules, inner surface granular. Immovable finger—inner surface with very dense row of hairs, and granular (shared with *O. ocellatus*), outer surface granular and pitted.

*Merus of third maxilliped:* Upper border slightly curved, antero-internal projection short and broad.

*Male pleopod:* Inner surface with bipinnate hairs terminating well beyond region of greatest curvature, outer surface with rounded spinules.

*Colour*

*Alcohol-preserved material:* After prolonged preservation orange pigment as follows in large specimen only: general surface anterior half of carapace excluding tips of anterolateral teeth; general anterior surface arm of cheliped including spines;

spine on outer surface of wrist; carinae on upper surface hand; general inner and outer surfaces of hand; general surfaces and especially carinae on movable and immovable fingers.

*Fresh material:* Williams (1962, pp. 40-1) has described this in detail from North Carolina material, but this cannot be firmly assigned to either of the above forms. His description runs: "General colour of carapace light lavender-grey underlaid with dull yellow, some specimens darker or lighter, with a regular pattern of lighter spots dull yellow, off-white, or bluish yellow to lavender-yellow, rear border of carapace light blue; spines of carapace purplish-red at base to red or purple subdistally, white at tips; carpus and merus of chelipeds somewhat same colour as carpus except pink-flesh coloured at carpo-meral joint and on hand; fingers white on inner surface, and with white teeth; large spine at internal angle of carpus and a few small but distinct spots on superoexternal surface of hand purple, large spine grading to lighter purple on body of carpus; anterior border of chela and first three pairs of walking legs with a longitudinal band of brownish-purple, band extending to lower border of dactyl on chela; dactyls of first three walking legs and outer border of hand immediately below external ridge, same colour, sometimes darker on dactyl with teeth same colour, distal tip of immovable finger similarly coloured; blade of swimming leg yellowish; underparts light. Iridescent spots between anterolateral teeth, on distal or dorsal surface of external carpal spine and along upper edge of hand, at superodistal corner of merus on first three walking legs and along dorsal edge of first three pairs of walking legs distally, on dorsal surface of second abdominal segment; spot between fourth and fifth anterolateral spines nearly semicircular."

The following specimens kindly lent by Dr Austin B. Williams, of the University of North Carolina, were received at a late stage:

*Eastern America.* 2 ♂♂ (64.5, 82.5 mm), 1 ovig. ♀ (67 mm), 34° 52' N., 76° 13' W.—34° 56' N. 76° 08.5' W., N. Carolina, 6/xii/1959, roller trawl, m/v "Silver Bay", 7 fm, coll. E. E. Deubler, Jr, UNC Cat. No. 924. 2 ♂♂ (75, 76 mm), 34° 23.5' N., 76° 24.5' W.—34° 25' N., 76° 22' W., N. Carolina, 6/xii/1959, roller trawl, m/v "Silver Bay" 1.2 fm, coll. E. E. Deubler, Jr, UNC Cat. No. 927. ♀ (72 mm), ovig. ♀ (66.5 mm), ESE. Cape Lookout, N. Carolina, 18/i/1963, coll. E. Bayer and N. Coe from fish boats, UNC Cat. No. 1612.

They agree very closely with *O. guadulpensis* form a, apart from the granulation of the inner surface of the hand (as form b). They tend to form b in that most specimens are without the band of enlarged granules in the midline of the carapace, although a few specimens show faint indications of these granules.

## VI. INTERRELATIONSHIPS OF SPECIES

### a. *O. punctatus* and Related Species

The close relationship between the following five species—*O. punctatus*, *O. trimaculatus*, *O. catharus*, *O. australiensis*, and *O. elongatus*—are indicated by the fact that the first four had been previously synonymized and the fifth species had been confused with them in collections. *O. georgei*, while separate in many features, shows greater affinity to the above five species than to others in the genus.

These six species are placed in a *group* within the genus (Group A), characterized by possessing the following features, none of which are shown by any of the other species:

- 1.1 outer supraorbital notch present, and upper border of orbit toothed;
- 1.2 subsidiary lateral frontal lobe on lower plane than remainder of front;
- 1.3 anterolateral teeth distinctly large, robust, and broad based;
- 1.4 pterygostomial area of carapace diffusely granular and without striae;
- 1.5 chelipeds relatively short;

- 1.6 anterior border of arm without spines or tubercles;
- 1.7 posterior border of arm distinctly hairy;
- 1.8 carina on outer surface of wrist not ending in a spine;
- 1.9 inner surface of hand with two central carinae, but without lower carina;
- 1.10 upper surface of movable finger with three carinae;
- 1.11 upper inner margin of movable finger with row of dense hairs, and below this a carina;
- 1.12 inner surface of immovable finger with two distinct carinae and two distinct rows of hairs;
- 1.13 dactyl of first walking leg of male triradiate in section;
- 1.14 carpus of first walking leg with two carinae on outer border;
- 1.15 carpus of second walking leg with two carinae (or one carina and one ridge) on outer border;
- 1.16 carpus of fifth leg without distal projection on carina on anterior border;
- 1.17 anterointernal projection of merus of third maxilliped short and relatively broad;
- 1.18 ultimate segment of male abdomen approximately triangular and only slightly broader than long;
- 1.19 male pleopod evenly curving and tapering throughout, without broad basal area.

Features 1.13, 1.18, and 1.19 are uncertain for *O. elongatus* for which no males are yet available.

The species in this group possess the following additional features in common, but these are shared with other species as indicated:

- 2.20 four frontal teeth, with medians produced further forward than laterals (shared with *O. molleri*);
- 2.21 upper surface of hand with pigmented granules (shared with *O. iridescens* and *O. gadulpensis* form a);
- 2.22 dactyls of second and third walking legs with flattened grooved surfaces and carinate edges but not quadriradiate (shared with *O. ocellatus* subgroup).

#### b. Subgroups of Group A

Within Group A there is a closely related subgroup centred around *O. punctatus*, referred to as the *O. punctatus* subgroup, while *O. georgei* is sufficiently separate from the remainder of Group A to merit a separate subgroup.

##### (i) *O. punctatus* subgroup

This comprises *O. punctatus*, *O. trimaculatus*, *O. catharus*, *O. australiensis*, and *O. elongatus*, which have the following features in common additional to those of Group A. None of these features are exhibited by other species in the genus.

- 3.23 subsidiary lateral frontal lobe visible on inner side of lateral lobe;
- 3.24 basal joint of first antenna without flattened dorsal area;
- 3.25 under surface of hand with conspicuous striae;
- 3.26 distal part of merus of first walking leg of male with conspicuous raised collar;
- 3.27 carpus of fifth leg with sharp, hirsute anterior border;
- 3.28 pigmented patch in each postlateral area of carapace in preserved specimens which retained colour (in *O. elongatus* more a line than a patch).

Feature 3.26 is uncertain for *O. elongatus*, for which no males are available.

Additional features held in common by the species of the *O. punctatus* subgroup but shared with species outside Group A are:

- 4.29 carapace areas relatively indistinct (shared with *O. ocellatus* subgroup).
- 4.30 anterolateral teeth bordered by relatively coarse granules (shared with most of *O. ocellatus* subgroup);
- 4.31 distinct pigment border just behind edge of frontal teeth (shared with most of *O. ocellatus* subgroup);
- 4.32 pigmentation present on tubercle of hand of cheliped at wrist articulation (shared with *O. ocellatus* subgroup).

(ii) *O. georgei* subgroup

The distinguishing features of *O. georgei* at the subgroup level comprise negatively the absence of the *O. punctatus* subgroup features, and positively the following:

- 5.33 subsidiary lateral frontal lobe directly beneath lateral lobe;
- 5.34 carapace granulation very coarse throughout;
- 5.35 carapace with mesobranchial area bearing striated ridge;
- 5.36 anterior half of carapace with four distinct tubercles;
- 5.37 hand of cheliped coarsely granular on general outer surface;
- 5.38 carpus of fifth leg with strongly cornified carina on anterior border;
- 5.39 merus of fifth leg with stout rounded thickening on posterodistal portion of under surface.

Features shared by *O. georgei* and species outside Group A comprise:

- 6.40 carapace areas very distinct (shared with *O. iridescens* subgroup);
- 6.41 male abdomen with sides of penultimate segment distinctly convex (shared with *O. iridescens* subgroup);
- 6.42 pigment on dorsal surface of carapace in large diffuse areas (shared with *O. iridescens* and *O. guatulpensis* form b);
- 6.43 pigment absent from inner surface of movable finger (shared with *O. molleri*);
- 6.44 pigment absent from outer surface of movable finger (shared with *O. iridescens* subgroup).

Two features are shared by *O. georgei* and individual species of the *O. punctatus* subgroup. These are:

- 7.45 upper surface of wrist of cheliped coarsely granular (shared with *O. australiensis*).
- 7.46 carapace relatively elongate (shared with *O. elongatus*).

### c. Remaining Species in the Genus

These comprise two pairs of species, viz. *O. iridescens* and *O. molleri*; and *O. ocellatus* and *O. guatulpensis* with its two forms, a, and b. These species possess a sufficient number of features in common to merit the status of a major grouping (Group B) with the following features in common:

- 8.47 upper border of orbit not toothed, and outer supraorbital notch absent;
- 8.48 pterygostomial area of carapace striated;
- 8.49 arm of cheliped with spines or tubercles on anterior border;
- 8.50 outer surface of wrist with carina ending in a spine;

- 8.51 hand of cheliped with carina at lower border on inner surface;
- 8.52 dactyl of first walking leg of male not triradiate in section, but long, sharp, with flattened grooved surfaces and carinate edges;
- 8.53 carpus of first walking leg with two smooth ridges on outer border;
- 8.54 carpus of second walking leg with one carina (or ridge) on outer border;
- 8.55 carpus of fifth leg with distal projection on carina on anterior border;
- 8.56 iridescence on carapace and chelae.

(i) *O. iridescens* subgroup

Each of the two pairs of species in Group B is sufficiently distinctive to merit subgroup status. The first subgroup, comprising *O. iridescens* and *O. molleri*, is referred to as the *O. iridescens* subgroup.

The species possess the following features held in common, additional to those of Group B. None are exhibited by other species of the genus.

- 9.57 subsidiary lateral frontal lobe on general frontal border and almost forming a submedian lobe;
- 9.58 dorsal area of basal joint of first antenna flat;
- 9.59 anterolateral teeth slender, not robust;
- 9.60 anterolateral teeth bordered by fine sparse granules;
- 9.61 carapace with areas of very thin cuticle;
- 9.62 chelipeds relatively very elongate;
- 9.63 arm of cheliped with posterior border sparsely granular;
- 9.64 wrist with three spines;
- 9.65 wrist with short inner spine;
- 9.66 wrist with fine granules on general upper surface;
- 9.67 hand with four large spines on upper inner margin;
- 9.68 movable finger with four or more large spines on upper inner surface;
- 9.69 movable finger with carina present on upper outer surface;
- 9.70 fingers slender;
- 9.71 dactyls of second and third walking legs strongly carinate and almost quadriradiate in section;
- 9.72 merus of third maxilliped without distinct raised edge on posterointernal surface;
- 9.73 merus of third maxilliped with short narrow anterointernal projections;
- 9.74 male pleopod with basal one half to one third broad, then narrowing abruptly with sharp curvature on outer side.

Additional features shared by species in the *O. iridescens* subgroup, but also shared with species outside Group B, are:

- 10.75 carapace areas very distinct (shared with *O. georgei*); feature 6.41 relisted.
- 10.76 general inner surface of hand smooth, not microscopically granular (shared with *O. punctatus*);
- 10.77 male abdomen with sides of penultimate segment distinctly convex (shared with *O. georgei*); feature 6.41 relisted.
- 10.78 pigment absent from outer surface of movable finger (shared with *O. georgei*); feature 6.44 relisted.
- 10.79 relatively elongate carapace (shared with *O. elongatus* and *O. georgei*).

(ii) *O. ocellatus* subgroup

The species in this subgroup (*O. ocellatus* and *O. guadulpensis* forms a and b) possess the following features in common, additional to those of Group B. None are exhibited by other species of the genus.

- 11.80 no subsidiary lateral frontal lobes;
- 11.81 lower border of orbit either without hairs or sparsely hairy;
- 11.82 basal joint of second antenna with iridescent dorsal area;
- 11.83 anterolateral teeth robust but relatively narrowly based;
- 11.84 anterolateral teeth bordered by moderately dense coarse granules;
- 11.85 first anterolateral tooth about as sharp as second;
- 11.86 chelipeds moderately long;
- 11.87 arm of cheliped with striated anterior proximal border;
- 11.88 hand of cheliped without distinct middle carina on outer surface;
- 11.89 movable finger with two distinct carinae on upper surface;
- 11.90 movable finger with outer surface either bearing microscopically granular carina or without carina;
- 11.91 propodus of first walking with bifurcate carina on outer border;
- 11.92 propodus of second walking leg with carina on outer border tending to bifurcate;
- 11.93 merus of third maxilliped with granular surface and at most sparsely hirsute;
- 11.94 merus of third maxilliped with very conspicuous long and broad antero-internal projection;
- 11.95 male pleopod with basal two-thirds broad then narrowing abruptly with sharp curvature on outer side.

Features held in common with the *O. ocellatus* subgroup, but shared with species outside Group B, are:

- 12.96 carapace areas relatively indistinct (shared with *O. punctatus* subgroup), feature 4.29 relisted;
- 12.97 anterolateral teeth bordered by relatively coarse granules (shared with *O. punctatus* subgroup), feature 4.30 relisted;
- 12.98 pigmentation present on tubercle of hand of cheliped at wrist articulation (shared with *O. punctatus* subgroup); feature 4.32 relisted.
- 12.99 dactyls of second and third walking legs with flattened grooved surfaces and carinate edges but not quadriradiate (shared with Group A); feature 2.22 relisted.

Features shared by the *O. ocellatus* subgroup and individual species of the *O. iridescens* subgroup are:

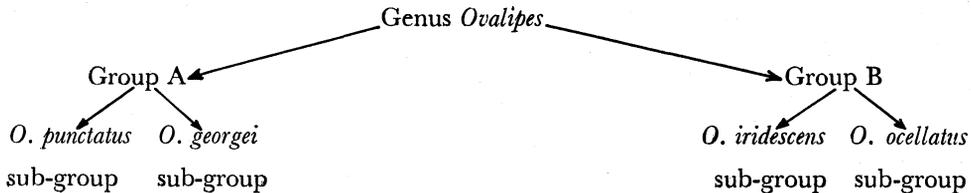
- 13.100 three frontal teeth (shared with *O. iridescens*);
- 13.101 arm of cheliped with posterior border finely granular and without hairs (shared with *O. iridescens*);
- 13.102 arm of cheliped with faint squamiform markings on under surface (shared with *O. molleri*);
- 13.103 immovable finger without carinae on outer surface (shared with *O. molleri*);
- 13.104 iridescence on dorsal area of basal joint of first antenna (shared with *O. molleri*);
- 13.105 discrete iridescent areas between anterolateral teeth (shared with *O. iridescens*).

### Discussion of Interrelationships

If the genus is to be split into formal taxonomic entities, Groups A and B should be given an appropriate formal status. The former possesses nineteen unique features and the latter ten of the basis of the present study. Against this Group A shares three additional features with species from Group B, and there are six further features shared between subgroups or individual species. Because of these "cross-links", it seems preferable at this stage to keep the genus intact even at the subgeneric level.

It should be noted that the subgroups of Group B each have a large number of diagnostic features, sixteen in the case of the *O. iridescens* subgroup and the same number in the *O. ocellatus* subgroup. If a "splitting" technique was applied to its limit each of these subgroups, and, therefore, presumably all the subgroups, could be given generic status. If so, the generic name *Ovalipes* would be restricted to the *O. ocellatus* subgroup because *O. ocellatus* is the type species of the genus (Rathbun, 1898). The *O. iridescens* subgroup would then become the genus *Aeneacancer* Ward (1933), while new generic names would have to be given to both the *O. punctatus* subgroup and to *O. georgei*.

The interrelations between the groups and subgroups can be expressed diagrammatically as follows:



### VII. DISCUSSION

*Ovalipes* is primarily an antitropically distributed genus, with four sub-groups, three of which show parallels between systematic affinities and biogeography. The remaining sub-group, containing only *O. georgei*, is known from two specimens from Western Australia.

In the *O. punctatus* sub-group there was considerable confusion in the synonymy. The majority of workers had synonymized all the species with *O. bipustulatus* (H. Milne Edwards, 1834), and later with *O. punctatus* (de Haan, 1833) following Rathbun (1930). However, Milne Edwards' material is actually *O. trimaculatus* (de Haan, 1833). Examination of all available material necessitated the division of this sub-group into five species, viz., *O. punctatus*, *O. trimaculatus*, *O. australiensis*, *O. catharus*, and *O. elongatus*.

With the exception of *O. trimaculatus*, each has a localized distribution as follows: *O. punctatus* from Japan and China, *O. australiensis* from Australia, *O. elongatus* from Lord Howe Island and Kermadec Islands, and *O. catharus* from New Zealand and southern Australia. *O. trimaculatus* has a wide cool-water Southern Hemisphere distribution comprising eastern and western South America, eastern and western South Africa, and the Indian Ocean.

The *O. iridescens* sub-group includes the only tropical recordings in the genus. *O. iridescens*, while known from widely separated areas, has been recorded from deep water in the Banda Sea where surface water temperatures are relatively low, c. 27° C (Rochford, 1962). In contrast, *O. molleri* is as yet known only from a restricted Australian area.

The *O. ocellatus* sub-group contains relatively shallow water Atlantic species which merit further investigation. Williams (1962) re-elevated *O. guadulpensis* to its original specific status, but of the characters he used for separation the following seem to vary: evenness of carapace granulation, size and shape of anterolateral iridescent spots, and granulation of the carina on the outer surface of the hand of the cheliped. Within the limited series of *O. guadulpensis* material here examined, there appear to be two forms. Many of the features used for the separation of these two forms show similarities with *O. ocellatus*. It is possibly significant that one of the forms is from the Gulf of Mexico and the other from the Atlantic. Extensive series of *O. guadulpensis* should be examined, particularly Brazilian material, which presumably is geographically separate from the remainder.

Although stridulating structures are known in other genera of portunids, for example *Portunus vocans* (A. Milne Edwards, 1878) and *P. nipponensis* (Sakai, 1938), it is in *Ovalipes* that they reach their best development—all species possessing stridulating mechanisms. In "*O. punctatus*" Guinot-Dumortier and Dumortier (1960) stress sound production by the striated undersurface of the hand of the cheliped engaging with the modified merus of the first pair of walking legs. They discount Balss' (1921) suggestion that the modified dactyl of the first leg is also engaged with the striae, but examination of preserved material throughout all the species of the *O. punctatus* sub-group convinces us of the reality of Balss' concept. Yet further stridulating possibilities are conceivable in these species, and it is hoped to detail them in a later paper. Meanwhile, for the sake of simplicity the *O. punctatus* sub-group may be described as stridulating species which use the ridges under the hand of the cheliped.

Meanwhile, in the *O. ocellatus* sub-group, the main stridulating structures are the striated pterygostomial regions of the carapace, engaged by the arm of the cheliped (Hansen, 1921; Balss, 1921; Guinot-Dumortier and Dumortier, 1960). In the *O. iridescens* sub-group, as Miers first noted, there are pterygostomial striae as in the *O. ocellatus* sub-group, but in this case they are engaged, not by the arm of the cheliped, but by the ischium. In *O. georgei* there is a quite different stridulating structure, apparently unique amongst Crustacea, of ridges on the posterior half of the carapace which are engaged by the fifth leg.

If the presence of stridulating structures is taken as a feature of the genus, it is difficult to understand why there should be three different types of striated structures, with one type (pterygostomial striae) engaged by two different kinds of plectra. It is possible that the genus is a polyphyletic group, but against this is the great similarity in general form and the coherence of the distributional picture. The only alternative seems to be to assume that the ancestral *Ovalipes* had a predisposition towards stridulation.

It is hoped to discuss this possibility in a later paper.

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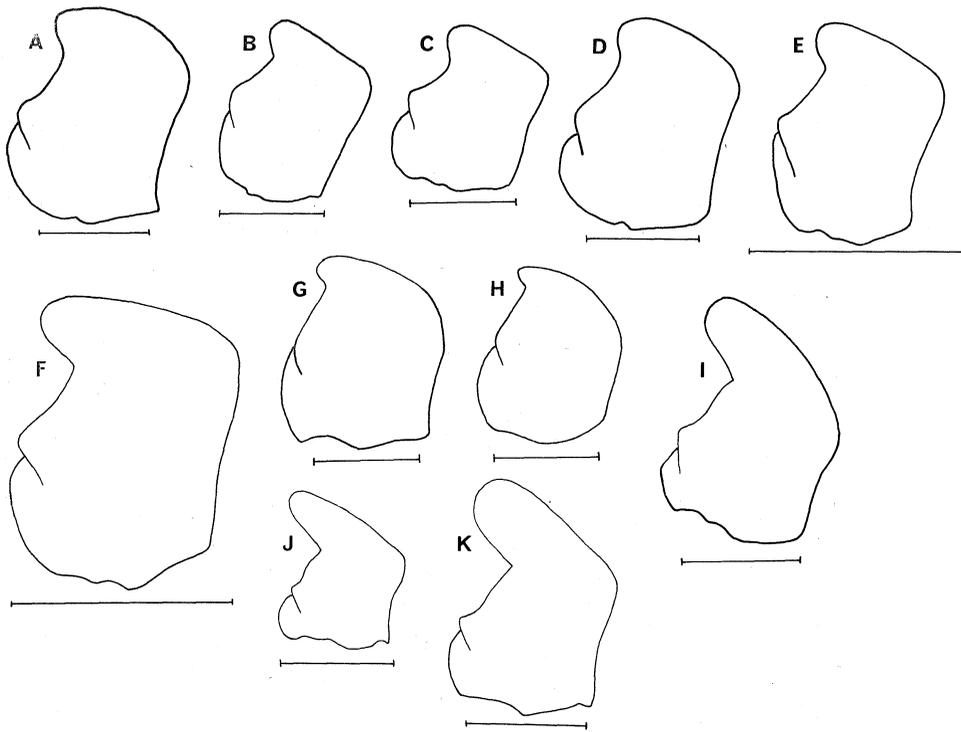


Fig. 1.—Meri of left third maxillipeds, anteroventral views, distal portions on top of drawings, bristles not shown. Scale, 5 mm. A. *Ovalipes punctatus*; B. *O. trimaculatus*; C. *O. catharus*; D. *O. australiensis*; E. *O. elongatus*; F. *O. georgei*; G. *O. iridescens*; H. *O. molleri*; I. *O. ocellatus*; J. *O. guadulpensis* form a; K. *O. guadulpensis* form b.

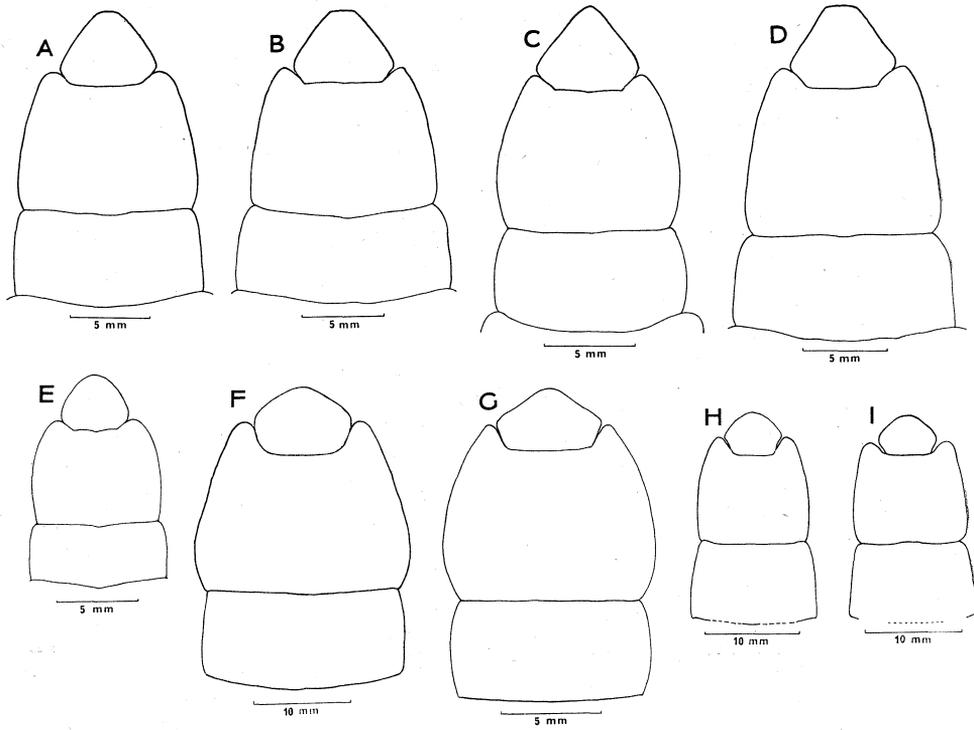


Fig. 2.—Male abdomens. A. *Ovalipes punctatus*; B. *O. trimaculatus*; C. *O. catharus*; D. *O. australiensis*; E. *O. georgei*; F. *O. iridescens*; G. *O. molleri*; H. *O. ocellatus*; I. *O. guadulpensis* form a

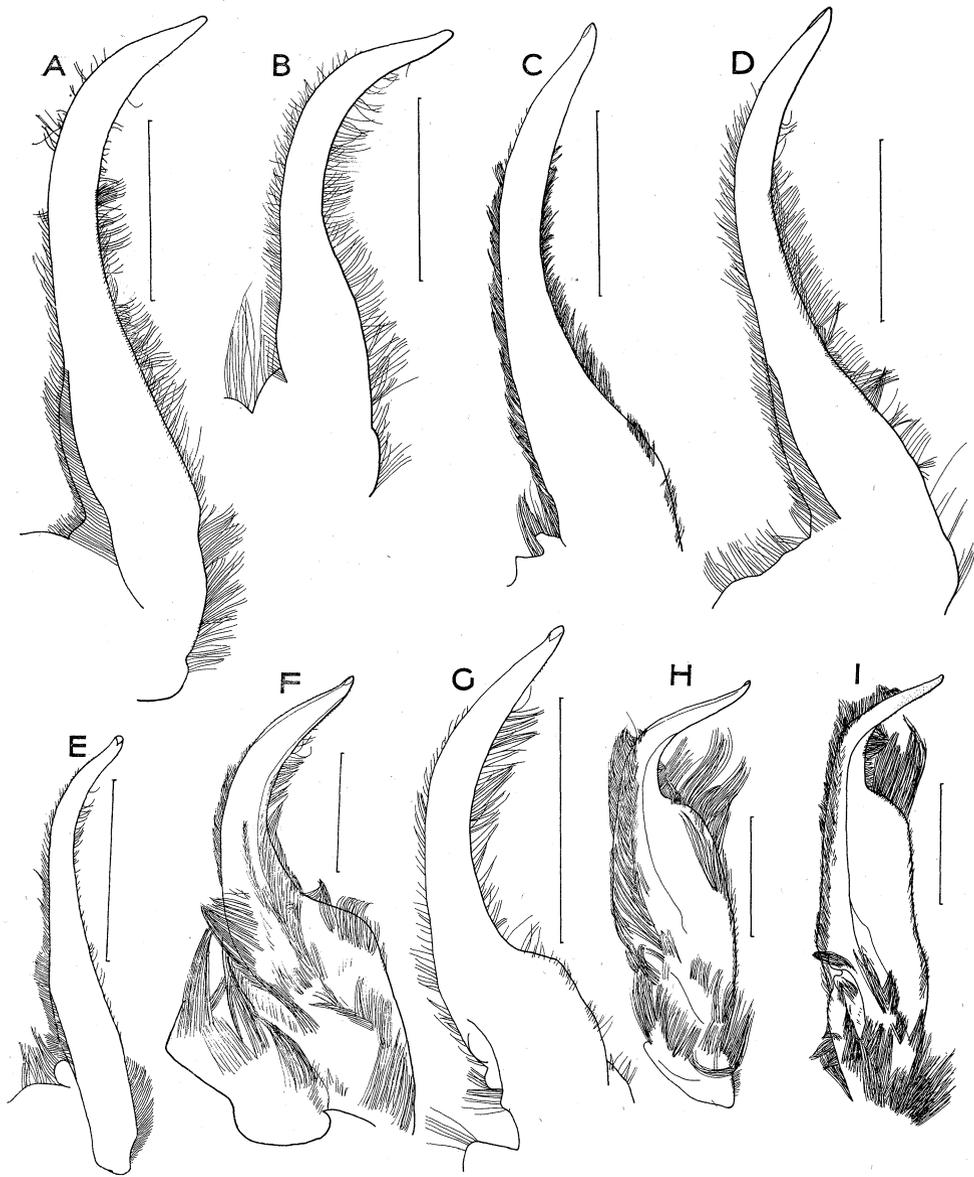


Fig. 3.—Low power views of upper surface of first male pleopod from left side. Scale, 5 mm. A. *Ovalipes punctatus*; B. *O. trimaculatus*; C. *O. catharus*; D. *O. australiensis*; E. *O. georgei*; F. *O. iridescens*; G. *O. molleri*; H. *O. ocellatus*; I. *O. guadulpensis* form a.

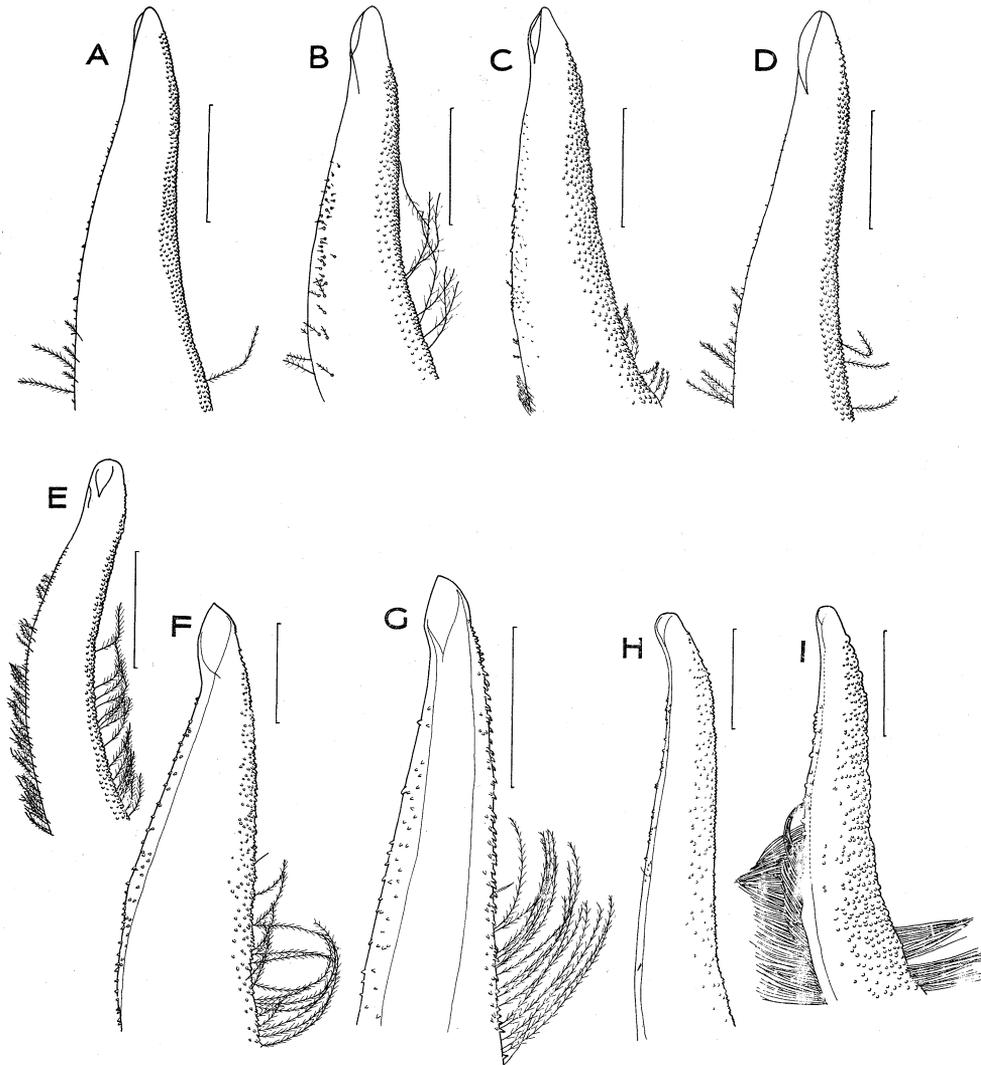


Fig. 4.—High power views of upper surface of first male pleopod from left side. Scale, 1 mm. A. *Ovalipes punctatus*; B. *O. trimaculatus*; C. *O. catharus*; D. *O. australiensis*; E. *O. georgei*; F. *O. iridescens*; G. *O. molleri*; H. *O. ocellatus*; I. *O. guadulpensis* form a.

## EXPLANATION OF PLATES

Plate 35. Dorsal views; scale for A-C, 1 div. = 1 mm; D, distance between white dots = 5 mm. A. *Ovalipes punctatus* (de Haan); B. *O. trimaculatus* (de Haan); C. *O. australiensis* n. sp.; D. *O. australiensis* n. sp., juvenile.

Plate 36. Dorsal views; scale, 1 div. = 1 mm. A. *Ovalipes catharus* (White); B. *O. elongatus* n. sp.; C. *O. georgei* n. sp.; D. *O. iridescens* (Miers).

Plate 37. Dorsal views; scale, 1 div. = 1 mm. A. *Ovalipes molleri* (Ward); B. *O. ocellatus* (Herbst); C. *O. guadulpensis* (Saussure) form a; D. *O. guadulpensis* (Saussure), form b.

Plate 38. Hand of cheliped. A. *Ovalipes punctatus* (de Haan) outer surface; B. *O. punctatus* (de Haan), under surface; C. *O. trimaculatus* (de Haan), outer surface; D. *O. trimaculatus* (de Haan), under surface; E. *O. catharus* (White), outer surface; F. *O. catharus* (White), under surface.

Plate 39. Hand of cheliped. A. *Ovalipes australiensis* n. sp., outer surface; B. *O. australiensis* n. sp., under surface; C. *O. elongatus* n. sp., outer surface; D. *O. elongatus* n. sp., under surface; E. *O. georgei* n. sp., outer surface; F. *O. georgei* n. sp., under surface.

Plate 40. A. *Ovalipes iridescens* (Miers), outer surface of hand of cheliped; B. *O. molleri* (Ward) outer surface of hand of cheliped; C. *O. georgei* n. sp., fifth leg; D. *O. ocellatus* (Herbst), upper surface of hand of cheliped; E. *O. guadulpensis* (Saussure) form a, upper surface of hand of cheliped; F. *O. guadulpensis* (Saussure) form b, upper surface of hand of cheliped.

Plate 41. A-E. Ventral surface of carapace showing pterygostomial ridge (pr), and ischium and proximal part of merus of cheliped; A. *Ovalipes iridescens* (Miers); B. *O. molleri* (Ward); C. *O. ocellatus* (Herbst); D. *O. guadulpensis* (Saussure) form a; E. *O. guadulpensis* (Saussure) form b. F. *O. australiensis* n. sp., dactyl of first walking leg of male, showing tricarinate tip; G. *O. australiensis* n. sp., distal part of merus and proximal part of carpus of first walking leg of male showing meral collar. Merus on left, carpus on right.

Plate 42. Front of carapace showing frontal teeth, orbits, and first anterolateral teeth. A. *Ovalipes punctatus* (de Haan); B. *O. trimaculatus* (de Haan); C. *O. catharus* (White); D. *O. australiensis* n. sp.; E. *O. elongatus* n. sp.; F. *O. georgei* n. sp.; G. *O. iridescens* (Miers); H. *O. molleri* (Ward); I. *O. ocellatus* (Herbst); J. *O. guadulpensis* (Saussure) form a; K. *O. guadulpensis* (Saussure) form b.

