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AN ACCOUNT OF AUSTRALIAN ATYIDAE.¹

By

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During the study of the freshwater carcinological materials from New Caledonia² I asked Dr. C. Anderson, Director of the Australian Museum in Sydney, to send me comparative materials of the family Atyidae from Australia.

Thanks to the kind assistance of my colleague, the late Mr. A. R. McCulloch, I have been able to study the Atyidae of the Australian Museum collected in this continent. I here wish to express my gratitude to these two gentlemen for their kindness.

As Australian Atyidae are very rarely mentioned in the carcinological literature, I consider it useful to publish the results of my investigations. I have been able to distinguish in the collection two new species, one belonging to the genus *Paratya* (*P. howensis*) and another to the genus *Caradina* (*C. mccullochi*); besides these I can mention the presence in Australia of two varieties of *C. nilotica* (var. *meridionalis* J. Roux, and var. *aruensis* J. Roux). The former also inhabits New Caledonia,³ while the latter was described by me from the Aru Islands.³ The species examined in this paper come from the mainland of Australia, Norfolk Island and Lord Howe Island.

The following is a list of the species:—

- Paratya* (*Paratya*) *australiensis* Kemp.
- Paratya* (*Xiphatyoida*) *norfolkensis* Kemp.
- Paratya* (*Xiphatyoida*) *howensis* n. sp.
- Caridina typa* Milne Edwards.
- Caridina nilotica*, var. *meridionalis* J. Roux.
- Caridina nilotica*, var. *aruensis* J. Roux.
- Caridina serratirostris* de Man.
- Caridina mccullochi* n. sp.

¹Since the completion of this paper the author has finished and published a work (referred to in footnote ²) on the Decapoda of New Caledonia which has some bearing on the facts contained herein, and is frequently referred to by him. Almost simultaneously with the appearance of Dr. Roux's New Caledonian report (1926) Dr. Calman published a paper on some freshwater prawns (Atyidae) collected in Queensland by Capt. G. H. Wilkins (Ann. Mag. Nat. Hist. (9), xvii, Feb., 1926, p. 241). A critical examination of this work, however, suggests that its contents do not conflict in any way with Dr. Roux's present contribution.—EDITOR.

²Roux—Crustacés décapodes d'eau douce de la Nouvelle-Calédonie in Fr. Sarasin and J. Roux, Nova Caledonia, Zoologie, iv, 2, 1926.

³Roux—Abhand. d. Senck. Naturf. Ges. Frankfurt, a/M., xxxv, 3, 1919, p. 321;

The species now known from the mainland of Australia are as follows:—

1. *Paratya (Paratya) australiensis* Kemp.

Queensland:—Burnett River (Ortmann, 1894).⁴

New South Wales:—Clyde, near Sydney (Kemp, 1917).⁵ Pallal, Horton River near Bingara; North Yanco, Narrandera; Jamberoo, South Coast; near Singleton; Duggan's Gully Creek, Upper Chichester, near Dungog; Norton's Basin, Nepean River; Prospect Reservoir, near Parramatta; creek at Middle Harbour, Port Jackson; Marrickville, near Sydney (Roux, this paper). Without precise locality (Thomson, 1903).⁶ Parramatta Park (Whitelegge, as *Palaemon* sp., 1889).⁷

South Australia:—Sturt Creek, near Blackwood, Adelaide (Roux, this paper).

Victoria:—Melbourne (Bouvier, 1905)⁸; without precise locality (Thomson, 1903).⁶

2. *Caradina typa* M. Edw.

Queensland:—Cooktown; Dunk Island (Roux, this paper).

3. *Caridina nilotica*, var. *meridionalis* J. Roux.

Queensland:—Burnett River (Ortmann, as *C. wycki* 1894,⁴ and Roux, this paper); Cooktown, Cairns (Roux, this paper).

4. *Caridina serratiostris* de Man.

Queensland:—Cairns (Roux, this paper).

5. *Caridina mccullochi*, n. sp.

New South Wales:—Pallal, Horton River, near Bingara; creek at Port Macquarie (Roux, this paper).

6. *Atya scabra* Leach.

Victoria:—No precise locality (Bouvier, 1905).⁸

7. *Atya striolata* McCulloch & McNeill.

New South Wales:—Norton's Basin, Nepean River (McCulloch & McNeill, 1923); Woronora River, tributary of George's River (as a footnote to this paper).

Genus PARATYA Miers.

In a work to be shortly published on the freshwater Decapoda from New Caledonia (see footnotes ¹ and ²), I have explained in detail the reasons which lead me to divide this genus into two distinct sub-genera, to which I have given the names of *Paratya* s. str. and *Xiphatyoida*. I will resume the differentiating characters of these two groups.

Sub-genus Paratya s. str. This group includes the species known up to date, viz.:—*P. compressa* (de Haan) of Japan and Adenare near Flores, *P. curvirostris* (Heller) of Assam and New Zealand, and *P. australiensis* Kemp of Australia. These species are characterised by the elongated carpus of the chelipeds, especially on the second pair; the carpus of these last legs is but very slightly excavated in front. The

⁴Ortmann in Semon's Zool. Forschungsr. Austr., v, (Denkschr. med.—naturw. Gesellschaft, Jena, viii), 1894, p. 10; and Proc. Acad. Nat. Sci. Philad., 1894, pt. 3, p. 400 (for references to Ortmann's Burnett River record of *C. nilotica*, var. *meridionalis* as above, see pages 11 and 405 respectively).

⁵Kemp—Rec. Indian Museum, xiii, 5, 1917, p. 304.

⁶Thomson—Trans. Linn. Soc. Zool., London (2), viii, 1903, p. 449.

⁷Whitelegge—Journ. Roy. Soc. N.S. Wales, 1889, p. 320.

⁸Bouvier—Bull. Sci. France et Belgique, xxxix, 1905.

digits of the chelipeds are provided with long and thin stylets. The fifth dactylopodite is characterised by the possession of only one terminal claw, which is larger than the lateral spines.

Sub-genus Xiphatyoida :—This group includes some species which are characterised by the noticeable shortness of the carpus of both pairs of chelipeds, those of the second pair having a deep and well marked excavation in front. I sometimes also notice in these species the occasional presence of large, strong nails at the extremities of the fingers; the fifth dactylopodite always possesses, next to the terminal claw, one or two other sub-terminals, which are also bigger than the lateral spines of the digit. This sub-genus includes to date the following species: *P. norfolkensis* Kemp (Norfolk Island); *P. howensis* n. sp. (Lord Howe Island); and three species from New Caledonia—viz.:—*P. bouvieri* J. Roux with its variety *ngoiënsis* J. Roux, *P. caledonica* J. Roux and *P. typha* J. Roux.

The species of this second group are to be regarded as more evolved than those of the first subdivision.

PARATYA (PARATYA) AUSTRALIENSIS (*Kemp*).

(Table A).

1894. *Miersa compressa* Ortmann, Jenaische Denkschrift viii (Semon's Forschungsreisen in Australien,) p. 10.
 1902. *Xiphocaris compressa* Thomson, Trans. Linn. Soc. London (2) viii, p. 449.
 1904. *Xiphocaris compressa* Bouvier, Bull. Mus. Hist. Nat. Paris, p. 129.
 1905. *Xiphocaris compressa* Bouvier, Bull. Scient. France & Belgique, xxxix, p. 61, fig. 1.
 1909. *Xiphocaridina compressa* Bouvier, Bull. Mus. Hist. Nat. Paris, p. 329.
 1912. *Xiphocaridina compressa* Kemp, Rec. Indian Mus., Calcutta, vii, p. 114.
 1917. *Paratyia australiensis* Kemp, Rec. Ind. Mus., Calcutta, xiii, p. 303, fig. 5.

Localities.—*New South Wales* :—Pallal, Horton River, near Bingara, December, 1909, collected by the late A. R. McCulloch; North Yanco, Narrandera, 1910; Jamberoo, south coast district, presented by Prof. L. Harrison, 1913; near Singleton, 1st August, 1918, descended with rain; Duggan's Gully Creek, Upper Chichester, near Dungog, Sept., 1921, collected by A. Musgrave; Norton's Basin, Nepean River, presented by the late A. R. McCulloch, 1913; Prospect Reservoir, near Parramatta, collected by the late R. Etheridge, 1902; creek at Middle Harbour, Port Jackson, January, 1911, collected by the late Dene B. Fry; from a disused potter's pit in Marrickville, near Sydney, April, 1924, collected by F. A. McNeill.

South Australia :—Sturt Creek, near Blackwood, Adelaide, collected by E. Le G. Troughton, March, 1920.

The numerous specimens before me show that this species, which is spread over a great part of the Australian continent, varies considerably,

TABLE A.

TABLE OF MEASUREMENTS OF *Paratya australiensis* KEMP.

				Horton River female ovig.	Nepean River female ovig.	North Yanco female ovig. (rostrum short)	Parra- matta female ovig.	Ade- laide female	North Yanco male (rostrum long)	Port Jackson male
		Total length		27 mm.	25 mm.	25 mm.	32 mm.	24 mm.	25 mm.	26 mm.
1st Chelip.	{	Carpus, length : breadth		2	2.4	2.6	1.6	1.83	2.2	2.8
		Chela, 1. : br.		3.2	3	3	2.5	2.6	2.6	3.2
		Chela, dact. : palma... ..		0.78	0.87	1.1	0.6	0.9	0.6	1
2nd Chelip.	{	Carpus, 1. : br.		7	7	7.5	5.1	5.6	7.4	6.6
		Chela, 1. : br.		4	4	3.7	3.1	3.2	3.5	3.4
		Chela, dact. : palma... ..		1	1.2	0.78	1.1	1.36	0.87	1.5
III Pereiop.	{	Prop. : dact.		3.8	4.2	3.1	4.2	4	4	4
		Dact., length : breadth		3.6	4.2	5.4	3.6	3.55	4.3	3.9
		Spines		9	12	11	10	11	10	9
V Pereiop.	{	Prop. : dact.		3.1	3.4	2.5	3	3.2	3.1	3.8
		Dact., length : breadth		4.5	4.7	5.7	4.8	4.2	5.2	4.3
		Spines		74	69	80	75	64	69	52
Eggs	{	length		0.52-0.57	0.66-0.69	0.66-0.69	0.82-0.85	—	—	—
		breadth		0.28-0.31	0.41-0.44	0.39-0.42	0.49-0.52	—	—	—

either in the form, the dimensions and armature of the rostrum, or in the proportions of the legs and the size of the eggs.

Notwithstanding the differences that are found among the specimens from the diverse localities of New South Wales and South Australia, I have not been able to separate these samples into peculiar regional races. Our knowledge of the Atyidean fauna is still too poor and at present it appears impossible on account of the intermediate forms which connect the very different specimens to establish very sharp divisions into varieties. I have found individuals with a short rostrum, others with a long one, and others again with a very long rostral appendage. These variations do not agree with those of the proportions of the legs or with the size of the eggs. Further, I have not been able to find marked differences in the form of the first male pleopod. I will therefore describe all these specimens under the specific name used by Kemp (*loc. cit.*). In his account of the Atyidae of the genus *Paratya*, this author mentions the great variations in the proportions of the legs, but I have found that they are greater than he has indicated.

The specimens from Horton River, near Bingara, have the rostrum as long as the antennular peduncle and armed with numerous teeth, two or three proximal of which are placed on the carapace. In one female specimen I have noted the rostral formula $\frac{(2)25}{5}$. In the table of measurements of this species (see p. 240) will be found the relations obtained by the measurements of the joints of the chelipeds and legs. These proportions are contained in the limits indicated by Kemp. The eggs of this female are 0.52-0.57 mm. long and 0.28-0.29 mm. wide; those of another female were of the same length, but slightly wider, 0.31 mm.

The specimens from North Yanco, Narrandera, may be divided into two groups. In the first, which includes two males and one female without eggs, the rostrum exceeds the extremity of the antennular peduncle and reaches in front as far as the antennal scale; the rostral formulae stated are: $\frac{(2)29}{8}$, $\frac{3(26)}{5}$, $\frac{(2)23}{5}$. I have mentioned in the table of measurements the totals obtained for a male specimen of about 25 mm. still possessing all its legs.

In the second group, which includes the other specimens from the same locality, the rostrum is much shorter; pointed downwards, it reaches hardly to the extremity of the first segment of the antennular peduncle and is sometimes even still shorter. In these specimens the teeth are fewer and none of them are situated on the carapace. The rostral formulae are as follows: $\frac{(0)12}{2}$, $\frac{(0)12}{3}$, $\frac{(0)13}{2}$, $\frac{(0)15}{1}$, $\frac{(0)15}{2}$, $\frac{(0)18}{3}$. The proportions of the limbs are given in the table of measurements for an ovigerous female of about 25 mm. length.

The carpi of the chelipeds are very long, but this is a character that is found also in *P. australiensis* with normal rostrum (e.g., from Horton River); the only point that would seem peculiar is the shortness of the dactylus V, but specimens with a long rostrum show the same character. The eggs of the female with a short rostrum are 0.66-0.69 mm. long and

0.39-0.42 mm. broad, so they are a little bigger than those of the females from Horton River, but we shall see below that they are, however, smaller than those of the females with a normal rostrum from Parramatta. The shortness of the rostrum does not seem to be a sufficient reason for separating these specimens from the others.

The specimens from Jamberoo (south coast district of New South Wales) show the normal characters of this species. The rostrum is longer than the antennular peduncle; it reaches sometimes beyond the end of the scaphocerite. The upper border carries 7-30 teeth, the two proximal of which are situated on the carapace; the lower border bears 4 to 9 teeth; a female without eggs is 26 mm. long.

From Singleton there are three typical specimens, the largest of which is a female without eggs 31 mm. in length. The very long rostrum reaches beyond the scaphocerite, and its upper border carries a great number of teeth (29-36); the lower border has 8-11 teeth. In this female the rostrum is 7 times as long as broad.

The only specimen from Duggan's Gully Creek, near Dungog, has a damaged rostrum, but judging from the part remaining, it seems to be normal and to reach as far as the extremity of the scaphocerite. Two teeth are on the cephalothorax and there are 21 teeth to the point of fracture; the lower border carries 3 teeth. This specimen is about 28 mm. long.

The two females found at Norton's Basin, Nepean River, are also typical. These have the rostrum very long, reaching a little beyond the scaphocerite; the rostral formulae are: $\frac{(2)21}{7}$, $\frac{(1)20}{8}$. One of these females, of normal size, bears eggs which are 0.66-0.69 mm. long and 0.41-0.44 mm. broad. The proportions of the legs are included in the limits known for this species; they will be found in the table of measurements.

The specimens from Parramatta are well preserved. The largest female bearing eggs measures 32 mm. in length and the eggs are 0.82-0.85 mm. long and 0.49-0.52 mm. broad. They are rather numerous, but still fewer than those of the females from the Horton River; probably a certain number of them must have become detached. The rostrum in these specimens does not reach the extremity of the antennular peduncle; it reaches only to the extremity of the second segment. The teeth are less numerous than those of the typical specimens; I have counted 14 to 23 teeth on the upper border. Sometimes the two proximal teeth are situated on the carapace, at other times only one. Again, others have all the teeth situated on the rostrum. The table gives the measurement relative to a big ovigerous female specimen in this batch.

From Marrickville (a suburb of Sydney) I have examined 5 females, which are the biggest in the whole collection. They were found in a disused potter's pit and do not bear eggs. The largest specimen is 35 mm. long, the others being a little smaller (34 and 32 mm.). In these examples the rostrum is quite as long as, or even a little longer than the antennular peduncle, and the teeth are very numerous. I have noted the following formulae: $\frac{(5)36}{16}$, $\frac{(3)33}{12}$, $\frac{(4)31}{8}$, $\frac{(3)29}{13}$.

TABLE B.

TABLE OF MEASUREMENTS OF

<i>Paratya (X.) norfolkensis</i> Kemp.						<i>Paratya (X.) howensis</i> n. sp.		
Sex.	Total length	After Kemp	Female 26 mm. W. side	Female 20 mm., E. side	Male 16 mm., E. side	Female, ab., 20 mm.	Female 18 mm.	Male 15 mm.
	Rostr. Formula ...	$\frac{(2-5) 21-32}{3-8}$	$\frac{(5) 27}{6} = \text{ant ped.}$	$\frac{(5) 33}{5} > \text{scaph.}$	$\frac{(4) 28}{5} = \text{ant ped.}$	—	$\frac{(1) 16}{5} < \text{ant ped.}$	$\frac{2) 15}{2} < \text{ant ped.}$
1st	{ Carpus, length : breadth ...	{ female 1.3-1.6 male 1.7-1.9	1.4	1.45	1.4	1.2	1.1	1.1
Chelip.	{ Chela, length : breadth ...	—	2.5	2.36	2.2	2.25	2.17	2
	{ Chela, dact : palm ...	—	0.58	0.62	0.75	0.63	0.66	0.62
2nd	{ Carpus, length : breadth ...	4.2-4.9	4.8	4.52	4	3.75	4	4
Chelip.	{ Chela, length : breadth ...	—	3.1	3	3.1	3.2	2.7	2.7
	{ Chela, dact. : palm ...	—	1.19	1.1	1.1	1.28	1.06	1.4
III.	{ Prop. : dactyl. ...	{ female 4.3-5.2 male 3.7-3.9	4.5	4.8	3.8	4.3	4.2	4
Pereiop.	{ Dactyl., length : breadth ...	2.1-2.7	3.1	3	3.5	3.3	3.1	4
	{ Spines ...	6-8(9)	7	7	7	8	6	6
V.	{ Prop. : dactyl. ...	{ 4.2-4.4 male 3.9	5	4.1	3.8	4	3.7	3.1
Pereiop.	{ Dactyl., length : breadth ...	2.4-2.8	3	3.1	4	4	3.88	4.1
Eggs	{ Spines ...	35-43 + 2-3	42 + 3	33 + 3	36 + 3	53 + 3	43 + 3	32 + 2
	{ ...	—	—	—	—	—	—	—

The specimens from a creek at Middle Harbour, Port Jackson, are typical. In most of these the very long rostrum reaches beyond the antennular peduncle, and the number of teeth on the upper border varies from 21 to 32; in some examples there are 1-3 teeth on the carapace, in others (especially the younger ones) all the teeth are situated on the rostrum. The lower border of the rostrum carries 3-8 teeth. One female without eggs measures 26 mm. in length; the proportions of the length of the legs can be found in the table.

In the specimens collected at Sturt Creek, near Blackwood, Adelaide, the rostrum is very long, reaching beyond the antennular peduncle. It has 19-24 teeth on the upper border, and these are all situated (with one exception) on the rostrum. Some individuals have the distal quarter of the upper rostral border devoid of teeth. The lower border carries 1-7 teeth that are often only very slightly distinguishable. The table gives the measurements of the limbs of a female specimen.

PARATYA (*XIPHATYOIDA*) NORFOLKENSIS *Kemp*.

(Table B.)

Paratya australiensis subsp. *norfolkensis* *Kemp*.

I have examined some individuals of this species, the larger ones coming from the west coast of Norfolk Island, the smaller collected on the opposite coast. The authors who have studied this species (*Grant* and *McCulloch*,⁹ and *Kemp*¹⁰) have also noticed the difference in size between the specimens from the two opposite coasts, but consider them, with reason, as belonging to one and the same species.

The differences noted in the length of the rostrum are not as constant as one might at first think, and the measurements taken of the appendages of the two forms show about the same proportions. I have already explained the reason why I separate this species from those living on the Australian continent.

As in the Australian species, the antennular bridge bears a high, cutting keel. The proportion of the length of the antennular peduncle (measured from the orbital notch) and the postorbital length of the cephalothorax varies between 0.66 and 0.76 in both races. The rostrum is similar in shape to that of *P. (P.) australiensis*; its length is variable, but is never less than the length of the antennular peduncle. In most individuals it is as long as the scaphocerite; it is bent downwards, more in adult specimens than in young ones. On its upper border it carries usually 26 to 29 teeth or more (34 teeth have even been counted), which form an uninterrupted series from the base to the apex. In the young specimens the rostral teeth are fewer, only 17-24 being present. The 4 or 5 proximal teeth of the adults are situated on the carapace behind the orbital notch; in the young these number only 2-3. On the lower border there are 3-6 teeth. As *Kemp* (*loc. cit.*) has already shown, the carpus of the chelipeds, especially that of the first pair, is much shorter than in the Australian species; the anterior excavation is deeper, more developed, and some-

⁹Grant and McCulloch—Proc. Linn. Soc. N.S. Wales, xxxii, 1907, p. 156.

¹⁰Kemp—Rec. Indian Museum, Calcutta, xiii, 1917, p. 305.

times extends for nearly half the length of this segment of the limbs. This same character is found in the species inhabiting Lord Howe Island, and also in those of New Caledonia. I have measured two females (a big one and a small one) and one male specimen of the last race, but have not been able to find that the differences between the two sexes are as marked as Kemp has indicated. The relations obtained in the measurements of these three individuals mentioned above are indicated in the table facing page 243.

The carpus of the first chelipeds is more than twice as broad as long and is deeply excavated in front. The chela is heavy and massive (ratio : 2.2-2.5); its surface is embossed and the finger is always shorter than the palm (ratio : 0.58-0.75).

The carpus of the second cheliped is also shorter and excavated more deeply than in *P. (P.) australiensis*. The ratio length : breadth varies, in the measured specimens, from 4 to 4.8. The chela is more slender than in the first legs, being about 3 times as long as broad; the dactylus is slightly longer than the palmar portion. I have found that the terminal armature of the finger of the first chelipeds is noticeably different to those of the Australian species. The dactyli are armed with 3 large yellow nails instead of the slender stylets already mentioned for *P. (P.) australiensis*. The longest nail is placed at the extremity of the dactylus, the two others a little in front, on the right and on the left of the inner surface of the finger. This conformation exists in the two Norfolk Island races, but in the smaller examples these nails are proportionately shorter and broader (ratio 2.5-3, instead of 5 in the larger race).

At the extremity of the dactyli of the second chelipeds, there are only 3 slender stylets, which are placed very close to one another, the median one being the longest. These stylets show a slight difference in the two races. In the smaller specimens the terminal stylet is a little broader than the two others (7 times as long as broad, instead of 10). In the larger race the form of the stylets is nearly the same, but they are proportionately longer (13-14 times).

Like Kemp, I have observed that the propodus of the third and of the fifth leg is proportionately a little longer in the male than in the female ($\frac{\text{Prop.}}{\text{Dact.}}$ III.—3.8 male, and 4.5-4.8 female; $\frac{\text{Prop.}}{\text{Dact.}}$ V.—3.8 male and 4.1-5 female). The dactylus III bears 7 spines, and that of the fifth leg 33-42 spines, in addition to 3 claws, which are larger than the spines; the terminal one of these claws is the largest.

The presence of the claws distinguishes at a glance the species belonging to the sub-genus *Xiphatyoida*.

Epipodites are present at the base of all the pereopods with the exception of the fifth. The dimensions of the specimens before me are about the same as those given by Kemp. None of the females bear eggs.

PARATYA (XIPHATYOIDA) HOWENSIS *n. sp.*

(Table B.)

Locality:—Big Creek, Lord Howe Island (collected, the late A. R. McCulloch, 3rd March, 1912).

The specimens lying before me are nearly of the same size as the small race from Norfolk Island, 18 mm.; the males are a little smaller, 16 mm.

This species has a well developed keel at the antennular bridge. The proportion of the antennular peduncle and the postorbital portions of the cephalothorax varies from 0.7 to 0.78. In all the specimens the supraorbital spine is well developed. This is not always the case in the infraorbital one, which is missing in half of the examples; in these the infero-orbital border is broadly rounded.

The rostrum is generally a little shorter than the antennular peduncle or quite as long. It is horizontal and possesses on its upper border 15-18 regularly implanted teeth, the 2 or 3 proximal ones being situated on the carapace. The lower border carries from 2 to 5 teeth, which are much larger and more inclined than the upper ones. The antennular acicle is very long and exceeds the base of the second antennular segment.

The chelipeds are massive, especially those of the first pair. In these latter the carpus is very short and deeply excavated in front; in the measured specimens (2 females and one male) the ratio $\frac{\text{length}}{\text{breadth}} = 1.1-1.2$

The chela is very broad in comparison with its length, and the surface of its palm is embossed; the proportion of the length to the breadth varies from 2 to 2.25. The mobile finger is very short and is only 0.63-0.66 of the length of the palm. As in the species from Norfolk Island and from New Caledonia, the finger of the first chelipeds has short and broad nails at its extremity; the median one is about 2.5 times as long as broad, while the others are nearly as long but are a little narrower.

The carpus of the second cheliped is much shorter than in the species *P. (P.) australiensis* and *P. (P.) curvirostris*. As already stated above, this character is to be found also in *P. (X.) norfolkensis* and the New Caledonia forms. In the specimens measured I have obtained the following proportions: $\frac{\text{length}}{\text{breadth}} = 3.75-4$. The anterior excavation is very

well marked and more accentuated than in the species of the sub-genus *Paratya*. The chela is not as thick as those of the first chelipeds, the ratio length: breadth varying from 2.7 to 3.2; the mobile finger is a little longer than the palmar portion (ratio: 1.1-1.4). The dactyli are armed at their extremities with 3 small stylets (ratio: length: breadth, 5-5.5); they are rather indistinct among the setae.

The propodite of the third legs is 4-4.3 times as long as the dactylus. This last segment is 3.3-4 times as long as broad, and has 32 to 53 lateral spines followed by 2-3 large terminal claws, the last of which is the strongest.

Epipodites are well developed at the base of the four anterior pairs of pereopods. None of the females was ovigerous.

This species is very nearly related to *P. (X.) norfolkensis* Kemp, but differs from it in the form and dentition of the rostrum and in the shorter carpus I. It is also related to *P. (X.) caledonica* Roux, from south New Caledonia, but this last species has a much shorter rostrum and a much smaller number of spinules on the fifth dactylus (13-23).

*Genus CARIDINA M. Edw.*CARIDINA TYPA *M. Edw.*

Localities.—*Queensland*:—Creek at Cooktown, May, 1918, collector A. R. McCulloch, 7 specimens (collected with *C. nilotica*, var. *australis* Roux), Aust. Mus. Reg. No. P.4296, part; Dunk Island, 1 specimen presented by the late E. J. Banfield, 1912, Aust. Mus. Reg. No. P. 3212.

The rostrum has the typical form. In some individuals it reaches as far as the end of the basal segment of the antennular peduncle; in others it is slightly longer. In all specimens it is bent downwards and the upper border is devoid of teeth; the lower border has 2-5 teeth. The antennular bridge has a low but distinct carina.

The epipodites are well developed at the base of the four anterior pairs of pereopods. The largest female is 24-25 mm. long. None of the specimens bears eggs.

CARIDINA NILOTICA var. MERIDIONALIS *Roux*.¹¹

Localities.—*Queensland*:—Creek at Cooktown, May, 1918, collector A. R. McCulloch, 10 specimens (found with the preceding species, Aust. Mus. Reg. No. P.4296, part; Cairns, presented by F. H. Taylor, 1918, 7 specimens (collected with *C. serratirostris* de Man), Aust. Mus. Reg. No. P.4233, part; Eidsvold, Burnett River, coll. Dr. T. L. Bancroft, 1911, 5 specimens.

The specimens possess the principal characters of *Caridina nilotica*: antennular bridge without keel, preorbital length of antennular peduncle being 0.8 from the postorbital length of the cephalothorax; epipodites well developed at the base of the four anterior pairs of pereopods; rostrum mostly without teeth on the distal part of the upper border. I consider the specimens before me as belonging to the variety *meridionalis* described by me in another paper on the crustaceans from New Caledonia.¹² Although some variation occurs in the proportions of the legs, I put together in the same variety the specimens from Australia and those from New Caledonia. Only the specimens from Cooktown are well preserved. Among the largest examples there are ovigerous females of 28-29 mm. length. The rostrum has the typical shape for this species; it is usually devoid of teeth on a longer or shorter distal part of the upper border (about $\frac{1}{3}$). This border has 16-22 teeth, the two first of which

¹¹Balss, in K. Sv. Vet. Akad. Handl. lxi, 10, 1921 (Res. Dr. Mjöberg's Swedish Sci. Expd. Australia, 1910-13, xxix), p. 7 gives a reference "*Xiphocaridina compressa*" from Cedar Creek, Cairns district, N. Qld. This record may be referable to the above species or to *C. serratirostris* as determined here by Dr. J. Roux.—EDITOR.

¹²Roux, in Sarasin & Roux, Nova Caledonia, Zoologie, iv, 2, 1926, p. 207. [The paper in "Nova Caledonia" here referred to by Dr. Roux was only in course of preparation at the time this present contribution was written. It may therefore be discovered by readers that the proportions of *Caridina nilotica*, var. *meridionalis* do not agree as closely with those of the New Caledonian examples written upon by Dr. Roux. We must assume, therefore, that the author had more complete material for examination when he finalised his report on "Crustacés décapodes de la Nouvelle-Calédonie.—EDITOR.]

are situated on the cephalothorax. Sometimes the space between the two distal teeth is larger than that between the others. On the lower border there are 13-16 teeth, the distal ones of which are often very small. In these specimens the rostrum is very long; it reaches beyond the end of the antennular peduncle, and its extremity, turned upwards, reaches to the end of the scaphocerite.

The antennular acicle is a little shorter than the basal segment. The carpus of the first cheliped is rather short; its breadth is not twice its length (1.7-1.9). The chela is twice as long as broad and the proportion between the finger and the palmar portion is a little more than 1: (1.1).

The carpus of the second pair of limbs is 4.4-4.8 times as long as broad anteriorly. The chela is rather elongated (2.3-2.7); the finger is always longer than the palmar portion (1.3-1.7). The propodite of the third leg is 4.2-4.5 times as long as the digit; this proportion is a little lower than in the New Caledonian specimens (4.6-5.3). The dactylus is 3.3-3.6 times as long as broad and bears 8-9 spines. In the specimens from New Caledonia the proportion is the same, but the dactylus possesses only 7 spines.

On the fifth pair of pereiopods, the proportion between the propodite and the dactylus varies from 3.8 to 4.1. The digit is 4.5-5 times as long as broad; it is armed with 51 to 66 spines.

There are 12 uropodial spines. The eggs are small and numerous (0.36-0.39 mm. long and 0.21-0.23 mm. broad). The smallest ovigerous females are about 27 mm. long. I also regard the 5 specimens from Eidsvold, Burnett River, as belonging to this variety. They are all devoid of pereiopods, but the form and proportions of the rostrum and the dimensions of the eggs are the same as in the before-mentioned individuals from Cooktown.

The rostrum reaches sometimes beyond the scaphocerite; the formulae are as follow: $\frac{(2)23 + 1 + 1}{13}$, $\frac{(2)23 + 1}{6}$, $\frac{(2) 21}{11}$, $\frac{(2) 19 + 1 + 1}{8}$.

The largest specimen is an ovigerous female which is about 33 mm. long. The eggs are 0.49-0.52 mm. long and 0.29-0.31 mm. broad. These dimensions are a little above those found in the specimens from Cooktown, but I have also noticed such variations in the examples from New Caledonia.

The specimens from Cairns, Queensland, are all young; only one of these has an undamaged rostrum, which is longer than the scaphocerite. The rostral formula is $\frac{(2) 17 + 1}{11}$. None of these specimens have any pereiopods at all.

The variety *meridionalis* is connected with *gracilipes* de Man and *brevi-dactyla* Roux, which also have small eggs. There are many differences, though, in the form and in the proportions of the legs. The carpi I and II are shorter. On the third pair of pereiopods, the digit is relatively longer than in *brevi-dactyla*, but a little shorter than in the variety *gracilipes*. On the fifth pair, the dactylus is relatively longer than in *brevi-dactyla* and broader than in *gracilipes*.

CARIDINA NILOTICA var. *ARUENSIS* J. Roux.

Locality.—*Queensland*:—creek 40 miles S.W. of Townsville (coll. Dr. W. E. J. Paradiçe, R.A.N., 1924), 4 female specimens (2 badly preserved).

These specimens agree very well with those I have described from the Aru Islands.¹³ The single female with eggs is — mm. long.¹⁴ The rostrum has the typical form and reaches to the end of the scaphocerite; this distal part is slightly turned upwards. The upper border bears a proximal series of 21-23 teeth, the two first of which are situated on the carapace. One or two apical teeth are separated from the long proximal series by a short space devoid of teeth. The lower border carries 9-11 teeth.

In the proportions of the legs, as well as in the dimensions of the eggs, the specimens also agree with *C. nilotica*, var. *aruensis*.

By the female with eggs, the proportions of the legs are as follow:—Cheliped I. Carpus, length: breadth 2.6; Chela, I. : br. 2.44; digit: palm 1.34.

Cheliped II. Carpus, length: breadth 5.3; Chela, I. : br. 2.9; digit: palm 1.5.

The III pereopods are absent.

At the IV leg the proportion:—propodite: dactylop. = 4. The dactylus is 4 times as long as broad and has 11 spines (the last included).

At the V pereopod the proportion:—propod.: dact. = 3.6.

The dactylus is 4 times as long as broad and bears 45 spines. The proportions of the III pereopod of another specimen are as follow:—Propod.: dactylus 3.7; Dactyl., length: breadth 4. Spines 11 (including the last one).

The eggs are rather few in number and rather large. They are 0.64 mm. long and 0.39 mm. broad; very different in size to those of the preceding variety of the same species.

CARIDINA SERRATIROSTRIS de Man.¹⁵

Locality.—*Queensland*:—Cairns, presented by Frank H. Taylor, 1918; 3 specimens (collected with *C. nilotica*, var. *meridionalis* Roux, Austr. Mus. Reg. No. P.4322, part). These specimens are unfortunately in a bad state of preservation. Nevertheless, I am able to recognise the most typical features of the species, thus making my determination certain.

In an ovigerous female of 20 mm. length, the rostrum is well preserved. The structure begins before the middle of the carapace and is

¹³Roux—Abhandl. Senckenb. Gesellsch. Frankfurt a/M., Bd. 35, 1919, p. 321.

¹⁴Of the four specimens examined by Dr. Roux only two were returned to the Australian Museum, neither of them being the ovigerous female referred to here. For this reason we are not able to give the length of the last-mentioned example. The two examples in the Australian Museum, however, measure 16 and 17.5 mm., and from what is remembered of the batch of 4 specimens, they were all of about the same length.—EDITOR.

¹⁵Roux, in M. Weber, Zool. Ergebn. Reise Nierld. Ind., II, 1892, p. 382, pl. xxiii, f. 28.

turned downwards; it reaches hardly to the extremity of the second antennular segment. It is about 5-6 times as long as broad, and has on the upper border 19 teeth, the 5 proximal of which are situated on the cephalothorax. On the inferior border there are only 3 teeth. The eggs are small and numerous; they are 0.28 mm. long and 0.19-0.20 mm. broad.

In another ovigerous female with a damaged rostrum, there are 6 teeth on the carapace and the rostral carina begins also before the middle of the cephalothorax. This specimen still possesses one cheliped I. The carpus is 2.6 times as long as broad and very little excavated in front. The chela is elongated and thin, longer than the carpus. It is 2.6 times as long as broad and the digit is 1.4-1.5 times as long as the palmar portion. In this specimen also the eggs are numerous, but a little bigger than in the preceding one; they are 0.34-0.36 mm. long and 0.2-0.21 mm. broad.

A detached carpus II, found with these specimens, probably belongs to this species, in spite of its shape. It is about 6 times as long as broad; the chela is absent.

The third individual is young and devoid of pereopods; the rostrum is nearly intact. It is directed horizontally and its formula is as follows:—

$\frac{(6)^{24}}{6}$. It is a little shorter than the scaphocerite and about 8 times as long as broad. Only the basilar segment of the antennular peduncle is present; the basilar acicle reaches to a little before the extremity of this segment. In the preceding specimens it was as long as this joint.

The three above specimens show, with small individual differences, the principal characters of *C. serratirostris* de Man. The antennular bridge is devoid of a keel; the proportions of the length of the antennular peduncle and the post-orbital length of the carapace is, in the adult examples, smaller than 0.8, being about 0.65. Epipodites are present at the base of the four anterior pairs of pereopods. The uropodial spines are 14-16 in number. In spite of the dimensions of the pereopod I (carpus) we can attribute these specimens to the typical form, for in the variety *celebensis*—which we (Sarasin and Roux) also found in New Caledonia, this segment is more elongated.

CARIDINA MCCULLOCHI *n. sp.*

(Table C.)

Localities.—*New South Wales*:—from a freshwater stream at Port Macquarie, 3 specimens collected by the late A. R. McCulloch, 1913; Pallal, Horton River, near Bingara, 6 specimens (types)—secured with *Paratya australiensis* Kemp—collected by the late A. R. McCulloch, 1909; North Yanco, Narrandera, 1910, 3 specimens (collected with *P. australiensis* Kemp).

I will describe as the types of this new species the specimens from Pallal, which are in the best state of preservation. The adult females are 28 to 31 mm. long. The antennular bridge is devoid of a keel. The proportions of the preorbital length of the antennular peduncle and the postorbital length of the cephalothorax varies between 0.7 and 0.8, being generally less than the latter number.

The rostrum is rather long; in the majority of the specimens it reaches the end of the scaphocerite or is even a little longer. It is at first slightly bent downwards before the orbit and afterwards directed horizontally. The length is seven times the breadth, sometimes even a little more. The upper border carries numerous teeth which occupy the whole length, but these often vary in size. The proximal series comprises small, regularly placed teeth, situated close to one another, while the distal ones are bigger, more inclined, and further removed from one another. This peculiar disposition is to be found also in *C. cognata* de Man.¹⁶ In two specimens only the teeth are equal, and regularly distributed on the upper border; these bear respectively 29 and 32 teeth.

The number of these teeth varies from 25 to 32, the 3 first of which are situated on the cephalothorax. The proximal series is of variable length, and is formed by 22 to 25 teeth, the two first of which are a little more spaced than the ones following. The distal teeth, unequally implanted, vary in number. The lower border has 7 to 10 teeth, which are long and directed obliquely to the front; they are placed on the anterior half of this lower border.

The spine at the base of the antennular peduncle is shorter than the first segment; the spine at the base of the 2nd segment is shorter than half this segment. The infra-orbital angle of the cephalothorax is very pointed; the antero-inferior border is rounded.

The first cheliped does not reach to the extremity of the antennular peduncle, whilst the second goes a little beyond this point. Epipodites are well developed at the base of the four anterior pairs of pereopods.

The carpus I is relatively long (2.5-3 times as long as broad); the distal excavation is very shallow. The chela is a little longer than the carpus (ratio 1.18). It is 2.2-2.6 times as long as broad. The fingers are longer than the palmar portion (1.27-1.4); their extremity is furnished with a stylet about 3 times as long as broad.

The carpus II is also elongated in shape (ratio 6-6.6). The chela is 2.6-3.3 times as long as broad, and the fingers are a little longer than the palm (1.4). The proportions of the chela and the carpus vary from 0.68 to 0.7.

The length of the dactylus III is contained 3.7-4.1 times in the propodite of this pereopod; it is 4-4.75 times as long as broad and is armed with 9-10 spines (the terminal one included).

The propodite V is 3-3.1 times as long as the dactylus, which is slender and elongated. Its length is 5.3-5.7 times its breadth (this last number is based on a non-ovigerous female which is a little smaller than the others). The dactylus bears 55-57 spines. The uropodial spines are 12-14 in number.

The telson is armed on its upper surface with 5 pairs of spines, and has on the distal border 4 pairs of spines of the same length. The eggs are small and numerous. They are (in a female of 30 mm. length) 0.5-0.53 mm. long and 0.33-0.35 mm. broad.

I include in this species three young specimens from Port Macquarie, which are badly preserved. The rostral formula is nearly the same as in

¹⁶ de Man, Zool. Jahrb. (Syst.), xxxviii, 1915, p. 397, Taf. xxviii, f. 3-3g und 4-4b.

the preceding specimens, whilst the number of teeth is smaller. There are 12-15 teeth on the upper border of the rostrum, the two proximal of which are situated on the cephalothorax; the intervals between the 2 or 3 proximal ones are a little greater than the others. The rostrum reaches in front the $\frac{1}{3}$ or the $\frac{1}{2}$ of the last segment of the antennular peduncle.

The proportions of the segments of the pereopods in one of the specimens are a little different to those which are given above. But this specimen is still a young one and cannot be compared exactly with the adult. The carpus of the first cheliped is, notwithstanding, slender (ratio 2.3). It is shorter than the chela, which is 2.2 times as long as broad; the finger is not longer than the palmar portion. The chelipeds of the second pair of pereopods are both absent.

At the third pereopod, the proportion of the propodite and the dactylus is 3.2; the digit is 4.4 times as long as broad and has 8 spines, the terminal one included.

The pereopod V has a very slender dactylus; its length is contained hardly 3 times in the propodite. The dactylus is 5 times as long as broad and bears only 27 spines. This specimen possesses 10 uropodial spines.

The three specimens from North Yanco, Narrandera, are not well preserved, being almost all devoid of their pereopods. In the form, the dimensions and the armature of the rostrum, they agree with this species. The rostral appendage is longer than the antennular peduncle and than the antennal scale. The formulae are as follow: $\frac{(3) 24}{6}$, $\frac{(3) 25}{6}$, $\frac{(3) 26}{4}$.

The distal upper rostral teeth are always a little larger and further from one another than the proximal ones.

One male specimen of 22 mm. still possesses some of its legs, and when measured, fairly large differences were found between these limb measurements and those given for the before-mentioned specimens from Horton River.

The carpus of the two pairs of chelipeds is a little shorter (resp. 2.3 and 5, instead of 2.5 and 6); at the pereopod III, the digit is in proportion with the propodite—a little larger, but the relation between its length and its breadth is the same. It has 11 spines (the terminal one included).

The pereopods V are wanting.

The uropodial spines are 10-12 in number.

This new species, which I have the pleasure of naming after my late colleague at the Australian Museum, Sydney, Mr. A. R. McCulloch, should be placed near to *C. cognata* de Man¹⁷ and *C. fecunda* Roux,¹⁸ both of which inhabit New Guinea. It differs from these two species in its larger size, in its more elongated carpi I and II and in the dimensions of its eggs, which are smaller and more numerous.

The following table shows the proportions obtained by measuring the species *C. mccullochi* from Horton River, and comparing the results with those of the two related species from New Guinea.

¹⁷After de Man, J. G., Zool. Jahrb. (Syst.), xxxviii, 1915, p. 402, and Tabelle B, p. 404.

¹⁸Roux, J., Nova Guinea, v, 1917, pp. 594-595.

TABLE C.
TABLE OF MEASUREMENTS OF

				<i>Caridina</i>		
				<i>mccullochi</i> n. sp.	<i>cognata</i> de Man	<i>fecunda</i> Roux
		Total length (female ovig.)	...	28.30 mm.	21-22 mm.	14-15 mm.
1st	Chelip.	Carpus, length : breadth	...	2.5-3	1.8-2.5	2.5
		Chela, l. : br.	...	2.2-2.6	2-2.2	2
		Chela, dactyl. : palm	...	1.27-1.4	1.1-1.65	1.51
2nd	Chelip.	Carpus, length : breadth	...	6-6.6	4.7-6	5-5.2
		Chela, l. : br.	...	2.6-3.2	2.6-2.9	—
	III.	Chela, dact. : palm	...	1.1-1.4	1.6-1.9	1.51
		Propod. : dactyl.	...	3.7-4.1	3.6-4.2	3-3.5
	Pereiop.	Dactyl. length : breadth	...	4-4.75	3.86-4.5	5
		Spines	...	9-10	5-6	7-8
	V.	Prop. : dactyl.	...	3-3.1	3.1-3.6	3.7
		Dactyl. length : breadth	...	5.3-5.7	4.6-5.4	6.2
	Pereiop.	Spines	...	56-57	30-50	40-45
		Length	...	0.5-0.53 mm.	0.8-1 mm.	0.8 mm.
Eggs		Breadth	...	0.33-0.35 „	0.4-0.56. „	0.5 . „

Genus ATYA Leach.

I wish to say here some words about the genus *Atya* and its presence on the Australian continent.

ATYA SCABRA Leach.

In his paper, published in 1905, Bouvier¹⁹ mentions that there are in the Paris Museum two specimens of *Atya*, collected by Baron von Müller in the State of Victoria, and identifies these as *Atya scabra* Leach, which species is known to inhabit the islands of Central America, the western part of Africa and also New Caledonia.²⁰

Thanks to the kindness of Prof. Chas. Gravier, I was able to examine these two specimens, the determination of which I consider to be correct.

If this record of *A. scabra* for Australia is correct—and it seems to me that it cannot be contested—it would indicate for this species an enormous area of geographical dispersion, just as for the other species of this genus. I must notice, however, that no other mention of *Atya* had since been made for Australia until 1923, when McCulloch and McNeill described a new species *A. striolata* (see below).

On my enquiring, the Director of the Australian Museum at Sydney wrote to the other museums in Australia to obtain information upon the eventual presence of specimens of this genus in those collections. Up to now the answers are in the negative; there are, for instance, no specimens of *Atya* at the National Museum in Melbourne. We must therefore admit that, if the species *A. scabra* does really exist in Australia, it must be very rare.

The question of the rarity of the genus *Atya* in the Australian continent must probably be in relation with the luxurious development of the family Parastacidae, which inhabits the same waters in this big island. Nevertheless, it is not impossible that the two species *A. moluccensis* (de Haan) and *A. pilipes* Newp., which inhabit neighbouring territories, will also be found in the northern part of Australia, when our knowledge of the freshwater crustaceans of this continent is more complete.

ATYA STRIOLATA McCulloch and McNeill.

This species, which McCulloch and McNeill²¹ described, seems to be very rare²²—judging by the details of the occurrence given by these authors (*loc. cit.*, p. 57).

¹⁹Bouvier—Bulletin scientif. France et Belgique, xxxix, 1905, pp. 122-123.

²⁰Bouvier *loc. cit.*, pp. 121 and 123, identifies rightly *A. margaritacea* A. M. Edw. from New Caledonia with *A. scabra*. I have also examined these specimens (see the discussion of this question in my New Caledonian work)—*loc. cit.*, 1926, p. 217.

²¹McCulloch and McNeill—Records of the Australian Museum, xiv, 1923, p. 55, pl. ix, figs. 3-4; pl. x, fig. 3.

²²The species has since been found much nearer Sydney than the type locality (Norton's Basin, Nepean River), and in quite a different watershed. There is now in the Australian Museum a good series of specimens from the upper reaches (freshwater) of the Woronora River, a stream flowing into George's River, which in turn flows into Botany Bay. The specimens were secured on the surfaces of stones in shallow water near the banks of the stream at a spot where the water was flowing rather rapidly.—EDITOR.

Thanks to the kindness of my late colleague, Mr. A. R. McCulloch, I have been able to obtain some specimens of this new and very interesting species, of which the authors have given a good description with drawings. I only wish to add a few details to their description.

The antero-lateral border of the carapace is rounded. The four anterior pairs of pereopods possess an epipodite, the one on the fourth pair being a little shorter than the others. The uropodial spines are numerous (14-20).

The ovigerous females which are in the Museum in Sydney are 49-52.5 mm. long and the dimensions of their eggs are as follow:—length 0.4-0.425 mm., breadth 0.275 mm.²³

²³Communicated by Mr. F. A. McNeill.

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