PART II.—A RE-EXAMINATION OF THE SPECIMENS OF *ROBSONELLA FONTANIANA* IN THE COLLECTIONS OF THE BRITISH MUSEUM

Robsonella (= *Joubinia*) *fontaniana* (Orbigny) is a well defined species, endemic to the subantarctic or antiboreal region of South America. Supposed records of this species from the Indian Ocean and from the Central Pacific are subject to the gravest suspicion, as pointed out by Robson (1929). Massy (1925) described a specimen from Natal which Robson has considered to be a local variety. Two closely related but supposedly distinct species have been described from Australia and New Zealand, viz. *R. australis* (Hoyle) and *R. huttoni* Benham. *Polypus campbelli* of Smith is included in the synonymy of *R. australis* (Robson, 1929, footnote p. 145).

Robson (1929) placed *fontaniana* and *australis* (+ *campbelli*) in the new genus *Joubinia* but this was shown to be pre-occupied and the name *Robsonella* was substituted by Adam (1938). The characters of the genus were summarized by Robson and have been reviewed recently by Dell (1952). They are as follows : the arms are subequal, the web is deep and subequal, the mantle aperture is partly closed, the adlateral tooth of the radula is supposedly bicuspid, the penis has a long primary and a small secondary diverticulum, and the ligula of the hectocotylus is remarkably stout with inrolled sides and wide cheeks. We may disregard the characters of the arms and web since these are not of generic value. The partial closure of the mantle is also unimportant since many species of the genus *Octopus* have a slightly narrowed mantle opening of Robson's type B, moreover the mantle aperture is wide in *R. australis* (Benham, 1942). The long diverticulum of the penis is highly distinctive as a species character, common to all three forms, but there are species of *Octopus* which show a similar feature. The secondary diverticulum to which Robson attached great significance is apparently a variable feature since it was lacking in one of Dell's specimens of *R. australis*. There remains only the remarkably stout form of the ligula which may be conveniently retained, at least for the present, as a generic character. However it appears probable that the genus *Robsonella* is not a valid one and that the species which have been assigned to it should be returned to the genus *Octopus*.

A second problem concerns the validity of the distinction between *R. fontaniana* and the two Australasian species. Time did not permit a re-examination of the specimens of *R. australis* (+ *campbelli*) which are in the collections of the British Museum, but the material has been well described and we have also the accounts of Benham (1942) and Dell (1952) for comparison. The entire series of 11 specimens of *R. fontaniana* was carefully re-examined with a view to confirming and enlarging our concept of this South American species (Tables I and II). There are insignificant differences between the mean values of the indices as given by Robson (1929) and as determined here. In addition there are some features which call for further discussion.

TABLE I.—Robsonella fontaniana (*Orbigny*). *Bodily characteristics of eleven specimens in the Collections of the British Museum.**

B.M. No.	Sex	ML	MWI	HWI	MAI	WDI	SnI	SeI	Gill
1851.1.24.5	♂	32	84	75	27	19	11·0	17·2	9·5
1869.6.5.54	♂	24	108	71	34	32	10·2	14·6	9
1869.6.5.65	♂ juv.	19	84	68	28	16	10·5	13·2	*ca.* 8
1869.6.5.69	♂ juv.	19	100	55	35	18	6·8	9·5	10
1851.1.24.12	♀ mat.	24	92	67	39	32	12·5	—	10
1848.6.16.2	♀	35	69	54	32	21	10·0	—	9
1869.6.5.63	♀	27	78	63	34	20	7·4	—	9·5
1868.7.10.2	♀	25	72	68	42	32	11·4	—	10·5
1899.8.31.84	♀	22	96	87	39	25	9·1	—	9
1869.6.5.62	♀	22	104	73	37	30	11·4	—	*ca.* 9
1851.1.24.4	juv.	10	100	90	42	29	10·0	—	10
Average			99	77	37	25	11·0	13·8	9·5

* Symbols as in Pickford (1945).

TABLE II.—Robsonella fontaniana (*Orbigny*). *Characteristics of male specimens in the Collections of the British Museum.**

B.M. No.	LLI	CLI	PLI	SpLI	Sp. Horn	Comments
1851.1.24.5	7·8	50	23·5	165	No coils	—
1869.6.5.54	5·1	50	27	83	One turn	—
1869.6.5.65	(damaged)		18·5	(not formed)		Immature
1869.6.5.69	3·9	56	15·8	(not formed)		Immature

* Symbols as in Pickford (1945).

Robson's sucker-diameter index does not distinguish between the diameter of the largest suckers of the normal series and the diameter of the specially enlarged suckers. It was found that such specially enlarged suckers occur only in males and are present in the four representatives of this sex that were examined. The penis of the two adult males is as figured by Robson, with an accessory knob-like diverticulum. The penes in the two immature specimens are similar but they lack the secondary diverticula. The ligula-length index averages 6·5 in the two adult specimens; as might be expected it is somewhat smaller in an immature male.

Two spermatophores were found in the larger male (B.M., 1851.1.24.5), lodged in Needham's organ, and one was removed for study. It is poorly preserved and doubled upon itself in a knot in the middle region. The estimated length of the horn plus middle piece is 38 mm., the sperm reservoir measures 15 mm. The total length is thus half as long again as the mantle (SpLI 165). The horn is dark and opaque and there is no evidence of coiling. Towards its distal end, i.e. proximal to the knot-like tangle, the inner tube has a moniliform appearance due to a series of three constrictions which are probably artifacts of preservation.

A single spermatophore was found in the smaller male (B.M., 1869.6.5.54). The horn plus middle piece measure 13 mm. and the sperm reservoir measures 7 mm.

The spermatophore-length index is thus lower than in the larger specimen (SpLI 83). The horn is straight except for a single widely-open turn of a spiral towards its distal end.

Nearly all the females are sexually immature with small and relatively undeveloped ovaries. However, the reproductive ducts are well developed and have been described by Robson. It may therefore be inferred that the specimens are spawned out or in a state of sexual quiescence rather than immature. Robson calls attention to the distal portion of the oviduct, or vagina, which is long and stout, but I find that this feature is somewhat variable. One specimen (B.M., 1851.1.24.12) has a well developed ovary with moderately large-sized eggs, *ca.* 3·5 mm. in length. The eggs are not fully ripe and the length of the stalk could not be determined. The vagina of this specimen is not abnormally stout.

DISCUSSION

Table III gives a comparison of indices and numerical characteristics of the species of *Robsonella*, compiled from data presented by Robson (1929), Benham (1942, 1943), and Dell (1952), and from the re-examination of the British Museum series of *R. fontaniana*. This table demonstrates the difficulty of assessing the

TABLE III.—*Comparison of the species that have been assigned to the genus* Robsonella.*

Species	ML range	MWI av.	HWI av.	ALI av.	WDI av.	SnI av.	SeI‡ av.	Gill range	LLI range
R. fontaniana (Orbigny)									
B.M. Series† . .	10–35	99	77	(74)	25	11·0	13·8	8–10	5·1–7·8‖
R. australis (Hoyle)									
Robson (1929)									
australis . .	22–33	81–86	62–73	72–76	33	11–13	—	6–9	10·8
" *campbelli* " .	28	85	71	78	28	?	21	10	8·5
Benham (1942) .	10–36	79	62	73	24	12	—	6–8	8·4
Dell (1952) . .	11–30	76	63	73	27	10·6	—	6–8	4·5–4·7
R. huttoni (Benham) .									
Dell (1952) . .	43–56	68	44·5	74	22	9·4	—	6–7	6·6–6·8

* Symbols as in Pickford (1945). Doubtful specimens from the Indian Ocean and Central Pacific excluded.

† Based on new measurements except for the arm-length index which is taken from Robson (1929) and which had to be used, instead of the mantle-arm index, to permit comparison with the published data for the other forms.

‡ Specially enlarged suckers found only in males.

‖ Sexually mature specimens only.

differences between the three species. *R. huttoni* differs from *R. australis* in its larger size, narrower body and much narrower head but a familiarity with the complexities of octopodan taxonomy suggests that these features are difficult to evaluate. The same is true of the relatively somewhat smaller size of the suckers. Both these Australasian species differ from *R. fontaniana* primarily in the smaller number of gill lamellae ; the ranges, however, overlap and the type of " *campbelli* "

has fully as many lamellae as a typical specimen of *R. fontaniana*. It must be remembered that an accurate count of the number of primary lamellae is highly subjective, depending upon the number of minute terminal foliations that are included in the count. However, the difference appears to be a valid one and must be accepted as such in the present state of our knowledge of these species. As indicated by Dell (1952) *R. huttoni* will probably prove to fall within the range of *R. australis*, but it is also evident that the Australasian specimens are at least racially distinct from the South American form.

A few more points may be discussed. The eggs of *R. australis* measure 2·5 mm. in length and have a short stalk (Benham, 1942). The eggs of *R. huttoni* are of about the same size, 3 mm. (Benham, 1943). Eggs, similar in size, measuring about 3·5 mm., are present in the ovary of a mature female of *R. fontaniana*, described here.

The characters of the hectocotylus and penis have been fully discussed by previous investigators and appear to offer no evidence for separating the species. Attention may be called to a curious error in Dell's paper, in discussing the affinities of *R. huttoni* he states on p. 40 that " The ligula index is appreciably lower than in *australis*—average 6·7 as compared with 10·8." But his table (p. 34, Table 9) shows that his own specimens of *R. australis* have a low index, averaging 5·4. The specimens appear to have been sexually mature since the presence of a spermatophore is mentioned in at least one of them.

The spermatophores of *R. fontaniana* are described for the first time. They are nearly as long as the mantle, or considerably longer. The horn is straight, as far as could be determined, or with a single distal turn, but admittedly the preservation is not good. Benham described and figured the spermatophores of *R. australis*. He states that they measured 40 mm. in length. The mantle-length of the male from which these spermatophores were taken is not given, but even his largest specimen has a mantle-length of only 36 mm. Therefore the spermatophore, like that of *R. fontaniana*, is about as long as or longer than the mantle. In the text Benham states that the " projectile apparatus " consists of a " closely-coiled spring". This would lead one to suppose that the horn of the spermatophore was coiled. However, a study of his figures (Benham, 1942, Figs. 6 and 7) suggests quite otherwise. The horn is apparently straight and what Benham mistook for the coils is clearly, in reality, the internal structure of the lumen which always has this delicate spiral structure, irrespective of whether the horn is straight or coiled (compare with the spermatophores of *O. macropus*, figured by Pickford, 1945, Pl. IV). The spermatophores of *R. huttoni* have not been described.

The author is indebted to Dr. W. J. Rees, for facilities to study these specimens.

SUMMARY

1. Eleven specimens of *Robsonella fontaniana* (Orbigny) in the Collections of the British Museum have been redescribed. The spermatophores, described for the first time are nearly as long as or longer than the mantle ; the horn is straight or with a single spiral turn towards its distal end. The eggs are moderately large, *ca.* 3·5 mm. in length.

2. The status of the genus *Robsonella* is discussed. It is considered probable that the two Australasian species, *R. australis* (Hoyle, 1885) and *R. huttoni* (Benham, 1943) are synonymous but together they form an assemblage that is at least racially distinct from the South American species, *R. fontaniana*. The chief distinguishing characteristic is the lower average number of primary gill lamellae in the Australasian species.

REFERENCES

ADAM, W. 1938. *Robsonella* nom. nov. für *Joubinia* Robson, 1929. (Cephalopoda, Octopoda). *Zool. Anz.* **121** : 223.

BENHAM, W. B. 1942. The octopodous Mollusca of New Zealand : (1) The midget Octopus of coastal waters. *Trans. R. Soc. New Zealand*, **72** : 226–236.

—— 1943. The octopodous Mollusca of New Zealand.—Part II. *Trans. R. Soc. New Zealand*, **73** : 53–57.

DELL, R. K. 1952. The Recent Cephalopoda of New Zealand. *Dominion Mus. Bull.*, No. 16 : 1–157.

MASSY, A. L. 1925. On the Cephalopoda of the Natal Museum. *Ann. Natal Mus.* **5** : 201–230.

PICKFORD, G. E. 1945. Le poulpe américain : A study of the littoral Octopoda of the western Atlantic. *Trans. Conn. Acad. Arts Sci.* **36** : 701–811.

ROBSON, G. C. 1929. *A Monograph of the Recent Cephalopoda. Part I—Octopodinae*. London (Brit. Mus.).