



PAPERS READ.

CONTRIBUTIONS TO A MORE EXACT KNOWLEDGE
OF THE GEOGRAPHICAL DISTRIBUTION OF
AUSTRALIAN BATRACHIA. No. III.

BY J. J. FLETCHER.

This third small contribution records the collections which have come to hand since June last. The subject is not by any means exhausted; but as there is no immediate prospect of further supplies of material, the results so far gained may presently be briefly reviewed; and with this, for the time being, one must be content.

(ii.) *The inland division of N.S.W. (West of the Dividing Range).*

(r) From Lucknow, near Orange (collected by Mr. W. W. Froggatt).

Limnodynastes tasmaniensis

Hyperolia marmorata

dorsalis

Pseudophryne bibronii

Hyla ewingii, var. B.

Only one species in this collection calls for comment, namely *H. ewingii*, var. B (eleven specimens), characterised, as to most of the specimens, by the presence of even more spots and markings on the flanks and elsewhere than in var. A (*calliscelis*) and than I have ever previously seen. This is the first time, too, that the species has occurred in any of the collections from the inland division, and it is probably to be regarded as a straggler from the coast. Further references to these specimens will be found below.

(s) From Wellington Caves (collected by Mr. W. W. Froggatt).

Limnodynastes tasmaniensis

Pseudophryne bibronii

(t) From Yass (collected by Mr. W. W. Froggatt).

Limnodynastes tasmaniensis

Crinia signifera

dorsalis

Pseudophryne bibronii

Hyla ewingii, var. B (one specimen).

Hyla aurea was seen also, but specimens were not brought. As in the collection from Lucknow, *H. ewingii* var., is here associated with some of the widely distributed species which are to be met with in any tolerably complete inland collection.

One or more specimens of a single species from a single station have been received as follows:—*Limnodynastes dorsalis*, Cooma (Dr. Cobb), Cowra (Rev. A. Fletcher); *L. tasmaniensis*, Wentworth, N.S.W. (Mr. A. Sidney Olliff); *Cryptotis brevis*, Gosford (Mr. C. T. Musson). A third instalment of frogs from Dandaloo yielded nothing not previously sent: a supplementary collection forwarded by Mr. Sloane from Emu Plains, Urana, contained specimens of *Hyla peronii*, not previously obtained. Quite recently on the Blue Mts. I have found both *Limnodynastes tasmaniensis* and *Hyla dentata* to occur.

Two collections from South Queensland—one from the coast, the other from inland—may here be recorded.

(a) From Pimpama, S. of Brisbane (collected by Miss A. Harding).

Limnodynastes peronii

Hyperolia marmorata

Cryptotis brevis

Pseudophryne coriacea

Hyla lesueurii

This collection was obtained during a very unfavourable season, and does not at all satisfactorily represent the batrachian fauna of the district. No peculiar Queensland species are included; otherwise, as far as it goes, it shows a fauna very similar to that of our northern river districts, as was to be expected.

(b) From Waroo, Inglewood, about 60 miles west of Stanthorpe (collected by Mr. A. J. Ewen).

Limnodynastes tasmaniensis

Crinia signifera

Hyperolia marmorata

Pseudophryne coriacea

Hyla lesueurii

latopalmata

Fifty-seven living specimens were kindly forwarded in an ingeniously contrived vivarium by Mr. A. J. Ewen, through the kind mediation of Mr. R. Etheridge, junr., of the Department of Mines. In this collection the burrowers are conspicuously absent; and there are no peculiar Queensland species; but it is noticeable how inland, as well as on the coast, in about this latitude, *P. coriacea* seems to have more or less completely replaced *P. bibronii*, so common further south (recorded by me from eight inland stations, besides Benalla and Ballarat in the southern colony): otherwise, as far as it goes, it is a fairly typical inland collection.

A somewhat more extended and definite knowledge of the geographical distribution of Australian Batrachians appearing to be desirable, the best way of making a beginning seemed to be to obtain from as many localities as possible, more particularly extra-coastal ones, as complete collections as could be got together, and then to record them. Thanks very largely to a number of friends, to whom I freely acknowledge my indebtedness, a start for N.S.W. has been made. Collections from seven coastal stations (in this case rather districts), and from seventeen inland stations—besides four others from which single specimens or specimens of a single species are recorded, circumstances not allowing of collections being made—have been got together, comprising several hundred individuals, and in some cases forming good series. Collections from stations on the South Coast, on the Northern Tablelands, and especially on the Darling, and still further west, are, however, still desiderata; and I should be very glad indeed to receive such, or promises of co-operation in obtaining them.

Every collection recorded, doubtless only more or less, and sometimes even very, incompletely represents the batrachian fauna of the particular locality whence it came. More particularly was this the case when the collectors were unprepared for burrowers, and when the collecting was not continued over a sufficiently long period, preferably over several seasons.

In an interesting paper on "The Distribution of Fresh-water Fishes"* in America, Professor Jordan says: "It is easy to ascertain the more common inhabitants of any given stream. It is difficult, however, to obtain negative results which are really results. You cannot often say that a species does not live in a certain stream. You can only affirm that you have not yet found it there; and you can rarely fish in a stream so long that you can find nothing that you have not taken before." If in this extract for the words "stream" and "fish," wherever such occur, we substitute the words "district" and "collect," we shall have the case not less admirably stated as regards Batrachians.

In spite of the difficulties in the way of getting even approximately complete collections, and in acquiring negative evidence of value, and though many desirable localities are still untouched, already certain conclusions, which further knowledge may extend but cannot otherwise very materially alter, may at this stage quite legitimately be drawn.

It is quite evident that batrachians are to be found in the interior wherever the conditions allow of their existing, not only near the rivers, but at a distance from these wherever there are lakes, lagoons, or swamps, even though these are not always absolutely proof against frequent or long continued droughts. A newspaper reporter quite recently accompanying a Minister of the Crown on a journey to the Bogan just after the breaking-up of a dry season thus describes what he saw between Warren and Coonamble, N.S.W.: "The scenery was of the monotonous order peculiar to the plain country. There were great bare patches of miles in extent without a living thing to be seen except a few

* Trans. American Fisheries Society, 1888, p. 4.

sheep here and there, kangaroos, emus, plain turkeys, bronze-winged pigeons, . . . various kinds of ducks and other game.

. . . The country is indented here and there with shallow depressions in the earth, which are filled with water after the rains, and sometimes form chains of ponds across the country."

At Emu Plains, some eighteen miles from the Murrumbidgee, Mr. Sloane has been good enough to collect for me; in this locality there are swamps, but they dry up every year about December, or exceptionally a month or two later; in fact there is no permanent water except in the station dams; nevertheless frogs are not scarce; and though my friend is a busy man, and natural history tastes in quite another direction occupy his leisure, yet just about the homestead he has been able to collect seven species—only one less than the number at present recorded from Tasmania (*Hyla verreauxii* not being regarded as a distinct species). Here, as elsewhere, provided only that the frogs can live out the more or less lengthy periods of æstivation, in some years more trying than in others, the ponds after rain, wherever the soil is not too sandy, are at times sufficiently permanent and sufficiently numerous, forming chains of ponds across the country as quoted above, to afford a means whereby batrachians may be enabled to migrate from places where they have become established, and so to gain new stations; or to re-people the old haunts should excessively dry seasons prove utterly disastrous. The possibility of spawn being carried to distant localities on the feet of aquatic birds need not be left out of consideration; but I imagine the means of dispersal mentioned to be of prime importance, and that the great river-system of the interior of the colony is the main source of distribution and replenishment.

Secondly, whenever anything at all like a fairly characteristic collection is obtained, it will be found to comprise representatives of all three dominant Australian families. This is exemplified over and over again in the larger collections recorded.

Out of about fifty-four known Australian species New South Wales may be credited with about thirty-four, of which four [*Hyla jervisensis*, *H. dimolops*, *H. nasuta*, and *Hylella bicolor*],

all from the coastal division, are not represented in my collections, but as a set-off to this two species [*Hyla gracilentata* and *Phanerotis*] have been added to the coastal fauna, and one [*H. rubella*] to the inland fauna. Of the thirty species met with, twenty-five belong to the coastal division, and eighteen* (not including *Limnodynastes fletcheri*, for reasons given below) to the inland division, fourteen species being common to both. The fauna of the coastal division, the conditions being very favourable, is rich for the relatively small area, and is tolerably well known, not many new species in all probability remaining to be discovered: its members may be roughly divided into four groups: (1) the species frequenting the semi-tropical brushes of our northern river districts, or the sequestered gullies of the Blue Mts., or the Illawarra Range, such as *Mixophyes*, *Phanerotis*, *Cryptotis*, *Limnodynastes peronii*, *Hyla gracilentata*, *H. phyllochroa*, and *H. lesueurii*: (2) the swamp and river frogs, such as most of the species of *Limnodynastes*, *Crinia signifera*, and *Hyla aurea*: (3) the largely terrestrial tree-frogs which at least have recourse to water for breeding purposes, such as *H. ewingii*, *H. cærulea*, *H. dentata*, and *H. peronii*: and (4) the terrestrial batrachians *par excellence*, mostly toads, frequenting damp places, but avoiding water, such as the species of *Pseudophryne*, and probably also *Hyperolia marmorata*.

The restriction of some species to the coastal division is explicable on the ground there only are to be found the natural conditions under which they flourish; on the other hand we find some species inhabiting both regions under conditions of humidity, &c., and amid surroundings widely different.

One of the most marked differences between the coastal and inland faunas arises from the absence from the latter of the brush and gully-haunting frogs; the balance is made up of three elements: (1) cosmopolitan species, (2) several peculiar species, of which two [*Notaden* and *Chiroleptes platycephalus*] seem to be characteristic of the plain country, for neither of them has occurred in collections

* Excluding also *Pseudophryne coriacea*, Waroo being just a little north of the northern border of N.S.W.

from the Tablelands, and Mr. J. D. Cox and Mr. A. G. Hamilton, who know the Mudgee District well, never met with either of them, and (3) a few stragglers, sometimes from the east, in collections from the Tablelands, as *Limnodynastes peronii* (one specimen) in the collection from Guntawang, close to the western slope of the Dividing Range, and *Hyla ewingii* var. in the collections from Yass and Lucknow; sometimes, however, apparently from the north, as *Limnodynastes ornatus* at Guntawang, *Hyla rubella* at Dandaloo and Bearbong, and perhaps *H. latopalmata*, though this may be a widely distributed northern inland species at about its southern limit. In any case, the distribution of some of our species cannot be satisfactorily dealt with until more is known of the distribution of Queensland species.

That the Dividing Range does not separate two more widely divergent faunas than, as far as present knowledge goes, have been met with, is not surprising when the faunas of the east and west coasts are contrasted, for it then appears that of fourteen species recorded in the B.M. Catalogue from W. Australia, seven, or 50 per cent., are members of our coastal fauna, and eight (including *Helioporus albo-punctatus*, recorded from the Murray) of our inland fauna. And it may be said generally of any and every colony, that its batrachian fauna consists of an admixture of more or less cosmopolitan forms and of a small number of others characteristic of the region. _____

Hyla ewingii, Dum. & Bibr., was described in the *Erpétologie Générale* (T. viii. p. 597, published in 1841), the habitat being Tasmania; the description adds, "les parties supérieures offrent un gris verdâtre." It is figured in *Voy. au Pôle Sud*, *Batrac.* pl. i. fig. 3, of which Dr. Günther in the first edition of the B.M. Catalogue of Amphibia says, "figure not good." The localities given in the second edition of the same work are Tasmania, Hobart, Melbourne, and Australia, var. A (*H. calliscelis*) being recorded from King George's Sound. Dr. Günther (*Ann. Mag. Nat. Hist.* (3), xx. (1867), p. 57) also records *H. ewingii* from N. E. Australia.

Mr. Krefft (P.Z.S. 1863, p. 389) includes *H. ewingii* among the Batrachians occurring in the neighbourhood of Sydney, and says: "This pretty little *Hyla* is rather a rare species, and I do not think that I ever found more than six or eight specimens of it generally under stones during the cold season." In the same paper he says of *H. verreauxii*: "A rather rare frog, which I have occasionally taken from under the bark of the Tea-tree, and from under rocks in moist localities; never taken during the summer. No specimens from other parts of Australia have as yet come under my notice." In his paper on "Australian Vertebrata, Recent and Fossil" (Industr. Prog. N.S.W. [1871], p. 747), we have a slightly different version: for it is there stated of *H. ewingii* that the Sydney "Museum is in possession of specimens from almost every part of Australia, the west coast excepted," while *H. verreauxii* is said to be "very common almost everywhere on the eastern border."

One of our commonest frogs in the County of Cumberland, equally common also in the three adjacent counties, though I have not seen it from any inland localities, until it occurred in two of Mr. Froggatt's collections noted above, is a little *Hyla*, of which Mr. Boulenger kindly named specimens for me as *H. ewingii* var. *calliscelis*, Peters. It is the little frog whose shrill *twee, twee, twee*, repeated from half-a-dozen to a dozen times or more, may be heard in damp weather even during the winter months, as I have pointed out elsewhere. From its common occurrence Mr. Krefft was no doubt familiar with this frog; but as Peters' description was published only in 1874, Mr. Krefft could not have referred to it under this name in the papers quoted above.

H. dentata, Keferst., is a Sydney frog, and was described in Archiv für Naturgesch., for 1868, but it is not mentioned in the latest of Mr. Krefft's papers published in 1871. It seems to me therefore very probable that when Mr. Krefft referred to *H. ewingii* and *H. verreauxii* as species occurring in the neighbourhood of Sydney and elsewhere on the east coast, he meant to denote the two frogs now known as *H. ewingii* var. *calliscelis*, Peters, and *H. dentata*, Keferst.

To Mr. W. W. Froggatt I am very much indebted for thirty-one specimens of the typical form of *H. ewingii* from the neighbourhood of Ballarat, Victoria. I do not know this frog from any locality in N.S.W., though I have one specimen of a *Hyla* obtained by me under the bark of a tree in a gully on the Blue Mts., which I am inclined to refer to this species: it is larger (52 mm. from snout to vent) than any specimen of *H. krefftii* or *H. ewingii* I have seen, it has the fingers insufficiently webbed to be referred to the former, and is too long in the legs, the tibio-tarsal joint of the adpressed limb reaching beyond the level of the tip of the snout, to quite satisfactorily be placed in *H. ewingii*, with which otherwise it has most in common; if it may correctly be regarded as a very large and unusually long-legged individual of the typical form of *H. ewingii*, then it is the only specimen from N.S.W. known to me; while if it should not strictly be referable to this species, then, as far as my experience goes, *H. ewingii* is represented in N.S.W. only by var. *calliscelis*.

H. ewingii var. *calliscelis* from King George's Sound differs from the typical form "in having the hinder side of thighs with large purplish-black spots on yellowish ground; a purplish-black spot in the groin" (B.M. Cat. 2nd ed. p. 407). In specimens from the County of Cumberland and from the three adjoining counties, the presence of spots seems quite constant either in the groin or on the flanks, frequently they are absent on the hinder surface of the thighs: the concealed surfaces of the legs in living specimens and in such as have not been long in spirits, are of a bright orange; while the dark inguinal spots in the living animal appear on a background tinged with light yellow. Some of Mr. Froggatt's specimens from Lucknow are much more spotted and blotched even than Sydney examples, in six of them "the large well-defined dark spot commencing between the eyes and covering the middle of the back" of the descriptions being not merely a darker shade of the groundcolour "speckled all over with blackish," but partially edged or to some extent invaded by a dark tint like that of the ordinary inguinal spots: none of them have spots on the hinder surface of the thighs, and some of them are not more blotched than Sydney specimens.

The beautiful little *Hyla* brought me alive from Ballarat by Mr. Froggatt, referred to in my last paper (p. 254), has puzzled me not a little: with the general characters of *H. ewingii*, it presented when alive a broad bright green dorsal band edged by a dark narrow band, and with also a lateral linear dark band, in which respects it differs from the thirty-one (spirit) specimens of *H. ewingii* from the same locality; and makes some approach to the specimens from Lucknow, collected and given to me also by Mr. Froggatt, who likewise brought me one of these specimens alive; (this specimen, like every other specimen of *H. ewingii* var. *calliscelis* which I have ever seen, was entirely devoid of any green tint). I do not know how to speak of it except as another variety of *H. ewingii* (var. C).

Limnodynastes tasmaniensis, Gthr., is a widely distributed and variable eastern species represented in my collections, exclusive of Sydney specimens, by about 120 specimens, from fourteen inland and several coastal stations. In the original description (B.M. Cat. 1st ed. p. 33) the toes are said to be "slightly webbed at the base, slightly fringed"; in the second edition of the B.M. Catalogue, Mr. Boulenger says, "toes moderate, slightly fringed." The typical form may be described as having usually no crimson or reddish spots on the upper eyelids, though in young specimens these may occasionally be present and more frequently a vertebral red stripe; three metacarpal tubercles, two metatarsal tubercles, tarso-metatarsal joint of adpressed limb reaching the eye, or between the eye and the nostril; fingers and toes not pointed, toes slightly fringed, slightly webbed at the base (the basal webbing appears to me merely the continuity of the fringe of two contiguous toes, and when the fringe is very slight the webbing is correspondingly slight, and the toes may be said to be almost free); throat of male dusky, tinged with yellow, concealed surfaces of both sexes tinged with yellow, especially in the breeding season. In some of my collections, as from Wentworth, Urana (together with the typical form), Mudgee (together with the typical form, and *L. fletcheri*), and Waroo,

however, there are specimens of what I can regard as only a well-marked variety of this species, with or without recognisable crimson or reddish spots on the upper eyelids, a little longer in the legs (the tarso-metatarsal joint of the adpressed limb reaching the level of the tip of the snout, or not quite so far, or even further), with two or with three metacarpal tubercles, with two or with one metatarsal tubercle (the outer one being either absent or at least not distinguishable), with very often a very distinct basal webbing of the toes, and without pointed fingers and toes. In other words, but that the head is not much depressed and the snout not shorter than usual, some of these specimens might be referred to *L. platycephalus*; while if the fingers and toes were but pointed, some of them might very well be referred to *L. fletcheri*. Of four specimens from Wentworth three have crimson spots, all have a distinct basal webbing, but in two of them the tarso-metatarsal joint of the adpressed limb does not reach beyond the level of the nostril; they have three metacarpal tubercles, but in none of them is there a recognisable outer metatarsal tubercle. From Urana Mr. Sloane, whom I had asked to look out for specimens with crimson palpebral spots, kindly sent me two specimens alive, of which he wrote, "I send you a couple of remarkably robust specimens of *L. tasmaniensis*; I have seen several specimens with reddish markings on the upper eyelids, but the two sent do not show it so strongly marked"; one of these, 60 mm. from snout to vent, is the largest specimen of the species I have seen; they agree substantially with the specimens from Wentworth, but are both a little duskier on the throat and sides of chest; and more spotted on the undersurface of the calf and foot. Of eighteen specimens from Waroo, some have crimson palpebral spots, some have two metatarsal tubercles, while others appear to have but one, and some appear to have but two metacarpal tubercles, some of them are much spotted on the throat, sides of chest and even of the abdomen, and on the undersurface of legs; one specimen is of quite the typical form. From Guntawang, with specimens of the typical form, together with specimens of what might be called *L. fletcheri* if the fingers and toes were

pointed, I have two specimens of the same batch as the two type specimens of the latter sent to Mr. Boulenger; these have the fingers and toes pointed as Mr. Boulenger describes, but I cannot help thinking that there is something abnormal about them—possibly they may, when collected, have been put into too strong spirit,—and that they are of the same species as the specimens without pointed fingers and toes, and that both are simply a variety of *L. tasmaniensis*.

Mixophyes fasciolatus, Gthr., the type specimens of which came from the Clarence River (two specimens appearing to be in the Collection at the time the second edition of the Catalogue was published), is said to have the tibio-tarsal articulation reaching to the tip of the snout, and the “toes two-thirds webbed, so that the three outer phalanges of the fourth toe remain free.” I have before me a fine series of seven large specimens, of which five were obtained for me by Mr. Helms on the Richmond River, and two others subsequently a little further to the north on the Tweed: in all these the tibio-tarsal articulation of the adpressed limb reaches well beyond the level of the snout (say from $\frac{1}{4}$ to 1 inch), while as to the webbing, several may be said to agree with the description, others have a little more webbing, it is thicker, and intensely pigmented, the maximum being reached in a very fine specimen from the Tweed: the difference in size between the type, of which measurements are given by Dr. Günther, and this specimen is very well indicated by the following: in Dr. Günther's specimen length of body (from snout to vent) 33 lines, length of hind limb 54 lines: in my specimen the corresponding measurements are $3\frac{1}{6}$ inches, and 8 inches (to the tip of the fourth toe along the straightened leg): now in this specimen every toe, even the fourth, is webbed to almost the very tip on at least one side (of the toe), but the toes cannot be said to be fully webbed, because toes 2-4 are not equally webbed on both sides (of the toe). There is in the Macleay Museum from the Richmond River a still larger and finer example than mine,—the largest Australian frog I have yet seen—which is more or less similar

in regard to the more than usually copious webbing ; it is not accessible at present, and I cannot give further particulars about it, but it is the frog exhibited by Mr. Masters at the meeting of this Society in March, 1886 [Proceedings (2), I. p. 238]. Specimens of this species from the Blue Mts. are normally webbed, but are longer in the legs than the type, like my northern river specimens.

In endeavouring to find a place in our systematic lists for such specimens as the above, one has choice of two alternatives ; either to consider that they are representatives of new species and to deal with them accordingly, or, as I think the more desirable course, to treat them as varietal forms, and to note them as such. With the advantages which residence in the country naturally gives in the way of acquiring some knowledge of certain species in their natural haunts, and of obtaining with greater facility perhaps larger series of specimens of other species than naturalists abroad can very often have at their disposal, it has ceased to cause me surprise that I sometimes meet with individuals whose characters refuse to come perfectly and exactly into the line as laid down in the text-books ; or that characters which seem to be of more or less considerable specific importance when only a few specimens have been available, should sometimes turn out to be variable when larger series of specimens are examined.

A MONOGRAPH OF THE *TEMNOCEPHALEÆ*. Part i.

BY PROFESSOR W. A. HASWELL, M.A., D.Sc.

[This paper will be published in the forthcoming Macleay Memorial Volume.]



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