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Results of the 1958–1959 Gilliard New Britain Expedition

3. Notes on the Frogs of New Britain

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INTRODUCTION

The present report deals with a collection of frogs Margaret and E. Thomas Gilliard obtained in west-central New Britain. The Gilliards traveled by trail inland from Kandrian on the south coast to the summit of the Whiteman Range, and collected frogs at the several camps designated herein by name, elevation, and the expedition camp number. A detailed itinerary and map of collecting stations will accompany the general account now being prepared by E. T. Gilliard.

Werner (1900) and Hediger (1934) provide fairly extensive accounts of the herpetology of New Britain, but the frog fauna is still poorly known. The Gilliards' collection includes a new species of *Platymantis*, permits clarification of the taxonomic position of the *Discodeles* from the island, and adds a species of *Hyla* not previously recorded from New Britain. I include accounts of two species of *Hyla* known to occur on New Britain but not collected by the Gilliards, in order to complete the treatment of the frog fauna.

METHODS

Specimens were measured with vernier calipers, at times with the aid of a binocular dissecting microscope, in the following ways: snout to vent length, from tip of snout to cloacal opening; tibia length, from

the fold of skin at the knee to the heel, with the foot held at a right angle to the tibia; head width, at the angle of the jaw; length of orbit, from anterior to posterior corner, with the eye forced into a natural position if necessary; distance from eye to naris, from the anterior corner of the eye to the center of the external naris; internarial distance, between the centers of the external nares.

The following abbreviations are used for ratios: tibia length to length from snout to vent, TL/S–V; head width to length from snout to vent, HW/S–V; length of orbit to length from snout to vent, ORB/S–V; distance from eye to naris to internarial distance, E–N/IN.

ACKNOWLEDGMENTS

I wish to thank Mr. and Mrs. E. Thomas Gilliard, who assembled the collection of amphibians and reptiles while working under arduous conditions when time could ill be spared from the principal objective, the study of the avifauna. Dr. R. F. Inger courteously lent specimens from the Chicago Natural History Museum (abbreviated C.N.H.M.), and Dr. Ernest Williams made available material in the Museum of Comparative Zoölogy (abbreviated M.C.Z.). I extend my thanks to these persons.

ACCOUNTS OF SPECIES

Hyla brachypus (Werner)

Hylella brachypus WERNER, 1898, p. 554; type locality, Ralum, New Britain. WERNER, 1900, p. 121. ?VOGT, 1911, p. 427.

Hyla brachypus, VAN KAMPEN, 1923, p. 37.

Hyla brachypus has not been reported from New Britain since the original description. Vogt (1911, p. 427) records the species from Sattelberg on the Huon Peninsula of Northeast New Guinea, but he gives no description of the specimen on which the record is based. In view of the difficulty of differentiating the several species of small hylas lacking vomerine teeth, *Hyla brachypus* should be removed from the list of Papuan species until more convincing evidence of its presence on New Guinea is forthcoming.

It might be suspected that *brachypus* is based on young specimens (lacking vomerine teeth) of *Hyla thesaurensis* or *H. infrafrenata*, the only other hylids known to inhabit New Britain. This is improbable, however, for Werner (1900, p. 121) states that two of the three specimens are adults calling when found. Meager evidence indicates that *Hyla brachypus* should be recognized as a species endemic to New Britain.

Hyla infrafrenata militaria (Ramsay)

Pelodryas militarius RAMSAY, 1878, Proc. Linnean Soc. New South Wales, vol. 2, p. 28; type locality, New Ireland.

Hyla dolichopsis, BOULENGER, 1882, p. 385 (part, specimens from Duke of York Island). VOGT, 1912, p. 9 (part, specimens from Simpsonhafen).

Hyla dolichopsis pollicaris WERNER, 1898, p. 554; type locality, Ralum, New Britain; 1900, p. 119.

Hyla dolichopsis calcarifera, VOGT, 1912, p. 10.

Hyla militaria, BOULENGER, 1912, p. 216. VAN KAMPEN, 1923, p. 55. HEDIGER, 1933, p. 22; 1934, p. 484.

Hyla infrafrenata militaria, LOVERIDGE, 1948, p. 404.

The Gilliards did not obtain this species, possibly because they limited their collecting efforts to upland regions, whereas *Hyla infrafrenata* appears to be restricted to lower elevations.

Hyla infrafrenata ranges from the Taluat Islands and Timor through New Guinea to the Cape York Peninsula of Australia and the Bismarck Archipelago. There are two subspecies: *militaria* on New Britain, New Ireland, and Duke of York Island between these two, and *infrafrenata* in the remainder of the range outlined above. Curiously, the frogs of the Admiralty Islands apparently are *infrafrenata* rather than *militaria*, which suggests immigration from New Guinea rather than by way of New Britain and New Ireland.

Both males and females of *Hyla infrafrenata militaria* possess a projecting rudiment of the pollex, the only characteristic in which it is known to differ from the nominate subspecies.

Vogt (1912, pp. 9–10) records both *Hyla dolichopsis* and *Hyla dolichopsis* var. *calcarifera* from Simpsonhafen (Rabaul), and credits the latter name to Werner. I can find no other reference to *calcarifera* in the literature and suspect that it may be a *lapsus* for *pollicaris*.

Hyla thesaurensis Peters

Hyla thesaurensis PETERS, 1877, Monatsber. Akab. Wiss. Berlin, p. 421; type locality, Treasury Island, Solomon Islands.

Iambon, Camp No. 6, 1500 feet, Whiteman Range, New Britain (A.M.N.H. No. 64252).

The specimen the Gilliards captured is the first of its species to be reported from New Britain, though *thesaurensis* is known from the Solomons (Brown, 1952, p. 20), New Hanover (Hediger, 1933, p. 21, listed as *Hyla impura*), Manus in the Admiralty Islands (Hediger, 1933, p. 22, listed as *Hyla macrops*), and New Guinea (Loveridge, 1948, p. 400).

Brown (1952, p. 21) remarks that "*Hyla thesaurensis* is highly vari-

able as to color and may prove to be constituted of at least two geographical races or be undergoing . . . differentiation." Loveridge (1948, p. 401) places two species described from New Guinea, *H. impura* Peters and Doria and *H. macgregori* Ogilby, in the synonymy of *H. thesaurensis*, noting that they are based on two phases of color pattern duplicated in *thesaurensis* of the Solomon Islands. Although the frogs of New Guinea and the other islands are similar in many respects and undoubtedly closely related, there are differences in maximum size and leg length that distinguish specimens from New Guinea from those taken on the islands to the east. The largest individual in a series of over 100 adults from Menapi on Cape Vogel in eastern Papua is a female slightly less than 45 mm. in snout to vent length. Individuals of some Solomon Island populations attain a much greater size. For example, a female from Malaita Island measures 67 mm. Legs are relatively shorter in the New Guinea frogs. Twenty-six adult females from Menapi have an average TL/S–V ratio of 0.501, range 0.48–0.53. The same ratio for eight females from Guadalcanal in the Solomon Islands averages 0.556, range 0.52–0.61.

The specimen from New Britain resembles those from the Solomons both in size and leg length. It is an adult female 52.4 mm. in snout to vent length, with a TL/S–V ratio of 0.54. Other measurements (in millimeters) are: tibia length, 28.3; head width, 17.5; head length, 16.8; tympanum length, 3.1; orbit diameter, 5.7; internarial distance, 4.4. The disc of the third finger is slightly smaller than the tympanum. A color transparency of this individual shows that it was bright yellow in life.

A more detailed study of *Hyla thesaurensis* probably will indicate that the name *impura* should be resurrected for the population of New Guinea, which may be a full species.

Discodeles guppyi (Boulenger)

Rana guppyi BOULENGER, 1884, Proc. Zool. Soc. London, 1884, p. 211; type locality, Shortland Island, Solomon Islands.

Rana bufoniformis cognata HEDIGER, 1934, p. 484; type locality, Mövehafen, New Britain.

Iambon, Camp No. 6, 1500 feet, Whiteman Range, New Britain (A.M.N.H. Nos. 64278, 64279). Moia, Camp No. 14, 1000 feet, Whiteman Range, New Britain (A.M.N.H. Nos. 64274–64277).

The genus *Discodeles* is represented in the Solomon Islands by three species, *bufoniformis*, *guppyi*, and *opisthodon* (Brown, 1952). Elsewhere, frogs of this genus are reported only from New Britain and

the Admiralty Islands, where little is known of them because of the paucity of specimens and the inadequate descriptions.

In 1912, Vogt described *Rana ventricosus*, based on a single specimen from Lambussa (= Rambutyo Island), Admiralty Islands. Hediger (1934, p. 485) renamed this form *Rana vogti*, because *ventricosus* is preoccupied by a Linnean name. In the same paper, Hediger (p. 484) proposed the name *Rana bufoniformis cognata* for a single specimen

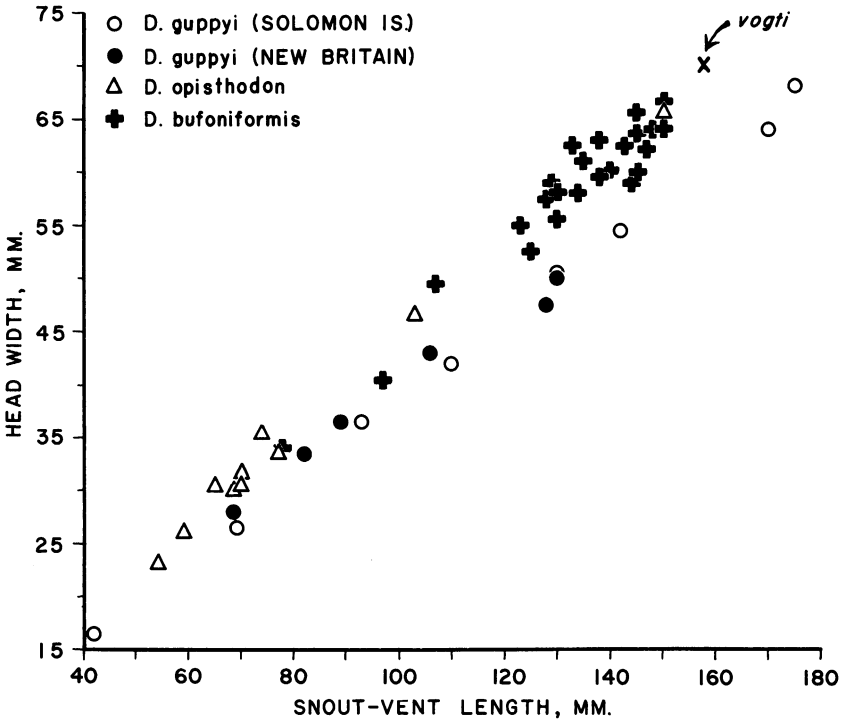

FIG. 1. Relative width of the head in four species of *Discodeles*. Measurements of *D. vogti* taken from the original description, other specimens measured by the author.

from New Britain. Hediger (1933) referred six specimens from Manus in the Admiralty Islands to *R. b. cognata*. It seems probable that Hediger studied these six specimens after the original description of *cognata* had gone to press, but wrote the paper published in 1933 later, though it apparently appeared in print first, and thus created a *nomen nudum*.

Brown (1952) describes and characterizes the three species of *Discodeles* found in the Solomon Islands. He believes (pp. 36–37) that the

reference to *cognata* as a subspecies of *bufoniformis* is in error, and suggests that *cognata* is "probably related to *D. opisthodon* or *D. guppyi* and should be reexamined in this light." Brown also notes that the measurements given by Vogt for *ventricosus* correspond to those of *opisthodon*.

Six specimens that the Gilliards collected establish the presence of *D. guppyi* on New Britain. They agree in all important respects with

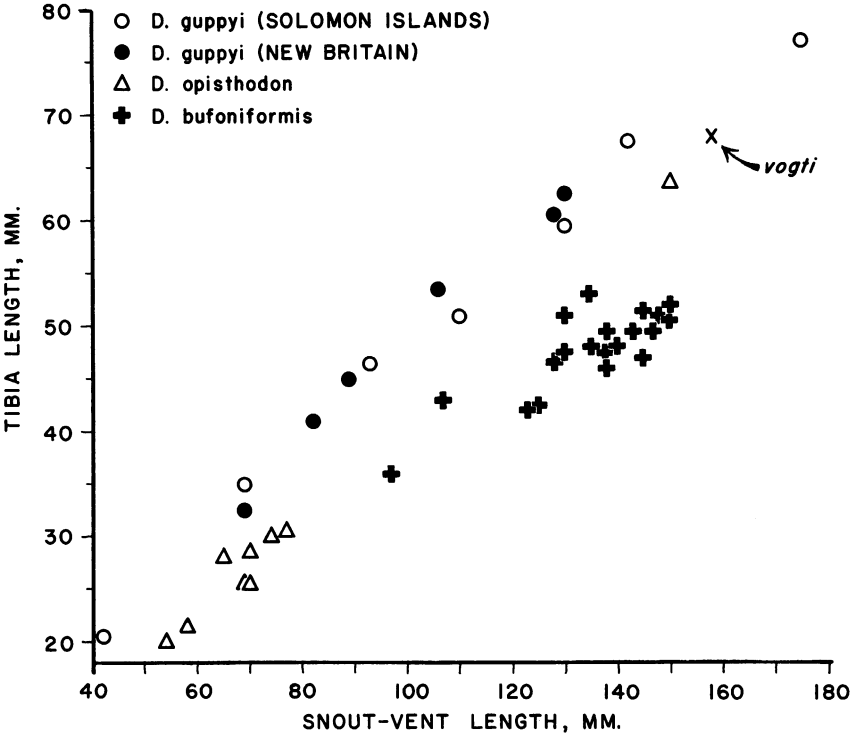

FIG. 2. Relative length of the tibia in four species of *Discodeles*. Measurements of *D. vogti* taken from the original description, other specimens measured by the author.

specimens of this species from the Solomon Islands. The males possess external vocal sacs, structures that *bufoniformis* and *opisthodon* lack, the head is relatively narrow, and the legs are long. Measurements of head width and tibia length in relation to snout to vent length are presented in figures 1 and 2 for specimens of the three species from the Solomon Islands, and for *guppyi* from New Britain and *vogti* from the Admiralties. The close correspondence in proportions of *guppyi* from

New Britain and the Solomons is evident, and there is no doubt that the populations represent the same species.

The presence of *Discodeles guppyi* on New Britain, however, does not demonstrate that Hediger's *cognata* is a synonym of *guppyi*. It is possible that New Britain is inhabited by more than one species of *Discodeles*, especially in view of the probable specific identity of *Discodeles vogti* and *D. opisthodon* (see figs. 1 and 2, and Brown, 1952, p. 37). Also, recall the presence of three species on Bougainville Island, the largest of the Solomon Islands close to the Bismarck Archipelago. Unfortunately, Hediger's description of *cognata* does not include the measurements of head width and tibia length, which would aid in determining whether the type specimen is closest to *guppyi* or *opisthodon;* the relatively long legs of *cognata*, with the heel of the adpressed limb reaching past the eye, suggest that *D. bufoniformis* may be eliminated from consideration. The vomerine teeth of *cognata* are said not to extend outward beyond the inner angles of the choanae. In his key Brown (*loc. cit.*) distinguishes *guppyi* from *opisthodon* partly on the character of the teeth, which extend outward beyond the sagittal plane of the inner edge of the choanae in *guppyi*. On this basis, *cognata* might be considered closest to *opisthodon*. However, the rows of vomerine teeth do not extend conspicuously past the corners of the choanae in any specimens of *guppyi* from New Britain.

In light of modern knowledge of the genus *Discodeles*, *Rana bufoniformis cognata* is inadequately described and diagnosed. There is nothing in the description that serves to distinguish it from *D. guppyi*, which occurs on New Britain. For this reason *cognata* is referred to the synonymy of *guppyi*. Study of the type specimen of *cognata*, however, may reveal relationships with *D. opisthodon* rather than *D. guppyi*. The identity of the six specimens Hediger (1933, p. 22) records from Iriu, Manus Island, and the Admiralty Islands as *Rana bufoniformis cognata* remains in doubt. Little significance can be attached to Hediger's statement that "These animals correspond exactly to the diagnosis given in my earlier work for a specimen from New Britain," because that diagnosis inadequately characterizes the subspecies.

Platymantis boulengeri (Boettger)

Figure 3

Cornufer boulengeri BOETTGER, 1892, p. 18; type locality, New Britain. WERNER, 1900, p. 114.

Iambon, Camp No. 6, 1500 feet, Whiteman Range, New Britain (A.M.N.H. No. 64254).

This species apparently is endemic to New Britain and is quite distinct from the other members of its genus. I have examined two specimens (M.C.Z. Nos. 1729, 9372, "New Britain") in addition to the individual obtained by the Gilliards.

Boettger bases the original description on a single specimen with locality no more specific than "New Britain." Werner (1900, pp. 114–117) reports eight additional specimens from localities on the south edge of Blanche Bay and discusses their variation; he notes that young individuals of *boulengeri* are difficult to distinguish from the sympatric

FIG. 3. *Platymantis boulengeri*, Iambon, New Britain, A.M.N.H. No. 64254. Natural size.

species, *P. papuensis*, whereas the adults are easily differentiated. Vogt (1912, p. 9) mentions a specimen from Simpsonhafen (= Rabaul).

Previous investigators stress the broadness of the head as a distinctive characteristic of this species. If the three specimens I measured are typical, the difference between *boulengeri* and other species of *Platymantis* is such that this character in itself is diagnostic, at least of adults. In the scatter diagram (fig. 4), head width is plotted against snout to vent length for *boulengeri*, *gilliardi*, *papuensis*, and *solomonis*. It is evident that *papuensis* and *solomonis* are similar in relative head width, but the head of *boulengeri* is conspicuously wider. Probably small individuals of *boulengeri* would bear more resemblance to the other species, and perhaps fall within the same range of variation. Measurements of one or two specimens of three other species, *pele-*

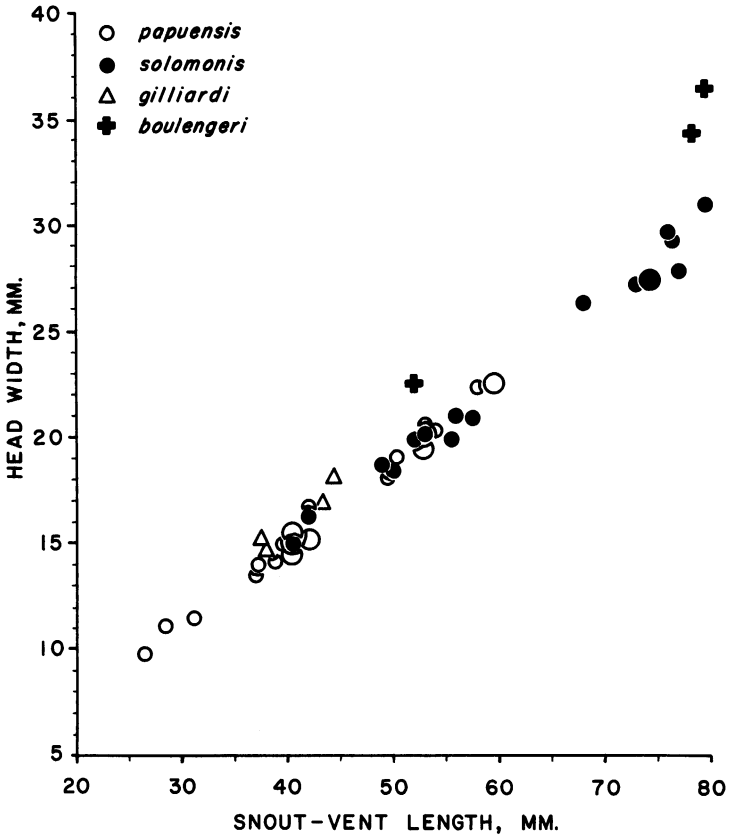

FIG. 4. Relative width of the head in four species of *Platymantis*. Specimens of *solomonis* from Bougainville Island, Solomon Islands, and *papuensis* from Iambon, New Britain. A symbol of larger size is used to indicate two specimens with identical measurements.

wensis, myersi, and *beauforti,* indicate that these, too, fall in the same general range as those of *papuensis* and *solomonis.* Measurements of one specimen (A.M.N.H. No. 34733), which Brown (1952, p. 48) tentatively refers to the dwarf species *P. aculeodactylus,* suggest that this species has a broader head than other species with the exception of *boulengeri.* However, the paucity of material prevents an adequate comparison of this tiny form with the large *boulengeri,* and Brown notes that this specimen has a broader head than the type and paratype of *aculeodactylus.* Young individuals of *boulengeri* may not differ from adults of *gilliardi* in head width.

The proportionately small size of the eyes also distinguishes *Platymantis boulengeri* from its relatives. This is shown graphically in figure 6. The eye of *boulengeri* is much smaller in proportion to the body size than that of *papuensis*. In turn, *solomonis* appears to have larger eyes than does *papuensis*. The eyes of *aculeodactylus, beauforti, gilliardi, myersi,* and *pelewensis* are all proportionately large compared to those of *boulengeri*.

Platymantis gilliardi, new species

Figure 5

Cornufer solomonis, VOGT, 1912, p. 9 (part?).

Cornufer corrugatus, STERNFELD, 1920, p. 434 (?specimens from Pak and Lo Islands).

TYPE: A.M.N.H. No. 64253, from Iambon, Gilliard Camp No. 6, elevation 1500 feet, Whiteman Mountains, New Britain, collected by Margaret and E. Thomas Gilliard on January 13, 1959.

PARATYPES: A.M.N.H. Nos. 23545 and 23546 from Pak Island, Admiralty Islands, and No. 23547 from Rambutyo Island, Admiralty Islands.

DIAGNOSIS: *Platymantis gilliardi* differs from other species of the genus in the following combination of characters: the size is moderately small, females reaching maturity at 43–44 mm. in snout to vent length; the internarial distance is approximately equal to the distance from the eye to the naris, E–N/IN = 0.88–1.07; the head is moderately broad, HW/S–V = 0.389–0.405; the eyes are relatively large, ORB/S–V = 0.132–0.140.

DESCRIPTION OF TYPE: The specimen is an adult female containing unpigmented ova of several sizes, of which the largest is slightly more than 2.5 mm. in diameter. The following measurements are in millimeters: snout to vent length, 44.4; tibia length, 20.1; head width, 18.0; head length, 16.5; internarial distance, 4.4; distance from eye to naris, 4.6; length of orbit, 6.1; horizontal diameter of tympanum, 3.4.

The nostril is nearer the tip of the snout than the eye, the canthus is distinct but not sharp, and the loreal region is shallowly concave. A moderately distinct fold passes from the posterior corner of the eye above the tympanum and then downward, disappearing before reaching the foreleg. The tympanum is moderately distinct and the interorbital space very slightly broader than the width of an upper eyelid.

The second finger is conspicuously shorter than the first and third, which are approximately equal in length. The fingers bear lateral fringes, but the tips of the fingers are not expanded into discs, and

there is only a slight trace of horizontal grooving such as separates the dorsal and ventral parts of the digital discs of some other species. Tubercles present on the fingers and hand include conical subarticular tubercles, a large inner metacarpal tubercle, smaller middle and outer metacarpal tubercles, and small palmar tubercles. There is no webbing.

The toes have small terminal discs with a groove between dorsal and ventral parts. There are conical subarticular tubercles, an elongate inner metatarsal tubercle, a conical outer metatarsal tubercle, and small tubercles on the sole. In order of decreasing length, the toes are

FIG. 5. *Platymantis gilliardi*, type specimen, A.M.N.H. No. 64253, Iambon, New Britain. Natural size.

4>5>3>2>1. Small, basal webs separate the toes, but there is no fringe on the toes as is apparent on the fingers.

The dorsal surface of the body is relatively smooth. A fold arises at the rear of each orbit; the two folds converge in the shoulder region, where they assume a parallel course and become indistinct and broken before reaching the sacrum. The eyelids are rugose. Several faint diagonal folds cross the tibia, but there is only the faintest trace of a tarsal fold. Between the folds on the back the skin is slightly granular, but the flanks are smooth. The chin and chest are smooth, and the abdomen is slightly granular.

Eight vomerine teeth on each side are arranged in slightly curved

rows. The length of a row is very slightly shorter than the gap between rows.

The dorsal color in preservative is gray-brown, slightly paler between the convergent dorsal folds than lateral to them. There is no pattern on the back other than an indefinite dark line that follows each of the folds for a short distance in the shoulder region. A band of dark pigment follows the lower margin of the supratympanic fold and passes through the upper edge of the tympanum. There are two indistinct dark, vertical bars beneath the eye and two more, slightly more distinct, on the snout—one anterior to the nostril and one posterior. Indistinct dark bars are present on the femur and tibia. The chin is pale, with very faint dark markings around the margin. The chest and abdomen are pale and almost immaculate. The rear of the thigh is dark, but many of the rugosities possess ill-defined light tips. The lower surface of the femur is dotted with sparsely scattered melanophores in no definite pattern. The under side of the tibia also lacks a definite pattern, but dark pigment predominates.

I have examined the skeleton of the type specimen only far enough to note that the pectoral girdle is firmisternal, with the omosternum deeply forked at the base, and the terminal phalanges bluntly rounded.

VARIATION IN THE TYPE SERIES: Paratypes were collected by Schoede and were obtained by the American Museum of Natural History in an exchange with the Berlin Museum in 1925. Presumably these were among the specimens Vogt (1912, p. 9) referred to *Cornufer solomonis*. The frogs from Pak Island bore this identification when received, but the individual from Rambutyo Island ("Lambussa") was sent as *Cornufer boulengeri*.

The paratypes are similar to the type specimen in proportions, as may be seen in figures 4, 6, and 7. The various ratios calculated for the specimens also illustrate this fact. The measurements (in millimeters) and ratios are given in the following order: type specimen; A.M.N.H. No. 23547 (Rambutyo Island); No. 23545 (Pak Island); No. 23546 (Pak Island). Snout to vent length, 44.4, 43.2, 37.6, 37.7; TL/S–V, 0.452, 0.472, 0.431, 0.432; HW/S–V, 0.405, 0.389, 0.401, 0.389; E–N/IN, 1.04, 1.07, 1.00, 0.88; ORB/S–V, 0.137, 0.132, 0.140, 0.138; length of third finger, 9.0, 10.2, 8.8, 8.3.

The paratype in the best state of preservation, A.M.N.H. No. 23546, has small but distinct finger discs with grooves separating dorsal and ventral parts. Grooves are only faintly seen in A.M.N.H. No. 23545, and are not visible in A.M.N.H. No. 23547. The first finger is longer than the second in all three specimens. The skin of the dorsum is even

smoother in the paratypes than in the holotype, but this may in part be attributable to the soft condition of the paratypes. Paired, convergent dorsal folds such as are seen on the holotype are present in A.M.N.H. No. 23545, though weaker than in the holotype. There is only a faint trace of these folds in A.M.N.H. No. 23546, and no indication at all of them in A.M.N.H. No. 23547.

The paratypes differ somewhat from the holotype in color pattern. The chin is mottled with brown in all three. Some of this color, more than in the type specimen, is present on the chest, and a little dark pigment is seen on the belly. The side of the head from snout to tympanum is much darker in the paratypes, and contrasts with the lighter dorsal surface. One specimen has a light line along the canthus and the edge of the upper eyelid. As in the holotype, there is a tendency for the middorsal region of the paratypes to be darker than the flanks.

The specimen from Rambutyo Island, A.M.N.H. No. 23547, is an adult female containing large, unpigmented ova.

Referring to 67 specimens from Pak Island, Sternfeld (1920, p. 434) records that "The largest specimen measures only 57 mm." However, we cannot be certain that Sternfeld's specimens were all *gilliardi*, and therefore do not know if *gilliardi* reaches so large a size.

COMPARISON WITH OTHER SPECIES: The species with which *P. gilliardi* first is to be compared are those that occur with it on New Britain. At the type locality, Iambon, the Gilliards secured 36 specimens of *P. papuensis* and one individual of *P. boulengeri*.

Platymantis gilliardi differs from *papuensis* in snout shape (as measured by the ratio of the distance from the eye to the naris to the internarial distance), head width, tibia length, and probably in size. The distance from eye to naris in *gilliardi* is considerably less than in specimens of *papuensis* similar in internarial distance (fig. 7, table 1). The head of *gilliardi* is only slightly wider (fig. 4, table 1), and the difference, though it is not great, may be significant for this conservative character. The tibia of *gilliardi* is notably shorter than would be expected in *papuensis* of similar size (table 1). It should be mentioned, however, that such difference holds true only for the sample of *papuensis* from Iambon. Other populations of *papuensis*, for example that of the D'Entrecasteaux Islands of Papua (see p. 22) are almost as short-legged as *gilliardi*. The female of *Platymantis papuensis* probably does not attain sexual maturity at a length of less than 50 mm. (Brown, 1952, p. 46). This suggests that *gilliardi* may be a smaller species, as the type and a paratype are mature at 43–44 mm.

Knowledge of variation in *Platymantis boulengeri* is rather lim-

ited, but certain features are probably reliable for distinguishing this species from *gilliardi*. As it reaches a length of about 80 mm., *boulengeri* is one of the larger species in the genus, ranking with *solomonis*

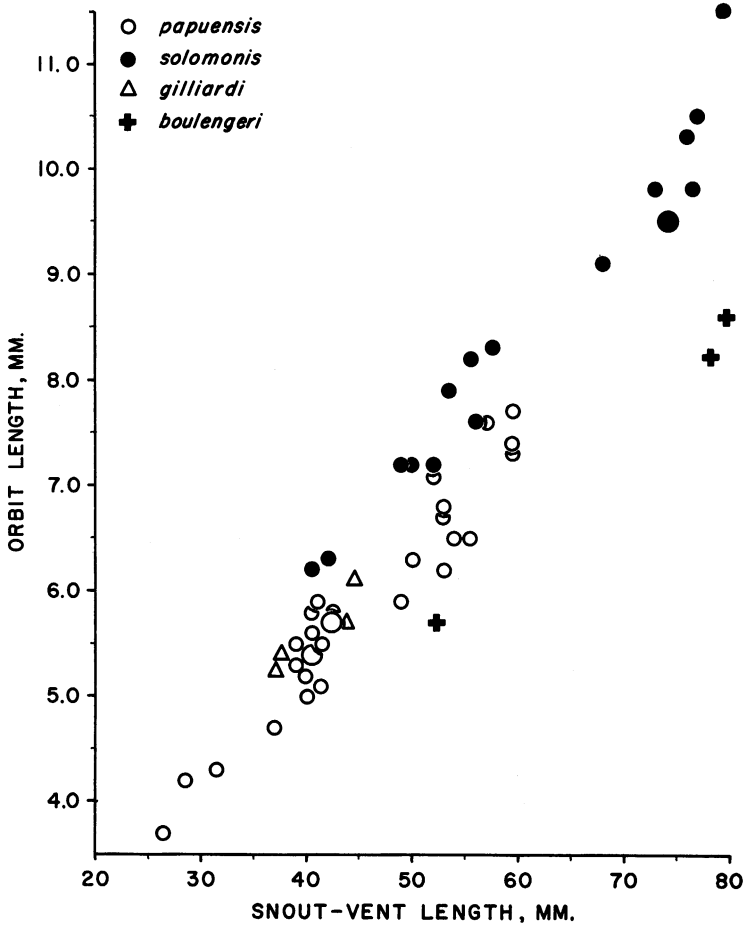

FIG. 6. Relative size of eye in four species of *Platymantis*. Specimens of *solomonis* from Bougainville Island, Solomon Islands, and *papuensis* from Iambon, New Britain. A symbol of larger size is used to indicate two specimens with identical measurements.

and *beauforti*. Females of *gilliardi* are mature at only 43–44 mm., strongly indicating a difference in maximum size. The size of the eye differs in the two species (fig. 6, table 1). *Platymantis gilliardi* has an

TABLE 1

RATIOS OF TIBIA LENGTH TO LENGTH FROM SNOUT TO VENT, HEAD WIDTH TO LENGTH FROM SNOUT TO VENT, LENGTH OF ORBIT TO LENGTH FROM SNOUT TO VENT, AND DISTANCE FROM EVE TO NARIS TO INTERNARIAL DISTANCE IN SAMPLES OF *Platymantis*

	boulengeri	*gilliardi*	*papuensis* Iambon, New Britain	*papuensis* Rabaul, New Britain	*solomonis* Bougainville Island	*myersi* Bougainville Island
TL/S–V						
Mean	0.440	0.447	0.542	0.499	0.475	0.475
Range	0.41–0.49	0.43–0.47	0.49–0.59	0.45–0.55	0.45–0.51	0.47, 0.48
N	3	4	34	25	17	2
HW/S–V						
Mean	0.442	0.396	0.373	—	0.374	0.380
Range	0.43–0.46	0.39–0.41	0.36–0.39	—	0.35–0.39	0.38, 0.38
N	3	4	34	—	17	2
ORB/S–V						
Mean	0.107	0.137	0.132	—	0.140	0.142
Range	0.105–0.109	0.132–0.140	0.117–0.147	—	0.127–0.153	0.131, 0.153
N	3	4	34	—	17	2
E–N/IN						
Mean	0.99	1.00	1.33	1.29	1.20	1.23
Range	0.93–1.03	0.88–1.07	1.20–1.55	1.21–1.48	1.10–1.33	1.17, 1.30
N	3	4	24	33	17	2

eye similar in size to that of *papuensis*, and distinctly larger than that of *boulengeri*. In snout shape and tibia length, *gilliardi* may not differ from *boulengeri*, or at least the differences that may exist are not so striking as to be obvious from the few specimens available. The head of *gilliardi* appears narrower than that of *boulengeri* (fig. 4, table 1), but small individuals of *boulengeri* may have narrower heads than do the three specimens examined.

Four species of *Platymantis* are found in the Solomon Islands, all of them known from Bougainville Island, the large island nearest New Britain (Brown, 1952). The species are *P. myersi*, *P. aculeodoctylus*, *P. papuensis weberi*, and *P. solomonis*. Specimens of *weberi* from Bougainville appear not to differ from *papuensis* on New Britain in the characters deemed of importance in distinguishing the species from *gilliardi*, so the comparison need not be repeated. The other species require discussion.

Platymantis solomonis is the only one of the three remaining species represented by an adequate number of specimens. The eye to naris distance of *gilliardi* is shorter than that of *solomonis*, though the difference is not so great as that between *papuensis* and *gilliardi* (fig. 7, table 1). Head width is probably slightly greater in *gilliardi* (fig. 4, table 1); *solomonis* is very similar to *papuensis* in this respect. The measurements indicate that *solomonis* has larger eyes than does *papuensis*, *gilliardi*, or *boulengeri* (fig. 6, table 1). No great difference between *gilliardi* and *solomonis* in tibia length is evident (table 1). Here again body size is probably significant, and the remarks made in the comparison with *boulengeri* apply.

Platymantis myersi is known from only four specimens; I have examined two, one of them the type. A paratype, A.M.N.H. No. 35340, is almost identical in length to the type of *gilliardi*, so the measurements of these two specimens may be compared directly. Measurements (in millimeters) of *myersi* are given first, followed in parentheses by those of *gilliardi:* snout to vent length, 45.7 (44.4); tibia length, 21.8 (20.1); head width, 17.5 (18.0); diameter of orbit, 7.0 (6.1); internarial distance, 4.3 (4.4); distance from eye to naris, 5.6 (4.6). The two specimens are similar in most proportions, but the eye is larger and the distance from eye to naris greater in *myersi*. The significance of a difference of approximately 1 mm. in these measurements might be questioned, but an examination of figures 6 and 7 (on which *myersi* is not plotted) shows that such a difference is truly considerable, in the light of the range of variation seen in other species.

There is a conspicuous difference between *myersi* and *gilliardi* in

the nature of the hands: the fingers are strikingly longer in *myersi*. The length of the third finger, measured from the proximal end of the central metatarsal tubercle, is 13.1 mm. in *myersi* and 9.0 mm. in the type specimen of *gilliardi*. The tips of the fingers are expanded into distinct discs in *myersi* and not expanded in the type of *gilliardi*, but I hesitate to place too much emphasis on this because the discs of the

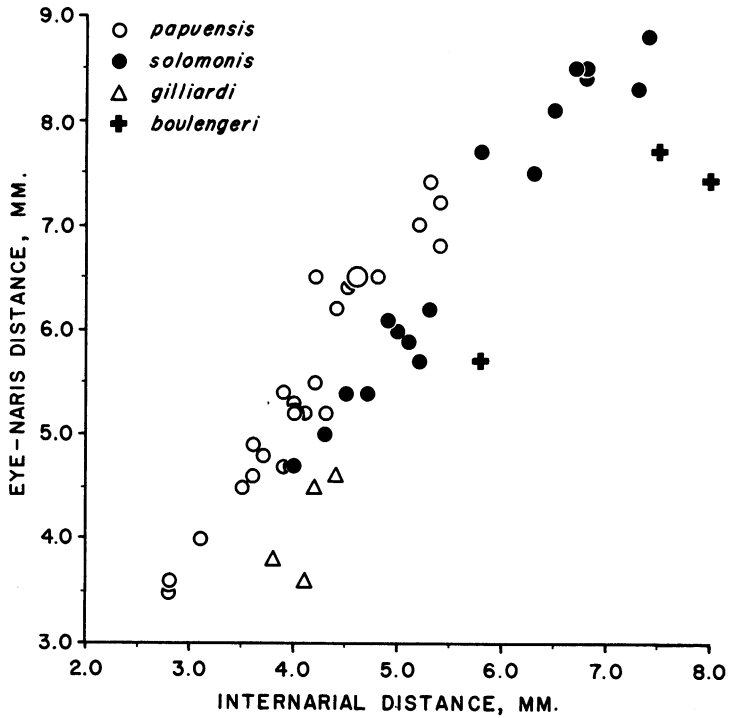

FIG. 7. Relationship of distance from eye to naris to internarial distance in four species of *Platymantis*. Specimens of *solomonis* from Bougainville Island, Solomon Islands, and *papuensis* from Iambon, New Britain. A symbol of larger size is used to indicate two specimens with identical measurements.

type of *gilliardi* may have shrunk, and a paratype has small but distinct discs. In *myersi* the first and second fingers are approximately equal in length, but the first finger of *gilliardi* is markedly longer than the second.

There seems little likelihood that *Platymantis gilliardi* is a member of the same species as *P. myersi*. In the original description of *P. myersi*, Brown (1949) suggested a close relationship with *P. vitianus* of Fiji,

but he later revised his opinion in favor of "probable closer affinities with *P. beauforti*" (1952, p. 48). Through the courtesy of Dr. E. E. Williams, I have examined a cotype of *P. beauforti* (M.C.Z. No. 10774, Majalibit Bay, Waigeo Island, Netherlands New Guinea) and compared it with the holotype of *P. myersi* (A.M.N.H. No. 35348, Bougainville Island, Solomon Islands). The two specimens are virtually identical in body size and in all pertinent dimensions. They agree even in such details as finger length, development of discs, and ventral coloration. As far as can be determined from the preserved specimens, they could have come from the same local population instead of from islands over 1600 miles apart. Each species is known only from its type locality. It is likely that when larger series of specimens become available differences not now apparent will be detected. I doubt that anything would be gained at present by placing *myersi* in the synonymy of *beauforti*.

My measurements of *P. myersi* and *P. solomonis* indicate that they are almost identical in proportions (table 1). Brown (1952, p. 46) distinguishes the two species in that the first finger is longer in *solomonis*, and the fingers of *solomonis* lack discs or grooves. The concordance of characters in the few specimens of *myersi* justifies recognizing it as distinct from *solomonis*, though the validity of a species based on either character alone would be open to question.

Platymantis aculeodactylus, described by Brown in 1952, was based on two specimens from Bougainville Island. Brown refers a third specimen from Choiseul Island, Solomon Islands, to the species, but notes differences from the type and paratype. The distinguishing characters of *aculeodactylus* are small size (the type is an adult female with a length from snout to vent of 25 mm.), pointed finger tips lacking grooves or discs, and first and second fingers about equal in length. Brown suggests that *aculeodactylus* is most closely related to *P. cheesmanae*, a species of similar size known only from the Hollandia region of New Guinea.

With only four specimens of *Platymantis gilliardi* and three of *aculeodactylus* (one referred to the species with question) known, the significance of the differences noted may be questioned. The much greater size of *gilliardi*, and its relatively longer first finger, are notable differences from *aculeodactylus*. The condition of the finger tips is variable in *gilliardi*, and there is some indication that the absence of discs is due to the poor state of preservation. If the specimens here ascribed to *P. gilliardi* were assigned to *aculeodactylus*, two of the apparently diagnostic features of *aculeodactylus*, size and finger length,

would have to be dismissed. It seems more reasonable to assume that *gilliardi* is a distinct species.

DISTRIBUTION OF *Platymantis gilliardi:* Although frogs of this genus have been recorded from several islands in the Bismarck Archipelago, the published accounts are for the most part inadequate, and it is impossible to determine for certain which species the authors had in hand.

Werner (1900, pp. 112–116) recorded *Cornufer corrugatus* and *Cornufer boulengeri* from New Britain. He experienced some difficulty in distinguishing young individuals of *boulengeri* from *papuensis,* which suggests that he may have had *P. gilliardi* in the series.

It is pointed out above that the paratypes of *P. gilliardi* from Pak and Rambutyo Islands were identified as *Cornufer solomonis* by Vogt (1912). Sternfeld (1920, p. 434) records specimens from Pak Island as *Cornufer corrugatus.* However, he mentions that the frogs are of plump habitus, short-legged (*"Hinterbein reicht nicht bis zur Schnauzenspitze"*), and without longitudinal striping. These characters are suggestive of *gilliardi* rather than *papuensis.*

There are records of *Platymantis* for several other islands, but in the absence of adequate description of the specimens, identity is in doubt. Hediger (1933, 1934) records *Rana rugata* (= *Platymantis papuensis?*) from Umboi, New Britain, New Ireland, Tabar, Lou, and Manus Islands, and Tanner (1951, p. 3) briefly discusses *"Platymantis* sp." from Los Negros in the Admiralties.

In the absence of reliable records in the literature, *Platymantis gilliardi* can be recorded only from New Britain, Pak, and Rambutyo Islands. However, it seems almost certain that specimens of this species from other islands exist, though presently misidentified.

Platymantis papuensis Meyer

Figures 8 and 9

Platymantis corrugatus papuensis MEYER, 1874, Monatsber. Akad. Wiss. Berlin, p. 139; type locality, Biak Island, Netherlands New Guinea.

Iambon, Camp No. 6, 1500 feet, Whiteman Range, New Britain (A.M.N.H. Nos. 64253–64272 plus 16 untagged); Moia, Camp No. 14, 1000 feet, Whiteman Range, New Britain (A.M.N.H. No. 64273).

Platymantis papuensis was treated as a subspecies of the Philippine form *P. corrugatus* by Loveridge (1948), but Brown (1952, p. 51) and Inger (1954, p. 352) agree that the Philippine and Papuan forms are specifically distinct. (Inger, in addition, would include *Platymantis* in the genus *Cornufer.*) *Platymantis weberi* of the Solomon Islands is

treated as a subspecies of *papuensis* by Brown (1952), and *Platymantis corrugatus rubrostriatus*, type locality Roon Island, Geelvink Bay, Netherlands New Guinea, is probably subspecifically related to *papuensis*, if worthy of recognition at all (Loveridge, 1948, p. 409).

Inasmuch as the populations of New Guinea and the Solomon Is-

FIG. 8. *Platymantis papuensis*, Iambon, New Britain, showing unicolored dorsal pattern. Natural size.

lands are recognized as different subspecies, it is necessary to determine the subspecific status of the frogs on New Britain. Brown (1952, pp. 50–51) observes that *weberi* "appears to differ [from *papuensis*] in the presence of a more distinct tarsal fold, more prominent and slightly wider folds on the dorsum; the greater rugosity of the solar area and the generally more distinct groove separating the inferior and superior

portions of the minute disks of the finger." He goes on to note (p. 52) that "There is no significant difference in body proportions, except perhaps for the length of the tibia in relation to the snout to vent length. . . ." The data he publishes for frogs from the Hollandia area of New Guinea and Isabel Island in the Solomons indicate that the legs may be slightly shorter in *weberi*.

The differences between *papuensis* and *weberi* are difficult to evaluate objectively. In addition, they may reflect both individual variation and the state of preservation of the specimen. The specimens from

FIG. 9. *Platymantis papuensis*, Iambon, New Britain, showing two-striped dorsal pattern. Natural size.

New Britain possess distinct grooves on the finger discs, resembling *weberi* in this respect, but even among well-preserved frogs from New Guinea I find considerable variation. For example, a topotype of *papuensis* shows scarcely a trace of grooves, but another collected with it has distinct grooves. Similarly, the prominence of dorsal folds varies rather greatly within and among several Papuan samples.

The length of the legs gives no clue to relationships. Any one local population usually has a relatively restricted range of variation, but there is no geographic consistency in the pattern. I have not made a broad survey of this character in *Platymantis papuensis*, but the fol-

lowing data serve to illustrate the point: five specimens from Bougainville Island (*"weberi"*) have a TL/S–V ratio averaging 0.499, range 0.48–0.53; 34 from Iambon, New Britain, average 0.542, range 0.49–0.59; 25 from Rabaul, New Britain, average 0.499, range 0.45–0.55; 19 from the D'Entrecasteaux Islands (southeast of New Guinea) average 0.472, range 0.40–0.52. These ratios are not directly comparable with those given by Brown (1952, p. 51), as his method of measuring the tibia differs from mine. However, he finds less difference between the widely separated populations of Hollandia (New Guinea) and Isabel Island (Solomons) than I find between two localities on New Britain.

In view of our inadequate knowledge of variation in *Platymantis papuensis*, I think it inadvisable to place a subspecific designation on the population of New Britain. In fact, the recognition of any subspecies of *P. papuensis* is open to doubt.

Inger (1954, p. 357) created a *nomen nudum* by the use of the name *C.[ornufer] nova-britannae*. Dr. Inger informs me (*in litt.*) that the name *nova-britannae* was a manuscript name coined by K. P. Schmidt; evidently Schmidt intended to give this name to a series of frogs from Rabaul but never published it. The specimens were placed in the collection identified as *nova-britannae*, leading to the inadvertent publication of the name by Inger. I have examined the specimens (C.N.H.M. Nos. 13856–13858, 13860, 13906, 109664–109704) and identify them all as *Platymantis papuensis*.

Rana papua novaebritanniae Werner

Rana novae-britanniae Werner, 1894, p. 1; type locality, New Britain; 1900, p. 111.

Rana kreffti, Roux, 1918, p. 411. Boulenger, 1920, p. 186. Van Kampen, 1923, p. 206. Hediger, 1933, p. 23.

Rana papua, Sternfeld, 1920, p. 433.

Rana papua kreffti, Hediger, 1934, p. 486.

Rana daemeli, Loveridge, 1948, p. 411.

Rana papua novaebritanniae, Loveridge, 1948, p. 412. Brown, 1952, p. 58.

Southwest New Britain (A.M.N.H. Nos. 64280, 64281).

The *Rana* of the Bismarck Archipelago has had a varied taxonomic history, and the nomenclature is not yet stabilized. I have followed Brown (1952) in treating the form of New Britain as subspecifically distinct from *Rana papua kreffti* of the San Cristobal Group, Solomon Islands, but suspect that some of the supposed differences between the subspecies are less constant than has been thought. For example, *novaebritanniae* is reported to have the "venter whitish or light, not

or little mottled with blotches of brown," while *kreffti* is "usually mottled with large brown blotches" (Brown, 1952, p. 56). The smaller of the two specimens collected by the Gilliards is an immature female 35 mm. in length from snout to vent. It has the venter very heavily mottled with brown. The other Gilliard specimen, an adult male 50 mm. long, shows only traces of mottling.

Loveridge (1948) records two species of *Rana* from New Britain, *R. daemeli* and *R. papua novaebritanniae*. I have examined the two specimens on which these records are based and think they belong to the same species. One of the specimens (M.C.Z. No. 1730) was stated to be an adult male with external vocal sacs, and the other (M.C.Z. No. 9376) an adult male with internal vocal sacs. The first of these is a male with vocal sac openings and slight external indication of vocal sacs, but the second appears to be an immature female. The internal organs are distorted and poorly preserved, so determination of sex is not certain, but no vocal sac openings are to be found.

There are several distinct species of the *Rana papua* group in New Guinea, but there is no good evidence that more than one is found on New Britain. Through the courtesy of Drs. Max K. Hecht and Jean Guibé, I have received detailed measurements of the two cotype specimens of *Rana papua* Lesson in the Paris Museum. On the basis of these measurements and preliminary studies of the ranas of New Guinea and Australia, I feel that the ranas of the Bismarck Archipelago and Solomon Islands are properly assigned to *papua*, but diagnosis of the species and subspecies must await additional study.

THE FROG FAUNA OF NEW BRITAIN IN RELATION TO FROG FAUNAS OF ADJACENT REGIONS

The most striking feature of the amphibian fauna of New Britain is its poverty of species, of which only eight are reliably recorded from the island. This is a remarkably small total for a large tropical island. The number of species seems even more unusual when the fauna is compared with that of New Guinea or the Solomon Islands which flank New Britain (see table 2). It seems probable that more species will be found on New Britain, but the number is not likely to be very great. Two possible additions are *Platymantis solomonis* and *Cornufer guppyi*, species widely distributed in the Solomons which Hediger (1933, p. 23) records, respectively, from New Hanover and Manus Islands north of New Britain.

Microhylids and hylids dominate the largely endemic fauna of New Guinea, for they constitute almost 90 per cent of the recognized species.

Ranids are the dominant frogs in the Solomon Islands, where microhylids are lacking and hylids are represented by only two species.

Whereas the ranid genera and species of the Solomon Islands are remarkably diversified, with three of the seven genera and eight of 14 species restricted to the Solomons, there is little endemism in New Britain. *Platymantis boulengeri* is a distinct species found only on New Britain, but the other apparently endemic species, *Hyla brachypus*, is known only from the type series, and its status therefore is less firmly established. The remaining species of New Britain are more widely represented in other regions. *Hyla infrafrenata militari* also occurs on New Ireland, but does not reach the Solomons, and the typical subspecies is widespread. *Hyla thesaurensis* ranges from New Guinea to the Solomon Islands, but, as noted in the foregoing species account, the specimen from New Britain is more like those from the Solomon Islands than those from New Guinea. *Platymantis gilliardi* probably ranges throughout the Bismarck Archipelago. *Platymantis papuensis* is found from the Moluccas to the Solomons. *Discodeles guppyi* is widely distributed in the Solomon Islands, but the genus does not reach New Guinea. The status of *Rana papua novaebritanniae* as a valid subspecies is uncertain, but the species is found throughout the Papuan region. If *novaebritanniae* is a valid subspecies, its range nevertheless includes the Admiralty Islands and northern Solomon Islands as well as New Britain and New Ireland.

TABLE 2

NUMBERS OF SPECIES AND GENERA (IN PARENTHESES) OF FROGS NATIVE TO NEW GUINEA, NEW BRITAIN, AND THE SOLOMON ISLANDS

Family	New Guinea[a]	New Britain	Solomon Islands[b]
Leptodactylidae	5 (3)	0 (0)	0 (0)
Hylidae	48 (2)	3 (1)	2 (1)
Ranidae	9 (2)	5 (3)	14 (7)
Microhylidae	61 (8)	0 (0)	0 (0)
Totals	123 (15)	8 (4)	16 (8)

[a] An estimate based on the list given by Loveridge (1948, pp. 322–325), with subsequent publications and unpublished data taken into account.

[b] Brown (1952, p. 14).

The Solomon Islands and Bismarck Archipelago, and New Guinea

as well, probably received their initial stocks of amphibians by over-water dispersal (Myers, 1953). There can scarcely have been a land connection between either New Britain and New Guinea or the Solomon Islands, or the fauna of New Britain would be much richer. The lack of ecological opportunity cannot restrict the fauna; Dr. Gilliard tells me that the forests in which he collected are very similar to their counterparts on New Guinea. Also, diversification of habitats is implicit in the great range of elevation on New Britain (up to 8000 feet) and large size of the island (roughly 300 miles long by 50 miles wide).

Purely on the basis of geography, one might expect New Britain to possess a dilute Papuan fauna, and the Solomon Islands to have a further reduced expression of the same fauna, for as Myers (1953, pp. 23–25) notes, "The mathematical chances of safe arrival over water barriers are such that we seldom see some islands of a chain skipped over by migrating forms." We have the anomaly, however, of an ecologically underpopulated island with little endemism between and quite close to two regions possessing more diverse and highly endemic faunas. If we assume that New Britain and probably other islands of the Bismarck Archipelago are of considerably more recent geologic origin than the neighboring islands to the southeast and west, a reasonable explanation for the peculiar fauna can be offered. The assumption of geologic recency has some support: "It may be accepted that all the islands off the north coast of New Guinea from the Schouten group to New Britain are of volcanic origin, and in most of them the bulk of exposed deposits was laid down within recent geological time" (David, 1950, p. 677). The Solomon Islands may have received the progenitors of their endemic ranid genera by chance dispersal at an early date; frogs of this group are evidently adept at island hopping. At a much later period in geologic history, the Bismarck Archipelago was formed, intruding between New Guinea and the Solomon Islands. In the absence of any connection with New Guinea or the Solomons, New Britain has been populated by over-water dispersal from both east and west, resulting in the present fauna of mixed affinities.

Both the small number of species and the relatively small amount of differentiation seen on New Britain indicate that the time available for colonization and speciation has been short, but there is no way of providing an accurate estimate of the duration of time.

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