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Reviewed work(s):
Source: *The Journal of the Polynesian Society*, Vol. 77, No. 4 (DECEMBER 1968), pp. 333-385
Published by: The Polynesian Society
Stable URL: http://www.jstor.org/stable/20704577
Accessed: 28/01/2013 15:58

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KARAM CLASSIFICATION OF FROGS

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CONTENTS

1. Introduction

1.0 *Objectives of paper*

This paper describes the ways in which a New Guinea Highlands people utilize, identify and classify frogs.[1] Frog-collecting is an important subsidiary aspect of the food-quest among Karam, as it is in some other

1. A version of this paper (Bulmer and Tyler, n.d.) was circulated in roneo'd form in November 1965. The many revisions now included result in part from additional data and collections obtained by R.B. in four months' further fieldwork in 1965–6 and 1967–8; in part from re-checked identifications of specimens and from taxonomic revision of certain groups; in part from helpful criticism of the earlier draft by H. C. Conklin and other friends; and in part from the authors changing their minds on certain points of interpretation over the past three years.

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areas of montane New Guinea.[2] There may therefore be some value to an account of this topic as a contribution to the regional ethnographic record. However we are primarily concerned to investigate relationships between nomenclature, taxonomy and cognition, and at the time of writing there are so few substantial publications in this field of ethnobiology that we feel justified in presenting data in extended detail.

We attempt to demonstrate that though knowledge, formal taxonomy and nomenclatural syntax are all closely related, each must be examined in its own right. The morpho-syntactical status of category names is not a fully adequate guide to the formal relationships of named categories. while formal equivalence of named categories does not necessarily indicate equivalence in terms of perceived content. In other words, given all combinations of frog nomenclature which have been recorded as actually occurring in Karam, one could predict neither the status of particular named categories in the Karam taxonomic hierarchy, nor the biological status ascribed by informants to each taxon.

Our exposition may throw some light on the apparently divergent views of ethnographers working in the field of ethnoscience and zoologists with extensive experience of primitive peoples' knowledge of natural history. Within the last decade there has been a growing awareness among ethnographers of the dangers of imposing categories of Western thought in studies of ethnobotany, ethnozoology and kindred fields. It has been argued that it is unreasonable to expect a close coincidence between the "species" and other taxonomic categories of scientific biology and the categories of folk-taxonomies, since the underlying principles of classification will be quite different.[3] On the other hand some highly qualified observers have reported a very close correspondence between indigenous taxa and the species of scientific zoology. Thus Ernst Mayr reports that a people of the mountains of West New Guinea had 137 names for 138 species of birds which he recorded,[4] while J. M. Diamond[5] describes a Fore (East New Guinea Highlands) community as classifying the 120 bird species occurring in their territory into 93 minimal taxa which correspond to zoological species, 9 which correspond to groups of closely related species, and 8 which are applied to the dimorphic sexes of 4 species of birds of paradise or bower-birds. The fact is, at least among larger and more readily observed fauna, that, as G. G. Simpson[6] says, "In spite of doubtful cases and myriads of complications, it is quite obvious to a modern scientist, *as it was to a prehistoric Guarani Indian* (our italics) that natural species do exist". And yet, strictly *formal* analysis of folk taxonomies, in terms of minimal contrasts between named categories, or the plotting of zoological species against the basic or minimal categories of a folk taxonomy, may in some cases produce little evidence of the existence of species recognition or of a species concept.

Briefly, our own conclusion is that the appreciation of natural species

2. Tyler 1961; Pospisil 1963:247–8, 255.
3. Conklin 1962:129; Sturtevant 1964:120.
4. Mayr, Linsley and Usinger 1953:5.
5. Diamond 1966.
6. Simpson 1961:57.

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is an extremely significant factor underlying Karam zoological taxonomy, even though only certain individual zoological species are given formal recognition in their system. But when they lump familiar zoological species they are in general well aware of what they are doing; while when they split zoological species they are normally aware either that their categories apply to polymorphic varieties, dimorphic sexes, or life-stages, or else they assert (in some cases patently incorrectly in the light of knowledge which they do not possess, in other cases with some plausibility) that the units they distinguish really *are* natural kinds, despite the opinions of the professional zoologist.

The "natural kinds" Karam are distinguishing are "natural" in the logical sense, that is, based on possession of many attributes, both morphological and biological, in common. To the extent that Karam recognise that creatures reproduce after their kind, we might say that these kinds are "natural" in the biological as well as in the logical sense. However there are a handful of cases, all applying to mammals, where they believe that metamorphoses sometimes occur between taxa each of which also reproduces after their kind, we might say that these kinds are "natural" in the biological as well as in the logical sense. However there are a handful of cases, all applying to mammals, where they believe that metamorphoses sometimes occur between taxa each of which also reproduces after its kind, which suggests that they do not see separate ancestry and reproductive isolation as necessary features of the units they distinguish. This is not surprising, as the theory of evolution which underlies modern biological taxonomy and the biologists' view of "natural" taxa being necessarily based on genetic or phylogenetic relationships is not part of the New Guinea Highlanders' cosmology. Nevertheless "natural" groupings of creatures in the logical sense are in practice very frequently also "natural" groupings in terms of common ancestry, which accounts for the general consistency between at least the implicit categories of Karam zoological folk-taxonomy and the lower-order taxa of scientific zoological taxonomy.[7]

1.1 *Fieldwork and methods*

In five periods of fieldwork totalling approximately twelve months between January, 1960 and February, 1968 in the Karam-speaking communities of Kaytog and Gobnem in the Upper Kaironk Valley and Gwlkm in the Upper Aunjang Valley, Schrader Range, Madang District, Territory of New Guinea, one of the authors (R.B.) collected 562 frog specimens among which at least 18 species are represented. On a further three-week field trip in August-September, 1968 with Mr J. Menzies of the Biology Department, University of Papua and New Guinea, 230 additional specimens were obtained. The great majority of specimens was purchased from Karam collectors, who were asked to name each example and describe in detail the location in which it was obtained.[8] When time permitted the

7. c.f. Bulmer n.d. (i).
8. Payments ranged from a trade razor blade (worth approximately ½c) a specimen for categories already well represented in the collection to 3c for moderately unusual kinds and an Australian shilling (10c) or more for anything really unusual.

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collectors and others present were asked to explain how they identified the specimens concerned. The fieldworker also observed the capture of frogs on a number of occasions, and had numerous discussions with his informants concerning the classification and uses of these creatures. The presence in Auckland from May to November, 1965 of two youths from the Kaironk Valley, Kiyas of *Kaytog* and Gi of *Skow*, and in Port Moresby during 1968 of Kiyas and also of Majnep of *Gobnem*, enabled him to elicit further pertinent information.

The languages used by R.B. in his enquiry were Neo-Melanesian (Pidgin English) and Karam. Much of his collecting took place in early months of fieldwork when almost all enquiries had to be made through interpreters or with Pidgin-speaking informants. His slow and gradual progress in speaking and understanding Karam must be taken into account in assessing data here presented. However brief texts on zoological points were from an early stage recorded verbatim, and he was fortunate both in having the collaboration of A. K. Pawley, whose command of Karam language greatly exceeds his own, and in enjoying the services of several excellent local interpreters and Pidgin-speaking informants.

This study is part of a wider enquiry into Karam language and society which is being undertaken by B. G. Biggs and A. K. Pawley of the University of Auckland, and R. Bulmer. Bulmer is particularly concerned with Karam ecology and natural history, and his fieldwork has also involved collecting or otherwise identifying mammals, birds, reptiles, invertebrates, and plants, in so far as Karam either use or take note of these.[9]

The 488 frog specimens collected in field trips up to 1965–6 were preserved in alcohol and sent, with field notes, to the other author (M.J.T.), who is responsible for their taxonomic determination (Table I and Section 2 below), as well as for many points of information and interpretation in the other sections of this report.

The fieldworker, who has no expertise in this branch of biology, was greatly assisted by a visit from Mr H. G. Cogger, Curator of Reptiles at the Australian Museum, Sydney, who with Mrs Cogger, spent a fortnight in December 1963 in the Kaironk Valley, using as base camp Klepn Rest House, approximately one mile up the valley from the base camp of the Auckland party. Bulmer accompanied Cogger on collecting trips, benefitting greatly from instruction concerning frog habitats and collecting techniques, and was also present when informants identified specimens for Cogger. On one occasion a group of informants identified, or argued over the identifications of, a collection of about 250 live frogs which Cogger was sorting for preservation and photographic record.

The authors are also most grateful to Mr Cogger for making available to them unpublished notes on his collection, and on the identifications which Karam collectors gave him (see Table I).

Although payment for specimens undoubtedly encourages some informants to think up new names for them, the checks provided by R.B.'s interpreters and friends limited this sufficiently for us to regard information presented in Table I and Section 5.4 as reliable. In almost all cases where it was possible to check on informants's statements as to where they obtained specimens, these proved accurate.

9. c.f. Bulmer 1967, n.d. (1), n.d. (2).

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Valuable additional information was also obtained with the assistance of Mr J. Menzies on the 1968 field-trip referred to above.

1.2 *Location and ecology*

The area of fieldwork lies between approximately 144° 21″ and 144° 28″ E., and 5° 13″ and 5° 19″ S.

The Kaironk River is a northern tributary of the Jimi River, itself a tributary of the Yuat, which in turn joins the lower Sepik. The headwaters of the Kaironk are separated from those of the Simbai and Aunjang (or Aunje) Rivers, tributaries of the Ramu, by a divide of 6,600 ft at its lowest point. The valleys of the Simbai and Kaironk Rivers divide the Schrader Range from the Bismarks and also present a continuous corridor of grassland and human cultivation areas cutting through from the Ramu to the Jimi Valleys and separating the surviving forests of the two mountain ranges.

The upper Kaironk Valley, where the larger part of the collection (418 of the specimens here reported) was made, runs East to West and is bordered on the North side by the *Nothofagus*, mixed and mixed-oak (*Pasania*) forests of the Schrader Mountains, which rise to about 8,600 ft on the highest points of the Kaironk-Aunjang divide.[10] On the South side of the Valley there are disturbed remnants of mixed-oak-*Castanopsis* forest rising to 7,600 ft at the highest point of the Bismark Range spur which divides the Kaironk from the Keiment, another tributary of the Jimi.

The valley floor drops from 6,600 ft at the head of the Kaironk-Simbai pass to about 5,000 ft at the Blm ford and westward turn of the Mundmbl River, which are here taken as the limits of the upper Kaironk Valley. Much of the steeply-sloping southern side of the valley and of the valley bottom, from 5,000 ft to approximately 6,500 ft, is covered by short grasses among which *Themeda australis* and *Ischaemum* spp. predominate, though there are also garden areas and, at higher altitudes, fairly extensive tracts of *Miscanthus* cane-grass.

The rather gentler slopes of the northern side of the valley are extensively gardened up to altitudes of 6,800 to 7,500 ft, at any one time the greater part of the area lying fallow under *Miscanthus* cane, bush regrowth (especially *Dodonea*, *Homalanthus*, PIPERACEAE, *Macaranga*, *Saurauia* and tree-fern spp.), induced *Casuarina* groves, as well as small patches of short grass on exposed slopes and ridges.

Thus the general ecological picture of the Kaironk Valley is one of contrasting types of climax vegetation (forest) on the flanking ridges, separated by a belt of disclimax vegetation induced by human disturbance which is continuous to the South-West with rather similar but lower-lying vegetation in the lower Kaironk and Jimi Valleys, and to the North-East with the Simbai Valley and ultimately with the Ramu lowlands.

The smaller part of the collection (70 specimens) was made at Gwlkm,

10. Botanical identifications are from herbarium specimens sent to the Division of Botany, Department of Forests, Lae, T.P.N.G., and from field identifications by Dr R. G. Robbins, then of the Department of Geography, Australian National University, who spent a week in the Kaironk and Aunjang Valleys in August 1964.

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upper Aunjang Valley, Ramu watershed, where, although only a few miles from the Kaironk Valley, ecological conditions are somewhat different. In this locality about a square mile of *Nothofagus* and mixed-Podocarp (especially *Dacrydium*) forest between 8,000 and 6,800 ft has within the past 45 years or so been cleared to create an isolated settlement and cultivation area still surrounded on all sides by forest. Garden fallow is of *Miscanthus* and bush regrowth and there are as yet no tracts of *Casuarina* fallow or short grass-land. The vegetation on the banks of streams is relatively undisturbed and, even in the garden zone, closely resembles that bordering forest streams at similar altitudes.

1.3 *Climate*

The Kaironk and upper Simbai Valleys enjoy the same seasonal climate as Highland areas to the South and East, with, in most years, a relatively dry season lasting from May or June to August, September or even October, while the remaining months have heavy rainfall. Thus, at Kaironk Rest House, 5,800 ft, rain totalling 59 inches fell on 104 out of 120 days from 25th September 1963 to 22nd January 1964, while a total of only 3.5 inches fell on 24 out of 47 days from July 12th to August 27th 1964. It is probable that the total rainfall in the upper valley is in the region of 120 to 140 inches in most years. However rain falls far more frequently, and probably in much greater quantity, on the forested ridges which flank the valley on the Northern side.

Night temperatures at Gobnem, Upper Kaironk Valley, 6,200 ft, fell to between 52° and 59° Fahrenheit in the months October-January, and rather lower (between 51° and 56°) in July and August, while maximum shade temperatures during the day in the same periods were between 66° and 81°, and 70° and 79°. Gobnem is sheltered from extremes of climate. At Kaironk Rest House, which is on an exposed ridge at 5,800 ft, maximum daytime shade temperatues rose to 88° or 89° on several occasions in November 1963.

1.4 *Ethnology of the Kaironk and Aunjang Valley Karam*

The people of the upper Kaironk and upper Aunjang Valleys number approximately 1,500 and form part of a total population of more than 10,000 speaking the Karam language, located in the Eastern sector of the Schrader Mountains, including the Ramu foothills and Asai, Aunjang and upper Simbai Valleys, and in the Western fringes of the Bismarck Mountains, upper Kaironk and Keiment Valleys.

Two different dialects of Karam are spoken in the upper Kaironk Valley. The majority of groups, including most members of Kaytog, one of the two communities with which we were mainly concerned, speak *etp mnm*,[11] which is also spoken by most Karam groups in the Simbai Valley, while Gobnem, the other community in which we worked, together with Womk, speaks *ty mnm*, the dialect generally spoken in the Asai Valley. The population of Gwlkm in the upper Aunjang valley is largely

11. Spelling of Karam terms follows the phonemic orthography of Biggs (1963) as revised by Pawley (n.d.).

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derived from the Kaironk groups of Gobnem and Womk, and from Asai Valley groups, and speaks *ty mnm*. In this paper (K) indicates Kaytog (*etp mnm*) dialect, (G) Gobnem (*ty mnm*). Where no marking follows a term this indicates that it is used in both dialects.

The middle and lower Kaironk Valley and adjacent areas of both the Schrader and Bismarck Ranges are occupied by speakers of Kopon, a language distinct from Karam but closely related to it.

The Karam are horticulturalists, with sweet-potato as their main subsistence crop and taro (*Colocasia esculenta*) as their crop of greatest ceremonial importance. Many other plants are also cultivated, of which bananas, sugar cane, yams, edible "pitpits" (*Saccharum edule*, *Setaria palmaefolia*), beans, and in recent years *Xanthosoma* taro and maize, are the most important. Pig husbandry is a very important activity, though pigs are usually only killed on ceremonial or ritual occasions, so that pork is an irregular constituent of diet. Hunting and collecting wild animals and plants are significant subsidiary economic activities. Small birds, mammals, reptiles, amphibia and invertebrates of many species make an important contribution to everyday diet.

Karam live in dispersed hamlets and homesteads and shift their location every few years with changes in garden areas dictated by the cycles of cultivation and fallow required by their horticulture. Most families reside at different times both in the long-cultivated grassland and garden areas on or near the valley floor, and higher up the ridges close to the forest edge. Thus, even children are generally familiar with the contrasting vegetation and animal life of the different ecological zones of their side of the valley. However, it is less usual for informants to be equally familiar with forest vegetation and ecology on both sides of the valley, since rather few people dwell and exercise rights to utilise the forest on both the Bismarck and the Schrader slopes.

2. Zoological taxonomy of frogs in the Kaironk Valley region

2.0 *General*

As the first collection from the Kaironk Valley obtained by R.B. in 1960 has been reported[12] and we anticipate a publication by H. G. Cogger reporting the collection he obtained there in 1963, the present section is mainly devoted to the zoological taxonomy of the species involved, and to the gross variation in their external morphology. By placing an emphasis on "superficial" characteristics it becomes possible to discuss the relative merits of different key characters and to compare the methods of identification of Karam with those of European herpetologists.

At this stage it is essential to point out the limitations of such a comparison. The most obvious one is that the museum worker has examined living specimens of only eleven of the eighteen species now known from the Kaironk Valley. Preserved material is a very poor substitute for living specimens, and obviously even the most detailed notes of habitat and calls cannot convey a complete picture to the laboratory based museum worker.

It is also pertinent to draw attention to the fact that whereas details of

12. Tyler 1963b.

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the fauna of the Kaironk have been known to the Karam for generations, it is only in very recent years that the major portion has been "discovered" by European collectors and reported in scientific journals. There seems little doubt that at least one further species known to the Karam has yet to be seen by a European, though this is probably restricted to lower altitudes than those with which the present study is primarily concerned. Of the current total, two species are undescribed, nine have been described within the last decade, and a further two since the end of the Second World War. Of the eleven Hylid and Ranid species the tadpole of only one has been described.

As far as we have been able to ascertain, only nine herpetologists have had the opportunity to visit New Guinea to conduct field studies. With the numerous recent discoveries (particularly in Australia) of examples of biological species that are apparently morphologically identical yet isolated by differences in such features as mating call, we naturally have misgivings about regarding some of the Karam taxa as identical when the Karam assert that differences exist. We recognise that much of our knowledge of the behaviour of the frogs of the Kaironk is vastly inferior to that of the Karam.

2.1 *The frog fauna of the Kaironk Valley region*

Frog species so far recorded in the upper Kaironk and upper Aunjang Valleys are listed in Table I. The customary practice when describing the contents of a collection is to place the species in some form of systematic order. To adopt this procedure in the present paper would be of little value, for the definitions of families and genera, and in the case of microhylids of species, are based primarily on skeletal characteristics. Since the morphological characteristics noted by the Karam are all external and superficial, the most satisfactory way of presenting our data is to ignore the practices of European systematists and group species according to their relative distinctiveness from sympatric animals, and to compare the external features and biology of those which are superficially similar to one another.

Since the habitat in which an individual specimen is collected may influence the taxon used by the Karam, an alternative form of presentation would be to subdivide the study area into different ecological segments and treat each segment separately. However, the boundaries of the component segments cannot be readily defined and as there is considerable peripheral intergradation of faunas this method would involve a considerable amount of repetition of data.

2.1.1 *Species morphologically distinct from sympatric species and exhibting slight variation in pigmentation.*

Cophixalus shellyi Zweifel, *Nyctimystes foricula* Tyler, *Asterophrys* sp. and *Hyla bulmeri* Tyler fall into this category. Within the Kaironk none of them is likely to be confused with any others, for each is quite distinctive and readily identified. *Nyctimystes foricula* is usually an immaculate green above and yellow beneath, the latter feature not being

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shared by any other Kaironk species except small juvenile *Rana grisea*, and at least some *H. bulmeri*.

Cophixalus shellyi was not collected by R.B. until 1968, but was included in Cogger's collection. A diminutive species (the largest specimen reported to date having a snout to vent length of 20 mm.), it is characterized by a very short first finger and a dark brown lateral stripe on the head and body, strongly contrasting with the pale brown dorsal surface. The length of the first finger serves to distinguish it from congeners (except *C. ateles* Boulenger)[13] but is hardly likely to be a feature utilised by the Karam.

The *Asterophrys* sp. is a uniform dull slate dorsally. Its squat habitus, short limbs and blunt, rounded head are a combination of features not shared by any other sympatric frog.

The specimens of *Hyla bulmeri* collected by R.B. were living at altitudes of 7,300–7,500 ft, and additional examples obtained by the late E. Thomas Gilliard were found at 8,200 ft at the head of the Simbai Valley. Few *Hyla* occur at such elevations and this species cannot be confused with those that do. The most characteristic feature of the majority of specimens is a dark lateral band extending from the naris to the eye and continuing posteriorly behind the eye along the side of the body.

2.1.2 *Species morphologically distinct from sympatric species and exhibiting considerable variation in pigmentation.*

Hyla arfakiana Peters and Doria, *Nyctimystes narinosa* Zweifel and *Rana grisea* Van Kampen are species whose gross morphology is such that they can be readily determined, but their coloration is highly variable. Superficial examination could therefore influence a casual observer to believe that more than one species is involved in each case.

Hyla arfakiana is at present distinguished from all other Papuan *Hyla* except *spinifera* Tyler by an exceptionally sharp and extremely prominent cantho-rostralis. The snout is prominent and pointed when viewed from above and in profile. There is a fairly consistent sexual dimorphism in the shape of the snout—obtusely angular in most females and acutely angular in males. Individuals may be grey, brown or dark green dorsally and occassional specimens have a paler marking on the head. This takes the form of a very clearly demarcated triangular patch extending posteriorly to the anterior one third of the upper eyelids, and abounded laterally by the cantho-rostralis.

Nyctimystes narinosa is a large montane species (the largest female recorded to date having a snout to vent length of 70 mm.). The fingers are exceptionally long and equipped with prominent, terminal adhesive discs. The ground colour of the dorsal surface is usually (in preservative) greyish and vividly marked with large circular spots or variegations which may be black, white, pale yellow or creamish.

Rana grisea is by far the most abundant (and in some areas the only) Ranid species found in the highlands of New Guinea. There is a definite ontogenetic trend in ventral pigmentation (discussed in 5.4.4.1 below) and considerable variation in dorsal pattern, but without any indication of

13. c.f. Tyler 1963a:20.

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true polymorphism. The dorsal ground coloration varies from a pale sandy brown to dark brown. The combination of the absence of large, dilated terminal discs on the fingers and toes, the long unwebbed fingers and the exceptionally muscular hind limbs characterize this species.

2.1.3 *Species morphologically similar to sympatric species and exhibiting considerable variation in pigmentation.*

This, the largest category, includes species whose status is uncertain, and the problems experienced by European taxonomists have undoubtedly been shared by the Karam. The species involved are *Nyctimystes disrupta* Tyler, *N. kubori* Zweifel, *Nyctimystes* sp., *Hyla angiana* Boulenger, *H. micromembrana* Tyler, *H. modica* Tyler, *Xenobatrachus rostratus* (Mehely), *Cophixalus parkeri* Loveridge, *C. variegatus* (Van Kampen), and *Sphenophryne brevicrus* (Van Kampen).

Nyctimystes disrupta attains a maximum size of approximately 80 mm. In life it is a dark olive sparsely spotted with white. In preservative the ground coloration of the dorsum changes to a very dark blue to deep violet. The ventral surface is often pigmented with lilac and pale copper.

There now seems reason to believe that *disrupta* is synonymous with *N. papua* Boulenger. As Cogger (in litt.) points out, the examination of large series of specimens reveals that the characteristics utilised by Tyler when comparing *disrupta* with *papua*,[14] do not provide a means of distinguishing the species. That we continue to use the name *disrupta* for the Kaironk population is primarily due to Tyler's observation that the type series of *papua* is not homogenous, but still consists of two quite distinct species.[15] Although the specimen figured by Boulenger[16] closely resembles our material, we feel that the interests of nomenclatorial stability are best served by utilising the taxon *disrupta* for topotypic specimens until such time that a lectotype of *papua* is designated. Furthermore the distribution of specimens bearing white spots (some densely covered) seems to follow a distinct geographic pattern, and the possibility that *disrupta* is a valid subspecies cannot be excluded at the present time.

Nyctimystes kubori and *Nyctimystes* sp. share a brown (in the case of the former a beautifully marked) dorsal coloration, a maximum size of approximately 60 mm., and triangular dermal lappets on the heels. Although there are several species that share such lappets, there is little doubt that our unidentified species is as yet undescribed.

The polymorphism of *Hyla angiana* has confused European taxonomists for many years and several erroneous identifications based on *angiana* have appeared in the literature.[17] The largest *Hyla* species occurring in the highlands, with a maximum snout to vent length of approximately 80 mm., it is characterised by extremely widely spaced nares, roughly one-third webbed fingers and an almost infinitely variable pigmentation. A detailed account of the *angiana* polymorphs based on material obtained throughout the island has been given elsewhere.[18]

14. Tyler 1963b:120.
15. Tyler 1963a:113.
16. Boulenger 1897.
17. c.f. *Hyla montana* (Tyler 1963b:117).
18. Tyler 1968:33–38.

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To the museum worker the complex of montane *Hyla* varying in adult size from 20 to 55 mm. and sharing broadly spaced nares, unwebbed or only slightly webbed fingers, highly variable tibia length to snout to vent length ratios and obscure coloration, are by far the most difficult to distinguish. Two species occur in the Kaironk Valley: *Hyla micromembrana* and *H. modica*. From the study of a large mixed series of preserved specimens it is possible to distinguish *micromembrana* by its larger size, proportionately larger eye diameter, difference in canthus rostralis shape and relatively longer hindlegs.

The Karam do not appear to have shared the museum worker's difficulty, for no single taxon has been applied to both species. This would indicate that colour in life and perhaps habitat preferences are so dissimilar that there can be no confusion.

Xenobatrachus rostratus is very highly variable in coloration without any distinct predominance of variants to suggest polymorphism. It shares with the *Asterophrys* sp. a squat and virtually obese habitus, but is distinguished from that species by its quite minute head. If it is possible to acknowledge that several New Guinea frogs are extremely beautifully coloured and gracefully proportioned, it follows that *rostratus* is an exceptionally ugly and repulsive animal. Most Europeans would probably share the Karam antipathy towards the species.

Xenobatrachus and *Asterophrys* are members of the sub-family *Asterophryinae* which, with *Barygenys*, *Sphenophryne* and *Metopostira*, is a complex group whose members are distinguished by various combinations of structural modifications to the bones of the upper and lower jaws. R. G. Zweifel of the American Museum of Natural History is currently revising the *Asterophryinae* and reports (in litt.) that examination of type specimens indicate future nomenclatural changes if the Rule of Priority of Zoological Nomenclature is strictly enforced. He has also informed H. G. Cogger of the inclusion of *Barygenys* amongst specimens referred to *Xenobatrachus*. In addition M.J.T. has recently noted divergence in superficial mandibular musculature in *Asterophrys*, and has interpreted this to indicate heterogeneity. It is reasonable to assume that a fairly major re-organisation of the *Asterophryinae* will eventuate.

Cophixalus parkeri, *C. riparius* and *C. variegatus* are difficult to distinguish in preservative and only slightly more readily distinguished when they are living. With the exception of *riparius* (which attains a maximum snout to vent length of approximately 51 mm.) they are small species rarely in excess of 35 mm. Markings, such as an X marking behind the head, are exhibited by each species and all share long digits equipped with truncated terminal discs. Their morphological similarities are so striking that they are particularly good subjects for erroneous identifications.

Only one example of *Sphenophryne brevicrus* was collected by R. B. Cogger noted that it was found in the same situations as, and often with, the *Asterophrys* sp.

3. KARAM UTILIZATION OF FROGS AND TADPOLES

3.0 *General*

Frogs form a conspicuous part of the fauna of the Karam domain,

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being extremely numerous, frequently seen and almost constantly heard. The piping of Microhylid frogs is the most characteristic sound of evening and night in the Kaironk Valley. This is recognised in the Karam saying *ŋgl ŋagl agp cn amnwno*! ("nyingle-nyangle calls, let's go", or "when the nyingle-nyangle calls it's time to go home"), "nyingle-nyangle" being the sound they ascribe to small frogs, crickets and earthworms collectively, though in practice much the larger part of it is apparently made by microhylids (*Cophixalus* spp.).

3.1 *Use as food*

3.1.0 Apart from those species placed in the Karam category *gwnm*, which approximates to the lay English category "toad" (*Xenobatrachus rostratus*, *Asterophrys* sp. and certain other Microhylid frogs: see 4.3.1.1 below), all frogs are on occasion eaten, though there are certain restrictions placed on frogs in general and on some categories in particular.

Although we cannot give estimates of the quantities of frogs and tadpoles consumed by Karam, women, girls and boys were frequently noted carrying them home, and there is little doubt that they provide an important minor source of animal protein in the diet.

3.1.1 Adults and children of both sexes collect frogs, though women and girls do more of this work than men, and are recognized to be more expert at it. The creatures are collected by searching in streams and searching or beating streamside vegetation, both in daylight and at night, by the light of flares. Boys are adept at finding frogs with their feet in the beds of shallow streams. Moonlight nights are favoured for hunting. In the forest, hunters prepare during daylight by cutting down all low vegetation along a stream bank, in a band up to about ten yards wide and for stretches up to forty or fifty yards long. After dark they readily find considerable numbers of Hylid frogs on top of cut plants, by searching with flares. They say that forest frogs, e.g. *Nyctimystes narinosa*, which spend the daytime in either trees or in the water, are normally present in the stream-side vegetation at night.

Not infrequently, twenty or thirty frogs may be gathered by a single collector in an hour or so. They are also picked up casually when noticed in gardens, bush fallow or forest.

Frogs are normally carried home in a package of leaves, or secured by the legs in a split cane which is tied around the end. Legs are sometimes broken or dislocated to prevent the animals' escape, or they are killed by biting behind the heads.

3.1.2 Before cooking, the legs are broken and femur and tibiofibula removed, and if not already dead, the animal is killed by biting behind the head. It is then put on the hot coals of a fire, and turned over after being roasted for about a minute on one side. When partially cooked it is taken off the coals, the belly is opened and the guts are removed. It is then returned to the coals till it is cooked crisp. It is then normally eaten on the spot, including most of the remaining bones except the mandibles of small frogs, and the entire skeletons of large frogs.

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Frogs are sometimes preserved by smoking over the fire, fastened in a row in a split stick. Smoked frogs are later cooked in the earthoven with greens. If this method is used the frogs are not gutted.

3.1.3 Tadpoles are also collected in large numbers, nowadays mainly by children, though it is said that before European contact grown men would also spend time at this activity when food was short. According to a few informants all kinds are eaten, though nearly all agree that the category known as *byn-yadw* (see below: probably *Rana grisea*) are avoided. Small streams are sometimes dammed up by boys pursuing tadpoles, and in shallow stretches of the Kaironk River long low stone weirs, running diagonal to the current, are constructed six or eight feet apart to provide backwaters in which the creatures can readily be captured. *Hyla* and *Nyctimystes* tadpoles are picked off the undersides of stones to which they adhere by their sucker mouths.

Like frogs, tadpoles may be carried home in leaf packages or fastened in split twigs or canes, or they may be strung on grass-stems. They may be roasted in the fire, either being simply thrown on the hot embers or placed there still in the split twig, or baked in a leaf package. Sometimes they are cooked in the earthoven, thrown in loose among edible sweet-potato leaves or foliage of the cultivated herb, *Rungia klossii*.

3.1.4 Endoparasitic leeches (*Philaemon* sp.: Karam *as set*, *kwymol* or *kataw*, the last two being general terms for leeches) found in frogs, which grow to approximately $1\frac{1}{2}''$ in length, are also eaten by women and girls, and are considered to be a delicacy. These are roasted in the embers of a fire.[19]

3.1.5 *Dietary prohibitions*

No frogs or tadpoles may be eaten by boys for a period of one to three years between their nose-piercing and their final release from initiation rites and prohibitions in the *smy* festivals. This prohibition may be explained briefly as reflecting the categorization of frogs as "soft" female food, though it may also relate to the fact that frogs are normally cooked in the fire and no food of any kind cooked in this way is permitted at this time.

Some adult men do not eat the categories *akpt* and *cebs* (*Rana grisea*) and *kabanm* (*Cophixalus parkeri*). This is said to be because these frogs have large bellies, and could cause a man who has the knowledge of sorcery in his belly to swell up likewise.

Certain people of both sexes avoid eating *akpt* (mature *R. grisea*) because this is a traditional prohibition of their ancestors, either paternal or maternal (see 3.3 below).

Some adult men avoid all frogs. Children are not supposed to eat *mabas* ("Forest frogs", *Nyctimystes narinosa* and *Nyctimystes* sp.) because the skin and limbs of these creatures are said to resemble those of old people (see 5.2.2.4) and would cause them not to flourish.

Most men and boys will not eat endoparasitic leeches. They say that

19. c.f. Tyler, Parker and Bulmer 1966.

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these creatures eat the grease or goodness of their host, causing the frog to be but skin and bone, and they fear this would happen to them if they ate them. (Further discussion of the significance of these prohibitions is provided in 5.1 and 5.5.3 below.)

3.2 *Use as eel-bait*

Eels (*Anguilla* sp. or spp.) are important to the Karam, being appreciated as food and ritually cooked in feasts of commemoration for recently deceased kinsfolk. The normal way in which eels are captured is in wicker traps with spring doors, and frogs or large white coleopterous larvae are the bait employed, impaled on the trigger.

Nowadays eels are also captured with lines and steel hooks, weighted with a stone, but a live frog is still the favoured bait.

3.3 *Alleged use in sorcery, and treatment as an evil omen*

It is said that *akpt* (mature *Rana grisea*) and *gwnm* toads are used in sorcery, but it was impossible to learn any details of these practices. If either *akpt* or *gwnm* are found in current gardens they are very gingerly removed ,with twigs, the garden owner taking care neither to kill the creature nor to handle it. Some men say that this is because they fear either sorcery or witchcraft; others that these frogs are feared merely because they are evil and poisonous in themselves.

For those with hereditary, totemic, prohibitions relating to *aymeneb* (or *akpt*), finding one of these in a garden or settlement area, particularly if it exudes fluid (*ss*—"urine") as it hops away, is an omen that some kinsman will die.

4. Karam knowledge of Anuran biology

4.0 Before reviewing Karam identifications, classification and knowledge of particular frog categories it is worth indicating that the general knowledge of frog biology is extensive and on the whole accurate. Thus they are aware of the life cycle sequence, and of the contrast between Hylid and Ranid frogs' spawning in water and production of tadpoles and the Microhylid habit of depositing eggs on the ground from which froglets emerge. They are also aware of the contrast in spawn and tadpoles between Ranid and most Hylid frogs, and note that at least some of these species have a well-marked spawning season.

They draw attention to the fact that the frogs which they observe do not copulate, as men, other mammals, birds and certain invertebrates do. They correctly identify the sex of gravid female frogs, know from observing amplexus that females are generally larger than males, and report that, in some cases, only the male calls. Since only the male frogs possess vocal sacs we presume that the "calling" by some females that they refer to are the cries produced by cultured frogs (see 5.3.7). They are well-informed on call-notes and many other aspects of behaviour.

As will be seen, informants' knowledge of habitats is very detailed, and they know of the cycle of diurnal activity of a number of species.

They are also aware of the major predators which compete with them-

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selves in the capture of tadpoles and frogs (water rats, eels and snakes) and interpret the habit of some Hylid frogs of depositing spawn in small crevices between stones as giving the eggs the maximum chance of escaping the attention of eels.

4.1 One might expect women to be better informed about frogs than men and boys, and to be more consistent in their identifications, but the field-worker's record of collectors' identifications of specimens suggests no significant difference in this respect.

It appears (here we follow Gi's generalizations, though the field-worker's observations were consistent with these) that girls learn to identify frogs from their mothers, other older women, and from other girls. Boys, who probably spend quite as much time as girls in frog collecting, in contrast learn mainly from other boys, though also, to some extent, from adult men and women.

It is notable that some of the older men, for example Wpc the "Big Man" of Gobnem, though seldom if ever eating frogs themselves because of personal dietary prohibitions relating to magic, were nevertheless very knowledgeable informants. It was the investigator's impression that a leading man could not afford *not* to be an authority on any topic, and would in the great majority of disputes over botanical or zoological identifications be deferred to, at least in his presence, though younger men and boys occasionally continued to assert divergent opinions in his absence.

5. KARAM CLASSIFICATION AND IDENTIFICATION OF FROGS

5.0 *Definition of terms and problems*

Distinctions need to be made between the morpho-syntactic status of terms which Karam apply to animals, the formal semantic status of named Karam categories vis-a-vis each other, and the status of Karam named categories in relation to implicit, unnamed categories and to the people's knowledge and perception of fauna. In this discussion we introduce the term *specieme*, defined and discussed in 5.0.3 and 5.0.4.

5.0.1 *Morpho-syntactic status of terms applied to frogs*

Names designating frogs consist of one, two or three terms. Following H. C. Conklin's distinction,[20] they may be described as either "unitary" or "composite" lexemes, with, in the latter case, at least one segment and frequently all segments also occurring as unitary lexemes. The small number of tri-segmental composite lexemes have semantically equivalent bi-segmental forms, and, in one instance, an equivalent unitary form. All bi-segmental composite lexemes other than those that have tri-segmental equivalents, have semantically equivalent unitary lexemic forms. Thus:

(a) *as daŋboŋ* (bi-segmental composite lexeme) = *daŋboŋ* (unitary lexeme)
as jejeg (bi-segmental composite lexeme) = *jejeg* (unitary lexeme)
etc.,

20. Conklin 1962:122.

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(b) *as jejeg km* (tri-segmental composite lexeme) = *jejeg km* (bi-segmental composite lexeme), but has no alternative unitary lexemic expression,

but (c) *as jejeg pkay* = *jejeg pkay* = *as pkay* = *pkay*.

In so far as it is possible to apply Conklin's somewhat arbitrary further distinction between "unitary simple" and "unitary complex" lexemes[21], one may say that nearly all Karam unitary lexemes applied to frogs are "simple". Exceptions are *mabas* ("forest-frog"), applied to certain forest-dwelling *Nyctimystes* species (5.4.2.3), and *byn-pk* ("light-skinned woman"), applied to a bright green and yellow frog (see 5.4.2.4 below).

In broad outline Karam nomenclature resembles Linnaean usage, with a majority of terms corresponding rather neatly to Linnaean generic, specific or subspecific terms in their application. Thus:

as "generic" ("frogs and certain small mammals")
as jejeg or *jejeg* "specific" (*Hyla angiana* form)
as daŋboŋ or *daŋboŋ* "specific" (*Hyla arfakiana*)
as jejeg km or *jejeg km* "sub-specific" (*Hyla angiana* form)

However Linnaean nomenclature is subject to a formal code of rules, so that all terms used in binomials and trinomials can be categorised in such a way that not merely their position in nomenclatural syntax but the taxonomic status of their referents can be unambiguously established. In Karam usage, in contrast, there are some cases where terms of identical nomenclatural status have referents of different taxonomic order, and conversely, where units of equivalent taxonomic status are labelled by morpho-syntactically dissimilar terms. Thus:

(a) the syntactically equivalent terms *kabanm* and *lk* (alternatively, *as kabanm*, *as lk*) contrast in their referents in that the former can only be applied to a secondary taxon (see 5.0.2 below) contrasting with other secondary taxa such as *jejeg*, *daŋboŋ* etc., whereas the latter is applied at two different levels of contrast, (i) to a secondary taxon contrasting with *jejeg*, *daŋboŋ*, *kabanm* etc., (ii) to a tertiary taxon contrasting with *bopnm* (or *lk bopnm*);

(b) *jejeg pkay* and *jejeg km* apply to tertiary taxa of equivalent status, both being immediate subdivisions of the secondary taxon *jejeg*. However, as noted above, *jejeg pkay* has the alternative lexemic forms *as jejeg pkay*, *as pkay* or *pkay*, whereas *jejeg km* has only the single alternative form, *as jejeg km*.

The general pattern of Karam *nomenclature* applied to frogs is thus that unitary lexemes with alternative binomial composite forms are applied. More restrictedly, binomials which also have trinomial alternatives are also used. As we shall see, there is an evident structural correspondence here with the *taxonomic* system applied to frogs, which is essentially a simple two-level hierarchical system, with partial extension downward to

21. *Idem*. Arbitrary to the extent that there is difficulty in many instances in deciding whether or not a Karam lexeme is segmentable. This difficulty also occurs in English. In Conklin's own list of examples of "unitary simple" lexemes, might some linguists or native-speakers not be prepared to regard "dandelion" as segmentable?

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a third level of contrast. However the structural parallels in nomenclature and taxonomy (which are clearly not fortuitous) do not mean that in all individual instances nomenclature is an adequate guide to taxonomic status. As Conklin says, "labels and categories can change independently, and therefore must be analysed separately."[22]

5.0.2 *Formal semantic status of Karam taxa*

All standardly named categories for frogs fall in a taxonomic hierarchy with three levels:

I. "Primary Taxon" *as*—most inclusive taxon (also including certain animals other than frogs: (see 5.1 below)).

II. "Secondary Taxa"—mutually exclusive sub-taxa of I: (a) *akok*; (b) *akpt*; (c) *aⁿm*; (d) *cebs*; (e) *daŋboŋ*; (f) *gepgep*; (g) *gyok*; (h) *gojmay*; (i) *gttek*; (j) *gwnm* (*i*); (k) *jejeg*; (l) *kabanm*; (m) *kawag*; (n) *kogop*; (o) *komnaŋat*; (p) *kosaj*; (q) *kwlek*; (r) *kwyos*; (s) *lk*(i); (t) *mabas*; (u) *wyt*; (v) *yogob*.

III. "Tertiary Taxa"—mutually exclusive sub-taxa of II(k), II(j) and II(s):

(of II(k)) (*jejeg*) *pkay*; *jejeg km*; *jejeg mlep*; *jejeg mosb*:

(of II(j)) (*gwnm*) *sbmganpygak*; *gwnm* (ii) (i.e. those members of *gwnm* (i) which are not *sbmganpygak*):

(of II(s)) *bopnm*; *lk* (ii) (i.e. those members of *lk* (i) which are not *bopnm*).

Apart from relationships of inclusion between categories I and II, and II (j), (k) and (s) and III, and those of mutually exclusive contrast between categories at the same level, categories II(d) and II(b) are related in that members of the former are said by some informants to develop into members of the latter.

We have demonstrated that it is not possible to derive this semantic classification directly from morpho-syntactic evidence. At the same time, the formal semantic relationships between named taxa do not themselves provide a fully adequate reflection of Karam perceptions. Enquiry into Karam knowledge of frogs reveals that some categories which are formally equivalent are of different order in terms of their perceived biological content (e.g. *kabanm* and *gwnm*), while others of different formal order are equivalent in terms of content (e.g. *kabanm* and *bopnm*).

5.0.3 *Cognitive status of Karam taxa*

Briefly, it appears that fundamental to Karam classification of frogs (and other vertebrate animals) is their appreciation of "natural kinds" or "*speciemes*"; that is, groups of creatures marked off from all other animals known to them by multiple distinctions of appearance, habitat and behaviour and not including recognised sub-groupings marked off from each other in a similar way. Most, but not all, speciemes recognised by Karam are given names and most of these named speciemes fall in level II of the formal taxonomy. However, some taxa of level II are not speciemes but groups of speciemes which may or may not be given individual nomenclatural recognition, while others refer only to subcategories of speciemes.

22. *Ibid.*:121.

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Taxa of level III include both speciemes and subcategories of speciemes, which in the particular case of frogs, are marked off from each other by a single morphological character (colour pattern) and may be termed "variants".

We shall argue that there is sufficient general correspondence between speciemes and basic named categories to justify the conclusion that Karam taxonomy is largely based on the people's appreciation of natural species. However, speciemes cannot be assigned a fixed status in formal taxonomy, nor can the names applied to them be given a fixed syntactic definition.

5.0.4 *The specieme concept*

Two other points need to be made in justification and explanation of this concept:

(i) Although there is a logical correspondence between the *specieme* and the *species* of scientific zoological taxonomy, and many individual speciemes do correspond precisely with zoological species, there are some divergencies between the particular units which Karam regard as natural kinds and those defined as species by professional zoologists. Thus, although there is ample precedent in Western European science and philosophy for calling Karam "natural kinds" "species", the introduction of this neologism may make for clarity in exposition, as well as emphasising that speciemes are units *as Karam themselves see them.*

(ii) While Karam vocabulary and syntax readily permit one to say of two creatures that their names, shapes, skins (i.e. normally, colour pattern), habitat, behaviour, etc., are identical, similar or different, and also enable Karam to express close relationship between named categories by use of terms with primary application to human kinship and social groupings, we have elicited no term which can be precisely equated with "kind" or "sort" or "specieme" (see 5.7.2). This does not, however, indicate that the specieme concept is an entirely artificial construct which we impose upon our data any more than the absence of terms approximating to "phoneme" or "morpheme" in a particular language invalidate the structural linguist's use of these concepts in his analysis of it. We hope that the reality and fundamental significance of Karam discrimination of "natural kinds" will be made clear by the evidence which follows in 5.2 below.

5.0.5 *"Natural" units of higher order*

It is not only the terminal or other lower-order taxa of a folk-taxonomy that may be "natural" units, defined by multiple attributes. In Karam classification of frogs, as also of other animals, there are cases where terminal taxa which are natural units are subsumed in one or more levels of higher order taxa which are also "natural" in this sense. Following the analogy of scientific biological taxonomy, it would be possible to group Karam speciemes into "super-speciemes", "genemes", etc., but there would be no obvious advantage to such an exercise. The essential relationship between folk-biology and scientific biology is established if the correspondences at the basic level are documented.

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As indicated above, there is not a precise fit between standardly named categories and categories consciously or implicitly recognised by Karam. Speciemes are not necessarily standardly named units. Natural units of higher order may also be recognised but not standardly named. The subdivisions of the primary taxon *as*, "frogs" and "small mammals" respectively, are of this kind (see 5.1).

5.0.6 Having distinguished three related levels of analysis (morpho-syntactic status of nomenclatural terms; formal status of taxa in taxonomic hierarchy; cognitive status of taxa) we still have to recognise the problem of variation in individual informants' usage at all these levels. Ideally all statements made at any of these levels should be given quantitative values. In practice we are only able to do this to a very limited extent, the main reason being that, in common with most ethnographers, the fieldworker relied on a handful of informants for a great deal of his data, on some scores of individuals for much additional fragmentary information. In no sense can the corpus of information thus obtained be looked upon as a controlled sample, and overly precise quantitative statements would be misleading, if not fraudulent. However we are reasonably convinced that our syntactic statements reflect a very standardised usage in the two communities with which we are mainly concerned; that there is relatively little variation in informants' views on the formal hierarchic status of taxa, and that our statements on this present norms from which there is rather little deviation; whereas at the cognitive level, that of biological content of taxa as perceived by Karam, we recognise that there is considerable individual variation, but hope that we nevertheless portray this reasonably adequately in 5.4 below, where each taxon is in turn described. And we would argue that this variation does not disqualify our attempt to distinguish specieme and variant categories. Thus though a fair proportion of informants might regard one or other of *mabas*, *gwnm* and *lk* as speciemes, i.e. as equivalent in biological status to *jejej*, *daŋboŋ*, *gepgep* etc., enough mature, skilled informants have provided evidence that they see one or two of these as including subcategories of biologically quite distinct status to justify us in regarding the latter as un-named speciemes rather than variants.

5.0.7 Finally, we may note that in reviewing folk-taxa we are concerned with two separate though related problems. Firstly, we need to understand the criteria by which Karam place individual creatures in one taxon rather than another, that is, to establish the principles of identification which they adopt. Secondly, we must consider possible explanations for the *existence* of these taxa, that is, attempt to understand the principles of Karam taxonomy.

5.1 *The Primary Taxon: as*

All frogs are collectively and individually classified as *as* or *jem* (a synonym used in contexts of word-taboo), a category which also includes eight secondary taxa applied to certain small, mainly terrestrial mammals

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(e.g. the rodents *Pogonomys* spp. and *Melonomys* spp. and the dasyurid *Phascolosorex dorsalis*).[23] The primary taxon *as* contrasts with *kopyak* (rats of genus *Rattus* found around homesteads and in gardens), *kmn* (furred mammals including all large marsupials and rodents, the majority of small aboreal species other than bats, and water-rats), *yakt* (birds other than cassowaries; bats), *yn̄* (skinks), *soyŋ* (non-poisonous terrestrial snakes), *aypot* (agamid lizard, *Goniocephalus* sp.), *joŋ* (most, but not all Orthoptera) etc.

Karam affirm, in answer to questioning, that frogs and small mammals really do fall in the *same* taxon (i.e. *as* = frog and *as* = small mammal are *not* homonyms), and indeed if one elicits the subcategories of *as* both frog and mammal names are normally supplied.

When R.B. enquired why it was that small mammals and frogs were placed in the same category, informants said firstly that these were all found on or in the ground. When the investigator pointed out that some of the frogs were in fact found in trees, and likewise certain of the *as* mammals, they said that both frogs and small mammals in the *as* category were collected by women, whereas *kmn* mammals were hunted by men. But this criterion is also not fully satisfactory, since men quite often collect both frogs and *as* mammals, while women not infrequently capture bandicoots, water-rats and certain other mammals classified not as *as* but as *kmn*.

In fact, the three taxa, *as*, *kmn* and *kopyak* appear essentially to be categories with contrasting status in terms of Karam food prohibitions, and, as we argue elsewhere,[24] express underlying principles of opposition in Karam cosmology, though also reflecting Karam observations of habitat and behaviour of the creatures concerned. Thus *kopyak* (rats) are basically unclean creatures associated with household refuse, excrement, and menstrual dirt, and believed to gnaw on corpses in the exposed graves: adult men and most adult women never eat them, and children and old women only eat them if they are captured at a considerable distance from homesteads, latrine areas and graves. *As*, with the exception of *gwnm*, which are never eaten, are not categorically unclean, but are "soft" food, liable to "stink" or "rot" (*kwy gp*). Provided they have not come from latrine areas or other unclean places most kinds may be eaten by all women and children and most men, but may not be eaten by youths in the period between their nose-piercing and their final release from initiation rites in the *smy* festivals, nor by some adult men who possess particular kinds of sorcery or magic. *Kmn* are regarded as good, highly valued food. All kinds may be eaten by men, women and children, the only restriction on their consumption being that two taxa (the cuscus *Phalanger gymnotis* and the striped possum *Dactylonax palpator*) may not be eaten by persons who are going to enter taro gardens within the next month, or be taken anywhere near growing taro.

23. A report on Karam classification of mammals by J. Menzies and R. Bulmer is in preparation.

24. Bulmer 1967.

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5.2 *Implicit taxa: frogs as such vs. small mammals*

Although Karam appear to have no standardised terms for the two natural divisions of *as*, namely "frogs" and "small mammals", they do of course recognise these. Informants with some knowledge of Pidgin English have no difficulty in grasping that the Pidgin category *rokrok* includes only frogs and not all kinds of *as*. Three ways of giving linguistic expression in Karam to the distinction have been noted. Frogs can in some contexts be distinguished as *as yb* (*yb* may be glossed "name", "true", "real"), though in other contexts it is equally possible to refer to frogs and small mammals collectively as *as yb*, or an individual small mammal as an *as yb*. Secondly, one informant explained that frogs could be distinguished as *as ñg-ket* (*ñg-ket* = "water-haunting"), small mammals as *as lwm-ket* (*lwm-ket* = "ground-haunting"): though this usage has not been recorded in spontaneous natural contexts. Thirdly, the field-worker noted on one occasion, when a group of girls had captured numbers of both frogs and small rodents and were debating among themselves as to which of these they should sell to him, they referred to the rodents as *kmn*, the term normally applied to game mammals. Although informants whom he questioned on this point insisted that it was quite incorrect to use *kmn* for mammals in the *as* taxon, it was clear that in the special context in which the girls used the term the extension of its referents was quite unambiguous.

5.3 *Characters used in identification of secondary and tertiary taxa*

5.3.0 *General.* In this section we are concerned with the ways in which Karam identify frogs, leaving aside the problems of the status of Karam categories and the principles of their taxonomy.

Each Karam frog category can be distinguished by a series of characters, consciously formulated by informants, which may include size, shape, colour pattern, skin-texture, body-firmness, call, odour, other aspects of behaviour, and habitat. The clearest formulations have been elicited with regard to categories which are most closely similar (e.g. *komnaŋat* and *jejeg*). However, we must note that some differences are so gross and obvious to any Karam that explicit formulation of these is uncalled for: in the same way as most Europeans need no identification key to aid them in their instantaneous discrimination of cows from horses. And in so far as Karam informants are prepared to construct "artificial" keys at the behest of the anthropologist, or even, possibly, in instructing their own children (we have no evidence on this point), the characters which they consciously draw attention to may, in fact, only constitute a very small part of the total configuration which is the basis for the informant's actual recognition of examples of particular speciemes. As Simpson puts it, such "non-technical recognition—identification—is normally not by . . . separate characters but by a mental image of the whole animal".[25] But one may add that the use of a mental image of the *whole* animal does not necessarily mean that the whole creature being identified need be seen. This was vividly illustrated by our experience when Cogger produced specimen after specimen from his collection and for the great majority of

25. Simpson 1961:12.

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these the group of about twelve persons present would say, or shout, the name almost instantaneously, often without even being able to see the whole creature, including parts of its anatomy which figured prominently in the key characters they mentioned in discussion.

With this very important qualification in mind we may discuss the set of characters which Karam do evidently, and often explicitly, utilize. In listing these we shall see how context can influence the range that can be applied and thus affect the placing of particular specimens. In the extreme case, frogs may be heard and not seen, which means that habitat and call are the only characters the observer has to go on. Alternatively, a creature may be seen in its habitat, but may not have been heard call; or may be examined when no detailed information on habitat can be provided; or be dead, so that its posture and movements cannot be observed. Finally, size, shape and colour characters are all relative, to a people who lack reference collections, book illustrations, precise techniques of mensuration, and objectively defined colour standards. Thus the presence or absence of comparative material is important. For example, the statement "*wyt* has longer legs than *lk*" is of less help when an isolated specimen or an isolated series of identical small frogs is being considered, than when a collection containing frogs of obviously varying limb-proportions is being examined.

5.3.1 *Habitat*

Although few explicit statements from informants that their knowledge of habitat could determine identifications were recorded, in fact the location in which a frog is found undoubtedly predisposes the finder to restrict the range of categories in which he or she will place it. In the extreme cases, large Hylid frogs found in forest areas, especially if they are not in streams or streamside vegetation, are almost certainly expected to be *mabas* (5.4.2.3) while small frogs found in moss or stones or under tree-trunks away from water are almost inevitably categorized as *gwnm* (5.4.3.1), though one suspects that in some cases (e.g. examples of *Cophixalus* spp.) the identical creatures would be classified as *lk* if found in short grass in gardens, of as *lk* or *kabanm* if found in the water.

5.3.2 *Size*

Overall size is a feature of considerable significance in Karam identifications. Frogs of small species, and small immature examples of large species, are noticeably less consistently identified than mature specimens of large species. This is not only because Karam are on the whole more interested in large frogs than small ones (for culinary and other reasons) but because the range of possible identifications for a large frog is very much more restricted than that for a small example.

Informants have provided very consistent statements regarding the relative sizes to which familiar frog taxa grow, and from these statements the following series may be constructed. Roman numerals distinguish seven somewhat arbitrary groupings from minute (I) up to very large (VII). These gradings are utilized in keys provided in 5.4 below. Approximate maximum body lengths, taken from specimens of species unambiguously

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placed in the taxa here listed, are provided. Where Karam state that two taxa which we have placed in the same division are nevertheless different in maximum size, we separate these by a colon, placing the smaller first, the larger second.

I	*bopnm*	20 mm.
II	*lk*	25 mm.
III	*wyt: kabanm*	35 mm.
IV	*kogop: gojmay*	50 mm.
V	*daŋboŋ, kwlek, kosoj: cebs*	60 mm.
VI	*jejeg, komŋanat, kawag, kwyos, gepgep: mabas*	80 mm.
VII	*akpt*	100 mm.

5.3.3 *Shape*

We suspect that general conformation is important in most cases of instantaneous recognition. Aspects which informants explicitly draw attention to in discriminating particular taxa include shape of snout, prominence of brows, proportions of head, proportions of belly, length of leg, size of thighs, length of digits, shape of digits.

5.3.4 *Colour*

Karam colour categories are described in Bulmer (1968), where it is noted that Karam have an elaborate vocabulary for describing and contrasting colour properties. Location, quality and patterned contrast (mottling etc.) of colour are all explicitly taken into account in distinguishing many taxa. At the same time Karam also state that certain taxa include examples of extremely varied colour pattern, and that in these cases colour qualities may be irrelevant.

5.3.5 *Other surface qualities, visual or tactile*

Uneven surface texture of skin ("goose-pimpling"), slimyness and softness or squashyness are noted as significant in some identifications.

5.3.6 *Odour*

Some informants assert that all kinds of frogs have their distinctive odours, and all agree that certain taxa can be readily distinguished by these. The difficulty in checking these assertions is that most kinds appear only to be noticeably odiferous on first capture. There are exceptions: the pungent smell of *kwyos* (*Nyctimystes disrupta*) can be distinguished even by the insensitive European nose, some hours after capture. It is of interest that Gi and some other informants insist that Karam specieme taxa which fall in the same species (*jejeg*, *komnaŋat* and *kawag*; *kwyos* and *gepgep*) all contrast in odour. Whether sex or breeding condition is the variable here, or in fact sibling species are present, remains to be investigated.

It is worth noting that the mucous and granular secretions released by some Australian frogs under stress or when exposed to irritants are quite distinctive.

Karam are, on the whole, markedly conscious of odours, with a large number of terms in their vocabulary which are compounds of *kwy*— "smell", "stink" or "decay". They distinguish the scents of a number of

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plants and trees, in some cases explicitly using this as a key characteristic in identification, and say that most marsupials and large rodents have characteristic odours, which are sometimes noted in hunting, when nests are being investigated.

5.3.7 *Call*

According to Majnep, Karam distinguish between the *mnm* ("speech", "call" or "natural sound") of a frog, which it makes spontaneously, and the *wal* ("cry"), which it makes in fright or pain, as when being taken by a snake or a human captor. Majnep says he does not think the "cries" of frogs vary greatly from kind to kind, whereas the "call" is generally different for each kind. Further, he says, some frogs make different sounds when they are just beginning to call in early evening, from those which they make when they are in full voice. Others have more than one standard call. Some frogs' calls (e.g. those of *kwlek* or *gwnm*) may be described as *gwglak* ("croaks"): others, e.g. one of the calls of *wyt*, as *sabok* ("whistle"): most, however, can only be described verbally as *mnm*, though informants distinguish them according to taxon, and can imitate many of them.

A limited attempt was made to check informants' skill in identifying frogs by call alone, by use of tape-recordings of five species. In so far as this test went, subjects tested were highly consistent.

5.3.8 *Other aspects of behaviour*

Two taxa, *kwyos* and *akpt*, are specifically said to be "strong" in jumping and swimming. Although this "strength" is a notable attribute of these two frogs, and possibly a very relevant one to the collector attempting to capture and retain specimens, it may be doubted whether this is a significant key feature in identification. The same applies to the strong adhesive capacity of *kwlek*, to which its synonym *cgep* specifically refers.

As already noted, some informants have accurate information on the differences in reproduction between Hylid, Ranid and Microhylid frogs. It may well be that this information is sometimes used in identifications, but we have no direct evidence of this.

5.3.9 *Characters not used by Karam*

To the European lay naturalist the Karam would appear to use most of the obvious kinds of morphological criteria in identifying frogs which he would use himself. They do not, apparently, note certain of the characters which zoological taxonomists have found valuable in constructing their keys. Thus, the shape of the constricted iris in hylid frogs is characteristically vertical in the genus *Nyctimystes* and horizontal in the genus *Hyla*; while the palpebral venation of some *Nyctimystes* species is very obviously elaborate (once this has been pointed out to the student!), but R.B., who drew Karam informants' attention to these characters, found none who regarded them as significant.

5.4 *Secondary and tertiary taxa applied to frogs*

5.4.0 In this section all recorded names for frog taxa of lower order than *as* are listed. The order of listing of secondary taxa is somewhat arbitrary.

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Although Karam recognise close similarities in various respects between many pairs of taxa, it is not possible to express more than a small proportion of these in a lineal arrangement. Nevertheless it makes sense to group taxa initially in five divisions, separating out firstly those applied to creatures locally present from those applied to less familiar creatures known only from areas away from home, and subdividing the former according to whether they apply to Hylid frogs of genus *Hyla*, Hylid frogs of genus *Nyctimystes*, Microhylid frogs, and Ranid frogs. It will be found that no Karam secondary or tertiary taxa cross-cut these last four divisions, and that informants' errors or inconsistencies of identification seldom involve taxa falling in different of these groups (see Table I). This is partly because each of these groups shares, to some extent, a complex of morphological features which marks it off from the others, partly because individual species or groups of species within these divisions are themselves quite distinctive in morphology.

It would be possible to provide a composite key embracing all taxa applied by upper Kaironk Karam to frogs present in their own domain. However, as an exposition of the processes Karam actually use to identify individual frogs this would be unrealistic, for they recognise many kinds quite as instantaneously as we do cows and sheep and horses. Only when instantaneous recognition fails or is challenged do they, apparently, consciously apply sets of binary discriminations. Even then there is no evidence that they start at the beginning, as it were, and work down from the generic taxon *as* to the terminal taxon most applicable. Instead they take it for granted that certain taxa are excluded from consideration, and consider precise points of difference between the relevant residue.

Further, a composite key embracing all Karam frog taxa would have to be extremely elaborate. This is because the characters Karam explicitly use in identification are in many cases not in fact shared by all individuals in a particular taxon (e.g. maximum size, typical habitat, distinctive colour pattern or even such morphological features as prominent brows).

For these reasons keys will here only be provided, separately, for each of the four sub-groups of locally-present frogs. Further, for simplicity, the keys will apply only to frogs at or approaching maximum size. In the descriptive statements on each taxon which follow the keys, further information on ways in which immature, under-sized specimens are identified will, where possible, be added. Size gradings in keys are as labelled in 5.3 above.

Finally, we must note the obvious but important point that key characters are not used in a consistent formula in all discriminations of secondary and tertiary taxa. Thus, though colour pattern is of importance in many identifications, gross recognised contrasts in colour may not prevent different individuals being identified, on other grounds, as being of the same category; conversely specimens with apparently identical markings may in some cases be placed in different taxa depending on size, or locality in which found. The same is the case with shape, size, and all other characters listed above.

Therefore, the keys which may be rationalised from contrasts which

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Karam draw between individual taxa do not reflect formal logic, but serve their purpose in discriminating *ad hoc* between categories which, as will be argued in 5.7 and 5.8 below, require further explanation. One may suggest that the fact that these are objective "natural" categories to Karam justifies them in applying rule of thumb methods in identifying individual creatures, and in not being constrained to adopt formal, logically rigorous, typological procedures. In this, of course, they are not unusual. Field observations suggest that professional zoologists and botanists often do precisely the same thing in so far as they are identifying animals and plants which they believe to fall in categories which have already been authoritatively described.

5.4.1 *Hylid frogs of genus Hyla*

Hylid frogs include the species which Karam see, collect and eat most frequently of all. We have no evidence that Karam explicitly or implicitly distinguish Hylid frogs as a group, or collectively distinguish the taxa they apply to species of the genus *Hyla* from those they apply to *Nyctimystes* species (see 5.3.9). Nevertheless it is seldom that they place specimens of either genus in taxa normally applied to the other, and when they do, these are in almost all cases small immature examples.

5.4.1.0 *Key to Karam taxa applied to genus* Hyla

1 (a) With very pointed snout—*daŋboŋ* (*H. arfakiana*) (5.4.1.4).
  (b) Lacking very pointed snout—2.
2 (a) Growing to size VI—3.
  (b) Not growing larger than size V—7.
3 (a) Uniformly very dark in coloration: lacks distinctive lateral markings—*kawag* (*H. angiana* variant) (5.4.1.3).
  (b) Not uniformly dark in coloration; distinctive lateral markings present—4.
4 (a) Dorsal surface brilliant light green; very pronounced lateral markings; characteristically found in broad-leaf vegetation in garden and bush-fallow areas—*komnaŋat* (*H. angiana* variant) (5.4.1.2).
  (b) Dorsal surface brown or green, but not brilliant light green—5.
5 (a) Undersurface markedly red—*jejeg pkay* (*H. angiana* variant) (5.4.1.1).
6 (a) Dominant colour, especially of upper surface, pale dull brown—*jejeg mlep* (*H. angiana* variant) (5.4.1.1).
  (b) Dominant colour of upper surface green—*jejeg km* (*H. angiana* variant) (5.4.1.1).
  (c) Dominant colour of upper surface dark grey-brown—*jejeg mosb* (*H. angiana* variant) (5.4.1.1).
7 (a) Growing to size V; predominantly dark in coloration; dorsal skin often granular; found in or near streams in cultivation zone, not in mountain forest—*kosoj* (*H. micromembrana*) (5.4.1.6).

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(b) Growing to size IV; often but not always with yellow throat and breast; only found in high altitude mountain forest—*kogop* (*H. bulmeri*) (5.4.1.5).

(c) Growing to size III; very varied in coloration; in streams and streamside vegetation in garden zone up to edge of forest, but not in mountain forest proper—*wyt* (*H. modica*) (5.4.1.7).

5.4.1.1 *Jejeg*

No etymology provided by informants, though some said that the name of the shrub (*bd*) taxon *alkn jejeg* or *alkn jejen* (PIPERACEAE sp.) reflected a similarity between leaf-colour of this and the most usual, dark green, colour of the frog. *Jejeg* is used as a personal name.

It is appropriate to commence with this taxon, as it is the one Karam themselves normally name first if asked to provide a list of frogs. It is the commonest large frog in their domain, one of the two taxa which they collect and eat most frequently, and the most widely distributed taxon known to them in terms of altitude and ecology.

From informants' descriptions and comments on speciments it is large (growing to size VI), very variable in coloration, but most often darkish green on back, with marks (often broad stripes of a brighter, contrasting green) on sides of back, and mottling on backs of thighs. It is found in streams and in vegetation near streams, both in cultivation and bush-fallow areas and also in mountain forest to at least 7,500 ft. It is said to be slimey, though not as much so as *kwyos* (5.4.2.1) and *gepgep* (5.4.2.2); to have a strong and characteristic odour; to have a usual call which may be rendered as a high-pitched "brrrrrr", and also, according to Majnep, a "warming-up" call which can be described as a croak (*gwglak*).

Informants variously distinguish four or five sub-taxa of *jejeg* which, they say, contrast in colour alone, not in shape, size, call, odour or any other feature. The four generally accepted varieties are *pkay* or *jejeg pkay* (*pkay* may be glossed as "having the quality of ripeness or brightness"), distinguished by markedly reddish belly; *jejeg mjkmab* or *jejeg km* (both qualifiers mean "green, as of living foliage"), as the names imply, markedly green on dorsal surface; *jejeg mlep* (*mlep* = "withered" or "pale brown, as dry grass or leaves"); and *jejeg mosb* (*mosb* = "black" or "dark"). Some informants regard *komnaŋat* (5.4.1.2) as a variety of *jejeg*. Of the four generally accepted sub-category names, *pkay* is the one most commonly used. The others appear mainly to be applied in cases where there is argument as to whether a particular example is really a *jejeg*, or is a *kawag* or *komnaŋat* or other closely similar taxon.

Jejeg, *komnaŋat* and *kawag* are said to be identical in shape and to grow to the same maximum size. These taxa contrast, however, at least ideally, in coloration, *jejeg* being generally darker than *komnaŋat* and brighter than *kawag*, especially in the lateral markings of many examples; in voice; in range of habitat; and, according to Gi, in characteristic odour. He says that *jejeg km* and *komnaŋat* are sometimes identical in coloration, but can still be told apart by their smell.

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Of 60 specimens collected, 57 were *Hyla angiana*, 2 *H. modica* and 1, possibly incorrectly recorded in field-notes, *Nyctimystes kubori*.

In general, *jejeg* corresponds with the highly variable *H. angiana*, if large examples of the bright green *komnaŋat* type and large examples of the very dark *kawag* type are excluded. Differences of opinion as to the proper designation of obvious borderline cases between these three categories occur, though not as frequently as the observer would expect. It seems probable that the location in which a specimen is found, and the call, if it is heard, predispose the finder to make the most appropriate decision. Gi's statement that smell may be the critical test requires investigation in the field. When going through Mr Cogger's live collection, where the informants did not know where each individual specimen had come from, there were a number of unresolved differences of opinion.

5.4.1.2 *Komnaŋat*

No etymology obtained. A large (to size VI) bright green frog, with lateral markings on body and legs, in which respect it contrasts with *gojmay* (5.4.2.4) which is also bright green. Characteristically found in *Suarauia* spp., *Ficus dammaropsis* and other large-leafed trees, shrubs and large herbs. Said to be voiceless; and, according to Gi, to have a distinctive odour.

Most informants regard this as a taxon contrasting with and not subsumable within *jejeg*. Wpc (see Appx. A) takes an unusual view, that it is a sub-taxon of *jejeg*. Majnep rationalises this difference of opinion by saying that the characteristically marked *komnaŋat* of second growth in cultivation areas is contrasted with *jejeg*: however very similarly marked examples found in the mountain forest are regarded by most people as *jejeg*, not *komnaŋat*; Wpc is lumping the lower altitude and higher altitude forms, regarding both as *komnaŋat*, but also regarding all *komnaŋat* as a variety of *jejeg*.

Of 19 specimens collected 18 were *H. angiana*, 1 (possibly incorrectly entered in field register) *N. foricula*, which is also a bright green frog. Corresponds to a polymorph or variant of *H. angiana*.

5.4.1.3 *Kawag*

No etymology obtained. A large (to size VI) dark green or black frog, said to grow to same size and be same shape as *jejeg*; identified by *mosb* ("dark" or "black") back and thin light stripes on backs of legs, and by mottling on (purplish) belly and on underside of legs; characteristically found in water; said by Gi to have a distinctive odour; call a high-pitched "kuk-kuk-kuk-kuk".

For contrasts with *jejeg*, and *kosoj*, the most closely similar taxa, see 5.4.1.1 and 5.4.1.6.

Evidently corresponds with a well-marked polymorph or variant of *H. angiana*. Of 28 specimens collected, 27 were of this species, 1 *H. micromembrana*.

5.4.1.4 *Daŋboŋ*

No etymology obtained. Grows to medium size (V); identified at once by its long, pointed snout (*mlk-n̄w*—"nose-point", *mlk pat-yob*—"nose

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long-big"); only found near water and at relatively low altitudes in the cultivation zone, characteristically in *Miscanthus* cane and, especially, in *Phragmites karka* reed-beds; call a high-pitched "pok-pok-pok"; said by Gi to have a characteristic odour.

On present evidence, corresponds precisely to *Hyla arfakiana*.

5.4.1.5 *Kogop*

No etymology obtained. A frog of streams and streamside vegetation in the mountain forest, seldom if ever found below 7,500 ft. Its restricted habitat may account for inconsistencies in informants' statements about it. Most agree that it is a rather small frog (to size IV), Majnep asserting that it doesn't even grow as large as *gojmay* (5.4.2.4); Gi on the other hand thought it grew as large as *jejeg* and *gepgep* (i.e. to size VI). It is said to be very variable in colour, but often yellow or greenish-yellow on throat and breast, in which case it can readily be distinguished from small *jejeg* which are found in the same locations and with which it is sometimes confused. Noting the triangular frontal patch of green on the heads of some specimens, a character which also occurs in many *wyt* and *daŋboŋ* and apparently in some *kosoj*, R.B. asked how *kogop* thus marked could be distinguished from *wyt* and *kosoj*. He was told that *wyt* and *kosoj* are never found up in the high forest, *kogop* is never found down in the cultivation zone, so there was no chance of confusing them. Informants disagreed as to its call, but some said, similar to *kwyos* (5.4.2.1).

The only 3 specimens of *H. bulmeri* obtained by R.B. prior to 1968 were identified as *kogop*, though so also were 2 small *H. angiana* obtained in the same locality. 20 additional specimens of *H. bulmeri* obtained by J. Menzies and R.B. in 1968 were all identified as *kogop*.

5.4.1.6 *Kosaj* (G), *kosoj* (K)

No etymology obtained. A medium sized frog (to size V); upper surface variable in colour pattern, but often mottled dark brown, with in some cases noticeably granular skin texture (*mablep magymagy sek*—"with small warts"), a character which Karam say does not occur in other taxa with which this frog might be confused; under-surface light-coloured but with mottled effect produced by what Karam assume to be intestines (*sb*) showing black through skin. Normally found in *Miscanthus* cane beds, restricted to lower altitudes (5,000–6,000 ft) in cultivation zone. Some informants say it does not call: Majnep, normally well-informed, says he does not know call; Gi says that although the female, which grows much larger than the male, is silent, the male's call is a high-pitched "tok-tok-tok". According to Gi has a characteristic odour.

Of the two taxa occurring in the same locations with which it may most readily be confused, *wyt* contrasts with *kosoj* in its smaller size (see 5.4.1.7); *kawag* contrasts in its larger size and rather different overall shape.

In collections up to 1966 the only 4 specimens obtained were all *H. micromembrana*, as also were probably most if not all of the larger number collected in 1967–8.

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5.4.1.7 *Wyt* or *wytwyt*; *gttek* (G) or *gwttek* (K)

All names said to be onomatopoeic.

Most informants regard *wyt* and *gttek* as synonyms and apply both to a very small Hylid frog taxon, not growing larger than size III and said by Gi to be smaller than all other frogs locally present except the Microhylid taxa *lk* and *bopnm*. In shape said to be identical to *kosoj* (5.4.1.6), but distinguished by smaller size and much more varied dorsal markings, some dark brown, some green. Undersurface generally same as *kosoj*, but contrasting with all other taxa in that it is whitish with mottled effect from dark "intestines" showing through. Majnep says that duller-coloured examples of *wyt* cannot be distinguished morphologically from immature *kosoj*. Found in or near running water (by day in water itself, by night sometimes in water, sometimes calling from streamside vegetation) in cultivation zone and bush fallow to approximately 7,000 ft, i.e. reaching a considerably higher altitude than *kosoj*. Said by Gi to have a distinctive odour, different from that of *kosoj*; to have a croaking (*gwglak*) call which may be described as a very loud high-pitched chatter; and to spawn in water. Kiyas notes that it is at the time when the females are full of spawn that the males call. Majnep says that this taxon both whistles (*sabok*) quietly, hence the name *wyt*, and also has the high-pitched chatter from which is taken the name *gttek*. Parents scold small boys who talk too much by saying "*wyt tek cece gpan*", "you chatter like *wyt*".

Those who equate *wyt* and *gttek* distinguish these from the Microhylid taxa *lk* and *kabanm*, of similar size and found with them in running water, by general body-shape and especially by the longer legs of *wyt*. *Wyt* contrast with small *cebs* (5.4.4.2) in general shape, and in absence of yellow undersurface which characterises the latter.

Some informants from settlements in the Kaironk Valley bottom and on the South side of the valley contrast *gwttek* and *wyt*, reserving *gwttek* for the small Hylid taxon and applying *wyt* to what is presumably a microhylid frog, said to be found in rotten logs. These informants say *wyt* has shorter, not longer, legs than *lk* (see 5.4.3.3). The application of *wyt* to a Microhylid taxon would not contravene the statement that the name is onomatopoeic ("wiirwiirwiir"), as piping is characteristic of certain *Cophixalus* species.

Of 25 specimens identified by collectors as *wyt*, 21 were *Hyla modica*, 2 *Cophixalus parkeri*, 1 *Hyla angiana* and 1 *Nyctimystes disrupta*. Of 9 identified as *gttek*, 4 were *H. modica*, 4 *C. parkeri* and 1 a small *H. angiana*.

5.4.2 *Hylid frogs of genus Nyctimystes*

5.4.2.0 *Key to Karam taxa applied to genus* Nyctimystes

1 (a) Uniformly light green above; yellow on undersurface; not growing beyond size IV—*gojmay* (*N. foricula*) (5.4.2.4).
  (b) Not uniformly bright green and yellow—2.

2 (a) Large, growing to size VI; notably slimey—3.
  (b) Not growing beyond size V; not notably slimey; generally brown in coloration; found in cultivation and cane-grass but not in forest—*kwlek* (*N. kubori*) (5.4.2.5).

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3 (a) Distinctive shape, with "long straight back"; brows prominent in many examples; extremely varied in colour pattern, but many examples with two small symetrically placed light-coloured spots behind head; only found at high altitudes (above 7,000 ft)—*mabas* (*N. narinosa*, ? *N.* sp.) (5.4.2.3).

(b) Distinctive shape, contrasting with 3 (a); brows not particularly prominent; does not have two symetrically-placed small light-coloured spots behind head—4.

4 (a) With red undersurface; very slimey and with very characteristic odour; found in water and streamside vegetation in garden areas and bush-fallow, but not in high altitude forest—*kwyos* (*N. disrupta* variant) (5.4.2.1).

(b) With dark belly; contrasts in odour with 4 (a); often found in trees, pandanus palms, tree-ferns, in high altitude forest as well as in cultivation zone—*gepgep* (*N. disrupta* variant) (5.4.2.2.).

5.4.2.1 *Kwyos*

Informants generally say etymology is *kwy as*—"stink frog", though one said it was onomatopoeic, representing call. Grows large, to size VI, and has a distinctive shape which it shares only with *gepgep* (5.4.2.2). Back *mosb* ("dark" or "black"), occasionally *kl tbj-jwan* or *kl skoy-skoy* ("spotted"); belly *lkañ* ("red/purple"), and under-surface of thighs *klklsek* ("mottled"). Notably slimey, with a characteristic, very pungent, odour. Said to be a strong (*kls*) frog, i.e. a powerful jumper and swimmer. Normally found in water, but sometimes in pandanus and other vegetation, in cultivation zone and bush-fallow fringing mountain forest to approximately 7,000 ft. Call said to be a squeak, as of air being drawn in between tightly pursed lips.

On account of slime, *kwyos*, as also *gepgep* and *mabas*, have to be washed carefully before cooking, and skin has to be roasted thoroughly, so that it peels off. Otherwise the eater's mouth is burnt, and vomiting may also follow.

For contrasts with *gepgep* see 5.4.2.2. All examples of both taxa collected are members of the distinctive species, *Nyctimystes disrupta*. It is of interest that Cogger, who was unaware of the etymology of the Karam name, noted of this species that, "these frogs exude a strong, sickly-sweet odour when caught".

Some informants say *mlem* ('slime' or 'spittle') is a synonym for *kwyos* (see 5.4.2.2).

5.4.2.2 *Gepgep*

Informants provided no etymology, but *agep* is the standard alternative term in situations of word-taboo for *mon* (K) or *mab* (G), "forest, tree, timber, firewood, fire". A large frog, growing to size VI, said to be of identical shape to *kwyos* (5.4.2.1). Like *kwyos* dark on back, though sometimes somewhat mottled and in general not as heavily marked as *kwyos*, and with mottled under-surface of thighs. Contrasts with *kwyos* in having dark, steely-grey undersurface and, according to some, by having white

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spots on terminal pads of digits (*n̄npn̄g twd*). Said to have a rather different distribution from *kwyos*, seldom found in lower altitude cultivation zone, overlapping with *kwyos* in bush-fallow but also found, sometimes at considerable distances from water, in montane forest. Call said to be same as that of *kwyos*. Gi says has characteristic odour, not as pungent as that of *kwyos*. Like *kwyos*, notable for its slime. Most informants say *mlem* ('slime' or 'spittle') is alternative name for this frog, not for *kwyos*.

Majnep says that when *kwyos* and *gepgep* are spawning (? in April/May), men know that the taro harvest is approaching.

5.4.2.3 *Mabas* (G) or *monas* (K)

Names may be glossed "tree/forest-frog". A very large frog, said by some to grow even larger than *kwyos*, *jejeg* etc. (size VI). Of distinctive shape, with "a long straight back", and, very frequently, extremely prominent eyes and "brow-ridges" (*wdn-kagsw*); skin said to be generally, but not always, goose-pimpled, like an old woman's, and long thin toes and fingers are also likened to an old person's .Very variable in coloration, ranging from dark brown to pale straw-coloured to bright green, often with very distinctive irregular patterning (see Wpc's statement, Appx. A), but many examples have two small light coloured spots symetrically placed on outer edge of back, behind head, a feature shared by no other frogs in the Karam domain. Skin of back exudes slime, which must be washed off before cooking. Informants disagree as to call, some saying it is a croak (*gwglak*), others that it is a very loud whistle (*sabok*). Found only in mountain forest, above 7,000 ft. Said to spend the day in trees and shrubs, sometimes at considerable heights above ground, but to come down at night to water and low streamside vegetation. According to Wpc, tadpole is large and *mosb*, "black" or "dark".

All but 1 of approximately 90 *Nyctimystes narinosa* specimens collected by R. B. and J. Menzies were identified as *mabas*, as was also the only specimen obtained of the undescribed large dark chocolate brown *Nyctimystes* species collected at 8,400 ft in the mountain forest. 2 large *Hyla angiana* and 2 *H. bulmeri* were also placed in this taxon.

It is said that children are forbidden to eat *mabas*, for fear that if they do they will age prematurely, on account of the wrinkled goose-pimpled skin of this frog.

5.2.4.4 *Gojmay*, *byn-pk* (K), *byn-pok* (G)

No etymology obtained for first name, but *byn-pk* or *byn-pok* may be translated 'bright-skinned woman'. A rather small frog, growing only to size IV. Dorsally uniform bright green, with uniform yellow or yellowish undersurface. Found in water, rock-clefts, *Miscanthus* cane, *Ficus dammaropsis*, *Homalanthus* and other trees and foliage near water. Common in cultivation zone to approximately 6,500 ft, but never found in or near mountain forest. Call variously rendered as "k-k-k" or a high-pitched throaty "la la la" (each squeak preposed by a glottal-stop); said by some to have a call rather like that of *kwyos*, but lower-pitched. Said by Gi to have a characteristic odour, like that of a putrefying corpse.

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The only possible confusion of this taxon is with the bright green *komaŋat* (5.4.1.2), from which it is distinguished by smaller size, absence of contrastive markings on sides of body and legs, by call and by odour.

Corresponds to *Nyctimystes foricula*, though occasional examples of this species are assigned to *komaŋat*, while occasional small bright green examples of *H. angiana* are assigned to *gojmay*.

Though informants could offer no etymology for *gojmay*, the term is also used for a variety of *alŋaw* Pandanus, the edible nuts of which have yellow-skinned kernels, and for a taro (*Colocasia esculenta*) cultivar with a yellowish shoot.

5.4.2.5 *Kwlek, cgep*

No etymology obtained for *kwlek*, but *cgep* may be translated, "it adheres"; some glossed the term, "it adheres like burned skin", referring to the frog's notable adhesive properties. A medium-sized frog (to size V), in shape like *gojmay*, but growing larger. Generally *pk* "light reddish or yellowish brown", with *twd* "white, light-coloured" or *wahn* "yellow" under surface. Found characteristically in *Miscanthus* cane, but also in water, Cordyline, *Homalanthus*, *Ficus dammaropsis*, PIPERACEAE and other shrubs. Very common indeed in cultivation zone up to approximately 6,500 ft. Call said to be a croak (*gwglak*), "k-k-k" (as also call of *gojmay*), or "tch-tch-tch". Gi says has characteristic odour, something like ginger.

This taxon thus contrasts with the one to which it corresponds most closely in shape, *gojmay*, in size, colour pattern and odour; and contrasts with other taxa which include examples of rather similar colour (*jejeg*, *wyt*), in shape, call and odour.

Of 51 *kwlek* collected up to 1966, 42 were *Nyctimystes kubori*, 7 *Hyla angiana* (all small specimens) and 2 *H. modica*.

5.4.3 *Microhylid frogs*

Eight species of Microhylid frogs have so far been recorded in the upper Kaironk Valley: it seems certain that others are yet to be discovered. Karam place them all in the three secondary taxa *gwnm*, *kabanm* and *lk*, further subdividing *gwnm* and *lk* into tertiary taxa. *Gwnm* are regarded as inedible, indeed poisonous: *kabanm* and *lk* can be freely eaten, though *lk* are so small that people do not often bother to collect and eat them. Karam say that frogs of these taxa do not lay typical spawn, but produce eggs, likened in some cases to those of centipedes, from which minute froglets (*as n̄lwk*) emerge directly.

5.4.3.0 *Key to Karam taxa applied to Microhylid frogs*

1 (a) Markedly squat in appearance, with relatively small or very small head, large belly and short legs—2.
  (b) Not markedly squat in appearance—3.
2 (a) Growing to size IV; not subterranean in habitat—*gwnm* (*Asterophrys* sp. or spp.).
  (b) Not growing larger than size III; subterranean—*gwnm sbmganpygak* (*Xenobatrachus rostratus*, *Barygenys* sp.).

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3 (a) Growing to size III or IV—4.
(b) Not growing larger than size II—5.

4 (a) With long legs and digits and remarkable, large pads at tips of digits; grows to size IV; found only in mountain forest and bush-fallow, not necessarily anywhere near water, often in epiphytic moss or decaying PIPERACEAE stems—*gwnm* (*Cophixalus ?riparius*).
(b) Grows to size III; only found in or near running water—*kabanm* (*Cophixalus parkeri*).

5 (a) Found either in or near water, or away from water but calling in low vegetation—6.
(b) Found away from water, on ground or hidden in moss, stones, under bark of fallen tree-trunks, etc.—*gwnm* (*Cophixalus* spp., *Sphenophryne brevicrus*).

6 (a) Growing to size II—*lk* (*Cophixalus variegatus*, etc.).
(b) Growing only to size I—*bopnm* (*Cophixalus shellyi*, etc.).

5.4.3.1 *Gwnm*

No etymology recorded. Alternative names *yenm* (also no ethymology) and, according to some, *mokpy* (said to mean "down-below", "underneath"), though others regard *mokpy* as only applying to one subcategory of *gwnm*. *Gwnm* was recorded as a personal name for a girl.

The only characters shared by all *gwnm* are curious appearance, including in most cases squat, bloated shape; characteristic concealment of resting-place—underground, under terrestrial moss or leaf-litter, in epiphytic moss, under bark of decaying fallen trees, in dead hollow PIPERACEAE stems, etc.; and attributed toxic properties.

All informants agree that *gwnm* are a "family" (*kn̄ŋ*—lit. "clumps of stems with a single root-base, as e.g. *Miscanthus* cane clump"), with many stems, though they disagree as to how many kinds there are and as to the extent to which there are agreed names for these.

Sub-categories of gwnm

Many informants can describe the differences Wpc (Appx. A) notes between the large (to size IV or V) *gwnm* found sometimes in water but often on the ground at considerable distances from water, and the smaller (to size III) kind found characteristically underground, generally in or near roots of *Miscanthus* cane, and often uncovered while gardens are being cleared. The former, which are found in high-altitude mountain forest (to at least 8,200 ft.) as well as in bush-fallow and garden areas, are *Asterophrys* sp. or spp. The latter, said only to be found in the cultivation zone below approximately 6,500 ft, include *Xenobatrachus rostratus* and the superficially very similar *Barygenys* sp. Karam note that both the larger and smaller kinds are characterised by very large bellies and short legs, but that the smaller are also distinguished by particularly small heads and bloated appearance. The tertiary taxon *sbmk* (K*ga*)*ygpan* or *cbmganpygak* (G) (glossed by some, "anus down-below", by others, "anus very-small") is applied by some informants to these subterranean

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gwnm. It is said that the very small anus prevents them from defecating properly, hence their bloated appearance. Others, e.g. Gi, say *mokpy* is the proper term for this taxon, and is not a general synonym for *gwnm*; *sbmganpygak* they reserve for yet another kind.

As with other kinds of *gwnm*, Karam do not eat either of these; nor will they touch them if they can possibly avoid doing so. The larger kind, if found in gardens or near homesteads, is thought to be the emissary of a sorcerer or witch. It is also said that these frogs are used in sorcery to kill men and destroy crops.

Informants familiar with the mountain forest distinguish as a third kind of *gwnm* a creature growing to size III or IV, with long legs, extended digits, and very large terminal pads. Hunters climbing after marsupials and giant rats come upon these in epiphytic moss high up in trees. They are also found in hollow tree-ferns and in decaying stumps of PIPERACEAE shrubs. Informants note that these are often red in colour. This unnamed category seems to equate with *Cophixalus riparius*, specimens of which obtained by Cogger from PIPERACEAE stems are described as "dorsally a fairly rich brown . . . with sides a rather lighter pinkish-fawn, while ventral surface is a rather transparent pinkish fawn". A minority of informants regard these not as *gwnm* but as a "red" *kabanm* (5.4.3.2.), i.e. placing them in the taxon normally applied to the morphologically somewhat similar *Cophixalus parkeri*.

Finally, any small microhylid found away from water and either on ground surface or concealed in moss, leaf-litter, stones, decaying tree-trunks, etc. (e.g. *Sphenophryne brevicrus*, *Cophixalus shellyi*, *C.* ? *darlingtoni*) is likely to be identified as *gwnm*, even though the same creatures, if discovered out on low vegetation and calling, are likely to be placed in the *lk* or *bopnm* taxa. Gi refers to certain of these, and not *Xenobatrachus* and *Barygenys*, as *sbmganpygak*. He says that these are small *gwnm*, variable in colour (yellow, reddish or dull grey-brown), which are found in rotting timber, where they lay their eggs.

5.4.3.2 *Kabanm*

In explaining name, informants note that *kab* means "stone", and that these frogs are often found among stones in stream-beds or at edges of streams. A small frog, growing to size III only. Noted to have a large belly and to be *gs* 'dull brown or grey' in colour. Found in or very close to streams, both in cultivation zone from about 6,000 ft upwards and in mountain forest to at least 7,500 ft. Call is a piping whistle: streamsides where these creatures are common are very noisy places at night. Said by Gi to have a characteristic odour. Said to lay eggs among stones near water's edge, from which froglets hatch out.

As noted above, a few informants refer to a "red" or "bright-coloured" (*lkaⁿ* or *pk*) *mkaban* found not in water but in hollow PIPERACEAE stems, but the majority view is that these creatures are not *kabanm* but *gwnm*.

Kabanm are distinguished from small examples of Hylid taxa (*wyt*, *jejeg*, *kwlek*, etc.) which are also found in water, by their general shape.

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Kabanm contrasts with *lk* (5.4.3.3.) in size, and, according to Gi, in odour; with most kinds of *gwnm* in shape (notably length of toes); and with all *gwnm* in habitat and markings.

This taxon was very consistently applied to mature examples of *Cophixalus parkeri*. Immature *C. parkeri* were however more often than not identified as *lk*, which is very understandable given the morphological similarities and overlapping habitats of *C. parkeri* and the much smaller *C. variegatus*. A few small specimens of Hylid frogs, found in stream water, were also identified by children who caught them as *kabanm*.

5.4.3.3 *lk*

Name said to be onomatopoeic. A very small frog (to size II only), with large belly, short legs, long digits and variable colour pattern. Found either in water or low vegetation. Call said to be a whistle, like *kabanm*. According to Gi, has a characteristic odour.

Cophixalus variegatus were consistently identified as *lk*; so in most cases were small, sexually immature, *C. parkeri*. Other small microhylids (*C. shellyi*, *C.* ? *darlingtoni*, *Sphenophryne brevicrus*) tended to be identified as *lk* if observed calling from low vegetation, whereas if discovered in diurnal hiding places they were identified as *gwnm*.

Informants state that there is a sub-category of *lk* known as *bopnm* (no etymology obtained). These are distinguished by particularly small size and by being found on ground or in low vegetation, not necessarily anywhere near water. Gi says that *bopnm* contrasts both with *kabanm* and with other kinds of *lk*, in that, like some *gwnm*, it lays eggs on the ground and not among streamside stones. *Lk* which are not *bopnm* can if necessary be distinguished as *lk yb* "true" or "real" *lk*.

In practice collectors only used the taxon *bopnm* once in identifying specimens (for a *Cophixalus* ? *darlingtoni*): presumably it would be appropriate for such very small species as *C. shellyi* and *C. darlingtoni*.

The name *lknm* is used by some informants as a synonym for *lk*. Others say that it is a synonym for *bopnm*, and does not apply to all *lk*.

5.4.4 *Ranid Frogs*

Only one species of Ranid frog, *Rana grisea*, has so far been recorded in the upper Kaironk Valley. Compared with all other local frogs this is quite distinctive in shape.

5.4.4.0 *Key to Karam taxa applied to Ranid frogs*

1 (a) Growing to size VII: lower part of belly and under-surface of legs whitish—*akpt* (mature *Rana grisea*).
  (b) Growing to size V only: lower part of belly and under-surface of legs yellow—*cebs* (immature *R. grisea*).

5.4.4.1 *Akpt* or *aymeneb*

No etymology provided by informants for *akpt*, but conceivably a corruption of *akok pat* "long" or "large" *akok*: (see 5.4.5.1). *Aymeneb* is the alternative name used by persons who have inherited totemic relation-

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ships to this taxon; this name also cannot be translated. Said to be the largest local frog (to size VII); of distinctive shape—like *cebs*, *kabanm* and *lk* has a big belly; *mosb* "black" or "dark" in colour, with a *twd* "white" belly; characteristically found in water, but also sometimes on land, in gardens, etc., and under stones; call "tytyty" ("chichichi"). Contrasts with *cebs* (5.4.4.2) in that latter is smaller and has *waln* 'yellow' belly. Some informants say *cebs* grows into *akpt*, others that they are quite distinct kinds. Said to spawn in water and to lay eggs which are "different" from those of the Hylid categories *jejeg*, *kawag*, *kosoj* and *kwlek*, and to produce the distinctive *byn-yadw* tadpoles (5.5.1.1) which are black or dark in colour, lack sucker-mouths and are characteristically found in streamside ponds and slack water in small streams. Eaten by women, girls and small boys, but by few adult men (see 3.1.5): some men will not even handle this creature. Allegedly used in sorcery, and presence in gardens thought to portend evil (see 3.3).

Ten specimens collected (8 *R. grisea*, 2 *C. parkeri*). Appears to approximate to "mature specimens of *R. grisea*", since in juveniles of this species the abdomen and lower surface of the thighs are brilliant yellow, but by the time the individual has attained 40 mm. body length the yellow is paler and less extensive, and by 60 mm. completely absent.[26] However, informants who believe the yellow-bellied *cebs* to be unrelated to *akpt* may possibly identify small frogs of other species, e.g. *C. parkeri* which is superficially similar to a Ranid frog, as young *akpt*.

5.4.4.2 *Cebs*

Informants' etymology *ceb as*—"water frog". A medium to large sized frog with a big belly, very similar to *akpt*, but with a yellow belly. Some say, grows into *akpt*. Call said to be *tytyty* (as *akpt*). Gi says it has a distinctive odour, though he is not prepared to say that it contrasts with *akpt* in this, since he has not handled or smelled *akpt*. Tadpoles said to be same as those of *akpt*.

Six specimens collected were all immature *R. grisea*, as almost certainly were a number of other examples noted, but not collected.

5.4.5 *Karam taxa applied to giant frogs and other non-local forms*

Four terms have been recorded which are applied to frogs not present in the upper Kaironk Valley, and which it was impossible for the field-worker to collect: *akok*, *gyok*, *aⁿm* and *yogob*.

5.4.5.1 *Akok*

Name said by some informants to be onomatopoeic. There is some vagueness about this category. Said by some informants to be like *akpt* and *cebs* (*R. grisea*) and to be found in water, but to be a small frog: by other informants to be like *akpt* in shape but very large, with different markings. Those who describe it as a very large frog say that it is not found locally, but at lower altitudes in the Jimi and Asai Valleys. One informant described the capture of an enormous *akok* which he knocked out of

26. Tyler 1963a:107.

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a *dog* tree in the Asai Valley; its call was a yodelling "akok-akok-akok". Gi describes finding one in August 1963 in a rock cleft by Kamok stream at Walcdaŋ, below Kandum in the Asai Valley. He says it was seven or eight inches long, its eye was as big as a man's, its skin colour like that of *gojmay* (bright green above and yellow below), and its hand like a man's or a large lizard's. Gi says it is essentially a tree-frog, though not found very high up in trees, and that it is said to grow to the size of a new-born baby. It is only found in the water and on the ground near streams at one time of the year, at the mating season, and hunting parties are organised at this time. He thinks this is towards the end of the rainy months when taro is being harvested and is the same time as *gepgep* and *kwyos* (*N. disrupta*) spawn. The men of the Asai Valley know that when the migratory *biblaw* bird (the Bee-eater, *Merops ornatus*) appears, probably in about April, it is time to hunt for this frog.

It is probable that two distinct species are involved. The tree-frog seen by Gi was possibly *Hyla infrafrenata*, which occurs throughout New Guinea at elevations of up to 3,000 ft a.s.l. A beautiful immaculate green dorsally, this species could be five inches long, but has not been known to attain a larger size.

The largest frog known to occur on the New Guinea mainland is *Rana arfaki*, which may have a snout to vent length of up to 200 mm., and has been collected by Wommersley (pers. comm.) and Camps[27] in the Jimi Valley. The informants who assert that *akok* resembles *akpt* and is found in water are almost certainly referring to a *Rana* species. Whether the species is *arfaki* or one of even larger proportions is uncertain, but it is noteworthy that the giant frog described to M.J.T.[28] by Wahgi Valley and Jimi informants was known to the Wahgi people by the cognate name *agak* or *akak*.

The only specimen collected for R.B. to which the name *akok* was applied was a very small example of *H. angiana*, found in *Miscanthus* cane.

5.4.5.2 *Gyok*

A giant frog in the Jimi Valley, possibly the same as *akok* or *ānm* but the term not known by some informants.

5.4.5.3 *Ānm*

Not found locally. Very large frog of Jimi Valley; some say, same as *akok*.

5.4.5.4 *Yogob*

Name given by Gi for croaking frog found in ponds at lower altitudes in Asai Valley, which, he says, is also the common frog found in Madang. He adds that it is not eaten, "is the cross-cousin (i.e. near relative) of *gwnm*". Majnep applied this term, rather hesitantly, to the cane toads (*Bufo marinus*) which are common at Port Moresby: Kyas said these were "like *akpt* but different."

27. Tyler 1963b:125.
28. Tyler 1962.

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5.5 *Karam taxa applied to tadpoles*

5.5.0 The primary taxon applied to all tadpoles, and excluding any other kind of creature, is *awleg* or *kokob*. Informants provided no etymology for *awleg*, the usual term. *Kokob* is also the term for "irrigated taro garden".

Karam are aware that Ranid tadpoles lack sucker-mouths. They say that all Hylid taxa have tadpoles with sucker-mouths, and that tadpoles which will change into different Hylid taxa differ in some cases in colour, shape, size and habitat. However they do not attempt to be over-precise in this matter, seldom asserting with confidence that a particular individual tadpole specimen could only turn into a frog of one particular taxon. An exception was the insistence of a group of teenage boys that the small black tadpoles with striped tail, found in August in the Kaironk River at 5,000 ft would grow eventually into *daŋboŋ* (*Hyla arfakiana*).

5.5.1 *Secondary taxa applied to tadpoles*

5.5.1.1 *Awleg byn-yadw*

Byn-yadw means "widow". Applied to black and mottled brown tadpoles with very small, sucker-less mouths. Name said to refer to mottling, like mourning clay smeared on a widow. Found in ponds and in slack water in small streams. Grows into *cebs* and *akpt* (*Rana grisea*). Some informants who do not recognise that *cebs* are immature form of *akpt* say that black *byn-yadw* grow into *akpt*, brown or grey ones into *cebs*. Not eaten.

5.5.1.2 *Awleg yb*

Some informants (e.g. Kiyas) contrast *awleg byn-yadw* with *awleg yb* (*yb* = "real", "true"), and say that latter have sucker-mouths, are black when small, then grow into *awleg gs* (5.5.1.3) and *awleg wosm* (5.5.1.4)

5.5.1.3 *Awleg gs, awleg kaj-gs*

Gs = "dull brown or grey"; *kaj-gs* = "grey pig". Has sucker-mouth and is found under and among stones in fast running water. Some are fairly uniform brown or grey, some are quite strikingly multi-coloured. Contrast with *awleg byn-yadw* in shape, colour and habitat, and with *awleg wosm* (5.4.1.4) in shape, colour and size. Said by some to grow into smaller Hylid frogs, e.g. *wyt* or *gttek*, by others to grow into *awleg wosm*. Eaten.

5.5.1.4 *Awleg wosm*

Wosm is also applied to very large pigs, and very large casuarina trees. Large tadpoles with sucker-mouths, found in same habitat as *awleg gs*. Said by some to grow only into large Hylid frogs, *jejeg*, etc.; by others to be the final, large stage through which all Hylid tadpoles pass.

5.6 *Nomenclature as a guide to identification*

If dialect variants are excluded, we have recorded 31 Karam frog names applied to secondary and tertiary taxa which constitute unitary

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lexemes. For 16 of these we were unable to obtain translations or etymologies from informants, though in all cases these were requested. Of the remainder, 5 (*akok*, *gttek*, *lk*, *lknm* and *wyt*) were said to be onomatopoeic; 4 (*cebs*, *kabanm*, *mabas*, *mokpy*) to describe typical habitat; 2 (*byn-pk*, *pkay*) to draw attention to colour; 1 (*sbmganpygak*) to anatomical peculiarity; 1 (*mlem*) to slimeyness; 1 (*kwyos*) to odour; 1 (*cgep*) to adhesiveness.

The three names which can only occur as bi-segmental composite lexemes (*jejeg km*, *jejeg mosb*, *jejeg mlep*) all include segments specifying colour qualities.

In addition two names (*gojmay*, *jejeg*) are associated with colour by the fact that they are also applied to plant taxa of similar colour. It seems probable in these cases that the frog taxa are the primary referents, the plant taxa the extensions, and not vice versa.

Thus to some extent names may remind collectors of key characters, and restrict possible use of the name by excluding creatures in which these are patently absent.[29] However, this point should not, perhaps, be overstressed: house-sparrows are by no means always found near houses, nor are all blackbirds black; nor need all *kabanm* be found among stones or all *cebs* in water.

5.7 *The Status of Karam Taxa*

5.7.1 *Karam taxa, speciemes and variants*

Twenty-five Karam taxa, all applied to frogs found in the territories of the communities studied, are listed in sections 5.4.1 to 5.4.4. Seventeen of these may be labelled "secondary taxa"; 8, "tertiary taxa". 14 of the 17 secondary taxa and all 8 of the tertiary taxa may be labelled "terminal taxa", in that they contain no standardly named subdivisions.

Of the 22 terminal taxa, 15 are clearly "natural" units, defined by multiple characters of appearance, ecology and behaviour. Of the 7 exceptions or possible exceptions, 4 are subcategories of *jejeg*, which informants regard explicitly and unanimously as differing only in colour-pattern. 2, *cebs* and *akpt*, are regarded by most informants as life-stages of the same creature, and as such constitute together a single un-named natural unit. The seventh is the "unmarked" taxon *gwnm* (ii), i.e. *gwnm* which are not *sbmganpygak*. At least some informants recognise that this is a residual category including creatures of widely differing appearance and ecology which are lumped together only by the fact that they are all of curious appearance, have concealed resting-places, and have poisonous properties attributed to them.

Of the three non-terminal secondary taxa, one, *jejeg*, is clearly a "natural" unit, and one, *lk* (i), may be regarded as this even though it is not a minimal natural unit, as its members do all share a wide range of morphological and behavioural features. The third, *gwnm* (i), is of somewhat doubtful status as a natural unit, for the same reasons advanced in discussion of *gwnm* (ii).

29. c.f. Tyler 1961:219.

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We see then that the majority of Karam taxa applied to familiar frogs (17 out of 25) are "natural units", and as "minimal natural units" 16 of them meet our definition of "speciemes" (5.0.4). Of the remainder, two taxa, *gwnm* (i) and *gwnm* (ii) are seen by many Karam as containing natural units, even though they do not give these standard names, while two others, *cebs* and *akpt*, together constitute an unnamed natural unit.

Conversely, while Karam only name "variants" within a specieme in the case of the sub-categories of *jejeg*, they recognise that similar degrees of variation occur in a number of other taxa of equivalent order to *jejeg*, e.g. *mabas*, *kogop*, *wyt* (see Appx. A), though they do not bother to name the variants in these cases.

These "natural kinds" seem logically entirely comparable with the "natural kinds" implicit in prescientific European natural history, or with what Ernst Mayr calls the "non-dimensional species" of Linnaeus and most subsequent compilers of local faunal lists,[30] and bear the same kind or degree of relationship to the species categories of modern zoological taxonomists as these less sophisticated European categories do.

Our primary evidence for the assertion that Karam frog taxa are in the main "natural kinds", and that where they are not natural kinds they are still relatable to named or unnamed natural units which they recognise, is thus the catalogue of attributes, in no sense complete, which we have elicited in respect of each of these taxa. Supporting evidence may be adduced from the lexicon used by Karam in discussing frog and other animal taxa and their relationships.

5.7.2 *Karam linguistic expression of biological status of taxa*

Taxonomic discussion in either lay or scientific English makes extensive use of noun forms—"kind", "sort", "genus", "species", "variant", "form", etc. While it is possible to use noun forms in Karam, and the use of such forms is significant for our argument, it is more normal in Karam to use verb forms alone. The verb *ay-* (K) or *l-* (G), is glossed by Pawley[31] as "to come into being, to set, establish, become, put, place, turn into", to which list "stabilise" and "manifest" might also appropriately be added. This verb is used in the past forms *ay gak* (K) or *ll gak* (G)—"having-manifested it-did", or *ayak* (K), *lak* (G)—"it (has) stabilised", "it (has) manifested", when describing the stable and persistent, as distinct from new and temporary, nature of phenomena. Thus *twd ayak*—"white/light-coloured it-stabilised", means, "it is white".[32] To say that a certain taxon manifests itself in a number of forms, one can simply say *omŋal lak* (or *omŋal ayak*), or *omŋal nokom lak*—"two it stabilised", "three it stabilised", without recourse to a noun form comparable to "kind" or "sort".

However Karam do also on occasion use the noun forms *wak*, *kn̄ŋ* (K) or *wagen* (G), and *magy* (K) or *magl* (G) in taxonomic discussion, and the last three of these can give some indication of taxonomic status. *Wak*

30. Mayr, Linsley and Usinger 1953:26.
31. Pawley n.d.:201.
32. c.f. Bulmer 1968:120, 124.

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approximates to "skin" in English, and hence also "surface appearance". Thus one may say of two phenomena that they have "one skin" (*wak nokom*), i.e. are the same or similar in appearance, or that they have more than one skin.

Karam explain *kn̄ŋ* as having as its primary referent a clump of stems growing from a single root-cluster, as for example a clump of *Miscanthus* cane. It is the most generally used term for kin-groupings, down to and including the elementary family. *Agn* or *wagen* on the other hand has as its primary referent the single base, stem or stock of a tree. It is also used for a human kin group, descended from a single ancestor. To some extent the referents of the two terms overlap, so that it is often possible to use either of them. However *wagen*—"one stock or line of descent" is relatively narrower than *kn̄ŋ*, which potentially includes a cluster of stocks. It is thus significant that Wpc, describing frogs in the text presented in Appendix A below, uses *wagen*, "single stem" for the taxa *mabas* and *wyt*, members of which only vary in superficial morphological details, i.e. colour pattern; whereas he uses *kn̄ŋ* for *gwnm*, members of which vary in gross morphology as well as in ecology and other behavioural features; and he uses in different contexts both *wagen* and *kn̄ŋ* for *jejeg*.

Majnep, who assisted us in translation of Wpc's text, commented that he could quite legitimately have used either term, *kn̄ŋ* or *wagen*, for all these taxa. However, by not doing so, and by using them to indicate two degrees of homogeneity/diversity, Wpc was making as clear a point as a French speaker would by use of the terms *genre* and *espèce*, which have the same kind of ideal, relative status, but in many contexts can be used as alternatives.[33]

Finally, complete identity or uniformity can be expressed by the phrase *magl nokom*, 'one egg' or 'one fruit'. Wpc uses this of *kawag* and *akpt*, taxa in which morphological, including colour, variation is minimal. Majnep comments that one can also use this phrase for bird, mammal or reptile taxa where there is no sexual dimorphism or other variation of colour, shape or size; but that one could not use it of any tree, shrub or herb taxon, except in respect of its fruit.

It is interesting that of the nouns used in Karam taxonomic discussion *kn̄ŋ* and *wagen* have primary reference to vegetation, secondary reference to human kinship and descent, and to animal life. This cannot be taken to mean that Karam necessarily see animal taxa as genetic or phylogenetic units: one of our most sophisticated informants, Majnep, says emphatically that this is not the case, "*ykop apay*"—Pidgin, "*oli toktok nating*", i.e. "they are using it metaphorically". Nevertheless this example, and countless examples from other cultures, of the use of terms for plant forms and processes in discussion of human kinship and descent; and the extension of use of terms appropriate to discussion of human relationships to discussion of the relationships of animals, and often also, plant forms, makes it easy to see how naturally the Western European pre-evolutionary biological taxonomy of Linnaeus and other early authors foreshadowed the theory of evolution, and required only partial rather

33. c.f. Bulmer n.d. (i).

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than radical revision in the light of the development and general acceptance of the theory of evolution.

5.7.3 *Speciemes and species*

Finally we may contrast the "natural kinds" recognised by Karam with those recognised by the scientific zoologist.

In point-to-point comparisons of particular Karam taxa with scientific zoological categories it is desirable to do two things: compare the Karam "ideal" with the appropriate zoological category or categories; and to check the individual identifications made by Karam against the zoologist's identifications (as provided in Table I), accounting for the resulting pattern.

However, the "ideal" is difficult to get at. As has been argued above, only certain of a taxon's attributes need be consciously and explicitly formulated (and not all of these may have been elicited in the present inquiry). At the same time, the evidence of specific cases of identifications as a means to infer ideal categories must, in general, be treated with caution: the runs of identifications need to be long; the context of each identification should be taken into account; while the expertise of the individual identifier also needs consideration—all points on which the data of the present study are less than fully adequate.

What is significant in a particular identification is less the objective result than the intention of the identifier. To illustrate by analogy: if an English bird-watcher occasionally identifies as "blackbirds" creatures which, if he observed them more closely or in different contexts he would almost certainly identify as "thrushes" or "starlings", this would not really justify the investigator of his folk-science in glossing his concept "Blackbird" as 'category of medium sized garden birds, generally including *Turdus merula* but sometimes *Sturnus vulgaris* and *Turdus ericetorum*', since the category which the informant thinks he is noting or reporting when he uses the term applies exclusively to what the zoologist would recognise as *Turdus merula*. Although the Englishman's view of the objectivity of the category "Blackbird" (= *Turdus merula*) is bolstered by the authority of ornithological handbooks, there seems no reason to believe that Karam, though lacking a reference literature on frogs or birds, are taking a different view of the objectivity of most of the categories which they apply; or that they are not liable, as the European naturalist is, to be in practice somewhat inconsistent in their application of these categories to particular phenomena. Thus it seems justifiable to infer a real correspondence between some Karam speciemes and zoological species, even when identifications are not entirely consistent.

At the same time it is clear that a few Karam speciemes definitely do not correspond with zoological species as defined in the light of present knowledge of New Guinea fauna. Thus one must try to distinguish, in reviewing Karam identifications reported in Table I and Section 5.4, cases where specieme identifications appear to be applied systematically to one species only, and only irregularly or inconsistently to others.

Present data do not allow such judgments to be more than tentative,

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but we may note that of the 16 Karam taxa applied to familiar frogs which we have defined as "speciemes", i.e. minimal natural units, only 6 approximate closely to individual zoological species. These are *daŋboŋ* (*Hyla arfakiana*), *kosoj* (*H. micromembrana*), *kogop* (*H. bulmeri*), *wyt* (*H. modica*), *gojmay* (*Nyctimystes foricula*) and *kwlek* (*N. kubori*). 6 others, *jejeg*, *kawag* and *komnaŋat* (all considered by the biologist to represent the single species *H. angiana*), *kwyos* and *gepgep* (both *Nyctimystes disrupta*) and *gwnm sbmganpygak* (*Xenobatrachus rostratus* and also *Barygenys sp.*) definitely do not correspond to single species. The remaining four are somewhat doubtful cases: *mabas* probably includes two species (*Nyctimystes narinosa* and the as-yet undescribed *Nyctimystes* sp., though we have only one specimen of the latter); *kabanm*, though consistently applied to mature specimens of *Cophixalus parkeri*, is not consistently applied to immature examples, which are very frequently identified as *lk*; *lk* (ii) is applied to *Cophixalus variegatus*, to immature *C. parkeri*, and also on occasion to other small, morphologically similar microhylids; we have too few field identifications of *bopnm* to be sure of the precise application of this taxon, but it seems likely that it is used for at least two very small *Cophixalus* species.

To some extent the discrepancies between these lists are offset by the fact that certain taxa Karam recognise but do not name correspond well with species: i.e. *cebs* + *akpt* = *Rana grisea*; the distinctiveness of *Cophixalus riparius* is recognised by many informants; as also the distinctiveness of *Asterophrys*, though it is not unlikely that two species of this genus are in fact present.

It is not impossible that some of the deviations between the Karam specieme list and zoological species list may reflect inadequate opportunities by professional biologists for field studies of the creatures concerned (see 2.0). Already since this paper was first drafted in 1965, one Karam discrimination, that between *kosoj* and *wyt* (initially both placed by the biologist in the same species, *Hyla becki*), has been substantiated as biologically valid, and the Karam taxa shown to apply quite consistently to the two morphologically very similar species, *H. micromembrana* and *H. modica*. It is not inconceivable that the forms now known as *H. angiana* and *N. disrupta* will turn out eventually to be complexes of sibling species, and the Karam also be justified in splitting these. Regarding the small *Cophixalus* species divided by Karam into *kabanm*, *lk* and *bopnm*, one can only say that these are morphologically very similar and still scientifically very little known. However in these cases the probability would seem to be that further scientific investigation will result in more and not less discrepancy between Karam and zoological taxonomy.

The general point thus stands. The fact that folk-naturalists, like the Karam, see animals as constituting "natural kinds" or "speciemes" which bear some logical relationship to the species of the scientific biologist, does not mean that there is a one-to-one correspondence between individual speciemes and individual species. Conversely, the fact that folk-taxa do not correspond one-to-one to scientific taxa does not mean that folk-taxa are necessarily not "natural" units.

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5.8 *The basis of Karam taxonomy.*

We have demonstrated that Karam have categories (speciemes) which correspond in general terms to species, and many of which are named, and noted the extent to which these individually correspond to particular zoological species, but we still have to seek the reasons why these categories exist. Why is Karam interest in frogs sufficient for them to subcategorise them at all? Why 22 named terminal taxa for 18 or 19 species, rather than 12 or 120? The answers to these questions are in part obvious and in part subtle. It will be apparent that we do not consider the mere listing of key characters to be a satisfactory answer to the question as to why the taxa exist, although these key characters undoubtedly reflect discriminations made by Karam in many other contexts of life. However, in different combinations and permutations they could equally well be used to construct typologies of 2-n subcategories of the primary taxon *as*. And in any case the principles of identification are of a different order from the principles of taxonomy.

Underlying modern zoological taxonomy is the theory of evolution. Ideally, species of frogs are populations that freely interbreed in nature (or would do so if not spatially or otherwise separated) to produce fertile offspring. Individual members or localised populations of species will vary in their physical characters or behaviour, but collectively all members of a species share some morphological and/or behavioural characteristics which distinguish them from representatives of other species. Well-differentiated local populations within a species are often distinguished as geographic races or sub-species. In terms of the theory of evolution they are, potentially at least, incipient species. Superspecific, generic and higher-order categories of zoological taxonomy are created on the evidence or assumption of degrees of common ancestry.

Since the theory of evolution is not part of Karam cosmology, it is unreasonable to expect Karam taxonomic categories to correspond with those of modern zoology. Indeed, as we have seen, Karam primary taxa bear very little relationship to the higher level categories of scientific zoology. What requires explanation is the fact that at the basic level of Karam taxonomy the units show any correspondence at all to zoological species. This can only be because the discriminations Karam make, at this level, and the interests underlying these discriminations, bear some relationship to the discriminations and underlying interests of the zoological taxonomist. The convergence would appear to be one of practical interest and procedures, rather than of underlying theory.

Ideally, one supposes, a zoologist should not describe a new species until he has full information on its distribution and on its variation and the genetic basis underlying this. In practice, of course, animals must be named if they are to be discussed at all. Thus, on the basis of morphological and, sometimes, behavioural characters which, from his knowledge of related creatures, the taxonomist has good reason to believe are significant, he describes, i.e. names, a new species. As further information comes to hand on this and on related forms (and as advances in genetics and other branches of biology bring about changes in evolutionary

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theory), revisions of classification and of nomenclature follow. But underlying taxonomic procedures is the expectation that morphological differences are accompanied by behavioural differences, including adjustments to different habitats or ecological niches.

Precisely the same expectation or assumption appears to underly Karam taxonomy. As they see them, a high proportion of their taxa do not contrast only in their morphology, but in behaviour and habitat as well. Given that Karam eat most kinds of frogs, and are concerned to collect them with reasonable efficiency, the way they classify them is highly rational. It provides a framework for storing and communicating information which enables them to go at the right time to the right locations and search the most likely host plants to enjoy fair prospects of success in collecting a meal: and to know when calls are worth following up, and when not.[34] It is notable that where individual speciemes do not equate with species, but only with sectors of these (e.g. *jejeg*, *kawag*, *komnaŋat*, *kabanm*) distinctions not only in morphology but also in characteristic habitat are in nearly all cases asserted.

Is it then possible to stop at this point, and consider the utilitarian interpretation, "Karam eat frogs and therefore classify them in ways that make for their efficient capture and consumption" a sufficient explanation for their taxonomy? We do not think it is. For one thing, there is no apparent necessary reason why the Karam should eat frogs at all. Undoubtedly they make a useful contribution to diet, but so could a number of creatures which Karam spurn—dogs, terrestrial snakes, and some very common small birds and large insects. And why do they not eat *gwnm*, place restrictions on *mabas*, *akpt*, *cebs*, *kabanm* and *lk*, and deny all frogs to adolescent youths during the period between their initiation rites? *Gwnm*, of course, may be a special case: certain species falling in this category may in fact be toxic. But it is clear that Karam interest in frogs, as in all other classes of flora and fauna, is not simply utilitarian, or is utilitarian only within limits themselves imposed by non-utilitarian factors. It expresses a view of the universe which must be understood in its broader terms if its detailed implications in the classification of frogs are to be fully comprehended.[35]

This is not the place for a general discussion of Karam cosmology, a tentative outline of which has been presented elsewhere.[36] However, certain of the more obvious associations and oppositions in Karam thought may be related to information presented in this paper. Thus, in terms of the male-female opposition the taxon *as*, all categories of which are thought of ideally as being collected by women, and which are

34. This is illustrated by a story Gi told of a Kaironk man who wished to assault a girl and hid in the cane grass while she was collecting frogs at night. He imitated the call of a *kwlek*, hoping to attract her to his hiding place. However she realised that the call was not quite right and fled, thinking a witch was abroad. Her screams brought a male relative to the scene, who shot the would-be assailant in the shoulder.
35. Here we echo Lévi-Strauss (1962), whose work provides the starting point for almost any contemporary discussion of the relationship of folk-taxonomies to cosmological structure.
36. Bulmer 1967.

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"squashy" or "rapidly putrefying" food, falls clearly on the female side. It is then consistent that in the period of boys' initiation rites, in which stress is laid on male symbols and on the transition to manhood, frogs should be forbidden food. The antithesis evident between forest and cultivation is possibly the underlying reason for the marking off of *mabas* as unsuitable food for children, as much as its possession of particular physical characteristics, which incidentally it appears to share with at least one other taxon. The particular association of running water, and of streamside vegetation, with cleanness and health, may be related to the general acceptability of most categories of frogs as food, whereas the contrasting dirtiness or potential defilement of the ground may partially explain why subterranean *gwnm* toads, along with earthworms, centipedes, terrestrial and burrowing snakes, ground-dwelling coleopterous larvae and most terrestrial spiders, are treated with apprehension or disdain. The rather special status of *akpt*, and to a lesser extent of *cebs*, *kabanm* and *lk*, may be seen both as reflecting the notion that their big bellies are associated with sorcery or poisoning, which is believed to cause human victims to swell up, and as reflecting the fact that though they are all typically found in water all of them, and especially *akpt*, are not uncommonly found on or near the ground at some distance from water, and, in the case of *akpt*, particularly in current gardens.

As we have tried to indicate, the interpretations of the last paragraph are still tentative. However, it would seem inescapable that a full understanding of Karam cosmology should ultimately provide explanations of this general kind for the existence of Karam taxonomic categories, not only as applied to frogs but to other classes of fauna and flora as well.

6. Conclusions

Although we have elicited no Karem lexeme closely equivalent to "natural kind" or "species" we believe that our evidence demonstrates that Karam nevertheless perceive frogs as grouped in "natural kinds" or "speciemes", marked off from each other by multiple distinctions of appearance, habitat and behaviour, and that, given the cosmological and economic status that frogs occupy, there are very good practical reasons why this should be the case. However, in spite of the obvious parallel between the "natural kind" or "specieme" implicit in Karam cognition and the "species" of scientific zoology, there is only partial correspondence between the Karam specieme list and the list of species in the same fauna at present recognised by the European herpetologist, though divergences may possibly be reduced by future revisions of zoological taxonomy.

We also note that though there is a general correspondence between "speciemes", as recognised by well-informed Karam, and minimal named Karam taxa, this is not perfect, some minimal taxa being sub-categories of speciemes (which we term "variants"), others representing developmental stages within a single unnamed specieme, others containing two or more unnamed speciemes. And although there is a general consistency between the three levels recognised in formal Karam frog taxonomy and

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the three major morpho-syntactic classes of terms used in frog nomenclature, there is again not a perfect correspondence here, some terms of equivalent syntactic status having referents which are taxonomically non-equivalent.

Frogs offer a good starting-point for the study of Karam ethno-zoology. They are important to Karam, readily collected, and include neither too many species or folk-taxa to make reasonably comprehensive treatment possible, nor too few to permit generalisations which may have wider application. Studies of Karam knowledge and classification of other vertebrate and invertebrate fauna are in preparation. Although each major faunal group (whether one follows Karam or scientific taxonomy) offers its own special problems in description and analysis, the general framework adopted in the present paper appears to be applicable at least to all other vertebrate animals. By and large, the appreciation of natural kinds seems fundamental to Karam classification of all vertebrates. To this extent the conclusions or assumptions of some earlier writers that there is a high degree of consistency between basic folk-categories and zoological species as applied to such groups as birds or mammals, may be justified. However, a note of warning must be sounded.

To the zoologist concerned with practical problems of studying and collecting fauna in alien territories the present inquiry may give some impression of the kinds of cultural factors possibly promoting or restricting the range and accuracy of his native assistants' knowledge of the creatures in their environment. It also suggests that while it is very useful for zoologists to record vernacular terms for animals, the application of these to particular species or other zoologically well-defined forms should not be assumed unless the investigator has unusual opportunities to check his data.

To the ethnographer or linguist both the positive findings and the deficiencies of this study should at least indicate the difficulties involved in a thorough investigation of any branch of folk-biology. Although any accurately transcribed vocabulary has its uses, it is simply not sufficient for the investigator endeavouring to understand folk taxonomy merely to record the names of indigenous categories of plants and animals and the statements of informants as to the criteria they apply in discriminating these. He must personally be as familiar with the phenomena concerned as his informants are, or he must have co-operation in the field from professional zoologists or botanists, or, as a poor third best, he must make such extensive and representative collections, with full notes on the circumstances of native identification of each specimen, that specialists who have not worked with him in the field can nevertheless effectively collaborate in the analysis of his data.

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TABLE I: SPECIES IDENTIFICATIONS COMPARED WITH KARAM TAXA APPLIED TO 438 FROGS†

SPECIES	KARAM TAXA: daŋboŋ	komnayat	jejeg	(jejeg) pkay	kawag	kosoj	kwlek	gojmay	kogop	wyt	gttek	kwyos	gepgep	mabas	kabanm	lk (inc. bopnm)	gwnm	akpt	cebs	akok	TOTALS
Hyla angiana	–	18*	52*	5*	27*	–*	7	1	2*	1	1	–	–	2	3	–	–	–	–	1	120
Hyla arfakiana	7*	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7
Hyla modica	–	–	2	–	–	–	2	–	–	21*	2*	–	–	–	–	–	–	–	–	–	27
Hyla micromembrana	–	–	–	–	1	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5
Hyla bulmeri	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	3
Nyctimystes disrupta	–	–	–	–	–	–	–	–	–	1	–	16*	9*	–	–	–	–	–	–	–	26
Nyctimystes foricula	–	1	–	–	–	–	–	16*	–	–	–	–	–	–	–	–	–	–	–	–	17
Nyctimystes kubori	–	–	1	–	–	–	42*	–	–	–	–	–	–	–	–	–	–	–	–	–	43
Nyctimystes narinosa	–	–	–	–	–	–	–	–	–	–	–	–	–	27*	1	–	–	–	–	–	28
Nyctimystes sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1
Sphenophryne brevicrus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1*	–	–	–	1
Cophixalus parkeri	–	–	–	–	–	–	–	–	–	2	4	–	–	–	39*	30*	5	2	–	–	82
Cophixalus riparius	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5*	–	–	–	5
Cophixalus shellyi	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–*	–	–	–	0
Cophixalus variegatus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	18*	1	–	–	–	19
Asterophrys sp. or spp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	21*	–	–	–	21
Zenobatrachus rostratus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	25*	–	–	–	25
Barygenys sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–*	–	–	–	0
Rana grisea	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7*	3*	–	10
TOTALS	7	19	55	5	28	4	51	17	5	25	7	16	9	30	43	48	58	9	3	1	438

† 488 specimens were collected between 1960 and 1966. The labels on 31 specimens became obliterated or detached, while for a further 19 information concerning Karam names is lacking.
Karam names recorded are those supplied by collectors of specimens, or, in the case of specimens collected by R.B. himself, by informants who witnessed capture.
Numbers of specimens do not reflect relative frequency with which species are captured by Karam. Only a small proportion of commoner Hylid frogs brought in were accepted, whereas nearly all examples of Microhylid frogs and rarer Hylid categories were preserved, and higher payments were offered for certain of these.

* Identification also supplied by informants to H. G. Cogger, or to R.B. for specimens obtained in 1967–68.

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APPENDIX A

A KARAM TEXT ON THE CLASSIFICATION OF FROGS

The following statement by Wpc, the Big Man of Gobnem, was recorded (Tape P4/ii) on 2nd September 1968, while J. Menzies and R.B. were camped at Kŋem, 8,200 ft, in the forest at the head of the Ced stream on the North side of the Kaironk Valley. Although Wpc, now probably in his fifties, has been one of R.B.'s best informants, he does not speak Pidgin and lacks the fairly sophisticated understanding of the problems the ethno-biologist is interested in that some of our younger informants, such as Gi and Majnep, now possess. We can thus say confidently that his formulations are in no way modified by his desire to help the ethnographer or by his understanding of the theoretical questions of interest to the ethnographer.

The text is in Gobnem (*ty mnm*) dialect, though as is typical in the upper Kaironk, the speaker alternates to some extent between *ty mnm* and *etp mnm* forms. It was translated by R.B. with the assistance of Majnep. A relatively free translation is provided, though sections of the original text are numbered so that they can be related to sentences in the translation. It will be seen that the Karam term *kn̄ŋ* is here rendered "family"; *wagen* is rendered "stock"; *magl* "kind" or "distinct kind"; while the verb forms *ll gak* or *lak*, used with numerals, are rendered, "has . . . forms" or "has . . . appearances" (see 5.7.2).

(1) Mabas gak ll gak wdnkag-sw, soysoy-sek lak, kamay epel mdebak. Dy apy apl mdl lwm yepy mdl n̄g-ayaŋ mdl gak; klkl sek key ll, mosb key ll, lkan̄ key ll gak as sŋok kogop gak tek, kd-okyaŋ lkan̄-sek a lak, cebs nwp gak tek, yaw me pabl okok lak, yaw me almal ll, almal ll. (2) Dy gepgep a pen ll gak, mosb all, klkl all gak, mabas agak tek klkl all gak, ok omŋal nep lak, lak mlep mlep kl all mosb ykop lak, almŋal. (3) Jejeg wagen amey gak, jejeg, mlep all, pkay all, jejeg km all, jejeg komnanat all gak, pkay amey mamd ak, ypey lkan̄-sek a nep akey pkay pkay akey aŋ. (4) Ll ll lak mamd, kawsek alak, gepgep ok omŋal lak, mabas apen gak omŋal ll omŋal ll gak, wagen nokom, wak kwd kwd okok pen ll gak. (5) kd okok pat nep kwb deg pat all, j kwd okyaŋ pen: as kogop a nwp gak tek all, mlep all gak, omŋal nokom lak, kl ok. (6) Gojmay, jy gojmay nwp yepel lak, gojmay nwp byn-pok nokom lak, ll wak at laŋ pen mjkmab lak, kd okyaŋ pen aŋ, ygam tek a lak, kan̄m pok tek lak kwd okyaŋ, wŋ okok gen pabl okok lak, ak, ok omŋal lak, jy sŋok. (7) As yenm a nep ak, ak kn̄ŋ koŋay lak, gak tawep patpat lak a mab yb yepel mdeb, tol dl dam n̄elakak, lwm yepy

(1) *Mabas* [*Nyctimystes narinosa* etc.] are various, some with brow-ridges, some with goose-pimpled skin; they live high in the beech-forest trees, but they come down to the ground and to the streams below; some are mottled, some dark-coloured, some red-purple—these are quite like *kogop* [*Hyla bulmeri*], with their under-surface marked with red [Majnep, who assisted in translation of this text, says Wpc made a slip of the tongue here, and meant "yellow"] some are like *cebs* [immature *Rana grisea*], with (upper and lower) breasts contrasting (in colour); yes, there are four forms. (2) Then *gepgep* [*N. disrupta*], some are dark-coloured, some are mottled, mottled like *mabas*; there are just two forms, one pale brown and mottled, one dark-coloured. (3) The *jejeg* [*H. angiana*] stock are thus, some pale brown, some bright-coloured, some green, some are *komnaŋat* [i.e. a very bright green frog], some bright-coloured, altogether five forms, you can distinguish the reddish ones from the bright-coloured ones. (4) So there are five of them, many forms indeed; of *gepgep* two forms; of *mabas* four forms, of one stock but the upper and under-surfaces variously marked. (5)

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mdeb a pen gak, ykey abey lwm nab pyow pken gol mseŋ gwp, pkeŋ gol mseŋ gwp cbmganpygak, jy ak ykop n̄g sŋaped mdeb ak aymeneb tek lak, aymeneb tek lak nonm lak ak, jy ak omŋal ll nokom, lak ll, omŋal ll nokom ll gak, omŋal ll bt kn̄ŋ omŋal lak; magl omŋal nokom lak. (8) Jejeg nopey nwp ll mamd a lak, jejeg ak omŋal nep lak, kwlek omŋal ll, nokom ll gak. (9) Ykey day n̄agebyn, ykey as koŋay nep sŋwl lak, (10) akpt yept, yaw, daŋboŋ o yepet, (11) ykey komŋanat? komnaŋat a jegjeg kn̄ŋ ay yp tek, yesek nb apal, amey mamd; as yepet yepet pen ageybn; (12) kwyos ok yepet lak, yaw pok me okol gen ll act me kl kwd oklaŋ gen lak. (13) Ykey, as sayn aŋ kawag magl nokom lak, akpt magl nokom lak, (kosoj), ok magl nokom lak, (14) wyt ok nep me wagen kwb ok lak, ll gak mlep a ll km all, kl all gak, bad a lak. (15) As bapsek - kabanm me nokom ll lak, lk nokom lak. Tep.

This (*mabas*) has a long straight back. The *kogop* [*H. bulmeri*] are thus, some are pale brown—there are three forms altogether—some are mottled. (6) Of *gojmay* [*N. foricula*] there is only one form, *byn-pok* is the same as this; the upper-surface is green, though the under-surface of some is (plain) yellow, of others like ripe bananas [orange-yellow], the chest, the breast, they are of both appearances. (7) *Yenm* are a numerous family, some with rather long legs live high up in tree-moss [i.e. *Cophixalus* ? *riparius*] —yesterday we caught some and gave them to you; some live on the ground, or rather, right down in the ground, so that they are dug up when gardens are being cleared—these are *cbmganpygak* ["small anus", i.e. *Xenobatrachus* sp., *Barygenys* sp.]; then some live some way from water and look quite like *aymeneb* [mature *R. grisea*], the mothers [i.e. "big ones"] are quite like *aymeneb* [these are *Asterophrys* sp.]; perhaps three forms altogether . . . or two families . . . ; three distinct kinds.

(8) So there are five forms of *jejeg*, just two forms of *gegep*, three forms of *kwlek* [*N. kubori*]. (9) Now how far have I got? There are many kinds of frogs here. (10) One form of *akopt* [mature *R. grisea*], yes, and one form of *daŋboŋ* [*H. arfakiana*]. (11) What, *komnaŋat*? *Komnaŋat* is of the *jejeg* family, he's talking nonsense [referring to an interrupter who takes the majority view that *komnaŋat* and *jejeg* are distinct, mutually exclusive taxa], there are five forms of them, I've already discussed each different one. (12) There's only one form of *kwyos* [*N. disrupta*], it's red-purple on the underside and mottled on the back. (13) Of others still to mention, there's one kind of *kawag* [*H. angiana*], one kind of *akopt*, of *kosoj* [*H. micromembrana*] also only one kind. (14) *Wyt* [*H. modica*], they are a big stock, some pale brown, some green, some mottled—several different forms. (15) There's one other frog, *kabanm* [*Cophixalus parkeri*] —just one form; and *lk* [*C. variegatus* tec.] has one form also. That's all.

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APPENDIX B

INDEX TO KARAM TERMS FOR FROG AND TADPOLE TAXA

ACKNOWLEDGMENTS

We gratefully acknowledge the support for R.B's fieldwork in 1963–4 of the U.S. National Institute of Health (Grant M.H. 07957–01) and the New Zealand University Research Grants Committee, and for his subsequent fieldwork from the New Zealand Golden Kiwi Lotteries Fund Scientific Research Committee, the New Zealand University Research Grants Committee, the Wenner-Gren Foundation and the University of Papua and New Guinea. M.J.T. wishes to thank the Trustees of the South Australian Museum for research facilities and assistance they have generously provided.

Our debt to H. G. Cogger will be very clear from the many references to his study in our paper. We are also most grateful to J. Menzies for collaboration and advice in the field and in the examination of specimens; to Mr J. S. Womersley and his staff in the Division of Botany, Department of Forests, Lae, to Dr R. G. Robbins and to Dr R. C. Cooper for help with botanical identifications; to B. G. Biggs and A. K. Pawley for information and assistance in the field and for comments on drafts of this paper; to H. C. Conklin for penetrating and extremely valuable criticism of an earlier draft; to the staff of the Anglican Mission, Simbai and to Messrs Gavin Carter, Ivan Smitmanus and Peter Kraehenbuhl, Patrol Officers, Simbai, for very cordial hospitality and practical help; and to our Kaironk field assistants and interpreters, especially Gi of Skow, Kiyas of Kaytog and Majnep of Gobnem, without whose help this paper could not possibly have been written.

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