An Analysis of Rofaifo Mammal Taxonomy

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introduction

This paper analyzes data from a study of Rofaifo folk zoology conducted in the Papua New Guinea Highlands between March 1972 and January 1973. I ask three questions: (1) To what extent does the folk classifier perceive the same entities as the scientific zoologist? (2) What is the cognitive status for folk of taxa located at different levels of their zoological taxonomy? (3) What is the fate of categories located at certain levels as the folk zoological taxonomy evolves? Much of the paper explores analytical methods that may have cross-cultural relevance.

Between March 1972 and January 1973 I lived with Rofaifo people, Komonku tribe (Siane) at Leu village on the eastern slopes of Mt. Erimbari (Eastern Highlands District, lat. 6°12′S, long. 145°10′E). Here I was studying mammal ecology over the altitude range 1,900-2,730 meters and in varied habitats (rainforests, grasslands, gardens; e.g., Dwyer n.d. and 1975). The data reported in this paper were gathered partly as ancillary to my biological pursuits and partly because my interest in folk classification was progressively nurtured under stimulus from Rofaifo. My methods were consequently eclectic in the extreme, and I learned rather gradually to accept as fact my mental dictum that folk and scientific taxa need not concur. I did not learn to speak Siane and was incompetent at Pidgin until Rofaifo taught me. A man named Guringbao who spoke and read three New Guinea native languages plus Pidgin was my primary language teacher. Guringbao, Siemon, and Yauwe Riyon influenced the approximately phonetic orthography that I developed; it is a modification of that proposed by Salisbury (1956). Yauwe Riyon was Rofaifo by birthright but not heredity, was fluent in English, and visited Leu for one week in April 1972.

I elicited taxa and identifications as often as possible (over 3,000 mammal specimens examined), discussed and crossreferenced the elicited names and identifications with as many people as possible (children, youths, and men provided most of my data), was the

Analysis of a New Guinea folk classification of mammals reveals considerable correspondence for entities perceived and labeled by folk and scientific zoologists, but notable differences in the cognitive status accorded those entities in the two classificatory systems. The cognitive status of folk categories may be best understood in a relativistic frame rather than by assigning them to fixed positions within a formalized hierarchy of conceptual states. Taxonomic evolution has been dominated by shifts in the conceptual level for archetypal categories, with upgrading of categories more frequent than the reverse. Categories with connotative rather than denotative referents seem to be appropriate candidates for upgrading.

instigator and accepted observer-employer of many hunting trips (Dwyer 1974), developed what I trust was an acute facility for overhearing unexpected combinations of terms that could later be checked, and learned early that context was integral to content. Details of these aspects of my methodology are more appropriate to a later report, wherein I shall establish the referents, and limits to these as I discerned them, for elicited taxa. Here, interpretative problems of a different order are important.

The data base for this paper comprises a list of Rofaifo categories together with a summary statement of their biological content. These translations are given in Figures 1 and 2, and the tabular data I present may be extracted from those figures. For some thirty years, however, Rofaifo have been subject to cultural change as an aftermath of contact with Europeans (cf. Salisbury 1962). Among other changes this has entailed reduced emphasis upon hunting, downgrading of certain dietary regulations, and, in my view, a notable simplification in taxonomic usage (Dwyer 1976a). In an important sense, therefore, I felt that I was investigating not one taxonomy, but two; that I was attempting to recreate the precontact system from its extant condensed form. This imposed a methodological paradox that is difficult to resolve, for I relied greatly upon

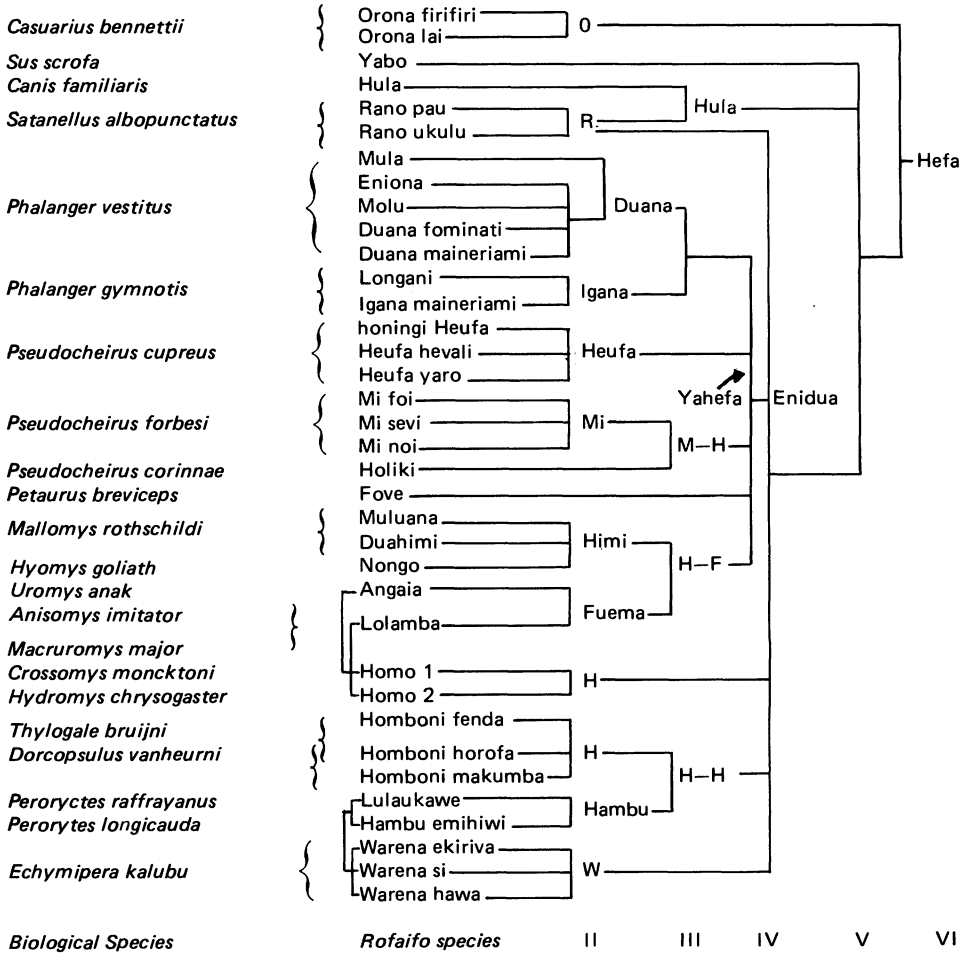

Figure 1. The cognitive status of Rofaifo categories within *Hefa*.

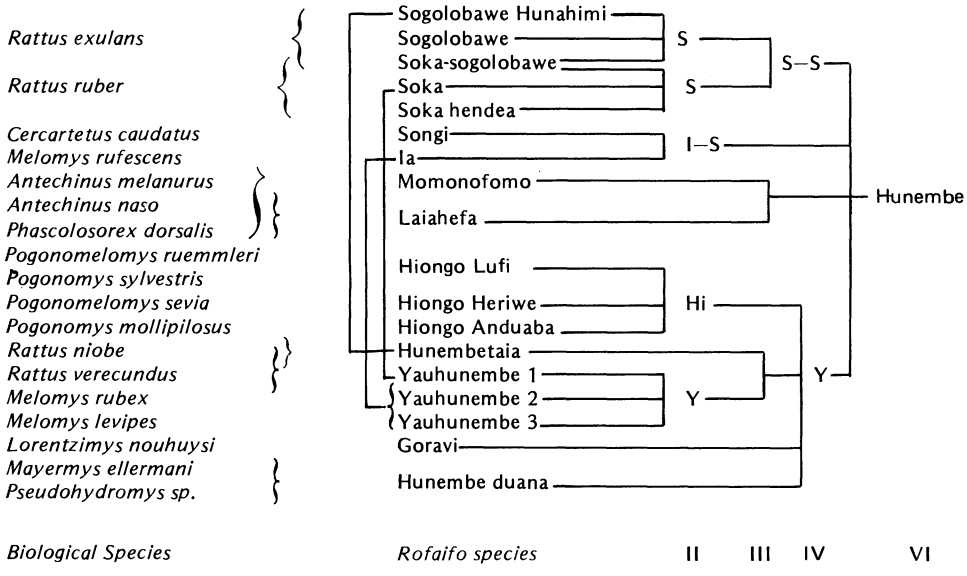

Figure 2. The cognitive status of Rofaifo categories within *Hunembe*.

older men, who usually did not speak Pidgin, to teach me the past, while at the same time I accepted the age of an informant as a major contextual parameter on the assumption that detailed taxonomic knowledge had to be learned.

Two men, Apia, estimated to be in his fifties, and Olubien, probably in his sixties, were valued teachers. Apia understood some Pidgin, was vitally interested in the prevailing milieu of change, and was a knowledgeable but erratic tutor on taxonomic matters. Olubien spoke no Pidgin, was a traditionalist who participated little in the new order, and was, I think, my most knowledgeable and consistent instructor on the subject of taxonomy. On two counts, however, access to Olubien was restricted; first, in that new-found kinship ties imposed some constraints on whom I should ask what and, second, in that I had to be selective of translators to offset a Rofaifo propensity for knowing more than anyone else. That is, in striking contrast to Bulmer's experience among Kalam (see Bulmer and Tyler 1968), there were few Rofaifo men who would spontaneously plead ignorance when confronted with a specimen and asked for its name. Most men tended to reinterpret Olubien's statements to accord with their own views, and it was necessary to choose young or zoologically naive interpreters if I sought reliable translation.

In this paper I treat two primary taxa in detail. These are *Hefa*, comprising larger mammals, except man, together with cassowary and eel, and *Hunembe*, comprising smaller mammals. In accordance with Berlin's recommendation (1973:268), I confine my formal analyses to Rofaifo categories for those biological species within *Hefa* and *Hunembe* that occur, or recently occurred, within the domain Rofaifo identify as their own. Introduced species are not included. Furthermore, the taxonomy I analyze is the precontact taxonomy, or, rather, my interpretation of that taxonomy. The translations of Figures 1 and 2 must, therefore, be understood as rarefied. For *Hunembe* my data are sometimes ambiguous in allowing the interpretations that certain categories crosscut biological species or that such crosscutting is absent. Here I treat both, referring to one as "preferred" (it recognizes Rofaifo categories as frequently crosscutting biological species) and the other as "conservative" (it eliminates this crosscutting).

I adopt the convention of capitalizing the initial letter of Rofaifo terms that may be used on their own to label categories unambiguously and of using lower case for the initial letter of terms that may not be used in this way. Thus capitalized terms are monomials or unitary lexemes, while terms commencing in the lower case are part of binomials or binary lexemes (cf. Bulmer 1974).

the perception of discontinuity

Table 1 examines Rofaifo taxa applied to *Hefa* and *Hunembe* for correspondence with biological species and according to their nomenclatural status as either (1) named terminal taxa, (2) secondary taxa, or (3) monomials.[1] For purposes of this presentation I accept monomials at the lowest level at which they occur in the taxonomic hierarchy. Thus for the categories, *Rano pau* and *Rano ukulu*, I accept *Rano* as a monomial and ignore *pau* and *ukulu*; for *Igana Longani* and *Igana maineriami*, I accept *Longani* as a monomial, ignore *Igana*, and treat *maineriami* as unanalyzable in the present context.[2]

Table 1. Correspondence between Rofaifo taxa and biological species.

	1:1	Under-differentiated Type 1	Under-differentiated Type 2	Over-differentiated	Total	% 1:1
Hefa						
terminal taxa	8	–	2	25(3)	35	22.9
secondary taxa	9	1	5	–	16	56.3
monomials–secondary	7	–	2	–	9	60.0
monomials–tertiary	5	–	1	5	11	
Hunembe (conservative)						
terminal taxa	7	–	4	4	15	46.7
secondary taxa	7	–	4	–	11	63.6
monomials–secondary	5	–	2	–	7	53.8
monomials–tertiary	2	–	1	3	6	
Hunembe (preferred)						
terminal taxa	5	–	5(3)	6(1)	16	31.3
secondary taxa	3	2(2)	5(4)	1	11	27.3
monomials–secondary	3	–	3(3)	–	6	35.7
monomials–tertiary	2	–	1	5(1)	8	

*For each nomenclatural state, instances of one-to-one correspondence, of underdifferentiated taxa (i.e., Rofaifo taxon corresponds to more than one biological species), and of overdifferentiated taxa (i.e., Rofaifo taxon corresponds to less than one biological species) are given. For underdifferentiated taxa, I separate cases where the included species are of the same genus (Type 1) from cases where the included species are from more than one genus (Type 2; cf. Berlin 1973). Values in parentheses indicate Rofaifo taxa that crosscut biological species.

Moderately high levels of one-to-one correspondence are suggested from analyses based upon secondary taxa or upon monomials, though for *Hunembe* correspondence is poor for all nomenclatural states if the preferred interpretations of Rofaifo taxa are accepted. However, the value of these results is seriously weakened for several reasons. First, the analysis based upon monomials renders some tertiary taxa unanalyzable (four for *Hefa*, one for *Hunembe*) and creates difficulties relating to the implied equivalence of status for certain secondary and tertiary taxa; these difficulties cannot be resolved *a priori*, and the analysis as given does not contribute to their resolution. Secondly, the analysis based

upon secondary taxa necessarily excludes those taxa at the tertiary level that exhibit one-to-one correspondence with biological species (six for *Hefa*, two for *Hunembe*); note also that the taxa exhibiting one-to-one correspondence for *Hunembe*, conservative, are not identical between nomenclatural states. Thirdly, when it is recognized that the number of biological species included in *Hefa* and *Hunembe* is twenty-two and eighteen respectively, the analyses emerge as somewhat deceptive; using secondary taxa it now appears that, at best, only sixteen Rofaifo taxa match one-for-one in a series of forty biological species (i.e., combining *Hefa* and conservative *Hunembe*).

The procedure followed above is essentially that of Berlin (1973) and Bulmer (1974). Its weakness resides in testing a single state selected from the folk classification against a single state (the biological species) selected from the scientific classification. But, since the *only* question at issue here is the question of perception, it would seem more appropriate to select a unit from one classificatory system for testing against the entities recognized in the other system irrespective of their nomenclatural or cognitive status in that system. It is clear that from the perspective of Western thought, it must be the scientific classificatory system that takes precedence in this analysis, and it must be the biological species that is selected as the relevant unit.

In a recent paper on the correspondence between folk and scientific classification, Hunn (1975a:312-313) states:

> It is not the case that the scientific species *must* be selected. Scientific species are certainly the basic units of the scientific classification, due to their unique logical status *vis-à-vis* other taxa. However, this unique status derives directly from evolutionary theory, *viz.*, species are genetically isolated populations . . . . The theory of folk systematics is not predicated on such considerations. Thus with respect to the correspondence of folk to scientific taxa, the scientific species is not necessarily the basic unit.

For a restricted spatial and temporal domain it is not true that the unique status of biological species derives from evolutionary theory. As the ecologist Robert MacArthur wrote (1972:71); "Species are the units, in fact the only units other than the individual organisms themselves, in the organization of a community." But he added, "Except in a community of coexisting individuals, species may lose their objectivity." Definitions of species proposed by Mayr, Dobzhansky, and other evolutionists (see Mayr 1963) are attempts to rationalize the "reality" of species in terms of an ideology of evolution. At this level it is of no consequence that "folk systematics is not predicated" on evolutionary considerations: biological species do reflect objective discontinuities of the natural world irrespective of their meaning for evolutionists. For scientific taxa above the level of species, and especially for animals likely to concern the folk, phylogenetic inference pervades the taxonomic system. The conceptual framework within which supraspecific scientific taxa are located requires that correspondences between these and folk taxa be taken as fortuitous. This does not deny that scientists and folk may *recognize* shared categories, such as "bat," on the bases of broadly overlapping percepts; it does deny that those percepts are entirely responsible for positioning "bat" within the scientific taxonomic structure. When taxa of this order correspond between the two classificatory systems it is not legitimate to conclude, as Hunn tries to do, that "folk and scientist employ comparable cognitive strategies in classifying living things" (1975a:321). Rather, it is indicative of the fact that evolution may often produce assemblages of organisms that, for a restricted time, share numerous attributes and are markedly distinct from all other organisms.

Hunn also argues that the correspondence of folk taxa to scientific species that lack locally occurring congeners (i.e., "isolated" species) is of a different kind from the correspondence to scientific species that have such congeners (1975a:320). He shows

that, for Tzeltal speakers, the correspondence for mammal species is higher in the first case than in the second and suggests that there is no justification for equating correspondence to "isolated" species with correspondence to scientific species *per se*. Here Hunn overlooks an impressive body of ecological theory suggesting that when closely related species co-occur, they will diverge significantly in the ecological strategies they adopt and often in the morphological correlates of those strategies. Diamond (1972) provides examples for birds in New Guinea. Indeed for rats of the genera *Pogonomelomys* and *Pogonomys* mentioned in this paper, and each represented in Rofaifo domain by two species, overt morphological similarities (body size, coloring) are greater for species between genera than for species within genera. Factors other than the presence or absence of congeners could account for differences in the degrees of correspondence. Examination of Hunn's list of mammal categories (1975a:322-323) reveals that the nine species with local congeners that fail to correspond to Tzeltal taxa include: three mice that, because of their size, might well be of little consequence to Tzeltal speakers and that are included in a genus, *Peromyscus*, that has proven difficult to clarify scientifically; dog, *Canis familiaris*, for which Tzeltal speakers seem to apply separate names to certain breeds; and two species of peccary which in fact no longer occur in the area.

I conclude, therefore, that Hunn has failed to establish either that it is logically valid to include supraspecific scientific taxa or that the scientific species should not be taken as the basic unit when comparing folk and scientific taxonomies. Had Berlin (1973) accepted the scientific species as a unit in his analysis of Tzeltal folk taxa, the level of one-to-one correspondence would presumably have been higher than the value he suggests of 61 percent; taxa treated as underdifferentiated (36 percent of Tzeltal generics applied to plants) are, in fact, each divided into two or more named categories, the majority of which exhibit one-to-one correspondence with biological species. Table 2 reveals higher levels of one-to-one correspondence between biological species and Rofaifo categories than were suggested from the analyses given above (77.3 percent for *Hefa*, 66.7 percent for conservative *Hunembe* and 38.9 percent for preferred *Hunembe*). Although correspondence as monomials is consistently higher than that shown for other nomenclatural states, it is clear that no single nomenclatural state depicts the full extent of correspondence.

Hunn provides a method purporting to measure "the degree of dissimilarity between a folk system and *the relevant portion of the scientific system*" (1975a, 1975b:26; italics mine). His statistic is a weighted and normalized Coefficient of Dissimilarity, D" (1975a). For the domain, *Hefa*, D" = 0.14 or 14 percent of the maximum possible disparity. For *Hunembe*, D" = 0.25. (I have used my preferred interpretation of the data with the exception that *Soka-sogolobawe* is deleted from the analysis. The scientific taxonomy

Table 2. Correspondence between biological species and Rofaifo categories.

	Hefa	*Hunembe*	
		conservative	preferred
No. of biological species	22	18	18
One-to-one correspondence detected:	17	12	7
at secondary level	9	7	3
at tertiary level	8	5	4
as formally named terminal taxa	8	7	5
no formal lexeme available	2	3	2
as monomials	14	9	5

followed is that given by Morris [1965], but its use does not imply agreement). Following Hunn, these values should mean that Rofaifo are less attentive to "the structure of 'reality' " (1975a:318) than are Tzeltal speakers, for whom D'' for mammals, excluding humans, bats, and armadillos, equals 0.07. I have difficulty accepting this conclusion.

Hunn says that the Coefficient of Dissimilarity is a "measure of the degree of correspondence of folk to scientific biological classification." It is not a measure of correspondence of fundamental taxa in the two systems, and, in my view, it cannot be a measure of correspondence in the perception of discontinuity, since at least the scientific taxonomy is deliberately biased in other directions. Hunn wants to expose possible similarities in the cognitive strategies used by folk and scientists when they classify living things. However, in defining "the relevant portion of the scientific system" through a series of "reduction rules" Hunn effectively maximizes similarity between the two systems before estimating dissimilarity. For example, both *Hefa* and *Hunembe* include members from three subfamilies within the Muridae (a family of rodents—placental mammals), from one subfamily within the Phalangeridae (possums, cuscuses, etc.—marsupials), and from the family Dasyuridae (marsupial mice, etc.). This bespeaks extraordinary divergence in the ways Rofaifo and scientists classify mammals, but these differences do not contribute to the values of D'' for *Hefa* and *Hunembe*. Hunn does not deal with problems of this kind in his methodology. In the same way the fact that Tzeltal speakers separate the armadillo from other mammals does not justify its exclusion from the analysis if the question being asked concerns cognitive processes. Like earlier workers, Hunn confounds questions of perception and cognitive status, and in trying to capture answers to both within a single analysis he does not come to terms with either. However, if the question is restricted to that of perception, then a modification of Hunn's method may be suitable for cross-cultural comparisons. By confining the analysis to folk categories whose biological content is equal to or less than the content of scientific species plus categories of greater content, provided that they are terminal within the folk system, a measure of dissimilarity may be made. For *Hefa* and *Hunembe*, values for D'' of 0.13 and 0.19 are obtained. These imply degrees of perceptual correspondence running at 87 percent and 81 percent, respectively (cf. 77 and 39 percent from Table 2). Because they include an objective measure of similarity for categories that are not in one-to-one correspondence in the two systems, they may reflect perceptual correspondence with more rigor than the method I have used.

For *Hefa* five of twenty-two biological species fail to correspond one-for-one with Rofaifo categories. These are three giant rats, *Mallomys rothschildi*, *Anisomys imitator*, and *Macruromys major*, and two macropods, *Thylogale bruijni* and *Dorcopsulus vanheurni*. Rofaifo split *M. rothschildi* into two named categories, *Muluana* and *Duahimi*, on the bases of size and pelage characteristics. These taxa are included with *Nongo* (the giant rat, *Hyomys goliath*) within the secondary taxon *Himi*, without formally acknowledging close affinity between *Muluana* and *Duahimi*. In practice, however, most informants placed specimens that could "properly" be identified as *Duahimi* within the taxon *Muluana* and never associated *Duahimi* with *Nongo*. *A. imitator* and *M. major* differ from other nonaquatic giant rats of the Rofaifo domain in having the terminal portion of the tail white. Both are named as *Lolamba*. *M. major* seems to be rare, and the single specimen I obtained elicited comment from one man that might have implied recognition of two forms within *Lolamba*. The two macropods are named as three terminal taxa by Rofaifo, who separate them on the basis of size and cut across the distinctions drawn by biological scientists.

For *Hunembe*, conservative, six of eighteen biological species fail to correspond one-for-one with Rofaifo categories. These are two marsupial mice, *Antechinus naso* and *Phascolosorex dorsalis*, two murine rodents, *Pogonomys sylvestris* and *Pogonomelomys ruemmleri*, and two microhydromine rodents, *Mayermys ellermani* and *Pseudohydromys* sp. Each of the three pairs is named as a single category by Rofaifo. Marked pelage differences between the marsupial mice are known to Rofaifo but are treated as being of little consequence. Both species are probably seldom encountered. The two murine rodents are remarkably similar in form and markings (I did not learn to separate them confidently without examining molar cusp patterns), with *P. sylvestris* abundant and *P. ruemmleri* apparently rare. The microhydromines are very small (ca. 16 grams), of very similar appearance and habitat preference and, if not rare, are certainly infrequently encountered.

For *Hunembe*, preferred, eleven of eighteen biological species fail to correspond one-for-one with Rofaifo categories. These include the murine and microhydromine rodents noted above, the murines, *Rattus exulans* and *R. ruber*, which Rofaifo name as five terminal taxa, one of which cuts across both species, *R. niobe* and *R. verecundus*, of which Rofaifo alienate a segment of *R. niobe* and include it with *R. verecundus*, and the marsupial mice listed above together with *Antechinus melanurus*, of which Rofaifo recognize and name two categories on the basis of size and irrespective of pelage markings or biological status. For *R. exulans* and *R. ruber* I am uncertain how to regard the crosscutting taxon, *Soka-sogolobawe*, first in that Rofaifo often treat this category as a transitional form between *Sogolobawe* and *Soka* (Dwyer 1976b), second in being unclear whether any *R. ruber* really belong here, and third in that the name is awkward to analyze. For present purposes I have treated it as a monomial at the tertiary level that may be aligned with either of the secondary taxa, *Sogolobawe* and *Soka*. In the case of *R. niobe* and *R. verecundus* it is of note that the latter and larger species characteristically has the terminal section of the tail white, that a small proportion of *R. niobe* may be similarly marked, and that it is the largest specimens of *R. niobe* and those that have acquired faded tails, apparently as a result of age or fighting, that are aligned with *R. verecundus*. In my preferred interpretation this should not be regarded as an error of Rofaifo identification; it is rather that the characteristics ideally attributed to *Hunembetaia* (i.e., most *R. niobe*) by Rofaifo necessarily exclude certain *R. niobe* from that category. The class of individuals concerned caused a similar difficulty for me. For the three marsupial mice there is no ready rationalization of the failure to detect a one-to-one correspondence. Here I consider that classificatory decisions relating to the cognitive status of taxa within *Hefa* and resulting in the frequent splitting of biological species, largely on the basis of size, into several Rofaifo species have, in effect, carried over to *Hunembe* and swamped the capacity for objective perception of the natural world.

Thus the formal analysis of Table 2 suggests *per se* a high or at least moderately high level of one-to-one correspondence between biological species and Rofaifo categories but shows that the level of formal correspondence need not be the same between major categories and that the correspondence may cut across several nomenclatural states. Detailed treatment of those biological species that fail to meet the requirements of Table 2 implies that the level of one-to-one correspondence may be higher still or, for certain species, provides rational reasons (e.g., rarity of one of a pair of similar species) for the failure to detect such correspondences. Rofaifo and scientific perceptions of the natural world are in strong agreement. Where they remain disjunct it seems possible that conceptual biases may be invoked to account for the "apparent" perceptual error.

the folk species as a conceptual unit

In moving to the question of the cognitive status of folk taxa it is necessary to identify a level within the Rofaifo classificatory system that may be treated for Rofaifo as a conceptual unit. The procedure used above stemmed directly from an exercise wherein the biological content of a series of Rofaifo categories was delineated. This amounted to a translation from the language of Rofaifo zoological classification to that of biological science. But this translation does not necessarily expose a unit within the folk classification that will serve as a baseline for analyzing the cognitive status of Rofaifo taxa. That unit must be derived from within Rofaifo classification, and, in the first instance, it must be independent of the precepts of biological science.

The unit for analysis favored by Berlin is the folk "genus." In a partial definition of this concept, Berlin (1973:268) quotes from Bulmer and Tyler's (1968) definition of "specieme," suggesting that "the folk genus . . . is formed . . . 'by multiple distinctions of appearance, habitat and behaviour.' " Berlin comments to the effect that his earlier failure to recognize the folk "genus" as a basic unit in any folk classification led him to underestimate the levels of correspondence between folk and scientific classificatory systems (see Berlin, Breedlove, and Raven 1966, 1968). In his more recent work, Berlin employs the concept of folk "genus" as an analytical tool and aligns himself with Bulmer in accepting a fairly close correspondence between the entities recognized by folk and scientists. There are, however, some difficulties of interpretation here. For Bulmer (1970; see also Bulmer and Tyler 1968), there is a close correspondence between Kalam named terminal taxa, which may or may not be "generics" in the sense of Berlin, and Kalam "speciemes," on the one hand, or biological species, on the other. However, Bulmer and Tyler are careful to emphasize that "speciemes" are "units *as Karam themselves see them*" (1968:350) and that despite the "logical correspondence between the *specieme* and the *species* of scientific zoological taxonomy" there are instances where the two units diverge. Thus when Bulmer argues that the correspondence between folk and scientific categories is of a high order, he does not assert that this implies correspondence between "the fundamental taxa" recognized in the two classificatory systems (cf. Berlin 1973:267). However, because of peculiarities of Kalam zoological classification, this implication might easily be drawn from Bulmer's text, and it appears that Berlin has done so in equating "generics" with "speciemes" and in then seeking a correspondence between folk "generics" and biological species.[3] Thus Berlin confounds the questions of perception and of the cognitive status of folk taxa, and his concept and interpretation of the folk genus is rendered unacceptable as a generalized basic unit in a folk classfication; it is unacceptable because, to follow Berlin, would in effect require that where instances of one-to-one correspondence were detected the relevant folk taxon be classed as "generic."

Bulmer and Tyler's "specieme" concept does not embody the same constraints, and I take it as a base line in attempting to elucidate the cognitive status of Rofaifo zoological taxa. That is, I accept that "speciemes" are units as Rofaifo themselves apply them, that, for Rofaifo, they are logically species and may be fairly labeled as such, and suggest further that for Rofaifo any given specieme (i.e., species) has the same conceptual content as any other. Thus, for Rofaifo, species are not merely individually defined in terms of an infinitely extendable set of percepts but, in my interpretation, share an essence which is abstracted from human social structure and immediately renders the idea, species, intelligible in a natural (i.e., biological) sense. This essence approximates symbolically, though it is not standardly labeled as such, a lineage (or kin descent group).

For Rofaifo, species are objectively "out there," but the concept, species, is an internalized transformation from human social relations. This conceptualization of species is quite appropriately less embarassed by questions of temporal continuity than are those invoked by evolutionary scientists. Given these initial assumptions and a set of *a posteriori* decisions regarding Rofaifo species, it becomes possible to examine categories of higher or of lower order for their cognitive rank. Without comparable assumptions it is not possible to proceed.

Table 3 provides an analysis of Rofaifo species included within *Hefa* and *Hunembe* in terms of their nomenclatural status. The forty biological species concerned are viewed by Rofaifo as fifty-three, or fifty-four, species. Between 31 and 38 percent of these latter correspond one-for-one with the species of biological science, and the level of correspondence is higher for *Hunembe*, where the splitting of biological species is less. Neither the hierarchical level within the taxonomy nor the lexical form may be taken to denote specific status; indeed *Hefa* and *Hunembe* differ considerably in regard to these nomenclatural states. It is perhaps noteworthy that where Rofaifo species are necessarily designated by binomials, correspondence with biological species is exceedingly poor (i.e., 4.8 percent; cf. 42-52 percent correspondence for monomials). This may imply that binomial species are of more recent origin in Rofaifo thought than are species designated by monomials, a view that is reinforced by the fact that the names for only two of the fourteen monomial species of *Hefa* are in any sense etymologically analyzable, while the terminal segment of the name for at least eleven of the twenty binomial species of *Hefa* is either polysemous with a name applied elsewhere in Rofaifo biological nomenclature or may be otherwise etymologically analyzed. The nomenclatural state that best depicts species as Rofaifo see them is that of formally named terminal taxa. Five Rofaifo species for which no formal lexeme is available fail to satisfy this criterion. For these (two in *Hefa*, three in *Hunembe*) there is the suggestion that names borrowed from elsewhere in the taxonomy and applied in an *ad hoc* way are available to mark the species concerned. For example, the two unlabeled species within *Homo* (water rats) were occasionally contrasted by colloquially naming them as *Homo angaia* and *Homo lolamba* to highlight size differences represented elsewhere by *Fuema Angaia* and *Fuema Lolamba* (giant rats of the genera *Uromys*, *Anisomys*, and *Macruromys*).

the status of higher categories

In attempting to assess the cognitive status, for Rofaifo, of higher categories applied to clusters of species within *Hefa* and *Hunembe*, I adopt the conservative procedure of

Table 3. The nomenclatural status of Rofaifo species.*

	Hefa	*Hunembe* conservative	*Hunembe* preferred
Number of Rofaifo species:	36(10)	17(10)	18(7)
at secondary level	3(3)	7(5)	7(3)
at tertiary level	31(7)	10(5)	11(4)
at quarternary level	2(0)	0	0
as formally named terminal taxa	34(8)	14(7)	15(5)
no formal lexeme available	2(2)	3(3)	3(2)
as binomial	20(1)	1(0)	1(0)
as monomial	14(7)	13(7)	14(5)

*Numbers in parentheses show incidence of one-to-one correspondence with biological species.

equating rank for various clusters as I proceed from lower order categories (i.e., species) to higher order categories (i.e., the primary taxa, *Hefa* and *Hunembe*). That is, I assume that the number of cognitive levels interposed between species and primary taxa will be minimal, and I do not accept a category as being ambiguously positioned unless forced to do so. Categories are accepted for consideration whether they are formally named or covert.

The outcome of my analysis for *Hefa* is summarized in Figure 1. Commencing at the left of the figure, I first translate biological species into Rofaifo species; these latter are then taken as the units for the analysis that follows. Collectively, they are Level I. Level II comprises minimal groupings of Rofaifo species. Thus, a Level II category immediately includes two or more species that cannot be members of another category at the same level. Eleven formally named taxa and one unlabeled category comprise Level II. These account for thirty-two of the thirty-six species. Four species are clearly unaffiliated at Level II; these are *Yabo*, *Hula*, *Holiki*, and *Fove*. The five Rofaifo species comprising *Phalanger vestitus* present some ambiguity. All may be formally named as subcategories of the covering term, *Duana* and, hence, at first sight might be linked at Level II. However, the category *Mula* stands apart from other divisions within *Duana*, and some Rofaifo, particularly younger men, are unwilling to name it as *Duana Mula*. In Figure 1, I have linked the four remaining divisions of *Duana* as an unlabeled Level II category and join these to *Mula* at a level between II and III.

Level III comprises either minimal groupings of Level II categories or minimal groupings of Level II categories plus unaffiliated species, provided that for each Level III category the included members cannot be positioned in another category at the same level. Five categories comprise Level III. Only one of these is formally named within the taxonomic hierarchy. This is *Hula* (= dog family) which is polysemous with *Hula* (= dog) at Level I. For three of the remainder the conjoined names *Mi-Holiki*, *Himi-Fuema* (usually *Him-Fuema*), and *Hambu-Homboni* are frequently applied by Rofaifo in the context of hunting. In this context, the binary expression may denote general identification and hence convey valuable expectations concerning behavior (e.g., solely arboreal, arboreal and terrestrial, and solely terrestrial, respectively) of quarry being pursued. *Duana* and *Igana* (i.e., cuscuses) are frequently considered as a linked pair by Rofaifo, though the conjoint expression, *Duana-Igana*, seems to be seldom used. In the present analysis I have preferred to equate this combination with *Mi-Holiki* rather than place *Duana* (*sensu lato*) at Level III and consider cuscuses as a group at a higher level. In fact, as I shall argue below, the ambiguity evident here is more informative than the formal positioning of the categories concerned. Four Level II categories and two species are unaffiliated at Level III. For *Orona* (cassowary), *Yabo* (pig), and *Homo* (water rats), no likely link is apparent that would have the same significance as, for example, *Him-Fuema*. For *Heufa* (i.e., ring tailed possum, *P. cupreus*) a biologist might wonder that it stands apart from *Mi-Holiki*, but given both its notably larger size and its frequent terrestrial behavior, the separation in the context of hunting is sensible. *Fove* (sugar glider) would in fact link at Level III if striped possums (*Harano*, outside Rofaifo domain) were included in the analysis. *Warena* (i.e., grassland bandicoots) is ambiguous in that Rofaifo clearly appreciate the relationship with *Hambu* and readily employ the Pidgin term, *mumut*, to cover both. At no time, however, did I hear the conjoint expression, *Hambu-Warena*, and in Figure 1 I treat the relationship as crosscutting conventional interpretations. The weak relationship between *Homo* and *Fuema* (see above) is also interpreted as crosscutting.

Two expressions, employed in different contexts, merit consideration as Level IV in

the present analysis. These are *Yahefa* and *Enidua. Yahefa* translates literally as "tree *Hefa*" but was always translated as "*Hefa* of the forest" (forest = *yau*) or was said to be equated with the Pidgin term *kapul*. In New Guinea, *kapul* is usually applied to larger arboreal mammals (e.g., giant rats, ring-tailed possums, cuscuses, tree kangaroos) and might be contrasted with *sikau* (macropods) and *mumut* (bandicoots) of terrestrial habit. Rofaifo use *Yahefa* either while hunting to indicate the presence or location of arboreal quarry or in recounting details of specific hunts for game of this kind. In this context *Yahefa* would include the mammals glossed above as *kapul*; in Figure 1 I have linked them accordingly. I am, however, ambivalent concerning the status of *Fove* (sugar glider, smallest species of *Hefa*) within *Yahefa*; it was never included in lists of *Yahefa* or *kapul*, although its Level III partner (*Harano*, striped possum) was sometimes included here. On occasions when *Yahefa* had been translated as '*Hefa* of the forest' I asked specifically whether *Homboni* (terrestrial macropods), *Hambu* (forest bandicoots), and *Warena* (grassland bandicoots) were included. Each time the response was initially "no" and then, upon reconsideration, it was decided that *Homboni* and *Hambu* should be included but that *Warena* was certainly excluded. I suspect that difficulties of translation evoked an irrelevant *sequitur* but must conclude that (for me!) the referents of *Yahefa* remain somewhat ambiguous.

Enidua is a word of quite different order. Contexts described to me were the injunction of an old man to a younger one who was embarking upon a hunt, "Return soon and bring me *Enidua*!," and the disclaimer, "Who stole my arrow to kill *Enidua*?" The word does not denote particular game. "Bring me what you can," "kill what he will," are implicit in the usage; there is an affectation of insult conveyed by the speaker. The intent of *Enidua* seems, therefore, to be more inclusive than *Yahefa*. When I asked concerning the content of *Enidua* it was frequently equated to *Yahefa*, but terrestrial macropods, all bandicoots, and aquatic rats were readily included if I specified them. Cassowary, pig, and dog were certainly excluded from *Enidua*, but, given the abstract context in which the term is used, I consider that *Rano* must be eligible for membership and that in this regard *Enidua* cuts across the taxonomic structure. In Figure 1 I have treated *Yahefa* and *Enidua* as alternative groupings at Level IV.

Level V is represented by a single unlabeled member that includes all mammals listed in Figure 1 and leaves *Orona* (cassowary) unaffiliated. If categories outside the Rofaifo domain were included in the analysis, then *Feni* (eel) would also be unaffiliated within *Hefa. Orona* and *Feni* clearly stand apart from all other *Hefa* to Rofaifo. In fact, some men suggested that their fathers had erred in placing *Feni* within *Hefa* and argued that *Feni* would more appropriately be allied with snakes. More impressive to me, however, was the fact that old men virtually always prefixed *Orona* and *Feni* with *Hefa* and virtually never did this for mammals within *Hefa*. Olubien, in particular, regularly and emphatically responded with "*Hefa Orona*" and "*Hefa Feni*" if I used either of the terminal words in unitary form. In my interpretation I was not being informed that cassowary and eel were necessarily denoted by binary lexemes but, rather, was being instructed: "*Orona* and *Feni* are *Hefa* though they obviously stand apart."

Level VI in Figure 1 comprises the primary taxon, *Hefa*. In this account I have not considered categories of a lower order than the species. For Rofaifo the possibilities here are numerous either by the addition of adjectival endings to the standard binominal or monomial or, more frequently, by conjoining names. Thus captured macropods that did not fall clearly into one of the three categories of *Homboni* might be named as, for example, *Homboni fenda-horofa*, or particularly large specimens of the cuscus *P. gymnotis* might be referred to as *Longani-Mula*, where *Mula* names the highly prized and

largest category of the related *P. vestitus*. In the absence of the specimen in question, all such names were denied as valid types. Nor were they ever spontaneously included in lists of names. I regard them as varietals employed primarily to rationalize awkward specimens or to highlight particular specimens and do not consider them, as a group, to be of equal weight.

Figure 2 summarizes my analysis for *Hunembe*. The biological content of Rofaifo species listed in the figure is my preferred interpretation. The conservative interpretation deletes *Soka-sogolobawe* from the list and avoids the crosscutting of biological species. The analysis is performed as for *Hefa*. Level II comprises five formally named categories (one, *Ia-Songi*, is conjoint) and leaves five of the eighteen species unaffiliated. At this level, however, the taxonomic structure is crosscut by relationships wherein a forest species is directly linked with a grassland species (*Hunahimi* with *Hunembetaia*, *Soka* with *Yauhunembe* 1, *Ia* with *Yauhunembe* 2-3; *Yauhunembe* 1 is sometimes named as *Yausoka*, i.e., '*Soka* of the forest'). Level III comprises three essentially covert categories and leaves one Level II category and two species unaffiliated. The Level III link between *Sogolobawe* and *Soka* is strongly reinforced in the sense that young children are first taught that all forms included here are *Hunembe* (polysemous with the name for the primary taxon), whereas other members of the primary taxon are identified to children by an appropriate Level II (if available) or Level I name.

Level IV comprises a single labeled category, *Yauhunembe* ('*Hunembe* of the forest'), which is polysemous with *Yauhunembe* at Level II. The linkage depicted in Figure 2 is based on names regularly elicited as members of this category with the exception that I have added the poorly known and seldom discussed species, *Hunembe duana*. Rofaifo were ambiguous regarding the status of *Momonofomo* and *Laiahefa* within *Yauhunembe* (*sensu lato*), though occasionally at least *Laiahefa* was spontaneously included. The category seems conceptually equivalent to *Yahefa* within *Hefa* and, when used, is employed in the same denotative sense. It appears, however, to be of far less significance within the taxonomic structure than *Yahefa*, probably because *Hunembe* are themselves of lesser note than *Hefa* but perhaps also because the crosscutting forest-grassland links within *Hunembe* have some conceptual importance. It would be possible to devise a Level IV category (*hianga Hunembe*) to include grassland species, but in my interpretation this would be no more than weakly adjectival for Rofaifo; the contrast between terrestrial and burrowing rats (i.e., *Sogolobawe* and *Soka*) and species building nests off the ground (i.e., *Ia* and *Songi*) is of far greater significance than the common denominator of living in grassland.

For *Hunembe* there is no grouping equivalent to Level V for *Hefa*, and in Figure 2 I assign the primary taxon, *Hunembe*, to Level VI. That is, I assume that *Hefa* and *Hunembe* are of equal weight within the taxonomic structure. This does not imply that all primary taxa are equivalent, nor does it imply equal salience; *Hefa* are undoubtedly more highly regarded than *Hunembe*. The assumption is difficult to justify. The frequent use of conjoint expressions, *Hefa-Hunembe*, *Hefa-Nema* (*Nema* = flying birds and bats) or *Nema-Hunembe*, in a variety of contexts (e.g., men hunt *Hefa-Nema*, youths hunt *Nema-Hunembe*), where *Hefa*, *Hunembe*, and *Nema* are each primary taxa with a large or moderately large membership, implies equivalence of rank. The fact that these three expressions crosscut the taxonomic structure in all possible ways suggests that assigning them to a formalized position above that of major primary taxa is not warranted.

One final expression used by Rofaifo must be considered. This is *Lumbe-Lauwe*, derived by linking the Level II name, *Lumbia* (including and here specifically connoting, the largest bird known to Rofaifo, i.e., New Guinea Eagle, *Harpyopsis novaeguineae*), to

the Level I name, *Lauwe* (the largest nondomestic mammal known to Rofaifo; a tree kangaroo, either *Dendrolagus goodfellowi* or part thereof, not present in Rofaifo domain). Like *Enidua*, *Lumbe-Lauwe* is only used in abstract contexts and never with reference to the particular. It is used by old men and, as described to me, it is "*tok nating*" or 'play talk.' Suggested contexts were, first, in reference to broken arrows or the play arrows of boys, "How many *Lumbe-Lauwe* did you get with that?," or "So you expect to get *Lumbe-Lauwe* with that!" and, second, as an admonition to a hunter returning empty handed, "Well, where is *Lumbe-Lauwe*?" Replies to my questions concerning the content of *Lumbe-Lauwe* always elicited "all *Hefa*, *Nema*, and *Hunembe*" and with prompting from me regularly elicited "*olgeta samting*" with the implication that edible animals were intended. Plants were definitely excluded. When I first heard the expression, *Lumbe-Lauwe*, and attempted to investigate its meaning, men younger than perhaps thirty-five years did not know that *Lumbe* was a contraction of *Lumbia*. I was variously told that *Lumbe* meant nothing or that it must designate *Lumbi* ("breadfruit," *Ficus* sp.) in reference to the fact that old men would have wrapped the nonexistent food item in the large leaves of this plant for cooking. Older men did not hesitate to interpret *Lumbe* as *Lumbia*. *Lumbe-Lauwe* certainly includes all edible animals, but the context in which it is used carries the implication that all animals of Rofaifo experience, with the single exception of humans, may be included (i.e., "You did not even kill something that I would not eat"). *Lumbe-Lauwe* may approximate, therefore, a "unique beginner" in the sense of Berlin (1973).

evolutionary considerations

What is the fate of categories located at certain levels as the folk zoological taxonomy evolves? Before this question can be approached it is necessary to disassemble the preceding analyses (Figures 1 and 2). Those analyses were necessarily constrained; they assumed equivalence of rank for all Rofaifo species and, with the single exception of *Momonofomo* and *Laiahefa* (Figure 2), they linked categories at the lowest level possible within the taxonomic structure. In that exception I interpreted Rofaifo thought as shown; that is, I made a decision that was opposed to my analytical technique. If the striped possum, *Harano*, had been available for analysis within *Hefa* I would similarly have linked it to *Fove* at Level III and not at Level II (see above).

It would, however, be possible to proceed in a quite different manner. While *Yabo* (pig) may be contrasted at Level I with any other Rofaifo species listed in Figure 1, the category, *Yabo*, may equally be contrasted with *Mi* at Level II, with *Mi-Holiki* at Level III, and with *Yahefa* at Level IV. In many contexts contrasts of these kinds are implicit when Rofaifo discuss animals of their domain; for example, *Heufa* was as likely to be contrasted with *Mi* as with the combination *Mi-Holiki*. Thus, for Rofaifo, certain faunal categories might validly be located at several levels, with the operative level determined solely by context.[4] The implication I draw from Figures 1 and 2 is that categories unaffiliated at a particular level are likely candidates for such indeterminant rank. If this is acceptable, then the above analyses may, of themselves, provide insight into both the process of elaborating a taxonomic domain and the fate of the categories themselves. Comparison with Kalam zoological taxonomy is pertinent here. For Kalam the referents of the primary taxon, *kmn*, are, with the exception of eel, cassowary, pig, and dog, essentially identical with the referents of *Hefa* (see Bulmer and Menzies 1972-1973). The nominated categories are distinct primary taxa for Kalam, and Bulmer suggests (1974:23) "that, in at least some contexts, pigs, dogs and cassowaries are taxa of equivalent order to

flying vertebrates or game mammals." For Rofaifo these categories remain unaffiliated within *Hefa* until the cognitive level attained is of a high order; or, alternatively, each category may be viewed as a contrast member of a set of five, *Feni, Orona, Yabo, Hula,* and *Enidua,* where the referents of *Enidua* match those of *kmn*. On the assumption that the higher categories of folk taxonomies evolve toward greater degrees of inclusiveness it may be reasoned from the comparative treatment of Kalam and Rofaifo that *Feni, Orona, Yabo,* and *Hula* are latecomers to the domain of *Hefa.*[5]

Enidua derives from the words, *Eniona* and *Duana,* where *Duana Eniona* labels a single species of *Hefa* that ranks high in Rofaifo thought. The expression, *Fenda-homboni,* corresponds in form to *Enidua* in that it reverses the conventional word order for a particular species. Thus *Homboni* denotes terrestrial macropods, and *Homboni fenda* denotes the largest of three species of *Homboni* recognized by Rofaifo. The expression, *Fenda-homboni,* is used in allusion to the collective of all terrestrial macropods in the Rofaifo domain without prejudicing the specific identity of a given individual. Thus a man may well express an intention to hunt *Fenda-homboni* but would never refer to a particular specimen in this way. It seems probable that the original referents of *Enidua* were comparable to those of *Fenda-homboni* and that the term has been upgraded as the taxonomy was elaborated. That this term once alluded to species of special significance and was unencumbered by concrete referents may have rendered it especially appropriate for repositioning as a new and higher category. The current status of *Lumbe-Lauwe* might be best understood in the same way.

The upgrading of names concomitant with elaborating the referents of primary taxa is implied for the major Rofaifo categories, *Hunembe* and *Hanu*. The referents of *Hunembe* are discussed above. It seems significant that the term, *Hunembe,* is used to mark a cluster of four or five closely linked Rofaifo species when these are identified to young children but is not used, in the same context, to identify other species within the primary taxon. These species might thus be interpreted as "type" representatives of the primary taxon for Rofaifo, for whom this interpretation is reinforced by the fact that their forest inhabiting counterparts may be glossed at different levels of the taxonomic structure and with different degrees of inclusiveness as '*Hunembe* of the forest,' i.e., *Yauhunembe* (Figure 2). Upgrading of the term, *Hunembe,* to embrace all small rodents and marsupials is clearly possible.

The primary taxon, *Hanu,* includes most insects and insect-like arthropods. Lice and fleas are excluded, and adult informants varied in their willingness to include such groups as bedbugs, cockroaches, flies, and ants. Children, however, are taught that grasshoppers and crickets are *Hanu,* and they insisted to me that insect groups, such as cicadas, butterflies, and wasps, which are all unambiguously *Hanu* to adults, were not to be prefixed with *Hanu*. Again, upgrading of the term, *Hanu,* as the taxonomy shifts toward greater inclusiveness is implied. It is of interest here that the Kalam category, *jon,* is used, unambiguously, in the denotative sense for grasshoppers, locusts, and crickets but may, in other contexts, connote "a collectivity including all insects and insect-like arachnids" (Bulmer 1974:15).

The ambiguous position of *Duana* depicted in Figure 1 may also be interpreted in terms of taxonomic change. The fact that some informants were unwilling to include the highly regarded category, *Mula,* within *Duana* may be part of a process of taxonomic simplification caused by culture contact. The short term outcome of this process might be that *Mula* and *Duana* would emerge as contrasted taxa at Level II with the referents of *Duana* reduced in scope (see Figure 1). This could then free the expression, *Duana-Mula,* for repositioning at Level III, where it would prove a logical counterpart to *Mi-Holiki* and

Him-Fuema. These changes may, in fact, have occurred without external influence. The status of *Mula* as the only game mammal able to understand the speech of humans surely placed it in a good position for taxonomic upgrading.

One final example of preculture-contact taxonomic change shows clearly that the paths of change may be both unpatterned and intricate. Rofaifo differ from neighboring Siane in the names they give to a grassland rat, *Melomys rufescens*, and to the marsupial pigmy possum, *Cercartetus caudatus*. Both species are at least moderately abundant in tall cane grass, where they build nests of similar design. The following nomenclature is applied:

	Rofaifo	Neighboring Siane
Melomys rufescens	*Ia rava* (*rava* = red)	*Ia Songi*
Cercartetus caudatus	*anumuna Songi* (*anumuna* = 'sniffing or snuffling')	*Ia Arungeba*

For both species, the affix employed by Rofaifo is optional and directly adjectival, suggesting that Rofaifo, and not their neighbors, have modified the nomenclature. For Rofaifo the species may be collectively denoted as *Ia-Songi* with *Ia* identified as prior; for neighboring clans collective denotation is as *Ia*, with *Songi* identified as prior. In addition to the interesting transfer of referents for the term, *Songi*, it is apparent that *Ia* has shifted from Level II to Level I in the taxonomic structure.

The examples above do not come squarely to terms with the task of interpreting evolutionary change in folk taxonomies. A given folk taxonomy depicts a current end point of a unique evolutionary past. No matter what relation it bears, at any level, to objective reality, it embodies and in part mirrors a multitude of cultural biases. To look within the taxonomy as given in an attempt to expose some primitive, ancestral, or core taxonomy is to beg the question; it is to demand that the course of evolutionary change be of the utmost simplicity. Without denying that etymological, semantic, or lexical analysis may provide valuable historical insights regarding particular categories or names, it seems improbable that the course of evolution will be clearly spelled out in its product.

In the absence of comparative linguistic data, the following may provide one method for approaching questions of evolutionary change. Given that the folk classifier perceives objective discontinuities in the natural world, it may be fair to postulate that the archetype for a given taxonomy comprised that set of categories which best represents objective reality (i.e., biological species). In this postulate I allow for reasonable perceptual error (e.g., failure to recognize a rare biological species as distinct from a closely similar common biological species), I allow that the archetypal taxonomy will have utilitarian relevance (e.g., clusters of similar biological species of little importance may be glossed), but I disallow errors that spring from conceptual biases (e.g., crosscutting of certain biological species as in my preferred interpretation of *Hunembe*, Figure 2). The degree of concordance between an inferred archetype and its current product may provide a quantitative measure of evolutionary change, while the direction of difference between the two taxonomies may reflect the course of evolutionary change. The method may prove suitable for cross-cultural analysis.

For both *Hefa* and *Hunembe*, inferred archetypes would be dominated by categories shown as Level II in Figures 1 and 2 together with species unaffiliated at this level.[6] Within *Hefa* the primary interpretative difficulty would arise for the three species Rofaifo recognize within *Homboni* (terrestrial macropods), where these crosscut two biological

species. The fact that two of these Rofaifo species carry names that are homonyms of categories within *Hiro* (the mythologically significant flying fox, *Dobsonia moluccensis*; cf. Salisbury [1965]), and might thus be understood as recently affixed to *Homboni*, implies upgrading of *Homboni* as the taxonomy changed. It is also possible that in the past a third biological species of macropod (i.e., *Dorcopsis* sp.) was part of Rofaifo experience and that the crosscutting currently evident is an artifact of faunal change (cf., Bulmer and Menzies 1972-1973).

It is clear for *Hefa* that at the level of species, as these are seen by Rofaifo, the inferred archetype and the existent taxonomy are entirely disparate. Within this assemblage of animals, taxonomic change has been marked by substantial resorting and disassociation of the originally marked species with the consequence that those originating entities, and the names applied to them, have generally shifted to higher levels within the taxonomic structure. And perhaps as a corollary to these changes, higher level categories (e.g., *Mi-Holiki, Him-Fuema*) have emerged as virtually incidental aids to communication, valuable in themselves to simplify a world that was becoming particularized and potentially cumbersome. Comparison with Kalam is of interest here. The archetypal taxonomy I infer for *Hefa* is remarkably similar in scope and in the referents of named categories to the taxonomy currently employed for game mammals (*kmn*) by Kalam (Table 4). Kalam have not engaged in the rash of resorting that emerges for Rofaifo, and appropriately they have not formalized higher categories to the degree apparent for Rofaifo. However, the Kalam taxonomy exhibits a property not found for Rofaifo in that many species Kalam recognize may be labeled, not by one name, but by either of a synonymous pair. For Kalam it seems that quantitative change has been minimal but that qualitative change is marked by a high degree of nomenclatural elaboration, while for Rofaifo the magnitude of quantitative change has imposed constraints on the direction of change. But it is pertinent to ask why these differences exist. More comparative data are needed, but it seems likely that both ecological and social considerations would importantly influence the amount and direction of taxonomic change. Here I am attracted to a view that quantitative change is less likely where the folk are more crudely dependent upon the faunal assemblage concerned and where the direction of change is likely to mirror the structure of social relations as these are conceived by the folk. Hence I am impressed by the facts that Kalam live in dispersed homesteads and homestead clusters, while Rofaifo live in nucleated villages, and that the social groupings of Kalam are more fragmented and less complex than those of Rofaifo. Surely here we see a reflection of the respective taxonomies in that Kalam are not disposed toward a multitude of conceptual levels or toward gathering all fauna within the ambit of a few primary taxa, whereas Rofaifo taxonomy is almost passionately concerned with such refinement.

concluding remarks

The methodology of the foregoing analyses differs considerably from that of previous ethnobiological studies. In examining the question of perception I searched within the structure of the folk taxonomy for entities that accorded with biological species as these are defined and identified by Western science. I accepted folk entities irrespective of their nomenclatural or cognitive properties. Other workers have preferred to select a particular nomenclatural or conceptual state from within the folk system as their comparative unit. In examining the question of cognitive status, for folk, of named and unnamed entities I first located a conceptual unit within the taxonomic structure (i.e., the folk species) and

Table 4. Kalam and Rofaifo names applied to game mammals.*

Biological species	Kalam nomenclature	Rofaifo nomenclature
Satanellus albopunctatus	*swatg*	*Rano* (2 t.t.)
Phalanger vestitus	*atwak** + *maygot**	*Duana* (+ *Mula?*) (5 t.t.)
Phalanger gymnotis	*madaw**	*Igana* (2. t.t.)
Pseudocheirus cupreus	*ymdŋ**	*Heufa* (3 t.t.)
Pseudocheirus corinnae	*wcm**	*Holiki*
Pseudocheirus forbesi	*skoyd** *yb*	*Mi* (3 t.t.)
Pseudoche.rus mayeri	*skoyd** *modaybn*	(not locally present)
Dactylonax palpator and/or *Datylopsila trivigata*	*blc* (*D.trivigata* not locally present)	*Harano* (not locally present)
Petaurus breviceps	*aymows**	*Fove*
Mallomys rothschildi	*mosak** (*yb*) + *mosak wlm-ket**	*Muluana* + *Duahimi*
Hyomys goliath	*mwok*	*Nongo*
Uromys anak	*abpen**	*Angaia**
Uromys caudimaculatus	*malek* (tentative identification)	(not locally present)
Anisomys imitator	*gwdy-ws*	*Lolamba*
Macruromys major	*kejŋ* (tentative identification)	
Parahydromys asper	*godmwg*	(not locally present)
Crossomys moncktoni, *Hydromys chrysogaster* or *H. habbema*	*kwypep* (two recognized)	*Homo* (two recognized)
Dorcopsis sp., *Dorcopsulus vanheurni*	(not locally present)	(not locally present)
	sgaw	*Homboni* (3 t.t., one has synonym)
Thylogale bruijni	*klwal*	
Peroryctes raffrayanus	*pakam*	*Hambu Lulaukawe**
Peroryctes longicauda	*wgy**	*Hambu emihiwi*
Echymipera clara and/or *E. kalubu*	*yaked* (not locally present)	*Warena* (3 t.t.)

*The set of names shown for Rofaifo represents an inferred archetypal taxonomy, existence of synonyms (*) and number of named terminal taxa (t.t.) for listed categories are indicated.

worked upward from this through categories of increasing inclusiveness. Berlin's approach is opposite in that he commences his analysis with higher order categories and progressively disassembles these to arrive at lower order categories. The dangers of such an approach are numerous in demanding *a priori* judgments concerning the cognitive rank of higher order categories, in blinkering the confounding effect of crosscutting categories, and perhaps in failing to reveal that particular categories may be positioned at several conceptual levels. In short, Berlin's approach seems to demand that a necessarily fluid taxonomic system be straitjacketed into an excessively rigid frame. An advantage of the method used here lies in the fact that it exposes its own shortcomings by insistently revealing the flexibility that is inherent in the taxonomy.

By disassociating the question of perception from that of cognition, it becomes possible to exploit answers from both in approaching the awkward subject of taxonomic evolution. That is, it becomes possible to argue that taxonomic change is, in a large degree, an outcome of conceptual biases prompting shifts in rank for various perceived entities. Thus a demonstration that the folk perceive objective discontinuities of the natural world allows differences of weight assigned to these entities to be taken as a measure of evolutionary change. Or again, a demonstration of inherent flexibility in the cognitive status of taxonomic categories permits inferences concerning the direction of

evolutionary change. Berlin's approach, wherein "generics" are taken as a powerful conceptual unit for folk and are, at the same time, seen as the best indicator of objective perception has the effect of imprisoning them within the taxonomy. They can, in effect, only be subdivided at lower levels or associated in groups at higher levels as the taxonomy changes; they cannot themselves, in Berlin's model, comfortably shift to either higher or lower conceptual planes.

In the area of perception I conclude that Rofaifo recognize objective discontinuities of the natural world. This is the interpretation drawn from studies of other folk taxonomies (Berlin 1973; Bulmer 1970; Diamond 1966; Hunn 1975b). By contrast, however, I conclude that the cognitive status of categories recognized by Rofaifo may only be understood in a relativistic frame. Here I am in agreement with Bulmer when he stresses that flexibility and elasticity are probably general features of folk taxonomies (1974:24) and must differ from Berlin by asserting that one is not warranted in assigning those categories to fixed positions within a formalized hierarchy of conceptual states. Concerning evolution the preeminent theme I extract from an examination of Rofaifo data is that taxonomic change has been dominated by shifts in the conceptual level for archetypal categories. While acknowledging this process to be fluid, it seems that the upgrading of categories has been more frequent for Rofaifo than the reverse. If it is true that taxonomies evolve toward increasing degrees of inclusiveness, then the upgrading of categories, particularly those whose referents are connotative rather than denotative, would seem an appropriate evolutionary path. Questions concerning the evolution of folk taxonomies are party to a more embracing quest: to grasp and understand the origins of human abstraction. For this it may be necessary, therefore, to attend more closely to the symbolic qualities, rather than the signal functions, of higher order terms within the taxonomy.

A closing apology is in order. For Rofaifo, as for other folk, the categories and category relationships they recognize, and which sometimes they position within a hierarchical taxonomy, are first and finally embedded in the fabric of culture; they are integral to the act of existence. The analyses I have performed on data abstracted from that culture can be of no consequence to Rofaifo. My concern with perception, with cognitive states, and with questions of origin and evolution does not portray classification as an active, ongoing, human process. Elsewhere I shall pursue that portrait.

notes

[1] It is not possible to assign "generic" status to Rofaifo categories unambiguously. Berlin (1973; see also Berlin, Breedlove, and Raven 1973) ascribes the following properties to generic taxa: monomials, usually monotypic, most numerous taxa in any folk system, first taxonomic terms learned by children, often etymologically unanalyzable and "speciemes" in the sense of Bulmer and Tyler (1968). In Rofaifo taxonomy these properties are often contradictory.

[2] This is because *Igana*, used by itself, necessarily includes *Longani* and can never refer to a category of equivalent status to *Longani*.

[3] This confusion springs from the fact that Kalam zoological taxonomy is shallow, with the majority of terminal taxa occurring as monomials at the secondary level within the hierarchy. The result is that terminal taxa both tend to be "speciemes" for Kalam and exhibit close correspondence to biological species. Where a folk taxonomy, or a part thereof, includes a high proportion of lower order taxa (i.e., tertiary, quaternary), there is less chance that terminal taxa, "speciemes," and biological species will neatly coincide. Berlin misses this point and consequently misinterprets Bulmer.

[4] This argument gives emphasis to the fact that the analyses of Figures 1 and 2 do not, and are not intended to, depict relationships between categories as Rofaifo see them. Those analyses are abstracted from Rofaifo conceptions in accordance with the dictates of formal contrast. For Rofaifo the matrix within which categories and category relationships are set will be of an entirely different order.

[5] In this discussion I am concerned primarily with the evolution of formal taxonomy and less with the evolutionary fortunes of particular terms or their archetypes. If I were to translate the complex term, *Hefa*, I would render it, in part, as 'Flesh to be desired as food.' Hence, in antiquity *Hefa*, or its conceptual archetype, may well have connoted "meat foods" without having fixed taxonomic referents. The development of pig husbandry and the deemphasis of hunting to provide meat, coincident with taxonomic elaboration, could have resulted in "*Hefa*" being positioned within an emerging formal hierarchy and acquiring fixed referents. The history of taxonomic change I deduce may have been predicated on such considerations. Indeed it seems probable that terms introduced into an evolving formal taxonomy would often be adapted, or borrowed, from conceptually related language domains.

[6] The archetypes I infer derive from methods that differ from those of Berlin (1972) but, in their form, are in keeping with the substance of his opinion that folk taxonomies originate as sets of "generics."

[7] I am grateful to Professor R. Bulmer, University of Auckland, for commenting upon a draft of this paper and for checking Kalam nomenclature in Table 4, to Mr. J. Menzies, University of Papua New Guinea, for assistance with mammal identifications, and to the Rofaifo who patiently taught me.

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