Ndumba Folk Biology and General Principles of Ethnobotanical Classification and Nomenclature
Author(s): Terence E. Hays
Source: *American Anthropologist*, New Series, Vol. 85, No. 3 (Sep., 1983), pp. 592–611
Published by: Wiley on behalf of the American Anthropological Association
Stable URL: http://www.jstor.org/stable/678661
Accessed: 10/07/2013 15:59

Ndumba Folk Biology and General Principles of Ethnobotanical Classification and Nomenclature

TERENCE E. HAYS
Rhode Island College

Brent Berlin's proposed "general principles of classification and nomenclature" are examined as they apply to folk biology in Ndumba, a Papua New Guinea highlands society. Focusing on Ndumba folk zoology, supplemented with a previous analysis of their folk botany, Berlin's analytical schema for ethnobiological classification is supported, but principles of nomenclature in ethnobiology appear to be in need of reconsideration. [ethnosemantics, folk biology, language universals, Papua New Guinea]

IN THE 1960s, AMERICAN ANTHROPOLOGISTS WERE GALVANIZED by proposals of a "New Ethnography" that would, it was claimed, revolutionize both the conduct of fieldwork and the nature of descriptions of cultures. A major emphasis of "new ethnographers" was on ethnosemantic analyses of terminological systems in the hope that "emic" descriptions of cultures as ideational systems would advance our understanding of human behavior by situating it in the conceptual worlds of the actors rather than in worlds consisting of categories that were real only to anthropologists. In this enterprise, the systematic study of folk classification assumed special importance, and "ethnoscience" became a conspicuous representation of the overall program (see Sturtevant 1964).

Amid the resulting flurry of elegant, fine-grained descriptions of folk botanical and zoological classifications, legitimate concern arose as to whether or not such studies were so particularistic that the goal of understanding Culture was placed further out of reach by the apparent requirements for understanding cultures. In this context, the reported discovery by Brent Berlin et al. of "General Principles of Classification and Nomenclature in Folk Biology" (1973) was a turning point for what some saw as the languishing study of ethnoscience (e.g., Keesing 1972). Working from a regrettably small number of well-described systems of folk biological classification and nomenclature, Berlin et al. (1973) proposed a descriptive and analytical schema that was purportedly universally applicable, thus offering the promise of cross-cultural comparisons that did not violate the integrity of the cultures being compared. Thus the groundwork was laid for ethnoscience itself to become "scientific."

Large-scale comparative analyses (e.g., Brown 1977, 1979) have indeed yielded support for Berlin's schema, but some investigators have reported difficulty in applying the framework to their own specific cases. It may or may not be coincidental that most of

TERENCE E. HAYS is Associate Professor (Anthropology), Department of Anthropology and Geography, Rhode Island College, Providence, RI 02908.

these detractors (especially Bulmer [1974], Healy [1978-79], and Hunn [1976, 1977]) have dealt either primarily or exclusively with the folk classification and naming of animals, in contrast to Berlin's initial emphasis on folk botany of the Tzeltal Maya (Berlin et al. 1974) and Aguaruna Jívaro (Berlin 1976), and the supportive evidence from Ndumba folk botany (Hays 1974, 1979).

As an exploration of the possibility that Berlin's "universals" may in fact be differentially applicable to folk botany and folk zoology, this paper extends the analysis of Ndumba folk biology to the ways in which they conceptualize and label their local fauna. It shows that Berlin's proposals require slight modifications for adequate representation of Ndumba folk biology, but some critics' insistence on the need for a radically different approach in folk biology is unwarranted.

NDUMBA ANIMAL CLASSIFICATION AND NOMENCLATURE

By "Ndumba" I refer to approximately 450 speakers of Tairora, an East New Guinea Highland Stock language, who live in Habi'ina Census Unit, a cluster of hamlets on the northern slopes of Mount Piora in the Eastern Highlands Province of Papua New Guinea. Ndumba subsistence is dependent primarily on cultivation of sweet potatoes and a variety of other crops, as well as numerous wild plant foods obtained from the grassland and extensive forested slopes of Mount Piora (Hays 1980, 1981). Domestic pigs are a valuable source of protein when they are slaughtered on ceremonial occasions, but for dietary purposes the wild fauna is much more important. Wild animals provide fur and plumes for ornamentation and teeth and bones for a few implements, but their main function is as a source of meat. Viewing the population as a whole, all birds (and their eggs), frogs, marsupials, and rodents are eaten, as are eels, some lizards, and some insects. Snakes are avoided by all, and dogs are eaten in neighboring communities but not in Ndumba.

All Ndumba men, except for the very old and infirm, regularly hunt and trap eels, birds, marsupials, and some rodents. Apart from large-scale distributions of smoked marsupials on occasions such as the emergence of mothers and infants from postpartum seclusion and rodents caught in communal hunts following funerals, consumption of game animals is sporadic. The most regular meat additions to the diet are the small animals caught opportunistically by women and children in the course of gardening and other activities. These rodents, frogs, lizards, and edible insects are eaten almost exclusively by women and children; men eat eels, some birds, and some marsupials, but ritual prohibitions effectively limit availability to a relatively few species at any given point in a man's life.

The fauna of the New Guinea Highlands is not nearly as diverse or complex as is the flora, and this contrast is paralleled by a much smaller inventory of Ndumba names and categories for animals than for plants (although there is no simple one-to-one correspondence between Ndumba and scientific categories). Compared with over 1,200 plant names and 800 plant folk taxa (Hays 1979), the animal name lexicon and folk taxonomy are only one-third to one-half as large, as is shown in Table I.[1] Nevertheless, all of the living forms that I would consider "animals" (except people) are encompassed, and none of the terms or categories to be discussed here corresponds to anything a Westerner would not include in the "animal kingdom."

Still, as in Ndumba folk botany and folk systems in general (Berlin 1976), there is no general Ndumba term that could be glossed 'animals'. There are two expressions that designate classes of wider inclusion than those considered here, but they should be regarded as "special purpose" categories (see below) and not included properly in the "general purpose" classification system: *kaapwaa,* or "food animals" (including insects), and *faahi-kuri,* literally 'rodents-birds' but best glossed as "game animals" (see Bulmer

TABLE I. NDUMBA PLANT AND ANIMAL NAME LEXICONS AND FOLK TAXONOMIES.

Informant[a]	Plants		Animals	
	Names	Taxa	Names	Taxa
A	1,040	835	403	340
B	1,145	885	424	350
C	1,162	883	422	347
D	1,146	873	423	348
E	1,141	884	416	340
F	1,071	825	417	350
G	1,111	848	417	359
H	1,112	851	405	340
I	1,129	858	419	344
J	1,180	897	425	364
Mean	1,123.7	863.9	417.1	348.2
"Shared"	970	766	369	323

[a] Informants A-E are males, F-J females, in order of ascending age.

and Menzies 1972-73 and Lancy and Strathern 1981 for similar name-pairing in Kalam and Melpa folk zoology, respectively).

Ndumba, like other people in the world, classify animals (and plants) in a number of ways. For differing purposes, groupings are based on habitat (e.g., forest versus grassland animals), economic significance (e.g., birds with highly prized plumage versus those without it), edibility, or other criteria. These kinds of distinctions should be seen as producing "special purpose taxonomies" in contrast to the "general purpose" classification of animals in terms of their morphological traits (see Hunn 1977). Special purpose folk taxonomies are invariably very shallow, and category membership often overlaps when such systems are combined. This latter fact has misled some critics (e.g., Healey 1978-79) to challenge the validity of such approaches as Berlin's and that adopted here. The existence of a variety of classification systems must be recognized and no analytical clarity is attained when functional and morphological classifications are confounded. No society is known that does not have a general purpose animal (or plant) classification system, *among others,* based primarily on morphological traits of the organisms; it is this system in Ndumba that concerns me here.

For the benefit of comparability with my earlier account of Ndumba folk botany (Hays 1979) and with descriptions of other folk biological systems, I focus my attention in this paper on a "shared" model of Ndumba animal taxonomy and lexicon. That is, the description and analysis are framed in terms of animal categories and names that are agreed on by at least nine of my ten principal informants. The model proposed can, I believe, be imputed reasonably to Ndumba adults in general.[2]

The discussion is also limited to those Ndumba animal categories that are habitually named. Insufficient data currently exist to include "covert categories" (Berlin et al. 1968; Hays 1976), those groupings of animals which are considered related but which receive no label apart from descriptive phrases (e.g., "night birds") or lists of the members (e.g., "frogs and toads" in American folk zoology). One exception to this exclusion is the postulated unnamed category "animals" which incorporates all of the Ndumba folk taxa to be described.

It should be noted that not all named Ndumba categories possess distinctive names. Polysemous usage of names of higher-level taxa is manifested in two ways. In Ndumba

folk zoology as in their folk botany, there are some "residual categories" (see Hunn 1977); that is, groupings of organisms that are members of some more inclusive category but that lack any shared trait warranting giving them a distinctive collective name (compare "It's just a *bird*" as a possible statement from an American). For any given Ndumba person, many birds are "just birds" and many insects are "just insects," and they are labeled only with the name applicable to the appropriate next-higher category, in these instances *kuri* and *tovendi*, respectively.[3] Another form of polysemy occurs with respect to what Berlin (1976:391) has called "type specifics," which typically are the "focal members" of generic categories. For various reasons, a given generic category (e.g., Ndumba *kaapa'raara*, "snakes") may be thought to have a focal member in that one form is considered the "true" or "genuine" type. Thus, *kaapa'raara tuana'nraana* ('snake netbag-thing', but glossed as "genuine *kaapa'raara*") is one Ndumba folk specific category, usually referred to simply by the more inclusive name *kaapa'raara* unless possible ambiguity leads to addition of the "genuine" attributive. The recognition of these two kinds of folk biological categories clarifies what can be a confusing aspect of folk nomenclature when one relies solely on formal eliciting procedures. Without deeper probing, the polysemy employed in both residual categories and type specifics can lead to misunderstanding and misrepresentation of folk classification systems.

A total of 441 lexemes are considered by at least one of my ten principal informants to be labels for distinguishable classes of animals.[4] (This number represents a "conservative" lexicon in that I have excluded an additional one hundred-odd expressions that I judge, based on discussion with informants, to be descriptive phrases or names for particular life-stages of animals.) None of my principal informants is familiar with this entire lexicon; the range of individual variation in individual lexicon sizes is indicated, together with comparable information for plant name lexicons, in Table I. Many of the animal names are synonyms, as is also true for plant names and probably for the same reasons, including knowledge of dialectal variants from neighboring communities and the value of alternative names to accommodate an extensive personal name taboo system in Ndumba.

In structural terms, Ndumba animal names may be characterized as either primary or secondary lexemes. Following Berlin (1976), primary lexemes are "semantically unitary" (compare *deer, wildcat*) and are either simple (linguistically unanalyzable, e.g., *deer*) or analyzable (e.g., *wildcat*). The latter type may be subdivided into those that are productive, with one of the constituents indicating a superordinate category (e.g., *wildcat*, which is a kind of cat, in the sense of "feline") or unproductive, where no constituent marks a superordinate category (compare *sea cow*, which is not a kind of cow). Secondary lexemes are those in which one constituent marks the superordinate category and *all* members of a contrast set are labeled in this way (compare *mule deer, white-tailed deer*, etc.).

Ndumba animal names employ both primary and secondary lexemes in forming monomial, binomial, and (rarely) trinomial expressions, although most binomials and all trinomials are optional in referring to particular animals and would normally be used only for emphasis or clarification. There is generally a close relationship between the linguistic structure of Ndumba animal names and the folk taxonomic ranks of the classes so labeled, but, as in Ndumba folk botany, the correspondence at the subgeneric level is not as perfect as Berlin has suggested (1976; see below).

NDUMBA FOLK ZOOLOGY AND GENERAL ETHNOBIOLOGICAL PRINCIPLES

Table I depicts the range of variation in my principal informants' animal and plant taxonomies as well as their lexicons. In both domains, the "shared" taxonomy (see above)

is somewhat smaller than that of any individual and smaller than that of the mean tax-
onomy (and lexicon). The shared animal taxonomy includes 323 mutually exclusive and
hierarchically ordered named taxa; addition of an unnamed category designating all
animals brings the total to 324 animal taxa. The Ndumba world of animals can be
represented in a model with five heirarchical levels, with the covert taxon "animals" as
the sole occupant of Level 0 (see Figure 1).

It is clear to all investigators in ethnosystematics that folk taxa at a given hierarchical
level do not all have the same "cognitive status." That is, while two or more categories of
animals or plants may contrast formally with each other in terms of their placement in
the taxonomic structure, they are clearly not the same kinds of categories when their con-
tent is taken into account. In the Ndumba animal classification eight taxa occur on Level
1 of the taxonomic structure; that is, they are included in no higher-level category other
than the covert class "animals." Two of these eight are *kuri* ("birds and bats") and *feri*
("dogs and [recently] cats"). In terms of the diversity of biological species included in
these two categories and their relative degrees of internal subdivision (see below), it is dif-
ficult to think of *kuri* and *feri* as the same kinds of categories, despite their formal tax-
onomic equivalence. Indeed, if we are to be faithful to the ways Ndumba think about
them, they should surely not be treated as similar categories.

To facilitate the identification, description, and analysis of different kinds of folk bio-
logical categories, Berlin (1976) has proposed a typology of taxonomic "ranks" (referred
to earlier as "categories" in Berlin et al. 1973). The proposed ranks are: *kingdom, life
form, generic, specific,* and *varietal.*[5] Assignment of a given folk taxon to a rank in
Berlin's schema is far from a "mechanical" or simple procedure; instead, it is based on a
combination of taxonomic (that is, structural), linguistic, psychological, and biological
features of the category (Berlin 1976:387). A crucial point to keep in mind in using
Berlin's typology is that his characterizations of taxa of the different ranks are not
theoretically derived definitions but empirical generalizations from his own extensive
field research in two societies (Tzeltal Mayan and Aguaruna Jívaro) and surveys of
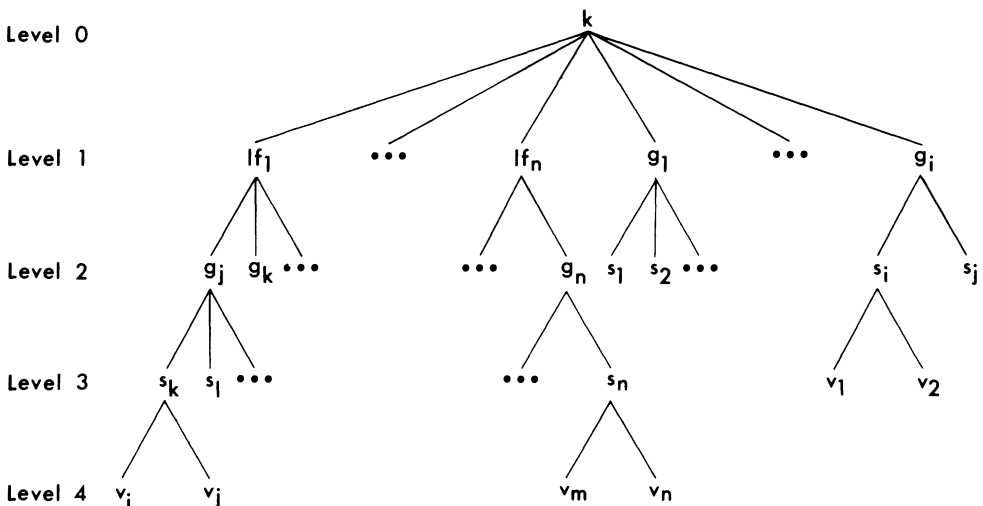published studies. Thus, what one is tempted to regard as diagnostic traits of the various

Figure 1. Schematic relationship of ethnobiological ranks and their relative structural positions
(after Berlin et al. 1973:215).

ranks are better seen as hypotheses of arguable validity. For example, to say that life form taxa are "few in absolute number" (ibid.:384) can only be a conclusion reached after identifying the life form taxa as such; it cannot be used to distinguish initially between taxa of life form and some other rank.

Indeed, all of the "criteria" and traits listed by Berlin are of this character, and it is probably this fact that has led Hunn (1976:510) to describe the identification process as a "methodological puzzle," requiring an "artful weighting" of the "criteria" (see Bulmer 1974:23). Some unnecessary confusion may have been created by considering Berlin's typology as more absolute than he intended, as indicated in his own warnings (1976:387) against viewing his own or any other schema as a "foolproof set of discovery procedures which can be automatically employed"; instead, "matters of judgment are always involved."

There is little argument among ethnobiologists that some kind of typology is needed for descriptive and comparative purposes, but alternatives proposed have not met with total success. Hunn's distinction between "inductive" and "deductive" categories (1977:43–53) is a useful one, but it presents problems of measurement that Hunn himself has not been able to solve with his own rich data on Tzeltal folk zoology. Bulmer's preference for distinctions among "primary," "secondary," and "tertiary" taxa avoids some problems arising from possible ethnocentric biases towards describing non-Western systems in terms familiar to us from Western systematics, but it fails to acknowledge that "primary" or other taxa (identified solely in terms of structural level occupied) are, after all, diverse in kind. In the end, he views Berlin's typology and terminology as useful with certain qualifications (1974:24), to be discussed below.

In this description, I use Berlin's typology but consider his characterizations of the different ranks as "working hypotheses," as they were intended, to be tested against the Ndumba case. I proceed *as if* his descriptions were diagnostic and, through an admittedly "artful weighting" of the criteria, allocate Ndumba animal taxa to the ranks he has proposed. Matters of judgment are, indeed, involved, but I try to make these judgments as faithfully as possible in terms of my understanding of the ways in which Ndumba think and talk about animals.

Ndumba Taxa of Life Form Rank

Following the assignment of the postulated unnamed category "animals" to the rank of *kingdom,* all of the taxa that occupy Level 1 of the taxonomic structure should be assigned to the rank of *life form* or *generic.* Distinguishing between taxa of these two ranks is the most critical step in the allocation of folk taxa to ranks. Once the folk generic taxa have been idenfified, they live up to their characterization as "the basic building blocks" (Berlin et al. 1974:27) or the "fundamental core" (Berlin 1976:396) of folk taxonomies. Their importance derives not only from their salience (see below), but also from the fact that folk-specific taxa are simply those that are immediately included in polytypic generics, and varietals are those categories subsumed by polytypic specific taxa. In the shared Ndumba animal taxonomic model, 8 taxa occur at Level 1 of the taxonomic structure (compared to 33 Level 1 taxa of plants). Identifying which of these should be considered life forms is the key to the remainder of the system; thus it will be useful to the following discussion to describe briefly these 8 "primary taxa."

1. *faahi* ("rodents"): In the shared folk taxonomy, this category includes most, if not all, of the rats and mice of the area. Ndumba appear to distinguish among *faahi* on the basis of tail length, overall size, hair color, and habitat, but not all features are relevant in each particular contrast. The category includes ten different named kinds (none of which is further subdivided), all of which are named with primary lexemes, although

binomialization is allowed (e.g., *tummunra faahi*) but optional. There is no type-specific taxon (i.e., "genuine *faahi* ") and there appears to be no residual *faahi* category.

2. *fai* ("marsupials and monotremes"): This category includes all of the larger (compared to *faahi*) undomesticated land mammals: tree kangaroos, possums, wallabies, cuscuses, bandicoots, and echidnas. Distinctions are made on the basis of overall size, tail length and type, and pelage pattern but, again, not all features are attended to in each case. Ndumba immediately subdivide *fai* into 18 named kinds, all of which are labeled with primary lexemes (with optional binomialization), and 5 of which are polytypic. There is no type-specific taxon and no indication of a residual *fai* category.

3. *fe'ana* ("frogs and toads"): Ndumba distinguish among 12 named kinds of frogs and toads, attending to overall size, color, and behavioral traits. All 12 kinds are labeled with primary lexemes (binomialization optional). There is a type-specific taxon, but probably no residual category. All *fe'ana* classes are monotypic, and 2 kinds (the "toads") represent possible cases of "ambiguous affiliation" (see discussion of *tovendi* below).

4. *feri* ("dogs and [recently] cats"): This taxon includes domestic and feral dogs and domestic cats, the latter of which were absorbed into the category with their introduction to Ndumba experience by Europeans in the 1960s. Incorporation of cats *(pusi)* has complicated the category in that, previously, *feri* was subdivided into two categories, *feri tuana'nraana* ("genuine *feri* ") and *paati feri* ("wild *feri* "); thus the two traditional immediate subdivisions of the category were labeled with secondary lexemes. The recent addition of cats, which may be but are not ordinarily referred to as *pusi feri* (or *feri pusipa*), means that not all members of *feri* are labeled habitually with names one constituent of which marks the superordinate category. I return to this point below, with additional examples.

5. *kaapa'raara* ("reptiles, eels, centipedes, and worms"): This complex category, with a highly polysemous name, includes all snakes and lizards, eels, "fleshy" centipedes, and earthworms, the latter of which are said to 'croak' (see Bulmer 1968 for a similar belief in Kalam). The taxon is immediately subdivided into five named classes, *faanri* ("eels"), *hihi'nraana* ("centipedes"), *kaapa'raara* (in this usage, "snakes"), *ku've'a* ("lizards"), and *taa'heru* ("earthworms"). All of these names are primary lexemes. Four of these taxa are polytypic, and two of these subdivisions are further subdivided; the names of these terminal taxa are optionally binomialized. The immediate subdivisions of *kaapa'raara* are based on gross morphological characteristics, for example, possession of legs, or habitat (as with eels, the only fish traditionally in the region). Within each of these categories, distinctions are made primarily in terms of overall size and color.

6. *kuri* ("bats and birds," including cassowaries): This is the largest named Ndumba animal category, with 113 immediate named subdivisions, and the most complex, including all bats and birds of the region. There is no type-specific taxon, but a residual category exists, as do several covert taxa.

Of the 113 named subdivisions of *kuri*, 9 are polytypic, with 6 of these including type specifics. At higher levels of contrast, groupings are based on overall configurations, yielding many categories that appear to correspond closely to Western bird classes, for example, swifts, kingfishers, and the like. At lower levels, size and color seem to be primary considerations, but some named categories are distinguished in terms of sex, an understandable concern of Ndumba who hunt and trap birds more for their plumage than meat. All of the 113 named subcategories are labeled with primary lexemes, although binomialization of bird and bat names is allowable. With regard to the 9 polytypic classes, the subdivisions of only 3 are labeled with secondary lexemes, although, again, optional binomialization complicates the situation. For example, one could say *saaru saa'uavi* as contrasted with *paati saaru* to differentiate the two kinds of brush turkeys, but simply *saa'uavi* would be more common, and *saaru* for both more common

still. On the other hand, the two kinds of one berrypecker should be called *haa'nra tondo* or *muso'i tondo,* marking habitat ("forest" versus "grassland" *tondo,* respectively); even in this case of secondary lexemes, however, the Ndumba preference would be to call both simply *tondo.* As with *feri* above, the matter of linguistic features raises methodological difficulties, which are addressed in the conclusions to this paper.

7. *tovendi* ("insects and arachnids"): This category, like *kuri* and *kaapa'raara,* is complex and caused considerable confusion in the field, since the expression *tovendi* may in some contexts designate animals (e.g., kinds of *fe'ana* or frogs) considered inedible (thus a particular frog may be a kind of *fe'ana* and also a kind of *tovendi*), or in other contexts it may label any "disgusting" creature (thus, snakes are both *kaapa'raara* and *tovendi*). Such polysemy led to an initial suspicion that some Ndumba taxa were "ambiguously affiliated," — members of more than one superordinate category (Berlin 1976). In this discussion, *tovendi* designates a postulated class of animals that includes all insects and arachnids. It is immediately subdivided into 46 named categories, has no type-specific taxon, but a residual category of "just *tovendi*" exists. Several of the named subdivisions appear to correspond closely with Western categories; thus, 8 of the 46 subdivisions are polytypic and seem to parallel my own classes of "ants," "bees and wasps," "cicadas," "butterflies and moths," "flies," "grasshoppers," "dragonflies," and "spiders." As with *kuri,* distinctions appear to be made on the basis of overall configurations. Within each of the polytypic taxa, contrasts are usually drawn by color or relative size, although all 8 include type-specific taxa.

All of the 46 immediate named subdivisions of *tovendi* are labeled with primary lexemes, although binomialization is allowed. The situation is more complicated within the polytypic taxa; in only 1 of the 8 do all members' names mark the superordinate category, while the other sets include both optional and obligatory binomials.

8. *'uara* ("pigs and [recently] other livestock"): As with *feri* discussed earlier, this category has become more complicated since the late 1960s when Ndumba became aware of the existence of sheep and cattle (and horses, for a very few Ndumba men). Before that time, this was a simple category, immediately subdivided into *suku 'uara* ("domestic pigs") and *paati 'uara* ("wild pigs"). Distinctions among the former were made on the basis of color or color pattern, but informants insisted that names such as *kuraama 'uara* ("white pig") were "not really names"; that is, they should be considered descriptive phrases. The category *suku 'uara* has now become internally subdivided into those domestic pigs left from precontact times, now considered *'uara tuana'nraana* ("genuine pigs"), and introduced breeds, which are simply called *'uara;* all of these are contrasted with *paati 'uara* ("wild pigs"). The three new subdivisions of the higher-level taxon are *hosi* ("horses"), *kausira* ("cattle"), and *sipa'sipa* ("sheep"). All of these three new kinds of *'uara* may be referred to with binomial names, but one never hears this occurring naturally. Only by restricting the set to the traditional two members could one say that *'uara* names are secondary lexemes.

With this background description of the eight Ndumba animal taxa that occur on Level 1 of the taxonomic structure, the task of deciding which are life forms and which are not can be appreciated better. Berlin characterizes life form taxa, the most-inclusive and widest-ranging named folk categories, in terms of four features (1976:384–385). *Taxonomically,* they occur at Level 1, immediately preceded by the "unique beginner" of kingdom rank; they are invariably polytypic; they include the majority of all taxa of lesser rank; and they are few in absolute number (not really a "taxonomic" feature). *Linguistically,* they are labeled with primary lexemes, as are most of the taxa which they immediately include. *Biologically,* they are diverse in extension in terms of the number of distinct biological species they include. *Psychologically,* they are definable in terms of a small number of biological characters, such as morphological traits.

The only other rank to which any of the eight Ndumba Level 1 taxa might be assigned is that of folk generic; more precisely, they would be "unaffiliated generics" (Berlin 1976:387), since they are only "affiliated with" (i.e., included in) the kingdom of "animals." If Berlin's folk generic taxa are to be equated with Bulmer's proposed "speciemes" (Bulmer and Tyler 1968:349) and Conklin's "basic plant categories" (1954:163), then Berlin is correct (1976:387) that "there may be general agreement among folk biologists as to the significance of generic taxa," but "there is little agreement concerning the criteria to be utilized in assigning some class of plants or animals to generic rank." This is especially true with regard to distinguishing between taxa of generic and life form rank (Bulmer 1974:23).

In a paper intended to clarify and resolve the controversy, Berlin (1976:387) first concedes that "there is no definitive set of criteria which will be unanimously accepted at this time," but "a balanced consideration" of taxonomic, linguistic, psychological, and biological features "will make possible the determination of the greater majority of all generic plant and animal taxa in any folk taxonomy." Combining Berlin's latest explication of these features (ibid.:385–389), in which he places most emphasis on linguistic criteria, with his somewhat broader earlier descriptions (Berlin et al. 1973:216, 1974:26–27), and including Bulmer's description of "speciemes" (Bulmer and Tyler 1968:349), since Berlin has likened folk generics to them, one arrives at the following characterization of folk generic taxa.

Taxonomically, "unaffiliated generics" occur at Level 1 of the taxonomic structure, and those included in life form taxa occupy Level 2; most are monotypic; and they are more numeorus than life forms, usually numbering about 500 (again, this is not a strictly "taxonomic" feature). *Linguistically,* they are usually labeled with primary lexemes; exceptions typically reflect ongoing changes in the system. Berlin (1976:387) considers that these "nomenclatural properties . . . constitute one of the first and most important features for their recognition" as generic names. *Biologically,* they are the smallest classes of organisms that "do not require much close study to recognize" (ibid.:389) or, as Bulmer says of speciemes (Bulmer and Tyler 1968:349), they are "groups of creatures marked off from all other animals . . . by multiple distinctions of appearance, habitat and behaviour and not including recognised sub-groupings marked off from each other in a similar way." *Psychologically,* generic taxa are "the most salient," representing the groupings most commonly referred to and likely to be among the first categories learned by children.

If we now try to use these descriptions of life form and generic taxa to assign properly the eight Ndumba animal categories in question, it is readily apparent that some kinds of features are of no help at all. Taxonomically, all eight of the Ndumba taxa occur at Level 1 and all are polytypic; thus, on these grounds, all eight could be either life forms or generics. Also, despite Berlin's emphasis on nomenclatural properties in the identification of folk generics, they are not useful in this situation, since life forms are always labeled with primary lexemes and generics usually are. Since all eight Ndumba taxa are labeled with primary lexemes, again they could be assigned to either rank.

One "linguistic" (taxonomic?) point of difference between the two, however, is that life form taxa are said to include immediately taxa that are for the most part labeled with primary lexemes; the subdivisions of polytypic generics, on the other hand, are labeled with secondary lexemes. There may be grounds here for separating two of the Ndumba animal categories from the other six candidates for life form rank. As earlier described, until recently the categories *feri* and *'uara* were simple and corresponded to "dogs" and "pigs," respectively. With the introduction of new forms of domesticated animals in the 1960s, the categories were expanded to include cats in *feri* and livestock in *'uara.* The important point here is that previously these two taxa were subdivided into classes labeled

with secondary lexemes; the new subdivisions are labeled with primary lexemes (although binomialization is allowed). This is exactly the kind of circumstance in which Berlin would expect exceptions to his general principles and, on these linguistic grounds at least, it would seem warranted to consider *feri* and *'uara* as unaffiliated generics, rather than life form taxa.

Biologically, life form taxa are characterized as diverse in their inclusion of numerous biological species, while there is at least the implication in Berlin's work that generic taxa are more restricted, as when he refers to them as the "smallest classes" requiring no close study to identify. While I do not have full information on the content of Ndumba animal categories, there are some clear impressionistic contrasts among the eight Level 1 taxa in terms of their apparent inclusion. Certainly *fai* ("marsupials and monotremes"), *kaapa'raara* ("reptiles, eels, centipedes, and worms"), *kuri* ("bats and birds"), and *tovendi* ("insects and arachnids") include many biological genera as well as species. This is less true of *faahi* ("rodents") and *fe'ana* ("frogs and toads"), although both of these categories include a number of species and genera, whereas *feri* and *'uara* traditionally included only one biological species each. On biological grounds, then, I consider *feri* and *'uara* to be different kinds of categories from the other six and have no hesitation in assigning them to generic status. The categories of *faahi* and *fe'ana* are more problematic, however, since each contains more species than *feri* or *'uara* but fewer than the other four taxa. The other four, however, are so much more internally diverse than are *faahi* and *fe'ana* that my inclination is to consider these latter, on these grounds, as folk generics.

Finally, the psychological criteria are of two sorts. The "salience" of categories is, at best, difficult to measure, and I have no clear impression as to which taxa are first learned by children. More potentially useful is the claimed contrast in terms of the number of distinguishing characteristics of the categories. In Berlin's view, life forms are distinguished from each other on the basis of a small number of biological characters, while generic distinctions are based on multiple traits. My impression regarding the eight Level 1 taxa is that it would not be easy to identify morphological (or behavioral) traits that "add up to" a *faahi* or *fai,* etc. These two taxa share many characteristics and contrast clearly with each other only on the dimension of relative size. All *kuri* fly, but some have feathers (birds) and others do not (bats); many insects fly, but are not *kuri.* All *kaapa'raara* have distinctive kinds of skin, but there are many points of difference among snakes, lizards, centipedes, and earthworms. Rather than attempt to enumerate and compare the number of traits attended to, I am inclined to see more utility in Brown's proposal (1979:793) that life forms are distinguished on the basis of a "gestalt" or *"the form of the whole animal"* (emphasis in original). However, while this is a clear point of contrast between higher- and lower-level taxa (especially folk species), which are often distinguished from each other in terms of a single feature, I am convinced that when Ndumba contrast the eight highest-level taxa in question, they are responding to "the form of the whole animal" in all cases, so this does not aid us in differentiating among them.

To summarize the deliberations regarding the eight level 1 Ndumba animal taxa: rank assignments are difficult in all but a few cases, and neither taxonomic nor psychological features provide clear guidance. On both linguistic and biological grounds, *feri* ("dogs and cats") and *'uara* ("pigs and other livestock") can be assigned to the rank of folk generic taxa. They would be "unaffiliated generics" and accord with the claim that such taxa are usually either morphologically conspicuous or conceptualized as "special" because of economic importance (Berlin et al. 1974:26). The latter is more to the point here in that dogs are highly valued for their assistance in hunting and pigs are the most important animal in the Ndumba world, not only for their meat but as indispensable items in prestations and other ceremonial contexts.

On the basis of biological diversity, *faahi* ("rodents") and *fe'ana* ("frogs and toads") stand out as being far less inclusive than the four remaining categories. They are no more conspicuous morphologically than are the other taxa, however, and neither is of great economic importance, although all frogs (but not toads) and rodents are eaten by women and children. As Berlin warned earlier, "matters of judgment" are clearly involved in the case of these two categories. In my best judgment, these two taxa are so different from the other four that I would assign them to the rank of folk generic.

The shared Ndumba animal taxonomy, then, includes 4 life form taxa: *fai* ("marsupials and monotremes"), *kaapa'raara* ("reptiles, eels, centipedes, and worms"), *kuri* ("bats and birds"), and *tovendi* ("insects and arachnids"). Ndumba thus fit Brown's (1979) proposed sequence of "universal" life forms with the 4 taxa just listed corresponding to his "MAMMAL," "SNAKE," "BIRD," and "WUG" categories. (The absence of any fish other than eels in the Ndumba environment would account for the lack of his "FISH" category.) Also supported is Berlin's claim (1976:384) that life form taxa "include among themselves the majority of all taxa of lesser rank." The 4 taxa I have assigned to the rank of life form include 283 (88.7%) of the 319 named taxa of lesser rank: *fai,* with 31; *kaapa'raara,* 29; *kuri,* 143; and *tovendi,* 80. The numerical distribution of named taxa across all ranks is shown in Table II, and comparable information regarding plants is provided in Table III (see Hays 1979).

Ndumba Taxa of Generic Rank

Once the life form taxa have been identified as such, assignment of the remaining categories to appropriate ranks is fairly straightforward. In the shared Ndumba animal taxonomy, the four "unaffiliated generics" may be combined with the 182 immediate named subdivisions of the life forms, yielding a total of 186 folk generic taxa. The fact that 98.4% of these generics are included in the 4 life form taxa is consistent with Berlin's expectation that "most" generics would be so affiliated. The life form *fai* immediately includes 18 generics; *kaapa'raara,* 5; *kuri,* 113; and *tovendi,* 46.

Berlin (see earlier discussion) expects the following to be true of folk generic taxa: they occur at Levels 1 or 2 in the taxonomic structure; "most" are monotypic and, when

TABLE II. DISTRIBUTION OF NAMED ANIMAL TAXA BY TAXONOMIC RANK.

Informant[a]	Life form	Generic	Specific	Varietal	Total
A	4	200	129	7	340
B	4	205	134	7	350
C	4	203	135	5	347
D	4	199	138	7	348
E	4	197	132	7	340
F	4	200	138	8	350
G	4	207	140	8	359
H	4	189	139	8	340
I	4	194	138	8	344
J	4	207	146	7	364
Mean	4.0	200.1	136.9	7.2	348.2
"Shared"	4	186	127	6	323

[a] Informants A–E are males, F–J females, in order of ascending age.

TABLE III. DISTRIBUTION OF NAMED PLANT TAXA BY TAXONOMIC RANK.

Informant[a]	Life form	Generic	Specific	Varietal[b]	Total
A	5	430	372	28	835
B	5	454	398	28	885
C	5	445	401	32	883
D	5	434	404	30	873
E	5	448	400	31	884
F	5	405	389	26	825
G	5	418	397	28	848
H	5	422	395	29	851
I	5	428	397	28	858
J	5	445	412	35	897
Mean	5.0	432.9	396.5	29.5	863.9
"Shared"	5	385	350	26	766

[a] Informants A–E are males, F–J females, in order of ascending age.

[b] In Hays (1979), two taxa were listed as "sub-varietals." Field research in 1981 has indicated that revision is necessary. For present purposes, I have incorporated these two taxa into the "varietals" category, but a proper full reconsideration is forthcoming.

polytypic, "most" are bitypic; they are more numerous than life forms; they are "usually" labeled with primary lexemes; they are distinguished in terms of multiple traits; and they are the most "salient" taxa, being the most commonly referred to groupings, and learned early by children. I have already shown that these attributes are difficult to use for diagnostic purposes, but if treated as hypotheses, almost all are confirmed by examination of the Ndumba folk generic taxa.

Of the 186, 4 occur at Level 1 and 182 at Level 2 of the taxonomic structure. Only 30 of the 186 taxa are further subdivided; thus 83.8% are monotypic. Of these 30, only 11 (36.7%) are bitypic, contrary to Berlin's expectation that "most" would be, as is also true for polytypic Ndumba plant folk generics, only 19.2% of which are bitypic (Hays 1979). Folk generics are far more numerous than are life forms in both Ndumba folk zoology and folk botany.

All 186 folk generics are labeled with primary lexemes, almost all of which are unanalyzable as normally used, but (optional) binomialization would convert them to productive primary lexemes. Unlike the situation with Ndumba plant names (Hays 1979:264), I know of no instances in which such binomialization is not allowed. A few generic names are unproductive primary lexemes, which can be misleading, as in *horavaira feri*, which is not a kind of *feri* ("dog") but a *tovendi* ("insect") found on the leaves and flowers of *horavaira* (a generic category of Compositae).

It is my impression that Ndumba distinguish among folk generic taxa in terms of multiple traits; but, as with life forms, I believe that Brown's suggestion of a gestalt (1979:793) is a more accurate characterization of how Ndumba conceptualize contrasts among folk generic taxa. As for the "salience" of generic taxa, I must repeat that I lack information on children's knowledge of animal taxonomy, but my guess is that, excepting *kuri* ("birds"), life form names are employed as frequently as are those of generic taxa. In any event, generic names appear to be used much more commonly than specific names.

One final point should be made here: if we attend to the "cognitive status" of folk categories and not simply to their formal status in the taxonomic hierarchy (Bulmer

1974; Berlin et al. 1981), it must be said that not all of the taxa I call generic are seman-
tically equivalent. This has been suggested already by difficulties faced in determining
whether unaffiliated generics are better viewed as life forms. Certainly in terms of their
inclusion of biological diversity, unaffiliated generics and indeed all polytypic generic
taxa are very different kinds of categories from monotypic generics. In the former,
numerous biological species (and genera) are included, whereas monotypic generics
typically correspond to only one or a very few biological species. It is potentially
misleading, then, to assign all of these categories to the same rank, a point to which I will
return in the conclusions to this paper.

Ndumba Taxa of Specific Rank

As with Ndumba folk botany (Hays 1979), at the subgeneric ranks, Ndumba animal
classification and nomenclature manifest a number of departures from Berlin's proposed
universal principles. The 30 polytypic generic animal taxa are further subdivided into
127 categories, which would be assigned to the rank of folk specific taxa. Berlin (1976:
390) attributes the following characteristics to folk specifics: they occupy Levels 2
or 3 of the taxonomic structure; "most" specific taxa occur in contrast sets of two or three
members, and sets of six or more members are "invariably organisms of major cultural
importance"; and they are less numerous than folk generic taxa. Folk specifics are said to
be differentiated on the basis of a single or very few morphological features, and they are
labeled with secondary lexemes, except for "type specifics," residual categories, and some
true exceptions, which are always taxa of "major cultural importance" (Berlin 1976:392).

Since 4 of the generic taxa occupy Level 1 of the taxonomic structure, their 30 subdivi-
sions occur at Level 2; the remaining 97 specific taxa are found on Level 3. As indicated
in the discussion of polytypic generics above, Berlin's expectation that most specific taxa
would occur in contrast sets of 2 or 3 members is true for Ndumba only by including the
3-membered sets; in all, 17 of the 30 sets of specific taxa (56.7%) have 2 or 3 members.
Of the 13 remaining sets, 2 have 4 members, 3 have 5, 1 has 6, 4 have 7, 1 has 8, 1 has 10,
and 1 has 12. If we examine the 7 sets with more than 6 members, we find that all but
1 *(kaapa'raara,* "snakes") include animals that are eaten, and 2 of these sets include birds
that are highly valued for their plumage. However, given the large number of fewer-
membered sets of animals that are also eaten or hunted for fur or feathers, it is difficult to
say that this degree of polytypy is related simply to "major cultural importance." The
other set with more than 6 members is *kaapa'raara* (in the sense of "snakes" proper),
which includes 7 named folk specifics. All snakes are feared in Ndumba and killed on
sight; if this be regarded as salience, and I believe it should be, then such polytypy would
be understandable in this broader glossing of "major cultural importance."

As expected, Ndumba folk specific taxa are less numerous than are folk generics, with
127 (39.3% of the total number of named taxa) compared to 186 (57.6%), respectively.
Also, Berlin is correct in saying that folk specifics are distinguished on the basis of only a
very few traits. While I do not have complete referential data, my impression is that
overall size or color are typical criteria, as is sex in the case of some bird categories.

The most serious challenge to Berlin's proposals comes from nomenclatural principles.
Ndumba animal folk specifics (as well as plants) can be considered as labeled with secon-
dary lexemes only if optional binomialization is taken into account, thus adding the
name of the superordinate generic category to all folk specific names that are not already
so marked. If this optional feature of nomenclature, which is rarely employed by Ndum-
ba, is excluded from consideration, only 4 (13.3%) of the 30 sets of folk specifics contain
members *all* of which are labeled with names that include the generic name as a consti-
tuent. Even this low number includes some sets that are questionable for Ndumba, in

that some expressions counted as proper names in this paper may, on further investigation, be regarded better as descriptive phrases (e.g., the kinds of *pimbo'ura* ["dragonflies"] that are distinguished mainly on the basis of color). It seems clear, and will be argued in more detail below, that Berlin's claim of a close correspondence between taxonomic structure and nomenclature needs serious reconsideration.

Ndumba Taxa of Varietal Rank

Only 3 (2.3%) of the 127 folk specific taxa are polytypic, with a total of 6 subdivisions that would be assigned to folk varietal rank. Berlin has found varietal taxa to be rare in the folk systems so far described, and this is certainly the case in Ndumba folk zoology. When they do occur, they are said to have the same characteristics as do folk specific taxa, namely, they occur in few-membered sets, they are distinguished on the basis of one or a very few traits, and they are labeled with secondary lexemes. Depending on the folk specific taxon of which they are subdivisions, they occupy either Level 3 or 4 of the taxonomic structure.

Ndumba folk varietal animal taxa present only one deviation from this characterization, and that is, again, in nomenclature. As predicted, all folk varietals occur on Levels 3 and 4 of the taxonomic structure, and all three sets have only two members each. In general, it apepars that a single feature is used in drawing distinctions between varietals of a given specific taxon. The two varietal taxa within *faake,* a specific taxon within the generic taxon *ku've'a* ("lizards"; itself included in *kaapa'raara* in the widest sense) are distinguished on the basis of overall length, and the two varietals of *waisa,* a specific taxon within the generic *kaapa'raara* (in the narrower sense of "snakes") are contrasted in terms of behavior, namely, a tendency to strike rapidly or more reluctantly, the outcome in either event said to be fatal. Finally, the two varietals of *suku 'uara,* "domestic pigs," are distinguished mainly on the basis of overall size.

This latter set presents a serious problem with respect to Berlin's expectations regarding nomenclature. If optional binomialization is taken into account, the members of both *faake* and *waisa* could be said to be labeled with secondary lexemes; otherwise they are not. The category *suku 'uara* is more complicated. As earlier mentioned, the category of "domestic pigs" has become subdivided recently due to introduction of new breeds by Europeans. These new breeds are clearly distinguished in Ndumba minds from the few remaining pigs from traditional stocks. The latter are now considered *'uara tuana'nraana,* or "genuine *'uara,"* that is, the "real" domesticated pig. The new introductions are referred to simply as *'uara,* with no binomialization. If greater specificity is required, descriptive phrases are used, such as "new pigs" or "White men's pigs." Thus, only one of the *suku 'uara* varietals is referred to with a binomialized name, and the set as a whole cannot be considered to employ secondary lexemes. This situation is a result of recent change in the fauna, which has been accompanied by taxonomic and nomenclatural responses that may alter, just as in 1981 field research, some informants' indicated discomfort with including sheep and cattle in the *'uara* ("livestock") category, which had been their automatic response in 1971–72. If difficulties with Berlin's nomenclatural proposals were limited to this example of ongoing change in the system, it would not present a problem, but other nomenclatural irregularities have been noted in this paper and are addressed more fully below.

CONCLUSIONS

In the discussion of Ndumba folk zoology above, considerable attention was devoted to the problem of determining whether certain folk taxa should be assigned to the rank of "life form" or "unaffiliated generic." This was necessary for two reasons: (1) the resolu-

tion of that question determined the modeling of the remainder of the system, and, (2) the problems encountered exemplify nearly all of the major points of debate and controversy within the ethnosystematics aspect of contemporary ethnobiology. I close my account by focusing on several points critics have raised with regard to Berlin's proposed typology of taxonomic ranks and on my own conclusions after having tried to apply it to two domains of Ndumba folk biology.

It is useful to begin by acknowledging, with Bulmer, that there are "three related levels of analysis" in ethnobiology: (1) determining the "formal status" of taxa in a hierarchical structure; (2) discerning the variable "cognitive status of different categories, whatever their formal status might be"; and (3) establishing the "morpho-syntactic status of nomenclatural terms" (Bulmer and Tyler 1968:351). I would agree with Bulmer in stressing the point that these represent three separate (albeit interrelated) tasks, since their results are not mutually predictive, that is, "the morpho-syntactical status of category names is not a fully adequate guide to the formal relationships of named categories, [and] formal equivalence of named categories does not necessarily indicate equivalence in terms of perceived content" (ibid.:334).

In Ndumba, I accomplished the first task primarily through systematic interviews, eliciting statements regarding relationships of inclusion and contrast among named plant and animal categories. The third task involves a simple linguistic analysis of the structure of animal and plant names, although several alternative typologies might be employed in the final analysis (see below). It is the second "level of analysis"—differentiating folk taxa in terms of their "cognitive status" or, in Berlin's schema, assigning folk taxa to their appropriate ranks—that has proven the most difficult and controversial among ethnobiologists, and Berlin's "general principles" are concerned principally with this aspect of investigation.

In the debate concerning Berlin's proposed typology of ranks (others' alternatives will not be examined in depth here), two main issues may be identified. The first concerns the degree to which "discovery procedures" in the assignment of folk taxa to different ranks can, or should, be "formalized." The second involves the distinction between diagnostic traits (or distinguishing features) of the different ranks and empirical generalizations from the taxa once their ranks have been determined.

Some critics appear to object to what they see as excessive formalism inherent in typological approaches. Healey (1978–79) refers to, and derogates, the "taxonomic rigidity" incorporated in Berlin's schema, and Bulmer (1974:24) is concerned that data might be distorted by commitment to a particular set of typological categories and that one would thereby fail to appreciate "the degree of flexibility and elasticity which is probably a very general feature of folk-taxonomies." On the other side, Hunn (1976:510) appears to demand *more* rigor than Berlin displays, and seeks more formal and precise ways of distinguishing among different kinds of taxa as alternatives to the "artful weighting" of criteria demanded in Berlin's approach.

Berlin himself has perhaps confused the issue by apparent ambivalence in methodological procedures. In the same paper where he denies (1976:387) that there is a "foolproof set of discovery procedures which can be automatically employed," and asserts, instead, that "matters of judgment are always involved," he also claims that plant classes in Aguaruna Jívaro (as well as in Tzeltal Mayan) "are *easily accommodated* into one of the proposed ranks in a *natural and straightforward fashion*" (ibid.:397; emphasis added). This last phrasing could easily convey the mistaken impression that Berlin advocates a more "automatic" or "mechanical" decision process than he himself actually employs or than has proven possible in analyzing the Ndumba material.

We have seen, in the deliberations over Ndumba "primary taxa," just how "natural and straightforward" the assignment of folk taxa to ranks is *not*. While Berlin claims that

"a balanced consideration" of taxonomic, linguistic, biological, and psychological features "will make possible the determination of the greater majority of all generic plant and animal taxa in any folk taxonomy" (1976:387), it developed that neither taxonomic nor linguistic features were useful in distinguishing between life form and generic taxa — a minority of the folk classes, but critical ones. It was only through an awareness of the differential biological inclusivity of the different taxa, and the number of morphological (and/or behavioral) traits that were being attended to — both of which involved considered judgment rather than a "natural and straightforward" checklist approach — that the sensed difference in "cognitive status" of the taxa could be translated into the language required for comparative studies and theory, which is to say, into typologies such as that proposed by Berlin.

Indeed, if there is one point on which his critics would be likely to agree with Berlin (however he may try to include other considerations), it is that at the crucial higher levels of folk taxonomy, distinctions among taxonomic ranks are most reliably and straightforwardly made on the basis of the "biological" and "psychological" features of the taxa in question. The strictly "taxonomic" features (i.e., position in the taxonomic structure) are important in displaying the model formally, and it is this aspect of folk biology that is illuminated by employing controlled, systematic eliciting procedures in field research. However, such techniques, and the responses they yield, do not in themselves allow differentiation among categories of varying cognitive status that occupy the same structural level; for this, observations and inquiries of diverse kinds are required. Finally, given the fact that both life forms and generic taxa are labeled in structurally similar ways (i.e., with primary lexemes), it is not useful to place as much emphasis on the linguistic structure of the names of folk taxa as Berlin has done, except when one is speaking to empirical generalizations rather than definitional matters.

The confounding of diagnostic characteristics of folk taxa of different ranks and empirical generalizations regarding resulting taxonomies and nomenclature is evident in Berlin's inclusion of both kinds of propositions in his proffered "universal principles" of ethnobiology. In this paper I have tried to demonstrate that assertions regarding the relative frequencies of taxa of different ranks and the linguistic structure of their customary labels are of a fundamentally different nature from proposals concerning the ways in which taxa are cognitively differentiated and their ranges of biological inclusion. The Ndumba evidence poses no serious challenges to Berlin's views on the latter, while his suggestions regarding relative frequencies of taxa of different ranks and relationships between folk classification and nomenclature appear to be in need of revision.

Significantly, in the light of his view that generic taxa are the "core" of folk taxonomic systems, the problems arise at the subgeneric ranks in both Ndumba folk botany and folk zoology, as can be seen in Table IV. It appears that subgeneric polytypy can be both more elaborate and less obviously "utilitarian" than Berlin has supposed, and the relative frequencies of taxa of different ranks deviate somewhat from expectations. This is especially true of "varietal" taxa, which Berlin considers "rare." In Ndumba folk botany, 26 varietal taxa exist, and in their folk zoology, 6. While these numbers may not be large, in both instances they exceed the number of life forms (with plants, by a ratio of 5 to 1), yet Berlin (1976:384) characterizes life forms simply as "few in absolute number."

One of the main criticisms lodged by Bulmer (1974) has arisen from Berlin's continued incorporation of nomenclatural characteristics in his hypothetical distinguishing features of taxonomic ranks. While his position on this matter is phrased less strongly in recent publications, his earlier view that "nomenclature is often a near perfect guide to folk taxonomic structure" (Berlin et al. 1973:216) seems still to be influential in his "definitions" of ranks. Not only are nomenclatural features not useful in distinguishing taxa of different ranks at higher levels, as I have already demonstrated, but at lower levels this ap-

TABLE IV. COMPARISON OF NDUMBA ETHNOBIOLOGY WITH PROPOSED GENERAL PRINCIPLES.

Taxonomic rank	Expectations[a]	Ndumba folk botany	Ndumba folk zoology
Kingdom	1 (covert)	Yes	Yes
Life form	Few (5–10)	Yes (5)	Yes (4)
	Level 1	Yes	Yes
	Polytypic	Yes	Yes
	Few distinguishing characters	Yes	Yes
	Primary lexemes	Yes	Yes
Generic	Many (500–600)	Yes (385)	Yes (186)
	Levels 1 and 2	Yes	Yes
	Most monotypic	Yes (86.5%)	Yes (83.8%)
	Many distinguishing characters	Yes	Yes
	Primary lexemes	Yes	Yes
Specific	Fewer than generics	Yes (350)	Yes (127)
	Levels 2 and 3	Yes	Yes
	Usually 2- or 3- membered sets	No (32.7%)	Yes (56.7%)
	Few distinguishing characters	Yes	Yes
	Secondary lexemes	No (?)	No (?)
Varietal	Rare	No (26)[b]	No? (6)
	Levels 3 and 4	Yes	Yes
	Few-membered sets	Yes (75%)	Yes (100%)
	Few distinguishing characters	Yes	Yes
	Secondary lexemes	Yes	No

[a] After Berlin et al. 1973; Berlin 1976.
[b] "Sub-varietals" in Hays (1979) are included in varietal taxa.

pears to be invalid as an empirical generalization, as judged by Bulmer's reports of Kalam folk zoology as well as Ndumba naming patterns.

The problems center on Berlin's claim that subgeneric taxa are labeled with secondary lexemes. For this to be true, it is necessary that *all* members of given sets of specific and varietal taxa be labeled with names one constituent of which is the name of the superordinate category (Berlin 1976:397, n. 5). In Ndumba folk botany this is invalidated by the existence of obligatory monomials in some specific taxa (Hays 1979:264), and in their folk zoology, the (admittedly new) category of *suku 'uara* contains two varietal taxa, only one of which may be labeled with a binomial expression. More importantly, the vast majority of Ndumba specific and varietal taxa could be considered labeled with secondary lexemes only if one chooses the option of binomializing all of the names. This would be legitimate culturally (although odd), but such optional binomialization also exists for folk generic taxa, which may be binomialized with the names of their respective life forms. If one did this, all but four of the Ndumba animal folk generics (those that are "unaffiliated") and most of the plant folk generics as well would be labeled with secondary lexemes, contradicting Berlin's claims that they are labeled with primary lexemes.

It is clear that Berlin's position regarding the relationship between folk classification and nomenclature is in need of reconsideration. One alternative would be to return to Conklin's (1962:122) contrast among "simple unitary" (the equivalent of Berlin's

"unanalyzable primary"), "complex unitary" (Berlin's "primary unproductive") and "composite" (Berlin's "primary productive" and "secondary") lexemes. This seems preferable to Bulmer's typology (1974:13) of "uninomials," "binomials," and "trinomials," if only because of the additional information conveyed by Conklin's phrases.

However the matter of nomenclatural typology may be resolved, it is important to reiterate that *it is a separate issue* from that of regularities in folk biological classification. Berlin's proposed typology of folk taxonomic ranks is a so-far unequalled contribution to the discovery of general principles that *do* appear to exist in folk classification systems. This examination of Ndumba folk zoology suggests that there is nothing peculiar about the study of animals per se that has given rise to criticisms of his approach. His typology is as applicable to folk zoology in Ndumba as it is to their folk botany. The same problems are found in both domains, and they are problems that critics have rightly pointed out from their own material.

What is crucial for the future is that we distinguish between problems that arise from inadequately formulated theoretical and methodological schemas and those that arise from our own confounding of separate issues. If we can bring as much elegance and precision to our own models as our informants demonstrate in their profoundly intimate knowledge of their physical environment, we will have learned more from them than we suspected we have.

NOTES

[1] My understanding of Ndumba conceptualizations of animals and plants is based on formal eliciting and interview procedures, opportunistic naming requests, field observations, and some use of stimulus materials from reference works. When probable referents of Ndumba animal names are indicated, these represent my inferences from informants' identifications from photographs or drawings or from my own field identifications.

[2] The size of the "shared" lexicon and taxonomy depends, of course, on how many informants must agree with a statement to consider it "shared." The animal lexicon shared by eight of my ten principal informants includes 397 names, and their shared taxonomy, 339 named taxa; seven informants agree on 406 names and 342 taxa, etc. The numbers vary, but generalizations offered about the classification and nomenclatural systems are not materially affected. I leave it to others to decide where "culture" is located amid this variation (Hays 1974).

[3] Eugene Hunn, working in Tzeltal Mayan folk zoology, and I independently discovered and formulated in 1971–72 the notion of "residual categories" in the two societies we were investigating. While these categories must be included in our understanding of folk systems, it is not now clear to me whether it is legitimate in all cases to postulate residual categories for the system when "the system" is considered as existing apart from individual versions of "it." It is my impression that every individual would have residual categories in his or her own view of the plant or animal world; what varies across individuals is the relative inclusivity of such categories. How we would decide that the "omniscient informant" also has residual categories remains, to me, a serious methodological problem. Until it is resolved, I will continue to include such groupings, conservatively, in my descriptions of Ndumba folk biology.

⁴ My principal informants in Ndumba were ten adults (five men and five women) roughly matched for age (ranging from early 20s to late 70s) and marital status.

⁵ An additional rank proposed by Berlin, that of intermediate taxa, is excluded from this discussion, since, except for the postulated category "animals," I am dealing here only with named taxa, and such categories are generally, but not always, "covert."

REFERENCES CITED

Berlin, Brent
   1976   The Concept of Rank in Ethnobiological Classification: Some Evidence from Aguaruna Folk Botany. American Ethnologist 3:381–399.
Berlin, Brent, James Shilts Boster, and John P. O'Neill
   1981   The Perceptual Bases of Ethnobiological Classification: Evidence from Aguaruna Jívaro Ornithology. Journal of Ethnobiology 1:95–108.
Berlin, Brent, Dennis Breedlove, and Peter Raven
   1968   Covert Categories and Folk Taxonomies. American Anthropologist 70:290–299.
   1973   General Principles of Classification and Nomenclature in Folk Biology. American Anthropologist 75:214–242.
   1974   Principles of Tzeltal Plant Classification: An Introduction to the Botanical Ethnography of a Mayan-Speaking People of Highland Chiapas. New York: Academic Press.
Brown, Cecil H.
   1977   Folk Botanical Life-Forms: Their Universality and Growth. American Anthropologist 79:317–342.
   1979   Folk Zoological Life-Forms: Their Universality and Growth. American Anthropologist 81:791–817.
Bulmer, Ralph N. H.
   1968   Worms That Croak and Other Mysteries of Karam National History. Mankind 6:621–639.
   1974   Folk Biology in the New Guinea Highlands. Social Science Information 13:9–28.
Bulmer, Ralph N. H., and J. I. Menzies
   1972–73   Karam Classification of Marsupials and Rodents. Journal of the Polynesian Society 81:472–499; 82:86–107.
Bulmer, Ralph N. H., and M. J. Tyler
   1968   Karam Classification of Frogs. Journal of the Polynesian Society 77:333–385.
Conklin, Harold C.
   1954   The Relation of Hanunóo Culture to the Plant World. Ph.D. dissertation, Anthropology Department, Yale University.
   1962   Lexicographical Treatment of Folk Taxonomies. International Journal of American Linguistics 28(2):119–141.
Hays, Terence E.
   1974   Mauna: Explorations in Ndumba Ethnobotany. Ph.D. dissertation, Anthropology Department, University of Washington.
   1976   An Empirical Method for the Identification of Covert Categories in Ethnobiology. American Ethnologist 3:489–507.
   1979   Plant Classification and Nomenclature in Ndumba, Papua New Guinea Highlands. Ethnology 18:253–270.
   1980   Uses of Wild Plants in Ndumba, Eastern Highlands Province. Science in New Guinea 7:118–131.
   1981   Some Cultivated Plants in Ndumba, Eastern Highlands Province. Science in New Guinea 8:122–131.
Healey, Christopher
   1978–79   Taxonomic Rigidity in Folk Biological Classification: Some Examples from the Maring of New Guinea. Ethnomedizin 5:361–384.
Hunn, Eugene S.
   1976   Toward a Perceptual Model of Folk Biological Classification. American Ethnologist 3:508–524.

1977   Tzeltal Folk Zoology: The Classification of Discontinuities in Nature. New York: Academic Press.
Keesing, Roger M.
    1972   Paradigms Lost: The New Ethnography and the New Linguistics. Southwestern Journal of Anthropology 28:299-332.
Lancy, David J., and Andrew J. Strathern
    1981   "Making Twos": Pairing as an Alternative to the Taxonomic Mode of Representation. American Anthropologist 83:773-795.
Sturtevant, William C.
    1964   Studies in Ethnoscience. American Anthropologist 66(3):99-131.