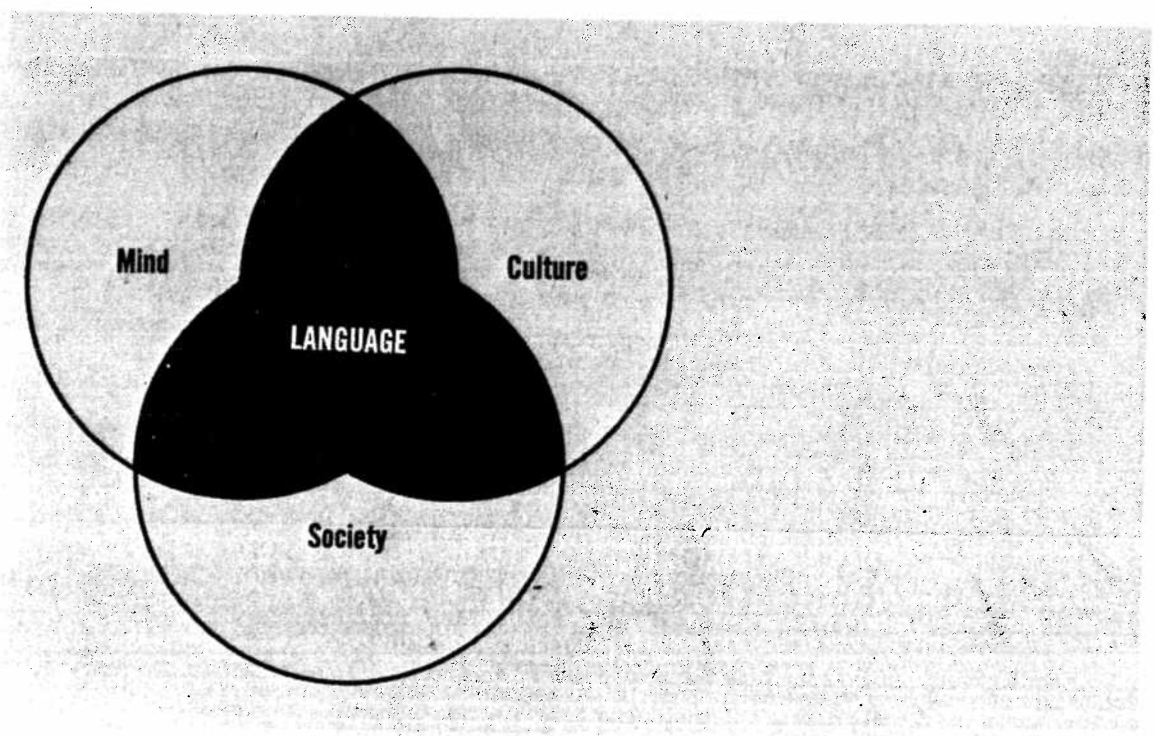
Working Papers of the
Language Behavior Research Laboratory
University of California, Berkeley



COGNITIVE PROCESSES IN FOLK ORNITHOLOGY: THE IDENTIFICATION OF GULLS

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Working Paper No. 42
Language Behavior Research Laboratory
1975

Cognitive processes in folk ornithology: the identification of gulls.

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Related areas of study: cognitive anthropology, folk classification, ethnographic semantics, ethnoscience.

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ABSTRACT

Recent studies of folk biology clearly reveal the detailed empirical knowledge of living things which is an important and characteristic element of pre-scientific cultures. This paper attempts a contribution to the study of such systems of knowledge by analyzing the comparable skills of a few American birdwatchers, the author among them. Since the author's personal experience was accessible, the analysis proceeded to questions rarely raised by folk biological studies in foreign contexts.

The process of identification of individual organisms is stressed as distinct from classification and nomenclature. An information processing model rather than a taxonomic model is suggested as a more meaningful framework for the description of identification processes. The identification routine of a beginner is contrasted with that of experts in terms of efficiency and organizational complexity. The contrast between "features" and "gestalts" is discussed and a typology of features outlined. The features used by birdwatchers for the identification and classification of gulls (Larinae) are described in detail.

INTRODUCTION

Folk biologists seek to describe primitive[2] man's knowledge of natural history. This task is important not only because much of primitive natural history accurately reflects the nature of biological reality, but also because natural history is such an important part of primitive man's total store of knowledge. This concern for "primitives" stems from a growing realization that as civilization progresses the average person's understanding of and respect for nature decreases. We are now beginning to suffer acutely from the consequences of this trend. Our scientific accomplishments cannot compensate for our general ignorance. Thus folk biology may provide a useful service in describing the "natural" science of primitive man.

I am both an anthropologist and a folk ornithologist, that is, a birdwatcher. In this paper I analyze an aspect of my knowledge and abilities as a birdwatcher. Linguists profitably analyze their own linguistic competence. Goodenough's (1965) analysis of his own kinship system has contributed to our knowledge of kinship systems in general. Similarly, I hope to add to our knowledge of folk biological systems by closely observing my own behavior.

It may not be immediately apparent what relationship exists between birdwatchers and the "primitive" natural historians that folk biologists usually study. The birdwatchers I know were born and raised in urban America and are not ignorant of the data and methods of scientific biology. The common stereotype of the birdwatcher--an eccentric, tweedy Englishman, able to love only his feathered friends--presents an image of hyper-civilized man. He is a man whose natural humanity has been perverted to the point that only birds can stir his sympathies. What can anthropologists concerned with the natural reality of primitive man learn from such a person?

I believe this stereotype misses the mark. The birdwatchers I know are in many ways akin to people such as the Fore of New Guinea (Diamond 1966). Both are on a first-name basis with every species of bird whose habitat they share. Like the primitive, the birdwatcher experiences birds in their natural state. As one of my informants put it, "Ornithologists study dead birds; birdwatchers study live birds," a hyperbolic statement with an important grain of truth. The birdwatcher's concern is not primarily scientific; birds are not experienced as data. Unlike the primitive, however, the birdwatcher's survival does not depend on his knowledge of nature; though it may provide a basis for his sanity.

Birdwatchers combine the concrete familiarity with nature which we attribute to primitive man with a degree of scientific knowledge and training and a civilized way of life. Thus a close look at them should tell us something about the contrast between scientist and primitive, a duality implicit in much of anthropological thought.

A basic assertion of this paper is that the processes involved in identifying species of organisms are basically equivalent for birdwatchers and primitives, indeed that they are universal mental processes. Given this I hope to contribute to our knowledge of cognitive processes. In particular I hope to clarify the relationship between semantic features and the identification process. I will argue that an ideal ethnography, i.e., a description of what one must know to act appropriately in a given culture (Goodenough 1957), must include not only the information encoded in the classification and naming of cultural objects, but also the information employed in identifying those objects. Finally I will present some tentative evidence in support of the hypothesis that the difference between generic and specific names and the taxa to which these refer, a critical distinction for folk biological theory (Berlin 1972), is partially replicated by contrasting cognitive processes involved in the identification of each kind of category.

METHODS

I interviewed five birdwatchers in addition to myself, all from the San Francisco Bay area. One interview was conducted in the field, the others at home without reference to books. These interviews averaged two hours each. The basic questions treated were the following: (_X_'s and _Y_'s are categories of birds. Conditions _A_, _B_, etc., are defined by the specification or implication that certain features can or cannot be seen under those conditions.)

How do you know an X when you see one?

Can you tell that a bird is an X under conditions A, B, etc.?

What Y's are most likely to be confused with X? Why?

Under what conditions?

What Y's are most closely related to X?

In the field interview I attempted to answer these questions by direct observation. My own original responses to these questions were corroborated during many subsequent field trips as well.

The informants were chosen to represent a range of familiarity with the identification of gulls. In all cases they knew the names of the species of gulls regularly occuring in the area and in most cases knew at least one feature which could be used to distinguish the adult birds under optimum conditions. They varied somewhat as to the number and kinds of features which they were capable of utilizing in field identification and a great deal in the degree to which their knowledge of features was "organized" and thus in their ability to identify gulls in the field.

Though the most detailed descriptions of gull identification are based on self-analysis, data from the other informants gives added weight to some conclusions and forms the basis for conclusions concerning the changes which take place as birdwatchers gain experience.

Gulls were chosen as the sub-domain for this analysis because they form a relatively clearly bounded higher-order grouping isolated as the sub-family Larinae by ornithologist and as "seagulls" by the man-in-the-street. The number of gull species (12) which regularly occur in the San Francisco Bay Area during the course of a year is large enough to be interesting and small enough to be manageable (see Appendix).

These local species of gulls also exhibit a range of difficulty of identification. Some identification problems challenge even the most expert observers. The classification of Thayer's Gull is still a bone of contention among ornithologists. Those who argued that this gull is a full species have now won their case (Eisenmann et al., 1973:415), though other taxonomists have considered Thayer's either a sub-species of the Herring Gull or of the Iceland Gull (McPherson 1961; Smith 1967). I have been able to compare scientific and folk methods of dealing with this current controversy.

Further complications derive from the fact that gulls undergo striking plumage changes during the developmental cycle which lasts from two to four years. Seasonal dimorphism also occurs in several species. I was curious to see how these problems could be dealt with within a taxonomic framework.

DEFINITIONS

Kay (1971) and others have stressed the importance of keeping the naming process distinct from the process of classification.

Thus a taxon is an entity different from the name which is applied to it. Berlin, Breedlove and Raven (1968) have demonstrated the existence of taxa which are not named. They call these "covert categories". Thus not only are naming and classifying analytically distinct processes, but the mapping of the set of names onto the set of categories within a domain need not be isomorphic (Kay 1971:879-881).

I believe it is necessary for folk biologists to distinguish a third process, that of identification (cf. Bruner, Goodnow and Austin 1956:8-10; Simpson 1961:18-19). Identification for my present purposes may be roughly defined as the process of associating a category--in the present instance, a taxonomic category--with a token, or example, of that category, i.e., naming an individual bird seen or heard. This mental activity is clearly distinct from classification. The difference is roughly analogous to the difference between the data stored in a computer (classification) and the process whereby the computer provides a specific answer to a specific question (identification). A classification of birds, for example, involves all that one has learned about birds in the past as well as the organization which one's mind has imposed upon that information. The identification of an individual bird involves only a portion of the total knowledge embodied in the classification. In addition it involves a process of translation whereby the sensory input is reduced to a form compatible with the classification, just as a problem presented to a computer must be translated into an appropriate computer language. The appropriately coded information abstracted from the sensory impression must then be compared with certain items of information selected from the total store of knowledge in the classification. The end result is an output which, when translated back into a human language format, takes the form of a declarative sentence, e.g., "That bird is a Yellow-bellied Sapsucker," or perhaps, "I have never seen a bird like that before."

This computer analogy is, of course, a radically simplified model of the activity in the human brain which must be associated with what we call identification and classification. Yet it provokes us to attempt the construction of more complex models and to search for more observable clues of the brain's operation. Attempting to explain the mental processes involved in perception has long been a major concern of psychologists; Dodwell (1970) presents a useful summary of this work. This paper is not intended as a contribution to the psychology of perception. I hope only to draw the attention of folk biologists to this process as it is involved in the identification of biological organisms and to illustrate some ways in which identification is related to the processes of naming and classifying to which folk biologists have devoted their primary attention.

Taxonomic models appear to be universally appropriate for describing certain significant aspects of folk biological systems, in particular the relationships among the categories of a folk biological classification. However, since the identification process is distinct from that of classification, a taxonomic description cannot as a rule accurately model the identification process. I believe an information processing model (Geoghegan 1973) is appropriate for describing some aspects of the process of identification and will use such a model in this paper.

Taxonomic rank. Berlin (1972) suggests that no more than six folk biological "categories" or ranks are required to describe any given folk biological system, i.e., that these ranks are structural universals. He suggests further that the nomenclatural recognition of taxa by rank exhibits an evolutionary sequence in folk systems. These ranks, in order of the nomenclatural recognition of taxa of each rank, are as follows: first generic, then specific and life-form, followed by varietal and intermediate, and finally the unique beginner. Taxa of each rank are related by inclusion as follows: varietal $\subset$ specific $\subset$ generic $\subset$ intermediate $\subset$ life-form $\subset$ unique beginner. Baby lima bean, for example, is a varietal included in the specific category, lima bean, which in turn is included in the generic category bean. Beans are vines (life-form) and, finally, vines are plants, the unique beginner.

It is clear from this example that there is no one-to-one correspondence between morphologically distinguishable name-types and the ranks. Berlin describes the relationship between types of names and ranks as follows: Two distinct name-types, primary and secondary lexemes, are distributed among the five major ranks. Primary lexemes, whether morphologically simple or complex and if complex, whether productive or unproductive, are employed to name generic taxa or taxa of higher rank. Secondary lexemes (multi-nomials) name taxa of subgeneric rank. The morphological distinction between simple primary lexemes and secondary lexemes is unambiguous, e.g., "oak" versus "white oak" or "goose" versus "Canada goose". Likewise, there is no difficulty distinguishing unproductive (complex) primary lexemes from secondary lexemes, e.g., "poison oak" (which is not a kind of oak) versus "white oak", though at this point it is necessary to consider semantic as well as morphological criteria. To distinguish productive (complex) primary lexemes from secondary lexemes requires yet more involved semantic considerations (cf. Berlin, Breedlove, and Raven 1973:217).

In short, the relationship between the process of classification and that of naming is complex. No strictly morphological classification of name types will exhibit a neat correlation with taxonomic rank. The distinction between primary and secondary lexemes, though at times difficult to draw, does appear to be the linguistic hallmark of a conceptual watershed between generic concepts on the one hand and specific concepts on the other. This distinction has a long and interesting history in the development of the scientific taxonomic classification from European folk biology (Bartlett 1940).

In this paper I hope to offer some corroborative evidence for the existence of this "conceptual watershed" by approaching the problem from a different perspective. I hope to demonstrate that two distinct processes are employed in the identification of gull species by the expert birdwatcher. I will argue that these two processes correspond approximately to the classificatory distinction between Berlin's generic and specific taxa. Thus I will refer to them as generic and specific identification processes.

Features. The term feature refers to the units of a birdwatcher's knowledge relevant to his classification and identification of organisms. These features are units only at one level of analysis. There is no claim that these units are ultimately unanalyzable into sub-units, only that they function as units for the informants. For example, there is a feature which might be glossed "typical-gullness". It involves a complex coordination of judgments about the size, shape and mode of flight of a bird, but it acts as a "welded unit". In other words, the processing of the sub-units does not involve conscious mediation. Again a computer analogy is of heuristic value. Most computer programming involves both a machine language, in which each "word" corresponds to one and only one electrical signal, and a programming language, in which a single word may correspond to one or to many machine language "words". In the programming language the instruction "cube root" is a single unit and is, at that level, no more complex than the instruction "add", which is also a single unit of the programming language. In the machine language, however, "cube root" involves many more individual steps than does the "add" instruction and is thus more complex at the machine language level. It is significant that once either the "add" instruction or the "cube root" instruction has been given, the sequence of steps, or sub-units, involved in each is fully determined. The programmer cannot interrupt or alter either process once it has been initiated. The units of a birdwatcher's knowledge to which I refer are units comparable to the units of the programming language. Each may involve thousands of units of neural activity, yet the units of neural activity which correspond to a single unit at the level of conscious awareness are "welded together" so that the sequence of their activation is fully determined by the specification of the higher-level unit. These higher-level units are the emic units of a cultural inventory. They are also the units of meaning relevant to a semantic analysis. Furthermore, at this level of analysis it can be argued that what we recognize as "red" and what we recognize as "my mother" may be equivalent in complexity, both may be identified by a single "feature". The time required to identify both phenomena, for all practical purposes, is the same, that is, our recognition is instantaneous.

I have found it useful to differentiate the features along four dimensions.

First of all, features may be more or less <u>verbalizable</u>. By way of introduction, it may be argued that folk categories of organisms are not necessarily defined in terms of features, i.e., in terms of relatively analyzable perceptual units which are parts abstracted from the "whole" sensory impression presented by tokens of the category. Instead organisms may be defined, or at least recognized, by an image of the whole, to which the term "gestalt" is loosely applied to contrast with the term "feature". Thus cows and horses are simply cows and horses, not two sets of criterial features. What, for example, is it about dogs, whether Great Dane or Toy Pekinese, that makes them unique? We experience no difficulty recognizing a dog as such. Yet it is practically impossible to abstract and verbalize the essential features of "dogness". Thus one might argue that features play no part in our understanding of categories such as "dog". This implies a strict limitation on the range of applicability of componential analyses.

This argument makes some intuitive sense, but I believe it is misleading. The definition of "gestalt" paraphrased here implies two things: that the observer has an image in his head of the whole organism with which to compare the token observed, and that what is in his head is an image, i.e., that his mental representation of the taxon is not selective; it is like a photograph which results from a random record of the impinging light (cf. Brown 1957, for a detailed critique of the "imagist" position in perceptual psychology).

The present data indicate that birdwatchers never see the whole bird. They indicate that even the best birdwatcher, who is able to make identifications instantaneously from the corner of his eye, is often unaware of aspects of the bird which are readily noted.

For example, informant one[3] can identify the Mew Gull in any life stage by the "gentle look in its eye". This feature apparently is a complex of proportions: head shape, bill shape and size relative to the head, and the prominence of the dark eye and its position in the head. Yet he incorrectly assessed the relative color of the Mew Gull's mantle (the back and upper-surface of the wings). Informant three stated that he must force himself to look at familiar birds because his reliance on an obvious feature tends to prevent him from noting other, perhaps relevant, aspects of these birds. In short, identification requires selective attention to a part or parts of the token observed. Learning to identify is essentially learning what to look for and what to ignore.

Thus "gestalts", in the loose sense discussed here, are simply features which are difficult to verbalize. If we describe a bird as "fat" this will be accepted as a relevant feature. If we describe the Mew Gull as having a "gentle look in its eye", we may feel that our analysis is incomplete. Yet both features involve complex relational judgments. In other words, both are "gestalts" in the original meaning of the term (cf. Kohler 1947). Thus the dichotomy which may be implied between features and gestalts as involving distinct perceptual processes does not exist. What does exist is a contrast between features which can be readily described or named and features which are ineffable.

A second distinction is useful when comparing the processes of identification and classification. Our knowledge of the organisms included in a taxon consists of features of three sorts.

Intrinsic features are part of the perceptual token. They are "attached" to the bird. Such features include the bird's size, shape and plumage pattern as well as postural and flight characteristics and vocalizations. Such features are essential to the identification process.

Contextual features tend to be less criterial (cf. Brown 1958). They include information about the habitat, season and geographical locale in which a particular bird is found. Western Gulls, for instance, are very rarely found more than a few miles from the sea coast. If we identify a bird as a Western Gull on the basis of intrinsic features and the bird happens to be on a mountain top in the Sierra Nevada, our suspicions are aroused. A special identification routine is then enacted; for the bird may be a Slaty-backed Gull or some other species not normally considered.

Extrinsic features are aspects of our knowledge of organisms or populations which are not available for purposes of identification. For example we know that tadpoles and frogs are but life-stages of a single category of organism "frog". This information is inferred from a long sequence of observations and is not "visible" at any given moment. Yet it is essential to the process of classification and thus an aspect of folk biological competence.

A further distinction is necessary to understand how assessments within an identification process are ordered. This distinction refers only to intrinsic features. Some are (for want of a better term) more visible than others. Size and shape are highly visible features. They may be noted on a high proportion of the tokens which the birdwatcher would like to identify. The color of a gull's feet, though highly criterial in some cases, is rarely visible. The bird must be adult, standing, and close to the observer before this information is available. In general more highly visible features make for more efficient identification of a greater proportion of tokens. Hence, though they may be less criterial, e.g., they may involve relative judgments for which errors are more likely, or they may not be unique, their importance in an identification routine increases as a birdwatcher gains proficiency.

Finally features vary in saliency. Birdwatchers and biologists both realize that certain kinds of features are more important to a classification than others (cf. Mayr 1966:142-143). For example, if we knew only that two birds differ in mode of flight, we would assume that they were probably only distantly related organisms. However, if we knew only that two birds differ in foot color, we would be far more hesitant to make such an assumption. Mode of flight is felt to be more salient than foot color. I believe this ill-defined distinction may be based on inferences as to the information content of a particular kind of difference between organisms. In short, if we know that two birds differ in mode of flight, we can predict with a high degree of certainty that they will also differ in plumage pattern, shape and, quite likely, foot color. If, on the other hand, we know only that two birds differ in foot color, predictions about other dimensions of difference between these birds are far less certain. This is true in general with reference to the gulls in my sample.

We will find that the types of features which are used to distinguish higher-order taxa, such as gulls from terns, are both highly salient and highly visible, such as mode of flight. Lower-order taxa are characteristically distinguished on the basis of less salient and less easily visible features. Though a single feature may suffice for the identification of both broadly inclusive taxa and specific taxa, the single feature in the first instance is highly salient, that is, it implies the existence of many other contrasting features less readily visible. When a single feature is used to distinguish a specific taxon, it may be the _only_ feature known which distinguishes the taxon.

Principles of category formation. One major finding of folk biology to date is the apparently universal utility of formal definitions of taxonomic structure (cf. Gregg 1954, 1967; Kay 1971) as a model for the structure of folk systems of biological classification. In fact, our present biological taxonomy, in its earliest form, was simply the folk system current in medieval Europe stretched to accomodate organisms brought back from all parts of the world.

However, Bright and Bright (1965) describe aspects of a folk taxonomic system which do not appear to be so neatly taxonomic. I also find it necessary to define a type of category which differs significantly from what is usually understood to be a taxonomic category. This type of category is referred to here as a chain. The same term has been applied to a similar process of categorization by students of concept formation (Vygotsky in Brown 1965:322-328).

Chains occur within taxonomies and may be either "open" or "closed". Chains are constructed around a typical member or members which I will call the "head" or heads of the chain. The chain A (see Figure 1) contains by definition the category a, which is the head. It also contains categories b and c if and only if these are "sufficiently similar" to a. It may also contain d and e if d is sufficiently similar to b and e to c. It contains all the categories which are sufficiently similar to any single member of A. A is a closed chain (see Figure 2) since it contains only one head. A' is an open chain since it has more than one head (a_1' and a_2'). The head of a chain is not necessarily an "average" member of the category but rather may epitomize the category, much as the "type species" was thought to epitomize the genus in early scientific biology.

Example of chains from everyday English are those categories of machines referred to as "cars" and "trucks". The typical car is perhaps a Ford sedan; the typical truck a huge semi-rig. However Jaguar XK-Es and station wagons are also cars while panel trucks and pickups fall in the latter category. The variation within each category is such that it is difficult to precisely

FIGURE 1. *A closed chain, A.*

$$\overbrace{d \leftrightarrow b \leftrightarrow a \leftrightarrow c \leftrightarrow e}^{A}$$

$$d \not\leftrightarrow e$$

$\leftrightarrow$ means "sufficiently similar to."

$\not\leftrightarrow$ means not "sufficiently similar to."

a, *b*, *c*, *d*, *e* are member taxa of the chain *A*.

FIGURE 2. *An open chain, A'.*

$$\overbrace{d' \leftrightarrow b' \leftrightarrow a'_1 \leftrightarrow c' \leftrightarrow e' \leftrightarrow f' \leftrightarrow a'_2 \leftrightarrow g' \leftrightarrow h'}^{A'}$$

a'_1, a'_2, *b'*, *c'*, *d'*, *e'*, *f'*, *g'*, *h'* are member taxa of the chain *A'*. a'_1 and a'_2 are heads of the chain *A'*, i.e., focal or "type" taxa of the chain. If *e'* did not exist, we would have two chains, the first with the head a'_1, the second with the head a'_2.

delimit the difference between all cars, on the one hand, and all trucks on the other. However the extreme examples of each category are linked by a series of less extreme types to the "typical" car or truck. Furthermore the boundary between "car" and "truck" is finely drawn. A Ranchero and a sedan or a station wagon and a panel truck are more similar to one another than are the various extremes within each category. Thus Rancheros are trucks not because they are used to haul things (station wagons are often put to that same purpose) nor because they are open in back (many trucks lack this feature) nor because of any other criterial feature of "truckness" used to characterize them, but rather because they are simply streamlined pickups, and pickups are but small versions of similarly shaped larger trucks which resemble more and more the essential truck, the semi-rig.

Chains differ in several interesting respects from what we more commonly think of as a "taxonomic category". The members of this more typical taxonomic category share some set of features not shared by any non-member. Membership in a superordinate taxon is determined by a rule applied uniformly to each subordinate taxon. A chain is constructed on a different principle. In a chain, one member may be so different from another that if the intervening "links" did not exist, each would be assigned to different superordinate taxa, as, for example, the XK-E and the station wagon in the absence of sedans. Membership is determined not by a uniform set of membership criteria but by a succession of dyadic comparisons. In a chain only adjacent members need be similar. Thus a chain is not a "contrast set" in the usual intuitive sense, since some members of the same chain may be so different from one another that they share no features unique to that chain, as, perhaps, the Ranchero and the semi-rig.

The existence of chains can be accounted for by the existence of areas of relatively continuous variation in the real world.[4] The difficulty which this fact poses for the biological taxonomist is evident in the following quote from Dwight's Gulls of the World (1925:71):

> "In passing it may be said that the genus should be considered a scientific convenience for grouping species and to be really useful it should have sharply defined limits,.... In fact, however we may arrange the species, some members of each group is bound to have some of the characters of the others and rarely is there a species, or even a genus which has characters or even one character, all its own. The chain connecting the species is, perhaps, not complete...but it becomes a question of expediency as to how the conditions found may best be met nomenclaturally" (emphasis added).

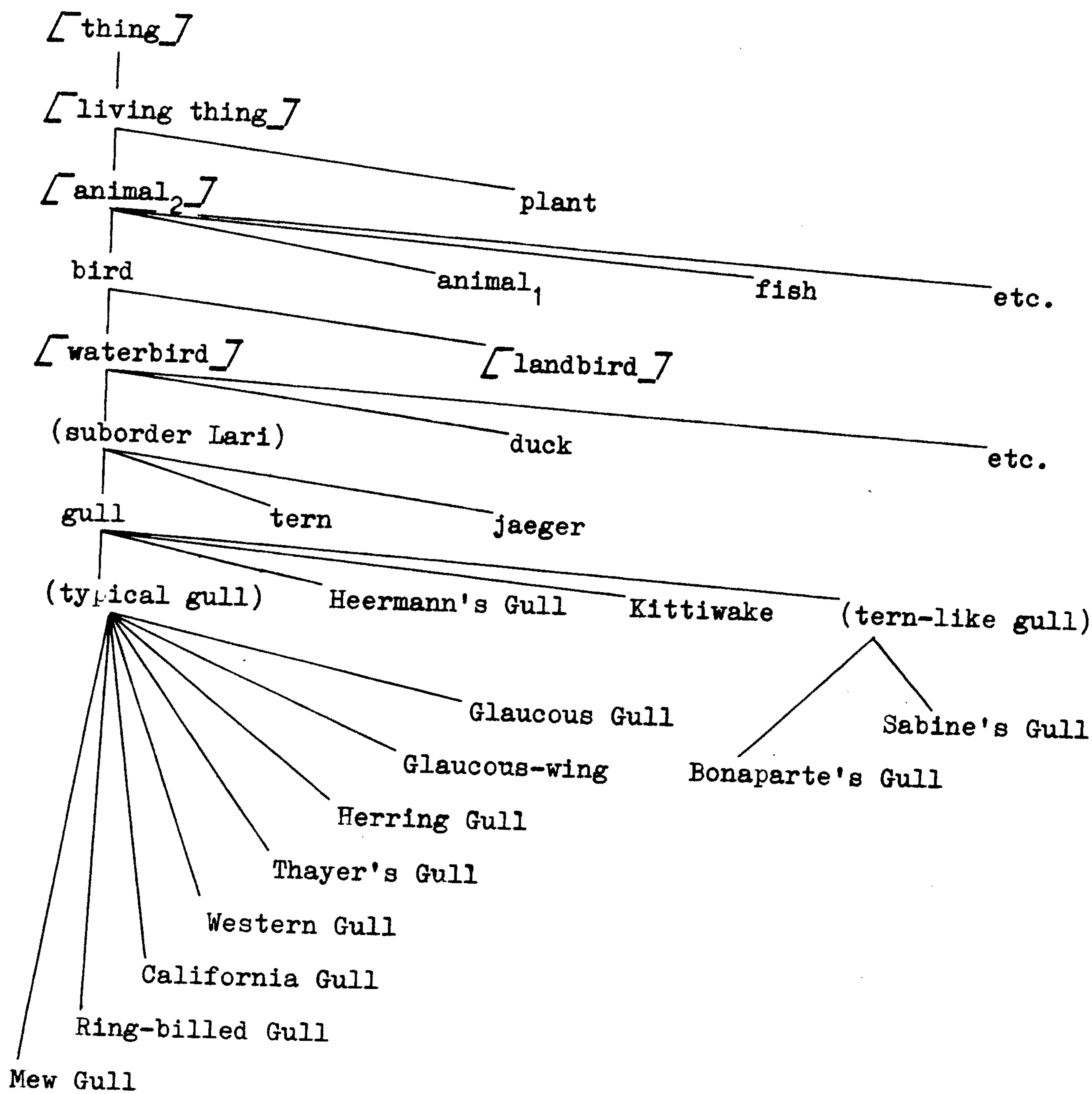
The critical point of our definition is the membership criterion "sufficiently similar to". I will suggest that if two taxa must be distinguished by a "specific identification process" they are "sufficiently similar" to one another. If they can be distinguished by a "generic identification process", they are not (see below, pages 52-59 for a discussion of these processes).

DATA AND FINDINGS: NOMENCLATURE

The depth of a taxonomic structure. Berlin and Kay (1970) have demonstrated that the acquisition of basic color terms by the world's languages (as indicated by their sample) exhibits an "evolutionary" pattern. As noted above Berlin has argued that the naming of taxa by rank in folk systematics may exhibit a similar pattern (Berlin 1972). Berlin assumes an original state in which only taxa of generic rank are named. Such a system is taxonomic in a trivial sense exhibiting a depth of zero (cf. Kay 1971:870, for a definition of the "depth" of a taxonomic structure) with reference to named taxa. The historical sequence is then presumed to exhibit a progressive increase in the depth of the taxonomic structure in terms of named taxa. The present data suggest a caution in this regard. These data indicate that the depth of taxonomic structure exhibited by the birdwatcher's system, one which is presumably "well advanced", does not differ significantly from the depth characteristic of folk botanical systems in languages such as Tzeltal (Berlin, pers. comm.). Most segments of the birdwatcher's taxonomy exhibit a depth of two or three levels with four as a maximum. By contrast, the depth of the scientific taxonomy, with which most birdwatchers are familiar, may exceed twenty (Simpson 1961:17).

Determining the depth of a natural taxonomic structure is not straightforward. It is first necessary to decide which terms are properly included within the taxonomic system. For example, the taxonomic segment illustrated in Figure 3--which represents my conceptualization of the relationship of gulls to other organisms--contains words such as "thing", "$animal_2$", "water-bird", etc., enclosed in brackets. The bracketting indicates

FIGURE 3. The author's taxonomic classification of gulls.



[names of doubtful taxonomic status]
(covert taxa)

ambiguity concerning their status as named taxa. My reasons are as follows.

There is no formal reason for excluding the category "thing" from the taxonomy. Birds are kinds of things as are frogs, rocks and automobiles. However "thing" has a somewhat unusual function in English. Statements such as, "A Kittiwake is a kind of gull," or "A gull is a kind of bird," clearly convey information. But the statement, "A bird is a kind of thing," is uninformative. Any noun (except perhaps a proper noun) is by definition a "thing". "Thing" may therefore be considered a "syntactic" rather than a semantic category. For these reasons I have chosen to exclude "thing" from consideration at this time.

The statement, "A bird is a kind of living thing," is neither false nor uninformative. However "living thing" is clearly polylexemic and thus does not qualify as a name. Furthermore no synonymous term exists in common usage (e.g., "organism" is not commonly used).

The term "animal" is polysemous. We may speak of "animals, vegetables and minerals," in which case a bird is a kind of animal ($animal_2$). However I very rarely use the term in this way. Typically "animal" ($animal_1$) contrasts with "bird". I would say, "That's not an animal, that's a bird." I believe the more inclusive use of the term "animal" is decidedly specialized and secondary in everyday English. Thus I consider "bird" to be the most inclusive named taxon in this segment of my personal taxonomic structure.

The terms "waterbird" and "landbird" mark a convenient binary division of the category "bird". However some of my informants were confused by two contradictory uses of these terms. (The more experienced informants chose to ignore them in our discussions of bird classification.) It was unclear to these informants whether these terms should be applied literally, i.e., "waterbirds" are birds characteristically dependent on a watery habitat, or as a name for a category of related organisms. In the latter case it is necessary, for example, to call a Mountain Plover (Charadrius montanus) a "waterbird" since Mountain Plovers are obviously related to other plovers, and most plovers are, strictly speaking, "waterbirds". However its characteristic habitat is dry prairie. On the other hand it is necessary to exclude the Osprey (Pandion haliaetus) from the category "waterbird" despite the fact that Ospreys are strictly fish-eaters and are rarely found far from water. Ospreys are hawks and most hawks are "landbirds".

A literal interpretation of these terms generates categories which do not strictly include lower-order categories. This violates a fundamental requirement of taxonomic structures. The alternative usage generates disjunctive categories. To determine that a particular bird is a waterbird one must first determine that it is either a duck or a gull or a plover, etc., since the groups of birds most of the members of which are "waterbirds" is a varied assortment with little else in common. Neither usage of these terms is properly taxonomic. The categories and the names exist, but for some purpose other than that of organizing categories of birds taxonomically.

Terms comparable to "waterbird", that is, terms which are distinguished from true names for taxa with some difficulty, are not uncommonly encountered in other domains as well. The English folk botanical term "weed" is an instructive example. Clearly "weeds" are kinds of plants, and there are many named varieties of weeds in an English folk system. Weeds are defined in part by morphological criteria--certainly no one would call a tree a weed--yet there are plants exhibiting all the morphological characteristics of weeds which are not weeds due to the fact that they are cultivated. In fact the same species may be a weed in one context and not a weed if the context changes. Thus two inconsistent principles must be coordinated in order to define the category. The principles are inconsistent since the application of the non-morphological criterion to define a higher-order category often involves the dismemberment of a morphologically defined lower-order taxon. In this case the lower-order taxon would not be strictly included in the higher-order category.

To simply disregard such ambiguous categories in one's description of a folk system is to distort the ethnographic reality. The category to which the term "weed" is applied is not strictly taxonomic, but it has its place in English folk botanical classification. An adequate ethnographic account of a folk biology should clearly expose the "weeds" of a classification in the neatly taxonomic garden, yet include both in a composite description. The human mind does not require total logical consistency to operate efficiently.

The headings in parentheses labeled "Sub order Lari" and "tern-like gulls" in Figure 3 represent covert categories. "Typical gull" is not a name for a category. Either the Western Gull or the Herring Gull was designated as the typical gull. The other species are linked with the "type species" by the chaining process described above (pgs. 17-19) and together they constitute a chain, a covert category glossed as "typical gulls" for want of a better term.

By applying the informal principles discussed above to the 565 species of birds (north of the Mexican border) with which I am familiar, I arrived at the totals, cited in Figure 4, for the number of named terminal taxa at each level (see Kay 1971:870, for a definition of "level") of my taxonomy.

In particular, all species of gulls are at level two. Examples of species at level one include the Anhinga (Anhinga anhinga), Limpkin (Aramus guarauna), Black Skimmer (Rynchops nigra) and American Coot (Fulica americana). These are birds belonging to groups represented by only a single species in North America or species classified in monotypic families or genera by ornithologist (e.g., Limpkin). Examples of species at level three include several ducks, e.g., Greater Scaup (Aythya marila), White-winged Scoter (Melanitta deglandi); hawks, e.g., Prairie Falcon (Falco mexicanus); as well as the Yellow-bellied Sapsucker (Sphyrapicus varius), a woodpecker;

FIGURE 4. The author's classification of birds; named terminal taxa at each level.

Level 0	bird
Level 1	33 terminal taxa (6%) immediately included in "bird."
Level 2	410 terminal taxa (73%) immediately included in a named taxon at level 1.
Level 3	122 terminal taxa (22%) immediately included in a named taxon at level 2.

Total terminal taxa equals 565.

and the Oregon Junco (Junco hyemalis; sp.), a sparrow. As a general rule these species are included in a group, e.g., ducks, which include an unusually large number of species, generally more than fifteen or twenty.

Comparable data from the Tzeltal folk botanical system (see Figure 5) exhibit a very similar distribution (abstracted from Berlin, Breedlove, and Raven 1974). Aside from the absence of a consistently named unique beginner in the Tzeltal system, the major difference between the two distributions is the somewhat larger proportion of terminal taxa in the Tzeltal system immediately included in the unique beginner.

These strikingly similar distributions, from two radically different cultures and from different domains, indicate that the American birdwatcher and the Tzeltal Indian, when faced with a comparable cognitive task, i.e., the efficient recall of several hundred discrete categories from memory, employ comparable solutions, i.e., similarly structured hierarchies of named categories. I suggest that, though the naming of folk biological taxa no doubt has an evolutionary history, the taxonomic depth given nomenclatural recognition in a given domain is primarily a function of the number of named taxa in that domain.[5]

<u>Generic versus specific names</u>. Though the birdwatcher's taxonomic structure is quite similar to a natural system, e.g., the Tzeltal plant taxonomy,

FIGURE 5. Tzeltal plant classification; named terminal taxa at each level.

Level 0	"plant"--taxon not consistently named.
Level 1	77 terminal taxa (12%) immediately included in "plant."
Level 2	451 terminal taxa (71%) immediately included in a named taxon at level 1.
Level 3	108 terminal taxa (17%) immediately included in a named taxon at level 2.
Level 4	2 terminal taxa (0.3%) immediately included in a named taxon at level 3.

Total terminal taxa equals 638 (abstracted from Berlin *et al*. 1974).

it differs strikingly in the typical form of names for terminal taxa (terminal names). The great majority of terminal names in natural systems are primary lexemes. Secondary lexemes occur infrequently (approximately 37% of the total terminal taxa are labeled by secondary lexemes, cf. Berlin et al., 1974). In the birdwatcher's vocabulary, however, the great majority of terminal names are binomial, i.e., specific names (approximately 90% of my terminal bird taxa are customarily labeled by secondary lexemes). Very few terminal generics exist. However the birdwatcher's vocabulary for terminal taxa is codified according to ornithological conventions (Van Tyne and Berger 1959:351) which specify that these names should be binomial.

Birdwatchers commonly abbreviate these specific names. When birdwatchers have only one kind of something to deal with they usually drop the attributive. American Robin (Turdus migratorius) is universally just robin; likewise the American Coot. Other robins and coots do not regularly occur in North America. The Black Skimmer and Brown Creeper (Certhia familiaris) are similarly abbreviated, though not invariably. Eastern birdwatchers call the Yellow-shafted Flicker (Colaptes auratus ssp.) simply "flicker" (Peterson 1941) because the other North American flickers are outside the normal range of their experience. On the West Coast "albatross" means the Black-footed Albatross (Diomedea nigripes), since all other species of albatross are exceedingly rare and would undoubtedly be specified by the speaker.

Birdwatchers also abbreviate specific names by dropping the head. When the higher-order category can be assumed from context birdwatchers typically refer to the species by the attributive alone. For example, when discussing gulls my informants used the terms "Mew", "Ring-bill", "Bonaparte's", etc., to refer to the Mew, Ring-billed and Bonaparte's Gulls. Among the ducks this tendency has gradually been incorporated into the official nomenclature. Red-headed Duck is now Redhead (Aythya americana), Canvas-backed Duck is now Canvasback (A. valisineria), etc. However the Ring-necked Duck (A. collaris) and Ruddy Duck (Oxyura jamaicensis) remain unaffected (cf. Audubon 1941 [1827-1838] for the earlier forms). Audubon also referred to the kittiwake as the "Kittiwake Gull" (Ibid.:plate 224).

Thus it seems likely that if birdwatchers were not dependent on ornithologists for the names of their birds, generic names rather than specific names would predominate, precisely as in natural systems.

CLASSIFICATION AND IDENTIFICATION

One of the first tasks of a folk biological description is to define the named categories of the domain being analyzed by comparing the range of denotation of the folk taxa with that of the scientific taxa partially or entirely included in each folk taxon. In this study such a task is relatively trivial since the vast majority of the birdwatcher's terminal taxa are identical to ornithological species. Only higher-order taxa likely to diverge. A second task of such a description is to define all folk taxa in terms of the criteria actually employed by the folk in question. This task has rarely been systematically attempted and has never been satisfactorily concluded. This is the case because the first stage of an analysis of a folk system which has developed independent of the scientific system is in itself a monumental undertaking.

By analyzing the birdwatcher's system we may more readily move on to the second task. This necessarily involves analysis of the identification process as well as of the classification system. I will first describe the higher-order categories in current use by birdwatchers. I will compare these with higher-order scientific taxa and attempt to specify the features used to define and/or identify them. I will be concerned as well with distinguishing taxa from non-taxonomic categories and will suggest certain principles for making such a distinction, limiting my analysis to categories subordinate to the unique beginner "bird".

I have already argued that the categories "waterbird" and "landbird" are non-taxonomic. To further clarify this point I believe it is useful to contrast two other similar terms. These are "pelagic bird" and "shorebird". The first term is clearly non-taxonomic. However the second appears to be a valid taxon. Both are rather commonly used by myself and my informants.

Pelagic birds are birds characteristically restricted to the open ocean. Birdwatchers rarely expect to see them from shore. Special "pelagic trips" are arranged by local organizations to observe these birds. A boat is rented for the day and all the passengers prepare for their semi-annual experience of the "pelagics." The following West Coast species are considered to be pelagic birds: albatrosses (Diomedeidae, one species likely), all shearwaters (Procellariidae, six species possible) including the Fulmar (Fulmarus glacialis), storm petrels (Hydrobatidae, six species possible), jaegers (Stercorariidae, two species common, two rare) including the Skua (Catharacta skua), all the alcids (Alcidae, eight species likely), plus the Sabine's Gull (Xema sabini), Kittiwake, Arctic Tern (Sterna paradisaea)and the Red Phalarope (Phalaropus fulicarius), a "shorebird".

These birds have a single extrinsic feature in common. They characteristically prefer the open ocean. Other species are often more common on pelagic trips such as a variety of gulls, cormorants (Phalacrocoracidae), loons (Gaviidae), etc. But such birds are not pelagics since they are easily seen from shore. The category cross-cuts several less inclusive but taxonomic categories such as gulls, terns and shorebirds. It is clear that in this case the category does not exist for the purpose of classifying morphologically similar or related birds. It is thus non-taxonomic.

The category "shorebird," on the other hand, corresponds exactly to the ornithologists' sub-order Charadrii, which together with the sub-order Lari (including gulls, terns and jaegers) and the family Alcidae (the "alcids") constitute the order Charadriiformes. Herons are not shorebirds, nor are gulls or cormorants, though all these birds characteristically frequent shores. Shorebirds are defined not in terms of "shores" but by some intrinsic feature or set of features rather than by the less than criterial generalizations concerning habits and habitat.

Though the terms "shorebird" and "waterbird" (see pg. 22) are structurally identical they may be distinguished by the following general rules. a) Membership in a taxon is never defined solely in terms of extrinsic features. b) A token of a taxon may be identified without reference to that individual's membership in any subordinate taxon. These principles do not provide a definitive answer to the problem of distinguishing taxonomic from non-taxonomic categories, indeed if a definitive solution is possible. However they will serve our present purposes.

Gulls and their relatives. The first taxonomic category we find subordinate to bird which includes gulls is a covert category corresponding closely to the sub order Lari. This sub-order includes three families, the Stercorariidae, jaegers and the Skua, the Laridae, gulls and terns, and the Rynchopidae, or skimmers. No skimmers occur in the San Francisco Bay area and were thus excluded from consideration. Informants one, two, four, and myself felt that jaegers, gulls and terns all go together. Informants three and five were not familiar with jaegers and so declined to comment on them. They did agree, however, that gulls and terns, at least, were closely associated in their minds. Informant three joked that "gullsnterns" is one word; they go together like track-and-field.

The only birds which could readily be confused with birds of this category are the shearwaters, especially the Fulmar. Sitting on the water a light-phase Fulmar looks very much like a gull. Shape and size are similar as is the general plumage pattern. However in flight there can be no doubt that a Fulmar is a shearwater. Shearwaters are incomparable flyers. They are in command of the waves, gliding and banking on stiff wings, manipulating the air currents generated by the slightest ocean swells. It is difficult to describe in scientific terms but nevertheless leaves no doubt as to the unique place these birds occupy.

The White-tailed Kite (Elanus leucurus) occasionally seems to be a gull at first glance. However it usually begins to hover or gives itself away by a particular twist of its wings. This error is gratuitous. No birdwatcher would claim that this sort of superficial deception makes the kite any less a hawk or any more a gull. All other birds differ greatly in size, shape and behavior from "gulls-n-terns".

Gulls, terns and jaegers go together for several and diverse reasons. First, they are compact in outline without the long legs of herons, the long necks of loons and cormorants, or the incongrous beaks of pelicans. Second, they seem at home in the air, flying a large proportion of the time. Ducks, geese, loons, grebes (Podicipedidae), cormorants and alcids are primarily swimmers; herons, egrets and shorebirds prefer to walk or stand. However they are not so completely adapted to the sea winds as an albatross or shearwater. Their abilities in flight reflect this characteristic adaptation. The salience of these features, i.e., body contour and mode of flight, is evidenced by many consistent morphological details such as wing shape, foot structure, bill structure, etc. The characteristic intrinsic features defining this group for the birdwatcher, i.e., shape and mode of flight, are also maximally visible. The existence of the group is further assured by the fact that some members of each sub-grouping approximate the characteristics of the other sub-groups, thus somewhat obscuring the discontinuities within the group.

This covert category includes three rather clear-cut sub-groups, all named (see Figure 3). These are the jaegers, the gulls (the sub-family Larinae) and the terns (the sub-family Sterninae which with the Larinae comprise the family Laridae). The informants familiar with all these groups agreed that they were of equivalent status, that is, the birdwatchers differed slightly from the ornithological opinion that gulls and terns are more closely related to one another than either group is to the jaegers. These groups were distinguished by most informants primarily on the basis of mode of flight. My description is not atypical. "Gulls soar a lot, their flight is rather heavy, labored. They lack the powerful falcon-like flight of jaegers and the erratic, light flight of terns."

Jaegers are typically pelagic; they are rarely seen from shore. Thus birdwatchers actively look for jaegers only at certain times and places; however I have seen them twice far inland. In both instances I was immediately struck by the "power" of their flight. They may be identified at a considerable distance by their habit of chasing gulls and terns. This behavior can be deceptive since gulls often act in a similar fashion. However no gull pursues the chase with such ease as a jaeger. When not chasing other seabirds jaegers habitually fly swiftly and directly with powerful strokes of the wings. Gulls, on the other hand, wheel and soar and struggle with the wind. It is not necessary to consider terns in this comparison because they always appear white at a distance (with the exception of the strictly inland Black Tern, Chlidonias niger). Jaegers, the Heerman's Gull (Larus heermanni) and immature gulls of several other species appear dark at a distance. However, unlike the dark gulls, jaegers are dark above, white below, and flash a patch of white on the primaries (the outer wing feathers). These characteristics are visible at a considerable distance.

Two other postures aside from flight must be discussed. Gulls and jaegers often swim or rest on the water but terns, as a rule, do not. Gulls and terns, on the other hand, both perch on posts or stand on the shore; I have seen a jaeger perch on only one occasion, on a piece of driftwood floating far off-shore. Adult gulls on the water are easy at any distance; they appear white. The Heerman's Gull is an exception which will be discussed in more detail shortly. The more experienced birdwatchers can identify a jaeger on the water with fair accuracy. An adult jaeger at close range is no problem; the long central tail feathers when present are then obvious. (However these are lacking on a large proportion of the birds.) The black cap and partial chest band can then be seen. However if one is this close to a jaeger, the identification problem becomes which species of jaeger, not whether the bird is a jaeger or a gull. At a distance too great for these highly criterial features to be seen, subtle postural cues may be used. According to informant one, "Gulls sit <u>in</u> the water, jaegers perch <u>on</u> the water." I have subsequently used some such cue myself and have been proven correct most of the time.

Terns characteristically fly with their bills pointed downward, scanning the water for fish. When they spot a fish they dive into the water. Neither gulls nor jaegers do this. The two tern-like gulls, Bonaparte's and Sabine's, approximate this diving behavior but always pull up short of the surface. Terns also have a distinctive contour. Informant four described them as more "pointed" than gulls. They have long pointed bills, pointed wings, flat heads and forked tails. They appear very much slimmer than jaegers and gulls and perched, their short legs and neck and long tails give them a distinctive silhouette.

Thus all three groups are distinguished from one another by highly salient and maximally visible features such as body contour and mode of flight (see Figure 6). The scientific definitions of these groups, of course, are based on very different features. Modes of flight and silhouettes are not capable of preservation in museum skins, nor are they easily specified verbally or by measurement.

The identification of atypical species. In each group there are species which are intermediate with reference to the criteria that birdwatchers rely on. My informants had no difficulty classifying these atypical forms unambiguously, however their deviation from the typical criteria often involves a special identification routine for the species.

Jaegers do not normally present a problem. The atypical species, the Long-tailed Jaeger (Stercorarius longicandus), which has a tern-like flight, and the Skua, which is heavily built and solid brown like a large immature gull, are rare. The terns likewise; the atypically plumaged Black Tern is quite strictly confined to inland lakes and marshes,and the Gull-billed Tern (Gelochelidon nilotica) is found in California only at the Salton Sea.

The Heermann's Gull is jaeger-like in several respects. First it is dark grey or brown in both the adult and immature plumages. Most notably it is more likely to be seen chasing other birds than most gulls. It habitually follows pelicans and steals fish from their beaks. It is apparently structurally adapted for

FIGURE 6. Intrinsic features of gull-like birds (suborder Lari) relevant to generic identification processes.

	In flight	On water	Standing
jaeger	falcon-like, chases gulls and terns; projecting tail feathers; dark above, white below; white wing patches	dark floats "on water"	rarely seen standing
tern	erratic, light flight; head may be pointed down; dives into water in feeding; pointed appearance; looks white	doesn't swim	long, pointed appearance; short legs
(tern-like gull)	tern-like flight (diving swoop to water); looks white; flashing wing patterns	gull-like shape; small; dark hood (summer)	gull-like shape; small; dark hood (summer)
Heermann's Gull	even dark body, not mottled; gull-like flight but slightly jaeger-like	even dark body; floats "higher" than typical gull	even dark body; gull shape
Kittiwake	rapid, shallow wing beat; concise wing pattern (adult) bold wing pattern (immature) looks white	like typical gull (must analyze details)	like typical gull (must analyze details)
Mew Gull	small, thus light flight; "gentle look in eye"	small; gentle look in eye	small; gentle look in eye
(typical gull)	typical gull flight; grey back, white body (adult); mottled grey-brown (juvenile)	floats "in" water; looks white (adult); looks dark, mottled (juvenile)	stocky; grey back, white body (adult); mottled grey-brown (juvenile)

the chase and thus flies more like a jaeger. Also, according to informant one, it floats somewhat higher in the water than do most gulls, again approximating jaegers.

The Heermann's Gull's peculiarities are not all in the direction of the jaegers. It is the only gull with a red bill or a black tail and the only gull which migrates south to breed. Most gulls are primarily winter visitors from the north. Heermann's is present from July through December and is as strictly confined to the outer coasts as is the Western Gull, though, unlike the Western and the other large gulls, it is not found at dumps. Thus the features which make Heermann's immediately identifiable are highly salient, i.e., they correlate with many intrinsic and extrinsic details which are unique among the local gulls.

Despite its unique position among local gulls it is placed with the great majority of gulls in the genus _Larus_ because intermediate forms exist in other parts of the world. Though local birdwatchers do not conceive of the Heermann's as a typical _Larus_-type gull, they certainly agree that it is a gull. Its body contour is identical to that of the typical gulls and though its flight is somewhat jaeger-like it is rather more gull-like.

Bonaparte's and Sabine's Gulls together form a covert category which may be glossed "tern-like gulls." Their flight is light and more erratic than that of the larger gulls, presumably because of their small size. They also swoop down to the surface of the water when feeding, reminiscent of the terns' diving behavior. In flight I often confuse them with terns at first glance though I never confuse them with any other gull. In most cases this confusion is brief, for their flight is not quite right for terns. The white flash of the Bonaparte's primaries or the bold black-and-white pattern of the Sabine's is easily visible and distinctive at a considerable distance. This feature also serves to distinguish one from the other at a glance.

In the breeding plumage both these gulls have dark hoods, the only local gulls that do. However at this season the terns have complete black caps. This distinction is not always obvious at a distance. In winter plumage these gulls have dusky markings on the head, a feature quite similar to the head markings of the terns in comparable plumage. Bonaparte's has red feet, a feature unique among the local gulls but common among the terns. Sabine's is the only gull with a noticeably forked tail, a feature characteristic of terns. Both are unique among the local gulls in having dark bills in the adult form. The slimness of their bills, a feature correlated generally with the size of the gull, is such that the distinctive gull shape of the bill is not easily visible. Both gulls are further exceptional in terms of extrinsic features. Sabine's is strictly pelagic, somewhat more so than the Kittiwake. Unlike both the Kittiwake and the majority of local gulls it is found only during spring (rarely) and fall migration periods. Bonaparte's likewise is most common at these times, though quite a few are present all winter at certain localities in the area.

These manifold atypical features might lead one to question whether these birds should be considered gulls at all. However when resting on the water--something terns almost never do--they are simply small gulls. In this posture most of the distinctive atypical features are not visible. The shape of the bird's head which is typically gull-like is visible. Head shape is perhaps one of the most criterial features of gulls as opposed to terns. Thus a single highly criterial feature when visible eliminates the potential ambiguity generated by a whole series of more readily seen atypical features.

Though Bonaparte's and Sabine's Gulls form a covert category for the birdwatcher, no such grouping exists in the ornithological system. Bonaparte's is placed in the genus *Larus* with most gulls while Sabine's is placed in the monotypic genus *Xema*. My most experienced informants could suggest no ready explanation for this. The explanation for this discrepancy, in my opinion, has little to do with the difference between scientific and folk conceptualizations of relationships. Rather it may be explained in terms of the worldwide scope of the scientific classification and the limited scope of the birdwatcher's experience. No clear break exists between Bonaparte's and the "typical gulls" on the worldwide scale. However Sabine's exhibits some features which have no counterpart elsewhere.

In short, the tern-like gulls are clearly classified as gulls but are not first identified as gulls (unless sitting on the water). The first impression is of a tern followed immediately by the recognition of the species. Thus there is a feature which is definitive of gullness in the classification, the head and bill contour, which is not sufficiently visible to allow immediate identification of all gull species as gulls, since identification at this level is primarily based on mode of flight.

The Kittiwake is also atypical. Ornithologists agree and have placed the Black-legged Kittiwake (the species with which we are concerned) and the Red-legged Kittiwake (found only in Alaska) in a separate genus Rissa. Thus the fact that this bird is named "kittiwake" rather than, for instance, "Black-legged Gull" is understandable. Yet it is certainly no more unique than Sabine's Gull. As I noted above Audubon used the term "Kittiwake Gull." Sabine's, Bonaparte's, and Heermann's Gulls are all named for people. Perhaps such names are less readily abbreviated.

The Kittiwake is distinctive in several ways, though it is neither tern-like nor jaeger-like. It is a pelagic species. It flies with a distinctive shallow wing-beat because of its short wings. This feature is subtle enough that my best informant was not sure how to characterize the mode of flight. Though its plumage pattern follows the typical-gull plan, i.e., white body, head and tail, grey mantle with black wing tips, it lacks the white spotting within the black wing tips characteristic of other gulls with this pattern. It thus appears "more concise" (according to informant one) than typical gulls. These two highly visible features are usually sufficient for identification purposes.

The dusky nape of the winter plumage (adult and immature) is somewhat less visible. It is the most important identifying feature for beginners, being far less subtle than the more visible features already mentioned. The black legs enshrined in the official name are shared only with Heermann's and Sabine's Gulls and are thus criterial with reference to the typical gulls. However they are not easily seen. The plain yellow bill is shared only with the Mew Gull, which is identical in size as well. Beginners, however, may rely on the Kittiwake's dusky nape and solid black wing tips for this discrimination. Immature birds have the dusky nape but lack the wing tip feature. They however have a unique mantle pattern and a black tail band. For those more familiar with the bird the immature is simply a Kittiwake at first glance due to its mode of flight. In fact all the atypical gulls we have discussed are sufficiently distinctive so that the immature forms do not require special identification routines, a problem which we will shortly encounter with reference to the typical gulls (see Figure 6 for a summary of identifying criteria).

The typical gulls. The core of the gull group is a covert category organized as a chain (see Figure 7) and referred to here as the "typical gulls". None of the member species are immediately recognizable as distinct from the remainder (the Mew Gull is distinct for informant one). However not all of the eight species included are equally "typical."

The word "gull" denotes a group of species all of which have a characteristic body contour and, within broad limits, mode of flight. But the word also implies an image of the "typical gull." According to informant one the typical gull is, "a bird that stands on the last post of a long pier and goes 'wroak, wroak, wroak' on a foggy morning, and he's got a dark grey back and usually has white on the belly and head and he's big and fat and if anybody throws in a fishline he'll come over to see what's happening." This description fits the Western Gull perfectly and the Great Black-backed Gull (of the Atlantic) even better. Perhaps early ornithologists had a similar image in mind when they designated the Great Black-backed Gull as the "type" species of the genus <u>Larus</u> (Dwight 1925). This is not an average, generalized image but an epitome of "gullness."[6]

The other typical gulls deviate more or less from this ideal type. Two dimensions of continuous variation are the primary components of variation within this group, first size and second mantle color (various shades of grey). The primary dimension is size, because it is the most salient of the distinguishing features within the group. For example, large gulls fly more "heavily" than do small gulls. They float more deeply in the water and are the dominant gull species at dumps. The atypical gulls are rarely found at dumps. The Mew and Ring-billed Gulls, at the small end of the typical gull chain, are more often found in fields or at sewage treatment plants. The largest local gulls all have pink feet (as adults), the smaller typical gulls have greenish or yellow feet. The largest gulls all have heavy bills, yellow with a red spot near the tip (again as adults). The smaller gulls have slimmer bills, yellow but with a variety of bill patterns. In other words, correct assessment of a gull's size eliminates the necessity for noting many less visible or less salient features and thus streamlines the identification process.

The following size ranges, within and among the local gulls, are cited by Peterson (1961:128). **Atypical gulls are marked with an** asterisk.

Gull	body length
Glaucous Gull	26-32 inches
Western Gull	24-27 "
Glaucous-winged Gull	24-27 "
Herring Gull (including the slightly smaller Thayer's Gull)	22½-26 "
California Gull	20-23 "
Ring-billed Gull	18-21 "
*Heermann's Gull	18-21 "
Mew Gull	16-18 "
*Black-legged Kittiwake	16-18 "
*Sabine's Gull	13-14 "
*Bonaparte's Gull	12-13 "

The intra-specific variation is largely due to the fact that males are larger than females. Thus size, though highly salient, is less than perfectly criterial. Furthermore a margin of error must be added (let us allow ± 1 inch for error), since it is difficult to accurately judge small size differences in the field. Only Bonaparte's and Sabine's Gulls are readily distinguished in the field by size alone (and the flight characteristics generally associated with size). Heermann's Gull and the Kittiwake are immediately distinguished by other criteria. It is noteworthy that most informants had only a vague idea as to the relative sizes of these two atypical gulls. This is further evidence of the unique classificatory position occupied by these species and supports the argument that identification requires selective attention to a part or parts of the token. It is not necessary to compare them with others on the size dimension since their uniqueness is assured by more "powerful" features.

Typical gulls are "big and fat." This clearly applies to the Glaucous, Glaucous-winged, Western and Herring Gulls and to at least some California Gulls. How then are these to be distinguished from one another? The first four all have pink feet and big yellow bills with red spots. Their behavior is typical. These features are thus redundant and the first two are not easily seen. However, mantle color is easily visible and distinctive. The following values are given by Dwight (1925:121-122) using a standard color chart for reference, numbered in order from pale to dark. (Atypical gulls are marked with an asterisk. Gulls without contrasting black wing tips are marked with a plus.)

1. Pallid neutral grey	+Glaucous Gull (not seen here in adult plumage)
2. Pale neutral grey	Herring Gull Thayer's Gull Ring-billed Gull

3. Light neutral grey	Mew Gull *Bonaparte's Gull
4. Neutral grey	California Gull *Black-legged Kittiwake *Sabine's Gull +Glaucous-winged Gull
5. Deep neutral grey	Western Gull (northern race)
6. Dark neutral grey	Western Gull (southern race, rare in area)
7. Deep mouse grey	*Heermann's Gull

($\pm\frac{1}{2}$ shade should be allowed for error.)

These values tell only a part of the story. The species marked with a "+" lack the triangular black wing-tips of the other typical gulls. Thus they appear paler to all my informants. Most perceive the Glaucous-winged Gull, for example, as paler than the Herring.

On the basis of mantle-color/wing-tip pattern (and given the margin of error) all the large gulls can be unambiguously distinguished with the exception of the California and Western Gulls. However the combination of marginal size and mantle-color differences is sufficient to distinguish them in almost all cases. If doubts remain it is always possible to move in close for a look at the legs and bill. The California Gull has greenish-yellow legs and a black bill spot (in addition to the red spot). The Western (unlike most others) is unlikely to be found away from the ocean shore.

Herring and Ring-billed Gulls, which are identical in terms of mantle color, differ sufficiently in size to be readily distinguished on that basis alone. The fact that my best informant incorrectly (according to Dwight) described the Ring-billed as paler on the mantle than the Herring is further evidence that these two species are distinguished by the more powerful size features. Ring-billed and California Gulls, adjacent in size, can be distinguished by mantle color. This criterion is commonly used by the more expert informants. It is therefore unnecessary to note the highly criterial but difficult to see ringed bill of the Ring-billed Gull. Ring-billed and Mew Gulls are not readily distinguished by either size or mantle color. However in combination these two marginal distinctions reduce the probability of error considerably. Thus if a gull seems too small and dark for a Ring-billed it is probably a Mew. However my most experienced informant felt that these two species were not that difficult to distinguish. This implied the existence of some more "powerful" feature.

The Mew Gull, according to informant one, has a "gentle look in its eye" which, together with its small size, distinguishes it from all other gulls at a glance. Thus for him the Mew Gull is not a "typical gull" at all. The chain is broken and the Mew Gull stands alone. The "look" in the Mew Gull's eye is apparently a complex feature involving head shape (more steeply rounded), bill shape (upper mandible more curved) and size relative to the head (smaller). The eye is dark (unlike the Ring-billed) and thus appears large in relation to the head. All this information is taken in at a glance. Thus the Mew Gull looks "gentle."

Significantly, the old-time naturalist Dawson (quoted in Bent 1947), described the Mew Gull in similar anthropomorphic terms. He said it appeared "unsophisticated." According to informant one, pale-eyed gulls look "mean," dark-eyed gulls, especially the Mew Gull, have a wide-eyed innocent look. The awareness of this feature and thus the ability to use it (though not necessarily to analyze it) comes only after a long period of familiarity with the bird. I have since been able to use this feature myself with good results. Previously I was forced to look carefully at the Mew Gull's bill to see that it lacked the red and black marks of the other species.

Thayer's Gull is the most difficult of all to discriminate. It is treated as a sub-species of the Herring Gull or not treated at all in the major bird guides available (cf. Peterson 1941, 1961; Robbins, Bruun, and Zim 1965). Certain supposedly criterial features have filtered down to bird-watchers by word of mouth from scientific articles or have been suggested on the basis of museum studies by the more academic birdwatchers. Thayer's is very slightly smaller than the Herring Gull, though their sizes broadly overlap. However the Thayer's Gull's bill is rather diminutive relative to the size of the head, in this approximating the California Gull. The adult bird has a dark iris, unlike the Herring. Thus, like the Mew Gull, it may appear more "gentle" than the Herring. Finally the black of the wing-tips is more restricted than that of the Herring Gull and, according to informant one, is sometimes lacking entirely. In that case it is distinguishable from the Glaucous-winged Gull, which also has a dark iris, only by reference to marginal size and mantle color differences. If the black wing-tips are present, they are supposedly visible only on the upper wing surface, unlike the Herring which shows a black triangle both above and below. It is possible to identify a "perfect" example of a Thayer's Gull but imperfect examples must pass as either Herring or Glaucous-winged Gulls.

The identification of Thayer's Gull is in a state of flux and resembles the identification process characteristic of beginning birdwatchers (see pages 57-59). The features have not been organized into a highly efficient, hierarchical series of assessments (of which more later). However birdwatchers are confident that if Thayer's is a good species, as the latest ornithological research indicates (cf. MacPherson 1961; Smith 1967), it should be possible to identify it. After all the gulls themselves must be able to make the discrimination. Otherwise they would not be able to select an appropriate mate.

Summary. All the typical gulls in adult plumage (with the possible exception of Thayer's) can be distinguished from one another with a high degree of certainty by a judicious combination of size and mantle color judgments. However neither feature by itself is sufficient. A judicious combination implies that the process of identification within the typical gull category involves a consciously mediated organization of diverse features. This is a "specific identification process." By contrast the atypical gulls are identified by a "generic identification process," the perceptual attributes involved are processed as a unit, at a glance. It should thus be possible to objectively determine which process is involved by measuring the time required for an identification.

The fact that the typical gull category is a chain is in part explained by the nature of the identification process required for distinctions within the chain. No expert birdwatcher will confuse Mew (or Ring-billed either) and Glaucous-winged Gulls, under any circumstances. The Mew Gull is more similar to the Kittiwake than it is to the Glaucous-winged. Yet the Mew and the Glaucous-winged are both included in the typical gull chain (for me at least), while the Kittiwake is set apart. This fact violates our intuitions about the implications of taxonomic classification. At a glance, however, the Kittiwake is nothing but a Kittiwake. The Mew without closer inspection could be mistaken for a Ring-billed Gull. A Ring-billed could be mistaken for a California Gull, a California for a Western or a Herring, and the Herring and Glaucous-winged Gulls differ but slightly. Nowhere along this chain do we find a clean break. Thus no boundary is appropriate for dividing the typical gulls into discrete sub-groups. I would argue that the typical gull category is not a "contrast set" in any but the formal sense (cf. Kay 1971:872-879). It is rather the set union of a series of "contrast sets." Contrast is here defined in a special but hopefully psychologically salient way as a relationship existing between those taxa which must be distinguished from one another by specific identification processes. For clarity I will use the term "specific contrast" for this type of contrast.

Immature forms. An interesting aspect of the problem of identifying typical gulls is the fact that the immatures of many species are very similar to one another yet very different from the adult forms. The immature forms require entirely different identification routines. Thus the determination of the bird's developmental stage must precede the identification of the species. The placement of the several plumage stages of a species into a single taxonomic category is based on extrinsic information. The processes of identification and classification are most clearly distinct in this area.

The larger gulls, including the California, all have a four-year cycle. The first-year birds (juveniles) are all one shade or another of mottled greyish-brown. In the second year the adult mantle color appears in the center of the back and the body and head are much lighter. (The second year Glaucous Gull, however, is perfectly distinct; it is almost pure white.) In the third year the gulls have the adult plumage pattern but with dark patches in the tail. At this stage the bill color and pattern as well as the foot color and wing-tip pattern have not yet fully developed. The third year California Gull often has a ringed bill which is misleading to beginners who rely on this mark. For the more experienced birdwatchers who rely primarily on size and mantle color, the sub-adult birds can be identified by a routine which varies little from the adult identification routine.

First year Glaucous-winged Gulls are clearly paler than Herring, Western and California Gulls, especially on the primaries. Herring and Western Gulls do not differ consistently in this respect. I cannot distinguish them and call them all Westerns (which are far more numerous), unless they are found inland. Informant three, however, asserted that he can distinguish juvenile Herring and Western Gulls by the somewhat longer hook on the tip of the Herring Gull's bill. They may also differ in the rump pattern.

The first year California Gull, besides being slightly smaller, generally has a pink base to the bill while the others have all dark bills. Second year Herring Gulls have a pink-based bill but are not confused because of the priority of the age identification.

The Glaucous Gull is extremely rare in the area. When it appears it is almost certain to be a first or second year bird. The first year bird can be confused only with the Glaucous-winged, since they both have pale primaries. It is usually somewhat larger, considerably paler, and has a sharply defined pink base to the bill. The second year Glaucous-winged Gull, which also has a pink-based bill, is not confused because of the prior age discrimination. I have also been told that to be certain I must note a mottled effect on the tail of the first year Glaucous Gull, since the bill pattern is not entirely criterial.

Thayer's Gull at this stage can be identified only if a direct size comparison is possible. More useful features may exist but I am not aware of them.

Mew and Ring-billed Gulls have a three-year cycle. Since the first-year Ring-billed Gull does not have a dusky mottled body it is easily distinguished at this stage. Thus the Mew, which follows the developmental pattern of the larger gulls, is clearly distinct from the Ring-billed due to its more typical first-year plumage pattern and from all other typical gulls due to its small size. Furthermore it always has the essential Mew Gull gentleness of the head and bill contour (see Figure 8).

THE IDENTIFICATION PROCESS

I have discussed the birdwatcher's categories which include or are included in the category "gull" and have compared these with the scientific categories which most closely correspond. In addition I have discussed the features which birdwatchers cite to either define or distinguish each category. I have thus provided a fairly complete description of the birdwatcher's verbalizable knowledge of gulls in the birdwatcher's own terms.

This is not yet an "adequate ethnographic description." As Perchonock and Werner (1965) note, "Ethnoscientists are interested in the speaker's knowledge of the various domains within his culture, not in his actual behavior in these domains." Hence ethnoscience has contributed information "which reveals that speaker's knowledge of his culture rather than his ability

FIGURE 8. Intrinsic features of typical gulls (juveniles).

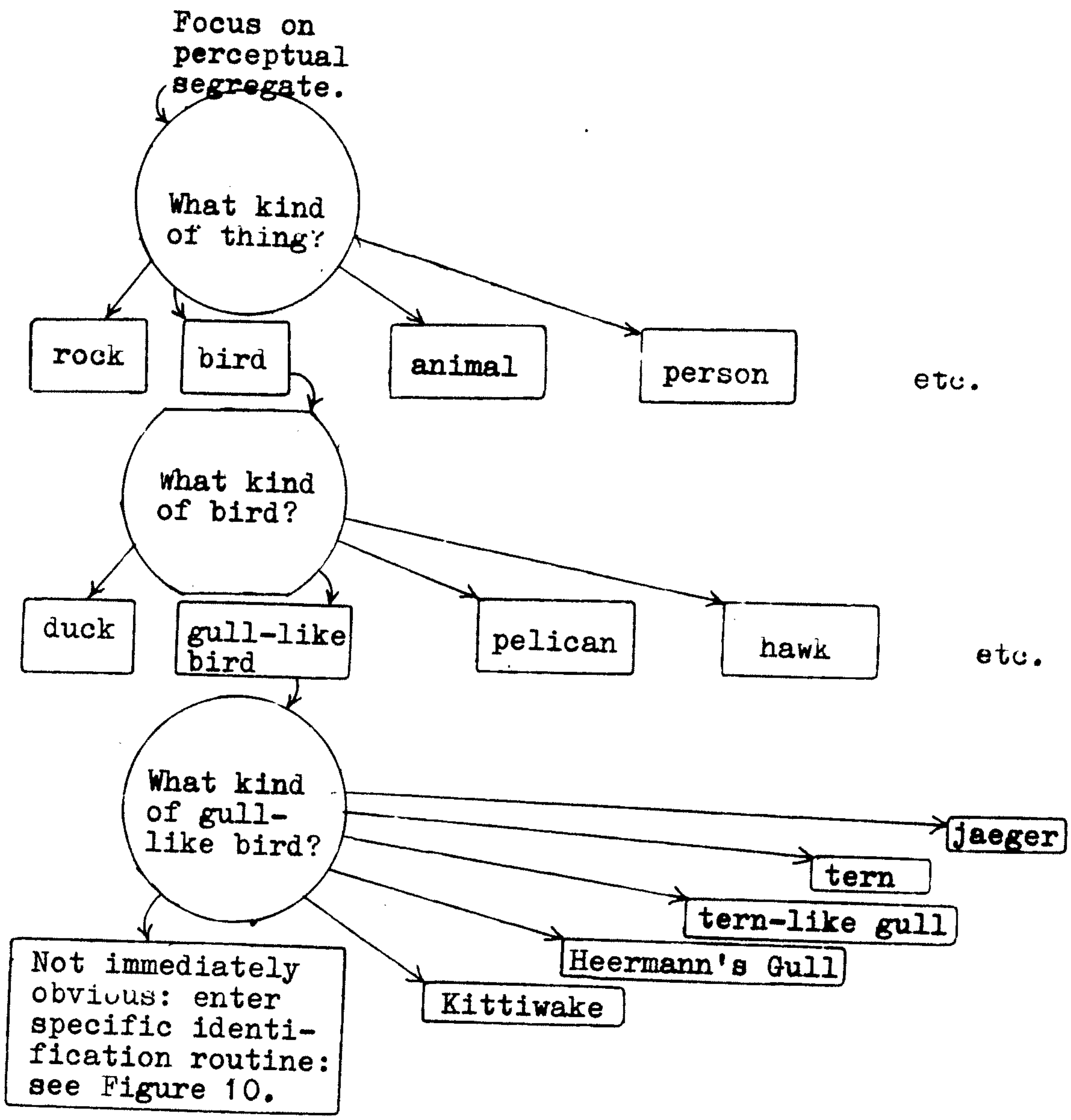
	Size, tone	Head, foot details	Plumage details
Glaucous Gull	very large; very pale	bill pink with black tip; flesh-colored legs	mottled tail
Glaucous-winged Gull	large; mottled grey-brown	dark bill and legs	grey tail and primaries
Thayer's Gull	slightly smaller than Herring; also slightly paler	dark bill and legs; proportionately smaller head and slimmer bill	grey tail and primaries (darker than Glaucous-wing)
Herring Gull	large; dark mottled brown	dark bill and legs	dark tail and primaries
Western Gull	large; dark mottled brown	dark bill and legs	dark tail and primaries; whitish rump?
California Gull	medium-large; dark mottled brown	pale-based bill	dark tail and primaries
Ring-billed Gull	medium size; not uniformly mottled, whitish		hint of adult wing pattern; black band on white tail
Mew Gull	medium-small; mottled grey-brown	gentle look in eye	dark tail and primaries

to perform. . ."(229). An ideal ethnography should account for actual performance abilities as well as the potential or "competence" implied by knowledge. How does a birdwatcher use his considerable knowledge to quickly and efficiently identify birds in the field? How, in other words, is his knowledge organized? This organizational component is certainly of great importance to hunters and gatherers whose search for food depends on their ability to quickly and accurately identify natural organisms.

In Figures 9-12 I have attempted to model the organization of a birdwatcher's knowledge as used in the identification of gull species. The model is based on the theory of Information Processing Systems (cf. Geoghegan 1973). Each "assessment" or feature identification is indicated by a diamond in the diagrams. The order in which assessments are made is indicated by arrows connecting the diamonds. "Outputs," identifications of species in this case, are indicated by rectanges. The "marked" routines are processed only in exceptional circumstances and are indicated by dotted arrows. The diagrams superficially resemble a taxonomic diagram in their tree-like structure. However the nodes of the identification process are not named taxa but feature assessments. The lines connecting the nodes do not indicate "kind of" relationships as in a taxonomic diagram, but rather a temporal ordering of mental processes.

<u>Generic identifications</u>. Figure 9 is a rough outline of the automatic part of the identification process, the generic identification process. Since this section of the identification

FIGURE 9. Automatic (generic) identification routine.



Generic "assessments" are in circles.
Outputs are in rectangles.
Arrows indicate a logical ordering.

process is not consciously mediated, it is difficult to describe how it is organized. The seriation which I have imposed within this section of the process is a logical ordering rather than an empirical one.

The circular nodes here are not assessments as defined by Geoghegan (1973:21ff) except in a trivial sense. Assessments tend to have a strictly limited number of values (in this case usually two, no more than three). The rectangular nodes have a large number of possible "answers." "What kind of thing?" has many possible answers. The answers to the implied question, "What size gull?" (see Figure 10), however, are probably strictly limited by the "magic number seven" (Miller 1956) or by efficiency criteria suggested by Information Theory. Intuition argues against suggesting that the answer to the question, "What kind of thing?" involves an ordered sequence of judgments, each with a limited number of answers, e.g., Is it a tree? Yes or no. Is it a rock? Yes or no. Is it a bird? etc. The distinctive feature of "birdness" is not actively looked for with the help of a search procedure; it is passively received, as it were. The answers required by an assessment are features. The answers required by the circular nodes are outputs, i.e., the assignment of a token to a category.[7] In any case the generic identification process involves a different kind of question than the specific identification process.

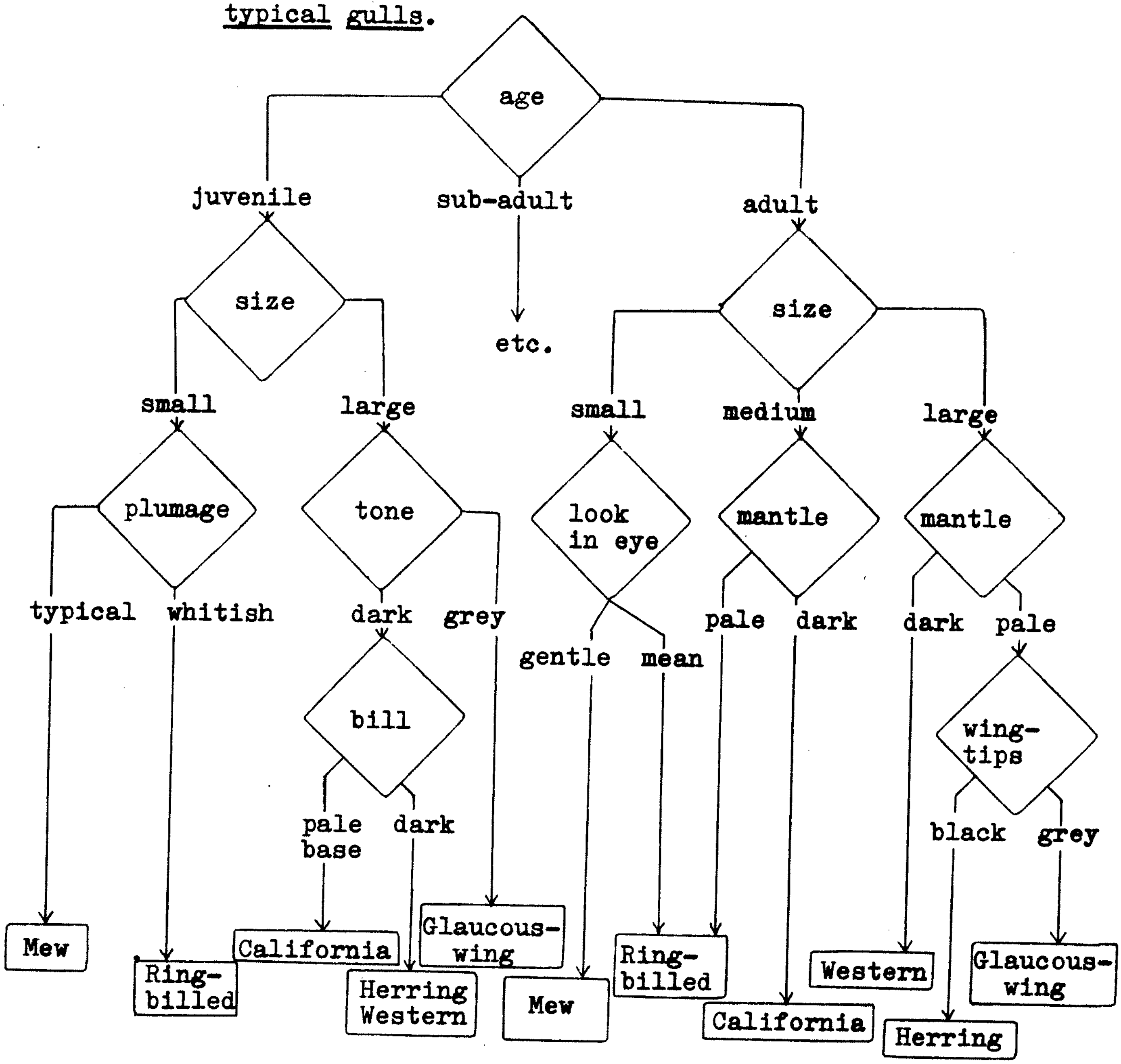
Figure 9 also illustrates the fact that the atypical gulls are identified as species <u>before</u> they are unambiguously identified as gulls. At this point the identification process clearly departs from the ordering of categories implied by the taxonomic structure. This departure is necessitated by the requirements of an efficient identification process. The most visible feature discriminating the Bonaparte's Gull (mode of flight) is not the most criterial feature for discriminating gulls as a group (contour of head and bill).

Specific identifications. Figure 10 illustrates the ordering of the assessments involved in the specific identification routine within the typical gull chain. Again the identification routine departs from the taxonomic structure. The age determination is primary and each output (species identification) is reached by several distinct paths depending on the bird's age. The ordering of the assessments in this figure is empirical rather than logical. I arrived at this particular ordering by observing my own actions while identifying gulls. Since the process is consciously mediated the stages could be isolated with fair confidence.

Interviews with other birdwatchers indicate that considerable individual variation between identification routines is to be expected. However the major portion of the variation is predictable if one knows the birdwatcher's level and breadth of experience with gulls. This problem will be analyzed in detail below (see pages 57-59).

Figure 10 indicates that size is the aspect considered next after the age determination. This attribute, as noted above, is

FIGURE 10. <u>An expert's specific identification routine: typical gulls.</u>



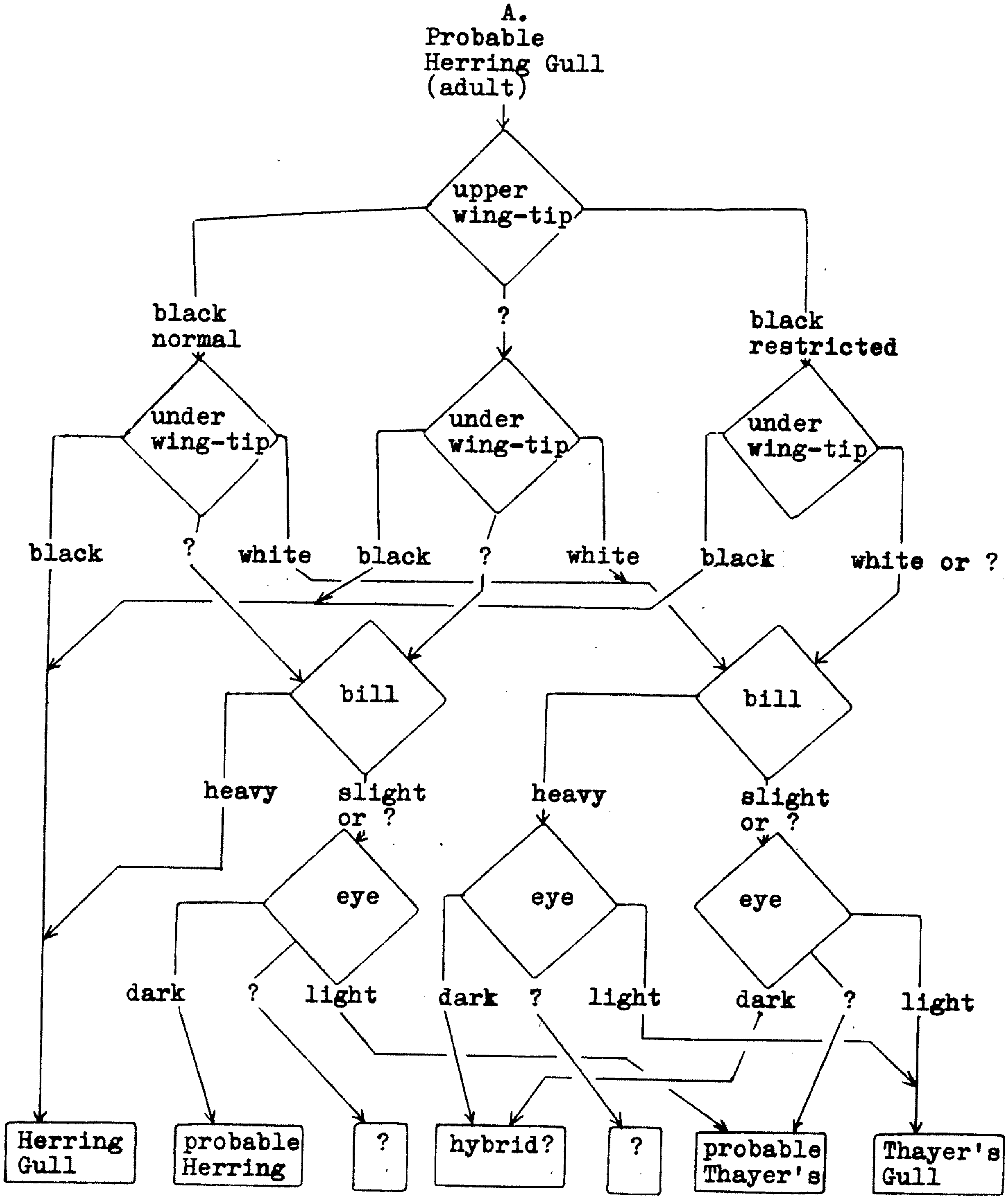
Assessments are in diamonds.
Probable outputs are in rectangles.
Arrows indicate the temporal ordering.

both highly visible and highly salient. However it is less than perfectly criterial since size ranges overlap in some areas and errors of judgment are likely due to the relative nature of size judgments. This difficulty is countered by a certain amount of built-in flexibility. For example, the Ring-billed Gull (adult) output can be reached by following either the "small size" path of the "medium size" path.

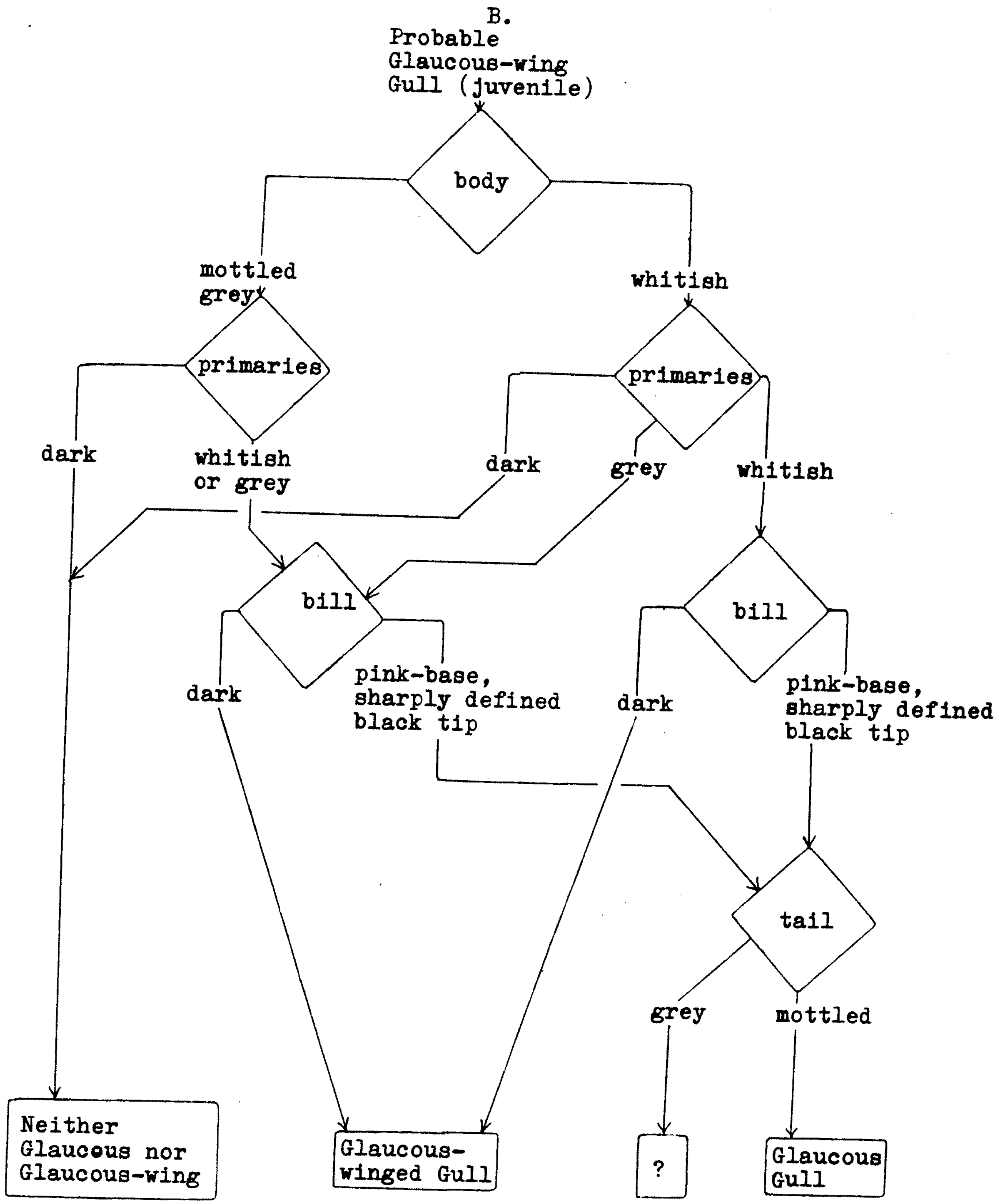
The outputs in Figure 10 are labeled "probable" and do not include the Thayer's or Glaucous Gulls. This figure illustrates the process utilized when rapid identification is the goal. Both Thayer's and Glaucous Gulls require more detailed study for their identification and neither is common. If the birdwatcher were to check every token as carefully as is necessary for the identification of these two species, time would run short and many individual birds could not be identified at all.

Marked specific identifications. Identifying subtly different rarities among a mass of common species is a very important skill for most birdwatchers. In order to do this efficiently a set of marked identification routines are held in reserve. Figure 11 illustrates two examples of such marked routines. They are entitled "Optional safety checks." These serve two purposes. First they allow the birdwatcher to make certain of a prior "probable" output as generated by Figure 10. This may be necessary if the situation requires it., e.g., if a reknowned expert is watching and you don't want to get caught misidentifying some common species. Second the marked routines may be triggered by

FIGURE 11. <u>Optional safety checks (marked specific identification routines): two examples.</u>



Assessments are in diamonds, outputs in rectangles. "?" indicates "indeterminate." Arrows indicate the temporal ordering.


B.
Probable Glaucous-wing Gull (juvenile)
body
mottled grey
whitish
primaries
primaries
dark
whitish or grey
dark
grey
whitish
bill
bill
dark
pink-base, sharply defined black tip
dark
pink-base, sharply defined black tip
tail
grey
mottled
Neither Glaucous nor Glaucous-wing
Glaucous-winged Gull
?
Glaucous Gull

a conscious desire to find an unusual species, e.g., Glaucous, Thayer's or some other rare gull, or by a subtle sense that the token observed is not quite right. In this way a birdwatcher is able to scan a large number of tokens rapidly, maximizing his chances of finding the rarities. It also helps minimize the error factor involved in rapid processing. For example, a large California Gull may be first identified as a Western. Yet it may seem not quite dark enough on the mantle. This uncomfortable feeling may trigger the marked routine allowing the observer to correct his error or verify his first impression. This routine directs his attention to details of bill and foot color, details which he ignores in the majority of cases. This organizational feature greatly increases a birdwatcher's efficiency with reference to the goals as he defines them.

A notable aspect of the marked section of the identification routine is the "looseness" of its internal organization. The assessments are not as strictly ordered as in Figure 10. The ordering here is determined more by what happens to be visible rather than by considerations of efficiency. This section of the routine is characterized also by a high degree of redundancy. For example, if a large, very pale first-year gull has a sharply defined pink-based bill, it is almost certainly a Glaucous Gull. Therefore it almost certainly has the mottled tail pattern. Yet the diagram indicates that birdwatchers check the tail pattern anyway, though only one "state" is at all probable for this assessment. The marked routine involves a suspension of the efficiency criteria in favor of criteria which might be termed "experiential." The marked routines further provide periodic checks on the accuracy of the efficient routine and allow for the possibility of discovering "new" features.

Fig 17 pl

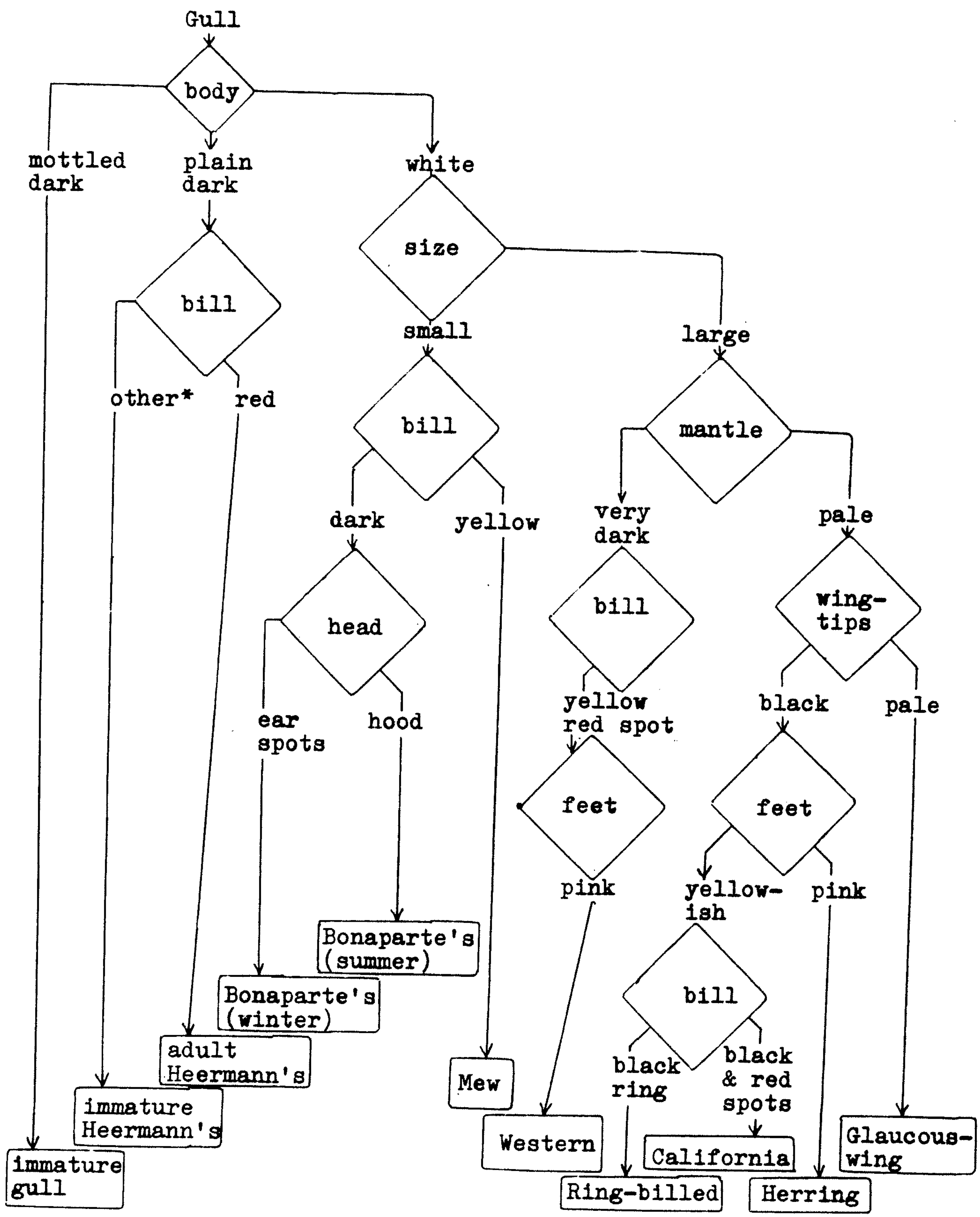
A beginner's identification process. Figure 12 illustrates the latter portion of informant five's identification routine as inferred from interview data. This informant had concentrated on "landbirds" and freely admitted he was not very familiar with gulls and other birds of the shore. He had never seen jaegers, kittiwakes or Sabine's Gulls in the field. Nor had he identified Glaucous or Thayer's Gulls. He was familiar with only one species of tern, the Caspian Tern (_Hydroprogne caspia_).

When this figure is compared with Figures 10 and 11 several noteworthy differences are apparent. First, immature gulls are not identified at the species level. Since at least 50% of the gulls one sees are immature, many tokens cannot be identified by this routine. Beginners are primarily motivated to find an example of each species rather than to identify as many individuals as possible. His identification routine is sufficient for this less ambitious goal.

Second, most species identifications of the beginner's routine require the observation of features which, though criterial, are difficult to see. This further limits the proportion of tokens which can be identified.

Third, several assessments are redundant, i.e., they have only one probable state and thus provide no additional information.

FIGURE 12. <u>A beginner's identification routine</u>.



*Informant five did not consider this possibility.

For example, this informant states that the Western Gull differs from all other gulls (except Heermann's) by its very dark mantle. Yet he suggests that the bill pattern and foot color of the Western Gull are also essential features which must be observed. It seems that he is not certain at what point the identification is secure. The assessments are organized generally in terms of visibility, the most visible preceding. **Redundant features are not held in reserve in order to** maximize efficiency.

Fourth, the major dimensions of size and mantle color are over-simplified. Two rather than three size values are distinguished. Furthermore the size continuum is not recognized as such. Informant five asserted that the Ring-billed Gull was as big as the Western Gull. Thus an absolute size distinction is perceived where none exists. Perhaps the Mew Gull's "gentle look" unwittingly enhances a subtle size difference. Similarly the mantle color distinction between the Ring-billed and California Gulls is not noted, necessitating the observation of the bill patterns.

In sum the efficient routine has more possible outputs and can process a far greater proportion of tokens more rapidly and more accurately than the beginner's routine. In terms of organization the efficient routine involves both "required" and "optional" components. The required component of the efficient routine uses fewer assessments in proportion to the number of outputs than the single component routine of the beginner. All non-essential features are incorporated into the optional routine. The experienced gull-watcher is able to make finer distinctions along the dimensions of continuous variation and he is clearly aware of the probability of error. When both the required and optional sections of the routine are considered, a greater total number of assessments are available for each output. Thus with experience the identification process exhibits both increased complexity and greater orderliness. Wallace (1961:61) has argued that this tendency is a universal characteristic of the development of human culture.

Finally, the Bonaparte's and Heermann's Gulls in the beginner's routine are identified by a specific identification process. The beginner does not perceive these atypical gulls as generically distinct. Furthermore the distinction between "big" and "little" gulls is absolute. Thus the category "gull" is partitioned into two covert categories. The typical gulls do not form a chain. The differences described between the identification routines of beginners and experts thus imply significant differences in the way gulls are classified as well. By analyzing the identification process we are able to more fully understand the process of classification and to explain the variation present within a culture in conceptions of taxonomic structure.

CONCLUSIONS

With reference to the perception and conceptualization of nature, birdwatchers do not differ greatly from other so-called primitives. The evidence of folk biology to date supports the conclusion that the natural world is not arbitrarily segmented by man. Rather the opposite; folk biological systems closely approximate the biosystematists' segmentation of the biological domains (cf. Hunn n.d.). This is no accident. Species are real for man, and many higher-level groupings, or organisms are based on distinctions difficult for any observer to ignore.

The differences between the nomenclatural systems of birdwatchers and other folk, when not readily explained, are minor. These systems differ strikingly from the biosystematists'. Since birdwatchers and other folk make fine discriminations in the field using only their eyes (binoculars are a simple extension of sight) and ears, it seems reasonable to assume that the features used by birdwatchers and other folk to identify and classify birds and the way these features are organized will closely correspond. The features used by scientists in their classification will be quite different, because scientific descriptions must be unambiguously and internationally communicable and replicable.

It might be argued, in contradiction, that birdwatchers, unlike other folk, learn to identify birds from books, and that these books are based on the work of scientists. True, birdwatchers accept the scientists' species (though, as noted, these appear to have an objective existence of their own) as the goals of their sport, and to an extent they accept the scientists' names for these species. However a brief comparison of the way birdwatchers learn with the learning process of Tzeltal children (with reference to botanical terminology: Stross 1969) demonstrates that despite the birdwatcher's reliance on books, important aspects of the learning process of both groups are similar.

Tzeltal children are not taught <u>how</u> to distinguish the organisms in their environment. Tokens are named as they are encountered. The names are provided by the adults, the local "scientists." The children generalize on the basis of a few examples. They learn to accurately distinguish the categories of natural organisms named in their language without being taught a feature definition. (Specifically-named taxa are an important exception; in these cases the name may specify the criterial feature.) In other words, they invent their identification routines for themselves.

Birdwatchers typically begin with bird books as their mentors. A bird book cannot name the tokens as they are encountered nor correct the beginner's errors. Instead they provide--in explicit verbal form--a set of features which enables the beginner to initiate the learning process on his own. However the features used by beginners--those specified in the bird guides--are not necessarily those used by the expert birdwatcher. He creates his own efficient system using features which need not be verbalizable. I clearly remember discovering for myself that the California Gull can be readily distinguished from the Ring-billed by its darker mantle. Learning to recognize the "look" in the

Mew Gull's eye was a revelation. It can hardly be described to a person who has not gradually come to recognize it. Thus it is not likely to be mentioned in a bird guide. The bird books provide verbal clues which initiate the learning process. Further progress (as in the learning process of the Tzeltal child) is largely a matter of developing one's own efficient identification routine.

It might be argued that these learning processes are, in fact, radically different, as different as the process of learning a foreign language as an adult from the process whereby a child learns to speak his native tongue. However, the acquisition of biological terminology by the Tzeltal child requires at least twelve years (Stross <u>Ibid</u>.). In general, the process of vocabulary acquisition is not comparable to that involved in acquiring grammatical rules, a process essentially complete by the fifth year, but is similar to "adult learning."

I have been able to carry my folk biological description into a relatively unexplored area. I found it necessary to isolate for analysis the identification process as distinct from the processes of classification and naming. The intricate relationships among these three aspects of folk biological systems illustrate the necessity of dealing with each of them. For example, a chain, a unit of classification, was defined partly in terms of identification processes. The existence of chains was justified by reference to an identification problem. The differences between identification routines of beginners and experts was reflected in parallel variation in their taxonomic structures. In order to decide which terms were properly part of the taxonomic system it was necessary to refer to aspects of identification and classification.

All three aspects of folk biological systems are relevant to the essential generic-specific contrast. Specific names are uncommon in natural nomenclatural systems perhaps because specific identification processes are rarely needed. We have seen that as birdwatchers gain experience they gradually "push" the level of generic identification downwards so that more terminal taxa are recognizeable as generics. Those whose livlihood depends on their ability to recognize natural "species" push the level of generic identification down to where most terminal taxa are immediately and automatically recognized. The few taxa which resist this process, or taxa which differ in but a single feature from one another, are the most likely candidates for specific names.

Specific names consist of a descriptive attributive plus a "head", which labels the superordinate generic. The descriptive attribute typically refers to a verbalizable feature. If Miller Galanter and Pribram (1960:71) are correct in asserting that conscious mediation of plans involves "talking to oneself", consciously mediated, i.e., specific, identification routines should depend on verbalizable features. This argument suggests an hypothesis for future testing:

> Taxa identified by specific identification processes will be specific or less inclusive taxa, and thus will be labeled by either specific or varietal names, i.e., secondary lexemes. Taxa identified by generic identification processes will be generic or more inclusive taxa, and thus will be labeled by primary lexemes.

If this hypothesis should be proven valid for folk biological systems in general, the allegation of universal psychological validity for the generic-specific distinction would receive strong support.

Appendix

Scientific names of gull species mentioned in the text with notes on their status in Northern California:

Glaucous Gull	Larus hyperboreus	Rare winter visitor
Iceland Gull	L. glaucoides	Not yet officially recorded in California, possibly occurs in winter
Glaucous-winged Gull	L. glaucescens	Common in winter, straggler in summer
Great Black-backed Gull	L. marinus	Occurs on Atlantic coast only
Slaty-backed Gull	L. schistisagus	Known in North America only from the Bering Sea
Western Gull	L. occidentalis	Common all year but only very near coast; breeds here
Herring Gull	L. argentatus	Fairly common in winter
Thayer's Gull	L. thayeri	Uncommon in winter
California Gull	L. californicus	Common in winter; straggler in summer
Ring-billed Gull	L. delawarensis	Common in winter; straggler in summer; breeds in NE part of state.
Mew Gull	L. canus	Common in winter only
Bonaparte's Gull	L. philadelphia	Common migrant; uncommon in winter
Heermann's Gull	L. heermanni	Common strictly on the coast; June through December
Black-legged Kittiwake	Rissa tridactyla	Common some years; uncommon in others; primarily pelagic

Red-legged Kittiwake	R. brevirostris	Bering Sea; a handful of N. Pacific coast records. Not known from California
Sabine's Gull	Xema sabini	Uncommon migrant; strictly pelagic

1. The original version of this paper was presented to Brent Berlin's seminar in ethnobiology, March 1970, University of California, Berkeley. He has been my major inspiration ever since. Helpful suggestions came also from William Geoghegan, John Gumperz, Paul Kay, and Robert Randall of the Language-Behavior Research Laboratory, University of California, Berkeley. Finally, thanks are due to the informants (listed alphabetically), David DeSante, Nancy Hunn, John Smail, Richard Stallcup, and Robert Stewart, and to all the other crazy birdwatchers who have contributed to my sanity.

2. My use of the term "primitive" here may be translated as "pre-scientific" or "non-scientific", terms which are unreasonably awkward when used repetitivly. Thus it may be inferred that the man-in-the-street of, say, New York, is "primitive". Likewise the eminent scientist when he berates his wife. If I understand Levi-Strauss (1960) correctly, his usage of "sauvage" is similarly ironic.

3. My informants are numbered, in order of decreasing experience with gulls,from one to five.

4. A recurrent problem involved in comparing the scientific taxonomic system and the folk system of the birdwatcher, on the one hand, with the more "natural" folk systems on the other, is the fact that scientists and birdwatchers are both far more mobile than people of traditional cultures. The scientists' system is world-wide. Most birdwatchers travel hundreds of miles seeking varied habitats in which to observe new species of birds. The

range of experience of a subsistence agriculturalist or a hunter-gatherer is far more restricted. Thus the fact that species may vary clinally over their geographic range is of no concern to him. Each breeding species which he is likely to encounter in his range will be discretely distinct from all others, in one respect or another. This is a biological fact. Thus it could be argued that the "existence of areas of relatively continuous variation in the real world" would pose no problem for most folk taxonomists. Two exceptions limit the validity of this argument. Migratory species (primarily birds) present the first exception, a limited one. Many slightly varied geographical forms of a single species may winter in or migrate through the same restricted territory. Confusion as to the boundaries of natural species could result. Second, and most important, "continuous variation" is often the rule rather than the exception among genera and other higher-level taxa within groups which are currently evolving rapidly, e.g., the passeriform birds. Thus the chaining principle may be an important factor when folk taxa correspond to higher-level scientific taxa.

5. This assertion is related to the regularities noted with reference to the so-called Willis distribution (cf. Herdan 1960: 210-225). Geoghegan has shown that the number of generic taxa of a given degree of polytypy in folk systems may be described by such a distribution (n.d.). However supergeneric taxa clearly do not fit this pattern.

6. The selection of a type or focal species for a group might be affected by other considerations, e.g., relative abundance or cultural significance.

7. Generic identification routines resemble Geoghegan's "marking rules" (1973:266-335) in that perceptual stimuli act as "cues" (Ibid., 278-279). However, the several other characteristics of marking rules cited by Geoghegan do not appear to be relevant here. The special routines I label "marked identification routines" are marking rules in that 1) an output (probable) is the starting point for the marked identification routine, 2) assessments are not strictly ordered, and 3) they are optional (Ibid., 275-277).

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