BULLETIN

OF THE

MUSEUM OF COMPARATIVE ZOOLOGY

AT

HARVARD COLLEGE, IN CAMBRIDGE

VOL. 109

CAMBRIDGE, MASS., U. S. A.
1953

The Cosmos Press, Inc.
Cambridge, Mass., U.S.A.

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2. A REVISION OF THE ABYLINAE

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Publications Issued by or in Connection with the

MUSEUM OF COMPARATIVE ZOOLOGY AT HARVARD COLLEGE

Bulletin (octavo) 1863 — The current volume is Vol. 109.

Breviora (octavo) 1952 — No. 13 is current.

Memoirs (quarto) 1864–1938 — Publication was terminated with Vol. 55.

Johnsonia (quarto) 1941 — A publication of the Department of Mollusks. Vol. 2, no. 31 is current.

Occasional Papers of the Department of Mollusks (octavo) 1945 — Vol. 1, no. 17 is current.

Proceedings of the New England Zoölogical Club (octavo) 1899–1948 — Published in connection with the Museum. Publication terminated with Vol. 24.

These publications issued at irregular intervals in numbers which may be purchased separately. Prices and lists may be obtained on application to the Director of the Museum of Comparative Zoölogy, Cambridge 38, Massachusetts.

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No. 1—*Notes on Siphonophores.* *2. A Revision of the Abylinae*

By Mary Sears[1]

Woods Hole Oceanographic Institution

CONTENTS

[1] Papers from the "Dana" Collection No. 31, and Contribution No. 602 of the Woods Hole Oceanographic Institution.

INTRODUCTION

Probably no plankton collection other than that of the "Discovery" has yielded such an abundance of siphonophores for studies of geographical distribution as that of the Carlsberg Foundation's Oceanographical Expedition Round the World, 1928–30, on the "Dana" (Carlsberg Foundation, 1934; 1944). In addition, the "Dana" material has provided an extensive series of abylids which were represented in earlier collections by only an occasional individual. Thus, it provides one of the first opportunities in recent years to re-examine this subfamily systematically. As a result, a number of misconceptions that have appeared in the literature during the last seventy-five years or more[1] can now be amended. From our observations of well-preserved colonies, the polygastric generation of most of the known members of this group can now be recognized with little difficulty. In addition, the characteristics of the eudoxids for the long established genera are now well defined. The new information at hand is sufficient to make it worthwhile to record our observations at this time with the hope of establishing a more natural grouping of the Abylinae, similar to that already developed by Totton (1932, pp. 345–346) for the Diphyinae, and to call attention to the points requiring further study when better material becomes available.

Several important contributions to our knowledge of the Abylinae are afforded by the "Dana" specimens listed in the appendix to this

[1] It should be remembered that earlier workers whose observations do not always appear correct, were handicapped in the days before formalin came into general use as a preservative (about 1900). Due to the shrinkage of specimens preserved in alcohol, they were forced to make most of their observations and sketches in the field and could not recheck them later. Dr. Bigelow informs me, for example, that all of Dr. Mayer's figures were made from life, in the field, for this reason and that he did not have the specimens available when writing his papers.

report. (1) Four new species of *Abyla* are reported: *A. schmidti* and *A. tottoni* (both previously confused with *A. trigona*), *A. ingeborgae*, (with an extra facet similar to *A. haeckeli*) and *A. brownia*. In addition, a new species, *A. peruana*, found in the "Albatross" material in the U. S. National Museum is described. (2) *Abyla carina*, long considered as a synonym for *A. trigona*, is reinstated as a good species. (3) The inferior nectophore of *Abyla bicarinata* Moser is now definitely known. (4) The truly prismatic superior nectophores of *A. haeckeli* were taken together with cormidia and small inferior nectophores attached within the hydroecium of several superior nectophores. (5) Two species, *leuckartii* and *dentata* formerly referred to the genus *Abyla*, are now transferred to the genus *Ceratocymba*. (6) The eudoxid of *Ceratocymba dentata* Bigelow previously identified by Totton (Moore, 1949) is figured and described for the first time. (7) The superior nectophore of a third new species, apparently a transitional one between *dentata* and *sagittata* is also described as *C. intermedia*. (8) It is possible to corroborate Bigelow's (1918) characters for distinguishing the bract of *Ceratocymba sagittata* Quoy & Gaimard from those of all other abylids. (9) Several additional, though minor, characters have been found for distinguishing more readily the superior nectophores and gonophores of *Abylopsis tetragona* Otto and *A. eschscholtzii* Huxley — even despite poor preservation — than was possible with Bigelow's (1931) criteria. (10) Well preserved gonophores can now be identified at least to genus in the absence of the bract, in all cases where the eudoxid is known. (11) Finally, four genera, *Pseudabyla*, *Pseudocymba*, *Pseudabylopsis* and *Abylopsoides*, are provisionally described. The structure of these suggests a tendency, not generally recognized among abylids, for the superior nectophores to develop asymmetrically as well as to increase or decrease the number of facets.

The revision is chiefly based on the "Dana" material, but I have also been able to compare this series with specimens taken on the "Albatross" and "Bache" in the collections of the Museum of Comparative Zoology at Harvard College and of the U. S. National Museum. These specimens were used in studies of the group made by Bigelow (1911; 1913; 1918; 1919) and I have therefore had the opportunity of checking my identifications with his. I have also had the privilege of receiving Dr. Bigelow's friendly advice and criticism, which encouraged me to attempt such a comprehensive review. In

addition, I wish to thank Captain A. K. Totton of the British Museum for his generosity in providing me with sketches, a discussion of his observations, and other material. Without his ready assistance I could not have clarified the status of *Abyla trigona* and *A. carina*. Similarly, Mr. A. Franc of the Museum National d'Histoire Naturelle, Paris, has kindly helped me in ascertaining the identity of Quoy and Gaimard's *Abyla trigona*. Dr. H. Engel of the Zoölogisch Museum, Amsterdam, loaned me not only the "Siboga" specimens of *A. trigona*, but also the type of *A. haeckeli*. I am also extremely indebted to Dr. Å. Vedel Tåning, Director of the Marinbiologisk Laboratorium, Charlottenlund, Denmark, for entrusting me with the examination of the "Dana" siphonophores and for his hospitality at the laboratory on two occasions. Finally, I am beholden to the Milton Fund for the grant to Dr. Bigelow which enabled me to make the first visit to Denmark in 1934 and to the Rask-Orsted Foundation for a most generous grant which permitted me to make a second trip in 1946.

ABYLINAE L. Agassiz, 1862

Within recent years, the group of species under discussion here have been generally accepted, with two exceptions (Totton, 1932, p. 328; Leloup, 1934, p. 4), as forming the Subfamilies, Abylinae L. Agassiz and Ceratocymbinae Moser, of the Family Diphyidae (Bigelow, 1911; 1931; Moser, 1925). Totton (1932), however, elevated the Abylinae to the status of a family because observations of living specimens led him to believe that the functions of the nectophores were so distinctive that separation from the Diphyidae was warranted. Whatever the merits for such action may be, function cannot be used as a means for distinguishing siphonophore families in most plankton collections. It therefore seems to me that structure, rather than function, is preferable for differentiating the families in this group, in a report such as this which is based entirely on preserved specimens. As a result, the closely related genera under consideration are placed in the Abylinae, a subfamily of the Diphyidae,[1] following other recent students of the group (Bigelow, 1911; Moser, 1925; Browne, 1926) rather than Totton (1932) and Leloup (1934).

[1] The Diphyidae, broadly speaking, include all siphonophores with two nectophores of dissimilar structure (Bigelow, 1911). For exceptions, see remarks in next paragraph on certain monophyid species.

I do subscribe, however, to certain innovations made by Totton as they appear to lead to a more natural grouping. In discussing his Abylidae, Totton (1932, p. 331) compares *Ceratocymba* (under the name *Diphyabyla*[1]) with *Abyla*, in such a way that it is to be presumed that he tacitly, at least, abandoned the Subfamily Ceratocymbinae of Moser (1925, p. 267), as had Browne (1926, p. 58) before him, in accordance with Bigelow's (1911, pp. 215–216) earlier views. This course has also been taken more recently by Leloup (1934, p. 4). Most recent authors have agreed that the peculiar prolongation of the apex of the superior nectophore of *Ceratocymba sagittata* hardly seems sufficient to warrant a special subfamily for this one species. At that time the genus was monotypic but, as already mentioned, two species previously referred to the genus *Abyla*, *leuckartii* and *dentata*, together with a new species, *intermedia*, are at present included in it. These form a well-defined transition from a species with no apical prolongation (*leuckartii*) to a marked one (*sagittata*) (Fig. 1)[2]. In short,

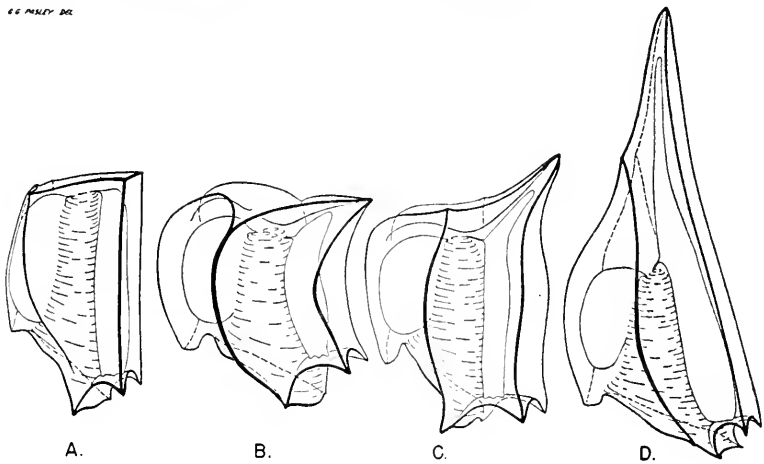


Fig. 1. Outline sketches of superior nectophores of *Ceratocymba*. A. *Ceratocymba leuckartii*. B. *C. dentata*. C. *C. intermedia*. D. *C. sagittata*.

[1] This name was superseded by *Ceratocymba sagittata* Quoy and Gaimard, when it was definitely proven that the eudoxid of that name belonged to the superior nectophore of Lens and Van Riemsdijk's *Diphyabyla hubrechti* (Moser, 1913; 1925; Bigelow, 1918, p. 412).

[2] The drawings throughout this paper have been prepared by Mr. Gale G. Pasley, to whom I am indebted for his painstaking efforts to devise a technique for illustrating transparent, geometric objects such as siphonophores, for his accurate observation of obscure details, and for his cooperation in making the drawings conform to the rather unusual requirements occasioned by the peculiarities of the group.

there now appears to be less justification than ever for maintaining a separate subfamily for *Ceratocymba sagittata*. Likewise, it is now agreed (Leloup, 1934; Bigelow and Sears, 1937, pp. 4–5) that Totton's (1932, p. 327) treatment of monophyid species results in a more natural classification of the heterogeneous genera previously referred to the Monophyidae. Within the limits of the present paper, *Enneagonum hyalinum* Quoy and Gaimard is the only such species definitely proven to be monophyid. In the Abylinae, as here defined, then, are included *E. hyalinum* and *Ceratocymba sagittata*, together with three other species now assigned to that genus.

The Abylinae differ from the other subfamilies of the Diphyidae in that the superior nectophores are rather generally prismatic and are distinctly smaller than the inferiors (with the exception of the modification found in *Ceratocymba sagittata*). The inferior nectophores are typically diphyid in character, with a basic plan of five ridges. There is a definite tendency, however, for one or another of the ridges to be suppressed (*Abyla*, *Ceratocymba* and *Bassia*) while others may be greatly expanded to form wing-like structures (*Abyla*). Supernumerary ridges may also be present (*Ceratocymba*). The bracts, like the superior nectophore, are prismatic and are larger and more conspicuous in the known species of *Ceratocymba* than those of other diphyids. Despite the diverse shapes of the bracts in this subfamily, they all have a basic plan which has been homologized and well illustrated by Totton (1932, p. 337, text fig. 17). A modified copy of his figure (Fig. 2) is included here to differentiate the bracts more clearly than can be done by words alone. It will be noted that in addition to differences in external shape, various portions of the somatocyst may be absent. Thus, in some the anterior median horn (or oleocyst) is missing, in one the median dorsal descending branch, and in another, the two ventro-lateral branches. Abylid gonophores are usually larger and more robust (*Abyla*, *Ceratocymba*, *Enneagonum*) than those of other diphyids and in many ways resemble the inferior nectophores of the group especially in the arrangement and size of the oral teeth. In one genus (*Abylopsis*), they appear both in size and in the arrangement of the ridges somewhat like those of the Diphyinae but the prominent apophysis, especially in the young stages, readily distinguishes them. The latter is markedly developed in all known genera of this group.

Before proceeding further, it appears desirable not only to present

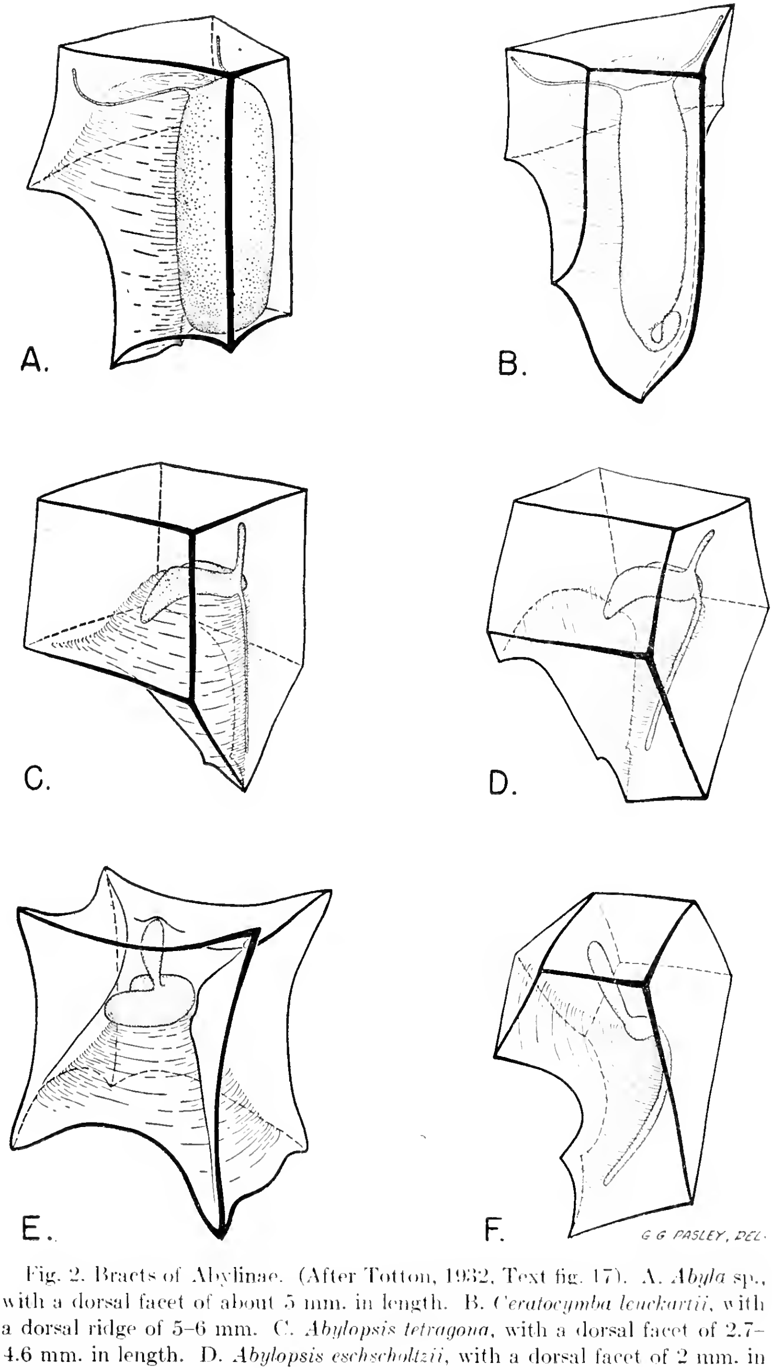


Fig. 2. Bracts of Abylinae. (After Totton, 1932, Text fig. 17). A. *Abyla* sp., with a dorsal facet of about 5 mm. in length. B. *Ceratocymba leuckartii*, with a dorsal ridge of 5–6 mm. C. *Abylopsis tetragona*, with a dorsal facet of 2.7–4.6 mm. in length. D. *Abylopsis eschscholtzii*, with a dorsal facet of 2 mm. in length. E. *Enneagonum hyalinum*, with a dorsal facet 10.3 mm. in greatest length. F. *Bassia bassensis*, with a dorsal facet of 5 mm. in length.

a problem which has arisen as a consequence of finding a half dozen superior nectophores of some new asymmetrical abylids in the "Dana" samples, but also to indicate my reasons for solving it by describing them as new species. These specimens are peculiar in that they have a curious asymmetry not found in other previously known members of the group. Therefore, since there are only one or two of a kind, it has been said that they are "monsters" (Totton, 1952). It seems to me difficult to draw a dividing line between "monsters" and valid species in this instance. One cannot say that because there is only one of a kind that it is a freak of some sort. In the literature, there are numerous examples of a genus or species described from one or two individuals. Over the years these have proven to be well-founded. On the other hand, there are examples of genera and species which were described when a good series were available for study and which have later been relegated to the synonomy of other well-known forms. A small number of specimens, then, is not a good reason for ignoring them.

Furthermore, on the basis of the present generic definitions for abylids, it would be difficult to draw the line between "monsters" and valid genera. In the Abylinae, the latter are differentiated by the number and arrangement of facets and ridges of the superior nectophore, in conjunction with the character of the hydroecium. It happens that in such well-established genera as *Abyla* and *Ceratocymba* the presence of two horizontal ridges subdividing the ventrolateral facets and an apical transverse ridge distinguishes the superior nectophores of *Abyla* from those of *Ceratocymba*. Both are symmetrical. It could equally well be, it seems to me, that the arrangement of the ridges or facets might be such as to make the superior nectophore asymmetrical. This is the situation found in *Pseudabyla*, *Pseudocymba* and *Abylopsoides* as described below. (In *Pseudabylopsis*, the asymmetry has chiefly developed in the region of the hydroecium.) Are we then to consider that all asymmetrical forms are "monsters" and symmetrical ones valid species? It hardly seems reasonable, especially as among the hundreds of thousands of specimens of *Abylopsis* examined within the past few years only a half dozen have been "monsters" and another half dozen mutilated, but recognizable as belonging to one of the known species. Were members of the genus *Abylopsis* highly variable, such variability should be described by a normal distribution curve. Obviously, from the above figures, this is not true, at least within the wide limits to be expected, if the "monsters" are extreme cases. Although not nearly as many specimens of *Abyla* and *Ceratocymba* have been examined, there is no indication that they are highly variable. In short, we have a series of specimens, although asymmetrical, which are as obviously related to the known abylids as are the previously described abylid genera.

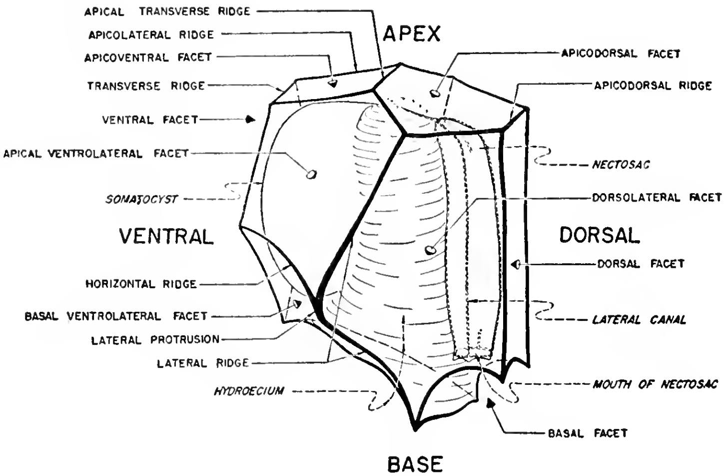
One further point is of interest in arriving at our conclusion concerning these specimens. There appears to be a tendency among coelenterates for a seemingly good species to appear in a particular locality, often in considerable numbers, and after a time to disappear, never to be seen again. Examples that readily come to mind are the leptomedusan species, *Pseudoclytia pentata* (Mayer, 1910) and the siphonophore, *Dromalia alexandri* (Bigelow, 1911). These seem to have been accepted as legitimate species, because a number of specimens were found in tolerably good condition. In describing them there was no reason to suppose that they would vanish. There is, of course, always the chance that they will reappear sometime in the future. Consequently, they have not been discarded as freaks. It is conceivable that the same may be true of the new abylid genera described below.

Finally, if these specimens were described without placing them in an appropriate place in the taxonomic scheme, their true affinities would not be clear. As a result, they would probably be overlooked by future students. Hence, there might be a considerable delay in coming to an understanding as to their true position among siphonophores. On the other hand, if they are treated as they are here, their status may be clarified sooner. In short, it appears that there is sufficient justification for describing them as new.

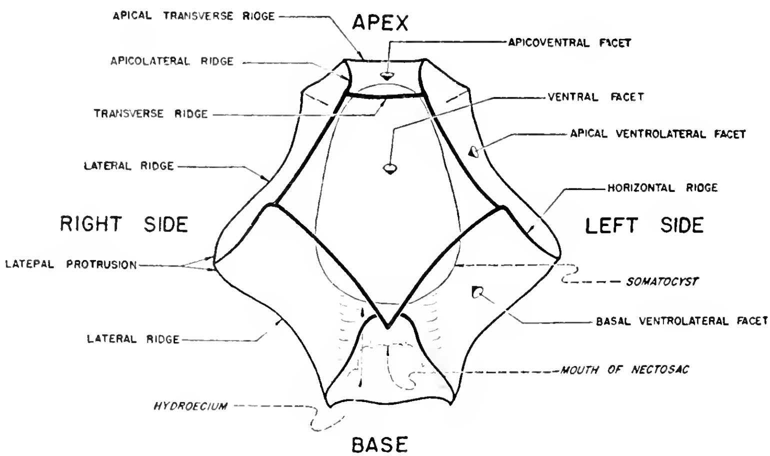
In describing the genera of the Abylinae, in general, it appears wise to base the definitions primarily on the superior nectophores because without these the colony could not exist. Among the long established genera, the arrangement of the facets and ridges on the superior nectophores appears to provide the most reliable characters upon which to differentiate the genera one from another (Figs. 3–4). Other secondary characters are to be found in the depth of the hydroecium, in the shape of its opening, in its position with reference to the somatocyst and nectosac, and in the shape of the somatocyst, as well as in the character of the bract (Fig. 2) and the inferior nectophore (Fig. 5).

In only two genera, *Pseudabylopsis* and *Abylopsoides*, is it impossible

G G. PASLEY DEL



A.



B.

Fig. 3. Diagrammatic drawing of superior nectophore of *Abyla haeckeli*. A. Dorsolateral view. B. Ventral view.

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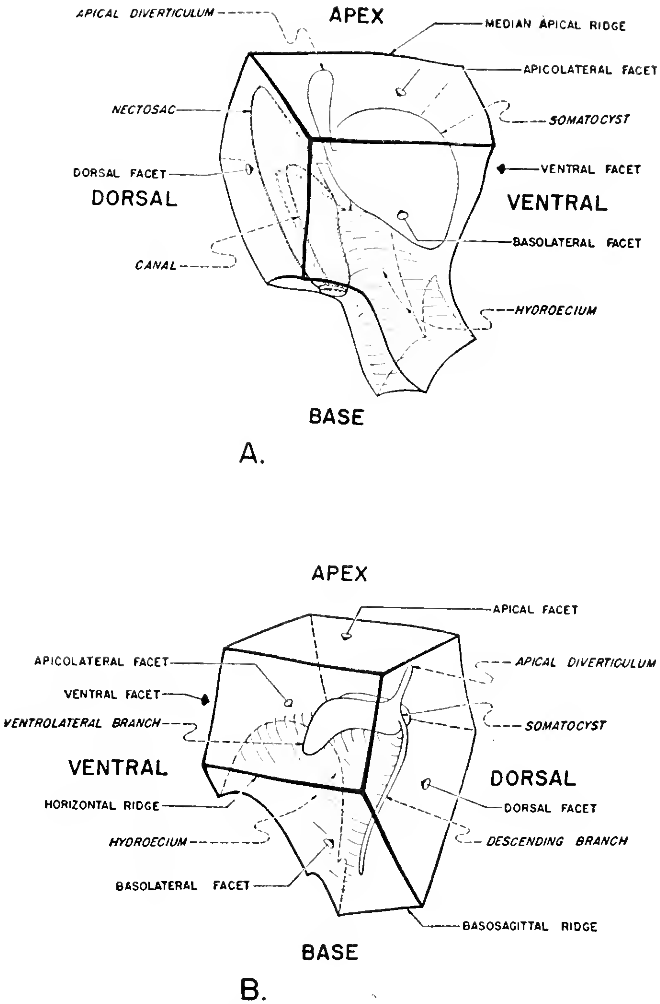

Fig. 4. A. Diagrammatic drawing of superior nectophore of *Abylopsis*. Dorsolateral view. B. Diagrammatic drawing of bract of *Abylopsis*. Dorsolateral view.

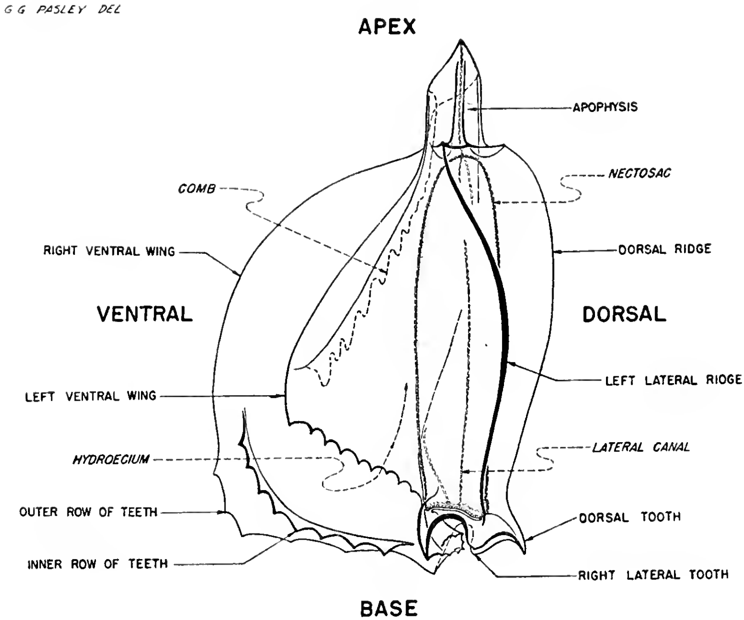

Fig. 5. Diagrammatic drawing of inferior nectophore of *Abyla tottoni*. Left lateral view.

to use the facets and ridges as a basis for separating them from all others. Thus, specimens have been found with an apical facet (as in *Ceratocymba*) or with a transverse apical ridge (as in *Abyla*). As a result were we to use merely the number and arrangement of the facets in each case in devising a key, the various species of *Pseudabylopsis* or *Abylopsoides* might be referred to *Abyla*, or *Ceratocymba* or the two closely allied genera, *Pseudabyla* or *Pseudocymba*. Yet, one recognizes a close affinity with *Abylopsis* because of the position of the hydroecium relative to the nectosac and somatocyst, as well as in the basal configuration. In most specimens of *Pseudabylopsis* and *Abylopsoides* the opening to the hydroecium is essentially a square with the corners marked by more or less well defined teeth. This is in contrast to the four genera (*Abyla*, *Ceratocymba*, *Pseudabyla*, *Pseudocymba*) in which this opening is more nearly triangular coming to a point beneath the somatocyst. The hydroecium itself in *Pseudabylopsis* and *Abylopsoides* is situated either below the somatocyst or is only partially intruded between the somatocyst and nectosac as in *Abylopsis*. On the other hand, in the other four genera, it completely separates these structures.

For convenience, we[1] have devised purely arbitrary keys, and we have included synonymies, figures, and sufficiently detailed descriptions of all the Abylinae in our discussion, to distinguish the genera and species which we have examined, without recourse to the widely scattered papers which have appeared in the last 125 years and which are not available in many libraries in this country.

The first key affords a means for separating the superior nectophores of the Abylinae into genera. As the parts are so often found separated from one another we have prepared keys not only for the superior nectophores, but also for the inferior nectophores, the bracts, and the gonophores, insofar as these are known. For a colony (i.e., both nectophores attached), the key to the superior nectophores will be the easier to use. The other keys are based on the obvious characters and structural peculiarities which we have found the most useful in our examination of the "Dana" material for distinguishing the various genera even when these are not too well preserved. The keys, as stated earlier, are thus entirely artificial and make no attempt to indicate possible relationships.

Care must be taken in using the keys to species because many specimens are so damaged or so shrunken by the preservative that they cannot always be recognized by any particular character. For this reason, it is almost impossible to discover relative proportions which might prove distinctive for any given species. We believe, however, that we have found characters to use in the keys which will be constant no matter what the conditions of the specimen. Nevertheless, in many cases, identification should not be made with certainty without consulting the descriptions and figures of the individual species given below.

To use the keys or read the subsequent descriptions, it is necessary to understand the terms used in describing bilaterally symmetrical

[1] My assistant, Miss Joan A. Brown, has been especially helpful in discussions as to the characters which prove most helpful in identifying the individual parts. Her careful attention to such details while sorting hundreds of thousands of specimens has made the burden of the work much lighter. In fact, it was she who first called my attention to the first colony of *Abyla bicarinata* and who found the specimens of *Abyla ingeborgae*, *A. brownia*, *Pseudabyla irregularis*, *P. dubia*, and the oddities referred to *Abylopsoides* and *Pseudabylopsis*.

animals as applied to accounts of radially symmetrical forms such as siphonophores, because this convention has resulted in so much confusion and so many inconsistencies in earlier papers (Bigelow and Sears, 1937, p. 4). The same arbitrary system, as was adopted earlier by Bigelow and Sears (1937, pp. 3–4) has been accepted here to conform with earlier work (Bigelow, 1911, 1918, 1919, 1931): "dorsal" is used for the abaxial side of eudoxids and of both nectophores, "ventral" for the axial, "anterior" or "apical" for the aboral end of the nectophores, and "posterior" or "basal" for the oral end, i.e., the end containing the opening to the nectosac. In the bracts, the upper end when the bract is attached to the stem becomes the apical or anterior end. "Left" and "right" sides of the bract then become automatically defined as they do in bilaterally symmetrical organisms.

It should also be noted that in describing an individual species, generic characters are not repeated unless needed for emphasis or clarity of some particular point. Furthermore, minute details of serrations on the ridges, the arrangement of the canals, etc. are not included unless they will prove helpful in distinguishing one species from another. In many instances, there appears to be considerable variation, in this respect, younger specimens being more strongly serrated than older ones. This suggests that serrations may wear off with age.

Finally, since so many specimens were damaged in one part or another, we have examined a series of individuals, whenever possible, to make sure that the specimens drawn were representative of the species. If only a single specimen is available, the details of that individual have been carefully reproduced. We believe the illustrations are thus more nearly like the living specimens. In most cases, the drawings seem quite characteristic of all sizes, except for the gonophores. The only specimens of these which were sufficiently well preserved to study in any detail were generally the smaller ones which were shielded within the bracteal hydroecium. For this reason, the apophyses are probably somewhat more prominent than in older specimens. The diagnostic characters, however, are present even in very young specimens, but the changes in the relative size and shape of the apophysis with the growth to the gonophore as a whole are not yet known.

Key to Known Genera of the Abylinae

A. Superior nectophores.
  1. Nectophores with roughly square opening to the hydroecium; hydroecium lies below somatocyst or only partially separates the latter from the nectosac 2
     Nectophores with roughly triangular opening to the hydroecium; hydroecium separates somatocyst from nectosac 6
  2. Nectophores with median apical ridge, dorsal and ventral facets, as well as lateral facets subdivided by a horizontal ridge 3
     Nectophores with one or more of these facets replaced by ridges or subdivided by the presence of additional ridges 4
  3. Somatocyst with apical diverticulum . . . . *Abylopsis* Chun 1888
     Somatocyst without apical diverticulum . . . . *Bassia* L. Agassiz 1862
  4. Nectophores with opening to nectosac next to dorsal wall of hydroecium at the base of a large triangular basal facet . . . . *Enneagonum* Quoy and Gaimard 1827
     Nectophores with opening to nectosac at base of rectangular or pentagonal basal facet next to dorsal wall of hydroecium 5
  5. Nectophores with more than seven facets . . . . *Pseudabylopsis* n. gen.
     Nectophores with fewer than seven facets . . . . *Abylopsoides* n. gen.
  6. Nectophores with apical transverse ridge 7
     Nectophores without apical transverse ridge 8
  7. Ventral and dorsal facets present . . . . . . *Abyla* Quoy and Gaimard 1827
     Ventral or dorsal facet absent . . . . *Pseudabyla* n. gen.
  8. Ventral and dorsal facets present . . . . *Ceratocymba* Chun 1888
     Ventral and/or dorsal facet absent . . . . *Pseudocymba* n. gen.

B. Inferior nectophores.
  1. Nectophore with five ridges . . . . *Abylopsis* Chun 1888
     Nectophore with four ridges 2
  2. Basal teeth slightly developed projections . . . . . *Bassia* L. Agassiz 1862
     Basal teeth large and obvious 3
  3. Right lateral ridge suppressed . . . . *Abyla* Quoy and Gaimard 1827
     Dorsal ridge suppressed; a supernumerary ridge is present on right ventral wing . . . . *Ceratocymba* Chun 1888

C. Bracts.
  1. Bracts with median dorsal ridge 2
     Bracts with a dorsal facet rather than median dorsal ridge 3
  2. Bract with two slender branches of somatocyst extending forward toward ventro-lateral margins and a stout median descending branch curved dorsad at posterior end . . . . *Ceratocymba* Chun 1888
     Bract without ventro-lateral branches to somatocyst; somatocyst has

a thin descending branch and a somewhat swollen apical horn . . . . . . *Bassia* L. Agassiz 1862
3. Bract imperfectly truncated pyramid; somatocyst with very much inflated descending branch and two very slender branches extending toward ventro-lateral margins . . . . *Abyla* Quoy and Gaimard 1827
Bract not of this type 4
4. Bract cuboidal; somatocyst with apical horn and two short, stubby ventro-lateral branches . . . . *Enneagonum* Quoy and Gaimard 1827
Bract prismatic; somatocyst with a slender descending branch, a small apical horn and two short, inflated ventro-lateral branches . . . . *Abylopsis* Chun 1888

D. Gonophores.
1. Gonophores with four relatively inconspicuous teeth 2
Gonophores with five prominent teeth 3
2. Ventral ridges diagonal apically . . . . *Abylopsis* Chun 1888
Ventral ridges vertical; all ridges opaque (Moser, 1925, pl. 22, figs. 6 and 8) . . . . *Bassia* L. Agassiz 1862
3. Dorsal, one lateral, and one ventral ridge incomplete; deep pockets beneath apophysis . . . . *Enneagonum* Quoy and Gaimard 1862
Dorsal ridge, alone, incomplete 4
4. Lateral ridges meet in arch at their apical ends, forming a pocket; apicolateral ridge with indentation beneath it; these ridges lie well below apex of nectosac . . . . *Abyla* Quoy and Gaimard 1827
Lateral ridges joined by obvious apicodorsal ridge, it and apicolateral ridge lack pockets; both are situated above apex of nectosac . . . . *Ceratocymba* Chun 1888

ABYLA[1] Quoy and Gaimard 1827

Genotype: Abyla trigona Quoy and Gaimard 1827

Generic characters

Superior nectophore (Figs. 6, 8, 9, 10, 12, 13, 14). In *Abyla*, the superior nectophores have ten or eleven facets. Like all abylids with a triangular hydroecial opening, the superior nectophores have an apical facet rather than a median apical ridge. In addition, they are characterized by an apical transverse ridge subdividing this surface into an apicodorsal facet and an apicoventral portion. The latter merges with the shield-like ventral surface to form a single facet in all

[1] As defined here the genus *Abyla* includes *A. trigona* Quoy and Gaimard, *A. carina* Haeckel, *A. haeckeli* Lens and Van Riemsdijk, *A. bicarinata* Moser, *A. schmidti*, n. sp., *A. ingeborgae* n. sp., *A. brownia* n. sp., *A. tottoni* n. sp., and *A. peruana* n. sp.

but two of the known species. In these, a second transverse ridge further subdivides that facet into ventral and apicoventral facets. Lateral ridges extending from the lateral corner of the apicodorsal facet to the basal margin of the hydroecium divide the sides into dorsal and ventral facets. The latter are subdivided by a horizontal ridge into apical and basal portions. In addition, there is an almost square basal facet surrounding the opening to the nectosac and a rectangular dorsal one.

In most species there may be fine serrations on the ridges, especially on the basal half, but they seem to "wear off" as they are not always present. These fine serrations are omitted from the drawings, because they do not show with the magnification used. The more rugged serrations are, however, shown and it is these which appear distinctive.

The arrangement of the internal structures is quite unlike that of other diphyids. Thus, in *Abyla*, as well as in *Pseudabyla*, *Pseudocymba*, and most species of *Ceratocymba*, the hydroecium is relatively deep, extending nearly the full height of the nectophore. It is wedged in between a large oval somatocyst on its ventral side and a long narrow nectosac on the dorsal. In *Abyla*, however, the keel beneath the somatocyst is at about the same level as the opening to the nectosac. The four radial canals, a dorsal, a ventral and two laterals diverge from a point near its apex.

Inferior nectophore (Figs. 7, 11, 15). The inferior nectophores of *Abyla*, exclusive of the long tapering apophysis, are often only slightly longer than they are wide. The right lateral ridge is completely suppressed,[1] so that a dorsal and left lateral are the only ones present, other than the two ventral wings. These in reality are the expanded and modified ridges forming the hydroecium. On the inner apicoventral surface close to the margin of the left ventral wing is a comb with teeth. These vary in number with the species. The basal margin of this wing has a series of jagged serrations. The number of these serrations varies, but this appears to be an individual variation rather than a specific one, insofar as we have been able to determine. The right ventral wing, on the other hand, has two rows of teeth separated by a thickening along the basal margin. These may also continue for a slight dis-

[1] Haeckel (1888a, p. 158) states that the "right dorsolateral ridge [i. e., right lateral] is the smallest and more rudimentary," and Bigelow (1911, p. 214) says that "the right lateral ridge is nearly but not altogether, suppressed." As noted by Gegenbaur (1860, p. 341), the right lateral ridge is absent. This is true not only of all the specimens in the "Dana" collection, but also of those specimens of Quoy and Gaimard (1827), Haeckel (1888a), and Bigelow (1911) which have recently been re-examined.

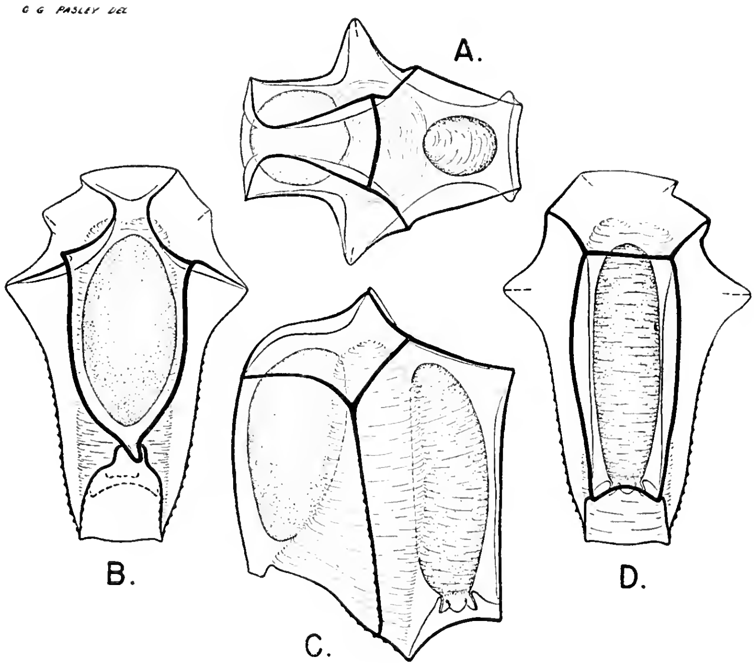

Fig. 6. Superior nectophore of Quoy and Gaimard's *Abyla trigona* of about 7 mm. in height. A. Apical view. B. Ventral view. C. Lateral view. D. Dorsal view.

tance along the ventral margin. The exact size, configuration and dentition of the basal margin is characteristic and affords a means for separating the species.

The absence of the right lateral ridge has seemingly effected a slight shift in the position of the right subumbral canal. Its insertion on the circular canal lies just above the right lateral tooth (mentioned below), but thence it bends rather sharply ventrad and comes to lie below the right ventral wing. It follows the sinuous course of the latter toward the apex where it joins the apical canal in a normal way. The other three canals are in their usual position.

There are five robust triangular oral teeth which are usually serrated. The two lateral ones curve inward toward the opening of the

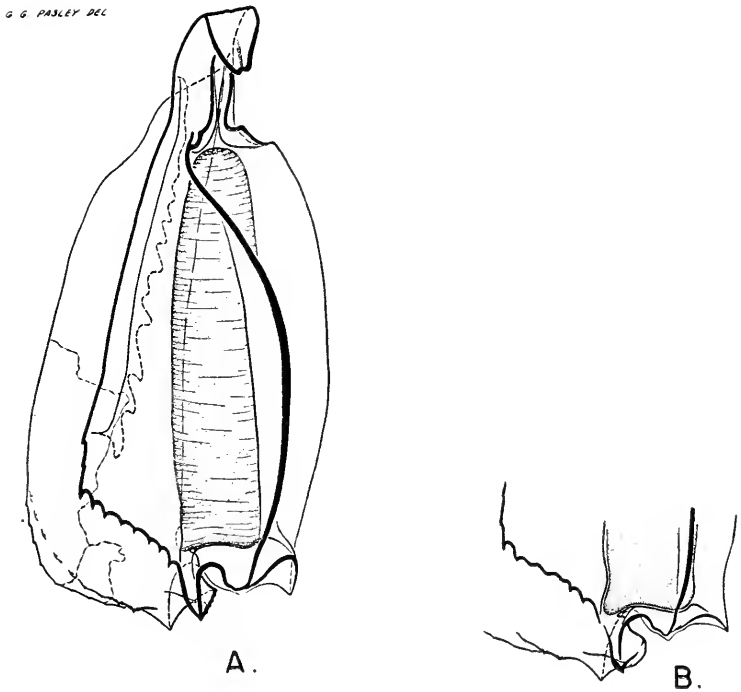

Fig. 7. Inferior nectophore of Quoy and Gaimard's *Abyla trigona* of about 24 mm. in height now referred to *A. carina.* A. Left lateral view. (Dashed line indicates fragments which have broken away from nectophore.) B. Detail of basal portion of second specimen of about 28 mm.

nectosac. The right lateral tooth may, however, be weaker and somewhat displaced. The dorsal tooth and the two ventral teeth are essentially straight. The lip between the two latter is thickened and on its free dorsal edge next to the opening of the nectosac, there is an ovoid serrated rim.

Bracts (Figs. 2, 26). Cormidia have been found on stems of the superior nectophores of most species of *Abyla* so that we now know that the "Amphiroa" type of eudoxid, usually referred to *A. trigona,* is characteristic for the genus as a whole. However, the identity of specimens described earlier by Gegenbaur (1859; 1860), Haeckel

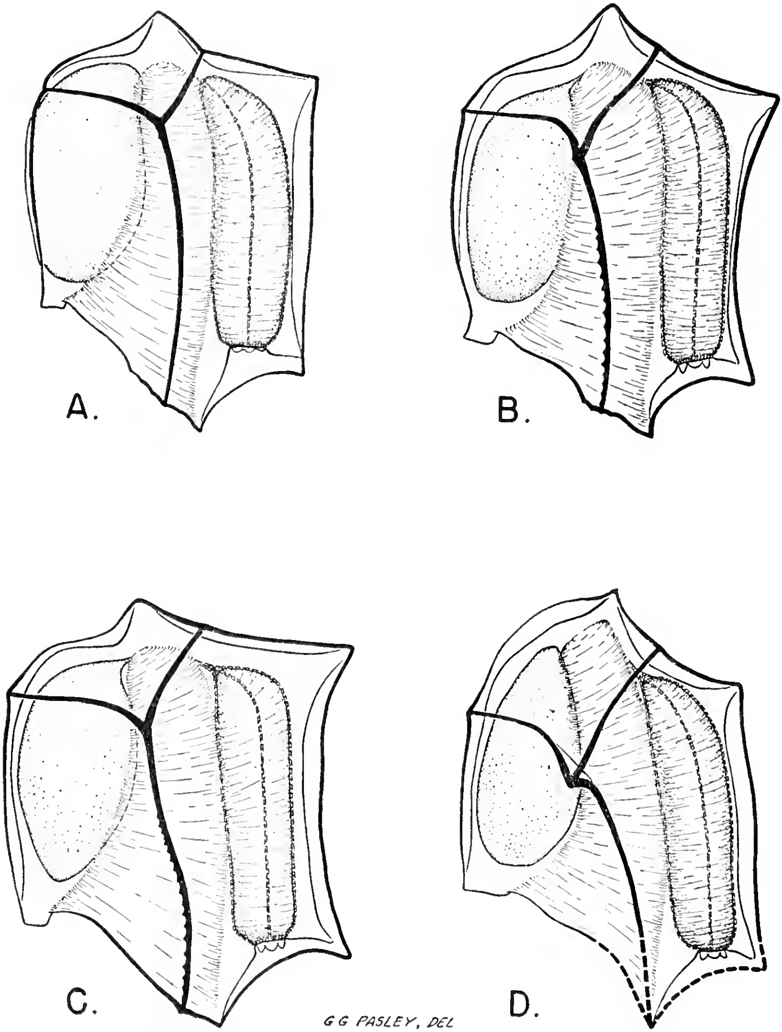

Fig. 8. Lateral view of superior nectophores. A. *Abyla carina* with a dorsal facet of 6.9 mm. in length. B. *A. trigona*, with a dorsal facet of 4.9 mm. in length. C. *A. schmidti*, with a dorsal facet of 7.4 mm. in length. D. *A. peruana*, with a dorsal facet of about 3.6 mm. in length.

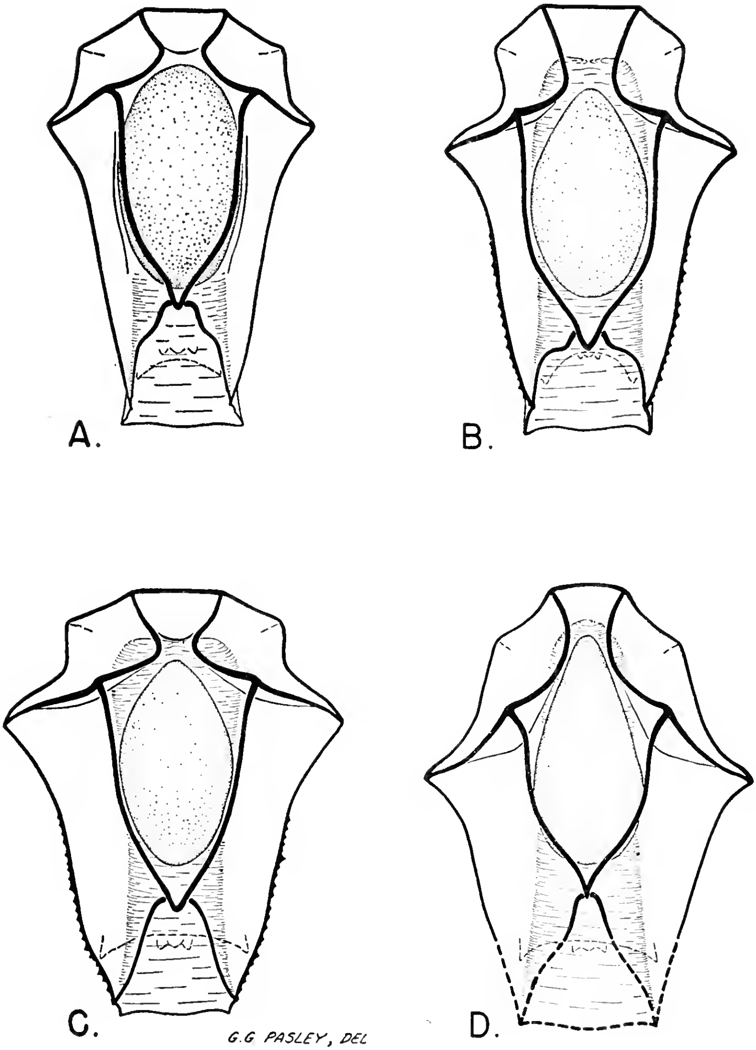

Fig. 9. Ventral view of same specimens as in Figure 8. A. *Abyla carina*. B. *A. trigona*. C. *A. schmidti*. D. *A. peruana*.

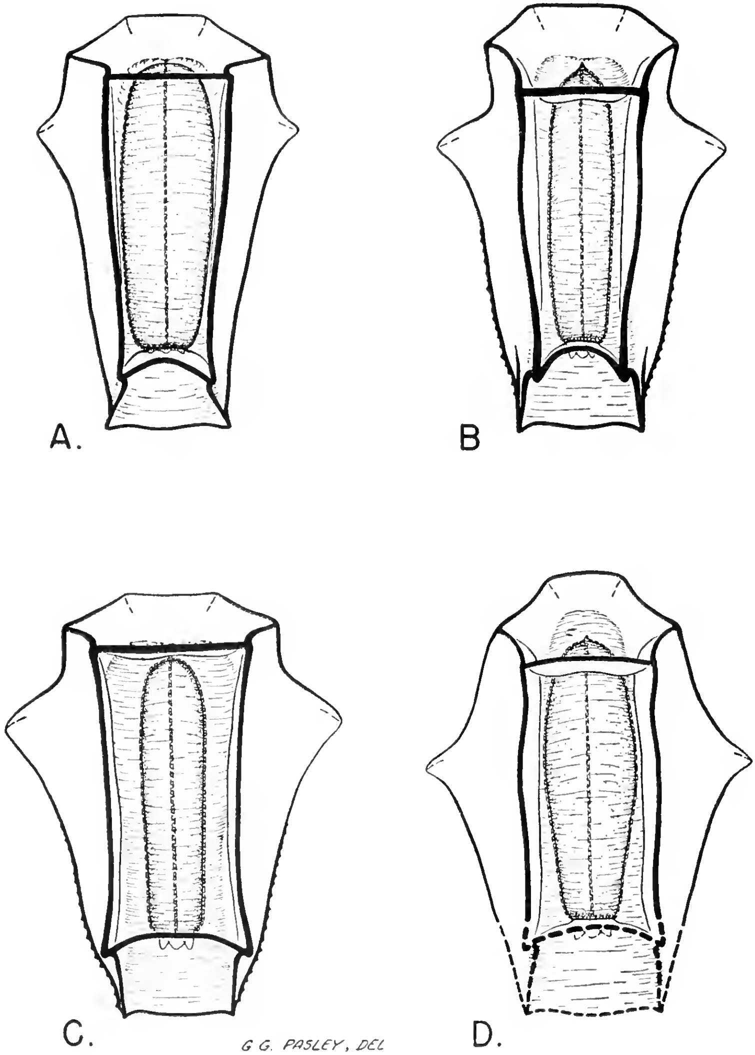

Fig. 10. Dorsal view of same specimens as in Figure 8. A. *Abyla carina*. B. *A. trigona*. C. *A. schmidti*. D. *A. peruana*.

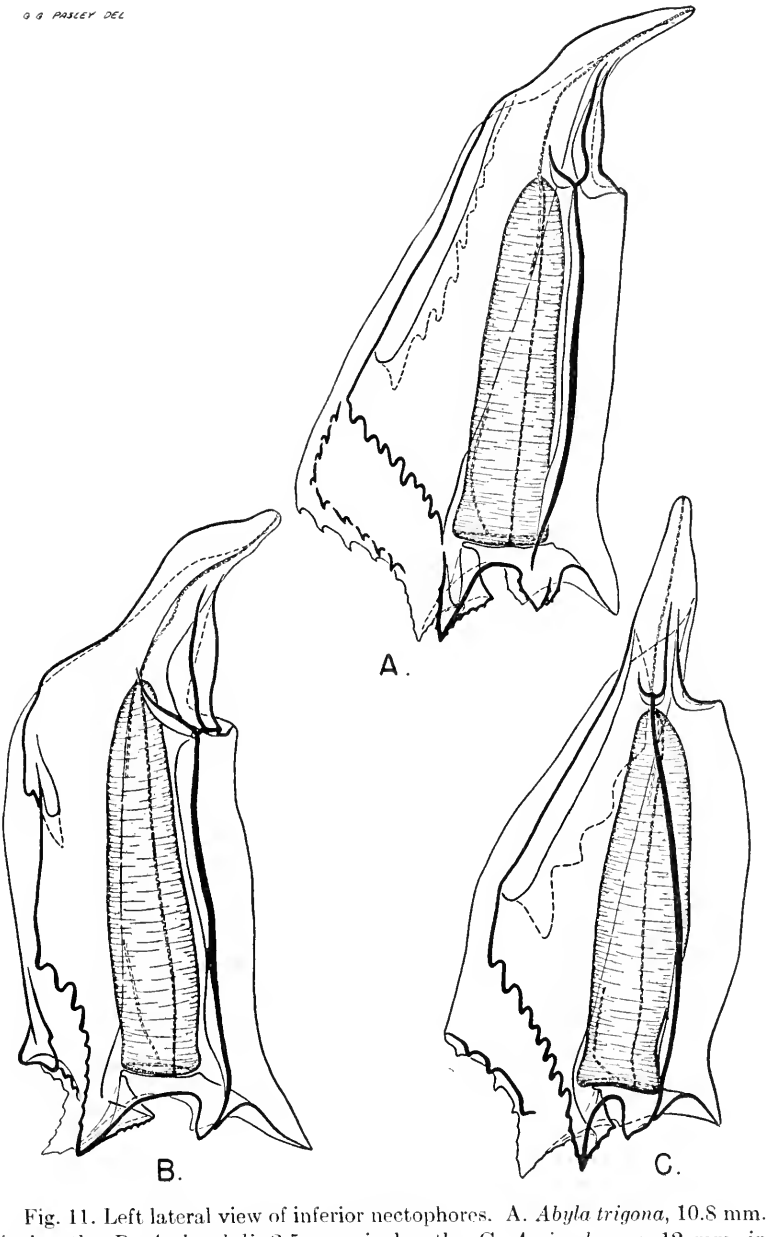

Fig. 11. Left lateral view of inferior nectophores. A. *Abyla trigona*, 10.8 mm. in length. B. *A. haeckeli*, 2.5 mm. in length. C. *A. ingeborgae*, 12 mm. in length.

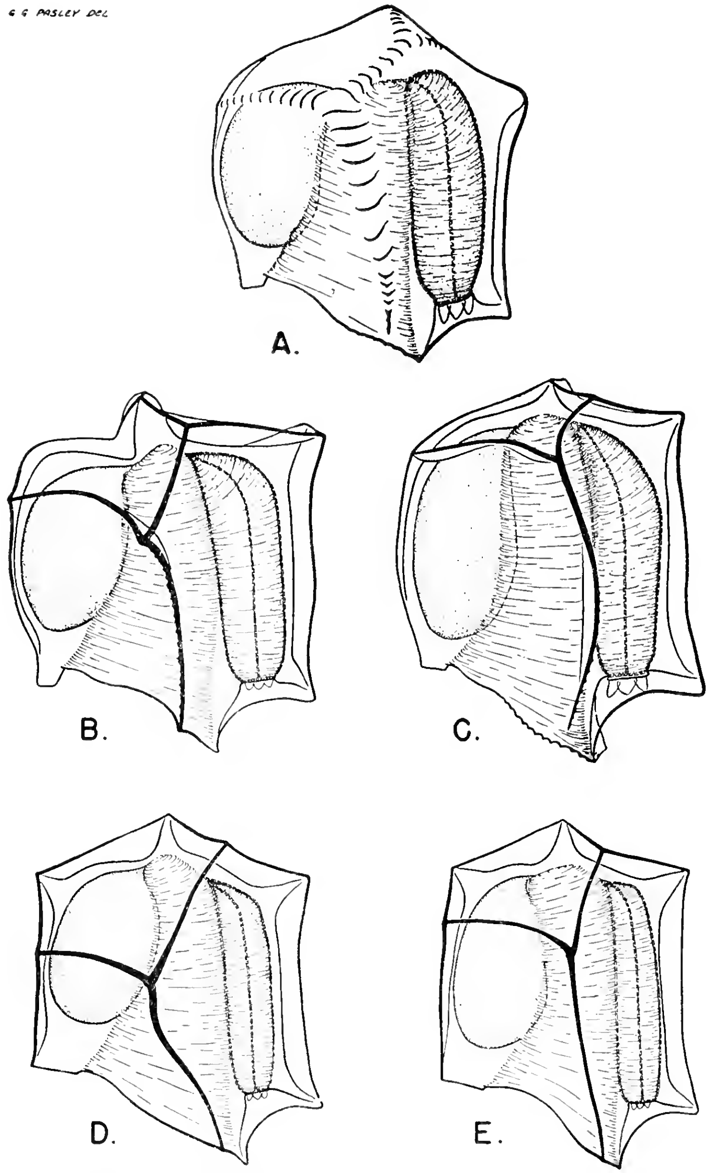

Fig. 12. Lateral view of superior nectophores. A. *Abyla bicarinata*, with dorsal facet about 9 mm. in length. B. *A. tottoni* with a dorsal facet of about 9 mm. in length. C. *A. brownia*, with a dorsal facet of about 3 mm. in length. D. *A. haeckeli*, with a dorsal facet of about 4 mm. in length. E. *A. ingeborgae*, with a dorsal facet of about 7 mm. in length.

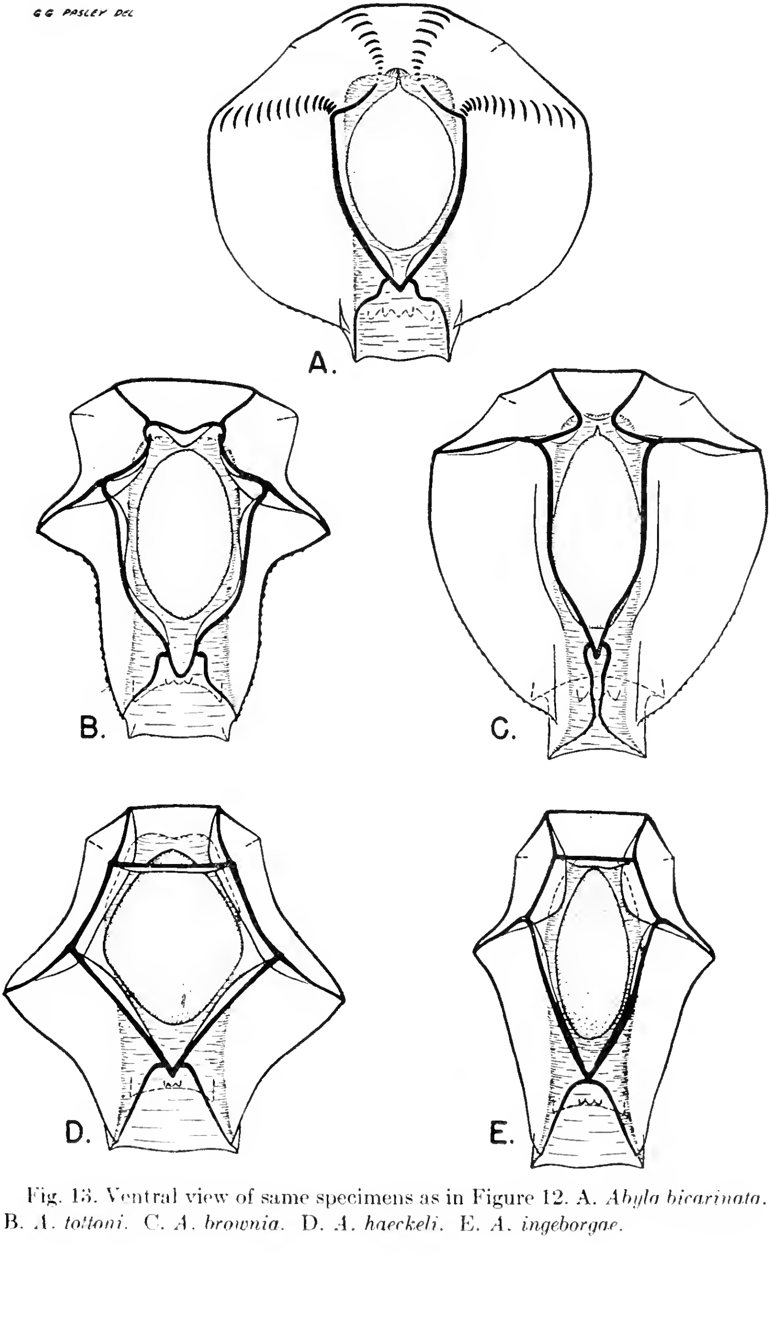

Fig. 13. Ventral view of same specimens as in Figure 12. A. *Abyla bicarinata*. B. *A. tottoni*. C. *A. brownia*. D. *A. haeckeli*. E. *A. ingeborgae*.

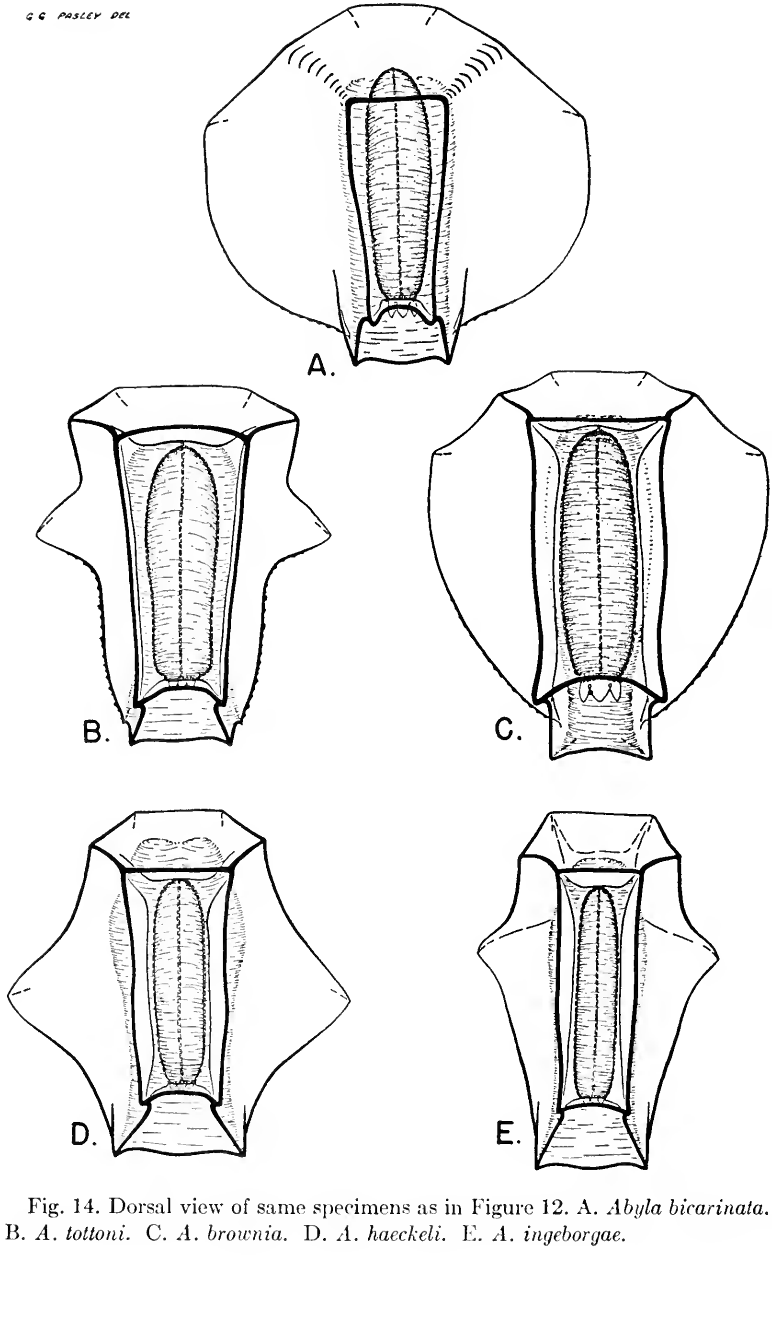

Fig. 14. Dorsal view of same specimens as in Figure 12. A. *Abyla bicarinata*. B. *A. tottoni*. C. *A. brownia*. D. *A. haeckeli*. E. *A. ingeborgae*.

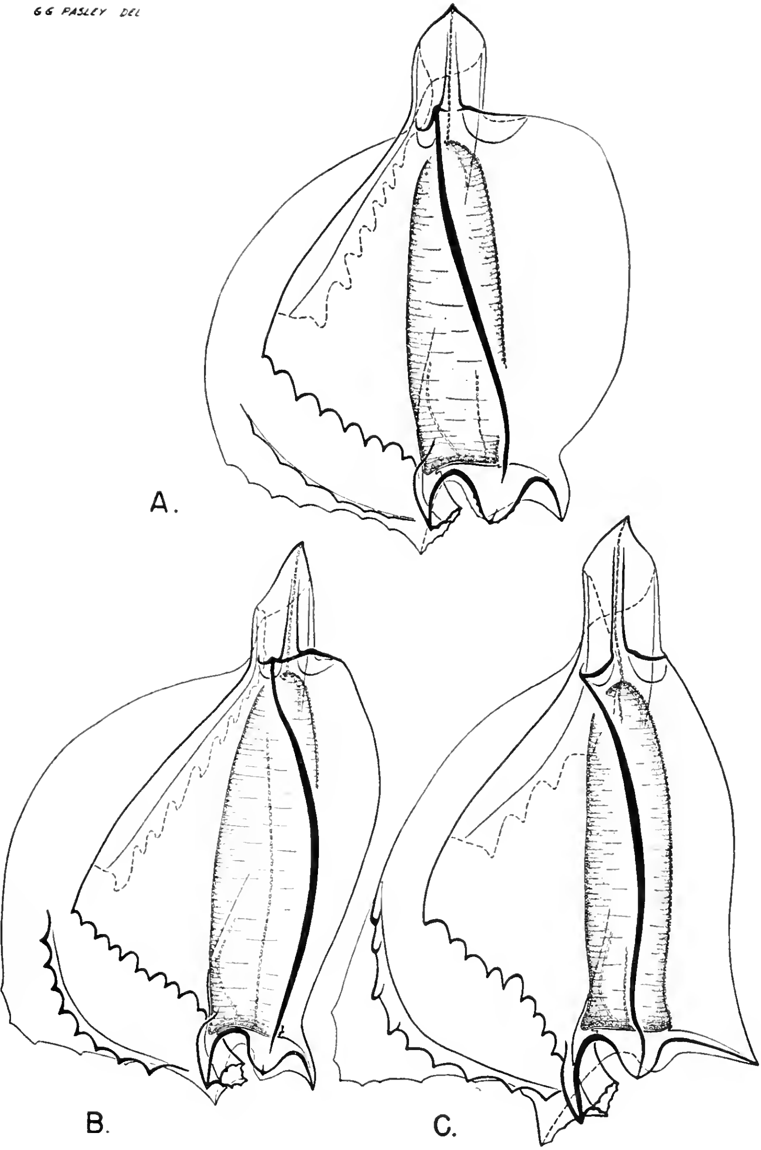

Fig. 15. Left lateral view of inferior nectophores. A. *Abyla bicarinata* 19 mm. n length. B. *A. tottoni* of about 22 mm. in length. C. *A. schmidti*, of about .2.3 mm. in length.

(1888a), and others is still open to question now that we know the eudoxids are so similar that small cormidia cannot be distinguished. Until better material is available, than that found unattached in the samples of the "Dana", it is impossible to ascertain the characters of value in determining the individual species.

The bracts are prismatic with six facets. The dorsal surface is in general smaller than the ventral. As a result, the basal and lateral facets are not in one plane, but veer outwards toward the ventral border. The dorsal facet is rectangular; the others, the apical, ventral, basal, and two laterals, are all trapezoidal. However, the laterals are imperfectly so, since the ventrobasal corners are cut away for the opening of the hydroecium. The latter occupies the basal half of the ventral surface and extends up into the interior of the bract almost to the apical facet. Above it lies the much swollen descending branch of the somatocyst. From its anterior end two thin ventrolateral branches extend down toward the ventrolateral corners of the apical facet.

Gonophores (Fig. 26). The gonophores of *Abyla*, like those of *Ceratocymba* and *Enneagonum* have five stout oral teeth surrounding the opening to the nectosac as well as a stout hook folded in toward the hydroecium from one of the ventral ridges.[1] Similarly there are four ridges, two laterals and two ventrals, with a partial ridge extending upward from the dorsal tooth (as is also the case in *Ceratocymba* and *Enneagonum*). Hence, it is often difficult to determine the genus unless the specimens are well preserved. The outstanding differences among them occur on the apical half of the gonophore. In *Abyla*, the apicodorsal and apicolateral ridges are arched and lie well below the apex of the nectosac. Beneath each arch is an indentation which is most prominent on the dorsal surface. Because of the position of these ridges, the apophysis is relatively more conspicuous in this genus than in *Ceratocymba*, but less so than in *Enneagonum*.

Remarks

In the closely related genus *Abylopsis*, the superior nectophores of the two species are so similar that it is only in recent years that it has become possible to distinguish them with any certainty in the absence of the inferior nectophores. Much the same situation apparently

[1] Since the gonophores are mirror images of one another, the hook may occur on one or other of the ventral ridges, but not on both.

exists today especially among poorly preserved specimens of several species within the genus *Abyla*. It appears, however, that we are justified in distinguishing species of *Abyla* on the basis of seemingly minor differences in the superior nectophores but with greater differences in the inferior nectophores. We have found, for example, three superior nectophores (*carina*, *trigona*, *schmidti*) which unless well preserved, prove quite difficult to distinguish. We believe, however, that in each instance, we have found sufficiently distinctive characters to separate them.

In the older reports these three species and at least one other, were confused under one name, *trigona*,[1] partly because so few specimens had ever been examined, partly because complete colonies were taken so infrequently that slight differences in the superior nectophores appeared to be merely individual variations, and partly because so many of the earlier figures and descriptions were lacking in detail. Thus, most of the earlier reports were diagnostic of the genus as a whole as we define it here rather than of any particular species. As a result, most subsequent authors referred their specimens to *trigona* rather than establish a new species for individuals with seemingly minor modifications. Until recently, therefore, when a large series of specimens could be examined only four species in the genus were recognized as distinct. Two of these, *leuckartii* and *dentata*, are now referred to *Ceratocymba*: the other two, *haeckeli* and *bicarinata*, still remain in the genus *Abyla*. The two latter are quite distinctive and have probably seldom been confused with *trigona*.[2] Thus, the superior nectophore of

[1] Bigelow (1911; 1918; 1919), for example, lists as *Abyla trigona*, three other species, *carina*, *schmidti* and a new species, *peruana*, as listed below:
M. C. Z. No. 1602, "Albatross" Sta. 4715, *A. carina* — eastern tropical Pacific.
M. C. Z. No. 1603, "Albatross" Sta. 4684, *A trigona* — eastern tropical Pacific.
M. C. Z. No. 1658, "Albatross" Sta. 5601, *A. schmidti* — Celebes.
M. C. Z. No. 3074, "Albatross" Sta. 5672, *A. schmidti* — Philippines.
U. S. Nat. Mus. No. 28349, "Albatross" Sta. 4673, *Abyla peruana* n. sp. — off Peru.
U. S. Nat. Mus. No. 41556, "Bache" Sta. 10163, *A. trigona* — off North Carolina.
U. S. Nat. Mus. No. 41557, "Bache" Sta. 10166, *A. carina* — off South Carolina.
U. S. Nat. Mus. No. 41558, "Bache" Sta. 10171, *A. trigona* — off Bermuda.
U. S. Nat. Mus. No. 41562, "Bache" Sta. 10194, *A. trigona* — south of Bermuda.
U. S. Nat. Mus. No. 41563, "Bache" Sta. 10207, *A. carina* — Straits of Florida.
U. S. Nat. Mus. No. 41564, "Bache" Sta. 10211, *A. trigona*, *A. carina?* — north of Bahamas Bank.
In most instances, the original identification was based on detached superior nectophores. The three species concerned are, as stated above, difficult to distinguish unless well preserved and unless one has been fortunate to study a series of complete colonies.

[2] Huxley (1859, p. 48) states that, "It is with some little hesitation that I identify this species with the *Abyla trigona* of Quoy and Gaimard .... but there are so many points of similarity that I prefer to run the risk of making a species too few rather than one too many." Huxley's specimen has usually been referred to the synonymy of *A. haeckeli*, but is possibly *A. ingeborgae*. Totton (1925) reports that among Haeckel's specimens of *A. carina*, there was one of *A. haeckeli*.

Abyla haeckeli (Lens and Van Riemsdijk, 1908) is characterized by an extra transverse ridge subdividing the apicoventral facet and that of *A. bicarinata* (Moser, 1925) by a marked expansion of the lateral ridges. However, a new species, *A. ingeborgae,* also has a transverse ridge separating the ventral and apicoventral facets and a second new species, *A. brownia,* has expanded lateral ridges. It is possible, therefore, that these species have been confused with *haeckeli* and *bicarinata* respectively.

Fortunately, it has been possible to examine Quoy and Gaimard's (1827) specimens of *trigona* and to compare them with specimens described by Haeckel (1888a) as *carina.* Much of the confusion would appear to stem from the fact that both Haeckel (1888a) and Quoy and Gaimard (1827) apparently had two species in their samples. Today, Quoy and Gaimard's two superior nectophores are detached from the inferior nectophores. I believe that they never were attached, because the apophyses of the two inferior nectophores appear too big to fit into the hydroecium of either superior nectophore. Secondly, they are very similar to specimens in Haeckel's sample[1] and in the "Dana" collection, several of which also have small inferior nectophores attached within the hydroecium. These inferior nectophores are quite different from those in Quoy and Gaimard's sample. Finally, a colony in the Haeckel samples with a badly damaged superior nectophore has an inferior nectophore which appears to be the same as Quoy and Gaimard's. The superior nectophore is, however, distinct from theirs, but resembles three others in Haeckel's sample.

Since it thus seems certain that there are the same two species in both Quoy and Gaimard's (1827) and Haeckel's (1888a) samples, a decision must be made as to which should be *trigona* and which should be Haeckel's *carina.* It seems to me that Lens and Van Riemsdijk (1908, pp. 30–31) have already indicated the answer. They compared their specimens of *Abyla trigona* with those of Quoy and Gaimard and found them to be identical "in all respects". Re-examination of their specimens has shown their statement to be correct for the superior nectophores.[2] It would therefore seem that the superior nectophores

[1] One of these has a small inferior nectophore attached within the hydroecium. There is also a loose inferior nectophore quite unlike the inferior nectophores in Quoy and Gaimard's sample.

[2] Lens and Van Riemsdijk (1908, p. 28) show their hesitancy in identifying the inferior nectophore by recording it as ?*Abyla trigona* (Cat. 78D). This is in reality the new species *A. schmidti.* A second poorly preserved specimen (Cat. 126D) may possibly belong to this species. It certainly is not the same as those in Haeckel's (1888a) and Quoy and Gaimard's (1827) samples.

can be considered to have been designated by them as *Abyla trigona*. Since the inferior nectophores in Quoy and Gaimard's sample apparently belong to the same species as the colony and three superior nectophores in Haeckel's, it would seem appropriate to designate these as *carina*.

Keys to the Nine Known Species of Abyla
(Figs. 6–15)

A. Based on characters of the superior nectophores.

1. Apicoventral facet subdivided by a transverse ridge 2
   Apicoventral facet not subdivided 3
2. Ventral facet approaches a regular pentagon in shape; protrusion at juncture of horizontal and lateral ridges markedly overhangs basal half of ventrolateral surface; ridges elevated like rim of a pie plate . . *Abyla haeckeli* Lens and Van Riemsdijk
   Ventral facet elongate with basal sides of pentagon roughly three times as long as apical ones; protrusion at juncture of lateral and horizontal ridges not excessive; ridges well defined but not markedly elevated above facets . . . . *Abyla ingeborgae* n. sp.
3. Nectophores nearly circular in dorsal or ventral view due to pronounced expansion of lateral ridges 4
   Nectophores elongate in dorsal or ventral view, but with a more or less pronounced knob at the juncture of the lateral and horizontal ridges . 5
4. All ridges well defined; a definite angle at juncture of horizontal and lateral ridges, greatest width of ventral facet about one half length from insertion of horizontal ridges to basal tip . . *Abyla brownia* n. sp.
   Ridges delineating the apicodorsal facet as well as horizontal ridge rounded and often indistinct, lateral ridge circular throughout, not angular, greatest width of ventral facet greater than distance from insertion of horizontal ridges to basal tip . . . . *Abyla bicarinata* Moser
5. Greatest width of ventral facet is about the same (0.87 to 1) as its length from the insertion of the horizontal ridges to its basal tip 6
   Greatest width of ventral facet is only about one half to two thirds (0.45 to 0.6) the length from the insertion of the horizontal ridges to its basal tip 8
6. In side view, apex of hydroecium considerably higher, apex of nectosac lower than that of somatocyst; horizontal ridge crosses somatocyst only slightly above its middle; no obvious depression ventrad to transverse apical ridge . . . . *Abyla peruana* n. sp.
   Apices of nectosac and somatocyst at about same level, apex of hydroecium only slightly higher; horizontal ridge crosses somatocyst well

above middle; obvious depression ventral to transverse apical ridge . . *Abyla tottoni* n. sp.

7. Transverse ridge in true side view lies above somatocyst, resulting in elongate apicodorsal facet . . . . *Abyla schmidti* n. sp.
   Transverse ridge in true side view lies above hydroecium 8
8. In true side view apicodorsal facet almost vertical from insertion of lateral ridge to apical transverse ridge; lateral border of basal facet curved and tends to parallel horizontal plane; heavy and irregular serrations on lateral ridges . . . . *Abyla trigona* Quoy and Gaimard
   In true side view apicodorsal facet essentially flat; lateral border of basal facet diagonal and only slightly curved; serrations fine . . . . *Abyla carina* Haeckel

B. Based on characteristics of the inferior nectophores.[1]

1. About two to five teeth on comb of left ventral wing 2
   About six to ten teeth on comb of left ventral wing 4
2. Two or three teeth on comb of left ventral wing; base of right ventral wing with thickening outlined by rather small teeth, the two ventral ones on both inner and outer row being the heaviest . . . . *Abyla haeckeli* Lens and Van Riemsdijk
   Four or five teeth on comb of left ventral wing, right ventral wing triangular 3
3. Base of right ventral wing with inner row of stout teeth continuous with its ventral margin and the outer row of finer teeth projecting below on a more or less well defined triangular pad; left ventral wing not continuous with left ventral tooth . . . . *Abyla schmidti* n. sp.
   Base of right ventral wing with three or four stout teeth on inner margin, with a few weak teeth almost scallops on outer; left ventral wing continuous with left ventral tooth . . . . *Abyla ingeborgae* n. sp.
4. Outer row of teeth on basal margin of right ventral wing continuous with its ventral margin; with inner row ending on inner surface 5
   Inner and outer rows of teeth on basal margin of right ventral wing merge to become its ventral margin 6
5. Nectophore (exclusive of apophysis) about as wide as it is long, nearly circular in general appearance; usually about 7 teeth on comb of left ventral wing . . . . *Abyla bicarinata* Moser
   Nectophores (exclusive of apophysis); somewhat longer than wide; ovoid in general appearance; 8–9 teeth on comb of left ventral wing. *Abyla tottoni* n. sp.
6. Ventral teeth elongate, heavily serrated; about six teeth on comb of left ventral wing; teeth on basal margin of right ventral wing heavy and prominent . . . . *Abyla trigona* Quoy and Gaimard

[1] Inferior nectophores have not yet been found for *Abyla brownia* n. sp., or *A. peruana* n. sp.

Ventral teeth stubby, 9–10 teeth on comb of left ventral wing; teeth on basal margin of right ventral wing scarcely more than strong serrations.
Abyla carina Haeckel

ABYLA TRIGONA Quoy and Gaimard 1827

Abyla trigona, Quoy and Gaimard, 1827, pp. 14–15, pl. 2B, figs. 1–8 (partim); Gegenbaur, 1859, pp. 1–10, pls. 1–2, figs. 1–12; 1860, pp. 337–349, pls. 26–27, figs. 1–12; Lens and Van Riemsdijk, 1908, pp. 29–34, text figs. 24–31, pl. 4, figs. 34–36; Bigelow, 1911, pp. 221–222 (partim); 1918, pp. 408–409 (partim); Moser, 1925, pp. 301-310, pl. 18, fig. 7 (partim); Moore, 1949, p. 13 (partim).

?*Abyla trigona*, Eschscholtz, 1829, pp. 131–132; Blainville, 1830, p. 123; 1834, p. 135, pl. 4, fig. 4 (not seen); Chun, 1888, pp. 1160–1161; 1897, pp. 31–32; Haeckel, 1888, p. 35; Fewkes, 1889, p. 519; Schneider, 1898, pp. 90–91, 197; Bedot, 1904, p. 27; Moser, 1912a, fig. 20; Kawamura, 1915, pp. 578–580, pl. 15, figs. 27–28; Browne, 1926, p. 62; Leloup, 1932, pp. 20–22, fig. 3; 1933, p. 21; 1935a, p. 5; Totton, 1932, p. 332, fig. 17B.

?*Amphiroa alata*, Blainville, 1830, p. 121; 1834, p. 133, pl. 4, fig. 1 (not seen); Huxley, 1859, p. 64, pl. 5, fig. 1; Chun, 1888, p. 1160; 1897, pp. 31–32; Lens and Van Riemsdijk, 1908, p. 28, pl. 4, figs. 37–38.

Diphyes abyla, Quoy and Gaimard, 1834, pp. 87–88, pl. 4, figs. 12–17 (partim).

Non *Abyla trigona*, Vogt, 1854, pp. 121–127, pl. 15, fig. 4, pl. 20, figs. 4–7, pl. 21, figs. 3–6, 10–13; Huxley, 1859, pp. 47–48, pl. 3, fig. 1; Bigelow, 1911, pp. 221–222; pl. 13, figs. 3–4 (partim); 1918, pp. 408–409 (partim); 1919, p. 334.

Abyla carina, Haeckel, 1888a, pp. 156–157, pl. 35 (partim).

?*Amphiroa carina*, Haeckel, 1888a, pp. 114–115, pl. 36.

Superior nectophore (Figs. 8B, 9B, 10B). The superior nectophore of *Abyla trigona*, even when poorly preserved, is perhaps the most readily distinguished of the three species, *trigona*, *carina*, and *schmidti*. Most of the ridges are heavily and irregularly serrated, the laterals and at times the basal ridges of the ventral facet and the laterals of the dorsal facet are especially so. In side view, the profile of the dorsal half is characteristic: the lateral ridges of the basal facet almost describe a semicircle close to the dorsal wall of the hydroecium, but the curvature widens gradually dorsad, to end parallel to the horizontal[1] plane or to continue down onto the prominent dorsal teeth. Almost without exception, whether well preserved or not, the apico-

[1] At times the sharp curvature is absent and the curve described may approach the diagonal of *A. carina*.

dorsal facet is sharply bent upward from the insertion of the lateral ridges to the transverse apical ridge. The latter lies above the center of the hydroecium. Just ventral to it the apicoventral facet drops away gradually so that there is only a slight depression in the furrow. The lateral protrusions are somewhat sharper and more prominent than those of *A. carina.* In addition, the facets of the nectophore as a whole are depressed below the ridges surrounding them. Thus, the nectophore often appears thinner and more fragile than *carina.*

Inferior nectophore (Fig. 11A). The inferior nectophore of *A. trigona* is only about one-half as wide as it is long. None of the ridges are markedly expanded. It is most readily distinguished from *carina,* however, by the decrease in number of teeth on the comb (6–8). In addition, in mature specimens, there are two rows of large sharp teeth on the basal margin of the right ventral wing, much as Haeckel (1888a, pl. 35, figs. 8–9) has shown them. These seem to vary in appearance with growth. In small specimens found attached within the hydroecium of the superior nectophore, the teeth are little more than a series of punctae and those on the outer row diverge somewhat from the inner and produce a small angular flap rather like that of *A. schmidti.* In somewhat older nectophores, the latter tends to disappear or to become very small. On such nectophores the two rows of teeth which are essentially parallel and separated only by a thickening of the basal part of the wing, continue for a distance along the ventral margin. In the oldest specimens examined, however, the teeth were limited to the basal margin.

The ventral teeth, likewise, show some variation with age. In younger specimens, they are straight and elongate rather like those on the inferior nectophore of *Ceratocymba leuckartii.* They become relatively shorter with age but they always remain straight, rather sharper than in most species, and are always coarsely serrated. The other oral teeth are also more heavily serrated than in any other known species of this genus.

Eudoxid. Although the eudoxid of this species may have been described by Gegenbaur (1860) and Haeckel (1888a) we cannot be sure whether their specimens were *A. carina* or *A. trigona.* As no cormidia were found in the "Dana" collection sufficiently far advanced to determine the specific characters, it is not possible to describe the eudoxid of this species for certain.

Remarks

On examination of Lens and Van Riemsdijk's (1908) specimens, most were in every way similar to others of *trigona* we have seen. However, two of their superior nectophores (Cat. 77B) had much more pronounced lateral protrusions. Nevertheless, they too appear to belong to this species.

Abyla carina Haeckel 1888

Abyla trigona, Quoy and Gaimard, 1827, pp. 14–15, pl. 2B, figs. 1–8 (partim); Bigelow, 1911, pp. 221–222 (partim); 1918, pp. 408–409 (partim); Moore, 1949, p. 13 (partim).
Abyla carina, Haeckel, 1888, p. 35; 1888a, pp. 156–159, pl. 35 (partim).

Superior nectophore (Figs. 8A, 9A, 10A). The superior nectophore of *A. carina* has a number of distinguishing features, although they are not always apparent in poorly preserved specimens. In lateral view the sides of the basal facet are diagonal and only slightly curved because the dorsal teeth do not protrude below it as they do in *trigona*. The apicodorsal facet is usually a flat surface and in side view its lateral ridges likewise form a diagonal to the dorsal facet. There may, however, be a slight break at the insertion of the lateral ridge especially in somewhat shrunken and poorly preserved specimens. If so, the transverse apical ridge which lies above the center of the hydroecium is elevated slightly above the surface of the facet as a whole. This is never as exaggerated as is characteristic for *trigona*. Ventral to it, there is almost always a slight depression in the furrow of the apicoventral facet. The lateral protrusions as seen in ventral or dorsal view are not prominent and may be quite unobtrusive. The ridges of the nectophore as a whole are not raised above the facets, but most of these on the basal half of the nectophore are slightly serrated. Finally, the nectophore as a whole appears more massive than that of *trigona*.

Inferior nectophore (Fig. 7). Quoy and Gaimard's specimens of the inferior nectophore, now referred to *A. carina* (p. 32), which are preserved in alcohol, have apparently shrunken considerably because they are only about one-half as wide as they are long. A well preserved specimen in the "Dana" collection, on the other hand, is about two thirds as wide as it is long. This is due chiefly to the expansion of the right ventral wing, as the dorsal ridge is only moderately expanded.

The general shape is not sufficient to differentiate this nectophore from that of other species. One feature which appears reliable is the number of teeth (9–10) on the comb of the left ventral wing. These were all the same size in both Quoy and Gaimard's and Haeckel's specimens, but they formed a graduated series on some of the "Dana" specimens which seemingly belong to this species. An equally distinctive character is the dentition at the base of the right ventral wing. The teeth on the latter are not as robust and jagged as are those of *A. trigona.* The inner row of nine or ten small spines is parallel to the basal margin close to the two ventral teeth but ventrad it gradually swerves inward a short distance from the margin crossing the inner surface to merge with the outer row at the ventral margin much as is shown in one of Haeckel's drawings (1888a, pl. 35, fig. 1). The outer row has about the same number of teeth as the inner, which are likewise weak and relatively inconspicuous. The ventral teeth are often quite blunt except for a sharp point at the tip.

Eudoxids. The eudoxids belonging to this species have been described by earlier authors, but it has not been possible to check their observations with specimens of known parentage. It therefore seems better to omit a description as it would only be misleading.

ABYLA SCHMIDTI[1] n. sp.

Abyla trigona, Lens and Van Riemsdijk, 1908, pp. 29–34 (partim); Bigelow, 1919, p. 334.

Abyla bicarinata Moser, 1925, pp. 298–301 (inferior nectophore) pl. 19, figs. 7–9 (partim).

Abyla sp. Totton, 1950.

The type specimen of *Abyla schmidti* consists of a well preserved superior and inferior nectophore taken at "Dana" Station 3922, at 3°45′S, 56°33′E with 1000 meters of wire out, on 12 December 1929 at 1850 hours with an open ring trawl, 300 cm. in diameter. These will be deposited in Universitets Zoologiske Museum, København, Denmark.

Superior nectophore (Figs. 8C, 9C, 10C). The superior nectophore of *Abyla schmidti*, although quite similar to the two previous species, is best differentiated by its proportionately larger apicodorsal facet. In a true lateral view, this is seemingly effected by a protrusion dorsad

[1] Named in honor of the late Professor Johannes Schmidt, the leader of the Carlsberg Foundation's Oceanographical Expedition Round the World, 1928–30.

over the dorsal facet and by the more ventral position of the transverse apical ridge over the dorsal portion of the somatocyst. Ventral to this ridge the apical portion of the apicoventral facet gradually slopes ventrad without any marked depression, although it is slightly furrowed. A second feature which is helpful in identifying many specimens is a dorsal facet tapering toward the base rather than one which bulges in the middle as in *trigona* and *carina*.

Inferior nectophore (Fig. 15C). On well preserved specimens of the inferior nectophore of *A. schmidti*, the right ventral wing is expanded so that the width of the nectophore nearly equals its length. In most specimens, however, it is damaged so that the relative measurements are not helpful in identification. Its triangular shape, however, provides the best means for separating this species from others in the genus. The inner row of teeth along the basal margin of the right ventral wing is rather strongly developed and joins the outer row to continue apically as the ventral margin. The triangular protrusion hanging below the inner row is in reality the thickening between the two rows of teeth since the outer row of weak teeth delimits it before it merges with the inner. This species is also readily recognized by the teeth on the comb on the left ventral wing which are fewer in number (4–5), larger, and more robust than in any other known species of *Abyla*.

Eudoxid. Cormidia have been found on stems attached to superior nectophores of *A. schmidti* but they are not distinctive enough to assist in identifying loose bracts and eudoxids. About all one can determine is that the bract is a typical "*Amphiroa*".

Small gonophores known to be *schmidti* likewise appear very similar to those found on cormidia attached to the superior nectophores of other species. On these the large tooth on one of the ventral wings is thin, elongate, and almost fingerlike. Insofar as we have been able to ascertain, teeth of this sort are characteristic of small specimens belonging to a number of other species. Other characters which might be diagnostic in differentiating the species are not obvious. It is possible that as the gonophore matures, differences not obvious on small specimens may appear.

ABYLA HAECKELI Lens and Van Riemsdijk 1908

?*Abyla trigona* Huxley, 1859, p. 47, pl. 3, fig. 1.[1]

[1] Huxley's specimen actually may have been the species described below as *ingeborgae*.

?*Amphiroa angulata* Huxley, 1859, pp. 64–65, pl. 5, fig. 2.
?*Amphiroa carina* Haeckel, 1888a, pp. 114–116, pl. 36.
?*Abyla alata* Haeckel, 1888a, pp. 113 and 156.
Non *Amphiroa dispar* Bedot, 1896, p. 373, pl. 12, figs. 5–6.
Abyla haeckeli Lens and Van Riemsdijk, 1908, pp. 32–34, text figs. 32–40, pl. 5, figs. 39–41; Bigelow 1911, pp. 222–224, pl. 13, figs. 1–2; Moser, 1925, pp. 310–318, pl. 18, fig. 6.
?*Abyla haeckeli* Browne, 1926, p. 63[1]; Leloup, 1932, pp. 19–20; Totton, 1925, pp. 446–447; 1932, pp. 331–333, figs. 12–13, 17B[2].

Non *Abyla haeckeli* Totton, 1932, text fig. 12.

Superior nectophore (Figs. 12D, 13D, 14D). In outline, the superior nectophore of *haeckeli* is as wide as it is high. It is also more truly prismatic than that of any other abylid. Mentioned, but not stressed, by Lens and Van Riemsdijk (1908, p. 33) in their original description are the flat facets. These are accentuated by sharp raised ridges so that most facets have rims the shape of polygonal pie plates. Two other characters at once separate this species from those already described and contribute to its unique appearance. The apicoventral facet is separated by a second transverse ridge to form a quadrangular facet on the ventral half of the apical surface and a nearly regular pentagonal one on the ventral surface. The latter is nearly twice as wide (1.8) at the insertion of the horizontal ridges as thence to its basal tip. The apical ventrolateral facet is large and overhangs the basal one, due to the shelf-like protrusion formed by the horizontal ridge and the basal half of the lateral ridge. The surface of the basal ventrolateral facet, however, appears to be only slightly smaller than the apical one. Nevertheless, in side view the horizontal ridge appears to lie just above the basal tip of the somatocyst. In no other *Abyla* have we found the horizontal ridge lower than the midpoint of the somatocyst.

Inferior nectophore (Fig. 11B). Several inferior nectophores so small that they have been shielded within the hydroecial cavity, have enabled us to learn the peculiarities of this species. Study of these permits identification of larger poorly-preserved detached inferior

[1] The fact that Browne (1926, p. 63) states that "the species is likely to escape notice unless every anterior nectophore of *Abyla trigona* is carefully examined on the ventral side" suggests that he may have had *ingeborgae* rather than *haeckeli*.

[2] "One anterior nectophore, the identification of which rests upon the presence of a transverse ridge dividing the ventral facet into two parts" (Totton, 1932, p. 331) might equally well refer to *ingeborgae*.

nectophores. The dorsal tooth, the largest of the five surrounding the oral cavity, juts forward and slightly downward. The two lateral oral teeth are relatively small, the right being distinctly the smaller. Rather than being midway in position between the dorsal and ventral teeth as is customary, both the laterals are displaced so that they lie close to the dorsal. The left ventral wing is continuous with the ridge of its corresponding tooth, the coarse serrations extending part way down the ridge of the latter. There are two or three teeth on the comb. The thickened basal margin of the right ventral wing is concave and is delimited by about four teeth on the inner and outer rows. Those on the inner row are somewhat heavier than the outer. The teeth at the ventral end of each row are stubby and connected to each other. The ventral margin above these teeth is likewise thickened. The ventral wings may be sufficiently expanded so that the nectophore as a whole may be nearly as wide as it is long.

Bract (Fig. 26A). Cormidia attached to the stem of the superior nectophore appear to have a peculiar flat dorsal facet with raised rims of the sort found only on the superior nectophore of *haeckeli*. The basal facet is at right angles to the dorsal and lacks all indications of teeth. Loose specimens have been found with these characters, but their gonophores have been too badly preserved to check their identity further.

Gonophore. Insofar as we can judge, the only distinctive feature of the gonophore of *A. haeckeli* is the stubby engorged curved tooth on the midportion of one of the ventral wings. We have not found older specimens in sufficiently good condition to study further.

Remarks

The peculiar shape of the horizontal and lateral ridges of the superior nectophore of *haeckeli* is figured but not mentioned by Lens and Van Riemsdijk (1908, pl. 5, fig. 41). Re-examination of their specimens proves that our specimens are more exaggerated in this respect than theirs. In Bigelow's (1911, pl. 13, fig. 1) figure, the horizontal ridge appears to be rather higher and it together with the basal half of the lateral ridge apparently is not protruded to overshadow the basal portion of the ventrolateral ridge. We have reexamined his specimens which are relatively small and perhaps not fully developed and his drawing is correct. Moser (1925, pl. 18, fig. 6) follows Bigelow in general outline but she depicted the facets as flat and surrounded by raised rims of the sort observed on our specimens. We have seen one rather poorly preserved specimen which is very like the one Moser (1925) figured.

The question of the identity of all the *Abyla* eudoxids is perplexing because insofar as we can see, the differences in each species are so slight that they cannot be determined for either the bracts or gonophores when small specimens are attached to the stem within the hydroecium of the superior nectophore. We have found specimens of *A. haeckeli* with cormidia which are not too unlike the one described by Huxley (1859, pl. 5, fig. 2) and which we believe develop into the detached specimens of the sort shown in Figure 26. Other bracts previously have been referred to *haeckeli* (Bedot, 1896, p. 373, pl. 12, figs. 5–6 [*Amphiroa dispar*]; Totton, 1932, text fig. 12) because they seemingly differed from the one described earlier as that of *trigona*. These, however, are not *haeckeli*, I believe, because the basal facet in *haeckeli* is at right angles to the dorsal and they do not have the angularity of Bedot's (1896, pl. 12, figs. 5–6) or the cleft of Totton's (1932, text fig. 12) specimens.

Abyla ingeborgae[1] n. sp.

?*Abyla trigona*, Huxley, 1859, pp. 47–48, pl. 3, fig. 1.
Abyla haeckeli Kawamura, 1915, pp. 577–578, pl. 15, figs. 24–26.
?*Abyla haeckeli*, Totton, 1932, pp. 331–333.

The type specimens of *Abyla ingeborgae* are 23 superior nectophores from ϕ. K 1.—Sta. No. 4762 at 8°13′S, 2°54′E taken on 11 February 1933 at 1930 hours with a stramin net 200 cm. in diameter. There are also five loose inferior nectophores which, we believe, belong to this species. These will be deposited in Universitets Zoologiske Museum, København, Denmark.

Superior nectophore (Figs. 12E, 13E, 14E). The superior nectophore of *Abyla ingeborgae* is very similar to that of *schmidti* in general appearance, when well-preserved, but it is readily distinguished from it by a transverse ridge dividing the apicoventral facet into two. Because of this character it may have been referred to *haeckeli* in the past. Nevertheless, the two species are quite distinct. The ventral surface is only about one half as wide at the insertion of the horizontal ridge as it is high from this point to its basal tip. This is seemingly due to the two

[1] Named in honor of Mrs. Johannes Schmidt, the widow of the expedition's leader.

elongate basal ridges of this facet. In addition, the width of the nectophore is only about two-thirds the height (0.69). The lateral protrusions are relatively inconspicuous and, in addition, are distinctly higher than those of *haeckeli*. The horizontal ridge in side view appears to lie well above the middle of the somatocyst not well below it, as in *haeckeli*. Hence, the apical ventrolateral facet is definitely smaller than the basal ventrolateral one below it. The dorsal facet is almost a perfect rectangle. In other words, it does not taper from the top as is usual in *schmidti* or bow on the sides as in a number of other species. The only serrations visible even under quite high magnification are at the base of the dorsal wall of the hydroecium.

Inferior nectophore (Fig. 11C). The inferior nectophore which we believe to be that of *A. ingeborgae* has some characters rather like that of *A. haeckeli*, some like those of *A. schmidti*. Thus, the comb has five teeth like *schmidti*, the right ventral wing is more nearly triangular rather than concave on its basal border and the dorsal tooth is smaller and less prominent. On the other hand, the position of the lateral oral teeth is close to the dorsal one as in *haeckeli*, but the right lateral tooth is almost as large as the left and has a well defined ridge. Likewise, the left ventral wing is continuous with the ridge of the left ventral tooth. Also, the dentition of the right ventral wing is more like that of *haeckeli*. There may be three or four stout teeth on the inner basal margin, but the outer one has only a weak scallop or two. There are, however, no strong teeth delimiting the ventral extent of the basal margin and the ventral margin is not as thickened as it is in *haeckeli*.

The general appearance of the nectophore is very like that of *haeckeli* in the specimens we have seen. Thus, while it may be almost as wide as it is long due to the expansion of the ventral wings, these are fragile and easily damaged.

Eudoxid. A cormidium was found attached within the hydroecium of one specimen. The bract is characteristic of that for the genus and the gonophore is seemingly like that of *haeckeli* with perhaps a conspicuous dorsal tooth and ridge and variations in the serrations on the ventral ridges and teeth.

Remarks

One small inferior nectophore was found within the hydroecium of a superior nectophore of *A. ingeborgae*, but it was not possible to observe characters to distinguish it from *A. haeckeli*. The above description is therefore based on two fairly well preserved specimens found in the same sample as the type (superior nectophores) and at one other station, where the superior nectophores of *A. ingeborgae* were found. It seems probable, therefore, that these inferior nectophores are actually those of *A. ingeborgae*, because we have proof from the small attached inferior nectophores that they are very like those of *A. haeckeli* and because the larger detached specimens have always been found associated with the superior nectophores of *A. ingeborgae*.

Abyla peruana n. sp.

Abyla trigona, Bigelow, 1911, pp. 221–222 (partim); pl. 13, figs. 3–4.

The type specimen of *Abyla peruana* is a superior nectophore collected at "Albatross" Sta. 4673 off Peru by Dr. H. B. Bigelow on 21 November 1904 and was deposited in the U. S. National Museum (No. 28349). It has previously been referred to *A. trigona*.

Superior nectophore (Figs. 8D, 9D, 10D). The superior nectophore of *Abyla peruana* superficially looks more like *A. haeckeli* than *A. trigona*. This is chiefly due to the fact that the horizontal ridge when seen in side view lies just above the middle of the somatocyst. There is no danger that this is a young specimen of *haeckeli* because it lacks the extra ridge separating the ventral and apicoventral surfaces. Indeed, in the one specimen seen, the two surfaces are only at an angle of about 45° rather than at a right angle. This appears to be due to the fact that the apex of the hydroecium is distinctly higher than either the somatocyst or nectosac. The transverse apical ridge is thus correspondingly higher. The apex of the nectosac is also lower than that of the somatocyst. In other species of *Abyla* these have been at the same level, although the apex of the hydroecium is usually slightly above the other two cavities. The ridges outlining the facets are in general more pronounced and wider than they are in *haeckeli* and presumably stood well above the facet when living. As the lower part of the dorsal facet and the basal facet are damaged, the only other peculiarity that one can see is an unusually long and heavy keel beneath the hydroecium.

Inferior nectophore. Unknown.

Eudoxid. Unknown.

Remarks

Although the specimens from two stations of the "Albatross" Expedition to the Eastern Tropical Pacific have not been found, it seems very likely that it was this specimen which Bigelow (1911, pl. 13, figs. 3–4) drew. The specimen is now damaged as described above, but it is hard to reconcile Bigelow's (1911, pl. 13, fig. 4) ventral view either with his (1911, pl. 13, fig. 3) lateral view or its present condition. While it is possible that the ventral ridge of the basal facet is as wide as he shows it, it seems unlikely that the nectophore ever narrowed along the lateral ridge (1911, pl. 13, fig. 4). One other feature not shown in Bigelow's drawings is the very marked ridges.

ABYLA BICARINATA Moser 1925

Abyla bicarinata Moser, 1925, pp. 298–299, pl. 19, figs. 3–6 (superior nectophores).

Non *Abyla bicarinata* Moser, 1925, pp. 299–301, pl. 19, figs. 7–9 (inferior nectophores).

Superior nectophore (Figs. 12A, 13A, 14A). The superior nectophore of *Abyla bicarinata* is unique in that it is wider than it is high. This is due to the extraordinary wing-like expansion of the lateral ridges. In some specimens these appear to end above the basal margin of the hydroecium but it is usually possible to trace them to the base, at least as a series of punctae. In addition, the edges of the facets are all rounded and tumid, but the exact location of the ridges may be traced as fine hair-like lines. There is no depression or furrow ventral to the transverse apical ridge. The apical ventrolateral facets appear more as a slight depression between the apical surface and upper half of the lateral and horizontal ridges. Furthermore, they do not actually lie in the horizontal plane, but are part of the apical surface. The result is that in a true lateral view the somatocyst may be viewed in its entirety through the basal ventrolateral facet.

Several other characters make this species quite distinct from the next species (*brownia*) to be described. The width of the ventral facet at the insertion of the horizontal ridge is about three-quarters (0.76) the height, thence to its basal tip. In ventral view the vertical distance between the insertion of the horizontal ridges to the ventral facet and the transverse apical ridge is proportionately greater in this species than in *brownia*. In side view, the lateral ridges of the basal segment are diagonal almost as in *A. carina*.

Inferior nectophore (Fig. 15A). The inferior nectophore of *Abyla bicarinata* is the only one known so far which is as wide as it is long. In addition, the left lateral ridge is as pronounced and as conspicuous as the dorsal one. Both are more expanded than in any other species and the two together, in preserved specimens at least, bound a somewhat circular rather than rectangular surface covering most of the left lateral half of the nectophore. In addition, the right ventral wing[1] forms an almost perfect semicircle. In fact, the inferior nectophore does not have the conventional diphyid outline but rather gives the impression of being two, flat, superimposed discs. While the teeth surrounding the opening to the nectosac are very like those of the other species in the genus, they are stronger and more prominent. The dorsal tooth lacks serrations. One further character helpful in distinguishing the inferior nectophores is that there are 4–7 teeth on the comb. Finally, there are six teeth on the inner row of the basal portion of the right ventral wing. This row at first parallels the outer but diverges from it to end on the inner surface well in from the ventral margin, a characteristic also found in *A. tottoni*.

Eudoxid. Unknown.

Remarks

The most obvious differences which Moser (1925) apparently failed to stress between this and closely related species is that in most specimens the nectophores are opaque as in *haeckeli*. Also, all of them are rather more turgid than others in the genus. In this respect, they resemble *Ceratocymba sagittata* and *C. dentata*. In one colony from the "Dana" collection, however, only the outer part of the ridges is opaque and a few of the inferior nectophores are quite transparent.

ABYLA BROWNIA[2] n. sp.

?*Abyla* sp., Totton, 1950.

[1] In some specimens viewed from the right side, there appears to be a partial ridge. Careful examination indicates that this is in reality the line of attachment of the right ventral wing, which may be more or less pronounced depending on preservation.

[2] Named in honor of its discoverer, Miss Joan A. Brown

The type specimen of *Abyla brownia* is a superior nectophore, which came from "Dana" Sta. 3964^{VIII} at 25°19′S, 36°13′E on 15 January 1930 at 2355 hours in a stramin net 150 cm. in diameter, with 2000 meters of wire out. It will be deposited in Universitets Zoologiske Museum, København, Denmark.

Superior nectophore (Figs. 12C, 13C, 14C). This nectophore will not be confused with any other species except possibly *bicarinata*, for it too has expanded lateral ridges which end just above the basal margin of the hydroecium. Relatively, these are not as wide as in *bicarinata*; the greatest width is somewhat less than the height (0.85). The ventral facet is likewise narrower, being somewhat less than half as wide (0.45) at the insertion of the horizontal ridges as it is thence to its basal tip. Furthermore, the ridges are well defined and most of them are finely serrated. The basal margins of the lateral walls of the hydroecium are heavily serrated, as is the basal portion of the laterals. Also, in contrast to *bicarinata* the arc formed by the lateral margins of the basal facet, as seen in a lateral view, has a marked curvature rather like that in *A. trigona*. The apicodorsal facet appears to be distinctly shorter than in *bicarinata*. This may possibly be due to the fact that in ventral view the vertical distance between the transverse apical ridge and the insertion of the horizontal ridges and the ventral facet is proportionately shorter than in *bicarinata*. Finally, the apical portion of the apicoventral facet is slightly furrowed, but lacks any indication of a depression just ventral to the transverse apical ridge.

Inferior nectophore. Unknown.

Eudoxid. Unknown.

Abyla tottoni[1] n. sp.

Abyla trigona Moser, 1925, pp. 301–310, text figs. 42–47, pl. 16, figs. 6–7, pl. 18, fig. 7 (partim).

The type specimen is a colony from "Dana" Sta. 3994^{I} at 15°45′S, 5°45′W taken on 24 February 1930 at 1930 hours with a stramin net 200 cm. in diameter. It will be deposited in the Universitets Zoolgiske Museum, København, Denmark.

[1] Named in honor of Captain A. K. Totton of the British Museum (N. H.) in appreciation for his many kindnesses in furthering my understanding of this genus.

Superior nectophore (Figs. 12B, 13B, 14B). The superior nectophore of *Abyla tottoni* is tumid, especially the apical portion. The transverse apical ridge is not distinct, but looks rather like a rounded chamfer or rolled joint. In large specimens this may also be true of the apicolateral and the apicodorsal ridges. The exact location of the ridges is, however, delimited by fine hair-like lines which may be seen with proper lighting. The horizontal ridge may be indistinct but it can always be traced by a series of punctate elevations. Likewise, in some of the larger specimens the projection formed at the junction of the lateral and horizontal ridges is a definite knob rather than angular, as it usually is in this and other species. These knobs might be caused by poor preservation, although it is seldom possible to detect any damage on such specimens. In any event, the lateral protrusions are more marked than in any species other than those with expanded lateral ridges. Thus, the nectophore is nearly (0.86) as wide as it is high.[1] Two other characters together with those just mentioned serve to distinguish it from all other species even when detached from the inferior nectophore. At the insertion of the horizontal ridge, the ventral facet is as wide (1.09) as from that point to its basal tip. Finally, one of the most consistent features is the extremely deep depression just ventral to the transverse apical ridge.

Inferior nectophore (Fig. 15B). The inferior nectophore of *A. tottoni* is usually about three-quarters as wide as it is long (exclusive of the apophysis). The dorsal ridge is so expanded toward the apex that it curves sharply before merging with the dorsal tooth. Likewise, the right ventral wing is a somewhat lopsided semicircle. The outer row of teeth (8–12) on its basal margin is continuous with serrations of its ventral margin. The inner row parallels the outer close to the ventral teeth, but gradually diverges to end on the inner surface of the wing well in from the ventral margin very much as it does in *bicarinata*. These teeth are coarser and may be slightly more numerous than those on the outer row. The characters enumerated above, together with the row of eight or nine teeth on the comb of the left ventral ridge make it possible to distinguish the inferior nectophore of *tottoni* without any difficulty.

Eudoxid. Unknown.

[1] Poorly preserved specimens, however, have been seen in which these protrusions were so damaged that this character cannot always be relied upon in differentiating this species.

PSEUDABYLA n. gen.

Genotype: *Pseudabyla irregularis* n. sp.

Generic Characters

Superior nectophore (Figs. 16 and 17). The genus *Pseudabyla* is established for three damaged superior nectophores. These resemble specimens of *Abyla* and might be referred to that genus if not examined carefully. They have a number of characters in common, a transverse apical ridge and horizontal ridges as well as the same internal arrangement and configuration of the basal region. Closer examination, however, reveals that there are fewer facets and that the nectophore is asymmetrical due to the absence of a facet or ridge and perhaps to a shift in the position of one ridge or another.

Inferior nectophore. Unknown.

Eudoxid. Unknown.

Remarks

The description given for *Pseudabyla* is general to include specimens of what appear to be two species closely related to *Abyla*, but until more is known of these it appears premature to go into greater detail. At present, the known variants of *Abyla* are included here to emphasize their existence. In making this genus, as well as three to be described later (*Pseudocymba*, *Abylopsoides*, *Pseudabylopsis*), so inclusive, the usual practise of differentiating the genera of the Abylinae by the number and arrangement of the facets and ridges of the superior nectophore has admittedly been disregarded. Such a course seems warranted, in view of the fact that only two or three specimens are known in each genus, at least until such time as a sufficient number of specimens become available either to substantiate or to disprove such action. One more or less parallel case among the Diphyinae also makes it somewhat justifiable. In that group, most genera have five ridges on the superior nectophore, but in one genus, *Lensia*, the number varies (Totton, 1941). This variation is one of the characters which is helpful in distinguishing the individual species. Totton (1941) had a sufficient number of specimens to prove the existence of good species in *Lensia*. It is possible then that much the same situation

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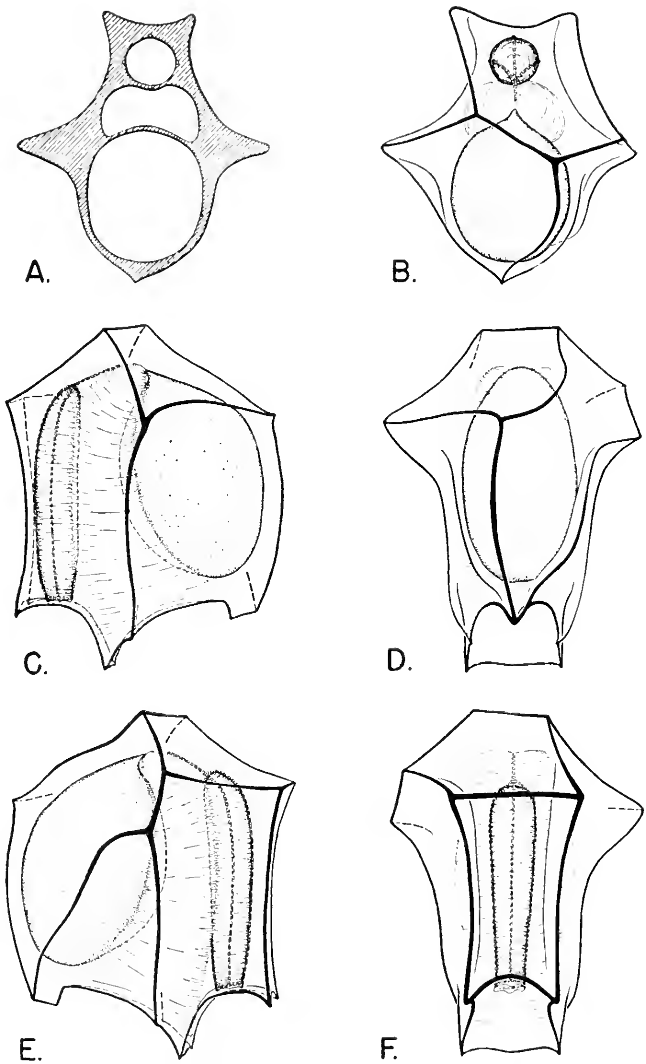

Fig. 16. Superior nectophore of *Pseudabyla irregularis* dorsal facet of about 3 mm. in length. A. Cross section. B. Apical view. C. Left lateral view. D. Ventral view. E. Right lateral view. F. Dorsal view.

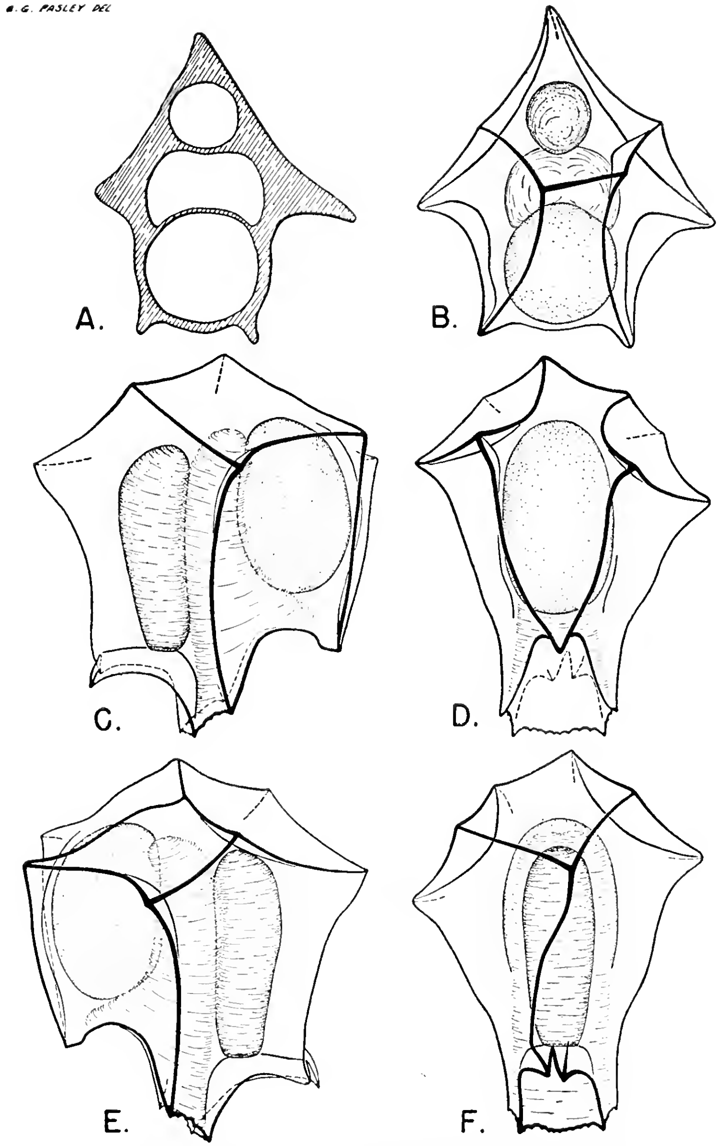

Fig. 17. Superior nectophore of *Pseudabyla dubia* with a dorsal facet of nearly 2 mm. A. Cross section. B. Apical view. C. Right lateral view. D. Ventral view. E. Left lateral view. F. Dorsal view.

exists among the Abylinae, but as yet we have an insufficient number of specimens to feel certain.

Another problem to be solved in the Abylinae, which does not arise in the Diphyinae, is the reason for the asymmetry in some of these variants. The chief difference between *Abyla* and *Ceratocymba* is the absence of the transverse apical ridge and the two horizontal ridges with a consequent reduction in the number of facets, but otherwise little change in their arrangement. The actual loss of a facet, however, seems to result in an asymmetrical arrangement. This has been found to be the case not only in this genus, but also in *Pseudocymba* and *Abylopsoides*. So far, we have only two bits of evidence to suggest that the asymmetry is a specific character. Two specimens of *Pseudabyla irregularis* have been found at widely separated localities and yet, despite the poorly preserved condition they were found in, it appears that the two are asymmetrical in exactly the same way. A second suggestion that this may, indeed, be true is that both species of *Pseudocymba* have triangular basal facets.

Key to the Species of Pseudabyla

A. Superior nectophore
   1. Ventral ridge present .... *Pseudabyla irregularis* n. sp.
      Ventral facet present .... *Pseudabyla dubia* n. sp.

Pseudabyla irregularis n. sp.

The type specimen of *Pseudabyla irregularis* is a superior nectophore taken at "Dana" Station 3919^{IV}, at 0°07′S, 63°56′E on 8 December 1929 at 1910 hours in a stramin net, 200 cm. in diameter, towing with 100 meters of wire out. A second superior nectophore was taken at "Dana" Station 3964^{V} at 25°19′S, 36°13′E on 15 January 1930 at 2030 hours in a stramin net 150 cm. in diameter, towing with 50 meters of wire out. The specimens will be deposited in Universitets Zoologiske Museum, København.

Superior nectophore (Fig. 16). The two specimens appear to be identical, insofar as can be determined in their damaged condition. The asymmetry which might be presumed to have resulted from poor preservation is actually caused by structural peculiarities as mentioned below. The most obvious characteristic of this species of *Pseudabyla* is the presence of a ventral ridge rather than a facet, but a more critical examination reveals that the left horizontal ridge crosses the ventrolateral surface diagonally and joins the ventral ridge at its basal end. The right horizontal ridge is in the position usual in *Abyla*. However, the apicolateral ridge on this side which in *Abyla* separates the apicoventral and apical ventrolateral facet is apparently missing. Consequently, the transverse apical ridge is diagonal and one of the right lateral ridges bordering the apicodorsal facet has seemingly disappeared. Thus, this facet is pentagonal rather than hexagonal as in *Abyla*.

Inferior nectophore. Unknown.

Eudoxid. Unknown.

Remarks

Since the two specimens taken at widely separated localities appear identical, even in their asymmetry, *irregularis* would seem to be a valid species which may previously have been overlooked because it appears so similar to *Abyla* unless carefully examined.

PSEUDABYLA DUBIA n. sp.

The type specimen of *Pseudabyla dubia* is a superior nectophore taken at "Dana" Sta. 3921^{III} at 3°36′S, 58°19′E on 11 December 1929 at 1900 hours in a stramin net 200 cm. in diameter, towing with 300 meters of wire out. The specimen when found was damaged and, most regrettably, was dried up after the sketches (Fig. 17) were made. The specimen has, however, been saved and will be placed in Universitets Zoologiske Museum, København.

Superior nectophore (Fig. 17). This species differs from the previous one in that the dorsal facet is replaced by a ridge. Also, a ventral facet is present. On the other hand, this is not symmetrical as in *Abyla*: the apical part being twisted to the left and the point of junction with the horizontal ridges is slightly higher on the right than on the left. In addition, the upright vertical ridge separating the dorsal facet from the right dorsolateral is seemingly missing. Strangely enough, the tooth at the end of the left upright (or dorsal ridge) is smaller and more irregular than the right. The apicodorsal facet is pentagonal, apparently due to the disappearance of the ridge which is present in *Abyla* and which separates the dorsal and apicodorsal facets in that genus. Finally, as in *irregularis* the transverse apical ridge is skewed.

Remarks

Despite the poor condition the specimen is now in, because it was accidentally dried, these characters can still be observed and hence, it appears desirable to call attention to this peculiar variant of *Abyla*.

CERATOCYMBA Chun 1888

Genotype: *Ceratocymba sagittata* Quoy & Gaimard 1827

Generic Characters

Superior nectophore (Figs. 18A, 19, 22). In general appearance the superior nectophores of the several species of *Ceratocymba* form a graduated series (Fig. 1), varying from an almost rectangular (*leuckartii*)[1] to an elongate pyramidal shape (*sagittata*). However, all members of the genus have the same basic arrangement of facets as in *Abyla*, but the number is reduced to a total of seven. The smaller number is due to the absence of any subdivision on the apical and ventral surfaces, or of the ventrolateral facets, i.e., both transverse and horizontal ridges are absent. In three of the four species, the dorsal facet is triangular rather than rectangular. When triangular, its apex, together with the adjacent facets, is more or less produced. This is slight in *dentata*, greater in *intermedia*, and very pronounced in *sagittata*. As a result of this growth, the definite apical facet in *leuckartii* and *dentata* seemingly disappears in *sagittata*. However, the ventral surface apical to the somatocyst is homologous with the apical surface as determined by the insertion of the lateral ridges. Primarily, the arrangement of the somatocyst, hydroecium, and nectosac is the same in this genus as in *Abyla*, but with the prolongation of the dorsal facet, the nectosac becomes correspondingly elongate. While the arrangement of the somatocyst, hydroecium and nectosac on the other hand, are essentially as in *Abyla*, the keel beneath the somatocyst in side view appears to lie well above the opening of the nectosac, unlike that of *Abyla*.

Inferior nectophore (Figs. 18D, 20C, 21C). The inferior nectophores of *Ceratocymba* differ from those of *Abyla* in that none of the ridges is expanded into pronounced wing-like structures. Hence, the nec-

[1] As defined here the genus *Ceratocymba* includes two species, *leuckartii* Huxley and *dentata* Bigelow previously referred to *Abyla*, as well as *C. sagittata* and a new species, *C. intermedia*.

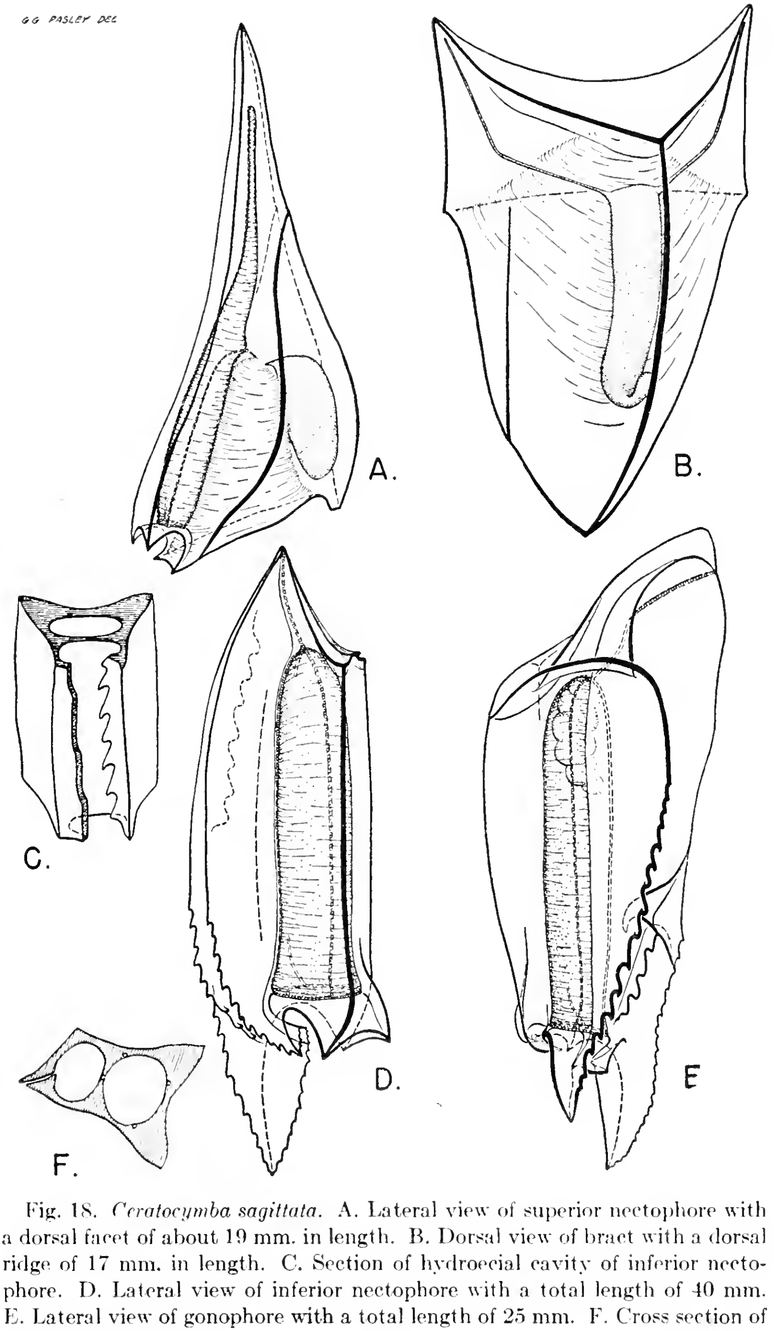

Fig. 18. *Ceratocymba sagittata.* A. Lateral view of superior nectophore with a dorsal facet of about 19 mm. in length. B. Dorsal view of bract with a dorsal ridge of 17 mm. in length. C. Section of hydroecial cavity of inferior nectophore. D. Lateral view of inferior nectophore with a total length of 40 mm. E. Lateral view of gonophore with a total length of 25 mm. F. Cross section of inferior nectophore.

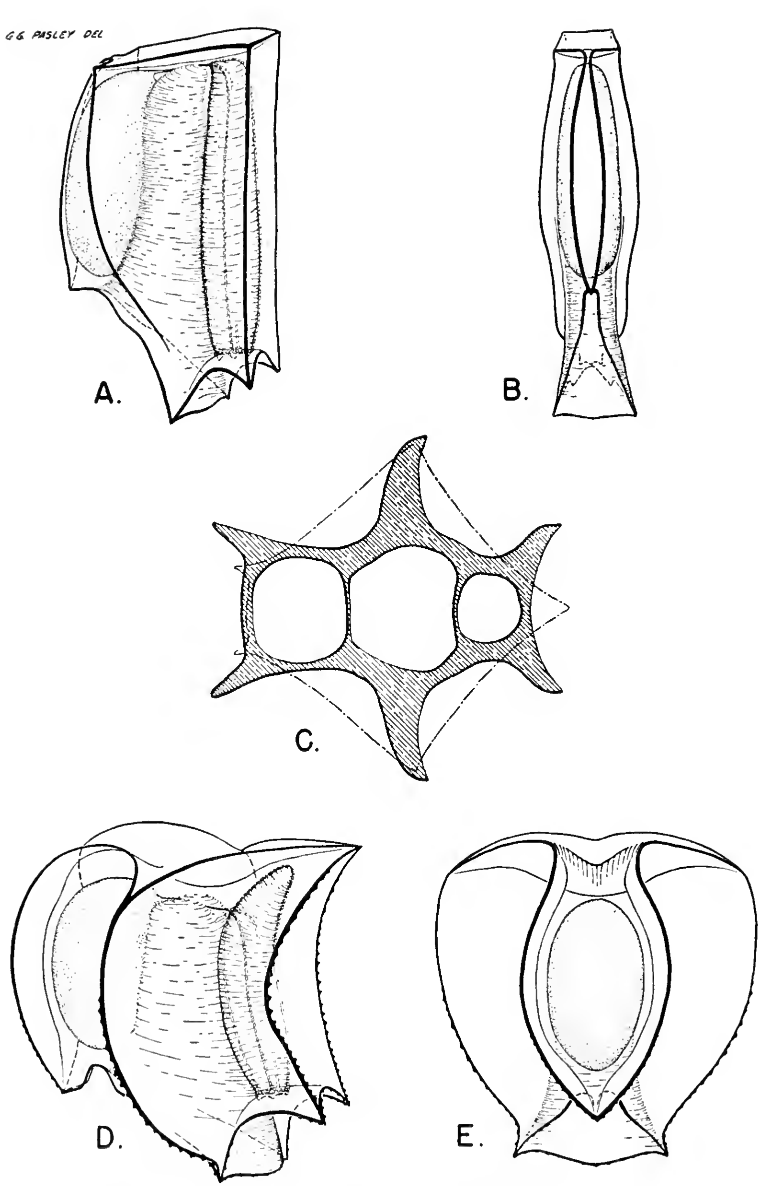

Fig. 19. Superior nectophores. *Ceratocymba leuckartii:* A. Lateral view of specimen with dorsal facet of about 5 mm. in length. B. Ventral view of same. *C. dentata:* C. Cross section with outline at apex superimposed as a dashed line. D. Lateral view of specimen with a dorsal facet of about 9 mm. E. Ventral view of same specimen.

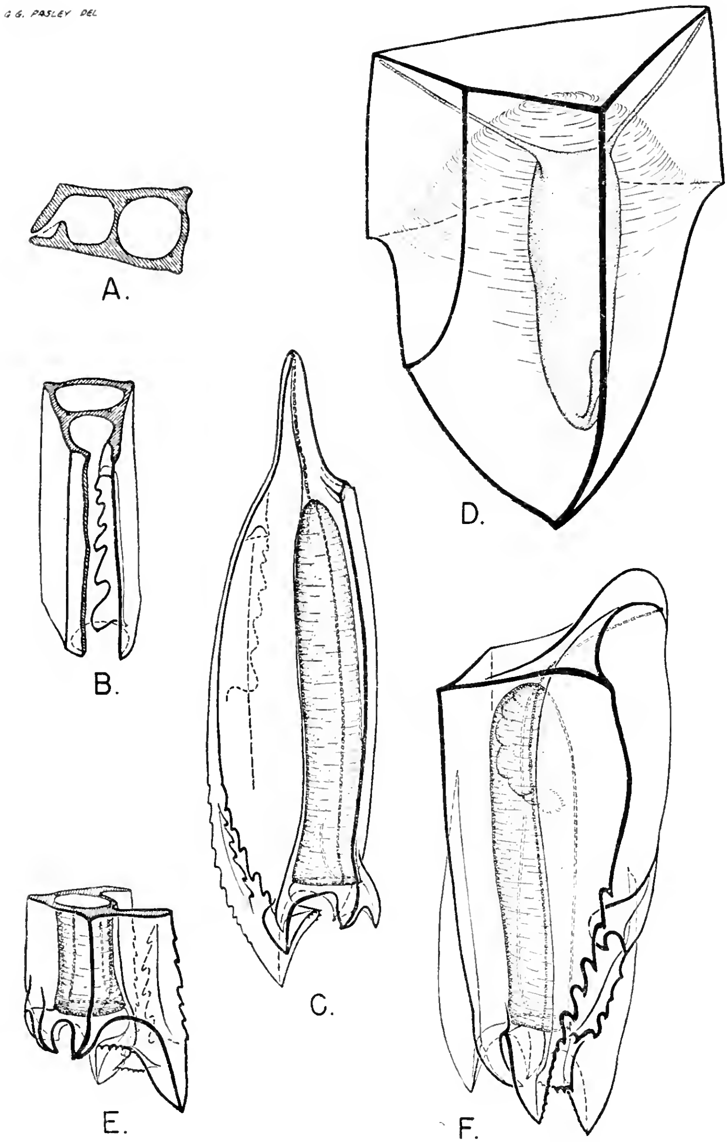

Fig. 20. *Ceratocymba leuckartii:* A. Cross section of inferior nectophore. B. Section of hydroecial cavity of same. C. Left lateral view of inferior nectophore 9.5 mm. in length (exclusive of apophysis). D. Bract drawn from specimens with a dorsal ridge of about 6 mm. E. Detail of mouth region from right side of same. F. Gonophore, about 4 mm.

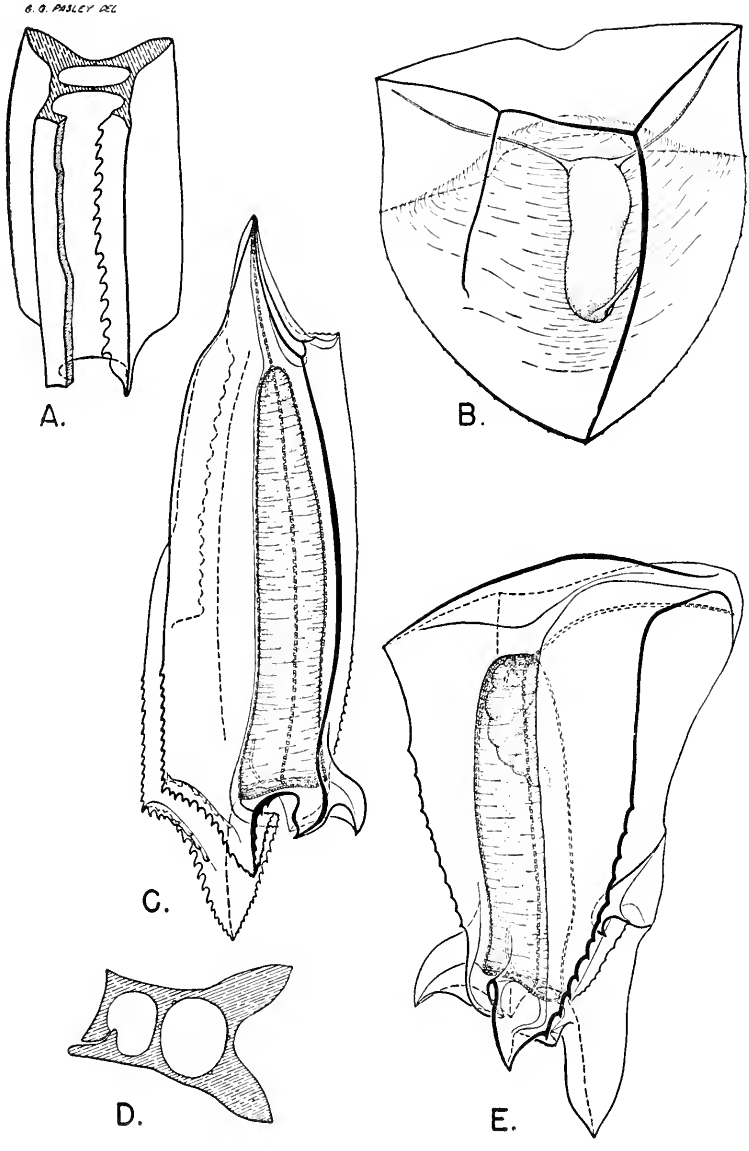

Fig. 21. *Ceratocymba dentata:* A. Section of hydroecial cavity of inferior nectophore. B. Dorsal view of a bract with a dorsal ridge of 13 mm. in length. C. Left lateral view of inferior nectophore of 45 mm. in total length (exclusive of apophysis). D. Cross section of inferior nectophore. E. Lateral view of gonophore 13.3 mm. in length.

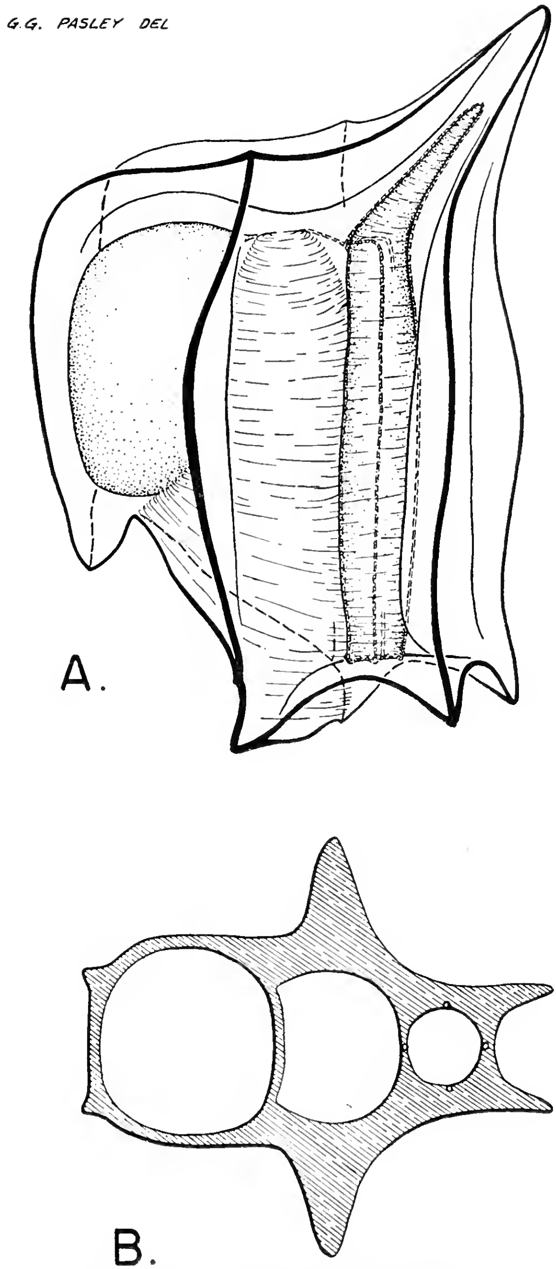

Fig. 22. Superior nectophore of *Ceratocymba intermedia:* A. Lateral view of a superior nectophore with a dorsal facet of 7 mm. in length. B. Cross section.

tophore as a whole tends to be long and narrow. Also, in contrast to *Abyla*, it is the dorsal ridge which is suppressed rather than the right lateral. This is shown by the fact that the ridge of the dorsal tooth ends abruptly a short distance above the tooth on the dorsal wall of the nectophore. The lateral ridge, especially the right, tends to replace the dorsal. As a result the basal teeth are usually somewhat asymmetrical in their arrangement. Still another character is a prominent supernumerary ridge on the outer surface of the right ventral wing. This appears to act as a hinge for the outer half of the wing bends along the ridge at a right angle to the lateral surface as a whole. Thus, its distal half forms a ventral wall to the hydroecium which is rather shallower in this genus than in *Abyla*. It would seem that this device affords a better protection for the stem than the comb of the left lateral wing. The latter structure is, however, quite as well developed in this genus as in *Abyla*. Likewise, the oral teeth are as prominent and stout as in *Abyla*, but the dorsal tooth, in the absence of the dorsal ridge, may appear to protrude forward rather more. The ventral teeth are joined by a thickened lip which on the side toward the opening to the nectosac has an ovoid serrated rim.

Within the nectophore, the only peculiarity of the genus is the arrangement of the radial canals. Two, the ventral and left lateral, are to be found in their usual positions, but the dorsal has shifted to a slightly lateral position and lies under the right lateral ridge. The right lateral canal has come to lie under the accessory ridge. As a result, the latter is not straight, but veers sharply dorsad just prior to its insertion on the ring canal. It enters the canal, then, close to the point where one might expect to find the right lateral canal.

Bracts. (Figs. 18B, 20D, 21B). The bracts of this genus are of the "*Cymba*" type which differ considerably in general appearance from the "*Amphiroa*" of *Abyla*, although of the same basic plan (Fig. 2). In contrast to the "*Amphiroa*" bract, however, these are dorsoventrally flattened, with a median ridge rather than a dorsal facet. The basal facet is also missing but nevertheless there are usually[1] a total of five facets, because the left lateral facet is further subdivided by a more or less complete lateral ridge. The somatocyst system is very similar to that of the "*Amphiroa*" type, with two thin ventrolateral branches and a swollen descending branch. The chief differ-

[1] In *Ceratocymba sagittata*, according to our observations, the lateral ridge may be missing as shown by Bedot (1904).

ence is that the posterior extremity of the latter curves sharply dorsad ending in a blind sac. The relative length of the descending branch of the somatocyst, the position and extent of the lateral ridge, and the degree of serration and the relative prominence of the ridges appear to be the best characters on which to base specific differences.

Gonophores (Figs. 18E, 20F, 21E). In many ways the gonophores of each species of *Ceratocymba* resemble the inferior nectophores of that species, i.e., in the number and arrangement of the ridges and the oral teeth. However, the apophysis is lopsided to fit into the hydroecial cavity of the bract. Depending on the sex, this together with the ventral ridges and teeth are mirror images of one another. The hydroecial cavity of the gonophore is characterized by the presence of a hook[1] curved inward from the margin of one of the ventral ridges. From beneath the tip of the hook a diagonal ridge extends down along the floor of the hydroecium toward the ventral tooth on the opposite side. This ridge may be scarcely detected, may be serrate, or even denticulate.[2] In any event, with the hook it forms a finger-like pocket in the lower portion of the hydroecium.

Remarks

The genus *Ceratocymba* has previously been considered monotypic, chiefly because the general outline of the superior nectophore of *sagittata* is unique among abylids. "This external modification obscures its close relationship to *A. leuckartii*, but when the ridges and facets are analyzed their fundamental unity is at once apparent" (Bigelow, 1911, p. 231; see also, p. 232). This statement remains true whether Bigelow's *Diphyabyla hubrechti* actually is *intermedia* or *sagittata*. As mentioned above, two species (*leuckartii* and *dentata*) which had earlier been considered as members of the genus *Abyla*, actually have the characteristic number and arrangement of the ridges and facets of the superior nectophore of *C. sagittata* (a comparison made by Lens & Van Riemsdijk (1908) in their original description), as well as similar inferior nectophores and eudoxids. That the apical prolongation in *sagittata* is merely an exaggerated development of the apicodorsal peak in *dentata*, seems quite obvious

[1] Since male and female gonophores are mirror images of one another, this character is found on the left ventral ridge in the female and the right in the male.

[2] There appears to be considerable individual variation in this character. It does not seem, however, to be entirely dependent on the state of preservation.

on comparing the two (Fig. 1). In short, the only pronounced differences between the two species are the apical extension of the dorsal facet and the consequent stretching of contiguous facets and nectosac. That this is indeed the case, now seems apparent on finding a superior nectophore of a new species intermediate between the two, which is described below as *intermedia*[1]. This transitional form affords a most convincing proof of the importance of the ridges and facets of the superior nectophore in determining generic differences in the Aby linae. Certainly, the close similarity, even in quite minute details, of the structure of the inferior nectophores, eudoxids, and gonophores in this genus as construed here, seems to justify the present definition of *Ceratocymba*. The broad outlines, on the other hand, appear to be a specific rather than a generic difference (Fig. 1). At the same time, it becomes obvious that the elongate apex of the superior nectophore, the elongate tooth below the right ventral wing of the inferior nectophore, and the apical horns of the bracts are merely specific differences of *sagittata*, as one might suspect, rather than generic characters as has previously been supposed.

Key to the Species of Ceratocymba

A. Based on the characters of the superior nectophore.

1. Dorsal facet rectangular . . . . *Ceratocymba leuckartii* Huxley
   Dorsal facet triangular 2
2. Lateral ridges expanded into wing-like structure; deep apical depression
   Ceratocymba dentata Bigelow
   Lateral ridges not markedly expanded 3
3. Nectosac at least twice as long as the hydroecium . . . .
   Ceratocymba sagittata Quoy and Gaimard
   Nectosac less than twice as long as the hydroecium . . . .
   Ceratocymba intermedia n. sp.

B. Based on the characters of the inferior nectophores (where known).

1. Nectophore with an elongate right ventral tooth; 6–7 teeth on flap folded in along apical portion of left ventral wing . . . .
   Ceratocymba sagittata Quoy and Gaimard
   Nectophore without an elongate right ventral tooth 2
2. Nectophore laterally flattened; accessory ridge short and inconspicuous;

[1] It is this species, I believe, which Bigelow (1911, pl. 12, fig. 7) has illustrated as *Diphyabyla hubrechti* and which Moser (1925, p. 274) considered to be a young specimen of *C. sagittata*. To be sure all known specimens are 5–7 mm., but the outline of *sagittata*, even when as small, is that of the adult (i.e., 19 mm. or more).

at most 5–6 teeth folded in along apical portion of left ventral wing. . *Ceratocymba leuckartii* Huxley

Nectophore not flattened; accessory ridge long, conspicuous and serrated; about 15 relatively small teeth folded in along apical margin of the left ventral wing. . . . . *Ceratocymba dentata* Bigelow

C. Based on the bracts (where known).

1. Bract with two prominent anterior horns; apical facet triangular; left lateral ridge does not usually join apicodorsal ridge. . . . . *Ceratocymba sagittata* Quoy and Gaimard

   Bract without horns; apical facet quadrangular; left lateral ridge joins apicodorsal ridge. 2

2. Left lateral ridge usually extends posteriorly to basal margin; margins and ridges generally smooth; somatocyst extends almost to posterior margin of bract. *Ceratocymba leuckartii* Huxley

   Left lateral ridge ends abruptly shortly before reaching posterior margin; ridges expanded; ridges and margins serrated; somatocyst confined to anterior half of bract. . . . . *Ceratocymba dentata* Bigelow

D. Based on gonophores (where known)

1. Gonophore with a dorsal ridge extending about half way up the nectophore above the dorsal tooth. . . . . . . *Ceratocymba leuckartii* Huxley

   Gonophore with ridge of dorsal tooth ending a short distance above it. 2

2. Gonophore with prominent dorsal tooth projecting forward. . . . . *Ceratocymba dentata* Bigelow

   Gonophore with rather inconspicuous dorsal tooth. . . . . *Ceratocymba sagittata* Quoy and Gaimard

Ceratocymba sagittata Quoy and Gaimard 1827

Cymba sagittata, Quoy and Gaimard, 1827, pp. 16–17, pl. 2c, figs. 1–9; 1829 p. 134; Eschscholtz, 1829, p. 134; Lesson, 1843, p. 454.

Nacella sagittata, Blainville, 1830, p. 120; 1834, p. 131, pl. 4, fig. 2 (not seen).

Diphyes cymba, Quoy and Gaimard, 1834, pp. 95–97.

Diphyes nacelle, Quoy and Gaimard, 1834, pl. 5, figs. 12–17.

Ceratocymba spectabilis, Chun, 1888, pp. 1160–1162.

Ceratocymba sagittata, Chun, 1888, p. 1162; 1897, p. 33; Bedot, 1904, p. 5, pl. 1, figs. 1–3; Bigelow, 1918, pp. 411–415, pl. 5, fig. 5, pl. 6, figs. 1–3, pl. 7, figs. 1–5; 1931, pp. 548–549; Bigelow and Sears, 1937, pp. 28–29; Browne, 1926, pp. 65–66; Leloup, 1932, pp. 18–19; 1933, p. 19; 1934, pp. 54–55; Moser, 1911, p. 431; 1912, figs. 22–23; 1912b, p. 408; 1913, p. 149; 1925, pp. 269–283, text fig. 40, pl. 15, pl. 16, figs. 1–5; Totton, 1925, p. 446; 1932, p. 332; 1936, p. 233.

Enneagonum sagittatum, Schneider, 1898, pp. 92–93.

Abyla leuckartii, Agassiz and Mayer, 1902, p. 165 (partim).

Diphyabyla hubrechti, Lens and Van Riemsdijk, 1908, pp. 36–39, text figs. 46–51, pl. 6, fig. 47; Bigelow, 1911, pp. 231–233, pl. 12, fig. 7; Moser, 1911, p. 431; Totton, 1932, p. 332.
Abyla sagittata, Moore, 1949, p. 13.

Superior nectophore (Fig. 18A). The general resemblance of *C. sagittata* to the diphyids was the reason for the choice of the original generic name, *Diphyabyla*, given to the superior nectophore by Lens and Van Riemsdijk (1908). This resemblance is effected by an extreme apical prolongation of the triangular dorsal facet and adjacent portions of other facets to produce a long, narrow, pyramidal extension above the characteristically abylid nectophore. This means that the apical facet is not obvious and that the portion of the ventral facet above the somatocyst is homologous with this structure in the other species of the genus as indicated by the insertion of the lateral ridges. With the apical prolongation of the dorsal facet the nectosac becomes tubular and about twice as long as the hydroecium. The somatocyst and hydroecium, however, are not proportionately increased in length.

One further character which contrasts with the new species, *intermedia*, is that the width of the basal facet in side view is much less than one third the width of the basal margin of the nectophore.

Inferior nectophore (Fig. 18D). The inferior nectophore of *C. sagittata* may be distinguished by the elongate right ventral tooth, by the 6–7 teeth on the comb of the left ventral wing and by the accessory ridge intermediate in length between *dentata* and *leuckartii*. The latter arises slightly below the level of the apex of the nectosac and extends basally almost to the level of the nectosac opening. Details in the mouth region, although minor, are diagnostic for the species. The ventral edge of the right ventral wing is continuous with the teeth on the inner surface of the giant tooth. The ventral ridge of this tooth continues upward and disappears on the outer surface of the right ventral wing. On the left ventral wing where there is but a single row of teeth, the free edge merges directly with the ventral ridge of the corresponding tooth.

Bract (Fig. 18B). The bract of *C. sagittata* is unique in that it has prominent lateral horns and a triangular, deeply concave apical facet. In addition, the left lateral ridge does not usually join the apicodorsal ridge in most specimens, although on a number of individuals it does. In every case we have examined, however, the lateral ridge when present starts at the posterior margin. The somatocyst in *sagittata* as in *dentata* does not extend into the posterior half of the bract.

Such variability in the location of the lateral ridge might indicate that more than one species is involved. However, without more evidence than is now available, I am inclined to believe that this is due to individual variation. Thus, there may be a partial ridge, starting at the posterior margin and ending short of the apicodorsal ridge, as is most usual, or the two may join. The latter type tends to be more serrate along the ridges than the others and this appears also to be true of the gonophores attached to it.

Gonophore (Fig. 18E). The gonophore of *C. sagittata* is often recognized by the relative length of the ventral teeth, but unfortunately this is not an infallible character. It appears usual for one to be elongate as in the inferior nectophore, but quite often the two are more nearly the same length. Bigelow (1918, p. 415) considered the variations to be dependent on the stage of development. Thus, he believed that ventral teeth of nearly equal length were found more often in younger stages than those with a greater disparity in length. Our observations contradict his account, for at times we have found the greatest disparity on the smallest gonophores (1–2 mm.) and *vice versa*. Insofar as we have been able to ascertain, this variability cannot be correlated with variations of the bract (i.e., with those of the lateral ridge). Constant characters on the gonophores of this species are: (1) the relatively small inconspicuous hook arising from one of the ventral ridges and curved in toward the floor of the hydroecium, (2) the presence of serrations extending well above this hook on the ventral margin of the opposite wing, and (3) a very weak inconspicuous dorsal tooth. Finally, the apex is distinctive in that its lateral ridge attached next the hydroecial wall of the bract is higher than the opposite exposed one.[1]

Remarks

Although the eudoxid of this species was described by Quoy and Gaimard (1827) as *Cymba sagittata* from the Straits of Gibraltar, the polygastric generation remained unknown until Lens and Van Riemsdijk (1908) recorded a superior nectophore as *Diphyabyla hubrechti* from the East Indies. Soon thereafter, both Moser (1925, pp. 271–272)

[1] Often when preservation is poor, it is impossible to determine the gonophore of this species with certainty because the apex and the hydroecial region are so damaged.

and Bigelow (1918, p. 414) found stems still attached to the nectophores of *D. hubrechti* with cormidia sufficiently well developed to ascertain that they actually were the nectophores of *Ceratocymba sagittata*.[1]

The similarity between the eudoxid of *sagittata* and that of *leuckartii* has been known for some time (Bigelow, 1911; Moser, 1925; Browne, 1926). Indeed, although at one time Moser (1913) considered the two bracts as quite distinct, later she (1925) was not able to distinguish them. Bigelow (1918), on the other hand, listed a number of differences most of which have proven constant in the "Dana" material. Earlier difficulties in distinguishing the bracts of *leuckartii* and *sagittata*[2] exist merely because of Moser's (1925, pp. 272–273) confusion. Perhaps she had too few specimens, or she placed too much confidence in finding the bracts associated with the polygastric generation or the gonophores of one or the other species in her samples, as was the reason for her erroneous identification of the inferior nectophore of *A. bicarinata*. She includes in her synonymy of *sagittata* the eudoxid described by Lens and Van Riemsdijk (1908, p. 9) as *C. asymmetrica* and figured a specimen of it which she called *sagittata* (1925, p. 278, text fig. 40a). Bigelow (1911, p. 218) was able, however, to prove the connection of this bract with *leuckartii* by finding attached cormidia of that species sufficiently far advanced to make their identity with the detached eudoxids of *asymmetrica* quite certain. All the bracts of *leuckartii* we have seen, definitely have a truncated apex as do the superior nectophores. In short, Moser's (1925, text fig. 40a) figure of the bract which she presumed to be *sagittata* is very like bracts which had earlier been referred to *leuckartii* (Bigelow, 1911, pl. 15, figs. 3–4; Lens and Van Riemsdijk, 1908, pl. 1, figs. 2–4, as *C. asymmetrica*). On the other hand, there seems to be little doubt that the bracts figured by Quoy and Gaimard (1827, pl. 16, pl. 2c), Bedot (1904, pl. 1, fig. 1), and Bigelow (1918, pl. 5, fig. 5) were all specimens of *sagittata*.

[1] Chun (1888, p. 1162) substituted *Ceratocymba* for *Cymba* since the latter name was preoccupied by a genus of the Mollusca.

[2] Lens and Van Riemsdijk (1908, pp. 9–10) make several contradictory statements concerning this species: "It differs from the *Ceratocymba's* hitherto described (. . . BEDOT, 1904. .) by the absolute asymmetrical structure of the bract." "BEDOT 1904 has published a figure of a *Ceratocymba* caught in the Atlantic which is to our opinion absolutely identical with our *Ceratocymba*." "We are sure that as soon as CHUN publishes figures of his *Ceratocymba sagittata*, every one will be struck by the differences which exist in his *Ceratocymba* and in BEDOT's and ours." Examination of Bedot's figure (1904, Pl. 1, fig. 1) and those of Lens and Van Riemsdijk (1908) make it very obvious that the bracts were not identical. Lens and Van Riemsdijk in reality figured *leuckartii*, Bedot, *sagittata*.

Ceratocymba leuckartii Huxley 1859

Abyla leuckartii Huxley, 1859, p. 49, pl. 3, fig. 2; Agassiz and Mayer, 1902, p. 165 (partim); Lens and Van Riemsdijk, 1908, p. 34, pl. 5, text figs. 42–45; Bigelow, 1911, pp. 216–221, pl. 13, figs. 5–8, pl. 15, figs. 3–4; 1918, p. 409; 1919, pp. 333–334; 1931, pp. 543–544; Moser, 1913, p. 149; 1925, pp. 288–293, pl. 17, figs. 4–6; Kawamura, 1915, p. 580, pl. 15, figs. 29–31; Browne, 1926, p. 62; Leloup, 1932, p. 22; Totton, 1932, text fig. 17A.
Enneagonum leuckartii, Schneider, 1898, p. 93.
?*Abyla leuckartii*, Totton, 1925, p. 448.

Superior nectophore (Fig. 19A, B). The superior nectophore of *Ceratocymba leuckartii* is laterally flattened as is *sagittata*. Thus, the dorsal, apical, and ventral facets are narrow and elongate,[1] while the two lateral facets together are pentagonal. The lateral ridge in this species is, however, peculiar in that it lies nearer the ventral surface than in the other three species of the genus, and near the base it curves sharply dorsad almost parallel to the basal margin. Furthermore, it ends well above the lateral tooth on the dorsal wall of the hydroecium. Thus, the dorsolateral and ventrolateral facets are incompletely and unequally divided. The ventrolateral facet is elongate like all the other facets except the dorsolateral. Not usually mentioned in earlier descriptions is the fact that apically, at least, the lateral ridge delimits the ventral surface, rather than the extraordinarily narrow ventral facet itself. Also, all the ridges are finely serrated when viewed with a moderately high power of a binocular microscope. Other characters which separate this species from others in the genus, are that the apices of the somatocyst, hydroecium, and nectosac are all at the same level as in *Abyla* and that the dorsal facet is rectangular.

Inferior nectophore (Fig. 20C). The fragile inferior nectophore of *leuckartii* is flattened laterally, but even in side view, it is about three times as long as it is wide. Contrary to Bigelow's (1911, p. 218) statements that there is a "well-marked dorsal ridge", there is none. The ridge which often appears to be the dorsal because it has shifted dorsad, is actually the right lateral, as is characteristic of the genus. In *C. leuckartii* the supernumerary ridge is relatively short, arising just below the apex of the nectosac and extends basad only about two thirds its length. Another distinctive feature is that there appear to be only five or at most six teeth on the comb of the left ventral wing. The

[1] For example, the dorsal facet is nearly five times as long as it is wide.

elongate tooth at the base of the right ventral wing is definitely larger than the left but not as long as is usual for the corresponding tooth in *C. sagittata* or *C. dentata*. Certain minor features of the mouth region are also characteristic of *leuckartii*. The free edge of the right ventral wing merges with the ventral ridge of the corresponding tooth. The inner row of teeth on this wing does not merge with the ventrobasal margin, but rather parallels it. The free edge of the left ventral wing, on the other hand, ends on the dorsal wall of the hydroecium ventrad to the ventral ridge of the left ventral tooth, which ends slightly above it and laterad. Finally, the lip between the two basal teeth separating the hydroecial cavity from the opening of the nectosac is thickened and overdeveloped, but at the same time it has a definite pocket, surrounded at its periphery by stout serrations.

Bract (Fig. 20D). Although the bract of *C. leuckartii* was confused with that of *C. sagittata* by Moser (1925), as mentioned above, the following combination of characters will differentiate the species under consideration from either of the other known species: the apical facet is flat and quadrilateral, the descending branch of the somatocyst extends almost to the basal margin, and the left lateral ridge extends from the basal margin to the apical ridge subdividing the left lateral facet into two unequal parts, the outer one covering but about half the area of the inner one.

Gonophores (Fig. 20F). In the "Dana" material, the gonophore of *leuckartii* like the inferior nectophore is usually in an extremely poor state of preservation. From study of a considerable series, however, it has been possible to ascertain that the gonophore is basically like those of *sagittata* and *dentata*. The lower part of one ventral wing is heavily and irregularly denticulate up to the level of the hook on the other. The membrane on the dorsal wall of the hydroecium below the hook is smooth except for one or two jagged teeth at its base. The oral teeth are strongly serrated and appear to be rather uniform in length but on occasion one of the ventral ones may be exaggerated. Furthermore, not only is the dorsal tooth heavier than either lateral, but also the ridge continues nearly half way up the nectosac before disappearing completely. Finally, the apicolateral ridges are at the same level just above the tip of the nectosac.

CERATOCYMBA DENTATA Bigelow 1918

Abyla dentata Bigelow, 1918, pp. 409–410, pl. 5, figs. 1–4; Totton, 1932, p. 334, text figs. 14A, 15A; 1936, p. 233; Moore, 1949, p. 12.
Abyla quadrata Moser, 1925, pp. 293–298, text fig. 41, pl. 17, figs. 1–3, pl. 18, figs. 1–5, pl. 19, figs. 1–2.

Superior nectophore (Fig. 19C, D, E). The superior nectophore of *C. dentata* is at first sight likely to be confused with *A. bicarinata* because it is cuboidal and has pronounced lateral ridges. However, it is obviously a *Ceratocymba*, not an *Abyla*, because of the absence of the horizontal ridges and of the transverse apical ridge. The most distinctive feature as originally described by Bigelow (1918), is, however, the triangular dorsal facet with strongly bowed and heavily serrated lateral margins and a deeply emarginated base. Its apex, together with portions of the adjacent facets, is produced to form a definite peak. As a result, the nectosac is relatively longer and its apex higher than those of the somatocyst and hydroecium.

The apical surface is essentially square, one corner at the apex of the dorsal facet, one at each of the junctions of the lateral and apicolateral ridges, and one at the sharp curvature in the narrow portion of the apicoventral facet separating the apical and ventral surfaces. This surface, furthermore, has an extraordinarily deep depression not found on any other abylid.

Inferior nectophore (Fig. 21C, D). The robust, elongate[1] opaque nectophore of *dentata*, originally described and well figured by Moser (1925) as *quadrata*, makes this species the most conspicuous of all abylids, not excepting *sagittata*. In keeping with its sturdy appearance, the supernumerary ridge on the right ventral wing runs the full length of the nectosac and is almost as pronounced as the other ridges. In addition, it is markedly serrate. Likewise, the lack of a dorsal ridge is more apparent because the dorsal tooth is larger and stronger than in the other members of the genus. As a result, it appears to be thrust forward in a characteristic manner. There are sixteen teeth on the comb, which are thus not only more numerous but also smaller in size than in closely related species.

The lower portions of the ventral wings and their corresponding teeth also are characteristic and at the same time show similarities

[1] The nectophore is at least three times as long as it is wide, i.e., 42 x 13 mm. in one specimen actually measured.

with *Abyla* which are not obvious in *leuckartii* or in *sagittata*. Thus, although the wings are only slightly expanded, they do have thickened basal margins. On the right ventral wing, seven spiny teeth delimit the inner border while the outer border is strongly serrate. The basal margin of the left ventral wing is almost a mirror image of the right, except that there are only six teeth along the inner border. The serrations marking the outer border on both basal margins continue down to merge without demarcation with the ventral ridge of the ventral teeth.

Bract (Fig. 21B). The bract which appears to belong to *dentata* is very similar to that of *leuckartii* except that it is as wide as it is long and the dorsal ridge is usually raised and often quite arched. At times it is even serrated. Thus, it is much more prominent than in *leuckartii*. The left lateral ridge, likewise serrated, is more elevated than in the preceding species and ends abruptly some distance short of the basal margin. The descending branch of the somatocyst occupies only the anterior half of the bract. Finally, in some specimens, at least, the basal and lateral margins of the bract are thinned.

Gonophore (Fig. 21E). The gonophore found attached to the bract referred to *dentata*, has a number of distinctive features: the lateral ridges are rather strongly serrate except near the apex. The serrations on the ventral ridge opposite the enlarged hook extend above it, but not as much so as in *sagittata*. The hook arising from one of the ventral wings and curved inward toward the floor of the hydroecium is large and conspicuous. The teeth surrounding the opening of the nectosac are unusually heavy. In fact, the dorsal and lateral teeth are almost exact replicas of those of the inferior nectophore of this species. Finally, the apex is peculiar in that the lateral ridge away from the bracteal hydroecium (when the gonophore and bract are attached) is higher than the opposite one.

Remarks

An abylid bract and eudoxid not hitherto figured or described has been found repeatedly in the "Dana" material. Presumably it belongs to *dentata*, not only because it is the only species of *Ceratocymba* (other than the new *intermedia*) for which the bract is not known but also because it has repeatedly been taken in the same haul with the polygastric generation of this species. Although Moser (1925) described and figured both the superior and inferior nectophores (apparently taken attached), neither she nor any subsequent author has published a detailed description of the eudoxid. Totton (1932, p. 332) probably had specimens similar to ours, because he mentions that the eudoxids of his *Abyla dentata* and *Diphyabyla hubrechti* [*Ceratocymba sagittata*] are of the "*Ceratocymba*" type. He does not, however, give a description.[1] Later, he identified two specimens from the Bermuda region as belonging to this species (Moore, 1949). I have had access to these and they prove to be identical with those I have found in the same samples as the polygastric generation. Hence, Totton and I appear to be in agreement as to the identity. As yet, however, attached cormidia with bracts sufficiently far advanced to prove their identity with the polygastric generation of *C. dentata* have not been found.

Ceratocymba intermedia n. sp.

?*Diphyabyla hubrechti* Bigelow, 1911, pp. 231–233, pl. 12, fig. 7.
?*Ceratocymba sagittata* Moser, 1925, pp. 269–283 (partim) pl. 15, fig. 3.

The type is a superior nectophore from "Dana" Sta. No. 3678 taken with a stramin net 150 centimeters in diameter in a tow to 300 meters. This specimen will be deposited in Universitets Zoologiske Museum, København.

Superior nectophore (Fig. 22). A superior nectophore, not too well preserved, but nevertheless quite distinct from *sagittata* was found in the same sample with a number of small specimens of the latter species. The striking characteristic of this specimen[2] is that its apical prolongation is intermediate between that of *dentata* and *sagittata*, i.e., in the latter the hydroecium extends only one third the total height of the nectophore, whereas in *intermedia* it is about one half the total height. The large basal facet occupies nearly one half the width of the nectophore at the base, as compared with less than one third the width in *sagittata*. The prominent apical surface is slightly dented just above the hydroecium and at the point where the lateral ridges join the apicoventral ridges. This depression is not as marked as in *dentata*. In other words, this species may be likened to *dentata* with

[1] In a letter dated 1 September 1950, he states that he has "never published on the eudoxids of *A. dentata*" and that he "arrived at their identity by deduction from association in the usual way."

[2] In the description and figures, we have made allowances for the mutilations, chiefly twisting of the lateral ridges and compression of the hydroecium.

the dorsal facet and contiguous surfaces produced into more of an apical prolongation. The dorsal teeth of the basal facet protrude forward and the ventral ones downward and ventral. The dorsal facet is elongate and narrow rather as in *sagittata,* the two upright ridges bordering it are elevated as much if not more than those in *dentata.* However, these appear to extend forward rather than to the sides as in the latter. As a result the dorsal surface is almost hidden between them. Due to poor preservation, it is not possible to ascertain the extent of the lateral ridges. These appear, however, to be relatively thinner and narrower than in *dentata,* but wider than in *sagittata.*

Inferior nectophore. Unknown.

Eudoxid. Unknown.

Remarks

Judging from their drawings of superior nectophores, both Bigelow (1911) and Moser (1925) appear to have had specimens of the species here called *intermedia,* but which they quite naturally supposed were representatives of the species now called *sagittata.* This was due to the fact that Bigelow's (1911) specimen was only the second to be recorded and was only about a quarter the size of Lens and Van Riemsdijk's (1908) *Diphyabyla hubrechti.* It could therefore be presumed that any differences were merely differences in the stage of development. Likewise, Moser (1925, pl. 15, fig. 3) illustrates a specimen of 5 mm. which she believed to be a young nectophore. It so happens that we have seen considerable numbers of young superior nectophores of *sagittata* and in every case the definitive shape has been established before they are 5 mm. in height. In short, specimens with a proportionately large basal facet and a definite apical depression above the lateral and apicoventral ridges are all probably the new species described above as *intermedia.* Unfortunately, the specimen from "Albatross" Station 4683 is no longer available so that it is not possible to re-examine it.

PSEUDOCYMBA n. gen.

Genotype: *Pseudocymba asymmetrica* n. sp.

Generic characters

Superior nectophore (Figs. 23 and 24). The genus *Pseudocymba* is proposed[1] for two superior nectophores which have many of the

[1] See remarks on p. 49 for *Pseudabyla,* many of which are also applicable to this genus.

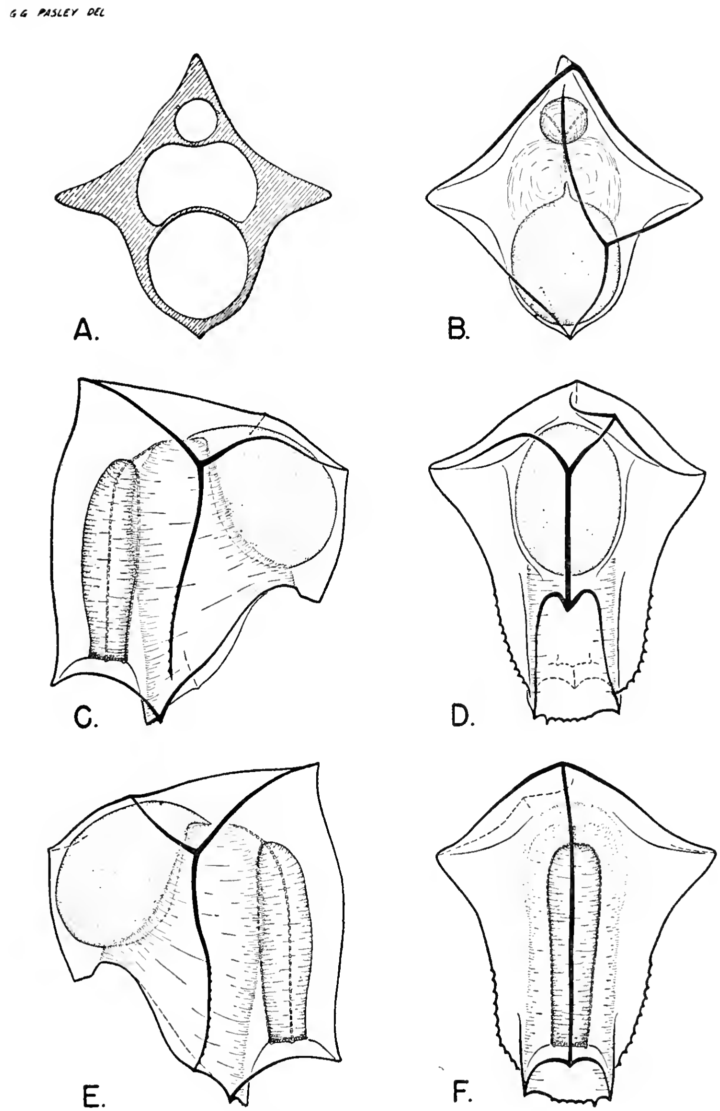

Fig. 23. Superior nectophore of *Pseudocymba asymmetrica* with a dorsal ridge 9.6 mm. in length. A. Cross section. B. Apical view. C. Left lateral view. D. Ventral view. E. Right lateral view. F. Dorsal view.

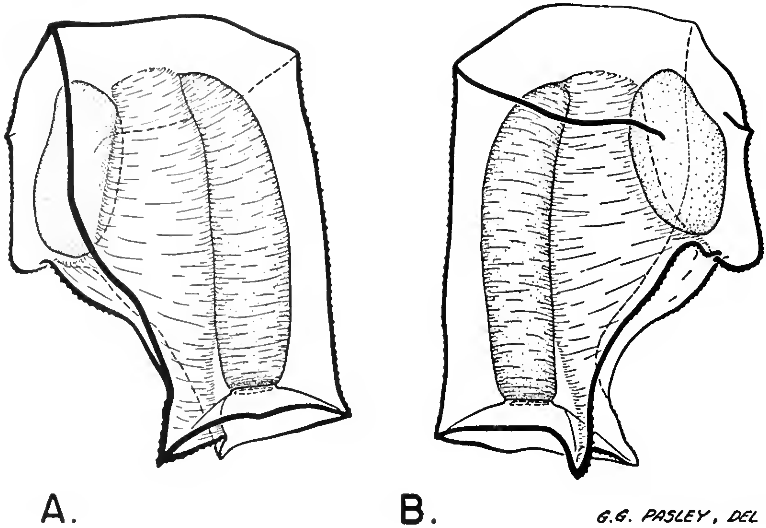

Fig. 24. Superior nectophore of *Pseudocymba anomala* with a dorsal ridge of about 3 mm. A. Left lateral view. B. Right lateral view.

characteristics of *Ceratocymba* in the arrangement of the facets and ridges, but which, like *Pseudabyla*, are variants with fewer facets and ridges than in that genus. The affinities with *Ceratocymba* are indicated by the absence of a transverse apical ridge subdividing the apical facet, and of the horizontal ridges. The general arrangement of the somatocyst, hydroecium, and nectosac is essentially as in *Ceratocymba*. One further peculiarity like *Ceratocymba* is that in lateral view, the keel beneath the somatocyst is obviously higher than the opening of the nectosac. In contrast to *Ceratocymba*, however, there is a dorsal ridge, not a facet. Furthermore, the basal facet is triangular, a characteristic previously found only in *Enneagonum hyalinum*. Other differences appear to be specific rather than generic.

Inferior nectophore. Unknown.

Eudoxid. Unknown.

Pseudocymba asymmetrica n. sp.

The type is an exceptionally well preserved superior nectophore from "Dana" Sta. 3920 taken at 1°12′N., 62°19′E. in a tow at 50 meters with a stramin net 200 cm. in diameter. It is to be deposited in Universitets Zoologiske Museum, København.

Superior nectophore (Fig. 23). The superior nectophore of *P. asymmetrica* has not only a dorsal ridge but also a ventral one. Thus, the ventrolateral and dorsolateral facets on one side are separated from the corresponding facets on the other by the ventral and dorsal ridges respectively. Hence, the number of facets have been reduced from seven in *Ceratocymba* to six in this species. Unlike any species in the previous genus an incomplete ridge starts at the left ventrolateral ridge of the apical facet and runs diagonally across it. The nectophore is therefore slightly asymmetrical.

The arrangement of the somatocyst, nectosac and nectophore are essentially as in *Ceratocymba* except that the number of radial canals on the nectosac have been reduced from four to three, a ventral and two laterals.

Pseudocymba anomala n. sp.

The type specimen is a badly multilated superior nectophore from the "Siboga" collection in the Zoölogisch Museum, Amsterdam. It bears the Catalogue No. 144C with a label *Abyla trigona*. In Lens and Van Riemsdijk's (1908) paper they record Cat. No. 144C as a sample containing four superior nectophores of *Abylopsis tetragona* from "Siboga" Sta. 220 at the "anchorage off Pasis-Pandjang, west coast of Binongka." Since the specimen is badly squashed, they seemingly had difficulty in its identification, but they apparently recognized its affinities with *Abyla*, as then defined, after the publication of their paper and segregated it from the other specimens of *tetragona*.

Superior nectophore (Fig. 24). Insofar as one can ascertain in its present mutilated condition, the left side is quite like that of *C. leuckartii*. There is a wide dorsolateral facet and a narrow ventrolateral. The right side seems to have no lateral ridge and there is no demarkation between it and the ventral surface. There is, however, a ridge separating the lateral surface from what appears to be the apical surface. The latter in its present condition is actually on the right side rather than apical and the left apicolateral ridge is seemingly apical. It would seem that the right lateral ridge and the ridge separating the ventral and right lateral facets are missing. The dorsal ridge and triangular basal facet appear to be characteristic for the genus but the latter is markedly curved on its outer margins. The ridges are all regularly and somewhat coarsely serrated.

ABYLOPSIS Chun 1888

Genotype: *Abylopsis tetragona* Otto 1823

Generic Characters

Superior nectophore (Fig. 25). As in *Ceratocymba* the superior nectophores of *Abylopsis* have seven facets.[1] In contrast to the preceding genera, however, it does not have an apical facet, but rather the lateral facets join to form a median apical ridge. Furthermore, the two lateral facets are divided horizontally into apicolateral and basolateral facets, not vertically as in the four genera just described. The apicolateral ones are quadrilateral, as are the basolaterals except for a break at the lower ventral corner for the opening to the hydroecium and its attendant basal teeth. The dorsal and ventral facets are both pentagonal. The basal facet is more elongate and quadrangular than square or triangular as in the genera just described. The opening to the nectosac is not in the center of this facet but at the angle between it and the dorsal wall of the hydroecium, a characteristic of this and succeeding genera. The somatocyst is swollen and ovoid. It is unique in that it has a small apical diverticulum not found in any previously known abylid genus.[2] In addition, the hydroecium is only partly interposed between the nectosac and somatocyst unlike most species in the preceding genera. It is not, however, relatively shorter than in the others, as it protrudes well below the base of the nectophore. The opening to the hydroecium is essentially square with a more or less marked tooth in each corner. In this way, it differs from the preceding genera.

[1] Certain aberrant specimens have been found very rarely (fewer than a half dozen out of more than 100,000 specimens) on which a ridge of one of the facets is missing. I believe these to be damaged in some way because other details of the species are intact, so that I have little hesitancy in referring them to either *tetragona* or *eschscholtzii*.

[2] The somatocyst of *Enneagonum* is constricted apically so that this might be construed as being a true diverticulum. The somatocyst is, however, quite different in shape from that of other abylids, being elongate rather than swollen and ovoid.

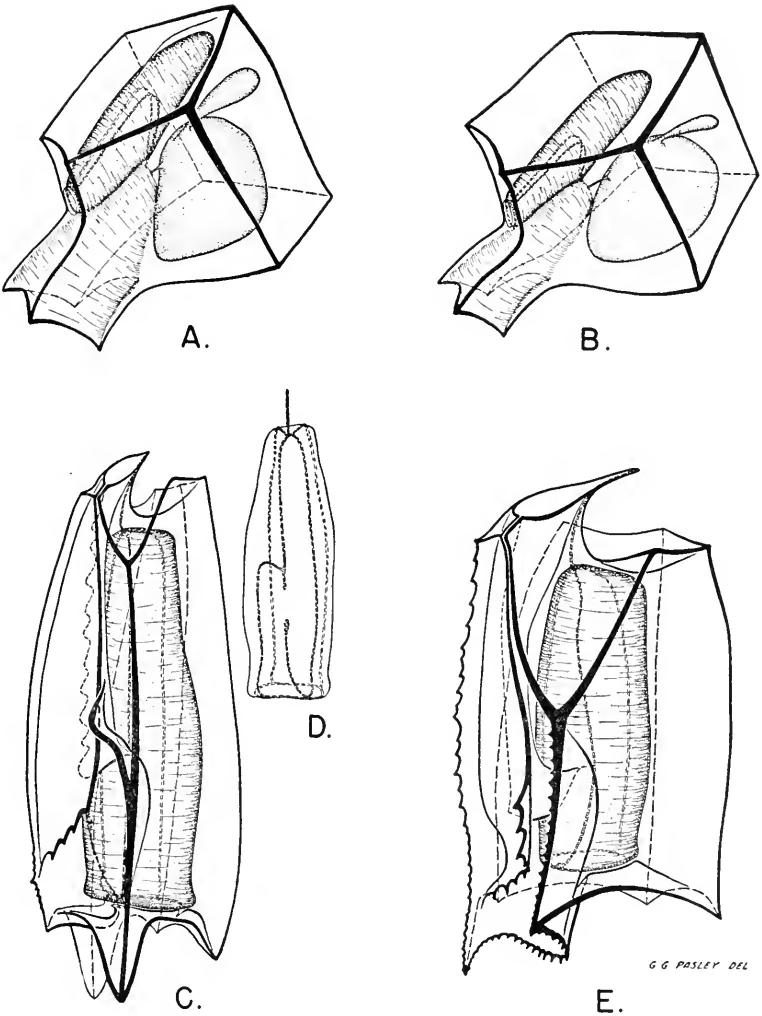

Fig. 25. A. Lateral view of superior nectophore of *Abylopsis tetragona* with a dorsal facet about 3.3 mm. in length. B. Lateral view of superior nectophore of *A. eschscholtzii* with a dorsal facet about 2.4 mm. in length. C. Ventrolateral view of inferior nectophore of *A. tetragona* about 22.5 mm. in overall length. D. Nectosac of *A. tetragona* to show canals. E. Ventrolateral view of inferior nectophore of *A. eschscholtzii* about 4.5 mm. in overall length.

Inferior nectophore. (Fig. 25). The inferior nectophores of *Abylopsis* have a combination of characters which readily separate them from those of any other abylid genus. Thus, the apophysis is much shorter than in the preceding genera and very characteristically hooked. There are five ridges each ending in a more or less prominent straight tooth. The left ventral wing is peculiar in that it forks at its apical end. The hydroecium is open, but deep and effectively covered by interlocking flaps from the inner surfaces of both ventral wings. Among the abylids so far known, flaps on both wings are found only in this genus and in *Bassia*.

Bract (Fig. 2C, D). The bracts are relatively smaller than in the preceding genera and have seven facets rather than five. In fact, their arrangement somewhat resembles that of the superior nectophores. In contrast, however, the bracts have an apical facet. The hydroecium is deep, almost thimble-like in shape, but flared at its base. The somatocyst is distinctive in that the descending branch is thin and the ventrolaterals swollen. In addition, there is an apical diverticulum somewhat more elongate than that in the superior nectophore. This structure is also found on the bracteal somatocyst of *Eassia* and *Enneagonum*, but not in the other genera of the subfamily insofar as is known.

Gonophores (Fig. 26B, D). Among the abylids, the gonophores of *Abylopsis* are the simplest and least adorned. Thus, there are four definite ridges, each ending in a straight tooth. Beneath each ridge lies one of the radial canals. One of the ventral ridges especially is peculiar in that it crosses the lateral surface to join the dorsal and apicolateral ridges where they meet. The other also diverges from the vertical but is not so erratic in its course and joins the apicolateral ridge at its ventral extremity. The apophysis, however, is in younger specimens (of about 1.5-2.5 mm.) extraordinarily large, perhaps being as much as a third of the entire structure. In older individuals (of 5 mm. or more) it is very much reduced, but nevertheless, together with the apical surface, it is prominent. The apophysis is flat, the edge on one side continuing down part way into the hydroecium as a wide band, which tapers to a thin ridge below a more or less conspicuous tooth (often so damaged that it is unrecognizable) located about midway down the nectosac. On the other side, the edge extends, sometimes as a rounded surface, to the junction of the ventral and apico-

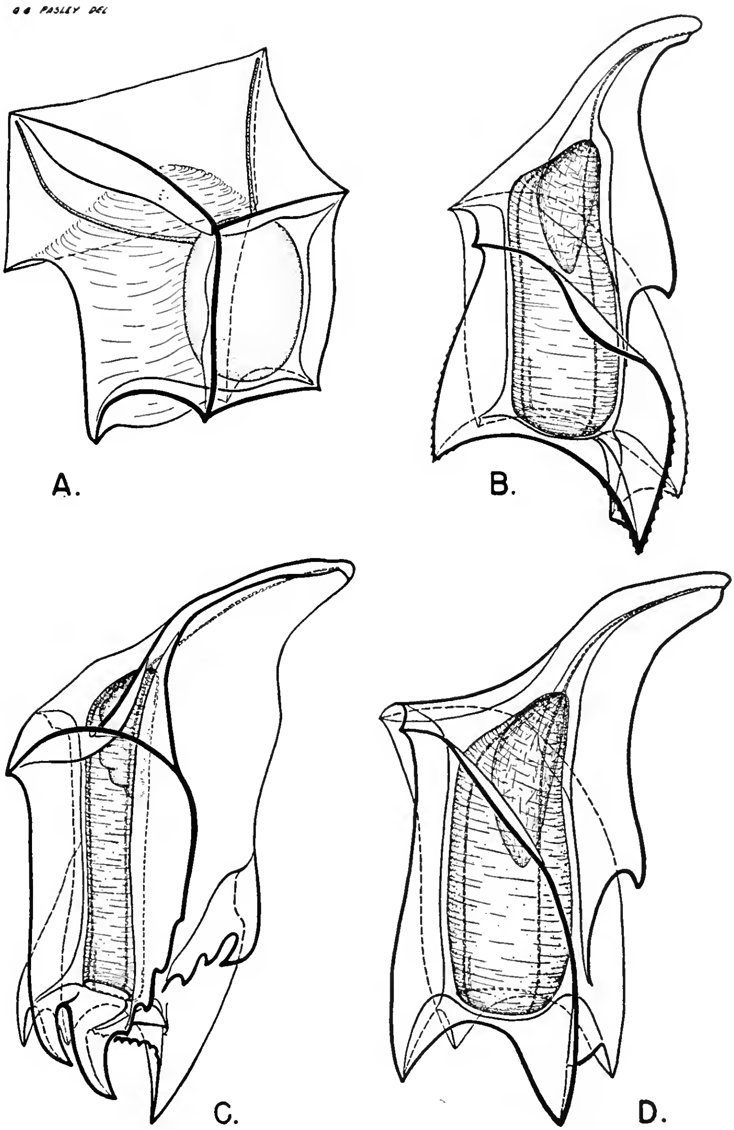

Fig. 26. A. Bract of ?*Abyla haeckeli.* Dorsal surface 4.7 mm. in length. B. Lateral view of gonophore of *Abylopsis eschscholtzii* of about 2.5 mm. in length. C. Lateral view of gonophore of *Abyla* sp.? of about 3 mm. in total length. D. Lateral view of gonophore of *A. tetragona* of about 2.5 mm. in length.

lateral ridge. The gonophores are mirror images of one another irrespective of the sex.

Key to the Species of Abylopsis

A. Based on the characters of the superior nectophores.

1. Ridges not obviously serrate; dorsal surface irregular pentagon, narrower, more elongate than in *eschscholtzii*; dorsal surface smaller than ventral; apex of nectosac extends apically above main body of somatocyst; lateral subumbral canals arched...... *Abylopsis tetragona* Otto

   Ridges heavy, serrate; dorsal surface nearly regular pentagon of same size and shape as ventral; apex of nectosac does not extend apically beyond main body of somatocyst; lateral subumbral canals not arched........................... *Abylopsis eschscholtzii* Huxley

B. Based on the characters of the inferior nectophores.

1. Nectophore at least twice as long as it is wide; margin of flap on inner surface of left ventral ridge denticulate; right lateral subumbral canal broken............................... *Abylopsis tetragona* Otto

   Nectophore only slightly longer than wide; margin of flap on inner face of left ventral ridge entire; canals normal.........................
   Abylopsis eschscholtzii Huxley

C. Based on the characters of the bracts.

1. Dorsal facet of bract subrectangular; general appearance cuboidal ....
   Abylopsis tetragona Otto

   Dorsal facet of bract almost a regular pentagon ....
   Abylopsis eschscholtzii Huxley

D. Based on the characters of the gonophores.

1. One ventral ridge diagonally crosses lateral surface of gonophore to join dorsal and apicolateral ridges roughly dividing lateral surface into one quarter toward the apex and three quarters toward the base; lower half of ventral ridges only very weakly serrated.............
   Abylopsis tetragona Otto

   One ventral ridge diagonally crosses lateral surface of gonophore to join dorsal and apicolateral ridges, roughly dividing lateral surface into two equal portions; lower half of ventral ridges markedly serrate
   Abylopsis eschscholtzii Huxley

ABYLOPSIS TETRAGONA Otto 1823

Pyramis tetragona, Otto, 1823, p. 306, pl. 42, figs. 2a–2e (not seen).
Aglaja baerii, Eschscholtz, 1825, p. 743, pl. 5, fig. 14.
Plethosoma crystalloides, Lesson, 1826, pl. 4, fig. 2 (partim); 1830, p. 64 (not seen).

Calpe pentagona, Quoy and Gaimard, 1827, pp. 11–13, pl. 2A, figs. 1–7; Blainville, 1830, p. 132; 1834, p. 134, pl. 4, fig. 3 (not seen); Lesson, 1843, p. 449 (not seen).
Aglaisma baerii, Eschscholtz, 1829, p. 129, pl. 12, fig. 5.
Abyla pentagona, Eschscholtz, 1829, p. 132; Leuckart, 1853, p. 56, pl. 3, figs. 1–6; 1854, pp. 259–273, pl. 11, figs. 1–10; Kölliker, 1853, pp. 41–46, pl. 10; Gegenbaur, 1853, pp. 292–295, pl. 16, figs. 1–2; 1860, pp. 349–356, pl. 28, figs. 17–19; Sars, 1857, p. 13; Huxley, 1859, pp. 40–44, pl. 2, fig. 2; Keferstein and Ehlers, 1861, pp. 14–15, pl. 3, figs. 5–6; Spagnolini, 1870, p. 21; Fewkes, 1879, pp. 318–324, pl. 3, fig. 1; 1880, p. 132; 1883, pp. 835–837, figs. 1–4; Chun, 1885, p. 525, pl. 2, fig. 11; 1897, p. 30; Lens and Van Riemsdijk, 1908, pp. 17–19, pl. 2, figs. 17–20; Moser, 1911, p. 431; 1912, p. 531, fig. 13; 1912a, fig. 14; 1912b, p. 408; 1917, p. 732.
Diphyes calpe, Quoy and Gaimard, 1834, p. 89, pl. 4, figs. 7–11.
Aglaisma pentagonum, Leuckart, 1853, p. 150, pl. 3, figs. 2–3.
Eudoxia cuboides, Leuckart, 1853, p. 54, pl. 8, figs. 7–10; Müller, 1871, pp. 264–266, pl. 11, figs. 6–7, pl. 13, fig. 9; Chun, 1885, pl. 2, fig. 11; 1888, p. 1160; Bedot, 1896, pp. 375–376.
Abyla trigona, Vogt, 1854, p. 121, pl. 15, fig. 4, pl. 20, figs. 4–7, pl. 21, figs. 3–6, 10–13.
Aglaismoides elongata, Huxley, 1859, p. 61, pl. 4, fig. 3.
Calpe huxleyi, Haeckel, 1888, p. 36; 1888a, p. 164.
Aglaisma gegenbauri, Haeckel, 1888a, pp. 119–121, pl. 40.
Calpe gegenbauri, Haeckel, 1888a, pp. 164–167, pls. 39–40.
Aglaisma cuboides, Chun, 1897, p. 30; Lens and Van Riemsdijk, 1908, p. 19, pl. 2, fig. 21.
Abyla tetragona, Schneider, 1898, pp. 89–90, 197.
non *Abyla pentagona*, Mayer, 1900, p. 77, pl. 30, figs. 101–103.
non *Aglaisma cuboides*, Mayer, 1900, p. 77, pl. 30, fig. 104.
Abyla huxleyi, Agassiz and Mayer, 1902, p. 166, pl. 11, fig. 48.
Abylopsis tetragona, Bigelow, 1911, pp. 224–226, pl. 14, figs. 6–8, pl. 15, fig. 2; 1913, pp. 68–69; 1918, p. 411; 1919, pp. 334–335; 1931, pp. 544–546, figs. 191–192; Kawamura, 1915, pp. 581–584, pl. 15, figs. 32–36; Browne, 1926, pp. 63–64; Totton, 1932, pp. 333–335, figs. 14B, 15B, 17C; 1936, p. 233; Boone, 1933, p. 36; Leloup, 1934, pp. 55–57, fig. 14; 1935, pp. 10–11; 1936, pp. 6–7; Bigelow and Sears, 1937, pp. 23–26; Gamulin, 1948, p. 9; Moore, 1949, p. 13.
Abylopsis pentagona, Moser, 1925, pp. 320–334, text figs. 52–53, pl. 20, figs. 1–4, pl. 21, figs. 3–4; Leloup, 1932, pp. 23–24.

Superior nectophore (Fig. 25A). The superior nectophore of *A. tetragona* is very similar to that of *A. eschscholtzii*. However, there are a number of characters which differentiate the two species even in the absence of an inferior nectophore. In *tetragona*, the ridges are not strongly serrate. In fact, few serrations are obvious in most specimens except in the basal region. The dorsal and ventral surfaces are proportionately more elongate along the apicobasal axis. The dorsal pentagonal facet is smaller than the ventral. Hence, the lateral surfaces flare outward toward the ventral forming a rather irregular truncated pyramid. In dorsal view, the apex of the nectosac extends above the main body of the somatocyst. Finally, the lateral subumbral canals of the nectosac are usually highly arched.[1]

Inferior nectophore (Fig. 25C, D). In this species, the inferior nectophore is at least twice as long as it is wide. Its apical hook is relatively smaller and less prominent than in *eschscholtzii*. Four ridges are distinct, but the fifth, the dorsal, is somewhat reduced and rather difficult to locate, were it not for a small basal tooth at its lower extremity. The fork of the left ventral wing starts near the apex of the nectosac. There are two conspicuous basal teeth, the left ventral and right lateral.[2] On the basal surface beneath each of the lateral teeth there is a small spine, a character which was overlooked by Bigelow (1911, pl. 14, fig. 7), although described and figured by both Haeckel (1888a, p. 167, pl. 39, figs. 2–4, 12) and Moser (1925, p. 330, pl. 20, fig. 4).

The two large straight teeth together with the characteristic shape of the apophysis afford the best means for distinguishing the inferior nectophore of this species from those of other abylids with rather similar outlines (*Ceratocymba*). Another character which is unique is the peculiar modification of the subumbral canals (Gegenbaur, 1860; Fewkes, 1879, 1880; Lens and Van Riemsdijk, 1908; Bigelow, 1911). Thus, the right lateral is incomplete with a segment of the lower half lacking. Parallel to it an extra canal runs from the ring canal and turns at right angles to enter the upper part of the right lateral slightly above the middle of the nectophore. Finally, the structure of the hydroecium is distinctive. Along the margin of the right ventral wing, there is an elongate flap without sculpturing except for four prominent teeth along its transverse basal margin. This flap is tucked over a denticulate flap projecting from the inner surface of the left ventral wing close to its junction with the wall of the nectophore.

[1] The canal illustrated by Vogt (1854, pl. 20, fig. 4) leading from these arches to the apex has not been seen in any of the thousands of specimens examined.

[2] Agassiz and Mayer (1902, pl. 11, fig. 48) incorrectly figured the right ventral tooth as being enlarged in their *Abyla huxleyi*, now referred to the synonomy of *tetragona*.

Bract (Fig. 2C). The cuboidal bract of *tetragona* is quite similar in shape to that of *Enneagonum hyalinum.* At first glance, this may be misleading, but in *tetragona* only the ventral and apical facets are square or nearly so. The dorsal and apicolaterals are squared only toward the apex. Thus, although quadrilateral, the latter are not rectangular but trapezoidal. Hence, the ridge separating the lateral facets, horizontal in *eschscholtzii*, is diagonal in *tetragona*. This is due to the unequal length of the lateral ridges of the ventral and dorsal facets, which they join; those of the dorsal facet being somewhat more elongate. These together with the comparatively short basal ridges make this surface quite different in shape from that of *eschscholtzii*, although it is pentagonal in both species.

The effect of a cube is further simulated by a reduction of the basolateral facets. These are proportionately very much smaller than in *eschscholtzii* and are roughly triangular. They extend from the apicolateral facet, where they are attached along the horizontal ridge, down the basal margin of the dorsal facet to its tip, thence diagonally to the lateral rim of the hydroecium. The free margin usually has a tooth and may, for a short distance from the dorsobasal tip, be contiguous with the margin of the opposite basal facet to form a short basosagittal ridge.

A large proportion of our specimens, however, lack any trace of a basosagittal ridge, a prominent feature in *eschscholtzii* (as well as in *Bassia*). There seems, however, to be considerable individual variation, because others — and these appear to be in the minority — have a short but definite ridge perpendicular to the dorsal facet at its basal tip. It does not appear that the presence or absence of the ridge is dependent on the state of preservation or the size (i.e., age) of the specimen, because both types have been seen on both well preserved and poorly preserved specimens of all sizes. Nor are there many gradations between the two extremes. In the specimens we have examined, however, the ridge has never been seen to protrude below the basal tip of the dorsal facet in the manner shown by both Bigelow (1911, pl. 15, fig. 2) and Totton (1932, fig. 17C).

Gonophore (Fig. 26D). The gonophore of *A. tetragona* is comparatively narrow and elongate like the inferior nectophore. This is largely due to the facts that the ridges are not expanded and that the relatively long teeth project straight downward. Both vertical ridges deviate from the vertical rather near the apex. The lateral surfaces (in true side view) are roughly divided into an apical quarter and a basal three-quarters. Finally, the ventral halves of all the ridges are only weakly serrated.

Abylopsis eschscholtzii Huxley 1859

Aglaismoides eschscholtzii Huxley, 1859, p. 60, pl. 4, fig. 2; Chun, 1888, p. 1160; Bedot, 1896, p. 375; Lens and Van Riemsdijk, 1908, pp. 25–26, pl. 3, figs. 28–31.

Eudoxia prismatica, Gegenbaur, 1860, pp. 363–364, pl. 27, figs. 13–16.

Abylopsis quincunx, Chun, 1888, p. 1160; Bedot, 1896, p. 375; Lens and Van Riemsdijk, 1908, pp. 21–25, pl. 3, figs. 22–27; Moser, 1911, p. 431.

Abyla (Abylopsis) quincunx, Chun, 1897, p. 29.

Aglaismodes quincunx, Chun, 1897, pp. 29–30.

Abyla tetragona, Schneider, 1898, p. 89 (partim).

?*Abyla quincunx*, Agassiz and Mayer, 1899, p. 180.[1]

Aglaisma cuboides, Mayer, 1900, pp. 77–78, pl. 30, fig. 104.

Abyla quincunx, Mayer, 1900, p. 78, pl. 34, figs. 115–117; Agassiz and Mayer, 1902, p. 163, pl. 11, figs. 46–47.

non *Abyla pentagona*, Mayer, 1900, p. 77, pl. 30, figs. 101–103.

Chunia capillaria, Mayer, 1900, pp. 78–79, pl. 27, fig. 90.

Aglaisma quincunx, Agassiz and Mayer, 1902, p. 164, pl. 10, fig. 45; Mayer, 1900, p. 78.

Abylopsis eschscholtzii, Bigelow, 1911, pp. 226–229, pl. 14, figs. 1–5, pl. 15, fig. 1; 1913, p. 69; 1918, p. 411; 1919, p. 335; 1931, pp. 546–548, figs. 193–194; Kawamura, 1915, pp. 584–585, pl. 15, figs. 37–38; Moser, 1925, pp. 334–347, pl. 20, figs. 5–6, pl. 21, figs. 1, 2, 5; Browne, 1926, p. 65; Totton, 1932, p. 338, fig. 17E, 1936, p. 233; Leloup, 1932, pp. 24–25; 1934, pp. 57–58; 1935a, p. 5; Boone, 1933, pp. 35–36; Moore, 1949, p. 13.

Superior nectophore (Fig. 25B). As already mentioned, the superior nectophore of *eschscholtzii* is very like that of *tetragona*. Yet it may be separated quite readily by a combination of characters which seem trivial, but which nevertheless are fairly consistent. The most reliable features for identifying *eschscholtzii* are that the lateral canals of the nectosac are not arched, the main body of the somatocyst does not extend above the nectosac in either dorsal or ventral view, and the nectophores are generally more rigid. Also, the dorsal and ventral

[1] I cannot refer this record with certainty to *eschscholtzii* because of the statement made by the authors that Huxley described their *quincunx* under the name *Abyla pentagona*. Huxley's (1859) species of *pentagona* has always been considered as a synonym of *tetragona*, and I believe rightly so. Hence,in the absence of any figures or description, we lack definite proof as to which species they actually had. (An incorrect page reference is also given in citing Huxley.)

facets are more regularly pentagonal than in *tetragona* and are nearly the same size. The lateral facets are thus more nearly perpendicular to both dorsal and ventral surfaces. Finally, the ridges separating all facets are not only more markedly serrate but they are more distinctly outlined than in *tetragona*, as has often been previously illustrated (Bigelow, 1931, fig. 194; Mayer, 1900, pl. 34, fig. 115). This is seemingly due to a difference in the consistency of the "jelly" of ridges and that within the nectophore.

Inferior nectophore (Fig. 25E). The inferior nectophore of *eschscholtzii* is proportionately much shorter than that of *tetragona*. Thus, it is about two thirds as wide as it is long, but the apophysis is relatively bigger and more robust. The teeth are all more or less uniform in size, none of them being extended conspicuously. Also, they tend to flare outward rather than to extend straight downward. The subumbral canals have no irregularities. The flap on the inner surface of the right ventral wing has distinct teeth along its basal margin, whereas the left-hand one is entirely smooth. The lower portion of the latter, however, forms a much thickened projection into the lower part of the hydroecial cavity.[1]

Bract (Fig. 2D). The bract of *eschscholtzii* in dorsal view forms a fairly regular pentagon. This character at once distinguishes it from *tetragona*. The ventral facet is essentially like the apical half of the dorsal but its basal ridges are very much foreshortened with a deep arch between them bordering on the opening to the hydroecium. The apicolateral facets are rectangular. Also, there is a prominent basosagittal ridge separating the basolateral facets. The latter are almost square, were it not for the arched ventral margin (interrupted near the base by a tooth) at the opening to the hydroecium.

Gonophore (Fig. 26B). In *eschscholtzii*, as in *tetragona*, it is the younger gonophores which have been sufficiently well preserved to study. The stance of the gonophore in *eschscholtzii* is remarkably like that of the inferior nectophore. The ridges are all more elevated than in *tetragona* and the lower halves, particularly, are strongly serrated. In addition, they, like the teeth at their basal extremities, tend to

[1] In this connection, it should be noted that Agassiz and Mayer (1902, p. 164) in the discussion of *Aglaisma quincunx* (i.e., the eudoxid of this species) and referring to their figure of this eudoxid (pl. 10, fig. 45) state that "a saw-toothed projection extends down the open groove of the inferior nectophore." They figure this structure on the inferior nectophore shown on plate 11, figure 46. I have never observed such a structure in *eschscholtzii*.

flare. The vertical ridges, like the left ventral of the inferior nectophore swerves from the vertical rather lower than in *tetragona*. Also, it differs in that the curve is sigmoid.

Remarks

In most cases, I agree with Bigelow (1911, p. 226) as to the earlier synonymies of this species. There are, however, several exceptions: for Mayer's (1900, p. 77, pl. 30, figs. 101–103) *Abyla pentagona*, the references he (Mayer, 1900, p. 77) lists have long been accepted as synonyms for *Abylopsis tetragona* (Bigelow, 1911, p. 224). On the other hand, he (Mayer, 1900, pl. 30, fig. 101) figures a colony which bears little resemblance to *tetragona*, as we know it, or to *eschscholtzii*. It does not even resemble his *Abyla quincunx* (Mayer, 1900, pl. 34, fig. 115). The latter was apparently *eschscholtzii*, as is generally agreed (Bigelow, 1911, p. 226). The superior nectophore (Mayer, 1900, pl. 30, fig. 101), judging from the configuration of the somatocyst and nectosac, as well as from their relative positions, is undoubtedly *Bassia bassensis*. The presence of a fifth ridge on the inferior nectophore appears, however, to have been an error. As it more nearly resembles *Bassia* than *A. eschscholtzii* I am inclined to believe that the drawing is not only somewhat inaccurate but also a composite. Thus, the bracts on the cormidia (Mayer, 1900, pl. 30, figs. 101–102) appear to be those of *eschscholtzii* (his *Aglaisma cuboides*, Mayer, 1900, pl. 30, fig. 104). The type of tentacles shown both for *A. pentagona* and *Aglaisma cuboides* (Mayer, 1900, pl. 30) are rather different from those for *Abyla quincunx* (Mayer, 1900, pl. 34, figs. 115–116). Which of the two he has illustrated actually belongs to *eschscholtzii* cannot be determined without examining the stems of both species. Unfortunately, none have been found thus far in the "Dana" material. Nevertheless, it seems to me that Mayer's figure (1900, pl. 30, fig. 101) must now be referred to the synonymy of *Bassia bassensis*, at least in part. The synonymies he lists (Mayer, 1900, p. 77), on the other hand, should be listed under *Abylopsis tetragona*, not *eschscholtzii* as hitherto.

I also agree with Moser (1925) in questioning whether Agassiz and Mayer's (1899, p. 180) specimens of *Abyla quincunx* should be referred to *eschscholtzii* because they consider it identical with Huxley's (1859)[1] *Abyla pentagona*. This appears to have been *Abylopsis tetra-*

[1] Agassiz and Mayer (1899) gave an erroneous page reference to Huxley's *pentagona*.

gona as we know it today. Furthermore, in Mayer's (1900, p. 77) record of *Abyla pentagona*, he listed known synonyms of *tetragona* but figured (Mayer, 1900, pl. 30, fig. 101) *Bassia bassensis* as described above. However, I am inclined to believe that their record (Agassiz and Mayer, 1899, p. 180) of the eudoxids of *eschscholtzii* (as *Aglaisma quincunx*) from the Fiji Islands is correct, because they figured it under this name elsewhere (Agassiz and Mayer, 1902, pl. 10, fig. 45). On the other hand, Bigelow (1911, p. 226) does not consider the latter record (Agassiz and Mayer, 1902, p. 164) to have been this species. In view of the figure (Agassiz and Mayer, 1902, pl. 10, fig. 45), which obviously belongs to *eschscholtzii*, there seems to be no reason for not including it as a synonym of this species.

ABYLOPSOIDES n. gen.

Genotype: *Abylopsoides dorsalis* n. sp.

Generic Characters

Superior nectophores (Fig. 27). The superior nectophores referred to this genus have definite affinities with *Abylopsis*. Thus, the opening to the hydroecium is essentially square and usually with a more or less prominent tooth at each corner. The basal facet together with the dorsal wall of the hydroecium is elongate, with the opening to the nectosac at the angle between the two. Within the nectophore the position of the nectosac and hydroecium relative to the somatocyst is more or less similar to that of *Abylopsis*. The arrangement of the canals radiating from a point on the ventral wall of the nectosac is also characteristic of that genus. The shape of the somatocyst may or may not be the same and may have a diverticulum. Likewise, the nectosac may be like that of *Abylopsis* or it may be short and stubby, more as in *Bassia*. Whether variations in these are characteristic of the species or whether in this genus each individual may vary cannot be determined until we have a longer series available for study.

The differences between this genus and *Abylopsis* are chiefly that there are fewer facets. As a result, there may be an apical surface, a transverse ridge, or perhaps a median apical ridge. Thus, the general arrangement of the facets and ridges bear no obvious relationship to *Abylopsis* in most instances. Even the character of the ridges differs by being elevated and ribbon-like.

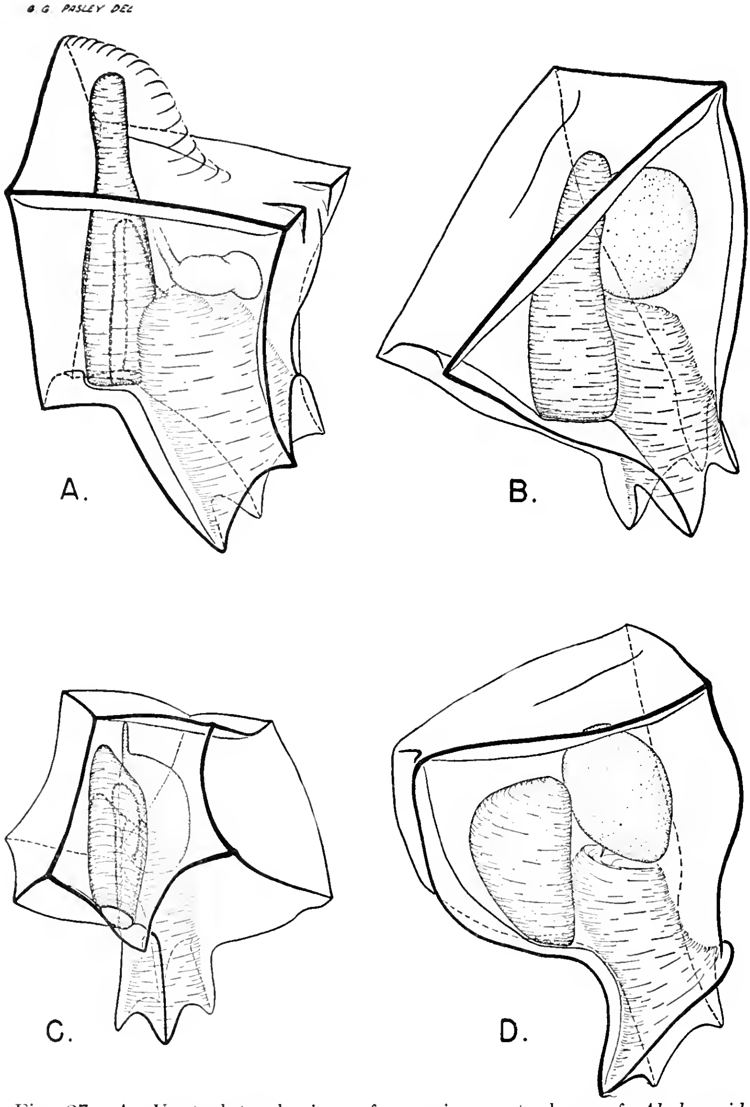

Fig. 27. A. Ventrolateral view of superior nectophore of *Abylopsoides dorsalis* with a dorsal facet of about 3.7 mm. in length. B. Dorsolateral view of superior nectophore of *A. ventralis* with a diagonal dorsal facet of about 2.6 mm. in length. C. Dorsolateral view of superior nectophore of *Pseudabylopsis anomala* with a dorsal ridge 1.5 mm. in length. D. Lateral view of superior nectophore of *Abylopsoides basalis* with an apical surface of about 3 mm. in length.

Remarks

Hundreds of thousands of superior nectophores belonging to *Abylopsis tetragona* and *eschscholtzii* have been examined. These have all been remarkably constant in general appearance. Of this number, there have been perhaps a dozen specimens which can be considered as mutilated in some way. A corner is missing or a ridge is incomplete, but in each instance, it has been possible to refer these to one or the other species of *Abylopsis*. At first, it appeared that the variants under consideration here should be placed in this same category. However, in these specimens, restoration of the missing parts would not produce an individual which could be identified as either *tetragona* or *eschscholtzii*. In the specimens examined, some of the ridges form pronounced knife-like edges not characteristic of *Abylopsis*. On one, the basal segment is elongate, on another it is shortened. Because these differences are more marked than any variations or mutilations yet observed in *Abylopsis*, it seems justifiable to establish the genus *Abylopsoides* for specimens of abylopsids with a reduced number of facets.[1]

Key to Species[2] *of Abylopsoides*

A. Superior nectophores
   1. Transverse apical ridge present . . . . *Abylopsoides ventralis* n. sp.
      Transverse apical ridge absent 2
   2. Pentagonal dorsal facet present . . . . *Abylopsoides dorsalis* n. sp.
      Dorsal facet absent . . . . *Abylopsoides basalis* n. sp.

ABYLOPSOIDES DORSALIS n. sp.

The type specimen of *Abylopsoides dorsalis* is a superior nectophore taken at "Dana" Sta. 3921^{III}(3°36'S, 58°19'E) on 11 December 1929, at 1900 hours in a stramin net 200 cm. in diameter, towing with 300 meters of wire out. The specimen when found was in tolerably good condition, but most regrettably it was dried up after the sketches for Figure 27 were made. The specimen has, however, been salvaged and will be placed in Universitets Zoologiske Museum, København, Denmark.

[1] See remarks on p. 49 for *Pseudabyla* many of which are also applicable here.

[2] One or two other specimens have been found which might belong to this genus, but their condition is not sufficiently good to determine the relationships.

Superior nectophore (Fig. 27A). The superior nectophore of *dorsalis* is essentially of the abylopsid type but it seemingly lacks most of the apical portion (i.e., the apicolateral facets and upper part of the ventral are absent). As a result, there is an apical surface which extends from the peak of the intact pentagonal dorsal facet but becomes flattened perpendicular to the ventral surface. This surface is, however, only partially separated from the ventral, so that there is actually but a single facet covering both surfaces. The horizontal ridges, the partial apicoventral and the ventrolaterals are distinctive in that they are like thin knife edges. The hydroecium is not unlike that of *Abylopsis* except the two teeth at the outer corners of the dorsal wall are longer and somewhat more obvious, because of a rather deeper cleft between them. It is also somewhat wider and occupies a greater part of the nectophore as a whole. The somatocyst is seemingly damaged but there is some evidence that it, like *Abylopsis*, has a diverticulum. In any event, the somatocyst must have been reduced in size because the nectosac and hydroecium nearly fill the nectophore. The nectosac is very like that of *Abylopsis* and the lateral canals were arched much as in *A. tetragona*. The basal facet is, however, somewhat shortened.

Inferior nectophore. Unknown.

Eudoxid. Unknown.

ABYLOPSOIDES VENTRALIS n. sp.

The type specimen of *Abylopsoides ventralis* is a superior nectophore taken at "Dana" Sta. 3921^{III} at 3°36'S, 58°19'E on 11 December 1929 at 1900 hours in a stramin net 200 cm. in diameter, towing with 300 meters of wire out. The specimen was only slightly damaged when found but, most regrettably, was dried up after the sketches (Fig. 27) were made. The specimen has, however, been salvaged and will be placed in Universitets Zoologiske Museum, København, Denmark.

Superior nectophore (Fig. 27B). The resemblance of *A. ventralis* to *Abylopsis* is not as obvious, perhaps, as the previous species, but the configuration of the opening to the hydroecium and the relation of the mouth of the nectosac to the basal facet and dorsal wall of the hydroecium are characteristic of that genus. Although *ventralis*, like *dorsalis*, has five facets, its outer surface is further reduced. Thus, it appears as if the apical half of an *Abylopsis* had been sliced off diagonally from the level of the horizontal ridges on the ventral facet to the dorsal ridge of the basal facet. In other words, there is apparently a rectangular dorsal facet separated from the ventral by a transverse ridge. The basal facet is more elongated dorsally than in other abylopsids which increases the space within the nectophore to provide room for a good-sized nectosac[1] and hydroecium. The somatocyst lacks a diverticulum. The four teeth surrounding the opening to the hydroecium are more pronounced than in the other three species, with deeper indentations between them. That on the ventral surface is a narrow and deep cleft.

Inferior nectophore. Unknown.

Eudoxid. Unknown.

ABYLOPSOIDES BASALIS n. sp.

The type specimen of *Abylopsoides basalis* is a superior nectophore taken at "Dana" Sta. 3921^{VIII} at 3°36′S, 58°19′E, on 11 December 1929 at 2240 hours in a stramin net 200 cm. in diameter, towing with 100 meters of wire out. The specimen is in a somewhat damaged condition. It will be placed in Universitets Zoologiske Museum, København, Denmark.

Superior nectophore (Fig. 27D). The specimen of *basalis* differs from *ventralis* in shape and in the arrangement of its facets. Thus, as far as one can ascertain in its present state of preservation, the basal appears to continue without demarcation to form the dorsal and apical surfaces. In any event, in contrast to *ventralis* which has a transverse apical ridge, this species has an apical surface. As a result, it resembles the basal half of an *Abylopsis*. In keeping with this, the nectosac[2] is very much shortened and ovoid in shape. Likewise, the somatocyst is relatively small and ovoid. The configuration of the opening of the hydroecium is asymmetrical because the right ventral tooth is missing. Consequently, the right ventral ridge, which in most cases continues down as the ridge of this tooth, veers inward toward the apex of the cleft between the teeth. The right lateral base of the hydroecial opening then curves from this point down to the right dorsal tooth. This species is thus somewhat asymmetrical in the ventral region.

Inferior nectophore. Unknown.

Eudoxid. Unknown.

[1] The canals were not apparent on the specimen even before it had been dried.

[2] The canals cannot be seen as the nectosac is badly damaged.

?ABYLOPSOIDES sp.

Finally, a superior nectophore taken at "Dana" Sta. 3921^VIII at 3°36′S, 58°19′E, on 11 December 1929 at 2240 hours in a stramin net 200 cm. in diameter, towing with 100 meters of wire out, has proven so aberrant that one cannot be certain of its status. It certainly has the appearance of a freak, although it has a number of abylopsid characters. There is, however, only one complete facet, the basal, and it is of the type characteristic of *Abylopsis*. The ridges delimiting the other facets are incomplete — so incomplete, in fact, that the various surfaces cannot be compared with the facets in other species with certainty. The ventral surface, determined because of its relationship to the somatocyst, is outlined apically by two prominent partial ridges meeting at the apex, which become tabs at their basal ends. This surface does not extend down, as one might expect in an abylopsid, to the ventral wall of the hydroecium, because of the peculiar twisted hydroecial opening. Its ventral margin does not protrude below the main body of the nectophore. Thus, the lateral margins end a short distance apart, the left on the ventral surface, the right on the lateral wall.

There is a short median apical ridge separating the dorsal from the ventral surface. It is not, however, as prominent as in most specimens we have seen of *Abylopsis*. The dorsal surface itself is large and, judging from the presence of two short, but pronounced tabs on the lower part of this surface, it extends down onto the right side. The latter, therefore, is very narrow and irregular. On the left side, an inconspicuous ridge extends from the base to the apex in a more normal position. As a result, the left lateral surface is wider and more regular than the right. The somatocyst seemingly has an apical and a basal diverticulum. The nectosac, although the apical half is somewhat collapsed, was reinflated enough to show its shape and canals to be more or less of the *Abylopsis* type. The left lateral did, however, bifurcate before joining the ventral.

PSEUDABYLOPSIS n. gen.

Genotype: *Pseudabylopsis anomala* n. sp.

Generic characters

Superior nectophore (Fig. 27C). In contrast to *Abylopsoides*, *Pseuda-*

bylopsis is proposed for a species with more facets than are characteristic for *Abylopsis*. The basal region and arrangement of the internal parts show the same affinities with *Abylopsis* as do specimens of *Abylopsoides*.

Pseudabylopsis anomala n. sp.

The type specimen is a superior nectophore from "Dana" Sta. No. 2922V taken at 3°45′S, 56°33′E on 12 December 1949 at 1850 hours with a stramin net 200 cm. in diameter towed with 50 meters of wire out. It will be deposited at Universitets Zoologiske Museum, København, Denmark.

Superior nectophore (Fig. 27C). The superior nectophore of *P. anomala* in its present state of preservation appears to be misshapen and slightly asymmetrical. It seems possible, however, that a better preserved specimen might be almost symmetrical. It has much the same arrangement of facets as occurs in *Abylopsis* with but two exceptions. An apical facet is interposed between the two apicolateral facets. This is not rectangular as one might expect, because its dorsal border comes to a point to conform with the apical portion of a subdivided dorsal facet. The two facets formed by this subdivision are pentagonal. However, because of preservation, it is not possible to ascertain whether they are exact mirror images of one another. The basal facet likewise is irregular, but it too appears damaged. Reconstructed, I believe it would be nearly square with a long extension from one corner down the dorsal wall of the hydroecium. Its base is forked but not as sharply as on the ventral wall. The ventral facet, on the other hand, is nearly pentagonal with an extension down the ventral wall of the hydroecium. It is sharply forked at its base. The apicodorsal facets are nearly square, the basolaterals are quadrangular with processes extending down as the lateral walls of the hydroecium.

The arrangement and shape of the internal parts is essentially as in *Abylopsis* even to an apical diverticulum of the somatocyst. It appears that there are only two highly arched lateral canals on the walls of the nectosac. No trace can be found of a dorsal or ventral canal. The nectosac is quite damaged so that these may therefore have been destroyed.

Inferior nectophore. Unknown.

Eudoxid. Unknown.

Bassia L. Agassiz 1862[1]

Genotype: *Bassia bassensis* Quoy and Gaimard 1834

Bassia bassensis Quoy and Gaimard

Abyla quadrilatera, Blainville, 1830, p. 123 (not seen); Haeckel, 1888a, p. 160.
Diphyes bassensis, Quoy and Gaimard, 1834, pp. 91–92, pl. 4, figs. 18–20.
Calpe bassensis, Lesson, 1843, p. 451 (not seen).
Abyla bassensis, Huxley, 1859, pp. 45–46, pl. 2, fig. 1; Haeckel, 1888a, pp. 116, 160; Schneider, 1898, pp. 91, 197; Lens and Van Riemsdijk, 1908, pp. 26–28, pl. 4, fig. 32.
Sphenoides australis, Huxley, 1859, p. 62, pl. 4, fig. 4; Chun, 1888, p. 1160; Haeckel, 1888a, p. 360; Bedot, 1896, p. 375; Lens and Van Riemsdijk, 1908, pp. 27–28, pl. 4, fig. 33.
Abyla perforata, Gegenbaur, 1860, pp. 356–359, pl. 29, figs. 20–21; Haeckel, 1888a, p. 160.
Bassia perforata, L. Agassiz, 1862, p. 372; Chun, 1888, p. 1160; Haeckel, 1888, p. 36; 1888a, p. 116; Bedot, 1896, p. 374; Moser, 1913, p. 148.
Bassia obeliscus, Haeckel, 1888, p. 36; 1888a, pp. 160–163, pls. 37–38.
Sphenoides obeliscus, Haeckel, 1888, p. 33; 1888a, pp. 116–118, pl. 38.
Sphenoides perforata, Haeckel, 1888, p. 33; Chun, 1897, p. 32.
Bassia tetragona, Haeckel, 1888a, p. 160.
Bassia quadrilatera, Haeckel, 1888a, p. 160.
?*Parasphenoides amboinensis*, Bedot, 1896, p. 376, pl. 12, figs. 2–3.
Abyla (*Bassia*) *perforata*, Chun, 1897, p. 32.
Abyla pentagona, Mayer, 1900, pl. 30, fig. 101.
non *Abyla pentagona*, Mayer, 1900, pl. 30, figs. 102–103.
Bassia bassensis, Bigelow, 1911, pp. 229–231, pl. 12, fig. 8, pl. 14, fig. 9; 1913, p. 69; 1918, p. 411; 1919, p. 336; 1931, p. 548; Kawamura, 1915, pp. 585–587, pl. 15, figs. 39–40; Moser, 1917, p. 733; 1925, pp. 347–356, pl. 21, figs. 7–8, pl. 22, Browne, 1926, p. 65; Leloup, 1932, pp. 25–26; 1934, pp. 60–62; 1935, p. 11; 1936, p. 7; Totton, 1932, pp. 339–340, text figs. 17F, 18; Bigelow and Sears, 1937, pp. 26–28; Delsman, 1939, figs. 32–36; Gamulin, 1948, p. 9; Moore, 1949, p. 13.

Although the genus *Bassia*, represented by only a single species, *bassensis*,[2] is found in great numbers in all oceans, it is so fragile and is usually so flaccid that not a single truly well-preserved specimen occurs among the thousands examined so far in the "Dana" material.

[1] See Bigelow, 1911, p. 229 for reasons for attributing this genus to L. Agassiz.

[2] One poorly preserved specimen of a superior nectophore was seemingly aberrant but no consideration has been given to its proper place, i.e., as to whether it should be treated as a new species or a new genus, because it was not possible to determine its exact structure.

Nevertheless, fragments are readily identified when preserved in formalin, by their general appearance: on a black background, the ridges are milky-white and opaque, but with transmitted light, these become an opaque gray or brown.[1]

Generic and specific characters

Superior nectophore (Fig. 28B). The external appearance of the superior nectophore, except for the peculiarity of the ridges just described, is very like that of *Abylopsis* and more especially *tetragona*. Thus, the dorsal and ventral facets are pentagonal, the basolateral borders being the more elongate. The apicolateral facets are quadrangular, but are definitely smaller than the basolateral ones. The latter are comparatively larger than in *Abylopsis* and pentagonal. The basal surface, as in *Abylopsis*, is elongate and rectangular rather than square as in most abylids, because the dorsal wall of the hydroecium protrudes below the base of the nectophore as a whole.

In contrast to all other abylids, which are distinguished almost entirely by external characters of the facets and ridges, the superior nectophore of *Bassia* can only be distinguished from those of the preceding genus by the peculiar ridges mentioned above and by the shape and relative position of its internal structures: namely, by the relatively short, at times almost ovoid nectosac, with four subumbral canals of approximately the same length, and by theg lobular somatocyst, which lacks the diverticulum characteristic of *Abylopsis*. The somatocyst lies above the nectosac in this species close to the dorsal wall. Finally, the hydroecium is rather shallower and has a comparatively larger opening.

Inferior nectophore (Fig. 28C). Superficially, the inferior nectophore resembles that of *A. eschscholtzii* in shape and general proportions. However, it has only four ridges (see discussion below) and the teeth at the base of the ridges are not as pronounced. The two flaps of the ventral ridges are closely held in place by the turgidity of the jelly, but they are definitely not fused. Furthermore, the two flaps are so interlocked, even at the free ends toward the base, that the hydroecium appears tubular. The free basal end of the flap from the inner surface of the left-hand ridge lies under that from the right-hand

[1] Huxley (1859, p. 46) wrote, "the edges of the larger specimens were all coloured a deep blue." These were presumably living.

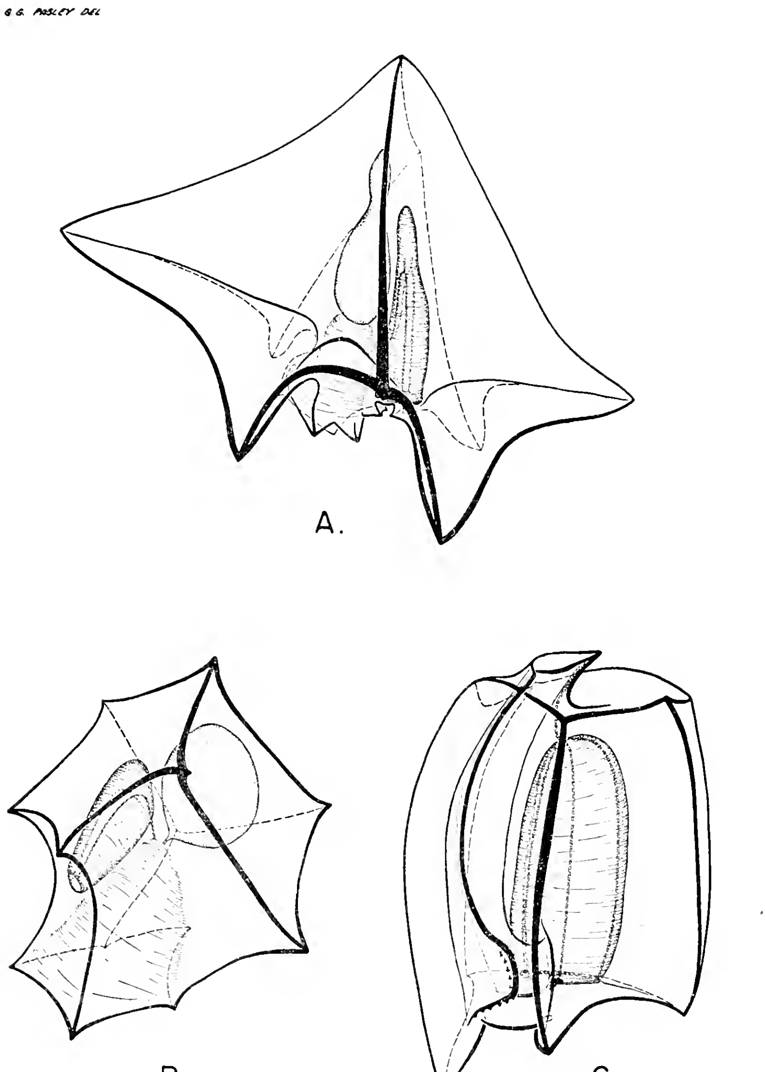

Fig. 28. A. Nectophore of *Enneagonum hyalinum* with a dorsal ridge 13.3 mm. in length. B. Lateral view of superior nectophore of *Bassia bassensis* with a dorsal facet of about 4 mm. in length. C. Ventrolateral view of inferior nectophore of *B. bassensis*.

one and protrudes into the enlarged basal portion of the hydroecium. The flap extends from this protrusion to the apex. It can, however, only be delimited from the ridge of the opposite side as a fine line. On prying the two ridges apart to view the hydroecial cavity, it can be seen to taper to a knife edge to fit under the right hand flap, at least on some of the better preserved specimens. The right hand flap, on the other hand, is rather flat with a wide toothed basal margin. From this it tapers toward the apex to fit into the flap from the opposite wing.

Bract (Fig. 2). A well-preserved bract appears to resemble *A. eschscholtzii* in general shape chiefly due to the length of the basolateral facets for the opening to the hydroecium. However, closer examination reveals that there is a median horizontal ridge rather than an apical facet. The dorsal facet is quadrilateral, the two apicolateral ridges being much shorter than the basolateral. The ventral facet is subdivided by a median longitudinal ridge. The horizontal lateral ridges divide the sides into a small quadrangular facet and a larger one which is essentially trapezoidal, but for the opening to the hydroecium. The hydroecium is, however, shallower and has a comparatively larger opening than in the previous genus. The unique character is the structure of the somatocyst: it has a thin descending branch, and an enlarged apical diverticulum but entirely lacks the ventrolateral branches.

Gonophore. The gonophores of *Bassia* have all been so poorly preserved that it has not been possible to corroborate earlier descriptions.

Remarks

A number of points have been raised by conflicting items in earlier descriptions of the inferior nectophore. Unfortunately our material affords insufficient evidence to clarify all of them. It is generally agreed that the inferior nectophore is a truncated obelisk with four ridges, two of which correspond to the ventrals of the species previously described and one to the left lateral. Bigelow (1911, p. 230) states that, "the right lateral ridge [is] entirely suppressed except at its basal extremity." Totton (1932, p. 339), on the other hand, reports: "I can see no trace of the almost-obsolete ridge marked by a very small pointed prolongation of the distal wall of the hydroecium of the posterior nectophore figured and mentioned by Huxley. . . . In my judgement it is not one of the laterals which has been suppressed, but the median dorsal ridge. The after end of the posterior nectophore is twisted round slightly . . ., so that the posterior end of the right lateral is brought near the middle line." However, the ridge in question seems to run diagonally from near the mid-dorsal region of the basal margin to what would appear to be the correct location for the insertion of a right lateral ridge at the apical margin. In *Abyla*, and *Ceratocymba*, the arrangement of the oral teeth gave the clue as to which ridge was suppressed. In the present case, there is no such evidence, as the teeth are only found at the base of each ridge, so that it is not possible with the evidence at hand to decide which ridge was actually suppressed.

The other controversial question concerns the hydroecium of the inferior nectophore. Bigelow (1911, p. 230) considers "the coalescence of the two ventral wings, by which the hydroecium is closed for the upper two thirds of its length" as one of the most diagnostic characters for the genus. Haeckel (1888a, p. 162) likewise mentions the "funnel canal." Moser (1925, pl. 22, fig. 7, pp. 351–352), however, definitely shows and describes the two flaps from the ventral ridges.

ENNEAGONUM Quoy and Gaimard 1827

Genotype: *Enneagonum hyalinum* Quoy and Gaimard 1827

ENNEAGONUM HYALINUM Quoy and Gaimard

Enneagonum hyalinum Quoy and Gaimard, 1827, p. 18, pl. 2D, figs. 1–6; Schneider, 1898, pp. 91–92; Totton, 1932, pp. 335–338, text figs. 16, 17D; Leloup, 1933, p. 23; 1934, pp. 58–60, fig. 15; Bigelow and Sears, 1937, pp. 20–23, figs. 21–25.

Cuboides vitreus Quoy and Gaimard, 1827, p. 19, pl. 2E, figs. 1–3; Eschscholtz, 1829, p. 135; Huxley, 1859, p. 63, pl. 4, fig. 5; Gegenbaur, 1860, pp. 364–366; Haeckel, 1888a, p. 111; Bigelow, 1911, pp. 190–191, 1918, p. 403; 1919, pp. 331–332.

Abyla vogtii, Huxley, 1859, p. 46, pl. 2, fig. 3; Haeckel, 1888a, p. 111.

Halopyramis adamantina, Chun, 1888, pp. 1155–1156; 1892, pp. 111–121, pl. 11, figs. 1–4, pl. 12, figs. 1–3; Bedot, 1896, p. 369; Lens and Van Riemsdijk, 1908, pp. 7–8.

Cuboides adamantina, Chun, 1888, pp. 1155–1156; 1892, pp. 121–137, pl. 10, figs. 10–11, pl. 11, figs. 5–7, pl. 12, figs. 4–29; Bedot, 1896, p. 369; Lens and Van Riemsdijk, 1908, p. 8.

Cuboides crystallus, Haeckel, 1888, p. 37; 1888a, pp. 111–113, pl. 42.

Cymba vogtii, Haeckel, 1888, p. 34; 1888a, p. 138.

Cymba crystallus, Haeckel, 1888, p. 34; 1888a, pp. 111, 138, pls. 41–42.

Generic and Specific Characters

Superior nectophore (Fig. 28A). The nectophore of *Enneagonum* is "easily recognizable by the pyramidal form and nine prominent angles" (Bigelow and Sears, 1937, p. 21). However, this description does not reveal its relationship to other abylids and is not based on the number and arrangement of the facets. In all the other descriptions thus far, except in *Bassia*, the latter have provided the basis for separating the genera. Most published figures such as that shown by Bigelow and Sears (1937, fig. 21) with the somatocyst and nectosac in a nearly vertical position show four facets on the upper surface and four underneath, but little attempt has been made to homologize these with other abylids, except by Totton (1932, p. 335) and Huxley (1859). In comparing these with the facets of other abylids, the apical point[1] appears to be the junction of dorsal, apical,[2] and lateral ridges (Figs. 3 and 4) if we use the terminology applied to *Abyla*. On the other hand, if we compare *Enneagonum* with *Abylopsis* (Figs. 25 and 4A), it appears that aside from differences in size and shape of the facets, the major alteration has been the addition of a median dorsal ridge bisecting the dorsal facet found in *Abylopsis*. Beneath and between the two dorsal facets is a nearly triangular basal facet. Ventral to these are the apicolateral facets. Basal to and between the apicolaterals and the dorsals are the basolaterals. Basal to and between the apicolaterals is the ventral. The peculiarity, then, of this genus which delimits it from others of the type with a median apical ridge is the addition of the median dorsal ridge subdividing the dorsal facet, as in *Pseudabylopsis*.

In contrast to the ovoid somatocyst of the other genera, in *Enneagonum*, this is elongate with a more or less pronounced constriction below its apex. As in *Bassia*, it lies above the hydroecium. The opening to the nectosac is peculiar in that it is surrounded by three lappets, two of which separate it from the basal facet (see Bigelow and Sears, 1937, figs. 24 and 25). The radial canals on the nectosac are essentially as in *A. tetragona*, except that at the apex of the arched radial canals there is a blind diverticulum.

[1] In some specimens, this point becomes a short transverse ridge (Totton, 1932, text fig. 16; Bigelow and Sears, 1937, p. 22, fig. 23).

[2] This ridge has previously (Bigelow and Sears, 1937, p. 22) been called the ventral one, but this was apparently merely a matter of convenience as no attempt was made to compare this species with other abylids.

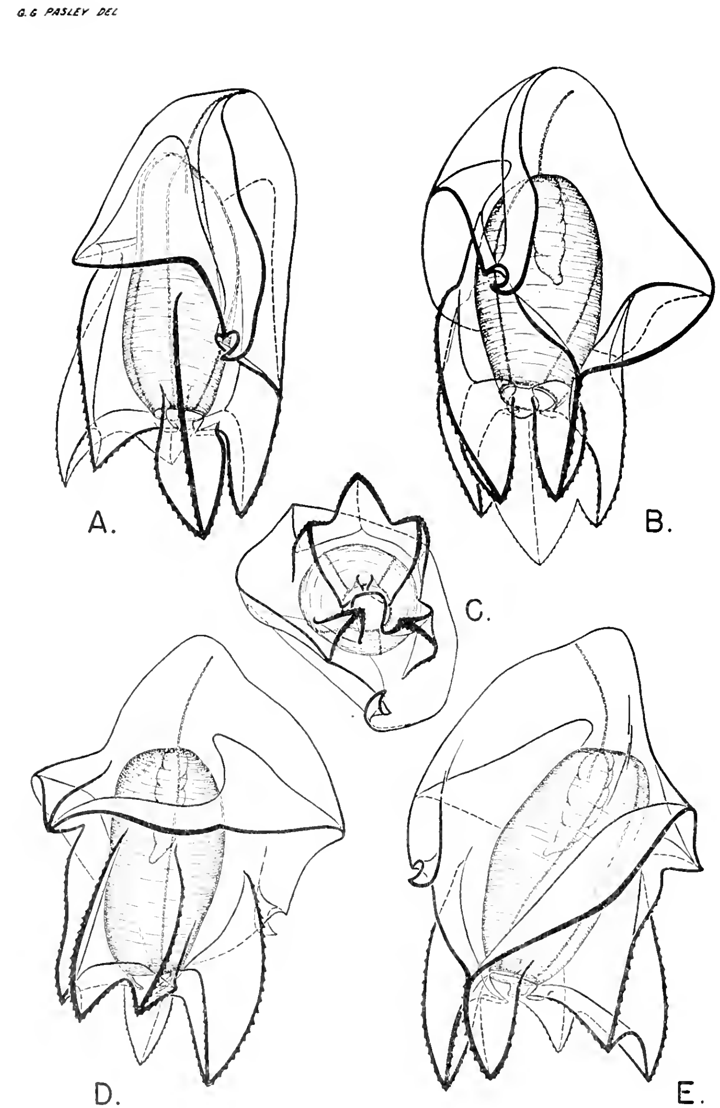

Fig. 29. Gonophore of *Enneagonum hyalinum* of 5.4 mm. in total length. A. Left ventrolateral view. B. Ventral view. C. Oral view. D. Lateral view. E. Right ventrolateral view.

Inferior nectophore. There is no inferior nectophore in this species.

Bract (Fig. 2). The bract is more nearly a perfect cube than that of *A. tetragona* the only other one with which it superficially might be confused. It has five facets, an apical, dorsal, ventral and two laterals. The basolateral facets are absent; the entire basal portion being the opening to the hydroecium. The somatocyst is unique in that it completely lacks the descending dorsal branch found in all other known genera of abylids. The lateral branches are swollen and the apical diverticulum is conspicuous.

Gonophore (Fig. 29). The best existing description and figures for the gonophore of *Enneagonum* appear to be those of Chun (1892). Unfortunately, certain of the more complex details were omitted. At first glance, it is difficult to visualize the relationship of the various surfaces with those of other gonophores among the abylids. However, comparison with those of *Abyla* or *Abylopsis* in which the apophysis is so developed as to form almost a third of the gonophore, at least in young specimens, suggests that the peculiar conical apex of *Enneagonum* is perhaps an overdeveloped apophysis which had become considerably modified. Thus, the lower margin of the almost conical upper portion might be considered homologous with the apical ridges separating it from the facets in *Abyla* or *Abylopsis*. In *Enneagonum*, however, the dorsal and right lateral[1] ridges do not extend apically as far as this margin and there are deep concave depressions beneath it. The latter are present, but less marked in young gonophores, at least, of *Abyla* and *Abylopsis*.

The lower half of the gonophore is essentially similar to others within the subfamily. There is a prominent dorsal tooth with almost equally prominent lateral teeth. The ridges associated with these are very pronounced, but extend only about half way up the nectophore. The laterals are not straight; apically, the right lateral swerves sharply dorsad, but the left lateral has a more sinuous dorsal course before connecting with the "apical ridge" girdling the mid-portion of the gonophore.

A peculiarity not found in other abylid gonophores, however, is the extensive concave surface beneath the dorsal and lateral teeth. At the base of each lateral tooth is a semicircular serrated lappet. Likewise, a third such protuberance extends forward from the ventral region.

[1] In order to avoid confusion, the gonophore is described as drawn. However, mirror images occur.

The ventral teeth are large and obvious. The ridge from the right ventral tooth ends like the dorsal and right lateral about half way up the nectophore. The left ventral ridge seemingly bifurcates, but joins again apically, surrounding a large concavity which apparently serves as the dorsal part of the hydroecium. One branch bears a definite hook resembling that found in *Abyla*, in *Ceratocymba*, and to a lesser extent in *Abylopsis*.

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Appendix

Listed alphabetically below are the specimens, other than uniques mentioned in the text and other than the ubiquitous species, *Abylopsis tetragona*, *Abylopsis eschscholtzii*, *Bassia bassensis*, *Ceratocymba sagittata*, and *Enneagonum hyalinum*, upon which the foregoing study was based. It should be noted in this connection, that the entire "Dana" collection has not yet been examined, so that the listing is by no means complete.

Abyla bicarinata Moser

St. 3620. 24°46.5′S. — 170°18.5′E. 7. XII. 1928.
S150. 100 m. w. 1 superior nectophore.
St. 3622. 25°54′S. — 172°36.9′E. 8. XII. 1928.
S200. 100 m. w. 5 superior nectophores.
S200. 200 m. w. 3 superior nectophores; 2 inferior nectophores.
St. 3623. 27°21′S. — 175°11′E. 9. XII. 1928.
S150. m. w. 1 superior nectophore; 1 inferior nectophore.
St. 3663. 33°33′S. — 154°94′E. 23. II. 1929.
S150. 50 m. w. 3 superior nectophores; 3 inferior nectophores.
S150. 100 m. w. 1 colony.
St. 3677. 5°28′S. — 130°39′E. 23. III. 1929.
E300. 5000 m. w. 1 superior nectophore; 1 inferior nectophore.
St. 3714. 15°22′N. — 115°20′E. 20. V. 1929.
S150. 100 m. w. 3 superior nectophores.

St. 3727. 25°27′N. — 121°30′E. 10. VI. 1929.
E300. 300 m. w. 6 superior nectophores; 5 inferior nectophores.
St. 3903. 5°50′N. — 93°28′E. 17. XI. 1929.
S200. 300 m. w. 1 superior nectophore; 1 inferior nectophore.
St. 3919. 0°07′S. — 63°56′E. 8. XII. 1929.
S200. 50 m. w. 4 superior nectophores; 2 inferior nectophores.
S200. 300 m. w. 1 inferior nectophore.
St. 3920. 1°12′N. — 62°19′E. 9. XII. 1929.
S200. 100 m. w. 1 superior nectophore.
St. 3921. 3°36′S. — 58°19′E. 11. XII. 1929.
S200. 200 m. w. 1 superior nectophore.
St. 3934. 11°24′S. — 50°05′E. 20. XII. 1929.
S200. 300 m. w. 6 superior nectophores; 4 inferior nectophores.
St. 3964. 25°19′S. — 36°13′E. 15. I. 1930.
S150. 50 m. w. 1 inferior nectophore.
S200. 100 m. w. 1 superior nectophore.
S200. 300 m. w. 7 superior nectophores; 6 inferior nectophores.
S150. 1500 m. w. 1 superior nectophore.
S150. 2000 m. w. 1 superior nectophore.
St. 4762. 8°13′S. — 2°54′E. 11. II. 1933.
S200. 293 m. w. 1 inferior nectophore.
St. 4775. 30°20′N. — 138°00′E. 11. IV. 1933.
S200. 220 m. w. 1 colony.

Abyla brownia n. sp.

St. 3622. 25°54′S. — 172°36.9′E. 8. XII. 1928.
S200. 200 m. w. 5 superior nectophores.
St. 3712. 12°44′N. — 110°45′E. 18. V. 1929.
S150. 50 m. w. 2 superior nectophores.
St. 3921. 3°36′S. — 58°19′E. 11. XII. 1929.
S200. 100 m. w. 1 superior nectophore.
St. 3964. 25°19′S. — 36°13′E. 15. I. 1930.
S150. 50 m. w. 8 superior nectophores.

Abyla carina Haeckel

St. 4003. 8°26′S. — 15°11′W. 9. III. 1930.
S150. 3000 m. w. 1 superior nectophore.
St. 4019. 33°08′N. — 10°22′W. 30. III. 1930.
S200. 300 m. w. 2 superior nectophores; 2 inferior nectophores.
St. 4195. 41°55′N. — 32°22′W. 22. VI. 1931.
S200. 100 m. w. 3 superior nectophores; 2 inferior nectophores
S200. 300 m. w. 1 superior nectophore; 1 inferior nectophore.

ABYLA HAECKELI Lens & Van Riemsdijk

St. 3620. 24°46.5'S. — 170°18.5'E. 7. XII. 1928.
S150. 100 m. w. 1 superior nectophore.
St. 3622. 25°54'S. — 172°36.9'E. 8. XII. 1928.
S200. 200 m. w. 4 superior nectophores.
St. 3663. 33°33'S. — 154°94'E. 23. II. 1929.
S150. 50 m. w. 2 superior nectophores.
St. 3676. 5°52'S. — 131°14'E. 22. III. 1929.
S150. 50 m. w. 2 superior nectophores.
S150. 100 m. w. 4 superior nectophores.
S150. 300 m. w. 5 superior nectophores.
St. 3677. 5°28'S. — 130°39'E. 23. III. 1929.
S150. 3000 m. w. 1 superior nectophore.
St. 3678. 4°05'S. — 128°16'E. 24. III. 1929.
S150. 100 m. w. 1 superior nectophore.
S150. 3000 m. w. 1 superior nectophore.
St. 3680. 2°22'S. — 126°58.5'E. 27. III. 1929.
S150. 50 m. w. 1 superior nectophore.
S150. 100 m. w. 1 superior nectophore.
S150. 1000 m. w. 1 superior nectophore.
St. 3751. 3°40.5'N. — 137°53'E. 12. VII. 1929.
S200. 600 m. w. 1 superior nectophore.
St. 3844. 12°05'S. — 96°45'E. 10. X. 1929.
S200. 200 m. w. 1 colony; 4 superior nectophores; 1 inferior nectophore.
St. 3919. 0°07'S. — 63°56'E. 8. XII. 1929.
S200. 50 m. w. 43 superior nectophores; 1 inferior nectophore.
S200. 100 m. w. 34 superior nectophores; 15 inferior nectophores.
S200. 300 m. w. 1 colony; 33 superior nectophores.
S200. 600 m. w. 5 superior nectophores.
St. 3920. 1°12'N. — 62°19'E. 9. XII. 1929.
S200. 100 m. w. 15 superior nectophores.
S200. 600 m. w. 5 superior nectophores.
S150. 1000 m. w. 3 superior nectophores.
S150. 2000 m. w. 1 superior nectophore; 1 inferior nectophore.
St. 3921. 3°36'S. — 58°19'E. 11. XII. 1929.
S200. 100 m. w. 5 colonies; 82 superior nectophores; 28 inferior nectophores.
S200. 200 m. w. 5 superior nectophores.
S200. 300 m. w. 2 superior nectophores.
S200. 600 m. w. 5 superior nectophores.
St. 3922. 3°45'S. — 56°33'E. 12. XII. 1929.
S200. 50 m. w. 8 superior nectophores; 4 inferior nectophores.

S200. 300 m. w. 5 superior nectophores.
St. 3934. 11°24′S. — 50°05′E. 20. XII. 1929.
S200. 300 m. w. 2 colonies; 127 superior nectophores.
S200. 500 m. w. 98 superior nectophores; 1 inferior nectophore.
St. 3955. 18°30′S. — 42°18′E. 9. I. 1930.
S200. 100 m. w. 1 superior nectophore.
St. 3964. 25°19′S. — 36°13′E. 15. I. 1930.
S150. 50 m. w. 11 superior nectophores.
S200. 100 m. w. 2 superior nectophores.
S200. 300 m. w. 1 colony; 56 superior nectophores.
S150. 1500 m. w. 1 superior nectophore.
S150. 2000 m. w. 1 superior nectophore.
St. 3998. 7°34′S. — 8°48′W. 1. III. 1930.
S200. 50 m. w. 1 superior nectophore.
St. 4808. 36°20′N. — 143°00′E. 2. V. 1934.
S200. 220 m. w. 3 superior nectophores.

Abyla ingeborgae n. sp.

St. 3920. 1°12′N. — 62°19′E. 9. XII. 1929.
S200. 600 m. w. 1 superior nectophore.
St. 3921. 3°36′S. — 58°19′E. 11. XII. 1929.
S200. 200 m. w. 35 superior nectophores.
S200. 400 m. w. 3 superior nectophores.
St. 3933. 11°18′S. — 50°03′E. 20. XII. 1929.
S150. 2000 m. w. 1 colony.
S150. 3500 m. w. 1 superior nectophore.
St. 3964. 25°19′S. — 36°13′E. 15. I. 1930.
S200. 600 m. w. 1 superior nectophore.
St. 3998. 7°34.5′S. — 8°84′W. 1. III. 1930.
S200. 100 m. w. 1 superior nectophore.
S150. 1000 m. w. 1 superior nectophore.
St. 4000. 0°31′S. — 11°02′W. 4. III. 1930.
S50. Surface. 6 superior nectophores.
S200. 50 m. w. 8 superior nectophores.
S200. 100 m. w. 15 superior nectophores.
S200. 300 m. w. 2 superior nectophores.
S150. 4000 m. w. 2 superior nectophores.
St. 4762. 8°13′S. — 2°54′E. 11. II. 1933.
S200. 293 m. w. 21 superior nectophores.

Abyla schmidti n. sp.

St. 3623. 27°21′S. — 175°11′E. 9. XII. 1928.
S150. 100 m. w. 1 superior nectophore.

St. 3657. 33°17′S. — 152°45′E. 31. I. 1929.
S150. 100 m. w. 1 superior nectophore.
St. 3665. 29°37.5′S. — 156°46′E. 25. II. 1929.
E300. 1000 m. w. 1 colony.
St. 3676. 5°52′S. — 131°14′E. 22. III. 1929.
S150. 50 m. w. 60 superior nectophores; 2 inferior nectophores.
S150. 100 m. w. 60 superior nectophores; 2 inferior nectophores.
S150. 300 m. w. 1 colony; 233 superior nectophores; 192 inferior nectophores.
S150. 600 m. w. 1 inferior nectophore.
S150. 3000 m. w. 2 superior nectophores; 2 inferior nectophores.
S150. 4000 m. w. 4 superior nectophores; 3 inferior nectophores.
S150. 5000 m. w. 1 colony; 1 superior nectophore; 1 inferior nectophore.
St. 3677. 5°28′S. — 130°39′E. 23. III. 1929.
S150. 1000 m. w. 6 superior nectophores; 2 inferior nectophores.
S150. 2000 m. w. 1 inferior nectophore.
S150. 4000 m. w. 5 superior nectophores; 3 inferior nectophores.
E300. 5000 m. w. 3 superior nectophores.
St. 3678. 4°05′S. — 128°16′E. 24. III. 1929.
S150. 300 m. w. 3 superior nectophores; 2 inferior nectophores.
E300. 1000 m. w. 1 superior nectophore.
S150. 2000 m. w. 1 superior nectophore.
S150. 4000 m. w. 1 superior nectophore; 1 inferior nectophore.
E300. 5000 m. w. 2 superior nectophores; 1 inferior netophore.
St. 3680. 2°22′S. — 126°58.5′E. 27. III. 1929.
S150. 100 m. w. 9 superior nectophores; 1 inferior nectophore.
S150. 300 m. w. 1 superior nectophore; 1 inferior nectophore.
S150. 2000 m. w. 1 colony; 1 superior nectophore.
St. 3681. 0°29′N. — 125°54′E. 28. III. 1929.
S150. 100 m. w. 8 superior nectophores.
S150. 300 m. w. 6 superior nectophores; 2 inferior nectophores.
St. 3682. 1°42′N. — 124°29′E. 29. III. 1929.
S150. 50 m. w. 15 superior nectophores; 5 inferior nectophores.
S150. 100 m. w. 18 superior nectophores; 6 inferior nectophores.
S150. 300 m. w. 7 superior nectophores; 5 inferior nectophores.
S150. 600 m. w. 3 superior nectophores; 1 inferior nectophore.
E300. 1000 m. w. 1 inferior nectophore.
St. 3689. 7°13.5′N. — 111°49′E. 9. IV. 1929.
S150. 50 m. w. 31 superior nectophores; 1 inferior nectophore
St. 3712. 12°44′N. — 110°45′E. 18. V. 1929.
S150. 100 m. w. 11 superior nectophores; 10 inferior nectophores.
S150. 300 m. w. 2 superior nectophores; 3 inferior nectophores.

St. 3713. 13°57′N. — 112°45′E. 19. V. 1929.
S150. 100 m. w. 3 superior nectophores; 1 inferior nectophore.
St. 3714. 15°22′N. — 115°20′E. 20. V. 1929.
S150. 4000 m. w. 2 superior nectophores; 1 inferior nectophore.
St. 3727. 25°27′N. — 121°30′E. 10. VI. 1929.
E300. 300 m. w. 5 superior nectophores.
St. 3729. 20°03.5′N. — 120°50′E. 14. VI. 1929.
S200. 300 m. w. 2 superior neetophores.
S200. 600 m. w. 2 superior nectophores; 2 inferior nectophores.
St. 3751. 3°40.5′N. — 137°53′E. 12. VII. 1929.
S200. 50 m. w. 66 superior nectophores; 16 inferior nectophores.
S200. 100 m. w. 1 colony; 66 superior nectophores; 42 inferior nectophores.
S200. 300 m. w. 1 colony; 10 superior nectophores; 3 inferior nectophores.
S200. 600 m. w. 2 superior nectophores; 2 inferior nectophores.
St. 3844. 12°05′S. — 96°45′E. 10. X. 1929.
S200. 200 m. w. 1 superior nectophore.
St. 3903. 5°50′N. — 93°28′E. 17. XI. 1929.
S200. 50 m. w. 8 superior nectophores; 1 inferior nectophore.
St. 3919. 0°07′S. — 63°56′E. 8. XII. 1929.
S200. 50 m. w. 71 superior nectophores; 53 inferior nectophores.
S200. 100 m. w. 60 superior nectophores; 40 inferior nectophores.
S200. 300 m. w. 10 superior nectophores; 3 inferior nectophores.
S200. 600 m. w. 7 superior nectophores.
St. 3920. 1°12′N. — 62°19′E. 9. XII. 1929.
S200. 100 m. w. 147 superior nectophores; 36 inferior nectophores.
S200. 300 m. w. 4 superior nectophores; 1 inferior netophore.
S200. 600 m. w. 4 superior nectophores; 1 inferior nectophore.
S150. 1000 m. w. 2 superior nectophores.
St. 3921. 3°36′S. — 58°19′E. 11. XII. 1929.
S200. 100 m. w. 2 colonies; 47 superior nectophores; 27 inferior nectophores.
S200. 200 m. w. 12 superior nectophores; 9 inferior nectophores.
S200. 300 m. w. 1 colony; 1 superior nectophore; 2 inferior nectophores.
S200. 400 m. w. 1 colony; 4 superior nectophores; 1 inferior nectophore.
S200. 600 m. w. 2 superior nectophores.
St. 3922. 3°45′S. — 56°33′E. 12. XII. 1929.
S200. 50 m. w. 45 superior nectophores; 8 inferior nectophores.
S200. 300 m. w. 1 superior nectophore.
E300. 1000 m. w. 1 superior nectophore; 1 inferior nectophore.
St. 3934. 11°24′S. — 50°05′E. 20. XII. 1929.
S200. 300 m. w. 1 colony; 49 superior nectophores; 16 inferior nectophores.
S200. 500 m. w. 7 superior uectophores; 3 inferior nectophores.

St. 3955. 18°30′S. — 42°18′E. 9. I. 1930.
S200. 100 m. w. 1 colony; 9 superior nectophores; 8 inferior nectophores.
St. 3964. 25°19′S. — 36°13′E. 15. I. 1930.
S150. 50 m. w. 1 colony; 61 superior nectophores; 19 inferior nectophores.
S200. 100 m. w. 10 superior nectophores.
S200. 300 m. w. 51 superior nectophores.
S200. 600 m. w. 4 superior nectophores.
E300. 1000 m. w. 2 superior nectophores.
S150. 2000 m. w. 2 superior nectophores.
S150. 2500 m. w. 1 colony.
St. 4762. 8°13′S. — 2°54′E. 11. II. 1933.
S200. 293 m. w. 1 superior nectophore.

ABYLA TOTTONI n. sp.

St. 3677. 5°28′S. — 130°39′E. 23. III. 1929.
S150. 2000 m. w. 1 superior nectophore.
St. 3996. 15°41′S. — 5°50′W. 25. II. 1930.
S200. 50 m. w. 8 superior nectophores; 6 inferior nectophores.
S200. 100 m. w. 1 colony; 6 superior nectophores.
S150. 3000 m. w. 1 superior nectophore; 1 inferior nectophore.
St. 3997. 11°00′S. — 7°36′W. 27. II. 1930.
S200. 50 m. w. 13 colonies; 3 superior nectophores; 2 inferior nectophores.
S200. 100 m. w. 7 colonies; 2 superior nectophores; 2 inferior nectophores.
S200. 300 m. w. 1 colony.
E300. 1000 m. w. 1 colony; 1 superior nectophore.
St. 3998. 7°34′S. — 8°48′W. 1. III. 1930.
S200. 50 m. w. 4 colonies; 3 superior nectophores; 4 inferior nectophores.
S200. 100 m. w. 5 superior nectophores; 4 inferior nectophores.

ABYLA TRIGONA Quoy & Gaimard

St. 3728. 24°15′N. — 122°00′E. 12. VI. 1929.
S200. 300 m. w. 1 superior nectophore.
St. 3804. 9°09′S., 114°47′E. 30. VIII. 1929.
S200. 600 m. w. 2 superior nectophores.
St. 3920. 1°06′N. — 62°25′E. 9. XII. 1929.
S150. 2000 m. w. 1 colony; 2 superior nectophores.
St. 3921. 3°36′S. — 58°19′E. 11. XII. 1929.
S200. 100 m. w. 4 superior nectophores.
St. 3955. 18°30′S. — 42°18′E. 9. I. 1930.
S200. 100 m. w. 1 superior nectophore.
St. 3971. 35°49′S. — 23°09′E. 29. I. 1930.
S200. 100 m. w. 33 superior nectophores; 20 inferior nectophores.

St. 3978. 30°15'S. — 13°15'E. 13. II. 1930.
S200. 600 m. w. 1 superior nectophore.
St. 3996. 15°41'S. — 5°50'W. 25. II. 1930.
S200. 100 m. w. 1 superior nectophore.
St. 4000. 0°31'S. — 11°02'W. 4. III. 1930.
S200. 100 m. w. 4 superior nectophores.
St. 4003. 8°26'N. — 15°11'W. 9. III. 1930.
S200. 100 m. w. 6 superior nectophores; 8 inferior nectophores.
St. 4192. 39°57'N. — 24°59'W. 19. VI. 1931.
S200. 50 m. w. 1 colony; 17 superior nectophores; 2 inferior nectophores.
S200. 100 m. w. 11 superior nectophores; 1 inferior nectophore.
S200. 300 m. w. 5 superior nectophores; 2 inferior nectophores.
S200. 500 m. w. 2 superior nectophores; 3 inferior nectophores.
S200. 600 m. w. 2 superior nectophores.
St. 4195. 41°55'N. — 32°22'W. 22. VI. 1931.
S200. 50 m. w. 1 colony; 4 superior nectophores; 4 inferior nectophores.
S200. 100 m. w. 66 superior nectophores; 11 inferior nectophores.
S200. 300 m. w. 6 superior nectophores; 3 inferior nectophores.
St. 4768. 19°20'N. — 119°48'E. 22. IV. 1933.
S200. 293 m. w. 11 superior nectophores; 4 inferior nectophores.

Ceratocymba dentata Bigelow

St. 3556. 2°52'N. — 87°38'W. 14. IX. 1928.
S150. 200 m. w. 1 bract.
St. 3663. 33°33'S. — 154°04'E. 23. II. 1929.
S150. 300 m. w. 2 superior nectophores; 2 inferior nectophores; 3 bracts & eudoxids; 4 gonophores.
St. 3678. 4°05'S. — 128°16'E. 24. III. 1929.
S150. 300 m. w. 1 superior nectophore; 7 bracts & eudoxids; 13 gonophores.
St. 3681. 0°29'N. — 125°54'E. 28. III. 1929.
S150. 300 m. w. 1 superior nectophore.
St. 3712. 12°44'N. — 110°45'E. 18. V. 1929.
S150. 100 m. w. 5 superior nectophores; 3 inferior nectophores. 4 gonophores.
St. 3729. 20°03.5'N. — 120°50'E. 14. VI. 1929.
S200. 300 m. w. 2 superior nectophores; 2 inferior nectophores.
St. 3919. 0°07'S. — 63°56'E. 8. XII. 1929.
S200. 300 m. w. 3 superior nectophores; 1 inferior nectophore; 3 bracts & eudoxids; 5 gonophores.
St. 3920. 1°12'N. — 62°19'E. 9. XII. 1929.
S200. 300 m. w. 4 superior nectophores.
S150. 1000 m. w. 1 superior nectophore.

St. 3921. 3°36′S. — 58°19′E. 11. XII. 1929.
S200. 100 m. w. 1 superior nectophore.
S200. 200 m. w. 1 superior nectophore; 2 bracts; 2 gonophores.
S200. 400 m. w. 1 bract.
E300. 1000 m. w. 1 superior nectophore; 1 inferior nectophore.
St. 3922. 3°45′S. — 56°33′E. 12. XII. 1929.
E300. 1000 m. w. 1 colony.
St. 3934. 11°24′S. — 50°05′E. 20. XII. 1929.
S200. 300 m. w. 8 bracts & eudoxids; 16 gonophores.
S200. 500 m. w. 3 bracts; 3 gonophores.
St. 3964. 25°19′S. — 36°13′E. 15. I. 1930.
S200. 300 m. w. 4 bracts.
E300. 3000 m. w. 1 bract.
St. 3971. 35°49′S. — 23°09′E. 29. I. 1930.
S200. 100 m. w. 3 bracts.
St. 3996. 15°41′S. — 5°50′W. 25. II. 1930.
S200. 100 m. w. 1 superior nectophore.
St. 4003. 8°26′S. — 15°11′W. 9. III. 1930.
S150. 3000 m. w. 2 colonies; 1 superior nectophore; 1 inferior nectophore; 10 bracts & eudoxids; 2 gonophores.
St. 4762. 8°13′S. — 2°54′E. 11. II. 1933.
S200. 293 m. w. 1 colony.

Ceratocymba intermedia n. sp.

St. 3677. 5°28′S. — 130°39′E. 23. III. 1929.
S150. 1000 m. w. 1 superior nectophore.
S150. 3000 m. w. 1 superior nectophore.
St. 3678. 4°05′S. — 128°16′E. 24. III. 1929.
S150. 300 m. w. 1 superior nectophore.
S150. 600 m. w. 2 superior nectophores.
St. 3680. 2°22′S. — 126°58.5′E. 27. III. 1929.
S150. 4000 m. w. 1 superior nectophore.
St. 3712. 12°44′N. — 110°45′E. 18. V. 1929.
S150. 300 m. w. 1 superior nectophore.
St. 3751. 3°40.5′N. — 137°53′E. 12. VII. 1929.
S200. 600 m. w. 2 superior nectophores.

Ceratocymba leuckartii Huxley

St. 1361. 27°07′N. — 51°10′W. 4. VI. 1922.
S200. 100 m. w. 17 superior nectophores; 2 inferior nectophores; 2 bracts.
St. 3587. 11°00′S. — 172°37′W. 2. XI. 1928.
S150. 50 m. w. 40 superior nectophores; 15 inferior nectophores; 44 bracts & eudoxids.

St. 3676. 5°52′S. — 131°14′E. 22. III. 1929.
S150. 50 m. w. 14 superior nectophores.
S150. 100 m. w. 10 superior nectophores.
S150. 300 m. w. 20 superior nectophores.
S150. 600 m. w. 2 superior nectophores.
S150. 3000 m. w. 1 superior nectophore.
S150. 5000 m. w. 1 superior nectophore.
St. 3677. 5°28′S. — 130°39′E. 23. III. 1929.
S150. 2000 m. w. 2 superior nectophores; 3 eudoxids.
S150. 3000 m. w. 2 superior nectophores; 1 inferior nectophore; 3 eudoxids.
S150. 4000 m. w. 1 superior nectophore; 2 inferior nectophores; 1 bract.
St. 3678. 4°05′S. — 128°16′E. 24. III. 1929.
S150. 50 m. w. 12 superior nectophores.
S150. 100 m. w. 11 superior nectophores; 21 bracts & eudoxids; 15 gonophores.
S150. 300 m. w. 4 superior nectophores.
S150. 600 m. w. 2 superior nectophores; 1 bract.
S150. 1000 m. w. 1 superior nectophore.
St. 3680. 2°22′S. — 126°58.5′E. 27. III. 1929.
S150. 50 m. w. 22 superior nectophores; 2 inferior nectophores; 9 bracts & eudoxids; 14 gonophores.
S150. 100 m. w. 43 superior nectophores; 15 inferior nectophores.
S150. 300 m. w. 4 superior nectophores; 3 inferior nectophores.
S150. 1000 m. w. 1 superior nectophore; 2 inferior nectophores.
S150. 2000 m. w. 2 superior nectophores; 2 inferior nectophores; 3 bracts.
S150. 4000 m. w. 1 superior nectophore; 1 inferior nectophore; 1 bract.
St. 3681. 0°29 N. — 125°54′E. 28. III. 1929.
S150. 50 m. w. 1 superior nectophore.
S150. 100 m. w. 56 superior nectophores; 7 inferior nectophores; 546 bracts & eudoxids; 462 gonophores.
S150. 300 m. w. 21 superior nectophores; 2 inferior nectophores; 220 bracts & eudoxids.
S150. 600 m. w. 10 bracts & eudoxids; 20 gonophores.
St. 3682. 1°42′N. — 124°29′E. 29. III. 1929.
S150. 50 m. w. 32 superior nectophores; 5 inferior nectophores; 6 bracts & eudoxids.
S150. 100 m. w. 22 superior nectophores; 8 inferior nectophores; 1 eudoxid.
S150. 300 m. w. 5 superior nectophores; 3 inferior nectophores; 3 eudoxids; 1 gonophore.
S150. 600 m. w. 2 superior nectophores.
St. 3686. 8°34′N. — 119°55′E. 6. IV. 1929.
S150. 50 m. w. 1 superior nectophore.

St. 3689. 7°13.5'N. — 111°49'E. 9. IV. 1929.
S150. 50 m. w. 11 superior nectophores; 5 inferior nectophores; 2 bracts.
St. 3712. 12°44'N. — 110°45'E. 18. V. 1929.
S150. 50 m. w. 2 colonies; 17 superior nectophores; 6 inferior nectophores; 3 eudoxids.
S150. 100 m. w. 1 colony; 33 superior nectophores; 11 inferior nectophores; 16 bracts; 22 gonophores.
S150. 300 m. w. 3 superior nectophores; 1 eudoxid.
St. 3713. 13°57'N. — 112°45'E. 19. V. 1929.
S150. 100 m. w. 1 colony; 8 superior nectophores; 3 inferior nectophores; 8 gonophores.
S150. 600 m. w. 1 superior nectophore; 1 inferior nectophore; 1 eudoxid; 3 gonophores.
St. 3714. 15°22'N. — 115°20'E. 20. V. 1929.
S150. 100 m. w. 1 inferior nectophore.
S150. 5000 m. w. 2 superior nectophores; 1 inferior nectophore.
St. 3723. 23°30.5'N. — 125°28'E. 30. V. 1929.
S200. 600 m. w. 5 superior nectophores; 1 inferior nectophore.
St. 3728. 24°15'N. — 122°00'E. 12. VI. 1929.
S200. 300 m. w. 10 superior nectophores; 5 inferior nectophores; 1 gonophore.
St. 3729. 20°03.5'N. — 120°50'E. 14. VI. 1929.
S200. 600 m. w. 2 superior nectophores; 1 inferior nectophore; 2 eudoxids; 2 gonophores.
St. 3751. 3°40.5'N. — 137°53'E. 12. VII. 1929.
S200. 50 m. w. 57 superior nectophores; 23 inferior nectophores; 19 bracts & eudoxids.
S200. 100 m. w. 31 superior nectophores; 14 inferior nectophores.
S200. 300 m. w. 5 superior nectophores; 3 bracts.
S200. 600 m. w. 3 eudoxids.
St. 3804. 9°09'S. — 114°47'E. 30. VIII. 1929.
S200. 600 m. w. 2 superior nectophores.
St. 3844. 12°05'S. — 96°45'E. 10. X. 1929.
S200. 200 m. w. 78 superior nectophores; 23 inferior nectophores; 18 bracts & eudoxids; 2 gonophores.
St. 3903. 5°50'N. — 93°28'E. 17. XI. 1929.
S200. 50 m. w. 1 superior nectophore.
St. 3919. 0°07'S. — 63°56'E. 8. XII. 1929.
S200. 50 m. w. 1 colony; 9 superior nectophores; 1 inferior nectophore; 9 bracts.
S200. 100 m. w. 6 superior nectophores; 6 inferior nectophores; 3 bracts & eudoxids.
S200. 300 m. w. 1 superior nectophore.

S200. 600 m. w. 1 superior nectophore, 1 inferior nectophore; 1 bract.
St. 3920. 1°12′N. — 62°19′E. 9. XII. 1929.
S200. 100 m. w. 8 superior nectophores.
S200. 600 m. w. 1 eudoxid.
S150. 2500 m. w. 2 superior nectophores; 1 inferior nectophore.
St. 3921. 3°36′S. — 58°19′E. 11. XII. 1929.
S200. 100 m. w. 16 superior nectophores; 13 inferior nectophores; 26 bracts.
S200. 200 m. w. 1 inferior nectophore.
S200. 400 m. w. 2 superior nectophores; 1 bract; 2 gonophores.
St. 3922. 3°45′S. — 56°33′E. 12. XII. 1929.
S200. 50 m. w. 5 superior nectophores; 6 inferior nectophores; 4 bracts.
St. 3934. 11°24′S. — 50°05′E. 20. XII. 1929.
S200. 300 m. w. 1 colony; 146 superior nectophores; 45 inferior nectophores; 87 bracts & eudoxids.
S200. 500 m. w. 3 superior nectophores; 1 bract.
St. 3955. 18°30′S. — 42°18′E. 9. I. 1930.
S200. 100 m. w. 4 superior nectophores; 1 inferior nectophore.
St. 3964. 25°19′S. — 36°13′E. 15. I. 1930.
S150. 50 m. w. 23 superior nectophores; 7 inferior nectophores; 2 eudoxids.
S200. 100 m. w. 1 colony; 19 superior nectophores; 5 inferior nectophores; 1 bract.
S200. 300 m. w. 3 superior nectophores; 2 inferior nectophores; 5 bracts & eudoxids.
S150. 2000 m. w. 1 superior nectophore.
S150. 2500 m. w. 2 superior nectophores; 1 inferior nectophore
St. 3971. 35°49′S. — 23°09′E. 29. I. 1930.
S200. 100 m. w. 6 superior nectophores; 1 inferior nectophore.
St. 3998. 7°34′S. — 8°48′W. 1. III. 1930.
S200. 50 m. w. 2 superior nectophores.
S200. 100 m. w. 2 superior nectophores.
St. 4000. 0°31′S. — 11°02′W. 4. III. 1930.
S50. Surface. 3 superior nectophores.
S200. 50 m. w. 2 superior nectophores.
S200. 100 m. w. 1 superior nectophore.
St. 4003. 8°26′S. — 15°11′W. 9. III. 1930.
S150. 3000 m. w. 1 superior nectophore.
St. 4195. 41°55′N. — 32°22′W. 22. VI. 1931.
S200. 100 m. w. 1 inferior nectophore.
St. 4768. 19°20′N. — 119°48′E. 24. IV. 1933.
S200. 293 m. w. 67 superior nectophores; 21 inferior nectophores; 127 eudoxids.

St. 4775. 30°20′N. — 138°00′E. 11. IV. 1933.
S200. 220 m. w. 13 superior nectophores; 7 inferior nectophores; 8 bracts; 6 gonophores.

St. 4808. 36°20′N. — 143°00′E. 2. V. 1934.
S200. 220 m. w. 1 superior nectophore; 1 inferior nectophore.

Bulletin of the Museum of Comparative Zoology

AT HARVARD COLLEGE

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REPORT ON THE McCABE COLLECTION OF BRITISH COLUMBIAN BIRDS

By
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University of Florida
and
Museum of Comparative Zoology
at
Harvard College

CAMBRIDGE, MASS., U. S. A.
PRINTED FOR THE MUSEUM

May, 1953

Publications Issued by or in Connection
with the

MUSEUM OF COMPARATIVE ZOOLOGY
AT HARVARD COLLEGE

Bulletin (octavo) 1863 — The current volume is Vol. 109.

Breviora (octavo) 1952 — No. 13 is current.

Memoirs (quarto) 1864–1938 — Publication was terminated with Vol. 55.

Johnsonia (quarto) 1941 — A publication of the Department of Mollusks. Vol. 2, no. 31 is current.

Occasional Papers of the Department of Mollusks (octavo) 1945 — Vol. 1, no. 17 is current.

Proceedings of the New England Zoölogical Club (octavo) 1899–1948 — Published in connection with the Museum. Publication terminated with Vol. 24.

These publications issued at irregular intervals in numbers which may be purchased separately. Prices and lists may be obtained on application to the Director of the Museum of Comparative Zoölogy, Cambridge 38, Massachusetts.

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No. 2 — *Report on the McCabe Collection of British Columbian Birds*

BY J. C. DICKINSON, JR.

INTRODUCTION

During the years 1929-1941 the late Thomas T. McCabe and his wife Elinor B. accumulated a most outstanding collection of birds from British Columbia. The great majority of these specimens were taken in the central and southwestern portions of the province (Plate 1.). The collection in its present form amounts to approximately 4700 study skins. Mr. McCabe very generously donated almost the entire collection to the Museum of Comparative Zoology in 1936. It was his intention to complete a definitive work on the birds of British Columbia. His death in 1948 prevented the fulfillment of this aim. Through the courtesy of the late Mr. James L. Peters, I was offered the opportunity of examining and reporting on this collection while I was in residence in Cambridge.

A great portion of the collection quite naturally comes from the Indianpoint Lake — Cottonwood — Barkerville region, where the McCabes had their residence. Mr. and Mrs. McCabe spent all of their summers and an occasional winter from 1929 to 1941 at their home on Indianpoint Lake. They were aware of the critical geographic position of this site and their efforts were bent toward collecting adequate series from the area. At the same time they also made frequent and sometimes extended trips to the coastal islands to gain a more complete picture of the bird fauna. I quote from a letter to Mr. Peters which Mr. McCabe wrote in connection with the transfer of his collections to Cambridge.

". . . Great Basin conditions and a great Basin fauna strike deeply into the interior of southern British Columbia to end rather abruptly on a line passing west from the middle North Thompson valley precisely through the town of Clinton and curving southward around Lillooet as it strikes the inner ranges of the Coast Range. Practically at Clinton the Western Kingbird and Bluebird, the Lazuli Bunting, the Cassin Purple Finch, House and Rock Wrens and Poor-wills, drop out of the picture for good, with many other things. Our interest has lain in the population immediately north of this line, to which we have hewed pretty closely. That to the south is very completely represented [in other collections] . . . our more northern zone is northern in its affinities as well as spectacularly eastern, — i.e., the great southeastern-northwestern sweep makes itself dominantly felt in British Columbia, even so far south, like an eddy of the transcontinental forest types. Many of these eastern or mid-continental things go through the Coast Range to salt water at the heads of the long inlets or fjords. The true coastal races form a mere pencil line on the *outside* coast and islands. No other collection contains much of anything from the coast between Vancouver and the islands of American southeastern Alaska, a stretch of some five hundred miles with more individuality than is realized.

"On the coast the great break to the southern fauna takes place much further south, where the offset and break occurs between the great Canadian Coast Range and the Cascades, a total transformation of topography and basic geology. Therefore we have worked a good deal farther south on the coast and have a good deal of stuff from the Fraser River Delta. So far we have omitted Vancouver Island for the most part, and we have never been to the Queen Charlottes. The latter, a young continent by themselves, we are simply leaving until we get around to them. The former we at first left simply because we thought Swarth had done it pretty well and because it was relatively much-worked by other collectors. Since making some superficial reconnaissance of the northern tip, however, we have come to realize the absurdity of treating Vancouver Island as a faunal unit as Swarth and other writers did after collecting in the extreme south. Although one or two forms may break sharply across the Queen Charlotte Sound, as the Hairy Woodpeckers do, it would be no great exaggeration to say that northern Vancouver Island was Alaska and southern Vancouver Island northwestern Washington. . . . We have a fair series of midwinter things from the country east of the Fraser River, but we have operated from April 1, to November 1, west of the Fraser and on the coast."

What a shame it is that Mr. McCabe, with his intimate knowledge of the region, could not have lived to complete his study!

In working with this collection I have been handicapped by the fact that I have never seen the country from which the material came. This lack of knowledge caused me to hesitate before even approaching the problem. There is little doubt in my mind that some of the decisions reached might be different if I had been able to use field-gathered information.

Mr. McCabe kept detailed field notebooks and these have been at my disposal through the courtesy of Mrs. McCabe. I have, on most occasions, been hesitant to rely too heavily on a second-hand interpretation of the information contained in these notes. For the individual familiar with the habitats in British Columbia, and intent on conducting a thorough faunal survey, the notes will prove to be of great value. They are deposited in the library of the Museum of

Comparative Zoology for future reference. Included are detailed itineraries of trips, notes on field behavior, numbers of birds seen, weather, habitats, song, dates of arrival and departure and much miscellaneous information. Mr. McCabe was quite interested in migrational problems and the majority of the skins have complete information as to the amount of fat present and the condition of the gonads. He was painstaking in the examination of each specimen as to its sex. In some cases tissue was removed at the time of skinning and later examined microscopically to verify the correctness of this information. Many specimens were weighed at the time of skinning. I note in another of his letters to Mr. Peters, the great distress with which he reported the loss of his "field balance".

Mr. McCabe was, for the most part, careful to use easily identifiable place names in designation of collecting localities. Practically all of the mainland localities can be located on any of the several "road maps" of the area which are available. I have taken certain minor liberties with locality data in listing the specimens, i.e. I have deleted, on most occasions, such information as "½ mile north" of various stations. In only one case have I substituted a different place name for the designation given by Mr. McCabe. Sometime during the period covered by his collecting activities, the name of "Bear Lake" became Bowron Lake. This was apparently done to avoid confusion caused by the multiplicity of "Bear Lakes" in British Columbia. I have used the present official designation — Bowron Lake — throughout this report.

The purpose of my report is to present a tabulation of the McCabe collection — with critical comments on distribution of the recognizable forms where the material available seemed adequate. I feel that it would be presumptive for me to try to add to the excellent general picture of bird distribution in British Columbia presented in the several works now available, by authors who have lived and worked in the habitats of the province. The major contributions which have come to my attention are as follows: Brooks and Swarth (1925), Cowan (1939), Munro (1941), the Stanwell-Fletchers (1943) Munro (1947), Johnstone (1949), Munro (1950), Munro and Cowan (1947), and Rand (1948a). Many other shorter contributions and works not concerned specifically with the problems of British Columbia are of interest, and mention of them is made in their appropriate connection elsewhere.

In the allocation of specimens I have, in so far as possible, tried to recognize the fact that the specimens at hand are simply samples of populations. Where the McCabe series is adequate to present a concept of variation I have probably been more successful in achieving this aim than in those cases where only one or a few specimens were collected. In most instances the collections of the Museum of Comparative Zoology are more than adequate for comparative purposes. I am however indebted to Museum of Zoology at Berkeley (through Alden H. Miller), the Chicago Natural History Museum (through Emmet R. Blake), the U. S. National Museum, and Fish and Wildlife Service (through J. W. Aldrich) for the loan of specimens.

In the annotated list which follows, I have listed every specimen, now in the Museum of Comparative Zoology collections, which was collected by Mr. and Mrs. McCabe in British Columbia[1]. I have chosen to give the earliest and latest date of collection for each of the localities. It must be remembered that this can not be interpreted as earliest and latest dates of record for the form concerned.

ACKNOWLEDGMENTS

I am deeply indebted to the late Mr. Peters for his many kindnesses extended during the course of my study. He was always ready to lend a hand to help me over some difficult decision. I feel fortunate that I was privileged to be associated with him. Critical examination of the material was completed prior to Mr. Peters' death and we had opportunity to discuss the form of this report. It must be understood, however, that the critical decisions are my own. Mr. Peters did not necessarily agree with me on all occasions.

The General Education Board furnished financial assistance which allowed me to spend a year away from teaching duties. The staff of the Museum of Comparative Zoology was most courteous and helpful whenever they were called upon. Mr. James C. Greenway, Jr. was always ready to stop what he was doing to discuss various problems and I am deeply grateful for his many favors. Mrs. McCabe very kindly consented to come to Cambridge to give me a first-hand account of the conditions under which the collection was assembled. She also furnished the photographs which appear as Plate 2.

To all of these persons and to the many others who made my stay in Cambridge pleasant and profitable I express my deep appreciation.

[1] Omitted from this report are a considerable number of pelagic birds collected off the coast of California, near Santa Cruz.

SOME REMARKS ON SPECIATION

The populations of flickers as they occur in British Columbia are at best a difficult problem to handle taxonomically. I am not too happy with the solution here presented, but under the circumstances I feel that a better picture of relationships is afforded by this treatment.

The action of uniting *Colaptes auratus* and *Colaptes cafer* requires some explanation and defense. My decision in this case is based in the main on study of the material in the McCabe Collection although I have examined a large number of skins in the collections of the Museum of Comparative Zoology in the course of the investigation.

Current practice has it that *Colaptes cafer cafer* (Gmelin) occurs along the coast, west of the Cascade Mountains; *C. c. collaris* Vigors is recorded east of the Cascades to the western slopes of the Rocky Mountains where it "hybridizes" with *C. auratus borealis* Ridgway. I can see no defense for maintaining these three subspecies as races of two species. That the yellow- and red-shafted elements of the populations involved, meet and intergrade along their mutual boundaries is well recorded. I believe the fact that the characters which serve to differentiate the two elements are easy to see (not requiring ruler and dividers), making it easy to recognize offspring of mixed ancestry, has been the principal factor allowing the retention of the two groups at the species level by earlier workers. I do not think that if the characters involved were wing length, tail length, tarsus length, and culmen rather than color of moustache, nape, throat and flight feathers, there would be any question as to their conspecificity. Even so, the diagnostic characters show continuous variation with all degrees of intensity of manifestation. Evidence has been presented by Bateson (1913: 147-159) to show that each of these characters is controlled by several genes with lack of dominance and/or a multiplicity of semi-dominant alleles for each of these genes. This concept is borne out by the blending of the various phenotypes. Neither do the genes controlling these characters appear to be linked in inheritance.

Ripley (1945: 340) suggests that the flickers are examples of the evolutionary pattern which he considers as "emergent species". His recommendation appears to be based on Huxley's (1942: 250) interpretation of the geologic history of the region showing divergence of the forms followed by a secondary meeting. The concept has considerable merit and I think the available evidence supports such a conclusion. On the other hand, our present nomenclatorial system unfortunately does not allow a distinction between this condition and one in which interbreeding and intergradation have always existed. I have commented on this weakness of our system in connection with subspeciation in *Pipilo erythrophthalmus* (Linné) (Dickinson 1952).

Conditions exhibited by the birds from central British Columbia reflect geographic intermediacy attended by morphological blending of characters. This I feel is "intergradation" by definition and I see no course open but to unite the forms as a single species.

As to the occurrence of *C. a. cafer* in coastal British Columbia, I have been unable to arrive at any opinion on the basis of the material contained in the McCabe collection. Mr. McCabe collected only five specimens from coastal localities. I can not detect any differences in color or measurements in these birds from those taken in the interior.

In the annotated list of specimens, I have, as is usually the practice in such cases, formed an arbitrary and subjective concept of a dividing line between the forms. Atypical specimens assigned to one or the other can be discovered by examination of the detailed summary of characters supplied in Table 3 (pp. 160-161).

In the case of the British Columbian sapsuckers, I find a totally different picture. There seems to be little if any indication of intergradation between the red-naped and red-breasted forms. In my opinion these forms should be regarded as specifically distinct. It is obvious that *S. varius* is replaced along the coast by *S. ruber* but the ranges of the two species overlap to a considerable degree. This zone of overlap is not occupied by a population of morphological intermediacy. In the combined series of 90 specimens of the two forms I find only a single specimen of doubtful parentage. This specimen, apparently a bird of the year, was collected at Bowron Lake on July 23, 1930. Munro and Cowan (1947: 141) comment that they have seen "two possible hybrids" taken at Springhouse and Lake la Hache. The collections of the Museum of Comparative Zoology reveal three additional variants — one each from Okanagan, B. C., Fort Klamath, Oregon and San Diego County, California.

The juncos of British Columbia have been treated critically by Miller (1941a). Mayr (1942) in his review of Miller's exhaustive study commented as follows: "Miller's species concept is that of the taxonomist of the old school, since his species is apparently entirely based on the degree of morphological difference. He admits freely that all the forms, so far as tested, are not only interfertile, but not even separated by psychological barriers. In fact, he presents a good case for considering *cismontanus* a stabilized hybrid race between the 'species' *hyemalis* and *oregonus* [*sic*, = *oreganus*], although there is slight evidence for some sexual isolation between *cismontanus* and *oregonus* [*sic*] *montanus*. Would it not be much simpler and biologically more nearly correct to include all the juncos in a single superspecies, with three species: (1) *vulcani*, (2) the yellow-eyed group, and (3) the brown-eyed group?"

I am not in a position to make any suggestions concerning any elements of the problem other than that included in "(3)" above. It may well be argued that I have not seen sufficient material or made a thorough enough investigation of the problem to venture an opinion on even this part. In comparison to Miller I have seen only a relatively small number of specimens. I am basing my action to a large extent on Miller's data. As Mayr has already pointed out, Miller presents a perfectly clear case for merging of *hyemalis* and *oreganus*.

Miller (1949) has commented, in a discussion of the problems of hybridization and intergradation, ". . . in instances of hybrid junction we must look with care for the true biological criteria for species, namely for some degree of actual reproductive isolation. Such isolation may be present in the form of lowered viability or fertility, even when hybridization is freely undertaken." In this discussion Miller has differentiated the terms "hybridization" and "intergradation" in a rather special way. In his definitions of these two terms he states: "Intergradation . . . indicates two things: (1) blending inheritance of the characters involved, and (2) frequent, if not free, interbreeding of individuals. Hybridization indicates: (1) non-blending or alternate type of character manifestation, usually with few genetic determiners involved in any one character, and (2) free, or partial, or at least a little, interbreeding." The difficulty of special definitions for such words as "hybridize" is immediately borne out in the body of Miller's discussion where he uses "hybridize" to label any cross of two unlike parents. Interbreeding might be a more descriptive term in this case. Hybridization must be thought of as a process — intergradation its result. Under Miller's definition, the problem presented by two forms which differ in two characters — one determined by a single gene and its allele and another dependant upon the varied expression of many genes — is not resolvable.

It is my feeling that the type of inheritance involved is not a valid criterion to be used in the study of such problems. More and more the study of speciation is being conducted in terms of populations, not individuals. Under such conditions the segments of adjacent populations which occupy areas of geographic intermediacy can be viewed as a whole. Under ideal conditions these segments can be characterized as "intermediate", regardless of the kinds of characters and/or types of inheritance involved in the transmission of these characters. The zone of junction will then, if subspecies are being dealt with, be occupied by a *population* which shows morphological and spatial blending, or spatial blending alone of the characters serving to distinguish the subspecies concerned. I believe that this intermediate population will have to be viewed as proof of close relationship of the parent stocks — best indicated nomenclatorially by designation of these stocks as subspecies.

Miller (1949: 341) indicates that some degree of reproductive isolation must be a criterion for the species. Two difficulties immediately present themselves: (1) what degree, and (2) how can this be detected? The first can be surmounted by the fact that this must be a subjective decision on the part of the investigator and in most cases some uniformity of treatment can be achieved. My comments with reference to *Colaptes auratus* and *Sphyrapicus ruber* and *S. varius* in this report are the result of this type of decision. The second difficulty presents a larger problem. In the great majority of cases it is impossible to arrive at any conclusion as to lowered vitality or fertility due to crossing of unlike stocks. Nor does it follow that such a circumstance will inevitably result from such a mixture of germ plasm. Such mixtures on many occasions are known to result rather in increased fertility and vitality, even though a psychological barrier to interbreeding may exist under natural conditions.

In some rare instances we may know enough of the historical background of two forms to propose that they are meeting and intergrading after following separate paths of evolution over extended periods. It is possible under these circumstances that a defense could be made for retention of these two stocks at the species level despite their second meeting and intergradation. In the present case and in that of *Colaptes auratus* I do not feel that the facts are at hand to support such action.

As Miller (1941a: fig. 28, and p. 340) indicates, specimens from Clearwater appear to represent a zone of junction between *J. h. hye-*

malis and *J. h. montanus*. Four of 26 birds examined by Miller and 5 of 27 which I have examined show the influence of *J. h. hyemalis*, which occurs to the northward. The five McCabe birds show the dark pileum and distinct neck line associated with *J. h. montanus* (and *cismontanus*) and may be the result of mixture of these two races.

ANNOTATED LIST

GAVIIDAE

Gavia immer immer (Brünnich)

Indianpoint Lake: 1 ♂, 22 June.
Ahbau Lake: 1 ♀, 22 May.

These two specimens are considerably larger than those assigned to the following form. The flattened wing of the female is 374 mm., that of the male 385 mm.

Gavia immer elasson Bishop

Aristazabel Island: 1 ?, 6 June.
Calvert Island: 2 ♀, 23 May–16 September.
Swanson Bay: 1 ♂ imm. 24 May.

Wing measurements of the two birds taken at Calvert Island are 322 mm. and 332 mm. The young male from Swanson Bay and the unsexed bird from Aristazabel Island measure 335 mm. and 354 mm. These measurements seem to conform to Bishop's (1921) diagnosis of this subspecies.

Gavia arctica pacifica (Lawrence)

Fitzhugh Sound: 3 ♂, 4–13 May.
Johnstone Straits: 1 ♂, 2 October.

Gavia stellata (Pontoppidan)

Milbanke Sound: 1 ♀, 9 October.
Swanson Bay: 1 ♂, 1 ♀, 23 May–28 June.

The female collected at Swanson Bay on May 23, 1936 was sitting on two eggs and is apparently the specimen previously reported on by McCabe and McCabe (1937).

COLYMBIDAE

Colymbus grisegena holböllii (Reinhardt)

Anahim Lake: 1 ♂, 1 ?, 14 May–10 October.
Buffalo Lake: 1 ♂, 26 April.

Calvert Island: 2 ♀, 5–17 October.
Chezacut: 1 ♀, 1 ?, 19 September–4 October.
Helmeken Island: 1 ♂, 1 October.
Indianpoint Lake: 1 ♀, 11 September.
Khutze Inlet: 1 ♀, 7 September.
LeRoy Lake: 1 ♂, 23 September.

Colymbus auritus Linné

Allison Harbor: 2 ♂, 1 ♀, 17 October.
Calvert Island: 1 ♂, 26 April.
Chezacut: 2 ♂, 26 April–6 October.
Emily Group: 1 ♂, 1 ♀, 15 October.
Indianpoint Lake: 1 ♀, 12 May.
Redstone: 1 ♂, 16 July.
Smyth Island: 1 ♀, 11 October.

The male taken at Chezacut on 31 August, 1933 is a bird of the year. All of the specimens collected in October are in winter plumage, the remainder have full breeding plumage.

Colymbus caspicus californicus (Heermann)

Buffalo Lake: 1 ♂, 1 ♀, 1 ?, 15 May.

Aechmophorus occidentalis (Lawrence)

Indianpoint Lake: 1 ♀, 19 October.
Johnstone Straits: 2 ♂, 1 October.

Podilymbus podiceps podiceps (Linné)

Chezacut: 1 ♂, 1 ♀, 1 ?, 28 August.
Kleena Kleen: 1 ♂, 1 ♀, 18 July.

The specimens from Chezacut are downy young, probably less than two weeks old. The male taken at Kleena Kleen is about one-half grown.

DIOMEDEIDAE

Diomedea nigripes Audubon

Goose Island, 20 miles west: 1 ♂, 1 ♀, 8 July.

PROCELLARIIDAE

Puffinus griseus (Gmelin)

Fitzhugh Sound: 3 ♀, 2 ♀, 6 September.
Johnstone Channel: 1 ♀, 1 October.
Milbanke Sound: 2 ♂, 1 ♀, 18 September.
Queen Charlotte Sound: 2 ♂, 2 ♀, 29 August–25 September.
Straits of Juan de Fuca: 1 ♂, 16 October.

Puffinus carneipes Gould

Goose Island, 20 miles west: 2 ♂, 1 ♀, 18 July.

Fulmarus glacialis rodgersi Cassin

Goose Island, 20 miles west: 1 ♀, 18 July.

HYDROBATIDAE

Oceanodroma furcata (Gmelin)

Fitzhugh Sound: 1 ♂, 11 September.
Galetas Channel: 1 ♀, 5 September.
Hunters Channel: 1 ♀, 16 September.
Johnstone Straits: 2 ♂, 1 ?, 25–26 August.
Londo Channel: 1 ♀, 6 September.
Milbanke Sound: 1 ♂, 3 ♀, 31 August–18 September.
Rivers Inlet, near Wadham: 1 ♀, 29 August.

Oceanodroma leucorhoa beali Emerson

Port Hardy: 1 ♂, 29 October.

PHALACROCORACIDAE

Phalacrocorax auritus albociliatus Ridgway

Allison Harbor: 2 ♀, 20–21 October.
Calvert Island: 1 ♂, 20 April.
Ragged Islands Pass: 1 ♀, 4 October.

Phalacrocorax penicillatus (Brandt)

Seaforth Channel (Bardswell Ids.): 1 ♂, 18 September.
Off Fort Rupert: 1 ♀, 3 September.
Galetas Channel, off Shusartic: 1 ♀, 5 September.

Phalacrocorax pelagicus pelagicus Pallas

Fitzhugh Sound: 1 ♀, 15 September.
Price Island: 1 ♂, 18 September.
Tofino: 1 ♂, 26 May.

These specimens all have the large heavy bill (culmen 48–49 mm.) and large size (wing 262–283 mm.) attributed to this form.

Phalacrocorax pelagicus resplendens Audubon

Calvert Island: 1 ♀, 19 May.
Emily Group: 1 ♀, 15 October.
Fitzhugh Sound: 1 ♀, 5 April.
Smyth Island: 1 ♀, 5 October.
Table Island: 1 ♀, 19 September.

Tofino: 1 ♀, 9 May.

I have assigned these specimens to this race on the basis of smaller bills (culmen 41–46 mm.) and shorter wings (238–258 mm.).

ARDEIDAE

Ardea herodias fannini Chapman

Bella Coola: 1 ♂, 22 April.
Calvert Island: 1 ♂, 1 ♀, 10–18 September.
Chatfield Island: 1 ♂, 5 August.
LeRoy Lake: 1 ♂, 23 September.
Smyth Island: 1 ♂, 11 October.

The birds from Bella Coola and Chatfield Island appear to be fully adult. The remainder I take to be birds of the year on the basis of plumage.

Botarus lentiginosus (Montagu)

Chezacut: 2 ♀, 1? 31 August.

In his description of *B. l. peeti*, Brodkorb (1936) indicated that the range of this race extended into British Columbia. One specimen from the Edgewood District and one from Fort Steele were examined by Brodkorb in this connection. In measurements and color the McCabe birds seem to agree with the estimates he furnishes for the eastern population.

Measurements of the two females are as follows: wing, 249, 250; tail, 69 (not complete), 78; exposed culmen, 67, 76; tarsus, 82, 88; middle toe without claw 75, 78. The unsexed bird, apparently a male, has the following measurements: wing, 277, tail 87; exposed culmen 69; middle toe without claw 81.

ANATIDAE

Branta canadensis occidentalis (Baird)

Aristazabel Island: 1 ♂, 1 ♀, 31 May.
Calvert Island: 5 ♀, 23 May–10 September.
Swanson Bay (Khutze Inlet): 3 ♂, 4 ♀, 24 May–3 October.

McCabe indicates that two of the birds taken at Khutze Inlet on May 24, 1936 were mates. One of the females, collected at Calvert Island on May 29, 1933 has a conspicuous brood patch. Included in the above list are two downy young specimens from Khutze Inlet, June 12, 1936.

Delacour (1951) has proposed that the breeding birds of the British Columbian coast are sufficiently larger and different in color from birds of the Prince William Sound region of Alaska to warrant recognition. He suggests that the name *fulva* be applied to this population. I have compared the McCabe material with specimens taken in the Sitka-Stikene River, and Prince William Sound areas. I am unable to detect the color differences as he has outlined them. In wing length the six females taken by McCabe, which appear to be breeding birds, range from 445 mm. to 472 mm. The two males measure 485 mm. and 490 mm. On the other hand two males from Prince William Sound, Alaska, have wing lengths of 445 mm. and 456 mm. which fall well within the range of the larger form proposed by Delacour as ranging along the coast of British Columbia and southern Alaska.

Delacour gives the measurements of the type of *B. c. occidentalis* as "wing, 463 mm." and culmen "43 mm.", and comments that it is a fairly small bird, very dark reddish in color — of unknown sex. I have not seen this specimen but I am at a loss to understand his evaluation of the measurements as "small". The wing length is within 2 mm. of the maximum which he attributes to this subspecies and is well within the range of the proposed new form which has a minimum wing length of "432 mm."

The culmen measurements given by Delacour (*loc. cit.*) seem to be much more conclusive. There is only one millimeter of overlap shown in his evaluation of the two races. Material examined by me seems to bear out this point. Six females from British Columbia and two from the coast of southeastern Alaska show a range of 45.5 mm. to 50.5 mm. The single female available from Prince William Sound is considerably smaller in culmen length (40.0 mm.). Five males from British Columbia and southeastern Alaska have larger bills (50.5–52.5 mm.) than two from the Prince William Sound region (46.5–47 mm.). The samples at hand are far too small to be conclusive but I am not convinced as to the validity of the race *fulva*. I am inclined to agree with Hellmayr and Conover (1948a: 299) in their conclusion that variation along the Pacific coast is in the nature of a cline with the more northern birds running smaller.

BRANTA CANADENSIS MOFFITTI Aldrich

Anahim Lake: 1 ♂, 19 April.
Buffalo Lake: 1 ?, 15 May.

These specimens are larger (wing 517 and 522 mm.) and much paler than the coastal birds and seem to conform nicely to the description given by Aldrich (1946a).

Branta canadensis minima Ridgway

Port Hardy: 1 ♀, 23 October.

Branta bernicla nigricans (Lawrence)

Port Hardy: 1 ♂, 1 ♀, 24–25 June.

Anas platyrhynchos platyrhynchos Linné

Alexis Creek: 1 ♀, 8 October.
Allison Harbor: 2 ♀, 24 October.
Anahim Lake: 3 ♂, 2 ♀, 1 ?, 24 April–8 June.
Chezacut: 7 ♂, 1 ♀, 31 August–5 October.
Cottonwood: 1 ♂, 1 ♀, 15–16 May.
Khutze Inlet: 3 ♂, 3–5 October.
Kliwixi: 1 ♂, 1 November.
100 Mile House: 1 ♂, 28 April.
Phillips Arm: 1 ♂, 5 November.

Two females and one unsexed bird taken at Anahim Lake are downy young about two weeks old. The males taken at Chezacut in August and September are in full eclipse plumage. The remainder are all in winter plumage.

Anas strepera (Linné)

Swan Lake: 1 ♂, 2 ♀, 3 September–1 October.

Anas acuta tzitzihoa Vieillot

Chezacut: 3 ♂, 2 ♀, 19–30 September.
Khutze Inlet: 1 ♀, 6 October.
LeRoy Lake: 2 ♀, 22 September.
Lulu Island: 1 ♂, 1 ♀, 5 October.
Moore Islands: 1 ♂, 12 September.
Port Hardy: 1 ♂, 4 ♀, 26 October.

Anas crecca carolinensis Gmelin

Anahim Lake: 1 ♂, 8 June.
Calvert Island: 3 ♀, 5–7 September.
Chezacut: 2 ♂, 4 ♀, 7–28 September.
Cottonwood: 1 ♂, 11 August.
Phillips Arm: 1 ♂, 5 November.
Port Hardy: 6 ♂, 12 ♀, 26–27 October.
Smyth Island: 1 ♀, 22 September.

Anas discors Linné

Anahim Lake: 1 ♂, 10 June.
Chezacut: 5 ♂, 4 ♀, 28 August–14 September.
Indianpoint Lake: 2 ?, 22 June–28 July.

100 Mile House: 1 ♀, 28 April.

The specimens collected in September are all in eclipse plumage. Two birds taken at Indianpoint Lake are downy young.

MARECA AMERICANA (Gmelin)

Anahim Lake: 3 ♀, 22 April–3 May.
Chezacut: 9 ♂, 9 ♀, 14–30 September.
Calvert Island: 1 ♀, 25 April.

The specimens taken at Chezacut are changing into winter plumage.

SPATULA CLYPEATA (Linné)

Chezacut: 3 ♂, 6 ♀, 31 August–30 September.

The males in this series are all in full eclipse plumage.

AYTHYA AMERICANA (Eyton)

Swan Lake: 2 ♂, 30 September–1 October.

AYTHYA VALISINERIA (Wilson)

Buffalo Lake: 1 ♀, 26 April.

Mr. McCabe noted on the label that this specimen had one shelled egg in her oviduct.

AYTHYA MARILA NEARCTICA (Stejneger)

Calvert Island: 2 ♀, 20 April.
Fraser River, near mouth: 1 ♂, 11 April.
Port Hardy: 2 ♂, 3 ♀, 26–27 October.

AYTHYA AFFINIS (Eyton)

Ahbau Lake: 1 ♂, 2 November.
Anahim Lake: 1 ♂, 2 ♀, 2–5 May.
Chezacut: 7 ♂, 5 ♀, 21 August–30 September.
Fraser River Delta: 1 ♂, 27 April.
100 Mile House: 1 ♂, 1 ♀, 3 May.
Phillips Arm: 1 ♂, 5 November.

Seven of the males collected in September at Chezacut, Ahbau Lake and Phillips Arm are young birds showing some down feathers. A single bird apparently a week or two old was taken at Chezacut on August 21, 1933. The adult males from Chezacut are in eclipse plumage.

BUCEPHALA CLANGULA AMERICANA (Bonaparte)

Anahim Lake: 4 ♂, 2 ♀, 15 April–12 June.
Chezacut: 1 ♀, 14 September.
Cottonwood: 2 ♀, 16 May–8 August.

Ground Hog Lake, near Barkerville: 1 ♀, 25 July.
Indianpoint Lake: 1 ♀, 30 August.
Phillips Arm: 1 ♀, 5 November.
Swanson Lake, near Swanson Bay: 2 ♀, 9 May.

The female collected at Ground Hog Lake is a bird in downy plumage, about one half grown. One of the females from Swanson Lake had a shelled egg in the oviduct.

Bucephala islandica (Gmelin)

Anahim Lake: 2 ♂, 18 April.
Chezacut: 1 ♂, 28 August.
Corona Lake, Princess Royal Island: 2 ♂, 1 ♀, 21 June.
Cottonwood: 1 ♂, 16 May.
Indianpoint Lake: 2 ♂, 14 May–23 July.
Phillips Arm: 2 ♀, 5 November.
Swanson Bay: 2 ♂, 24 May–? May.

The three specimens from Corona Lake are perhaps less than a week old. A young male about one-half grown was taken at Indianpoint Lake on 23 July, 1930.

Bucephala albeola (Linné)

Anahim Lake: 2 ♂, 1 ♀, 14 April.
Buffalo Lake: 1 ♂, 26 April.
Chezacut: 3 ♂, 4 ♀, 6–30 September.
Indianpoint Lake: 1 ♂, 1 ♀, 26 June–19 October.
Phillips Arm: 2 ♂, 5 November.
Star Lake: 1 ♂, 28 May.
Swanson Bay: 1 ♂, 4 May.

Clangula hyemalis (Linné)

Fraser River Delta, North Channel: 2 ♂, 11 April.
Fraser River Delta, near Vancouver: 1 ♂, 1 ♀, 27 April.
Queen Charlotte Strait, off False Head: 8 ♂, 3 ♀, 30 October–1 November.

Histrionicus histrionicus (Linné)

Allison Harbor: 2 ♂, 1 ♀, 17 October.
Calvert Island: 2 ♂, 4 ♀, 19 May–8 September.
Emily Group: 1 ♂, 15 October.
Smyth Island: 3 ♀, 23 September.
Smyth Island, islets west of: 1 ♂, 9 October.
Swanson Bay: 2 ♂, 2 ♀, 7–21 May.
Table Island: 1 ♂, 1 ♀, 1 ?, 19–21 September.

Mr. McCabe noted that two of the birds taken at Swanson Bay on May 7, 1936 were mated. The female had yolks up to 35 mm. in diameter present.

The disjunct range of the Harlequin Duck certainly leads one to expect some geographic variation in the species. I have examined considerable material from both the Atlantic and Pacific coastal areas. The table (Table 1) of measurements presented leads me to believe that there is not sufficient difference in size present to allow the recognition of *H. h. pacificus* W. S. Brooks.

Table 1

Locality	*No.*	*Flattened Wing*	*Culmen*	*Bill Depth*
Atlantic Coast; Greenland, Iceland, coastal United States	32	189–208 (201.1)	24.5–28.0 (26.3)	13.0–15.0 (14.2)
Alaska	16	195–208 (203.8)	26.0–29.0 (26.4)	14.0–16.0 (14.9)
British Columbia	10	197–207 (201.1)	26.0–28.0 (26.9)	14.5–15.0 (14.5)
Japan; Honshu, Hokkaido	9	197–211 (203.7)	26.5–30.0 (29.0)	14.0–15.5 (14.6)
All Pacific coast	35	195–211 (202.8)	26.0–30.0 (27.4)	14.0–16.0 (14.7)

I have examined the type of *pacificus* and, as Brooks (1915) indicated, it is somewhat different in coloration from the average bird taken on the Atlantic Coast. I am convinced, however, that this is due to age or season in this particular skin, in that it does not seem to be representative of the Pacific Ocean birds. The brown stripes on the crown of the type do not extend over the crest of the head as far forward as is usual and the color itself is quite bleached. It appears that the population of the western Pacific averages slightly larger in most measurements. The amount of overlap is such, however, that it is possible to allocate correctly less than 50 per cent of the present sample of 67 specimens. I am grateful to Dr. O. L. Austin, Jr. for furnishing me with measurements of material examined at my request in the American Museum of Natural History collections.

Melanitta deglandi (Bonaparte)

Allison Harbor: 1 ♂, 17 October.
Anahim Lake: 1 ♂, 8 May.
Johnstone Straits: 1 ♀, 30 September.
Smyth Island: 2 ♂, 9 October.
Swanson Bay: 1 ♀, 6 May.

The subspecies *dixoni* described by W. S. Brooks (1915: 393) might logically be expected to occur in British Columbia. Upon examination of specimens from the Atlantic and Pacific coasts I agree with Conover in Hellmayr and Conover (1948a: 393) that there is no geographical significance in bill variation.

Melanitta perspicillata (Linné)

Allison Harbor: 1 ♂, 17 October.
Calvert Island: 1 ♀, 8 September.
Indianpoint Lake: 1 ♂, 1 ♀, 25–26 May.
Khutze Inlet: 2 ♂, 2 ♀, 4–8 October.
Smyth Island: 1 ♂, 8 October.
Swanson Bay: 4 ♂, 4–14 May.

Oidemia nigra americana Swainson

Allison Harbor: 1 ♂, 17 October.

Oxyura jamaicensis rubida (Wilson)

Buffalo Lake: 1 ♂, 1 ♀, 15 May.

Lophodytes cucullatus (Linné)

Allison Harbor: 1 ♂, 1 ?, 17–20 October.
Allison Harbor, Shelter Bay: 4 ♀, 21 October.
Aristazabel Island: 1 ♂, 4 June.
Calvert Island: 1 ♀, 18 September.
Indianpoint Lake: 1 ♀, 26 September.
North Thompson River, above Kamloops: 1 ♀, 12 May.
Klekane Inlet: 1 ♀, 1 July.
Yule Lake: 3 ♂, 2 ♀, 18 June.

Downy young specimens from Aristazabel Island, Klekane Inlet and Yule Lake are tentatively assigned here.

Mergus merganser americanus Cassin

Clearwater: 1 ♀, 15 May.
Khutze Inlet: 1 ♂, 24 May.
Koeye River: 1 ♀, 12 September.
Phillips Arm: 1 ♀, 5 November.
Swanson Lake, near Swanson Bay: 1 ♂, 1 ♀, 2–9 May.

The female taken at Clearwater in 1935 was noted as "sitting on 8 eggs — full clutch."

MERGUS SERRATOR SERRATOR (Linné)

Allison Harbor: 1 ♂, 20 October.
Calvert Island: 1 ♂, 2 ♀, 21 May–3 June.
Koeye River: 2 ♂, 12 September.

ACCIPITRIIDAE

ACCIPTER GENTILIS ATRICAPILLUS (Wilson)

Alexis Creek: 1 ?, 26 August.
Bowron Lake: 1 ♂, 1 ?, 13 September, fall of 1929–30.
Chezacut: 4 ♂, 2 ♀, 1 ?, 4 September–2 October.
Cottonwood: 2 ♂, 27 August–13 November.
Indianpoint Lake: 3 ♂, 1 ♀, 30 July–29 September.
Kleena Kleen: 1 ?, 21 August.
Khutze Inlet: 1 ♀, 6 October.

ACCIPTER GENTILIS LAINGI (Taverner)

Chezacut: 1 ♂, 29 September.
Hope Island: 1 ♀, 28 June.

Munro and Cowan (1947: 77–78) state that they find no conclusive evidence proving the existence of two races of the Goshawk in British Columbia. They further comment that no examples of breeding birds were available for examination but that the young of the year specimens from the Queen Charlotte Islands are more heavily marked than specimens of comparable age taken in the interior. Hellmayr and Conover (1949: 49-51) after examination of 83 specimens of *A. g. atricapillus* and 12 of *laingi* conclude that *laingi* is a valid subspecies. These authors indicate their ideas as to the random wandering of the two subspecies by listing specimens of both from inland and coastal localities in British Columbia. The two specimens listed here are considerably darker than those assigned to *atricapillus* in the present collection as well as seven additional specimens in the Museum of Comparative Zoology.

ACCIPITER STRIATUS PEROBSCURUS Snyder

Anahim Lake: 2 ♂, 11–26 April.
Bowron Lake: 1 ♂, 7 September.
Chezacut: 1 ♀, 16 September.
Indianpoint Lake: 10 ♂, 3 ♀, 20 April–23 September.

The population represented by this series of specimens I take to be closer to *perobscurus* than to *A. s. velox*. Compared with birds taken in the eastern United States they are definitely darker. They are not as heavily streaked in juvenal plumage as five birds from the Queen Charlotte Islands which were available for comparison.

ACCIPTER COOPERI (Bonaparte)

Bowron Lake: 1 ♀, 3 September.
Clearwater: 1 ♂, 1 May.
Indianpoint Lake: 1 ♂, 24 August.

The single male taken at Clearwater is an adult bird. The other two are birds of the year.

BUTEO JAMAICENSIS CALURUS Cassin

Bowron Lake: 1 ?, 22 September.
Kleena Kleen: 1 ♂, 20 August.
100 Mile House: 1 ♀, 22 July.
Ten Mile Creek: 1 ♀, 13 August.

Wing length of the two females is 365 mm. and 382 mm. The single male measures 370 mm., while the unsexed bird has a wing length of 388 mm.

BUTEO JAMAICENSIS ALASCENSIS Grinnell

Calvert Island: 1 ♂, 27 May.

A bird of the year, this specimen has a wing length of 359 mm. Taverner (1936) has indicated that he finds this size difference in the coastal birds to be diagnostic.

BUTEO SWAINSONI Bonaparte

Cottonwood: 1 ?, 13 August.

HALIAETUS LEUCOCEPHALUS WASHINGTONIENSIS (Audubon)

Indianpoint Lake: 1 ♂, 2 ♀, 16 July–5 August.

CIRCUS CYANEUS HUDSONIUS (Linné)

Anahim Lake: 2 ?, 22–24 April.
Bowron Lake: 1 ♂, 4 August.
Chezacut: 1 ?, 29 August.
Williams Creek: 1 ♂, 17 August.

PANDION HALIAETUS CAROLINENSIS (Gmelin)

Jack o' Clubs Creek: 1 ♂, 6 August.

FALCONIDAE

Falco peregrinus peali Ridgway

McKenny Islands: 1 ♂, 3 ♀, 6 June.
Moore Islands: 2 ♂, 4 ♀, 2–6 June.

Two adult specimens from the McKenny Islands were apparently the parents of two downy young females also collected by McCabe. One of the males collected on the Moore Islands is adult, the remainder are nestlings.

Falco columbarius suckleyi Ridgway

Indianpoint Mountain: 1 ?, 4 August.

This immature, unsexed specimen is very heavily streaked and agrees well with birds taken along the coast of British Columbia.

Falco columbarius bendierei Swann

Indianpoint Lake: 2 ♂, 1 ♀, 12 August–15 September.

All of these specimens are in immature plumage and are much lighter in coloration than the single specimen assigned to *F. c. suckleyi*.

Falco sparverius sparverius Linné

Anahim Lake: 1 ♀, 3 May.
Barkerville: 1 ♀, 17 August.
Chezacut: 2 ♂, 2 ♀, 2–5 September.
Clearwater: 3 ♂, 1 ♀, 19 April–23 May.
Crowsnest Pass: 2 ♂, 1 ♀, 6 September.
Indianpoint Lake: 2 ♂, 2 ♀, 17 July–12 August.

In the course of investigating the possibility of east-west geographic variation in this species I examined some of the material used by Bond (1943: 179) in his description of *F. s. guadalupensis*. The results of this rather cursory, non-statistical examination are included here. Five of the six males (including the type) and all of the females used by Bond were available to me. All of these skins were made by W. W. Brown and I believe that Bond's detection of the "light collar" is due to "make" of skin rather than to geographical variation. All of the skins are uniform in design with well-extended and padded necks which I think tends to produce a light appearance in the collar. All of the adults (6) are in worn plumage which probably further aggravates this bleached appearance. As Bond points out, his proposed form does not differ significantly from *F. s. sparverius* in mensural characters. My measurements of wing length in 68 males from British Columbia, California, the Great Basin, and the eastern United States agree with this conclusion. I found a range of 177 mm. to 196 mm. in this sample whereas the same measurement in the five Guadalupe Island birds ranged from 178 mm. to 194 mm. Perhaps examination of a larger series of birds from Guadalupe Island will establish the validity of this form but on the basis of material at hand I do not feel that it is worthy of recognition.

TETRAONIDAE

Dendragapus obscurus richardsoni (Douglas)

Clearwater: 1 ♂, 16 May.
Bowron Lake: 1 ♂, 2 ♀, 23 June.
Grizzly Park (near Clearwater): 2 ♂, 26 May–9 June.
Indianpoint Lake: 3 ♂, 5 ♀, 1 ?, 24 May–6 August.

Specimens collected at Bowron Lake in 1933 are newly hatched chicks with egg teeth. Those taken at Indianpoint Lake on July 14, 1929 (2) are still in full down plumage while an additional two collected on July 30, 1930 are about one-fourth grown.

The material collected by McCabe indicates that the Clearwater — Indianpoint Lake region is along the line of junction of *D. o. richardsoni* and *D. o. pallidus*. Specimens typical of each of these races were collected in the vicinity of Clearwater.

Dendragapus obscurus pallidus Swarth

Alkali Lake: 1 ♀, 15 June.
Clearwater: 1 ♂, 16 May.
Clinton: 2 ♂, 1 ♀, 20 April–8 May.
Corbin: 3 ♀, 4 September.
Crowsnest Pass: 5 ♀, 5–6 September.
Dog Creek: 1 ♀, 15 June.
Hanceville: 1 ♂, 15 October.
Lillooet: 2 ♀, 21 June.
127 Mile House: 1 ♂, 5 July.
Williams Lake: 1 ♀, 9 July.

Downy young birds were collected at 127 Mile House and at Lillooet (1). I find that the birds from southwestern localities, Corbin and Crowsnest Pass, are referable to *pallidus* rather than *richardsoni* as indicated by Munro and Cowan (1947: 88).

Dendragapus obscurus sitkensis Swarth

Banks Island: 4 ♀, 18–19 August.
Bella Coola: 6 ♂, 23 April–11 June.

Calvert Island: 3 ♂, 8 ♀, 16 May–18 September.
Princess Royal Island: 1 ♂, 2 ♀, 28 September.
Smyth Island: 1 ♂, 2 ♀, 23–24 August.
Stuie: 2 ♂, 27 May.
Swanson Bay: 3 ♂, 5 ♀, 5 May–26 September.

A female collected at Swanson Bay on May 5, 1936 had laid one egg and a second was present in the oviduct. Mr. McCabe noted that another female taken at the same locality on June 23, 1936 was the parent of a half-grown chick taken at the same time.

The two females collected on Smyth Island (Bardswell group) seem to be from the southern limit of this race, showing a tendency toward *D. o. fulginosus*. I found no demonstrable difference in the males of *fulginosus* and *sitkensis* and these birds are assigned here on the basis of locality.

Canachites franklinii (Douglas)

Alexis Lake: 1 ♀, 12 July.
Anahim Lake: 3 ♂, 21 April–7 June.
Bowron Lake: 5 ♂, 1 ♀, 1 ?, 29 June–4 September.
Barkerville: 1 ♂, 1 ♀, 29 May.
Chezacut: 2 ♂, 3 ♀, 2–16 September.
Cottonwood: 1 ♂, 1 ♀, 24 July.
Donald, 28 mi. north: 1 ♂, 25 September.
Indianpoint Lake: 12 ♂, 2 ♀, 1 ?, 28 March–14 September.
Isaac Lake: 1 ♂, 1 ♀, 15–18 July.
Kleena Kleen: 3 ♂, 2 ♀, 17 July–23 August.
Quesnel: 1 ♀, 23 July.
Rainbow Mountains: 3 ♀, 18–22 June.
Star Lake: 3 ♀, 28 May–11 June.
Stuie (Caribou Mountain): 1 ♀, 29 May.
Summit Lake: 1 ♀, 30 April.

Downy young and one-half to three-quarter grown birds were colleeted throughout the area during June-August.

Bonassa umbellus umbelloides (Douglas)

Alexis Lake: 1 ♀, 12 July.
Anahim Lake: 4 ♂, 2 ♀, 29 April–9 June.
Barkerville: 1 ♂, 6 September.
Blackpool (near Clearwater): 1 ♀, 2 May.
Bowron Lake: 1 ♂, 1 ♀, 1 ?, 8 July–5 October.
Bull Canyon (near Alexis Creek): 1 ♀, 6 April.
Chezacut: 2 ♂, 4 ♀, 5 September–4 October.
Clearwater: 4 ♂, 7 ♀, 19 April–9 June.

Cottonwood: 2 ♂, 1 ♀, 1 ?, 14 March–5 November.
Indianpoint Lake: 7 ♂, 2 ♀, 11 April–27 December.
La Fontaine (near Barkerville): 1 ♂, 17 March.
100 Mile House: 1 ♂, 3 ♀, 24 April–4 May.
Quesnel: 1 ♀, 23 June.
Soda Creek: 1 ♂, 8 September.

A single downy young specimen, less than a week old, was collected at Clearwater on June 9, 1935. Other young birds, one-quarter to one-third grown were taken at Indianpoint Lake (1), Quesnel (1), Cottonwood (1) and Bowron Lake (2) during June and July, 1930–31. Three of the specimens from Chezacut, 5–16 September, were moulting primaries and/or rectrices.

Arbitrary classification into two color phases shows 8 in "brown phase" and 34 in "gray phase".

Aldrich and Friedmann (1943) in their revision of the Ruffed Grouse have proposed a new subspecies, characterized by short tarsal feathering and dark pigmentation, as inhabiting central British Columbia. This form, *affinis*, is suggested as ranging from mid-central British Columbia well south into southern Washington and Oregon. I am not concerned with denying or corroborating the validity of *B. u. affinis* as it may occur in the southern parts of its range, but have considered the problem only as it affects British Columbian populations. The 40 skins suitable for comparative purposes collected by Mr. McCabe, were compared with a series from the eastern slopes of the Rocky Mountains in Alberta. I see no constant color differences between the Alberta (*B. u. umbelloides*) and British Columbian material. Nine of the 40 birds show an unfeathered tarsus for more than one-half its length. The degree of feathering does not seem to be associated with any special variation in pigmentation. I feel that the evidence shows that the population represented by this sample must be referred to *B. u. umbelloides*.

BONASSA UMBELLUS BRUNNESCENS Conover

Bella Coola: 6 ♂, 4 ♀, 25 April–25 June.
LeRoy Bay: 1 ♂, 1 ♀, 23–24 September.
Stuie: 1 ♀, 27 May.

These specimens are clearly referable to the dark brown race of the southwestern coast.

Five downy young, three to four days old, the offspring of a female collected at Bella Coola are of interest. These chicks are easily distinguished from 13 comparable birds taken in the eastern United States within the ranges of *B.u. umbellus* and *B.u. togata*. The brown markings of the head are much darker in the western specimens. The dark line over the eye is extended well forward of the orbit and a small brown spot occurs at the lateral base of the upper mandible. There is also a middorsal darkening on the forehead which appears as a dark stripe extending from the base of the mandible to the crown. The possibility exists of course that this variation is limited to this particular brood.

Lagopus lagopus lagopus (Linné)

Rainbow Mountains: 3 ♂, 1 ♀, 17 June.

The differences attributed to *L. l. albus* by various authors, as outlined by Friedmann in Ridgway (1946), are, as far as I can determine, not associated with geographic location. In addition to the material in the McCabe collection I have examined 13 other specimens from the Bella Coola District and I am unable to detect any constancy of color variation in these birds as compared to birds of Old World origin. As to slenderness of the bill, seven males from British Columbia measure 12.7–14.6 mm. (av. 13.8 mm.). Eight males from inland Alaska range from 13.1 mm. to 15.0 mm. (av. 13.8 mm.). Seven males from Siberia, Sweden and Lapland have bill widths from 12.9 mm. to 14.1 mm. (av. 13.6 mm.).

Lagopus mutus rupestris (Gmelin)

Bella Coola: 5 ♂, 2 ♀, 11–25 June.
Yule Lake: 2 ♂, 24 June.

These specimens were taken on "Mt. N. E. of Bella Coola" and "Peaks North of Yule Lake, Swanson Bay."

Lagopus lecurus lecurus (Richardson)

Rainbow Mountains: 1 ♂, 20 June.
Indianpoint Lake: 5 ♂, 1 ♀, 2 ?, 27 May–3 September.

The two unsexed birds and one of the females collected at Indianpoint Lake July 14–31 are young of the year about one-third grown.

Pedioecetes phasianellus columbianus (Ord)

Alexis Creek: 1 ♂, 2 ♀, 6 October.
Anahim Lake: 4 ♂, 3 ♀, 17 April–10 June.
Chezacut: 4 ♀, 28 August–26 September.
Lac la Hache: 1 ♀, 5 July.
100 Mile House: 3 ♀, 21–22 April.
127 Mile House: 1 ♂, 5 July.
Quesnel, 33 mi. south: 1 ♀, 3 July.

GRUIDAE

Grus canadensis tabida Peters

Aristazabel Island: 1 ♂, 1 ♀, 14 September.

RALLIDAE

Porzana carolina (Linné)

100 Mile House: 1 ♂, 29 April.
127 Mile House: 1 ♂, 4 July.

Fulica americana americana Gmelin

Indianpoint Lake: 1 ♂, 19 October.

HAEMATOPIDAE

Haematopus ostralegus bachmanni Audubon

Ann Island: 1 ♂, 1 ♀, 14 October.
Calvert Island: 2 ♂, 1 ♀, 18–23 May.
Goose Island: 1 ♂, 30 May.
Lama Passage at Fisher Channel: 1 ♂, 1 ♀, 16 September.
Moore Island: 3 ♂, 2 ♀, 6 June–6 July.
Schooner Passage, Rivers Inlet: 1 ♂, 1 ♀, 30 August.

Nesting on the islets near Moore Island is indicated by three downy young collected there on June 6, 1936.

CHARADRIIDAE

Squatarola squatarola (Linné)

Calvert Island: 1 ♂, 16 May.
Hardy Bay: 1 ♂, 1 ♀, 30 September.
Ione Island: 2 ♂, 17 April.
Poultney Point, Kliwixi marshes: 1 ♂, 1 November.
Siwash Meadows, near Alexis Creek: 2 ♀, 19 September.

Charadrius hiaticula semipalmatus Bonaparte

Calvert Island: 8 ♂, 2 ♀, 25 April–17 July.

Charadrius vociferus vociferus (Linné)

Alexis Creek: 1 ♂, 2 April.
Anahim Lake: 1 ♂, 1 ♀, 10 June.
Barkerville: 1 ♂, 2 ♀, 28 May.
Chezacut: 2 ♀, 5–28 September.
Port Hardy: 1 ♀, 28 October.

One of the females collected at Barkerville on May 28, 1930 is a juvenal, still in downy plumage.

SCOLOPACIDAE

Aphriza virgata (Gmelin)

Allison Harbor: 1 ♂, 20 October.
Calvert Island: 5 ♂, 3 ♀, 5 September.
Haystack Island: 1 ♂, 1 ♀, 29 August.
Koeye River: 1 ♀, 12 September.
Shelter Bay, near Allison Harbor: 1 ♂, 19 October.

Arenaria melanocephala (Vigors)

Allison Harbor: 1 ♂, 2 October.
Hakai Passage: 1 ♀, 17 July.
Haystack Island: 3 ♂, 4 ♀, 29 August.
Hurst Island: 1 ♀, 25 September.
Koeye River: 1 ♂, 12 September.
Schooner Passage: 1 ♀, 30 August.
Poultney Point Light: 11 ♂, 27 August.

Capella delicata (Ord)

Anahim Lake: 2 ♂, 1–5 May.
Bella Coola: 1 ♂, 1 ♀, 3 May–14 September.
Bowron Lake: 1 ♀, 6 October.
Calvert Island: 1 ♂, 28 April.
Chezacut: 1 ♂, 1 ♀, 14–23 September.
Cottonwood: 1 ♀, 7 September.
Indianpoint Lake: 2 ♂, 28 April–6 July.
Lac la Hache: 2 ♂, 5–6 July.
Port Hardy: 1 ♂, 3 ♀, 26–28 October.

Numenius americanus parvus Bishop

Dog Creek: 4 ♂, 15 June.

Numenius phaeopus hudsonicus Latham

Ione Island: 1 ♀, 27 April.

Actitis macularia (Linné)

Anahim Lake: 1 ♂, 10 June.
Barkerville: 2 ♂, 2 ♀, 5 June–13 July.
Beaver Sound, Big Muskeg: 1 ♀, 31 May.
Bowron Lake: 1 ♀, 30 June.
Calvert Island: 1 ♂, 4 ♀, 23 May–9 September.
Chezacut: 1 ?, 4 September.
Indianpoint Lake: 1 ♂, 3 ♀, 24 May–26 June.
Isaac Lake: 1 ?, 19 July.
Koeye River: 1 ♀, 12 September.

Princess Royal Id., Canoona Lake: 1 ♀, 21 June.
Schooner Passage: 1 ♂, 20 May.
Swanson Bay: 2 ♂, 4 ♀, 19–23 May.

All of the specimens collected during September are in fall plumage.

Tringa solitaria solitaria Wilson

Indianpoint Lake: 3 ♂, 2 ♀, 15 May–5 July.
Rainbow Mountains: 1 ♂, 17 June.
Selina Lake: 1 ♂, 1 ♀, 30 June.

Tringa solitaria cinnamomea (Brewster)

Chezacut: 2 ♀, 2 September.
Indianpoint Lake: 1 ♂, 23 August.

Tringa melanoleucus (Gmelin)

Alexis Creek: 2 ♂, 20 July.
Anahim Lake: 2 ♂, 18 April–6 May.
Calvert Island: 2 ♂, 2 ♀, 24 April–27 May.
Goose Island: 1 ♀, 23 July.
Kleena Kleen: 1 ♂, 17 July.
Lac la Hache: 1 ♂, 7 July.
Lulu Island: 1 ♂, 5 October.
Quesnel: 1 ♂, 2 July.

Tringa flavipes (Gmelin)

Goose Island: 1 ♀, 20 July.
Jack o' Clubs Creek: 2 ?, 5 August.

Heteroscelus incanus (Gmelin)

Calvert Island: 7 ♂, 3 ♀, 2 May–3 September.
Dufferin Island: 1 ♀, 29 July.
Horsfall Island: 1 ♀, 28 July.
St. Johns Harbor (Bardswell Ids.): 1 ♂, 23 August.
Table Island: 1 ♀, 19 September.

All of the specimens taken in August and September (3) are in fall plumage.

Calidris canutus rufus (Wilson)

Fitzhugh Sound, off Calvert Id.: 2 ♂, 1 ♀, 17 May.

Crocethia alba (Pallas)

Calvert Island: 4 ♂, 7 ♀, 15 April–10 September.
Goose Island: 1 ♀, 20 July.
Ione Island: 2 ♂, 2 ♀, 15 April.

LIMNODROMUS GRISEUS CAURINUS Pitelka

Calvert Island: 6 ♂, 4 ♀, 1–4 May.
Hakai Pass: 1 ♂, 17 July.

The females in this series have measurements as follows: wing 149.0 mm.–152.5 mm.; culmen 61.0 mm.–64.0 mm.; tarsus 35.5 mm.–39.0 mm. Males measure as follows: wing 140.0 mm.–151.0 mm.; culmen 55.0 mm.–59.0 mm.; tarsus 34.0 mm.–37.5 mm. These measurements seem to conform to Pitelka's (1950: 43) estimate of the population which he has designated as *L. g. caurinus.*

LIMNODROMUS SCOLOPACEUS (Say)

Lulu Island: 2 ♀, 5 October.

Wing lengths of 140.0 mm. and 141.0 mm., culmens 73.0 mm. and 75.0 mm., tarsi 41.5 mm. and 38.5 mm. fall within the limits of variation for this form as given by Pitelka (1950).

EROLIA PTILOCNEMIS TSCHUKTSHORUM (Portenko)

Port Hardy: 5 ♂, 30 October–1 November.

These specimens are all in winter plumage. Two birds have not quite completed the moult and retain a few brown-tipped and edged feathers in the secondary coverts and scapulars. These are quite dark and reddish.

EROLIA BAIRDII (Coues)

Calvert Island: 1 ♂, 10 September.
Fraser River delta: 2 ♂, 11 April.
100 Mile House: 1 ♂, 30 April.

EROLIA MELANOTOS (Vieillot)

Calvert Island: 1 ♀, 9 September.
Chezacut: 7 ♂, 3 ♀, 9 September–4 October.
Port Hardy: 1 ♀, 28 October.
Poultney Point: 2 ♂, 30 September.
Vancouver Island: 1 ♀, 30 September.

EROLIA MINUTILLA (Vieillot)

Anahim Lake: 1 ♂, 15 May.
Calvert Island: 4 ♂, 4 ♀, 25 April–22 May.
Chezacut: 1 ♂, 2 ♀, 5–15 September.
Indianpoint Lake: 1 ♂, 13 August.
100 Mile House: 4 ♂, 30 April–4 May.

Erolia alpina pacifica (Coues)

Calvert Island: 1 ♂, 4 ♀, 1–19 May.
Fitzhugh Sound (Schooner Pass): 6 ♀, 17 May–28 October.
Ione Island: 3 ♂, 2 ♀, 1 ?, 17 April.
Port Hardy: 2 ♂, 1 ?, 25 October.
Swanson Bay: 6 ♂, 3 ♀, 15–22 May.
Tofino: 1 ♂, 17 May.

The birds collected in September and October are in fall plumage.

Ereunetes maurii Cabanis

Calvert Island: 21 ♂, 22 ♀, 14 May–10 September.
Chezacut: 1 ♀, 5 September.
Koeye River: 3 ♂, 1 ♀, 15 September.
Swanson Bay: 2 ♂, 15–22 May.

All of the specimens taken in September are in fall plumage.

Ereunetes pusillus (Linné)

Calvert Island: 7 ♂, 1 ♀, 14 May–18 September.
Indianpoint Lake: 1 ♂, 18 August.

All of the birds collected in August and September are in fall plumage.

PHALAROPODIDAE

Steganopus tricolor (Vieillot)

Lac la Hache: 1 ♂, 5 July.
127 Mile House: 2 ♂, 4 July.

Phalaropus fulicarius (Linné)

Lama Pass (Hunter and Campbell Ids.): 1 ♂, 16 September.
Storm Islands: 12 ♂, 1 ♀, 1 ?, 25 September.
Stuart Island: 1 ♂, 1 September.

Lobipes lobatus (Linné)

Alert Bay: 1 ♀, 3 September.
Beauchemin Pass, N. W. Aristazabel Id.: 1 ♂, 1 ♀, 30 May.
Calvert Island: 2 ♀, 17 May.
Churchouse: 1 ♂, 1 September.
Galetas Channel, off Shushartie: 2 ♂, 5 September.
Hunter Channel, Hunter and Campbell Ids.: 2 ♀, 16 September.
Johnstone Straits: 5 ♂, 6 ♀, 26 August–2 October.
Milbanke Sound: 1 ♀, 9 October.
Storm Islands: 1 ♀, 25 September.
Stuart Island: 3 ♀, 1 September.

STERCORARIDAE

Stercorarius parasiticus (Linné)

Fraser River Delta: 5 ♂, 29 September.
Steviston: 3 ♂, 3 ♀, 8 October.
Vancouver, Point Gray: 1 ♂, 9 October.

Stercorarius longicauda (Vieillot)

Rainbow Mountains: 1 ?, 21 June.

This specimen, a mummy, was found dead in 1932.

LARIDAE

Larus hyperboreus Gunnerus

Bella Coola: 1 ♂, 4 May.

Larus glaucescens Naumann

Calvert Island: 1 ♂, 1 ♀, 24 May–17 September.
Swanson Bay: 1 ♀, 21 May.

Larus argentatus smithsonianus Coues

Anahim Lake: 1 ♀, 8 May.
Bella Coola: 2 ♀, 3 May.

These birds are in fourth year plumage and are typical of this race. The specimens listed below would most logically be of this form, but because they are in first and second year plumage I hesitate to make a definite allocation.

Bella Coola: 1 ♀, 1 ?. 3 May.
Chezacut: 2 ♂, 1 ♀, 14–30 September.

Larus californicus Lawrence

Calvert Island: 1 ♂, 2 ♀, 20 May–5 September.

These specimens are in fourth year plumage.

Larus delawarensis Ord

Straits of Juan de Fuca: 5 ♀, 14 October.

Larus canus brachyrhynchos Richardson

Ahbau Lake: 1 ♂, 14 August.
Bella Coola: 4 ♂, 8 May.
Calvert Island: 2 ♂, 1 ♀, 22–29 May.
Haystack Island: 3 ♂, 29 August.
Indianpoint Lake: 3 ♂, 3 ♀, 11 May–17 July.
Swanson Bay, Yule Lake: 1 ♂, 2 ♀, 19 June.

Nesting at Yule Lake in 1936 is indicated by two downy young birds collected on June 19.

Larus philadelphia (Ord)

Anahim Lake: 1 ♂, 30 April.
Bella Coola: 2 ♀, 7 May.
Chezacut: 2 ♂, 24 September.
Indianpoint Lake: 2 ♀, 11 May–10 July.

Larus heermanni Cassin

Straits of Juan de Fuca: 2 ♂, 14 October.

Rissa tridactyla pollicaris Ridgway

Camaaño Sound: 1 ♂, 17 September.
Laredo Channel: 2 ♂, 5 ♀, 5 October.

Sterna hirundo hirundo Linné

Fraser River Delta and vicinity: 12 ♂, 8 ♀, 27 April–8 October.

Sterna paradisaea Pontoppidan

Goose Island Banks: 1 ♂, 18 July.
Indianpoint Lake: 3 ♀, 27 August.

ALCIDAE

Uria aalge inornata Salomonsen

Johnstone Straits: 1 ♂, 26 August.
Queen Charlotte Sound: 1 ♂, 1 ♀, 25 September.

These birds were collected during the period in which they were undergoing a moult of primaries. The specimen taken in August is completely without primaries and the September birds have not as yet regained fully grown feathers. They are arbitrarily assigned to this subspecies on the basis of locality.

Cepphus columba ssp.

Calvert Island: 3 ♂, 2 ♀, 3–8 September.
Sointula: 1 ♂, 27 August.

Due to the fact that these specimens are all undergoing moult of primaries it is impossible to determine wing length. Culmen length alone is not sufficient to allow separation of *C. c. columba* and *C. c. adianata* according to Storer (1950).

Cepphus columba adianata Storer

Calvert Island: 2 ♀, 17–19 May.
Swanson Bay: 1 ♀, 14 May.

Culmen measurements of 34.5 mm. and 35.0 mm. conform to Storer's (1950) description of the British Columbian population.

Cepphus columba kaikura Portenko

Lund: 1 ♀, 24 August.

This bird is in badly bleached, worn breeding plumage. I do not believe that wing length is materially affected by wear, however, and the shortness of wing (174.0 mm.) combined with a short damaged culmen which I think could not have been more than 32 mm., dictates assignment to this subspecies.

Brachyramphus marmoratus marmoratus (Gmelin)

Bella Coola: 1 ♂, 1 ♀, 2 July.
Calvert Island: 3 ♂, 24 August–4 September.
Cortez Island: 1 ♂, 1 September.
Graham Reach: 1 ♀, 1 July.
Harwood Island: 1 ♂, 1 September.
Johnstone Straits: 2 ♂, 6 ♀, 26 August–2 October.
Ragged Islands Pass: 1 ♂, 2 ♀, 24 August.
Sliammon Indian Village: 1 ♂, 1 ♀, 24 August.
Smyth Island: 1 ♀, 24 September.
Swanson Bay: 5 ♂, 4 ♀, 6–23 May.

McCabe noted ova up to 15 mm. in diameter in the birds collected at Swanson Bay in May, 1936. A young male and female were taken at Ragged Islands Pass on August 24, 1934 with egg teeth in place.

Synthliboramphus antiquus (Gmelin)

Beauchemin Pass: 1 ♂, 2 ♀, 30 May–2 June.
Poultney Point Light: 1 ♂, 2 ♀, 27 August.

Ptychoramphus aleuticus aleuticus (Pallas)

Beauchemin Pass: 1 ♂, 2 June.
Milbanke Sound: 3 ♂, 3 ♀, 18 September.
Queen Charlotte Sound: 3 ♂, 2 ♀, 25 September.

Cerorhinca monocerata (Pallas)

Beauchemin Pass: 1 ♀, 2 June.
Calvert Island: 4 ♂, 5 ♀, 30 August–11 September.
Cape Calvert: 2 ♂, 20 April.
Cape Cockburn, 1 ♀, 24 August.
Johnstone Straits: 5 ♂, 1 ♀, 25 August–2 October.
Milbanke Sound: 1 ♂, 1 ♀, 18 September.
Poultney Point: 1 ♀, 30 September.
Queen Charlotte Sound: 2 ♀, 25 September.

Lunda cirrhata (Pallas)

Moore Island: 5 ♂, 2 ♀, 2–6 June.

COLUMBIDAE

Columba fasciata monolis Vigors

Bella Coola: 1 ♂, 28 June.
Sumas, Vedder Mountain: 1 ♀, 25 September.

The wing of the male specimen measures 219.0 mm., the female 201.0 mm. The female is apparently a bird of the year and this probably explains its falling well short of the minimum measurement given by Brodkorb (1943). In both specimens the tenth primary is considerably longer than the seventh. In the male this excess measurement is 7.0 mm., in the female 16.0 mm.

Zenaidura macroura marginella (Woodhouse)

Indianpoint Lake: 1 ♀, 25 May.
Lillooet: 1 ♀, 23 June.
Lytton: 1 ♀, 21 June.

TYTONIDAE

Otus asio kennicotti (Elliot)

Princess Royal Island: 1 ♂, 19 May.

Bubo virginianus lagophonus (Oberholser)

Anahim Lake: 1 ♂, 24 April.
Chezacut: 1 ♂, 3 ♀, 1 ?, 4 September–12 October.
Cottonwood: 1 ♂, 1 ♀, 9 November.
Indianpoint Lake: 5 ♂, 6 ♀, 25 June–23 October.

Five of the males and two of the females collected at Indianpoint Lake between July 7 and August 8 are juvenals approximately one-half to three-quarters grown.

Bubo virginianus saturatus Ridgway

Indianpoint Lake: 1 ♂, 4 September.
Stuie: 1 ♂, 30 June.

The single male collected at Indianpoint Lake in 1930 has the dark face and back associated with this subspecies. Apparently it had wandered far inland from its normal range along the coast.

Surnia ulula caparoch (P. L. S. Müller)

Anahim Lake: 1 ♂, 11 April.
Chezacut: 1 ?, 23 September.
Indianpoint Lake: 1 ?, 11 January.

Glaucidium gnoma swarthi Grinnell

Hardy Bay: 1 ♀, 25 October.

Glaucidium gnoma californicum Sclater

Bowron Lake: 1 ?, Spring.
Indianpoint Lake: 5 ♂, 30 September–23 October.
100 Mile House: 1 ♂, 1 ♀, 22 April.

Asio otus wilsonianus (Wilson)

Bowron Lake: 1 ?, Winter.

The head only is preserved of this bird collected sometime during the winter of 1931-32.

Asio flammeus flammeus (Pontoppidan)

Chezacut: 1 ♂, 29 November.
Cottonwood: 1 ♀, 20 October.
Port Hardy: 1 ♀, 25 October.

Aegolius funereus richardsoni (Bonaparte)

Barkerville: 1 ♂, *circa* 1 January.

Aegolius acadia acadia (Gmelin)

Cottonwood: 1 ♀, 14 March.

CAPRIMULGIDAE

Chordeiles minor minor (Forster)

Alexis Creek: 2 ♂, 1 ♀, 11 July.
Clearwater: 1 ♂, 8 June.
Precipice Camp (Hotnarko River): 1 ♀, 5 June.
Indianpoint Lake: 1 ?, *circa* 7 September.
Lac la Hache: 1 ♀, 6 July.
Lytton: 1 ♀, 21 June.

APODIDAE

Nephoecetes niger borealis (Kennerly)

Chezacut: 1 ♂, 4 September.
Clearwater: 2 ♀, 24 May–9 June.
Indianpoint Lake: 1 ♀, 26 June.

Chaetura vauxi vauxi (J. K. Townsend)

Clearwater: 1 ♂, 3 ♀, 24 May–2 June.
Indianpoint Lake: 1 ♀, 24 June.
Stuie: 2 ♂, 22 May.

One of the females collected at Indianpoint Lake on June 2, 1935 had a shelled egg in the oviduct.

TROCHILIDAE

Selasphorus rufus (Gmelin)

Anahim Lake: 1 ♀, 6 May.
Bella Coola: 2 ♂, 28 April–7 May.
Clearwater: 1 ♂, 2 ♀, 6–23 May.
Isaac Lake: 1 ♂, 9 July.
Stuie: 1 ♂, 3 ♀, 24–28 May.
Swanson Bay: 5 ♂, 3 ♀, 3–13 May.

Stelula calliope calliope (Gould)

Clearwater: 1 ♂, 16 May.
Cottonwood: 1 ♂, 18 May.

ALCEDINIDAE

Megaceryle alcyon caurina Grinnell

Anahim Lake: 1 ♂, 16 May.
Buffalo Lake: 1 ♂, 26 April.
Calvert Island: 4 ♂, 30 April–10 September.
Chezacut: 2 ♂, 30 August–14 September.
Clearwater: 1 ♀, 1 June.
Hurst Island: 1 ♂, 29 August.
Indianpoint Lake: 1 ♂, 22 July.
Koeye River: 1 ♂, 1 ♀, 12 September.
Smith Inlet: 1 ♀, 24 September.
St. Johns Harbor (Bardswell Ids.): 2 ♀, 19 September.
Table Island: 1 ♀, 21 September.

Munro and Cowan (1947: 137), through omission, indicate a disbelief in the validity of the race proposed by Grinnell (1910). Grinnell based his race on the difference in relative lengths of primaries and secondaries in the eastern and western populations. Measurements in millimeters of 12 British Columbian males and 10 males from Massachusetts, New York, New Hampshire and Minnesota are given in Table 2.

Table 2

	British Columbia	*Eastern*
Wing length	155–161 (159.5)	149–159 (154.7)
Secondary length	125–137 (130.5)	107–121 (117.3)

PICIDAE

Colaptes auratus borealis Ridgway

Anahim Lake: 1 ♂, 27 April.
Clearwater: 1 ♂, 2 ♀, 25 April.
Cottonwood: 1 ♂, 23 May.
Indianpoint Lake: 4 ♂, 4 ♀, 8 September–11 October.

Colaptes auratus collaris Vigors

Anahim Lake: 2 ♂, 4 ♀, 13 April–10 June.
Bardswell Ids. (St. Johns Harbor): 1 ♂, 19 September.
Barkerville: 1 ♂, 29 May.
Calvert Island: 4 ♀, 1–2 September.
Chezacut: 4 ♂, 5 ♀, 2–15 September.
Clearwater: 8 ♂, 7 ♀, 25 April–20 May.
Cottonwood: 1 ♂, 1 ♀, 14–23 May.
Indianpoint Lake: 1 ♂, 3 ♀, 12 June–28 September.
Lac la Hache: 2 ♂, 2 ♀, 4–7 July.
100 Mile House: 2 ♂, 2 ♀, 22–29 April.
Stuie: 1 ♂, 28 May.
Watson Lake: 1 ♂, 1 May.

A female collected at Anahim Lake on April 17, 1932 is of particular interest. Rectrices 2, 3 and 4 (right side) are typical of *borealis*, the remainder are typical of *collaris*. I judge this to be due to a somatic mutation in the genes controlling pigment production.

I have discussed the treatment of the flickers presented here on page 127 (Also see Table 3, pages 160-161).

Dryocopus pileatus picinus (Bangs)

Chezacut: 1 ♂, 6 September.
Clearwater: 4 ♂, 22 April–23 May.
Hardy Bay: 1 ?, February (head only).

Asyndesmus lewisi (G. R. Gray)

Clearwater: 1 ♂, 3 May.
Fernie: 1 ♂, 8 September.
Indianpoint Lake: 1 ♀, 24 October.
Kamloops: 1 ♀, 10 May.

Sphyrapicus varius nuchalis Baird

Anahim Lake: 3 ♂, 1 ♀, 16 May–13 June.
Chezacut: 1 ♂, 1 ♀, 12 September.
Clearwater: 25 ♂, 8 ♀, 24 April–10 June.
Cottonwood: 1 ♂, 14 May.
Lac la Hache: 2 ♂, 2 ♀, 5–7 July.

Table 3
MALES

Throat	*Moustache*	*Nape*	*Flight Feathers*	*Wing*	*Tail*	*Locality*
A	A	A	A	164.0	116.0	Indianpoint Lake
A –	A	A	A –	163.5	117.0	" "
C	A	A	A –	161.0	113.0	" "
C	A –	A	A	163.0	110.0	Clearwater
A	A –	A	A –	158.0	111.5	Cottonwood
A –	C –	A	A –	163.0	111.0	Anahim Lake
C –	A –	A –	A	168.0	xxx	Indianpoint Lake
C	C	A –	A –	163.0	112.5	Clearwater
C –	C	A	A –	167.0	xxx	Cottonwood
C	C	C	A –	162.0	115.0	Clearwater
C	C	C	A –	170.0	118.0	"
C	C	C	C	xxx	114.0	Barkerville
C	C	C	C	169.0	119.0	Watson Lake
C	C	C	C	163.0	106.5	Clearwater
C	C	C	C	169.0	110.5	100 Mile House
C	C	C	C –	173.0	113.0	Clearwater
C –	C	C	C	168.5	xxx	Chezacut
C –	C	C –	C	171.0	xxx	"
C –	C	C	C	164.5	111.0	100 Mile House
C –	C	C	C	166.0	xxx	Calvert Island
A –	C	C	C	169.0	111.0	Clearwater
A –	C	C	C	xxx	xxx	Calvert Island
C	C	A	C	xxx	110.0	Lac la Hache
C	C	A	C	167.0	xxx	Clearwater
C	C –	C –	C	164.0	101.0	Calvert Island
C	C	C –	C	165.0	117.5	Anahim Lake
C	C	A –	C –	164.0	113.0	Indianpoint Lake
C	C	A –	C	163.0	111.5	LeRoy Bay
C –	C	C –	C	169.0	116.0	Calvert Island
A	C	C –	A –	167.0	115.0	Anahim Lake
A	C	C –	C	164.0	xxx	Stuie
A –	C	C –	C	162.0	xxx	Chezacut
A –	C	C –	C	168.0	xxx	"
C	C –	C –	C	163.0	xxx	St. Johns Hrbr.
C –	C –	C	C	173.0	115.0	Clearwater
C –	C	C	C	xxx	112.0	Lac la Hache

Table 3 (*Continued*)

FEMALES

Throat	*Moustache*	*Nape*	*Flight Feathers*	*Wing*	*Tail*	*Locality*
A	—	A	A			Indianpoint Lake
A	—	A –	A			" "
C	—	A –	A –			Clearwater
A –	—	C	A –			Indianpoint Lake
C	—	C	A –			Anahim Lake
C –	—	C	A –			Clearwater
C –	—	C	A –			Chezacut
A	—	A	C –			Cottonwood
A	—	A	A –			Indianpoint Lake
C	—	C	C			100 Mile House
C	—	C	C			Lac la Hache
C –	—	C	C			Chezacut
C	—	C	C			Clearwater
C –	—	C	C			"
C	—	C	C			Indianpoint Lake
C	—	C	C			" "
C	—	C	C			Clearwater
C	—	C	C			"
C	—	C	C			"
A –	—	C –	C			"
A –	—	C	C			Chezacut
A –	—	C	C			"
A –	—	C	C			Lac la Hache
A –	—	C	C			Anahim Lake
C	—	A –	C			" "
C	—	A –	C			100 Mile House
C –	—	C	C –			Cottonwood
C	—	C –	C			Anahim Lake

Table 3 — The data presented above, with relation to color of the areas of plumage indicated, are symbolized as follows: *A*, typical *auratus; C*, typical *cafer; A-* and *C-* atypical specimens nearer one of the two forms as indicated. Measurements are given in millimeters.

100 Mile House: 1 ♀, 22 April.

Comments concerning this and the following species are to be found on page 128.

SPHYRAPICUS RUBER RUBER (Gmelin)

Anahim Lake: 2 ♂, 2 ♀, 18 April–14 May.
Bella Coola: 12 ♂, 3 ♀, 24 April–4 July.
Bowron Lake: 2 ♀, 22 June–23 July.
Calvert Island: 2 ♀, 13 September.
Cottonwood: 5 ♂, 2 ♀, 15–24 May.
Hotnarko River: 1 ♂, 1 ♀, 21 May.
Indianpoint Lake: 4 ♂, 30 June–20 September.
LeRoy Bay: 1 ♀, 23 September.
Quesnel, 33 mi. south: 1 ♂, 3 July.
Stuie: 4 ♂, 22–28 May.
Swanson Bay: 1 ♂, 2 ♀, 18 June–23 September.

A male collected at Indianpoint Lake on June 30, 1929 was banded at the same locality on July 14, 1928. When banded the bird was in immature plumage.

DENDROCOPOS VILLOSUS SEPTENTRIONALIS (Nuttall)

Anahim Lake: 3 ♂, 2 ♀, 11 April–15 May.
Atnarko: 1 ♂, 22 May.
Barkerville: 2 ♂, 31 May–6 June.
Bella Coola: 1 ♂, 6 May.
Birch Island: 1 ♀, 12 May.
Chezacut: 5 ♂, 1 ♀, 2 June–4 October.
Clearwater: 6 ♂, 7 ♀, 25 April–3 June.
Cottonwood: 1 ♂, 1 ♀, 15 March–14 May.
Flathead Summit: 1 ♂, 10 September.
Hotnarko River: 1 ♀, 4 June.
Indianpoint Lake: 1 ♂, 2 ♀, 1 May–4 June.
Loon Lake: 1 ♀, 9 April.
Lytton: 1 ♀, 21 June.
100 Mile House: 2 ♂, 21 April–3 May.
Williams Lake: 1 ♀, 31 March.

The specimens listed here are clearly referable to this race. The bird collected at Bella Coola is far out of the normal range of *septentrionalis* but in whiteness of underparts and spotting of wings it conforms with topotypical material. A female from Lytton resembles *monticola* but is closer to *septentrionalis*. Munro and Cowan (1947: 143) indicate that *monticola* is the resident form in central British Columbia. The majority of the McCabe specimens were taken during the summer months and from them I judge that *septentrionalis* extends farther west and south than their records showed.

Dendrocopos villosus sitkensis (Swarth)

Alexis Creek: 1 ♀, 4 April.
Bella Coola: 1 ♀, 24 April.
Calvert Island: 6 ♂, 3 ♀, 30 April–18 September.
Stuie: 1 ♀, 25 May.
Swanson Bay: 3 ♂, 1 ♀, 12 May–29 September.

The specimen from Alexis Creek taken in early April, 1932 is not quite typical of *sitkensis* but it is much closer to this race than any other. Apparently it is a stray individual, or an extreme variant of *septentrionalis*.

Dendrocopos villosus harrisi (Audubon)

Hope Island: 2 ♂, 28 June.

Hope Island, off the northern tip of Vancouver Island, lies in a position of geographic intermediacy between the ranges of *harrisi* and *sitkensis*. These two specimens, one an immature bird, I believe are closer to the latter though not typical.

Dendrocopos pubescens leucurus (Hartlaub)

Anahim Lake: 1 ♂, 3 ♀, 1–15 May.
Beaver Lake: 1 ♂, 20 March.
Chezacut: 1 ♂, 2 October.
Clearwater: 2 ♂, 1 ♀, 17–23 May.
Corbin: 1 ♂, 4 September.
Cottonwood: 1 ♂, 1 ♀, 14–21 May.
Indianpoint Lake: 1 ♀, 15 September.
100 Mile House: 1 ♂, 1 ♀, 24 April.
Townsend Island (Bardswells): 1 ♂, 30 August.

The series shows the belly as slightly more buffy or tawny than birds from California.

Picoides arcticus (Swainson)

Alexis Creek: 2 ♂, 4–6 April.
Chezacut: 1 ♀, 8 September.
Clearwater: 1 ♂, 23 April.
Indianpoint Lake: 2 ♂, 3 ♀, 7 April–27 December.
Williams Lake: 1 ♀, 31 March.

Picoides tridactylus fasciatus (Baird)

Beaver Pass (Beaver Lake ?): 2 ♂, 16 March.
Cottonwood: 3 ♂, 2 ♀, 11 March–13 November.

Flathead Summit: 1 ♀, 10 September.
Indianpoint Lake: 6 ♂, 4 ♀, 1 ?, 30 March–18 December.
Kleena Kleen: 1 ♀, 17 July.

Three specimens collected at Indianpoint Lake on June 14 and 28, 1928 and 1930 are juvenal birds about one-half grown.

TYRANNIDAE

Tyrannus tyrannus (Linné)

Clearwater: 1 ♂, 2 ♀, 26–29 May.
Indianpoint Lake: 1 ♂, 1 ♀, 1–19 June.
Lillooet: 2 ♂, 2 ♀, 23 June.
127 Mile House: 1 ♂, 1 ♀, 4 July.

Tyrannus verticalis Say

Clearwater: 2 ♂, 1 ♀, 3–17 May.
Khutze Inlet: 1 ♂, 24 May.
Lillooet: 2 ♂, 2 ♀, 21–23 June.
Lytton: 1 ♀, 21 June.

Sayornis saya saya Grinnell

Anahim Lake: 1 ♀, 18 April.
Chezacut: 1 ♂, 28 August.
Indianpoint Lake: 1 ♂, 1 ♀, 1 ?, 20 May–18 August.

Material available in the Museum of Comparative Zoology collections is insufficient for me to examine the validity of *S. s. yukonensis* Bishop. I am certain, however, that the McCabe specimens are not separable from the nominate form.

Empidonax flaviventris (Baird)

Indianpoint Lake: 6 ♂, 1 ♀, 21 June–2 August.

The female, July 5, 1930, was collected with nest and 4 eggs.

Empidonax traillii traillii (Audubon)

Crowsnest Pass: 1 ♂, 5 September.
Indianpoint Lake: 4 ♂, 1 ♀, 14–24 June.
Isaac Lake: 1 ♀, 22 June.
Khutze Inlet: 2 ♂, 13 June.
Lac la Hache: 1 ♂, 2 ♀, 5–7 July.
127 Mile House: 1 ♀, 4 July.
150 Mile House: 1 ♂, 22 July.

Comparison with specimens from the eastern United States shows no constant difference in size or color. Phillips (1948: 510) defends the validity of *E. t. adastus* Oberholser and indicates that it extends into southern British Columbia. Miller (1941b: 259) concludes that this race is not recognizable. Apparently both *adustus* and *E. t. brewsteri* Oberholser are recognizable, if at all, only in series. Faced with the problem of identification of individuals, or at best a very small series, I see no other choice than to refer them to this subspecies.

Empidonax hammondii (Xantus)

Anahim Lake: 1 ♂, 14 May.
Atnarko: 3 ♂, 21–22 May.
Bella Coola: 10 ♂, 24 April–28 June.
Blackpool: 1 ♂, 2 May.
Bowron Lake: 1 ♀, 21 July.
Chezacut: 2 ♂, 1–2 September.
Clearwater: 11 ♂, 2 ♀, 7 May–1 June.
Cottonwood: 7 ♂, 4 ♀, 15–24 May.
Indianpoint Lake: 8 ♂, 1 ♀, 6 May–25 August.
100 Mile House: 1 ♂, 4 May.
Quesnel: 1 ♂, 24 July.
Raft River, near mouth: 1 ♂, 21 May.
Stuie: 3 ♂, 24 May–30 June.

Empidonax wrightii Baird

Alexis Creek: 1 ♂, 12 June.
Barkerville: 2 ♂, 29 May.
Bella Coola: 2 ♀, 29 April–22 July.
Clearwater: 8 ♂, 2 ♀, 4 May–5 September.
Cottonwood: 3 ♂, 15–25 May.
Hotnarko River: 1 ♀, 4 June.
Indianpoint Lake: 3 ♀, 21 May–7 July.
Kleena Kleen: 1 ♂, 17 July.
100 Mile House: 3 ♂, 28 April–3 May.
150 Mile House: 1 ♀, 22 July.
Raft River, near mouth: 1 ♀, 21 May.
Redstone: 1 ♂, 10 July.
Stuie: 1 ♀, 25 May.

Nesting data are furnished by a female collected at Clearwater on May 22, 1935 while building a nest; a female from Indianpoint Lake, July 7, 1930 with nest and eggs; a female from the Hotnarko River, June 4, 1932 with a hard shelled egg in the oviduct.

Empidonax difficilis difficilis Baird

Bella Coola: 1 ♂, 8 June.
Borrowmans Bay: 3 ♂, 3–4 June.

Bowron Lake: 1 ?, Spring, 1933.
Calvert Island: 6 ♂, 2 ♀, 22 May–15 September.
Riske Creek: 1 ?, 21 July.
Swanson Bay: 3 ♂, 12–17 May.

The specimen from Bowron Lake was found as a mummy, apparently killed by winter conditions.

Contopus richardsoni richardsoni (Swainson)

Anahim Lake: 4 ♂, 1 ♀, 15 May–5 June.
Beaver Lake: 2 ♂, 3–6 June.
Bella Coola: 4 ♂, 3–8 June.
Bowron Lake: 1 ♂, 12 June.
Chezacut: 1 ♂, 1 ?, 2 September.
Clearwater: 7 ♂, 1 ♀, 1 ?, 17–23 May.
Indianpoint Lake: 5 ♂, 2 ♀, 6 June–6 July.
Stuie: 2 ♂, 2 ♀, 24 May–6 June.

Nuttallornis borealis (Swainson)

Anahim Lake: 1 ♂, 13 May.
Beaver Lake: 2 ♂, 30 May–20 June.
Bella Coola: 6 ♂, 4 ♀, 2–8 June.
Bowron Lake: 1 ♂, 1 ♀, 12–30 June.
Calvert Island: 1 ♂, 22 May.
Cottonwood: 1 ♂, 1 ♀, 24–25 May.
Hotnarko River: 1 ♂, 4 June.
Indianpoint Lake: 4 ♂, 1 ♀, 6–22 June.
Swanson Bay: 1 ♀, 16 May.

ALAUDIDAE

Eremophila alpestris arcticola Oberholser

Hanceville: 3 ♂, 31 March.
Indianpoint Lake: 3 ♂, 1 ♀, 10 July–16 September.
100 Mile House: 1 ♂, 2 ♀, 30 April–2 May.
Rainbow Mountains: 9 ♂, 5 ♀, 20 June.

Comments concerning the Horned Larks in the McCabe Collection are made in connection with the succeeding subspecies.

Eremophila alpestris merrilli Dwight

Riske Creek: 9 ♂, 2 ♀, 25 June.

These specimens have been previously reported on by Behle (1942). My allocation of specimens is the same as his, following critical re-examination.

HIRUNDINIDAE

Tachycineta thalissima lepida Mearns

Alexis Creek: 1 ♂, 1 ♀, 1 ?, 10 July.
Clearwater: 1 ♂, 5 ♀, 7–24 May.
Khutze Inlet: 2 ♂, 13 June.

Iridoprocne bicolor (Vieillot)

Anahim Lake: 2 ♀, 1–14 May.
Beaver Lake: 1 ♂, 30 May.
Barkerville: 1 ♂, 6 June.
Calvert Island: 1 ♀, 30 May.
Clearwater: 2 ♂, 2 ♀, 28 April–3 June.
Indianpoint Lake: 1 ♂, 2 ♀, 13–18 July.

Two females collected at Indianpoint Lake, July 13, 1930 are juvenal birds about one-half grown.

Riparia riparia riparia (Linné)

Cottonwood: 1 ?, 9 August.

Stelgidopteryx ruficollis serripennis (Audubon)

Alexis Creek: 2 ♀, 10–13 July.
Clearwater: 6 ♂, 2 ♀, 21 April–16 May.
Cottonwood: 1 ♂, 1 ♀, 15 May.
Indianpoint Lake: 1 ♂, 11 June.
127 Mile House: 1 ♂, 4 July.
Watson Lake: 1 ♂, 1 ♀, 1 May.

Hirundo rustica erythrogaster Boddaert

Khutze Inlet: 2 ♂, 2 ♀, 24 May–12 June.

Pterochelidon pyrrhonota pyrrhonota (Vieillot)

Alexis Creek: 1 ♂, 10 July.
Indianpoint Lake: 2 ♂, 5 July.
127 Mile House: 1 ♂, 4 July.

CORVIDAE

Perisoreus canadensis canadensis (Linné)

Alexis Creek: 2 ♂, 1 ♀, 2–4 April.
Anahim Lake: 3 ♂, 2 ♀, 27 April–8 May.
Barkerville: 1 ♂, 1 ♀, 29 May–6 September.
Chezacut: 4 ♂, 3 ♀, 28 September–4 October.
Cottonwood: 3 ♂, 1 ♀, 16 May–9 November.
Hotnarko River: 1 ♂, 1 ♀, 5 June.

Indianpoint Lake: 7 ♂, 3 ♀, 10 June–15 December.
Kleena Kleen: 1 ♀, 17 July.

All but one of these birds are clearly referable to this race. The specimen collected at Kleena Kleen in 1931 is towards *P. c. griseus.* The following birds should perhaps be referred to this form but they are atypical — towards *bicolor.*

Anahim Lake: 1 ♀, 27 April.
Chezacut: 2 ♂, 2 ♀, 5 September–4 October.
Clearwater: 3 ♀, 5–9 June.
Indianpoint Lake: 1 ♀, 30 March.

Perisoreus canadensis bicolor Miller

Clearwater: 3 ♂, 3 ♀, 4–9 June.
Flathead Summit: 2 ♂, 10 September.
Natal, 17 miles north: 1 ♂, 8 September.

Specimens listed here I take to be typical of this race. As Miller indicated (1933: fig. 2.), the area in which McCabe did most of his work lies in the zone of intergradation of *canadensis* and *bicolor.* The McCabe skins seem to bear this out nicely.

Perisoreus canadensis arcus Miller

Rainbow Mountains: 1 ♀, 20 June.

Miller (1945) describes this race as having a very limited range, "Thus far known only from the Rainbow Mountains area . . ." The McCabe specimen is in juvenal plumage and to Miller's information I can only add that in this plumage *arcus* does not differ from *canadensis* or *griseus.* I have not seen any specimens of *arcus* in adult plumage and this bird is assigned here on the basis of locality.

Perisoreus canadensis griseus Ridgway

Allison Harbor: 1 ♀, 17 October.
Bella Coola, mountains northeast: 1 ♀, 1 ?, 23 June.
Calvert Island: 6 ♂, 4 ♀, 2–18 September.
LeRoy Bay: 1 ♂, 2 ♀, 24 September.
Little Rainbow Mountains: 1 ♂, 2 ♀, 22 June.

Two specimens from the mountains northeast of Bella Coola, and two from Calvert Island are in juvenal plumage. Mr. McCabe's collections of birds which are surely referable to *griseus,* in localities adjacent to the type locality of *arcus,* certainly indicate a very restricted range for the latter form. His label notation of "Bella Coola, mountains northeast" on the two juvenal plumaged birds poses a bit of a problem. As I have commented above, a single topotype is not distinguishable from the other races in this plumage. In that the Rainbow Mountains lie northeast of Bella Coola these birds may possibly be *arcus*. Adults from the Little Rainbow Mountains, however, are quite representative of *griseus* and I feel that it is best to refer these juvenal birds of questionable geographical origin to this race.

Cyanocitta stelleri (Gmelin)

Frank A. Pitelka of the Museum of Vertebrate Zoology at the University of California borrowed 33 specimens of this species from the McCabe collection prior to the beginning of my study. He has not made sufficient progress in his survey to allow him to furnish me with identifications of these specimens. I am hopeful that he will report on them at a later date.

Pica pica hudsonia (Sabine)

Chezacut: 1 ♀, 2 October.
Clinton (Hat Creek): 1 ♂, 9 May.

Corvus corax principalis Ridgway

Anahim Lake: 1 ♂, 24 April.
Bardswell Ids. (St. Johns Harbor): 1 ♀, 19 September.
Calvert Island: 2 ♂, 5 ♀, 27 May–4 September.
Smyth Island: 2 ♀, 22–24 September.
Swanson Bay: 1 ♂, 24 June.

Corvus brachyrhynchos hesperis Ridgway

Anahim Lake: 4 ♂, 5 ♀, 16 April–12 May.
Chezacut: 1 ♂, 2 ♀, 5–25 September.
Clearwater: 1 ♂, 30 April.
Indianpoint Lake: 2 ♀, 1–31 May.
100 Mile House: 7 ♂, 4 ♀, 23 April–3 May.
Quesnel, 32 miles south: 1 ♀, 3 July.

Corvus caurinus Baird

Bella Coola: 8 ♂, 4 ♀, 29 April–8 June.
Calvert Island: 2 ♂, 1 ♀, 21 May–8 September.
Goose Island: 1 ♂, 1 ?, 30 May.
Hurst Island: 1 ♂, 1 ♀, 27–28 August.
Khutze Inlet: 4 ♂, 4 ♀, 13 June.

Breeding at Khutze Inlet in 1936 is shown by seven young birds, four about one-third grown and three newly hatched downy young.

Nucifraga columbiana (Wilson)

Kleena Kleen: 1 ♀, 17 July.
Lillooet to Lytton: 1 ♂, 2 ♀, 21 June.
Rainbow Mountains: 2 ♂, 1 ♀, 17 June.

PARIDAE

Parus atricapillus fortuitus (Dawson and Bowles)

Alexis Creek: 4 ♂, 3 April–12 July.
Anahim Lake: 2 ♂, 1 ♀, 21 April–14 May.
Chezacut: 1 ♂, 2 ♀, 1 ?, 2 September–4 October.
Clearwater: 7 ♂, 2 ♀, 20 April–3 June.
Cottonwood: 1 ♀, 10 March.
100 Mile House: 2 ♂, 1 ♀, 22–30 April.

My measurements of the tail length of the 17 males are as follows: 59.0 mm. — 67.0 mm. (average 64.4 mm.). The vagaries of measurements made by different individuals may well account for the disparity of these birds from Duvall's measurements of *fortuitus* (1945a: 62). He comments that (*op. cit:* 66) birds [from the northern half of British Columbia] "may represent an undescribed race." Certainly the birds from the area here reported on are not worthy of taxonomic recognition.

Parus gambelli grinnelli (van Rossem)

Anahim Lake: 4 ♂, 3 ♀, 28 April–10 June.
Birch Island: 1 ♂, 1 ♀, 8 May.
Chezacut: 7 ♂, 4 ♀, 2 September–2 October.
Clearwater: 1 ♂, 30 April.
Hotnarko River: 1 ♂, 4 June.
Indianpoint Lake: 1 ♀, 5 May.
Lytton: 1 ♂, 21 June.
100 Mile House: 1 ♀, 4 May.
Quesnel: 1 ♀, 3 July.
Redstone: 1 ♂, 10 July.
Watson Lake: 1 ♀, 1 May.

Parus hudsonicus columbianus Rhoads

Anahim Lake: 1 ♂, 29 April.
Indianpoint Lake: 2 ♂, 3 ♀, 30 March–19 December.

Parus rufescens rufescens Townsend

Aristazabel Island: 4 ♂, 3–5 June.
Bella Coola: 6 ♂, 2 ♀, 24 April–9 June.
Calvert Island: 4 ♂, 7 ♀, 27 April–18 September.
Indianpoint Lake: 1 ♂, 21 April.

Koeye River: 1 ♂, 1 ?, 12 September.
Princess Royal Island: 1 ♂, 1 ♀, 19 May.
Smith Inlet (LeRoy Bay): 1 ♂, 24 September.
Smyth Island: 1 ♀, 23 September.
Swanson Bay: 2 ♂, 1 ♀, 13 May–29 September.

SITTIDAE

Sitta carolinensis tenuissima Grinnell

Lytton: 1 ♀, 21 June.

Measurements as follows conform to Aldrich's (1944: 595) findings for the limits of variation in *tenuissima:* wing, 88.0 mm.; culmen 19.0 mm.

Sitta canadensis Linné

Alexis Creek: 1 ♂, 1 ♀, 4 April.
Anahim Lake: 1 ♂, 3 ♀, 11–16 May.
Bowron Lake: 1 ♂, 3 June.
Chezacut: 3 ♂, 2 ?, 2–16 September.
Clearwater: 9 ♂, 3 ♀, 7 May–6 June.
Cottonwood: 1 ♂, 26 July.
Flathead Summit: 1 ?, 10 September.
Indianpoint Lake: 3 ♂, 2 ♀, 29 April–10 July.
Khutze Inlet: 2 ♂, 1 ♀, 24 May–1 October.
Natal, 13 miles north: 1 ♂, 8 September.
Princess Royal Island: 4 ♂, 19 May–28 September.
Smyth Island: 1 ♀, 22 September.
Stuie: 1 ♂, 24 May.
Williams Lake: 1 ♂, 1 ♀, 31 March.

Sitta pygmaea melanotis van Rossem

Lytton: 2 ♂, 21 June.

CERTHIIDAE

Certhia familiaris montana Ridgway

Indianpoint Lake: 1 ♀, 4 ?, 2 August–18 December.

Aldrich (1946b: 129) has described a fôrm, *caurina*, which I judge should be found in the Indianpoint Lake vicinity. I can see no difference in the color of the McCabe skins when compared with birds from Idaho, Arizona and New Mexico. I find it difficult to visualize a third form, intermediate between *montana* and *occidentalis*, as occurring in British Columbia. Aldrich did not see any British Columbian material and included this region in the range of the proposed form on the basis of specimens from Alaska and the Washington-Oregon area.

CERTHIA FAMILIARIS OCCIDENTALIS Ridgway

Aristazabel Island: 1 ♂, 1 June.
Calvert Island: 2 ♂, 1 ♀, 16 May–11 September.
Campania Island: 1 ♂, 30 September.
Khutze Inlet: 1 ♀, 1 October.
LeRoy Bay: 1 ♀, 24 September.
Stuie: 1 ♂, 28 May.
Swanson Bay: 2 ♂, 1 ♀, 1 ?, 18 June–26 September.

CINCLIDAE

CINCLUS MEXICANUS UNICOLOR Bonaparte

Allison Harbor: 1 ♀, 21 October.
Clearwater: 2 ♂, 1 ♀, 22 April–10 May.
Indianpoint Lake: 3 ♂, 19 December.
Phillips Arm: 1 ♂, 1 ♀, 5 November.
Swanson Bay: 4 ♂, 1 ♀, 9 May–2 October.

TROGLODYTIDAE

TROGLODYTES AËDON PARKMANNII Audubon

Clearwater: 1 ♂, 17 May.

TROGLODYTES TROGLODYTES PACIFICUS Baird

Aristazabel Island: 4 ♂, 1 ♀, 4–5 June.
Bella Coola: 5 ♂, 3 ♀, 1 ?, 23 April–27 June.
Calvert Island: 12 ♂, 7 ♀, 1 ?, 23 April–18 September.
Indianpoint Lake: 5 ♂, 5 ♀, 1 ?, 19 May–6 September.
Koeye River: 2 ♂, 12 September.
Khutze Inlet: 2 ♂, 1 ♀, 13 June–12 September.
Smyth Island: 1 ♂, 22 September.
Storm Island: 1 ♀, 25 September.
Swanson Bay: 4 ♂, 4 ♀, 1 ?, 11 May–6 October.
Table Island: 1 ♂, 1 ♀, 20 September.

THRYOMANES BEWICKII CALOPHONUS Oberholser

Sea Island: 1 ♀, 22 September.

TELMATODYTES PALUSTRIS PLESIUS Oberholser

Alexis Creek: 2 ♂, 1 ♀, 12 July.
Chezacut: 6 ♂, 4 ♀, 1 ?, 31 August–6 October.
100 Mile House: 7 ♂, 28–29 April.

Telmatodytes palustris paludicola (Baird)

Ione Island: 5 ♂, 2 ♀, 17 April.
Kleena Kleen: 1 ♂, 17 July.

Salpinctes obsoletus obsoletus (Say)

Indianpoint Lake: 1 ♀, 25 May.
100 Mile House (Mount Bagbie): 1 ♂, 14 May.

TURDIDAE

Turdus migratorius propinquus Ridgway

Alexis Creek: 6 ♂, 3–4 April.
Anahim Lake: 5 ♂, 3 ♀, 17 April–10 June.
Aristazabel Island: 1 ♀, 31 May.
Barkerville: 1 ♀, 3 July.
Bella Coola: 7 ♂, 8 ♀, 22 April–5 June.
Calvert Island: 2 ♂, 4 ♀, 16–29 May.
Chezacut: 7 ♂, 1 ♀, 6–25 September.
Clearwater: 13 ♂, 15 ♀, 19 April–22 May.
Cottonwood: 6 ♂, 1 ♀, 20–28 May.
Hurst Island: 1 ♀, 15 June.
Indianpoint Lake: 4 ♂, 3 ♀, 1 ?, 3 May–29 June.
Khutze Inlet: 2 ♂, 1 ♀, 13 June–5 October.
Lac la Hache: 6 ♀, 6 July–4 October.
100 Mile House: 5 ♂, 1 ♀, 21 April–2 May.
150 Mile House: 1 ♀, 22 July.
Redstone: 1 ♀, 16 July.
Riske Creek: 4 ♂, 2 ♀, 21 July.
Smyth Island: 3 ♂, 22 September.
Stuie: 2 ♂, 24-27 May.
Swanson Bay: 1 ♂, 1 ♀, 22 May–17 June.
Watson Lake: 1 ♂, 1 May.

As a series, these specimens seem to represent atypical *propinquus*. Wing measurements of the fourteen males from coastal localities are from 130.0 mm. to 137.0 mm. Fifty males from inland localities range from 129.0 mm. to 142.0 mm. In series the coastal birds may average *slightly* darker than the inland birds. The amount of white-tipping on the rectrices shows some slight influence of *T. m. migratorius* which occurs to the northward. On the basis of these specimens I feel that the southern limits of *caurinus* on the mainland of British Columbia must lie north of Swanson Bay.

Ixoreus naevius naevius (Gmelin)

Aristazabel Island: 1 ♂, 31 May.
Anahim Lake: 5 ♂, 6 ♀, 13 April–24 May.
Barkerville: 1 ?, 6 September.
Bella Coola: 15 ♂, 5 ♀, 24 April–30 May.
Birch Island: 2 ♀, 8–18 May.
Calvert Island: 9 ♂, 10 ♀, 14 May–18 September.
Chezacut: 5 ♂, 3 ♀, 6 May–4 October.
Clearwater: 9 ♂, 2 ♀, 19 April–24 September.
Indianpoint Lake: 6 ♂, 3 ♀, 7 May–24 October.
Khutze Inlet: 3 ♂, 1 ♀, 13 June–6 October.
LeRoy Bay: 1 ♀, 24 September.
Smyth Island: 2 ♀, 22 September.
Stuie: 2 ♀, 25 May.
Swanson Bay: 2 ♂, 3 ♀, 1 ?, 12 May–28 September.

Wing length in ten males from Indianpoint Lake, Anahim Lake, Clearwater and Chezacut ranges from 124.0 mm. to 130.0 mm. Ten males from Bella Coola and Calvert Island have wing lengths between 123.0 – 129.0 mm. Fourteen females from the inland localities vary from 121.0 mm. to 129.0 mm. Fifteen females from the coast are between 122.0 mm. and 129.0 mm.

There are no uniform color differences in the birds from inland localities when they are compared with birds from the coast. Specimens from Sitka, Alaska are likewise indistinguishable from these birds. Birds from Anahim Lake show a slightly grayer back than the remainder of the series but it is certainly not sufficient to be of diagnostic value. I have not been able to examine any material from MacKenzie and thus am not in a position to comment on the validity of *I. n. meruloides*. I do not feel, however, that there are two recognizable forms represented in the collections from British Columbia.

Hylocichla guttata guttata (Pallas)

Anahim Lake: 1 ♂, 1 ♀, 11–15 May.
Barkerville: 3 ♂, 2 ♀, 30 May–6 September.
Chezacut: 1 ♂, 1 ♀, 9–23 September.
Cottonwood: 1 ?, 25 May.
Indianpoint Lake: 4 ♂, 3 ♀, 21 May–10 October.

Oberholser (1932: 8) has suggested that the birds of "central southern British Columbia . . . ." be recognized as differing from *guttata* in being paler and more grayish or greenish (less brownish or rufescent). He proposes the name *oromela* for this population. I can not be sure that the McCabe specimens come from within the range of this proposed subspecies but I am sure that I am unable to detect constant color differences when they are compared with specimens I take to be typical of *guttata*. Miller (1941b: 262) and McCabe and McCabe (1932, 1933) have commented earlier on the validity of *oromela*. Munro and Cowan (1947: 176–177) assign birds from this same area to *guttata* while recognizing *oromela* as occurring farther to the south in British Columbia. They base their conclusions partially on the fact that the two forms occupy distinct habitats within the province. I am unable to comment critically on this point.

Wing measurements of 9 males are 88.0 mm. — 96.0 mm. (av. 90.2); of 5 females, 84.0 mm. - 89.0 mm. (av. 87.4).

HYLOCICHLA GUTTATA NANUS (Audubon)

Aristazabel Island: 1 ♀, 31 May.
Bella Coola: 12 ♂, 23 April–5 May.
Calvert Island: 13 ♂, 5 ♀, 2 ?, 21 April–13 September.
Kliwixi: 1 ♂, 1 November.
LeRoy Bay: 2 ♂, 1 ♀, 23–24 September.
Princess Royal Island: 1 ♂, 2 ♀, 19 May–21 June.
Smyth Island: 1 ♂, 22 September.
Swanson Bay: 10 ♂, 7 ♀, 6 May–25 June.
West Estevan Island: 1 ♂, 4 October.

HYLOCICHLA USTULATA USTULATA (Nuttall)

Alta Lake: 1 ♂, 24 August.
Balaklava Island: 1 ♀, 12 June.
Bella Coola: 9 ♂, 5–28 June.
Calvert Island: 4 ♂, 1 ♀, 1 ?, 17 May–11 September.
Hurst Island: 1 ?, 18 June.
Khutze Inlet: 3 ♂, 12–13 June.
Princess Royal Island: 1 ♂, 21 June.
Stuie: 2 ♀, 30 June.
Swanson Bay: 5 ♂, 1 ♀, 27 May–11 June.

The birds from Bella Coola and Stuie are not typical of this form. They are not as brown — showing intergradation with *swainsoni*.

HYLOCICHLA USTULATA SWAINSONI (Tschudi)

Alexis Creek: 2 ♂, 10–12 July.
Anahim Lake: 2 ♂, 2 ♀, 5–9 June.
Barkerville: 1 ♂, 1 ♀, 6 September.
Bella Coola: 1 ♀, 9 June.
Cottonwood: 1 ♀, 24 July.

Clearwater: 6 ♂, 1 ♀, 27 May–10 June.
Crowsnest Pass: 1 ♂, 6 September.
Hotnarko River: 2 ♂, 1 ♀, 4 June.
Indianpoint Lake: 14 ♂, 8 ♀, 26 May–6 September.
Kleena Kleen: 1 ♀, 17 July.
150 Mile House: 1 ♂, 22 July.
Rainbow Mountains: 1 ♀, 18 June.

These birds have been compared with Alberta and Saskatchewan skins and I agree with Godfrey (1951) that there is no apparent difference. They are slightly grayer than birds from the northeastern United States (New York and Maine). Under these circumstances I am following Godfrey and placing *H. u.almae* Oberholser in synonymy with *swainsoni*.

In the absence of comparative material I am not venturing an opinion on the race proposed by Godfrey (*loc. cit.*) as inhabiting northwestern North America. This form, which he has designated as *H. u. incana*, presumably may be expected to occur as far south as the areas in which McCabe made his collections.

Specimens listed here from Bella Coola and the Rainbow Mountains show the influence of *ustulata* and are not typical of *swainsoni*.

Hylocichla minima minima (Lafresnaye)

Rainbow Mountains: 2 ♂, 1 ♀, 18–19 June.

Hylocichla fuscescens salicola Ridgway

Clearwater: 1 ♂, 1 ♀, 6 June.
150 Mile House: 1 ♀, 22 July.
Stuie: 1 ♀, 30 June.

Sialia mexicana occidentalis Townsend

Clearwater: 4 ♂, 1 ♀, 22 April–17 May.
Lytton, 25 miles west: 1 ?, 21 June.
Riske Creek (Beechers): 2 ♂, 21 July.

Sialia currucoides (Bechstein)

Alexis Creek: 1 ♂, 2 ♀, 2 April.
Anahim Lake: 2 ♂, 1 ♀, 23 April–6 May.
Chezacut: 1 ♂, 24 September.
Clearwater: 7 ♂, 4 ♀, 23 April–10 May.
Cottonwood: 1 ♂, 23 May.
Crowsnest Pass: 1 ♂, 1 ♀, 6 September.
Indianpoint Lake: 1 ♀, 30 July.
Lytton, 25 miles north: 1 ♂, 21 June.

Marguerite: 1 ♀, 8 September.
150 Mile House: 1 ♂, 22 July.
Quesnel, 17 miles south: 1 ♀, 3 July.
Riske Creek (Beechers): 1 ♀, 21 July.
Soda Creek: 1 ♂, 8 September.
Tatla Lake: 1 ♂, 16 July.

Myadestes townsendi townsendi (Audubon)

Alexis Creek: 1 ♂, 1 ♀, 10 July.
Anahim Lake: 1 ♂, 5 June.
Barkerville: 2 ♂, 29 May.
B. L. [Bowron Lake ?]: 1 ?, 10 July.
Calvert Island: 1 ♀, 8 May.
Clearwater: 10 ♂, 6 ♀, 21 April–10 June.
Indianpoint Lake: 2 ♂, 1 ♀, 23 May–26 June.
Hardy Bay: 1 ♀, 12 April.
Kleena Kleen: 1 ♂, 1 ♀, 17 July.

SYLVIIDAE

Regulus satrapa olivaceous Baird

Anahim Lake: 1 ♂, 27 April.
Aristazabel Island: 5 ♂, 2 ♀, 31 May–5 June.
Bella Coola: 2 ♂, 1 ?, 6–30 May.
Calvert Island: 2 ♂, 4 ♀, 17 May–13 September.
Clearwater: 9 ♂, 1 ♀, 24 April–9 June.
Indianpoint Lake: 9 ♂, 2 ♀, 19 May–8 October.
Koeye River: 1 ♀, 12 September.
LeRoy Bay: 2 ♂, 23–24 September.
Port Hardy: 1 ♂, 1 ♀, 26 October.
Princess Royal Island: 1 ♂, 21 June.
Quesnel: 1 ♂, 1 ♀, 24 July.
Smyth Island: 1 ♂, 11 October.
Swanson Bay: 5 ♂, 5 ♀, 17 May–4 October.
Swindle Island: 1 ♂, 1 ♀, 8 October.
Table Island: 1 ♂, 21 September.

A. J. van Rossem (1945: 77) suggested that the kinglets of the Sierra Nevada of California be recognized as differing from the birds of the Northwest sufficiently to be designated *R. s. amoenus*. He stated that the southern birds differed from *olivaceous* in being larger and lighter and brighter. The Committee on Classification and Nomenclature of the American Ornithologists' Union (1948: 442) accepted this form and stated that the range included interior British Columbia.

Miller (1951: 620) comments as to the status of *amoenus* in California and rejects this subspecies.

The McCabe collections include 24 birds from inland localities and 35 from the coast. I can see no constant color differences in these two samples. Twenty males from the coast range from 52.0 mm. to 57.0 mm. (av. 54.8) in tail length. Nineteen males from inland range from 52.0 mm. to 56.0 mm. (av. 54.8). I can see no basis for the recognition of two forms in British Columbia.

Regulus calendula cineraceus Grinnell

Anahim Lake: 5 ♂, 3 ♀, 27 April–16 May.
Bella Coola: 1 ♂, 3 ♀, 27 April–4 May.
Birch Island: 2 ♂, 30 April.
Bowron Lake: 1 ♀, 6 September.
Chezacut: 8 ♂, 5 ♀, 1 ?, 30 August–25 September.
Clearwater: 12 ♂, 2 ♀, 22 April–10 June.
Indianpoint Lake: 6 ♂, 2 ♀, 21 May–26 July.
Natal: 1 ♀, 8 September.
100 Mile House: 1 ♂, 22 April.

Munro and Cowan (1947: 182) assign the inland population to *R. c. calendula*. I find this series to be typical of *cineraceus*. A single specimen from Clearwater approaches *R. c. calendula* in the color of its back. Four birds from Bella Coola are referable to *cineraceus* although three specimens taken at Anahim Lake seem to show the influence of *R. c. grinnelli*.

Regulus calendula grinnelli Palmer

St. Johns Harbor (Bardswells): 1 ♀, 22 September.
Bella Coola: 3 ♂, 24–30 April.
Calvert Island: 2 ♂, 1 ♀, 27 April–18 September.
Khutze Inlet: 1 ♂, 1 October.
Swanson Bay: 1 ♀, 18 June.

These specimens are clearly referable to *grinnelli*. As indicated above, intergradation with *cineraecus* in the coastal area is clearly shown by this excellent series totaling 63 birds.

MOTACILLIDAE

Anthus spinoletta pacificus Todd

Anahim Lake: 5 ♂, 27 April–8 May.
Bella Coola: 5 ♂, 2 ♀, 9 May–25 June.
Calvert Island: 1 ♂, 17 April.
Chezacut: 4 ♂, 2–24 September.

Clearwater: 1 ♂, 29 April.
Indianpoint Lake: 5 ♂, 5 ♀, 4 May–23 September.
Port Hardy: 1 ♀, 28 October.
Rainbow Mountains: 1 ♂, 20 June.
Swanson Bay: 1 ♀, 6 May.

BOMBYCILLIDAE

Bombycilla garrula pallidiceps Reichenow

Beaver Lake: 9 ♂, 4 ♀, 13 July–3 August.
Bowron Lake: 1 ♂, 29 June.
Indianpoint Lake: 4 ♂, 27 July–21 November.
Kleena Kleen: 1 ♂, 17 July.
Port Hardy: 1 ♂, 29 October.

Two half-grown males collected at Indianpoint Lake on August 9, 1934 provide a nesting record.

Bombycilla cedrorum Vieillot

Bella Coola: 1 ♂, 25 June.
Clearwater: 1 ♂, 1 ♀, 7 June.
Indianpoint Lake: 1 ♂, 2 ♀, 13–22 June.
Isaac Lake: 1 ♀, 22 June.
Lac la Hache: 1 ♀, 7 July.
Swanson Bay: 1 ♀, 20 June.

LANIIDAE

Lanius excubitor invictus Grinnell

Alexis Creek: 1 ♀, 5 April.
Indianpoint Lake: 1 ♂, 2 ?, 20 April–29 September.

VIREONIDAE

Vireo solitarius cassinii Xantus

Chezacut: 1 ♀, 5 September.
Clearwater: 7 ♂, 8–19 May.
Cottonwood: 2 ♂, 14–18 May.
Hotnarko River (Atnarko): 1 ♂, 21 May.
Indianpoint Lake: 1 ♂, 12 June.
Quesnel: 1 ♂, 3 July.

Vireo olivaceus (Linné)

Clearwater: 2 ♂, 3–11 June.
Indianpoint Lake: 1 ♂, 21 June.
150 Mile House: 1 ♀, 22 July.
Quesnel: 1 ♂, 3 July.

VIREO GILVUS SWAINSONI Baird

Anahim Lake: 2 ♂, 1 ♀, 14 May–7 June.
Bella Coola: 2 ♂, 4 ♀, 2–7 June.
Chezacut: 4 ♂, 1 ♀, 1 ?, 30 August–17 September.
Clearwater: 1 ♀, 2 June.
Goose Island: 1 ♀, 30 May.
Indianpoint Lake: 7 ♂, 3 ♀, 8 June–22 August.
Stuie: 1 ♂, 1 ♀, 28 May.
Swanson Bay: 2 ♂, 11–14 May.

PARULIDAE

VERMIVORA PEREGRINA (Wilson)

Bella Coola: 1 ♂, 3 June.
Bowron Lake: 1 ♂, 21 July.
Chezacut: 1 ?, 29 August.
Clearwater: 1 ♂, 1 June.
Indianpoint Lake: 5 ♂, 2 ♀, 1 ?, 1 June–23 July.
Isaac Lake: 2 ♂, 2 ♀, 18 July.
Kleena Kleen: 1 ♀, 16 July.

Breeding at Indianpoint Lake is indicated by a juvenal specimen, about one-quarter grown, collected on July 23, 1929.

VERMIVORA CELATA ORESTERA Oberholser

Anahim Lake: 7 ♂, 2 May–9 June.
Beaver Lake: 1 ♂, 22 June.
Bowron Lake: 1 ♀, 8 July.
Chezacut: 2 ♂, 1 ♀, 13 May–4 October.
Clearwater: 3 ♂, 2 ♀, 3 May–1 June.
Cottonwood: 1 ♂, 14 May.
Indianpoint Lake: 2 ♂, 1 ♀, 24 May–19 June.

Sixteen males have wing lengths between 59.0 mm. and 64.0 mm. (av. 62.3). The series is too small to arrive at any recommendation on the validity of *orestera* but it appears to be a fairly weak race on the basis of these specimens.

VERMIVORA CELATA LUTESCENS (Ridgway)

Aristazabel Island: 1 ♀, 3 June.
Calvert Island: 7 ♂, 4 ♀, 1 ?, 16 May–13 September.
Khutze Inlet: 1 ♀, 1 October.
Little Rainbow Mountains: 2 ♂, 22 June.
Swanson Bay: 12 ♂, 4 ♀, 5–16 May.

Twenty-one males range from 57.0 mm. to 63.0 mm. in wing length (av. 60.1). As can be seen from measurements of *V. c. orestera* there is a small average difference, with considerable overlap, between the coastal and inland populations. I can see no conspicuous color differences in the two samples.

Vermivora ruficapilla ridgwayi van Rossem

Clearwater: 7 ♂, 7 May–1 June.

Dendroica petechia rubiginosa (Pallas)

Atnarko: 1 ♂, 22 May.
Barkerville: 2 ♂, 5 June.
Bella Coola: 11 ♂, 5 ♀, 24 May–11 June.
Bowron Lake: 1 ?, Spring, 1933.
Calvert Island: 2 ♀, 11–18 September.
Chezacut; 1 ♂, 1 ♀, 2 September.
Clearwater: 6 ♂, 17 May–1 June.
Indianpoint Lake: 3 ♂, 1 ♀, 15 June–8 July.
Khutze Inlet: 2 ♂, 12 June–5 October.
Smyth Island (Bardswells): 1 ♀, 22 September.
Swanson Bay: 5 ♂, 2 ♀, 14–27 May.

I am in agreement with Munro and Cowan (1947: 192) when they comment that they are unable to detect any variation in the British Columbian material. They comment that both *Dendroica p. petecia* [*sic*] and *D. p. rubiginosa* have been recorded from the province but that they are unwilling to recognize two forms.

I have compared the British Columbian material at hand with typical *D. p. amnicola* and *D. p. aestiva*. I find that *aestiva* is brighter in color than the British Columbian sample. These birds can be distinguished from *amnicola* by the intensification of the dark areas on the outer rectrices. The dark areas also seem to be of slightly greater extent in *D. p. rubiginosa*. Five Alaskan birds agree well with the McCabe material.

Dendroica magnolia (Wilson)

Clearwater: 1 ♂, 2 ♀, 27 May–9 June.
Indianpoint Lake: 9 ♂, 3 ♀, 5 June–18 August.

Dendroica coronata hooveri McGregor

Anahim Lake: 1 ♂, 1 ♀, 29 April–19 May.
Beaver Pass: 1 ♀, 6 September.
Bella Coola: 6 ♂, 4 ♀, 26 April–9 May.
Clearwater: 2 ♂, 21–29 April.
Indianpoint Lake: 1 ♂, 21 May.

Khutze Inlet: 1 ?, 5 October.
Watson Lake: 1 ♀, 1 May.

Wetmore (1943: 313) has pointed out that *hooveri* is distinct from *D. c. coronata* in plumage stages of fall, winter, and early spring. The present series collected mainly during the summer months differs only faintly, if at all, from comparable birds from the northeastern United States.

Dendroica auduboni auduboni (Townsend)

Alexis Creek: 1 ?, 12 July.
Anahim Lake: 3 ♂, 3 ♀, 26 April–7 June.
Bella Coola: 6 ♂, 1 ♀, 27 April–5 May.
Bowron Lake: 1 ♂, 8 July.
Chezacut: 3 ♂, 5 ♀, 2 ?, 28 August–25 September.
Cottonwood: 1 ♂, 2 ♀, 20–24 May.
Clearwater: 15 ♂, 5 ♀, 24 April–1 June.
Indianpoint Lake: 7 ♂, 5 ♀, 20 May–3 August.
Marguerite: 1 ♂, 1 ♀, 2 ?, 8 September.
Natal: 1 ♂, 8 September.
100 Mile House: 1 ♂, 23 April.
Redstone: 1 ♂, 16 July.
Swanson Bay: 1 ♂, 1 ♀, 13–17 May.

Dendroica nigrescens (Townsend)

Stuie: 2 ♂, 1 ♀, 24–27 May.

Dendroica townsendi (Townsend)

Anahim Lake: 4 ♂, 9–15 May.
Bella Coola: 8 ♂, 3 May–11 June.
Calvert Island: 1 ♂, 16 May.
Chezacut: 1 ♂, 2 ♀, 29 August–26 September.
Clearwater: 5 ♂, 23 May–9 June.
Indianpoint Lake: 4 ♂, 1 ♀, 20 May–23 September.
Stuie: 1 ♂, 1 ♀, 25–28 May.

Dendroica castanea (Wilson)

Indianpoint Lake: 1 ♂, 12 July.

Dendroica striata (Forster)

Anahim Lake: 2 ♂, 8–9 June.
Barkerville: 1 ♀, 5 June.
Chezacut: 1 ♀, 2 September.
Indianpoint Lake: 8 ♂, 1 ♀, 1 ?, 14 June–26 August.
Rainbow Mountains: 1 ♂, 19 June.

SEIURUS NOVEBORACENSIS LIMNAEUS McCabe and Miller

Anahim Lake: 1 ♂, 8 June.
Bowron Lake: 1 ♂, 1 ♀, 8–21 July.
Indianpoint Lake: 5 ♂, 8–29 June.
Stuie: 1 ♂, 27 May.

McCabe and Miller (1933: 196) claim average differences in color and size for this form in distinguishing it from *S. n noveboracensis* and *S. n. notabilis*. Grinnell and Miller (1944: 409) "reaffirm" their belief in its validity. I can see no appreciable color difference in the topotypical material from Indianpoint Lake and a series of six birds from Lake Athabasca, Saskatchewan (*notabilis*). Wing measurements of the British Columbian males are between 73.0 mm. and 76.0 mm. (av. 74.7). The Saskatchewan males range from 73.0 mm. to 80.0 mm. (av. 76.8). The average difference claimed is apparently present—although the series is far too small to be acceptable as evidence. I believe that further study of *S. n. limnaeus* is needed to ascertain its true status.

OPORORNIS TOLMIEI TOLMIEI (Townsend)

Bella Coola: 7 ♂, 6 ♀, 30 May–15 June.
Bowron Lake: 2 ♀, 8–21 July.
Chezacut: 1 ♂, 16 September.
Clearwater: 4 ♂, 30 May–5 June.
Indianpoint Lake: 5 ♂, 1 ♀, 14 June–30 July.
Isaac Lake: 1 ♀, 18 July.
Khutze Inlet: 3 ♂, 12–13 June.
Lac la Hache: 1 ♀, 7 July.
Stuie: 3 ♂, 24 May–30 June.

Phillips (1947) in his review of the races of MacGillivray's Warbler has proposed several new forms for recognition. The McCabe collection (at least a portion of it) apparently was examined by Phillips in connection with the preparation of his report. Ten of the males from Bella Coola and Khutze Inlet are marked "*tolmiei* ARP '46." It appears that only seven of these were included in Phillips' final calculations (*op. cit.*: 300). My measurements (in mm.) of 10 males from Indianpoint Lake and Clearwater (inland localities) and 10 males from Stuie, Bella Coola and Khutze Inlet are as shown in Table 4.

Table 4

	Wing	*Tail*	*Wing–Tail*
Inland (N 10)	58.0–63.0	50.0–57.0	4.0–8.0 (Av. 6.0)
Coastal (N 10)	58.5–63.0	53.0–55.0	6.5–9.5 (Av. 8.2)

An average difference as estimated by Phillips is present but in the series at hand the trend is exactly the reverse of that which he found. The inadequacy of the present material and that which Phillips examined is clearly shown. Using my measurements I find that I am able to allocate correctly only 60 per cent of the McCabe birds on the basis of difference in wing length and tail length. Perhaps the existence of two forms of MacGillivray's Warbler in British Columbia can be shown by more adequate series combined with statistical treatment of the data. Under the circumstances, however, I see no course but to refer all of the McCabe birds to *tolmiei*. Rand (1948a: 76) has also reviewed this problem and he too was hampered by inadequate material.

Geothlypis trichas campicola Behle and Aldrich

Chezacut: 6 ♂, 7 ♀, 30 August–14 September.
Clearwater: 2 ♂, 3 ♀, 30 May–9 June.
Indianpoint Lake: 7 ♂, 1 ♀, 1 ?, 21 June–17 August.

With only two exceptions all of the birds (18) collected in August and September proved to be birds of the year.

I have examined typical material of *G. t. occidentalis*, including the type, and I feel that Behle and Aldrich (1947) have correctly assessed the trends in geographic variation as they are represented in British Columbia.

Wilsonia pusilla pileolata (Pallas)

Anahim Lake: 9 ♂, 3 ♀, 3 May–8 June.
Atnarko: 3 ♀, 22 May.
Barkerville: 1 ♂, 1 ♀, 5 June–3 July.
Bella Coola: 13 ♂, 17 ♀, 6 May–9 June.
Blackpool: 1 ♂, 2 May.
Bowron Lake: 1 ♂, 1 ?, Spring 1933–21 July.
Calvert Island: 3 ♂, 2 May–23 May.

Chezacut: 3 ♂, 3 ♀, 29 August–6 September.
Clearwater: 4 ♂, 3 May–5 June.
Cottonwood: 1 ♂, 23 May.
Indianpoint Lake: 3 ♂, 3 ♀, 27 May–21 August.
Isaac Lake: 1 ♀, 18 July.
Stuie: 3 ♂, 1 ♀, 24–25 May.
Swanson Bay: 1 ♂, 3 ♀, 12–14 May.

Mr. McCabe noted that the specimen collected at Chezacut on September 6, 1933 was an immature female in male plumage. His notes on this bird are as follows: "Number 2384 im, ♀, in ♂ plumage. Sexing unquestionable — ovary substantial though flaccid and semi-transparent, structure visible under hand lens, duct traced to vent."

All of the McCabe specimens are referable to this race rather than *W. p. chryseola*. If there be any constant difference in coloration it appears that the inland birds are slightly brighter than those from Bella Coola, Stuie and Calvert Island.

SETOPHAGA RUTICILLA TRICOLORA (Müller)

Alexis Creek: 1 ♀, 10 July.
Anahim Lake: 1 ♂, 2 ♀, 7 June–10 July.
Bella Coola: 1 ♂, 1 ♀, 7–25 June.
Bowron Lake: 2 ♂, 2 ♀, Spring 1933–21 July.
Clearwater: 2 ♂, 30 May–1 June.
Indianpoint Lake: 6 ♂, 3 ♀, 1 June–27 July.
150 Mile House: 1 ♂, 22 July.

Two males and one female collected at Bowron Lake in the spring of 1933 were found as mummies, apparently winter-killed.

PLOCEIDAE

PASSER DOMESTICUS DOMESTICUS (Linné)

Indianpoint Lake: 1 ♂, 2 ♀, 15 May–25 October.

ICTERIDAE

STURNELLA NEGLECTA Audubon

Alexis Creek: 1 ♂, 3 April.
Clearwater: 2 ♂, 10 May.
Lac la Hache: 2 ♀, 5 July.
Lillooet, 20 miles west: 1 ♂, 23 June.
100 Mile House: 1 ♂, 29 April.
Port Hardy: 2 ♀, 26–28 October.
Poultney Point: (Malcolm Id.): 1 ♀, 30 September.

Xanthocephalus xanthocephalus (Bonaparte)

Alexis Creek: 1 ♂, 12 July.
Anahim Lake: 1 ♀, 12 June.
100 Mile House: 2 ♂, 28 April.
130 Mile House: 1 ♂, 24 June.
Springhouse: 1 ♂, 7 May.

Agelaius phoeniceus ssp.

Calvert Island: 1 ♂, 16 May.

This specimen can not be satisfactorily referred to any of the known forms. The bill is excessively heavy — much heavier than *A. p. caurinus*, *arctolegus* or *nevadensis*. It most closely approaches the massive-billed *A. p. fortis* in this character. It is apparently an individual variant, most logically, of *caurinus*.

Agelaius phoeniceus arctolegus Oberholser

Buffalo Lake: 3 ♂, 1 ♀, 26 April.
Clearwater: 1 ♂, 1 ♀, 6–10 May.
Indianpoint Lake: 1 ♂, 22 May.
Lac la Hache: 1 ♂, 5 July.
100 Mile House: 8 ♂, 3 ♀, 24–30 April.

The localities listed are, it appears, from the southern edge of the range of *arctolegus*. I believe that these birds are closer to this form than to *A. p. nevadensis* but two females from 100 Mile House are slightly grayer than typical *arctolegus* and indicate the influence of the southern race.

Agelaius phoeniceus caurinus Ridgway

Ione Island: 4 ♂, 1 ♀, 15–17 April.

Euphagus carolinus (Müller)

Anahim Lake: 2 ♂, 3 ♀, 23 April–7 May.
Barkerville: 1 ♂, 28 May.
Beaver Pass: 1 ♂, 6 September.
Bowron Lake: 2 ♂, 1 ♀, 29–30 June.
Chezacut: 5 ♂, 1 ♀, 5–24 September.
Clearwater: 1 ♂, 20 May.
Cottonwood: 2 ♂, 15 August.
Indianpoint Lake: 4 ♂, 3 ♀, 1 May–24 June.
Kleena Kleen: 1 ♀, 17 July.
150 Mile House: 1 ♀, 22 July.
Rainbow Mountains: 1 ♂, 17 June.

EUPHAGUS CYANOCEPHALUS (Wagler)

Alexis Creek: 2 ♂, 12 July.
Anahim Lake: 6 ♂, 5 ♀, 15 April–10 June.
Beaver Pass: 1 ♀, 6 September.
Chezacut: 8 ♂, 6 ♀, 3–24 September.
Clearwater: 2 ♂, 1 ♀, 22 April–6 May.
Cottonwood: 3 ♂, 4 ♀, 20 May–7 September.
Indianpoint Lake: 3 ♀, 1 ?, 26 April–30 June.
Lac la Hache: 1 ♂, 1 ♀, 7 July.
Lillooet: 1 ♂, 1 ♀, 23 June.
100 Mile House: 3 ♂, 2 ♀, 28 April–3 May.
150 Mile House: 2 ♀, 22 July.
Tatla Lake: 2 ♂, 2 ♀, 16 July.

MOLOTHRUS ATER ARTEMISIAE Grinnell

Indianpoint Lake: 1 ♀, 1 ?, 23 May–27 July.
Lac la Hache: 1 ♀, 5 July.

THRAUPIDAE

PIRANGA LUDOVICIANA (Wilson)

Anahim Lake: 1 ♂, 19 May.
Atnarko: 1 ♀, 22 May.
Bella Coola: 2 ♂, 3–7 June.
Birch Island: 1 ♂, 18 May.
Clearwater: 10 ♂, 1 ♀, 5 May–3 June.
Indianpoint Lake: 2 ♂, 3 ♀, 21 May–27 July.
Stuie: 2 ♂, 22–28 May.

FRINGILLIDAE

PHEUCTICUS MELANOCEPHALUS MACULATUS (Audubon)

Bella Coola: 1 ♀, 3 July.

PASSERINA AMOENA (Say)

Lillooet, 12–28 miles north: 2 ♂, 23 June.

HESPERIPHONA VESPERTINA BROOKSI Grinnell

Bella Coola, 30 miles east: 1 ♂, 30 May.
Bowron Lake: 1 ♀, 1 July.
Clearwater: 2 ♂, 4 ♀, 20 May–8 June.
Indianpoint Lake: 3 ♂, 25 June–27 July.

CARPODACUS PURPUREUS CALIFORNICUS Baird

Bella Coola: 2 ♂, 1 ♀, 21 April–5 June.
Sea Island: 1 ♀, 13 April.

Duvall (1945b: 202), in proposing the subspecies *C. p. rubidus*, comments that birds from the Bella Coola region may be intermediate between *rubidus* and *C. p. purpureus*. He bases this statement on an earlier conclusion of Laing (1942: 181) who quoted Allan Brooks' identification of specimens from this area as intermediate between *californicus* (= *rubidus* of Duvall) and *purpureus*. Rand (1946: 96) has re-examined Laing's specimens and states that these birds are "plainly referable to *rubidus* in color." He adds that the measurements of the wing, ". . . (male, 78, 82; female, 78, 78) while not conclusive, permit the same allocation." Rand does not give any measurements of *rubidus* and I assume that he was using those supplied by Duvall (*loc. cit.*: 204) as the basis for this comment. If this be the case then it should be pointed out that the larger male might just as well be referred to *purpureus*.

In describing a fourth subspecies Rand (*loc. cit.*: 95) characterizes it as being in the same size category as *purpureus* (wing length of 10 males, 82–87 mm.) — larger than *californicus* and *rubidus*. In color, *C. p. taverneri* Rand is stated to be paler than any of the other forms. Streaking of the dorsal surfaces is indicated as being most pronounced in *taverneri*. Rand postulates that the birds of northern and eastern British Columbia probably belong to this form.

I find that the coastal and inland birds are barely separable on the basis of wing length. Wing lengths in the two males listed above are 81.0 mm. and 82.5 mm. Fourteen males from inland localities (listed below) range from 80.5 mm. to 87.5 mm. However, their smallish size, combined with color differences is sufficient, I believe, to refer them to *C. p. californicus*. I have compared these birds with a series of twenty skins from the San Bernardino Mountains of California which are in the same stages of plumage wear. I can see only a slight difference in color in the two samples. I find it impossible to pick out the British Columbian birds when they are placed in this southern series. I do not think that the northern birds are sufficiently and constantly different enough to warrant nomenclatorial recognition.

CARPODACUS PURPUREUS PURPUREUS (Gmelin)

Clearwater: 6 ♂, 1 ♀, 10 May–1 June.
Cottonwood: 5 ♂, 16–22 May.
Indianpoint Lake: 2 ♂, 29 April–2 May.
Quesnel: 1 ♂, 3 July.

The wing length of the males listed here is given in connection with the discussion of the preceding form. On the basis of size these birds approximate the limits of variation for ten males as given by Rand (*op. cit.*) in his description of *C. p. taverneri*. Rand does not indicate that *taverneri* differs from *purpureus* in size. The limits of variation for *purpureus* as given by Duvall (*op. cit.*: 204) are 80.0 mm.–87.0 mm. I have used adult males from the northeastern United States for comparison of color and I do not note the light color which Rand predicts for the British Columbian interior population. I believe that these birds are correctly referred to the nominate form.

Carpodacus cassinii Baird

Clinton: 1 ♂, 1 ♀, 8 May.

Duvall (1945b: 203) has proposed the name *C. c. vinifer* for use in designating the northern portion of the population of this species. He characterizes *vinifer* as being of the same size as *C. c. cassinii* but differing in color. The McCabe specimens are obviously insufficient for the formation of any concept of variation. I am unable, however, to distinguish them from Colorado birds in comparable plumage. In this circumstance I see no course open but to refer these specimens to *C. cassinii*.

Pinicola enucleator alascensis Ridgway

Beaver Pass: 1 ♂, 1 ♀, 16 March.
Bowron Lake: 1 ♂, 27 November.
Cottonwood: 4 ♂, 1 ♀, 14 March–7 November.

Using bill shape and the amount of color present on the rump of the females, I believe that these specimens are correctly allocated to this form.

Pinicola enucleator montana Ridgway

Anahim Lake: 1 ♂, 1 ♀, 28 April.
Bowron Lake: 1 ♂, 1 ♀, 30 June.
Indianpoint Lake: 2 ♂, 3 June–31 July.

Leucosticte tephrocotis littoralis Baird

Bella Coola, Mts. northeast: 1 ♂, 25 June.
Rainbow Mountains: 2 ♂, 20 June.
Swanson Bay, peaks above Yule Lake: 2 ♂, 24 June.

Leucosticte tephrocotis tephrocotis (Swainson)

Indianpoint Lake: 5 ♂, 1 ?, 27 May–14 July.

These specimens were taken at altitudes of 6500–7000 feet.

Acanthis flammea flammea (Linné)

Cottonwood: 3 ♂, 1 ♀, 28 January.
Indianpoint Lake: 2 ♂, 4 ♀, 23–26 October.

Spinus pinus pinus (Wilson)

Alexis Creek: 1 ♀, 4 April.
Bella Coola: 7 ♂, 4 ♀, 6–10 June.
Clearwater: 1 ♂, 1 ♀, 1 June.
Indianpoint Lake: 12 ♂, 3 ♀, 1 ?, 8 June–27 July.
150 Mile House: 1 ♂, 22 July.
Swanson Bay: 3 ♂, 3 ♀, 11 May–26 September.

Spinus tristis jewetti van Rossem

Sea Island: 2 ♂, 22 September.

Wing measurements of 71.5 mm. and 73.0 mm. seem to indicate that these specimens should be referred to this form (see van Rossem, 1943: 158).

Spinus psaltria hesperophila (Oberholser)

Indianpoint Lake: 1 ♂, 9 June.

This specimen apparently constitutes the first record for the form in British Columbia. Mr. McCabe notes: "One lone ♂ suddenly appeared below dining room window and lit on a dandelion. I heard its plaintive note at the same time as I rushed for the gun. It turns out to be not only new to B. C. but I find none of this species listed for Canada! . . . . . Testes 5.4 mm., crop filled with dandelion seeds—moderately fat. Looked and listened several times in course of day but find no mate. A south wind has been blowing but should not suppose it likely to have blown this bird so far out of its range as it is not an especially strong wind."

Loxia curvirostra sitkensis Grinnell

Balaklava Island: 3 ♂, 1 ♀, 11 June.
Goose Island: 1 ♂, 1 ♀, 30 May–20 July.
Hurst Island: 1 ?, 18 June.
Indianpoint Lake: 2 ♂, 21 June–9 August.
Swanson Bay: 3 ♂, 4 ♀, 15–28 June.
Table Island: 1 ♀, 7 June.
Williams Lake: 2 ♂, 25 June.

Wing lengths of the males in this series range from 82.5 mm. te 86.5 mm. Culmens are all less than 15.0 mm. The inland records for this form are apparently not unusual according to Munro and Cowan (1947: 215).

Loxia curvirostris bendirei Ridgway

Indianpoint Lake: 16 ♂, 5 ♀, 1–24 August, (1 ?, Spring, 1933).
Quesnel: 1 ♂, 1 ♀, 3 July.
Swanson Bay: 3 ♂, 2 ♀, 28 May–20 June.
Williams Lake: 4 ♂, 3 ♀, 31 March.

These birds all have wing lengths of more than 87 mm. and culmens of more than 15 mm. Eleven additional skins from Indianpoint Lake, and two from Alexis Creek are probably referable to this form. They are made up as "flat skins" with no head and hence positive identification is not possible.

Two females taken at Indianpoint Lake on August 13 and 19, 1931 had shelled eggs in the oviducts — apparently ready to lay.

Loxia leucoptera leucoptera Gmelin

Chezacut: 1 ♂, 6 September.
Cottonwood: 5 ♂, 1 ♀, 26 July–13 November.
Flathead Summit: 1 ♂, 10 September.
Indianpoint Lake: 4 ♂, 8 ♀, 2 August–5 October.

Pipilo erythrophthalmus curtatus Grinnell

Lillooet: 1 ♂, 23 June.

I have commented elsewhere (1951: 350) as to Sibley's (1950: 119) recommendation to merge *Pipilo maculatus* and *Pipilo erythrophthalmus*. My own work with the eastern populations (1952) supports his view.

Passerculus sandwichensis sandwichensis (Gmelin)

Bella Coola: 1 ♂, 5 May.
Calvert Island: 4 ♂, 2 ♀, 5 May–21 October.
Hardy Bay: 2 ♂, 1 ♀, 30 September.
Mayer Island (Seymour Inlet): 1 ♂, 15 October.
Port Hardy: 1 ♀, 28 October.
Shelter Island: 2 ♂, 21 October.
Table Island: 4 ♂, 2 ♀, 12–21 September.

These migrants appear to be certainly referable to this form. Measurements of the males are as follows: wing [15], 76.5 mm.–80.5 mm. (av. 78.1); depth of bill [13], 5.9 mm.–7.5 mm. (av. 6.6); culmen [14], 9.6 mm.–11.2 mm. (av. 10.4). Wing measurements of the five females are from 75.0 mm. to 76.0 mm. In addition, the specimens listed here conform in color to the diagnosis given by Peters and Griscom (1938: 448) in their revisionary study of variation in the species.

PASSERCULUS SANDWICHENSIS BROOKSI Bishop

Bella Coola: 1 ♂, 9 May.
Lulu Island: 5 ♂, 1 ♀, 17 April.
Rainbow Mountains: 6 ♂, 2 ♀, 17–19 June.

Measurements of the males in this series are as follows: wing [11], 68.0 mm.–74.0 mm. (av. 67.7); depth of bill [11], 5.4 mm.–5.8 mm. (av. 5.6); culmen [10], 9.0 mm.–10.0 mm. (av. 9.5).

The specimens collected in the Rainbow Mountains were apparently resident birds. One female taken on 17 June, 1932 had a "16 millimeter" egg in the oviduct.

PASSERCULUS SANDWICHENSIS ANTHINUS Bonaparte

Anahim Lake: 3 ♂, 1 ♀, 3–12 May.
Bella Coola: 1 ♂, 4 May.
Barkerville: 1 ♂, 2 ♀, 28 May–6 September.
Calvert Island: 4 ♂, 1 ♀, 4–15 September.
Chezacut: 10 ♂, 7 ♀, 14 July–28 September.
Clearwater: 6 ♂, 2 ♀, 25 April–6 June.
Cottonwood: 1 ♂, 22 May.
Indianpoint Lake: 2 ♀, 2 ?, 17 August–3 September.
Khutze Inlet: 1 ♀, 24 May.
LeRoy Lake: 1 ?, 24 September.
Marguerite: 1 ♂, 5 September.
100 Mile House: 6 ♂, 24–29 April.
"103 L", near 100 Mile House: 2 ♂, 1 ♀, 30 April–1 May.
Swanson Bay: 1 ♂, 1 ♀, 7–10 May.
Watson Lake: 4 ♂, 1 May.

Color and size in these specimens seem to conform to the description provided by Peters and Griscom (*op. cit.:* 463). Measurements of the males are as follows: wing [36], 71.0 mm.–76.0 mm. (av. 73.1); depth of bill [32], 5.0 mm.–6.0 mm. (av. 5.4); culmen [35], 9.1 mm.–10.8 mm. (av. 9.7).

PASSERCULUS SANDWICHENSIS CRASSUS Peters and Griscom

Bella Coola: 12 ♂, 1 ♀, 29 April–9 May.
Calvert Island: 6 ♂, 11 ♀, 26 April–15 September.
Goose Island: 1 ♀, 30 May.
Hardy Bay: 1 ♂, 2 ♀, 30 September.
LeRoy Bay: 1 ♂, 1 ♀, 24 September.
Lulu Island: 1 ♀, 1 ?, 5 October.
Smyth Island: 1 ♀, 11 October.
Swanson Bay: 3 ♂, 2 ♀, 7 May–26 September.
Table Island: 4 ♀, 21–22 September.

Measurements of these males are as follows: wing [23], 70.0 mm.–76.0 mm. (av. 73.5); depth of bill [20], 5.7 mm.–7.0 mm. (av. 6.3); culmen [22], 9.3 mm.–11.2 mm. (av. 10.1).

PASSERCULUS SANDWICHENSIS NEVADENSIS Grinnell

Anahim Lake: 1 ♂, 1 ♀, 12 June.
Barkerville: 5 ♂, 2 ♀, 29 May–25 July.
Bowron Lake: 1 ♂, 21 July.
Buffalo Lake: 1 ♂, 26 April.
Chezacut: 2 ♂, 2 ♀, 29 August–5 September.
Indianpoint Lake: 4 ♂, 6 ♀, 6 June–6 July.
Lac la Hache: 2 ♀, 5 July.
127 Mile House: 1 ♂, 5 July.

Measurements of the fifteen males are as follows: wing, 67.5 mm.–76.5 mm. (av. 72.2); depth of bill, 5.2 mm.–6.2 mm. (av. 5.7); culmen, 9.0 mm.–11.2 mm. (av. 9.9).

A female collected at Anahim Lake on June 12, 1932 had a 16 mm. yolk in the oviduct. Another female from Indianpoint Lake, June 6, 1930, had an egg in the duct ready to lay.

POOECETES GRAMINEUS GRAMINEUS (Gmelin)

Anahim Lake: 1 ♂, 15 May.
Chezacut: 5 ♂, 4 ♀, 28 August–15 September.
Clinton: 1 ♀, 8 May.
Hanceville: 1 ♀, 21 July.
Indianpoint Lake: 1 ♂, 1 ♀, 12 May–25 August.
Lac la Hache: 1 ♂, 5 July.
Lillooet: 3 ♂, 23 June.
Marguerite: 1 ?, 8 September.
100 Mile House: 6 ♂, 2 ♀, 26 April–3 May.
150 Mile House: 2 ♂, 1 ♀, 22 July.
Quesnel: 1 ♀, 3 July.
Redstone: 1 ♀, 16 July.
Riske Creek: 1 ♀, 21 July.
70 Mile House: 1 ♂, 5 May.
Soda Creek: 1 ♂, 8 September.
Williams Lake: 1 ♂, 25 June.

These skins have been compared with specimens in comparable plumage collected in the eastern United States and with others from Arizona and Colorado. In color they must be referred to the eastern form. They are not nearly so pale as the southwestern birds which I take to represent *P. g. confinis* Baird. Twenty-one males have wing lengths between 80.0 mm. and 88.0 mm. (av. 83.9). Ten eastern males

(Massachusetts) range from 81.0 mm. to 86.0 mm. (av. 82.3). Eleven males from Arizona and Colorado have wing lengths between 83.5 mm. and 89.5 mm. (av. 85.9). The larger average size claimed for *confinis* by Ridgway (1901 : 184) seems much more evident in the southwestern part of its range. Despite the considerable overlap in measurements these southwestern birds are easily recognized by their paleness. The British Columbian material, on the other hand, can not be separated from the eastern birds on the basis of either size or color.

Junco hyemalis hyemalis (Linné)

Clearwater: 2 ♂, 2–27 May.

These specimens are both gray-headed, gray-sided birds and I believe correctly assigned to this form.

Junco hyemalis montanus Ridgway

Clearwater: 27 ♂, 10 ♀, 1 ?, 19 April–11 May.
Natal, 15 miles north: 2 ♂, 8 September.
100 Mile House: 4 ♂, 3 ♀, 23 April–3 May.

Junco hyemalis shufeldti Coale

Sea Island: 1 ♀, 13 April.

A short wing (70.0 mm.) and quite brown-back color refers this specimen from near Vancouver to this form.

Junco hyemalis oreganus (Townsend)

Calvert Island: 7 ♂, 4 ♀, 23 April–18 September.

These specimens are much redder in back color than birds from the southern coast of British Columbia. Wing length of the males ranges from 75.5 mm. to 78.8 mm. The adult females (3) range from 72.0 mm. to 73.0 mm. Size is not a critical factor in distinguishing *J. h. oreganus* and *J. h. shufeldti* and these specimens (possibly migrants) must be referred to this form on the basis of color of the back.

Spizella arborea ochracea Brewster

Indianpoint Lake: 2 ♀, 25 September–6 October.

Spizella passerina arizonae Coues

Alexis Creek: 1 ♂, 1 ?, 10 July.
Anahim Lake: 3 ♂, 1 ♀, 8–10 June.
Barkerville: 1 ♂, 3 July.
Beaver Lake: 1 ♀, 12 June.
Bella Coola, 30 miles east: 3 ♂, 30 May–3 June.
Bowron Lake: 1 ♂, 8 July.

Clearwater: 9 ♂, 5 ♀, 22 May–6 June.
Hanceville: 1 ♂, 21 July.
Indianpoint Lake: 4 ♂, 8 ♀, 23 May–21 September.
Lillooet: 1 ♂, 1 ♀, 23 June.
100 Mile House: 2 ♂, 1–4 May.
Quesnel: 2 ♂, 3 July.
Soda Creek: 1 ♂, 8 September.

This excellent series is much paler than typical *S. p. passerina* from the eastern United States. Wing length in 28 males ranges from 70.0 mm. to 76.0 mm. (av. 72.9). Thirteen males from Massachusetts and South Carolina range from 66.5 mm. to 73.0 mm. (av. 69.2).

Spizella pallida (Swainson)

Beaver Lake: 1 ♀, 6 June.
Indianpoint Lake: 1 ♂, 19 September.

The specimen collected at Beaver Lake in 1930 apparently is not included in the records available to Pitelka (1947).

Zonotrichia leucophrys gambellii (Nuttall)

Ashcroft: 3 ♂, 1 ♀, 19 April.
Anahim Lake: 4 ♂, 24 April–1 May.
Barkerville: 1 ♂, 1 ♀, 1 ?, 6 September.
Bella Coola: 9 ♂, 6 ♀, 2 May–3 June.
Bowron Lake: 1 ♂, 5 September.
Calvert Island: 1 ♂, 27 April.
Chezacut: 11 ♂, 15 ♀, 1 ?, 30 August–28 September.
Clearwater: 13 ♂, 6 ♀, 1 ?, 25 April–10 May.
Clinton: 7 ♂, 20–24 April.
Cottonwood: 2 ♂, 1 ♀, 14–26 May.
83 Mile House: 1 ♂, 20 April.
Indianpoint Lake: 7 ♂, 6 ♀, 1 May–21 September.
Kersley: 1 ♂, 8 September.
Lac la Hache: 1 ♂, 7 July.
100 Mile House: 3 ♂, 7 ♀, 19–30 April.

Of the males, 76 are white-lored, two are black-lored (see Rand 1948b: 426).

Zonotrichia leucophrys pugetensis Grinnell

Comox: 6 ♂, 5 ♀, 7 May–3 June.
Huntingdon: 8 ♂, 8 ♀, 1 ?, 5 May–5 October.
Metchosin: 2 ♂, 5 August–14 September.
Merville: 25 ♂, 7 ♀, 15 April–4 June.
Sea Island: 4 ♂, 3 ♀, 16 April–22 September.
Victoria: 4 ♂, 4 ♀, 8 May–1 September.

ZONOTRICHIA CORONATA (Pallas)

Anahim Lake: 1 ♂, 15 May.
Barkerville: 1 ?, 13 July.
Bella Coola: 17 ♂, 3 ♀, 22 April–5 May.
Calvert Island: 2 ♂, 6 ♀, 20 April–18 September.
Chezacut: 2 ♂, 1 ?, 16–28 September.
Clearwater: 1 ♂, 9 May.
Fitzhugh Sound: 1 ♀, 15 May.
Indianpoint Lake: 4 ♂, 11 ♀, 16 May–16 August.
LeRoy Lake: 1 ?, 24 September.
Rainbow Mountains: 3 ♂, 17 June.
Stuie: 1 ♂, 29 May.

ZONOTRICHIA ALBICOLLIS (Gmelin)

Indianpoint Lake: 1 ♂, 5 October.

PASSERELLA ILIACA ZABORIA Oberholser

Indianpoint Lake: 1 ♂, 15 September.

PASSERELLA ILIACA ALTIVAGANS Riley

Indianpoint Lake: 1 ♂, 1 ♀, 7 May–16 July.

PASSERELLA ILIACA OLIVACEA Aldrich

Rainbow Mountains: 4 ♂, 1 ♀, 1 ?, 17-19 June.

This race described by Aldrich (1943) from Mount Ranier, Washington, is undoubtedly breeding in the Rainbow Mountains. One male and one bird of unknown sex collected on June 18, 1932 are juvenals — one-quarter to one-half grown. The adults were compared with topotypical material of *olivacea* in the collections of the U. S. National Museum.

PASSERELLA ILIACA UNALASCHCENSIS (Gmelin)

Bella Coola: 3 ♀, 23 April–8 May.
Calvert Island: 1 ♀, 29 April.
Smyth Island: 1 ♀, 22 September.

PASSERELLA ILIACA SINUOSA Grinnell

Calvert Island: 2 ♂, 29–30 April.

PASSERELLA ILIACA TOWNSENDI (Audubon)[1]

Bella Coola: 3 ♂, 2 ♀, 24 April–9 May.
Calvert Island: 1 ♂, 2 ♀, 27–30 April.
Khutze Inlet: 1 ♂, 5 October.

[1] J. Dan Webster of Hanover College borrowed 17 specimens from the McCabe collection during the course of my study. He has kindly furnished me with the following list of this series with his critical determinations. *P. i. townsendi:* Bella Coola (9), April 22–May 2; Calvert Island (1), Sept. 11; Goose Island (1), May 30; Vancouver Island (3), Sept. 30. *P. i. fulginosa:* Calvert Island (1), Sept. 16; Table Island (2) Sept. 21.

PASSERELLA ILIACA INSULARIS Ridgway

Pitt Island: 1 ♂, 28 September.

PASSERELLA ILIACA ANNECTENS Ridgway

Bella Coola: 1 ♂, 25 April.
Calvert Island: 2 ♂, 27–29 April.
Chezacut: 2 ♀, 2 September–4 October.
Indianpoint Lake: 1 ♂, 15 September.

MELOSPIZA LINCOLNII LINCOLNII Audubon

Anahim Lake: 3 ♂, 1 ♀, 30 April–6 May.
Australian: 1 ♂, 8 September.
Bella Coola: 7 ♂, 2 ♀, 27 April–11 September.
Birch Island: 1 ?, 30 April.
Calvert Island: 1 ♂, 2 ♀, 1 ?, 8–15 September.
Chezacut: 7 ♂, 3 ♀, 28 August–17 September.
Clearwater: 5 ♂, 2 ♀, 22 April–6 May.
Cottonwood: 1 ♀, 12 August [?].
Indianpoint Lake: 10 ♂, 6 ♀, 2 June–6 September.
Isaac Lake: 1 ♂, 18 July.
Lac la Hache: 1 ♀, 6 July.

Thirty-five males range from 61.0 mm. to 67.0 mm. (av. 64.0 mm.) in wing length. Twenty females have wing lengths between 57.5 mm. and 63.0 mm. (av. 60.6).

The birds collected on Calvert Island and Bella Coola are apparently migrants. McCabe comments in Miller and McCabe's (1935: 151) study of *M. lincolnii*, that he had not at that time found the species breeding at Bella Coola. In wing length these birds are fairly large (61–63 mm.) and in color I believe that they are closer to *M.l. lincolnii*. McCabe at a later date did discover the species breeding at Khutze Inlet and the birds collected there seem closer to *gracilis* in color although the size of one is nearer *lincolnii*.

MELOSPIZA LINCOLNII GRACILIS Kittlitz

Bella Coola: 1 ♂, 7 May.
Khutze Inlet: 3 ♂, 12 June.
Swanson Bay: 1 ♀, 17 May.

The specimens collected at Khutze Inlet in 1936 were breeding birds. In his field notes for this day Mr. McCabe writes, ". . . Finally found breeding rather commonly on flats at Khutze Inlet in crabs and willows and in heavy grass and siwash rhubarb June 12–13. By this time had young out of nest . . ." In color these birds are referable to *gracilis* although in wing length one specimen is nearer *M. l. lincolnii.* Wing length of the males varies from 58.0 mm. to 63.0 mm. The female has a shorter wing, 55.0 mm.

MELOSPIZA GEORGIANA ERICRYPTA Oberholser

Indianpoint Lake: 1 ♂, 9 October.

McCabe and McCabe (1932) have previously reported this specimen.

MELOSPIZA MELODIA CAURINA Ridgway

Allison Harbor: 4 ♀, 17–20 October.
Calvert Island: 1 ♂, 4 ♀, 8–21 September.
Estevan Island: 1 ♂, 1 ♀, 3–4 October.
Hardy Bay: 1 ♀, 30 September.
Hurst Island: 1 ♀, 25 September.
Koeye River: 1 ♂, 12 September.
Khutze Inlet: 1 ♂, 1 ♀, 4–5 October.
Lowe Inlet: 1 ♂, 23 September.
Pitt Island: 1 ♀, 28 September.
Princess Royal Island: 1 ♀, 28 September.
St. Johns Harbor: 1 ♀, 19 September.
Smyth Island: 2 ♂, 22–23 September.
Swanson Bay: 1 ♂, 1 ♀, 29 September.
Table Island: 1 ♂, 3 ♀, 19–21 September.

These birds as a group stand out as being much larger than the remainder of the specimens collected along the coast during the fall (see Tables 5, 6 and 7). Nine males range from 72.0 mm. to 75.5 mm. (av. 73.8) in wing length. Wing length of 18 females ranges from 69.0 mm. to 74.0 mm. (av. 71.4). Both sexes are much less ruddy in color than the remainder of the coastal birds and are easily separable on this basis alone.

MELOSPIZA MELODIA RUFINA Bonaparte

Moore Islands: 1 ♀, 12 September.

Wing length of 72.0 mm. and quite reddish plumage — not dark as in remainder of the large specimens — I believe refers this bird to *rufina.*

MELOSPIZA MELODIA MORPHNA Oberholser
(Coastal localities)

Allison Harbor: 2 ♂, 20–21 October.
Aristazabel Island: 4 ♂, 2 ♀, 4 June–10 September.
Bella Coola: 9 ♂, 8 ♀, 22 April–3 July.
Calvert Island: 5 ♂, 8 ♀, 21 April–18 September.

Clam Cove: 1 ♀, 10 June.
Estevan Island: 1 ♂, 3 October.
Goose Island: 1 ♂, 30 May.
Hardy Bay: 2 ♀, 30 September.
Hurst Island: 2 ♀, 26 August–26 September.
Ione Island: 9 ♂, 6 ♀, 15–17 April.
Khutze Inlet: 8 ♂, 4 ♀, 24 May–1 October.
Koeye River: 1 ♂, 1 ♀, 14 July–12 September.
Moore Islands: 1 ♂, 1 ?, 12 September.
Phillips Arm: 2 ♂, 5 November.
Poultney Point: 2 ♂, 1 ♀, 30 September.
Princess Royal Island: 2 ♂, 2 ♀, 21 June.
St. Johns Harbor: 1 ♀, 19 September.
Sea Island: 4 ♂, 13 April.
Smyth Island: 1 ♀, 22 September.
Stuie: 1 ♂, 27 May.
Swanson Bay: 4 ♂, 1 ♀, 17–21 May.
Table Island: 1 ♂, 2 ♀, 8 June–21 September.
Victoria, 14 miles northwest: 1 ♂, 16 October.

(Inland localities)

Alexis Creek: 1 ♀, 20 July.
Anahim Lake: 3 ♂, 2 ♀, 19 April–8 June.
Atnarko: 1 ♀, 4 June.
Australian: 2 ♂, 8 September.
Beaver Lake: 1 ♀, 30 May.
Buffalo Lake: 1 ♂, 26 April.
Chezacut: 10 ♂, 9 ♀, 8 June–2 October.
Clearwater: 8 ♂, 7 ♀, 21 April–3 June.
Cottonwood: 4 ♂, 14 May–12 August.
Indianpoint Lake: 7 ♂, 2 ♀, 12 June–12 September.
100 Mile House: 2 ♂, 1 ♀, 28 April–3 May.
127 Mile House: 2 ♂, 3–4 July.
150 Mile House: 1 ♂, 22 July.

Munro and Cowan (1947: 236) state that, in their opinion, the characters differentiating *M.m. morphna* and *M.m.inexpectata* Riley are demonstrable. The range of *morphna* is given as including the "Coast Forest" biotic area. I can see no constant color differences in the coastal and inland birds collected by McCabe. Measurements (in mm.) of the two groups of specimens are summarized in Tables 5, 6, and 7.

Table 5

Males	*Wing*	*Culmen*
Coastal Spring (April–June)	N = 40 66.0–72.0 (68.9)	N = 40 10.5–12.9 (11.0)
Coastal Fall (August–Oct.)	N = 18 66.0–72.0 (69.7)	xxx
All Coastal	N = 58 66.0–72.0 (69.2)	N = 40 10.5–12.9 (11.0)

Table 6

Females	*Wing*	*Culmen*
Coastal Spring (April–July)	N = 26 63.0–69.5 (66.1)	N = 26 10.4–13.2 (11.4)
Coastal Fall (Aug.–Sept.)	N = 16 63.5–69.0 (66.5)	N = 15 10.5–11.9 (11.2)
All Coastal	N = 42 63.0–69.5 (66.3)	N = 41 10.4–13.2 (11.4)

I have also compared the McCabe birds with material in the collections of the Museum of Comparative Zoology which was taken in southeastern British Columbia and find that they are indistinguishable. I have seen no specimens of *M. m. merrilli* Brewster but I believe that Swarth (1923) was correct in his assessment of the lack of geographic variation in coastal and inland British Columbian populations.

Table 7

	Wing	*Culmen*
Interior Males	N = 40 67.0–72.0 (68.8)	N = 10 11.0–11.6 (11.2)
Interior Females	N = 23 63.0–69.0 (65.0)	xxx

CALCARIUS LAPPONICUS ALASCENSIS Ridgway

Anahim Lake: 3 ♀, 11 April.

Indianpoint Lake: 3 ♂, 22 September–5 November.

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Manuscript received for publication August 7, 1952.

PLATES

PLATE 1

General area covered by the McCabe collection of British Columbian birds.

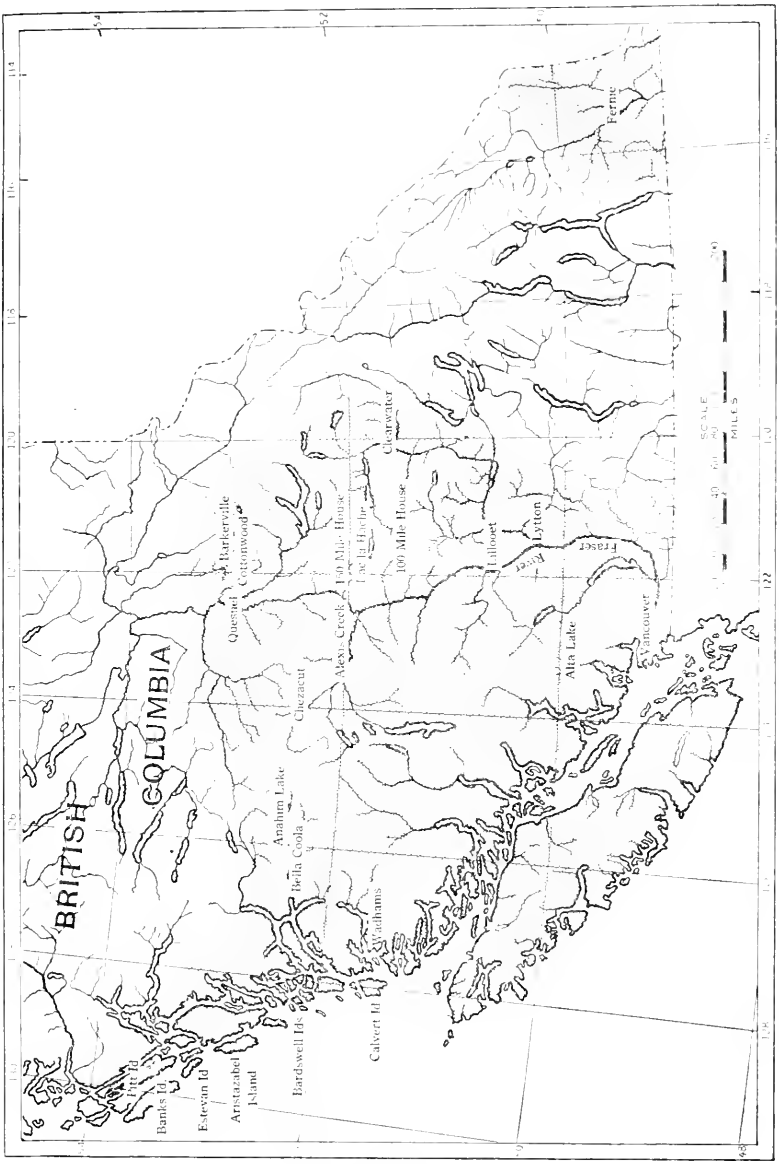
BRITISH
COLUMBIA
Fernie
Barkerville
Cottonwood
Quesnel
Clearwater
150 Mile House
Lac la Hache
100 Mile House
Lillooet
Lytton
Fraser
River
Alexis Creek
Chezacut
Alta Lake
Vancouver
Anahim Lake
Bella Coola
Wadhams
Calvert Id
Bardswell Ids
Aristazabel
Island
Estevan Id
Banks Id.
Pitt Id
SCALE
MILES

PLATE 1

PLATE 2

Upper: Mr. and Mrs. McCabe's home on Indianpoint Lake, B. C.
Lower: West end of Indianpoint Lake with Beaver (Kibbee) Lake beyond. Photograph taken from the north end of Indianpoint Mountain.

PLATE 2

ERRATA

Bulletin of the Museum of Comparative Zoology Vol. 109, No. 2. Report on the McCabe Collection of British Columbian Birds — J. C. Dickinson, Jr.

Page 134	Line 14	read—Botaurus
Page 141	Lines 7 and 15	read—Accipiter
Page 142	Line 6	read—Accipiter
Page 142	Line 27	read—Haliaeetus
Page 143	Line 13	read—bendirei
Page 144	Line 7	read—richardsonii
Page 145	Line 33	read—Bonasa
Page 146	Line 33	read—Bonasa
Page 147	Line 21	read—rupestris
Page 147	Line 26	read—leucurus leucurus
Page 148	Line 10	read—Haematopodidae
Page 148	Line 11	read—bachmani
Page 151	Line 15	read—tschuktschorum
Page 152	Line 9	read—mauri
Page 153	Line 1	read—Stercorariidae
Page 153	Line 6	read—longicaudus Vieillot
Page 156	Line 2	read—monilis
Page 156	Line 16	read—kennicottii
Page 157	Line 15	read—acadicus acadicus
Page 158	Line 9	read—Stellula
Page 167	Line 2	read—thalassina
Page 167	Line 26	read—Petrochelidon
Page 170	Line 21	read—gambeli
Page 172	Line 19	read—parkmanii
Page 176	Line 23	read—salicicola
Page 177	Line 18	read—olivaceus
Page 180	Line 1	read—swainsonii
Page 195	Line 17	read—gambelii
Page 196	footnote line 4	read—fuliginosa

Bulletin of the Museum of Comparative Zoology

AT HARVARD COLLEGE

Vol. 109, No. 3

NEW AND LITTLE KNOWN SHARKS FROM THE ATLANTIC AND FROM THE GULF OF MEXICO

By

Henry B. Bigelow, William C. Schroeder
and Stewart Springer

CAMBRIDGE, MASS., U.S.A.
PRINTED FOR THE MUSEUM
July, 1953

Publications Issued by or in Connection
with the

MUSEUM OF COMPARATIVE ZOOLOGY
AT HARVARD COLLEGE

Bulletin (octavo) 1863 — The current volume is Vol. 109.

Breviora (octavo) 1952 — No. 17 is current.

Memoirs (quarto) 1864–1938 — Publication was terminated with Vol. 55.

Johnsonia (quarto) 1941 — A publication of the Department of Mollusks. Vol. 2, no. 31 is current.

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No. 3. — *New and Little Known Sharks from the Atlantic and from the Gulf of Mexico*[1]

By

Henry B. Bigelow, William C. Schroeder and Stewart Springer

Experimental trawlings in which we took part, were carried on in the northern sector of the Gulf of Mexico, by "Oregon" of the U. S. Fish and Wildlife Service, 1950–1952, and on the continental slope off southern New England, by the dragger "Cap'n Bill II" chartered by Woods Hole Oceanographic Institution, during the summer of 1952. These have brought to light three sharks of the genera *Etmopterus* and *Scymnodon* which appear to represent species new to science, as do a series, contributed by Dr. Max Poll, of the *Etmopterus* recently reported by him (Poll, 1951) from tropical West Africa, as *E. hillianus*. The "Oregon" and "Cap'n Bill II" trawlings have also yielded specimens of *Apristurus atlanticus*, of *Squalus fernandinus* and of *Centrophorus uyato*, none of which had been recorded previously from the western side of the North Atlantic; also series of *Apristurus profundorum* and of *Scyliorhinus retifer* that add to knowledge of those species.

Myers (1952, p. 108) has recently emphasized the desirability of including a statement of the problem in hand in papers on systematic biology. Thinking the point well taken, we may add that the following pages continue the attempt, on which we have long been engaged, to learn what kinds of elasmobranch fishes exist today, where they live, and how they live.

All the drawings in this paper are by H. B. Bigelow and Jessie H. Sawyer.

Family SCYLIORHINIDAE
Genus Scyliorhinus
Scyliorhinus retifer (Garman) 1881

Previous locality records for positively identified specimens of the chain dogfish had been confined to the outer edge of the continental shelf and upper part of the slope, between the offings of Cape Lookout, North Carolina, and of New York, at depths of 40–125 fathoms (Bigelow and Schroeder, 1948, p. 210). Recent captures by "Oregon" and by the draggers "Eugene II" and "Cap'n Bill II" in 1950, 1951 and 1952 extend the known range of the species to the northern part of the Gulf of Mexico in the one direction and to the offing of southern

[1] Contribution No. 596, Woods Hole Oceanographic Institution.

New England and to the southwestern edge of Georges Bank (Lat. 40°02'N, Long. 69°37'W) in the other. The greatest depth from which *retifer* has yet been recorded in the northern part of its range is 125 fathoms; it ranges deeper, however, in the Gulf of Mexico, where "Oregon" trawled it at 240–260 fathoms.

Genus Apristurus

Examination of a Gulf of Mexico specimen of *Apristurus* apparently referable to *A. atlanticus* Koefoed 1932, known only from off Morocco previously, and of six specimens of *A. profundorum* that were trawled on the continental slope off southern New England by "Cap'n Bill II" during the summer of 1952, enable us to offer a key to the North Atlantic species of the genus, more satisfactory than our earlier attempt (Bigelow and Schroeder, 1948, p. 221).

Key to North Atlantic species of *Apristurus*

1. First to third gill openings nearly as long as distance between inner ends of nostrils; upper and lower labial furrows form about a right angle at each corner of mouth . . . . *riveri* Bigelow and Schroeder, 1944
North coast of Cuba

First to third gill openings less than half as long as distance between nostrils; upper labial furrow forms an acute angle of about 45° with lower labial furrow at each corner of mouth 2

2. Origin of anal fin under or behind rear end of base of first dorsal; origin of first dorsal fin is above rear part of bases of pelvic fins; base of anal fin only about 2 to 2½ times as long as base of first dorsal fin. . . . .
profundorum (Goode and Bean) 1895, p. 00

Origin of anal fin about under origin of first dorsal; origin of first dorsal fin is opposite or behind rear end of bases of pelvic fins; base of anal fin is very nearly 4 times as long as base of first dorsal fin. . . . .
atlanticus (Koefoed) 1932, p. 00

Apristurus profundorum (Goode and Bean) 1895

Two specimens, only, of this deep water scyliorhinid had been reported previously from the western side of the North Atlantic, both of them taken off Delaware Bay (the type locality) by the "Albatross" many years ago, and both of them in damaged condition when we saw them (Bigelow and Schroeder, 1948, p. 222, Fig. 38). We can now report eight more, 113 mm. to 596 mm. long, trawled by the dragger "Cap'n Bill II" along the continental slope from southeast of Nova Scotia to southern New England between Lats. 42°39′ and 39°46′N, and between Longs. 63°54′ and 71°35′W, at 395–530 fathoms during June and July, 1952. This additional material allows us to amend our earlier account in the following respects.

A. Relative sizes of first and second dorsal fins: On the type specimen (this was pictured by us earlier) the base of the second dorsal fin is about as long as the base of the first dorsal, with the second dorsal a very little larger in area than the first dorsal. And since the second dorsal is definitely the larger of the pair on a newly hatched specimen, we had regarded this as a juvenile character. But the present series shows that the relative areas of these fins in *profundorum* is subject to considerable variation from specimen to specimen, irrespective of size, the transverse breadths of the first and second dorsals, measured at the rear end of the base, being as follows for six of the "Cap'n Bill II" specimens of different sizes.

total length	*breadth of 1st dorsal*	*breadth of 2nd dorsal*	*ratio of breadth 2nd dorsal to 1st dorsal*
mm.	*mm.*	*mm.*	
596	17.5	18	1.0
514	14.5	17	1.2
267	8	10	1.3
258	7.5	9	1.2
254	7	8	1.1
232	6.5	9	1.4
113	4	4.8	1.2

B. Length of caudal fin: The percentage of the total length that is occupied by the caudal fin is as follows for seven specimens of different sizes: 113 mm., 30%; 146 mm., 25%; 232 mm., 33.6%; 254 mm., 32.3%; 267 mm., 30.7%; 510 mm. (the type[2]) 25%; 514 mm., 25%. Evidently the variation in the relative length of the caudal does not depend on the size of the individual.

C. Lengths of gill openings: The relationship between the length of the third gill opening and the distance between the nostrils is as follows for the specimens listed under *A*.

[2] The 146 mm. specimen, U. S. National Museum, No. 83894, was measured by us earlier; for measurements of the type, of 510 mm., No. 35646, see Bigelow and Schroeder, 1948, p. 222.

total length	*length 3rd gill opening*	*distance between nostrils*	*ratio, distance between nostrils to length of 3rd gill opening*
mm.	*mm.*	*mm.*	
596	7	22.5	3.2
514	6	21	3.5
267	3.2	10.5	3.3
258	4.5	11	2.4
254	3.5	10.5	3
232	3	11	3.7
113	2	4.5	2.3

The resultant ratios of 2.3 to 3.7 for the gill lengths *vs.* the internarial distance indicate that an appreciable variation exists in these proportions irrespective of the size of the shark.

D. Labial furrows: The upper and lower labial furrows make an angle of about 45° at each corner of the mouth in all of the "Cap'n Bill II" specimens. This is a matter of interest because of the difference in this respect between *A. profundorum* and *A. riveri*, which is employed as an alternative character in the preceding Key to Species (p. 214).

E. Relationship between horizontal diameter of eye and distance between the nostrils:

total length	*diameter of eye*	*distance between nostrils*	*ratio, distance between nostrils to diameter of eye*
mm.	*mm.*	*mm.*	
596	19.5	23	1.2
514	15	21	1.4
267	7	11	1.6
258	8	11	1.4
254	7	10.5	1.5
232	7	11	1.6
113	5	4	0.8

Thus, there appears to be no trend in the ratio of these proportions as between young and grown specimens although in the new born one (113 mm.) the eye is relatively much larger, as would be expected.

F. Teeth: The number of teeth in the 596 mm. specimen is $\frac{40\text{-}40}{41\text{-}41}$, the outermost in each jaw being difficult to count; this contrasts with $\frac{25\text{-}25}{25\text{-}25}$ recorded for the type specimen, of 510 mm. Both the uppers and the lowers agree closely with our earlier account of those of the type specimen (Bigelow and Schroeder, 1948, p. 223).

Proportional dimensions in per cent of total length of female, 596 mm. long from Lat. 39°46′N., Long. 71°35′W., 395–405 fathoms, and of male, of 254 mm. long from Lat. 39°52′N., Long. 70°43′W., 415–440 fathoms. Museum of Comparative Zoology Nos. 37425 and 37416, respectively.

Trunk at origin of pectoral: breadth 9.2, 9.5; height 8.4, 8.3.
Snout: length in front of mouth 10.2, 11.8.
Eye: horizontal diameter 3.2, 3.7.
Mouth: breadth 6.9, 5.5.
Nostrils: distance between inner ends 3.8, 4.1.
Labial furrow lengths: upper 3.9, 3.1; lower 2.7, 2.5.
Gill opening lengths: 1st 1.2, 1.2; 3rd 1.2, 1.4; 5th 1.2, 1.4.
First dorsal fin: vertical height 2.8, 2.8; length of base 7.0, 5.9.
Second dorsal fin: vertical height 3.5, 3.3; length of base 6.1, 6.7.
Anal fin: length of base 14.9, 15.0.
Caudal fin: upper margin 25.0, 32.3; lower anterior margin 12.9, 11.8.
Pectoral fin: outer margin 11.9, 11.8; inner margin 5.4, 6.3; width 7.5, 6.3.
Distance from snout to: 1st dorsal 51.2, 44.8; 2nd dorsal 66.2, 57.2; upper caudal 75.0, 67.7; pectoral 22.8, 27.5; pelvics 46.0, 42.9; anal 59.2, 52.7.
Interspace between: 1st and 2nd dorsals 8.0, 6.3; 2nd dorsal and caudal 2.7, 4.0; anal and caudal 0.0, 0.0.
Distance from origin to origin of: pectorals to pelvics 23.1, 15.3; pelvics to anal 13.2, 9.8.

Range. *A. profundorum* is now known from the continental slope off Delaware Bay (type locality), off southern New England and off the southern part of Georges Bank and the offing of Cape Sable, Nova Scotia at 395–530 fathoms; also off the coast of Iceland, if we are correct in our view that the *Scyllium laurussonii* of Saemundsson (1922, p. 173, Pl. 4, fig. 1) cannot be distinguished from *profundorum.*

APRISTURUS ATLANTICUS (Koefoed) 1932
Figure 1

This species had been known only from the type specimen 247 mm. long, trawled by the "Michael Sars" off the coast of Morocco, Lat. 28°8′N, Long. 13°35′W from 1365 meters (Koefoed 1932, p. 18, Pl. 3, fig. 3). We can now report a second specimen, from the northern part of the Gulf of Mexico, which agrees with *atlanticus* in all the features that seem likely to be of specific importance in *Apristurus*. Consequently we refer it to that species, though with some reservation, for Koefoed's original account does not include any information as to shape of nostrils, as to labial furrows, teeth, or dermal denticles; or as to color other than that dark appears to be implied.

Description. Female, 297 mm. long, northern part of Gulf of Mexico, Lat. 27°32'N., Long. 93°02'W., 400–450 fathoms, "Oregon" Station 534, April 11, 1952.

Proportional dimensions in per cent of total length.

Trunk at origin of pectoral: breadth 11.1; height 9.5.

Snout: length in front of mouth 11.5.

Eye: horizontal diameter 3.4.

Mouth: breadth 7.8.

Nostrils: distance between inner ends 4.5.

Labial furrow lengths: upper 2.2; lower 1.9.

Gill opening lengths: 1st 1.2; 3rd 1.2; 5th 1.2.

First dorsal fin: vertical height 2.7; length of base 4.4.

Second dorsal fin: vertical height 3.4; length of base 5.7.

Anal fin: length of base 16.5

Caudal fin: upper margin 28.5; lower anterior margin 11.1.

Pectoral fin: outer margin 11.8; inner margin 6.4; distal margin 10.8.

Distance from snout to: 1st dorsal 51; 2nd dorsal 62; upper caudal 71.5; pectoral 24.6; pelvics 40.5; anal 51.6.

Interspace between: 1st and 2nd dorsals 6.7; 2nd dorsal and caudal 3.7.

Distance from origin to origin of: pectorals to pelvics 16.8; pelvics to anal 10.4.

Trunk, noticeably soft, about ⅛ as high opposite pectorals (where highest) as it is long to origin of caudal fin; somewhat broader there than high, but compressed, thence rearward, so that the caudal peduncle is only about 3/7 as broad as it is high. Dorsal profile sloping gently forward from shoulder region to rather thin-tipped and very flexible snout. Snout ovoid anteriorly, its length to mouth a little less than ½ of head (47%) to origins of pectorals. Eye oval, its horizontal diameter a little less than ⅓ as long as snout in front of mouth (30%). Spiracle between ¼ and ⅕ (22%) as long as eye; close behind eye and about level with the longitudinal axis of eye. Nostrils about 1.4 times as long as eye, their outer ends at outer edge of head; anterior nasal flap broadly triangular with blunted tip; distance from tip of snout to level of outer (anterior) ends of nostrils about ½ as long as length of snout to mouth; and distance between inner ends of nostrils about 40 per cent as great as length of snout to mouth. Mouth moderately arched, the gape occupying about 70 per cent of breadth of head. Upper labial furrow about ¾ as long as distance between inner ends of nostrils; lower labial furrow about ⅔ as long as upper; the upper and lower labial furrows making an acute angle of about 45° at corner of mouth.

Anterior margins of gill openings concave, but not enough so as to expose the tips of the gill filaments; the longest (4th) about 40 per cent as long as eye, and about 30 per cent as long as distance between nostrils. Teeth $\frac{35\text{-}35}{31\text{-}31}$ in specimens seen; uppers and lowers similar, those along central ⅔ of mouth mostly with 5 or 7 cusps, but those near outer corners of mouth with 3-5 cusps; the median cusp longest and curved slightly outward in most cases, the lateral cusps graduated in length, nearly straight, and radiating outward; about 4 rows of teeth in function simultaneously in each jaw. Dermal denticles minute, clothing the trunk closely and the fins out nearly to margins; the denticles rising steeply from skin over trunk as a whole; leaflike, the blades without evident sculpture, their margins tridentate, those on lower surface of snout with shorter median tooth than those on back, sides, and belly.

First dorsal fin rounded, of shape shown in Figure 1; its base about 1.3 times as long as eye, its origin about 70 per cent of distance rearward from snout toward origin of caudal, and about over origin of anal. Distance from rear end of base of first dorsal to origin of second dorsal about twice as long as eye and about 1½ times as long as base of first dorsal. Second dorsal similar in shape to first; its base about 1.3 times as long as base of first; its length from mid point of base to tip about 1½ times as great as length of first dorsal, similarly measured; its origin about over mid point of base of anal. Distance from rear end of base of second dorsal to origin of caudal a little less than ⅔ (65%) as long as base of second dorsal. Caudal about 1.2 times as long as head to origin of pectorals; upper margin nearly straight; tip rounded — truncate, with moderate subterminal excavation; lower posterior margin slightly sinuous, forming a blunted angle of about 115° with lower anterior margin; the latter being weakly convex.

Anal trapezoid in shape, anterior margin weakly convex; distal margin nearly straight; base nearly three times (2.9) as long as base of second dorsal; origin about under origin of first dorsal. No measurable interspace between rear end of base of anal and origin of lower side of caudal fin. Pelvics rhomboid; the margins nearly straight, the corners rounded; outer margin about $2\frac{1}{2}$ times as long as anterior margin; base about 60 per cent as long as base of anal; interspace between rear end of base of pelvics and origin of anal about $\frac{1}{5}$ as long as base of anal. Distance between origin of pelvics and axils of pectorals about 1.1 times as long as base of pelvics (in female). Pectorals with broadly rounded corners and weakly convex margins, of shape shown in Figure 1. Extreme length of pectoral from point of origin, about as great as distance from front of eye to pelvic origin; the fin conspicuously broad based, the base being about as long as maximum breadth of pectoral fin.

Color. The "Oregon" specimen is uniformly dark sooty gray, after preservation in alcohol, both on trunk and on fins out to their margins, and about as dark below as above. The type specimen is described as "brown" (Koefoed, 1932, p. 19).

Size. The two specimens that have been seen are respectively 247 mm. (the type) and 297 mm. ("Oregon" specimen) long; but as both are females their sizes give no clue to how large this shark may grow.

Remarks. *A. atlanticus* resembles *A. profundorum* very closely in its general appearance. But the differences between the two listed in the preceding key (p. 214) are so sharp-cut that identification of any given specimen of *Apristurus* of this general type as the one species or as the other should present no special difficulty.

Range. Present indications are that *atlanticus* is restricted to the tropical-subtropical belt of the Atlantic, east and west, including the Gulf of Mexico, localities of record for it being off the coast of Morocco[3], and the northern part of the Gulf of Mexico at the locality listed above, (p. 218) at depths of 746 fathoms and 400–450 fathoms respectively. Nothing is known about its habits.

Family SQUALIDAE

Genus SQUALUS

SQUALUS FERNANDINUS Molina 1782

Figure 2

The only members of this well known genus that have been reported

[3] "Michael Sars" N. Atlant. Exped. 1910, Sta. 41.

reliably from the western side of the Atlantic, north of the equator, or from the Gulf of Mexico, are the common spiny dog (*Squalus acanthias* Linnaeus 1758) of northern seas, and the Cuban dog (*Squalus cubensis* Howell-Rivero 1936). But word was to be expected, sooner or later, of spiny dogfishes of the *fernandinus-blainville* group somewhere along our South Atlantic coasts, or in the Gulf of Mexico, for these little sharks are common not only in the Mediterranean but along tropical West Africa as well.[4] And we can now report the captures of two small specimens of this group off South Carolina (Lat. 33°00′N, Long. 77°07′W), by "Albatross" III of the U. S. Fish and Wildlife Service, in a trawl haul from 206 fathoms, and of a third (a female of 640 mm.) trawled by "Oregon" in the northern part of the Gulf of Mexico, Lat. 27°44′N, Long. 85°02′W, at 215 fathoms, September 29, 1951; "Oregon" Sta. 490.

Comparison has failed to show anything to differentiate these specimens, as to species, from an excellent female of *fernandinus*, of 914 mm., in the Museum of Comparative Zoology, from the island of Juan Fernandez, which is the type locality of the species.[5] The only other reliable record for a shark of the *fernandinus-blainville* group, for the western side of the Atlantic, north or south, is for a 320 mm. specimen that was taken from the stomach of an albatross off the coast of Argentina, Lat. 34°44′S, Long. 53°W (Lahille, 1928, p. 327; Bigelow and Schroeder, 1948, p. 479, Footnote 65).

Among the North Atlantic members of its genus, *fernandinus* differs from *acanthias* in that the exposed base of its first dorsal fin spine stands about even with the inner corner of the pectoral or a little anterior to it, when the fin is laid back (considerably posterior to the inner corner of the pectoral in *acanthias*); that the mid points of the bases of the pelvics are about opposite the mid point of the interspace between the two dorsals (Fig. 2; much nearer the second dorsal than the first dorsal in *acanthias*); and that the flap-like expansion of the anterior (inner) margin of the nostril bears a small accessory lobe. *Fernandinus* agrees with *cubensis* in the foregoing respects. But there should be no danger of confusing the one species with the other, for the distal margin of the pectoral is only weakly concave in *fernandinus*, and the inner corner of the fin rounded, whereas the distal pectoral

[4] Poll (1951, p. 59) reports *fernandinus* at 19 stations along the West African coast between latitudes 9°32′N, and 19°52′S.

[5] For an illustration of this Juan Fernandez specimen, see Bigelow and Schroeder, 1948, p. 456, Fig. 87E.

margin is deeply concave and the inner pectoral corner sharp-pointed in *cubensis*.

In our earlier discussion of the species of the genus *Squalus* (Bigelow and Schroeder, 1948, p. 454, 455) we retained *blainville* Risso 1826 of the Mediterranean provisionally, as distinct from *fernandinus*, because perhaps it has a relatively longer second dorsal spine than that of *fernandinus*, and a larger eye relative to the length of the snout and relative to the distance between the nostrils. But it appears that the second dorsal spine may vary considerably in length in the Mediterranean form, for while Rey (1928, p. 43) writes that it may exceed the length of the anterior margin of the fin in *blainville*, his excellent illustration of the latter (Rey, 1928, Pl. 4, Fig. 2), which we had overlooked, pictures its tip as falling about as far short of the apex of the fin as is the case in our Gulf of Mexico specimen of *fernandinus*, and almost as far short of the apex of the fin as in the Juan Fernandez specimen.[6] Neither does it seem likely that the size of the eye relative to the length of the snout in front of the mouth (horizontal diameter of eye about 60 per cent as long as snout in *blainville*, *vs.* 40–50 per cent in *fernandinus*[7]) can be used as the basis of specific separation. Poll's (1951, p. 59) definite reference of *blainville* to the synonymy of *fernandinus* seems, therefore, to be correct.

SQUALUS CUBENSIS Howell-Rivero 1936

The Cuban dogfish, made easily recognizable among North Atlantic spiny dogs of the genus *Squalus* by the sharply pointed inner corner of its pectoral fin, was known only from the north coast of Cuba, from Trinidad (probably), and from Rio de Janeiro (Bigelow and Schroeder, 1948, p. 477). We can now report it from the northern part of the Gulf of Mexico, when "Oregon" trawled two specimens, 375 and 465 mm. long, one at Station 257, Lat. 28°41′N, Long. 86°03′W, on January 27, 1951, 165 fathoms; the other at Station 278, Lat. 29°49′N, Long. 85°45′W, 112 fathoms on February 24, 1951. The geographic distribution of the locality records for this species suggests that it will prove to be widespread throughout the West Indian, Gulf, and Caribbean regions, and along the northern and northeastern coasts of South America.

[6] In the Juan Fernandez specimen the spine, measured from the level at which it emerges from the skin, is about 77 per cent as long as the free anterior margin of the fin. Our earlier illustration (Bigelow and Schroeder, 1948, Fig. 87E) pictures it as too short.

[7] In our Western Atlantic and Gulf of Mexico specimens, the varietal range in this respect is from 40 to 50 per cent. In the Juan Fernandez specimen it is 48 per cent, stated erroneously as 40 per cent in alternative 3B of our earlier key to the Western Atlantic species of *Squalus*. (Bigelow and Schroeder, 1948, p. 455.)

Genus CENTROPHORUS Müller & Henle 1837

The genus *Centrophorus* was proposed by Müller and Henle (1837, p. 398) for a squalid shark identified by them as the *Squalus granulosus* of Bloch and Schneider 1801, of which Müller and Henle published a detailed account with illustrations four years later (1841, p. 88, Pl. 33), based in part on a dried specimen from Bloch's collection, as well as on other specimens from Sicily. Its most distinctive characters, among squalid sharks, are: upper and lower teeth both one-cusped, but unlike in the two jaws, the cusps of the lowers being blade-like and directed sharply outward along each half of the jaw, the cusps of the uppers more narrowly triangular to awl shaped along the median section of the jaw, but more nearly similar to the lowers toward each corner of the mouth; dorsal fin spines lying along anterior margins of the fins, the second longer than the first, and both of them at least moderately prominent; both the dorsal fins short, neither member of the pair much larger than the other; pectoral fins with the inner corner sharp pointed and considerably extended. And the passage of time has added nothing to make us doubt the validity of the foregoing set of characters as distinctive of the genus *Centrophorus*. Garman (1913, pp. 189, 211), it is true, abandoning the shape of the pectorals as a primary generic character, retained the genus *Lepidorhinus* Bonaparte 1838, not only for the reception of its type species, *Squalus squamosus* Bonnaterre 1788, but also for *Centrophorus steindachneri* Pietschmann 1907,[8] both of which fall in *Centrophorus* as defined here because the pectoral corners of each are sharp pointed though only slightly extended. Garman also placed *Centrophorus foliaceus* Günther 1877 and *Centrophorus rossi* Alcock 1898 in *Lepidorhinus* but both of these fall in the genus *Scymnodon* in our view, because with rounded inner pectoral corners (p. 230). But to abandon the shape of the pectorals as a primary generic character is to ignore the most conspicuous feature by which we can subdivide the considerable group of squaloids that agree in having one-cusped blade like teeth in both jaws and simple, dermal denticles.

The species in question with the inner corners of the pectorals more or less produced, have been redistributed more recently by Fowler (1941, p. 229, 242) between *Centrophorus* Müller and Henle 1837, and *Entoxychirus* Gill 1862. But, as we have already remarked (1948, p. 451, footnote 8), "the differences on which this division is based, i.e., the relative degrees to which the inner corners of the pectorals

[8] For a good illustration of *steindachneri*, see Pietschmann, 1908, Pl. 1, fig. 1

are produced and the shapes of the dermal denticles, do not seem to us sufficient for generic separation."

Sharks, referable to *Centrophorus* as defined here, that have been named from the North Atlantic and Mediterranean, are *Squalus squamosus* Bonnaterre 1788; *S. granulosus* Bloch and Schneider 1801 (discussed above); *Galeus* [*Squalus*] *uyato* Rafinesque 1810; *Centrophorus lusitanicus* Bocage and Capello 1864; *Machephilus dumerilii* Johnson 1867; and *Centrophorus braganzae* Regan 1906. The *Squalus infernus* of Blainville 1825 was also placed in *Centrophorus* by Garman (1913, p. 197), as a synonym of *uyato*, perhaps on the strength of Blainville's (1825, p. 60) suggestion that it might be identical with Rafinesque's *uyato*. But Blainville's (1825, p. 59) description of its upper teeth as with a rather long erect, pointed median cusp flanked on either side by a small accessory cusp, combined with his failure to mention the shape of the inner corners of the pectorals, suggest that *infernus* was not a *Centrophorus*.[9] Its tooth characters, as described by Blainville, suggest, rather, an *Etmopterus* (p. 237) , but the proportional dimensions given for it by him differ considerably from those of any member of that genus known from the Atlantic.

Garman (1913, pp. 197, 212) was no doubt correct in referring *braganzae* to the synonymy of *uyato*, and *dumerilii* to that of *squamosus*. Rey (1928, p. 436) has reduced the list of accepted species still farther by placing both *lusitanicus* and *uyato* in the synonymy of *granulosus*. And while Nobre (1935, p. 449)[10] has revived *lusitanicus* as a distinct species, Rey's treatment of it seems to be preferable, so far as we can judge from Bocage and Capello's (1864, p. 260, fig. 1) original description and illustration of it. *C. squamosus* (Bonnaterre) 1788, differs both from *granulosus* and from *uyato* in the shape of its pectoral fins, in a relatively larger second dorsal fin relative to the first dorsal, and also in its dermal denticles (see below).

The status of *uyato*, if perhaps more puzzling, is the most pertinent to our present study. The original account and illustration of it, by Rafinesque (1810, p. 13, Pl. 14, fig. 2) tell us only that it resembles *Squalus* in general, but has minute, sharp teeth, and that the inner corners of the pectorals are somewhat extended, and angular. About all we learn from the brief first-hand accounts that have appeared since Rafinesque's time is that the eastern Atlantic in low and mid latitudes and the Mediterranean do harbor a *Centrophorus*, to which

[9] We might note, in passing, that while Blainville (1825, p. 59) quotes "Pl. 14, Fig. 1" for his *infernus*, his Pl.14 actually pictures a Thresher (Fig. 1) and a *Lamna* (Fig. 2).

[10] His Plate 61, figure 194, is credited both to *granulosus* (p. 118) and to *lusitanicus* (p. 449).

the name *uyato* Rafinesque 1810 seems to apply. It appears to differ from *C. granulosus* (Bloch and Schneider) 1801, type species of the genus, in its sharp, pointed, dermal denticles and in a longer second dorsal spine; perhaps in some of its proportional dimensions as well, though such information as is available does not afford satisfactory comparison between the two in this last respect.[11] Comparison, however, of the specimens of *uyato* described below, with a dried skin of *granulosus*, about 860 mm. long, from Europe (no definite locality), in the Museum of Comparative Zoology, shows that the two species actually differ widely as regards their dermal denticles, those of *granulosus* being block-like, quadrate, and close set in quincunx mosaic (Fig. 3A), but those of *uyato* very small, conical, thorn like, recurved, and so sparsely distributed that the skin is exposed between them (Fig. 3C). And the denticles of *C. squamosus* (Fig. 3B) are of so different a type, being scale like and overlapping, that a glance at the skin with a hand lens is sufficient for identification, among these three species (Fig. 3).

Provisional Key to North Atlantic-Mediterranean Species of *Centrophorus*

1. Inner corners of pectorals only a little extended though sharp-pointed, reaching only about even with origin of first dorsal fin when pectoral is laid back; base of first dorsal fin nearly or fully twice as long as base of second dorsal. Dermal denticles scale-like, overlapping (Fig. 3B) . . . . *squamosus* (Bonnaterre) 1788[12]

   Inner corners of pectorals considerably extended, reaching nearly or quite as far as the mid base of the first dorsal when the pectoral is laid back; base of first dorsal fin only about $1\frac{1}{3}$–$1\frac{1}{2}$ times as long as base of second dorsal; dermal denticles not overlapping 2

2. Cutting edges of cusps of lower teeth with fine serrations more or less evident[13]; second dorsal spine reaches not more than $\frac{1}{2}$ way along free anterior margin of second dorsal fin; dermal denticles block-like, sessile from end to end, the exposed surface nearly parallel with the skin so that

[11]Poll's (1951, p. 60, fig. 33; p. 65, fig. 34) recent illustrations of *uyato* in side view, and of the lower surface of its head, are not accompanied by a description.

[12]For excellent illustrations of *squamosus*, see Jensen, 1899, Pl. 3; and Saemundsson, 1932, Pl. not numbered (*Centrophorus squamosus*). The Museum of Comparative Zoology has recently received an excellent specimen of *squamosus* about 49 inches long from west of Iceland, 218 fathoms, from Dr. Arni Fridricksson.

[13]Described and pictured as finely serrate by Müller and Henle (1841, p. 88, Pl. 33); also by Bocage and Capello (1866, p. 26, Pl. 1, Fig. 3D); and so described by Garman (1913, p. 202). But microscopic examination of the teeth of the specimen Garman had at hand shows no regular serrations but only a certain amount of raggedness.

the latter feels no rougher when stroked from rear to front than when stroked from front to rear; and so close spaced in regular quincuncial mosaic that they are very nearly in contact, one with the next, concealing the skin; the exposed surface nearly square in outer view, with rounded edges and angles, cornering antero-posteriorly, and weakly convex dorso-ventrally, the anterior ½ to ⅔ sculptured radially with 5 to 7 low ridges separated by shallow rounded furrows, converging anteriorly, so that two adjacent ridges often fuse one with the other (Fig. 3A); lining of mouth dark-spotted, only. . . . . *granulosus* (Bloch and Schneider) 1801

Cutting edges of lower teeth perfectly smooth; second dorsal spine reaching at least ⅔ the way along free anterior margin of second dorsal fin; dermal denticles (Fig. 3C) conical-thorn shaped, sharp-pointed, so loosely spaced that the skin is widely exposed between them, and with the tips elevated so that the skin is much rougher to the touch when stroked from rear to front than when stroked from front to rear; the outer surface sculptured with 3 to 5 sharp radial ridges converging toward the tip; lining of mouth uniformly either sooty gray, very dark blue, or perhaps black. . . . . *uyato* (Rafinesque) 1810, p. 227

Besides the North Atlantic species just discussed, nine of the squalid sharks that have been named from Indo-Pacific waters fall in the genus *Centrophorus* as defined here; namely, *C. tesselatus* Garman 1906, *C. steindachneri* Pietschmann 1907, *C. acus* Garman 1913 and *C. atromarginatus* Garman 1913 from Japanese waters; *C. moluccensis* Bleeker 1860 from the East Indies; *C. nilsoni* Thompson 1930 from New Zealand; *C. scalpratus* McCulloch 1915 and *C. harrisonii* McCulloch 1915 from Victoria, Australia; and *Atractophorus armatus* Gilchrist 1922 from southern Africa.[14] These stand in evident need of revision which we are now not able to undertake.

Up to the present time, records for the genus *Centrophorus* in the Atlantic had been from the eastern side only; those for *granulosus* from the Canaries, Madeira, Spain (both coasts) and Portugal; those for *uyato* from Senegal and the Mediterranean; those for *squamosus* from Madeira, the Azores, the Mediterranean, Portugal, the waters southwest of Ireland, the Faroe Bank, and south and southwest of

[14] Fowler (1941, p. 233, 234) also includes *Centrophorus kaikurae* Whitley, 1934, and *Centrophorus waitei* Thompson 1930 in the genus *Centrophorus*. But the illustrations of the former by Thompson (1930, Pl. 42, Figs. a–i, as *C. calceus* Lowe 1839), show it as with rounded pectoral inner corners and with a very long first dorsal fin, long pointed snout, and pitchfork shaped dermal denticles; these refer it to the genus *Deania* according to the classification adopted earlier by us. And *waitei* seems referable provisionally to *Scymnodon*, though Thompson's illustration of it (1930, Pl. 44, Fig. A) seems to have been of a specimen with damaged fins, the caudal being pictured as with a pointed tip, and the pectoral as paddle shaped, bilaterally symmetrical, broadest about midway of its length and tapering to a narrowly rounded tip, which does not accord with any known group of squalids.

Iceland.

The known range of the genus has now been extended to the northern part of the Gulf of Mexico, by the capture there of three specimens which appear to be specifically identical with the specimen in the Museum of Comparative Zoology from "France" on which Garman (1913, p. 197, as *uyatus*) based his description of *uyato*. As this is the first report of the presence of the genus *Centrophorus* in the western side of the Atlantic, a description follows from which the reader may judge the correctness of our identification.

CENTROPHORUS UYATO (Rafinesque) 1810

Figure 4

Study material. Female, 420 mm. long, "Oregon" Sta. 278, Lat. 28°39'N, Long. 85°46'W, 112 fathoms, February 24, 1951; juvenile male, about 429 mm., and female about 442 mm., "Oregon" Sta. 515, Lat. 29°17'N, Long. 87°42'W, 208 fathoms, April 1, 1952. Also juvenile male, 480 mm., Nice, France, in Museum of Comparative Zoology.

Description. Proportional dimensions, in per cent of total length, of female, 442 mm., Gulf of Mexico; and juvenile male, 480 mm., Nice, France (Mus. Comp. Zool. No. 943).

Trunk at origin of pectoral: breadth 10.8, 9.9; height 11.3, 11.4.

Snout: length in front of mouth 11.8, 10.5.

Eye: horizontal diameter 5.6, 5.9.

Mouth: breadth 7.5, 7.3.

Nostrils: distance between inner ends 4.1, 3.8.

Labial furrow: 5.6, 5.1.

Gill opening lengths: 1st 2.5, 2.1; 4th 2.9, 2.7; 5th 3.1, 3.1.

First dorsal fin: vertical height 6.3, 6.9; length of base[15] 7.7, 8.2.

Second dorsal fin: vertical height 4.9, 4.6; length of base[15] 6.5, 5.7.

Caudal fin: upper margin 23, 22.8; lower anterior margin 13.3, 13.2.

Pectoral fin: outer margin 12.0, 12.0; inner margin 13.5, 12.6; distal margin 11.8, 11.1.

Distance from snout to: 1st dorsal[15] 32.8, 34.2; 2nd dorsal[15] 62.8, 66.2; upper caudal 77.0, 77.2; pectoral 22.8, 22.7; pelvics 53.5, 56.1.

Interspace between: 1st and 2nd[15] dorsals 21.2, 25.8; 2nd dorsal and caudal 6.8, 7.1; rear base of pelvics and caudal 14.0, 14.0.

Distance from origin to origin of: pectorals to pelvics 30.7, 33.4; pelvics to caudal 19.4, 20.6.

[15] to base of spine.

Trunk fusiform, tapering both rearward and forward from region of first dorsal fin; ovoid in cross section, the belly somewhat flattened (unless in gravid females or after a full meal); caudal peduncle without lateral longitudinal ridges. Height at first dorsal (where highest) about $\frac{1}{5}$ as great as length to origin of caudal; the breadth there about $\frac{1}{2}$ as great as the height or a little more; breadth close in front of first gill openings (where broadest) a little more than $1\frac{1}{2}$ times as great (1.7 times in 442 mm. female) as at level of first dorsal fin. Head nearly straight in dorsal profile, its length to origin of pectorals nearly $\frac{1}{3}$ (30% in 442 mm. female) of trunk to origin of caudal fin. Snout thin tipped, narrowing forward to rounded tip (Fig. 4); its length in front of mouth a little less than $\frac{1}{2}$ of head (47% in 442 mm. female) to origin of pectorals. Eyes noticeably large, a little more than twice as long as high, and about $\frac{1}{4}$ as long as head. Distance from front of eye to tip of snout about 1.2 times as long as eye. Spiracles about $\frac{1}{3}$ as long as eye, posterior to latter by a distance about $\frac{1}{5}$ as long as eye, and at a slightly higher level than longitudinal axis of eye.

Nostrils about $\frac{1}{4}$ as long as eye; nearly transverse; their outer (anterior) ends posterior to tip of snout by a distance about 4/5 as long as eye; anterior nasal flap rather broadly triangular with rounded tip; and without accessory lobe. Mouth very low-arched, the gape (when closed) occupying about $\frac{2}{3}$ of breadth of head or a little more; labial furrows noticeably short, the upper furrows extending inward a little less than half of distance toward the mid line of head; the lower furrows a little shorter; their rearward extensions traceable about half the distance toward the first gill openings. Anterior margins of first to fourth gill openings weakly concave, the fifth the most oblique; longest gill (fifth) about 1.2 times as long as first, and a little more than $\frac{1}{2}$ (52–55%) as long as horizontal diameter of eye. Teeth $\frac{18\text{-}1\text{-}19}{16\text{-}1\text{-}16}$ in female of 442 mm. one-cusped and smooth edged; uppers with triangular cusp on quadrate base; the median upper tooth erect and symmetrical, the next few teeth either side of the symphysis nearly so, but successive teeth thence outward along each side of the jaw with cusps increasingly oblique, so that the upper teeth along the outer $\frac{1}{4}$ or so of the jaw are similar to the lowers in shape. Lower teeth (except for median tooth) considerably larger than uppers, the cusps triangular, directed strongly outward all along each half of the jaw, their inner cutting margins at an angle of about 15° with the general contour of jaw. Lower median tooth much smaller than the others, its cusp curving obliquely toward the one side or the other. Teeth $\frac{18\text{-}18}{16\text{-}16}$ in male of 480 mm., no median tooth.[16] Dermal denticles small (average length about 0.2 mm. on 442 mm. specimen), evenly distributed in random arrangement, mostly spaced so loosely that skin is widely exposed between them, but rarely the tip of one overlapping the base of the next; the denticles clothing entire trunk and fins out to margins; anterior ends of denticles thick, sessile, but tips elevated so that skin is rough to the touch; blades thick, ovoid narrowing rearward to sharp pointed tip; their upper surface conspicuously corrugated with median ridge flanked either side by two (usually) lateral ridges, the furrows converging toward tip, and the extreme margin also elevated a little. Denticles on lower surface in general similar to those on sides and back, but those on fins smaller, narrower, very sharp tipped, and less conspicuously sculptured, or even smooth.

Origin of first dorsal (first sensible elevation above general profile of back) posterior to origins of pectorals by a distance about as long as from tip of snout to center of eye; its base about twice as long as distance between nostrils, or about 1.2 times as long as from tip of snout to eye; anterior margin weakly convex, distal margin moderately concave, rear tip rather narrowly acuminate, free lower margin about as long as from rear end of base to point of emergence of spine. Interspace from rear end of base of first dorsal to origin of second dorsal (first sensible elevation) about as long as from snout to level of second gill opening. Second dorsal similar to first in shape, but only about ¾ as long as first dorsal at base and correspondingly smaller in area. Dorsal fin spines with a longitudinal groove close to anterior edge on either side; the rear surface of the spines slightly furrowed also. Both of the spines are well exposed; the second about 1⅓ times as long as the first, its tip about even with the apex of the fin. Interspace between rear end of base of second dorsal and origin of upper side of caudal a little longer than base of second dorsal. Caudal fin about as long as head to origin of pectorals; about ½ as broad as long or a little less, the upper margin nearly straight, tip obliquely truncate; lower posterior margin with obtuse subterminal excavation, the lower anterior corner a little extended as a low, rounded lobe; the lower anterior margin weakly convex, about 3/5 (58–60%) as long as upper margin. Interspace between lower origin of caudal and rear ends of bases of pelvics about as long as distance from snout to level of spiracles

[16]For a recent account of the spacial relationships between the successive rows of teeth in *C. uyato*, see Landholt, 1947, p. 353

or slightly more than ½ (54%) as long as from origins of pelvics to axils of pectorals. Pelvics approximately as large as second dorsal, their origin at a perpendicular about ½ to ⅔ of the distance rearward from rear end of first dorsal base toward origin of second dorsal. Anterior pelvic margin moderately convex, outer corner rounded, distal and inner margins weakly concave, rear corner pointed, reaching back about to below second dorsal fin spine. Pectorals with moderately convex outer margin, rounded outer corner, the distal margin nearly straight outwardly, but inwardly curving rearward to narrowly acuminate, sharp pointed inner-rear corner; the latter reaching back nearly or quite as far as rear end of base of first dorsal when pectoral is laid back; inner pectoral margin thus about as long as from tip of snout to rear of eye.

Color. Back and upper parts of the sides mouse gray after preservation in alcohol, paling to greyish white along the lower parts of the sides and on the lower surface as a whole; outer parts of the dorsal and caudal fins in general are sooty, but rear tips of dorsals, also extreme distal margin and acuminate rear corner of pectorals pale; a pale spot at base of each dorsal fin spine also; and one on the top of the head between the eyes. Region of gill openings bluish (perhaps brighter blue in life); lining of mouth uniformly very dark gray blue;[17] lining of body cavity black.

Size. This shark has been reported up to about 38½ inches (980 mm.) long (Poll 1951, p. 64). How much larger it may grow is not known.

Genus SCYMNODON Bocage and Capello 1864

Sharks of this genus are characterized among the Squalidae by dorsal fin spines at the anterior edges of the fins with at least the tips projecting; by one-cusped teeth above as well as below, the uppers much narrower than the lowers, at least along the central part of the mouth; by more or less acutely dentate dermal denticles; and by rounded inner pectoral corners. Their closest affinities seem to be with *Centrophorus* from which they differ chiefly in the shape of the pectoral fins, and with *Centroscymnus*, from which they are separated by their dentate dermal denticles.[18] In the type species of the genus,

[17]The linings of the mouth and of the body cavity are described as dark turquoise by Bonaparte (1841, text to Pl. 57).

[18]The distinction between *Scymnodon* and *Centroscymnus* applies only to adults, if Tortonese's (1952, p. 386, fig. 1) recent identification of a juvenile male with dentate denticles is correct, as *C. coelolepis*.

ringens Bocage and Capello (1864, p. 261, fig. 5 p. 263; 1866, p. 32, Pl. 1, fig. 1), the broadly triangular cusps of the lower teeth are described as symmetrical and erect along the central part of the jaw, but as directed increasingly outward, toward its corners;[19] and the genus *Scymnodon* was characterized accordingly in Bocage and Capello's original (1864) diagnosis.[20] But the genus has been expanded, by subsequent authors,[21] to include species in which the lower teeth are more or less strongly oblique all along the jaw, from the symphysis to either corner of the mouth.

Three species referable to *Scymnodon* as defined above are known from the eastern side of the North Atlantic, *ringens* Bocage and Capello 1864,[22] *crepidator* (Bocage and Capello) 1864,[23] and *jonsonii* Saemundsson (1922).[24] Fowler (1941, pp. 226, 227) credits a third species, *Scymnodon squamulosus* (Günther) 1877, to the Atlantic, quoting Regan (1908, p. 48) as authority. But the locality stated for *squamulosus* by Regan was Japan, nor has it ever been reported elsewhere, so far as we know.

Available information, including notes on a specimen in the British Museum, identified by Günther as *crepidator,* kindly contributed by Mr. N. B. Marshall, also makes it likely that the cusps are erect (or nearly so) on a larger number of the teeth along the mid section of the lower jaw in *ringens*, and the dermal denticles more pronouncedly tridentate, than in *crepidator*, though a more detailed comparison between the two species is much to be desired in these respects. If the illustrations of the two that have appeared are to be relied upon, *crepidator* differs further from *ringens* in smaller eyes, but a considerably longer snout relative to other bodily proportions.[25] The illustrations suggest also that the caudal is truncate at the tip, and with a

[19]For the best description and illustration of the teeth of *S. ringens* with which we are acquainted, see Rey, 1928, pp. 455, 456, fig. 152.

[20]In their subsequent account (1866, p. 32, Pl. 1, fig. 1C) they characterized the lower teeth as erect, and so pictured them all around the jaw.

[21]Garman 1913, pp. 207–208; Fowler 1941, pp. 225–226; Bigelow and Schroeder 1948, pp. 450–451.

[22]For descriptions and illustrations see Bocage and Capello 1866, p. 31, Pl. 1, fig. 1; and Rey 1928, p. 454.

[23]For descriptions and illustrations see Bocage and Capello 1866, p. 27, Pl. 2, fig. 2; and Rey 1928, p. 449. *Crepidator*, referred by its describers to the genus *Centrophorus*, was made the type of a new genus *Centroscylachus* by Garman 1913, p. 206. But it falls within the limits of *Scymnodon* as defined here. See Bigelow and Schroeder 1948, p. 494, footnote 1.

[24]For description and illustrations see Saemundsson 1922, p. 192, Pl. 5, figs. 1, 2. According to Saemundsson, the first mention of this species was in Schmidt, 1901, p. 23, where it was listed as "*Centrophorus* nov. spec." on the authority of Jensen.

[25]Eye about $\frac{1}{5}$ to $\frac{1}{4}$ and snout about $\frac{1}{5}$ to $\frac{1}{4}$ of head in *ringens;* eye about $\frac{1}{8}$ and snout about $\frac{1}{3}$ of head in *crepidator*.

definite lower anterior lobe in *crepidator*, contrasting with narrowly rounded tip, and without lower anterior lobe as it is described[26] and pictured[27] in *ringens*. But it is a question whether the pictured differences can be accepted as specific, for the tracing by Mr. Marshall of the caudal of the British Museum specimen labelled *crepidator* shows the fin as intermediate in shape in these respects, i.e. with rounded tip, but with definite lower anterior lobe. In both *ringens* and in *crepidator* the upper tooth band along each side of the upper jaw follows an arc of long radius, the convexity directed rearward, with these two lateral arcs connected by a shorter but similar arc in the region of the symphysis. And in both of them the entire pelvic fin on each side is anterior to a perpendicular at the point of emergence of the second dorsal fin spine. *Jonsonii*[28] differs conspicuously both from *ringens* and from *crepidator* in that its pelvic fins are described and pictured as with their bases very nearly opposite the base of the second dorsal fin.[29]

The following seven squalids also, that have been named from the Pacific and Indian Oceans, and from the Straits of Magellan, appear to fall in the genus *Scymnodon* as defined here: *foliaceous* (Günther) 1877, Japan and also reported from the Philippines;[30] *macracanthus* (Regan) 1906, Straits of Magellan; *plunketi* (Waite) 1910, New Zealand; *rossi* (Alcock) 1898, India; *sherwoodi* Archey 1921, New Zealand; *squamulosus* (Günther) 1877, Japan; and *waitei* (Thompson) 1910, New Zealand. *Macracanthus* is set apart, among these, by "well developed and strongly projecting" first and second fin-spines;[31] *foliaceous* by a strongly projecting second dorsal fin-spine.[32] If the original illustration is to be relied upon, *waitei* is even more sharply separated from its genus mates by a pointed caudal fin. The remaining members of the Pacific-Indian Ocean group (*rossi*, *plunketi*, *sherwoodi* and *squamulosus*) resemble one another closely in most respects. But *squamulosus* is the only one of these that we have seen, and the published accounts of the other three are not detailed enough to serve as basis for the revision of which they stand in evident need.

[26]Bocage and Capello 1866, p. 39, footnote.

[27]Bocage and Capello 1866, Pl. 1, fig. 1; Rey 1928, p. 455, Fig. 151.

[28]Saemundsson (1922, p. 192, Pl. 5, figs. 1, 2), who has given the only detailed account of this species, left it in the genus *Centrophorus*. But his description of its pectoral fin as with rounded posterior corner places it in *Scymnodon* according to the scheme followed here.

[29]Saemundsson 1922, p. 195 (Table of Measurements), Pl. 5, fig. 1.

[30]By Smith and Radcliffe 1912, p. 679.

[31]Regan 1906, p. 436.

[32]As pictured and described by its author. Jordan and Fowler's (1903, p. 631) description as *foliaceus*, of a Japanese specimen with only the tips of the fin spines exposed suggests that they may have been dealing with *squamulosus*, in which this is the case.

The experimental trawlings by "Cap'n Bill II" on the continental slope off southern New England and off Georges Bank during the summer of 1952 have now yielded three specimens of a *Scymnodon* which seem not to be referable either to *ringens* or to *crepidator* for the reasons stated below (p. 236), and which differ from *jonsonii* in the fact that their pelvic fins are wholly anterior to the base of the second dorsal fin (for further discussion, see p. 232). Neither do the specimens in question seem to fall within the probable limits of variation of any of the representatives of the genus that have been described from other seas. We therefore propose for it the new specific name *melas*. We must confess, however, that we would do so with more confidence, if the published accounts and illustrations of *ringens* and of *crepidator* were more satisfactory and informative.

Scymnodon melas, n. sp.
Figure 5

Type specimen. Female, 462 mm. long, trawled by the dragger "Cap'n Bill II" on the continental slope off Georges Bank, Lat. 40°00'N, Long. 68°52'W, at 420–480 fathoms, July 12, 1952, Museum of Comparative Zoology, No. 37452.

Additional material. Two juvenile males, 330 mm. and 339 mm. long, trawled by "Cap'n Bill II" on the slope off southern New England, Lat. 39°52'N, Long. 70°43'W, 415–440 fathoms, and Lat. 39°51'N, Long. 70°48'W, 450–495 fathoms, both on August 24, 1952, also in Museum of Comparative Zoology.

Description. Proportional dimensions, in per cent of total length, of female of 462 mm. (type) and male, 339 mm.

Trunk at origin of pectoral: breadth 13.2, 12.1.

Snout: length in front of mouth 8.2, 9.8.

Eye: horizontal diameter 4.1, 4.1.

Mouth: breadth 7.8, 7.7.

Nostrils: distance between inner ends 3.9, 3.5.

Labial furrow length from corner of mouth: 7.3, 7.4.

Gill opening lengths: 1st 1.3, 1.3; 2nd 1.3, 1.3; 3rd 1.3, 1.3; 4th 1.3, 1.3; 5th 1.6, 1.6.

First dorsal fin: vertical height 3.0, 3.2; length of base 5.0, 4.7.

Second dorsal fin: vertical height 3.2, 3.5; length of base 6.1, 4.7.

Caudal fin: upper margin 23, 22.

Pectoral fin: extreme length 12.3, 12.1.

Distance from snout to: 1st gill opening 17.9, 19.2; 1st dorsal origin

35.5, 34.2; 2nd dorsal origin 62.8, 64; upper caudal origin 77, 78; pectoral origin 22.5, 23.3; pelvic origins 59.8, 59.3.

Interspace between: 1st and 2nd dorsals 22.3, 25.1; 2nd dorsal and caudal 8.2, 9.2; base of pelvics and caudal 10.4, 9.7.

Distance from origin to origin of: pectorals to pelvics 37.2, 36.1; pelvics to caudal 10.8, 10.9.

Trunk at first dorsal (where highest) about 1/6 as high as it is long to origin of caudal; slightly flattened sidewise, rearward from pectoral fins; its thickness at first dorsal only about ½ as great as its height there, but much thicker anteriorly, the breadth of the head, abreast of the first gill opening being almost twice as great as that of the body at the first dorsal. Head, to origin of pectorals, between ¼ and ⅓ (29%) of length of trunk to origin of caudal; flattened above, the dorsal profile sloping downward slightly; only a little narrowed at eyes. Snout moderately fleshy, but not very flexible; its anterior outline obtusely angular with rounded tip; its length in front of mouth 37 per cent of head, and its length to eyes 19 per cent. Eye oval, a little more than twice as long as high, its horizontal diameter ½ as long as snout in front of mouth. Spiracle about ⅓ as long as eye, its outward margin about on a level with upper margin of eye, and forward margin posterior to eye by a distance ½ to ⅔ as long as eye. Nostrils about ½ as long as eye, close to front of snout, and moderately oblique; the anterior nasal flap narrowly triangular, crossing the nasal aperture at about the mid-length of the latter. Mouth very little arched, the gape occupying a little less than ⅔ (about 60%) of breadth of head; anterior (upper) labial furrows extending between ½ and 3/5 of distance toward symphysis; rearward extensions of labial furrows reaching about ½ of distance toward first gill openings. Longest gill opening (5th) nearly ½ (44–46%) as long as distance between nostrils; first gill about 4/5 (80%) as long as fifth. Anterior margin of first gill concave, but not enough to expose the gill filaments, the 3rd to 5th gill openings nearly straight; first and second gills almost vertical, but the 3rd to 5th increasingly oblique.

Teeth smooth edged; $\frac{20\text{-}1\text{-}20}{21\text{-}21}$ in female of 462 mm. (type); $\frac{20\text{-}20}{20\text{-}20}$ in juvenile male of 339 mm.; the upper teeth slender, sharp pointed and erect along central ⅔ of mouth, but successively broader, more blade-like, and with cusp curving increasingly outward toward corners; the individual teeth largest along median third, or so, of each side of mouth; smaller both in region of symphysis and toward corner of mouth, the outermost teeth much the smallest. Lower teeth triangular, with blade-like cusp, directed so strongly outward, all along each half of the tooth band, that the inner edges of the successive cusps form a practically unbroken cutting edge following the general contour of the jaw from the symphysis outward. No median lower tooth in the specimens seen. About 2 to 3 rows of teeth are in function simultaneously in the upper jaw, but one row only in the lower jaw.

The upper tooth band extends considerably beyond the outer limit of the gape on either side, i.e. into the mouth, and when viewed from below with mouth wide spread, is seen to follow an arc of long radius along either side of the mouth, the convexity facing inward (i.e. into the mouth), with these two lateral tooth-arcs interconnected around the symphysis of the jaws, as is the case in *S. ringens*. It is along the regions of transition between the median tooth-arc and the two lateral arcs that the individual teeth are the largest.

The lower tooth band extends considerably farther outward than the upper, on either side, and its arc of curvature is uniform, from the one end to the other.

Dermal denticles unevenly spaced, some close set, others more scattered, clothing the entire trunk (except for the lips) as well as the fins out very nearly to the margins of the latter; their arrangement random; the individual denticles rising rather steeply from the skin, on short pedicels; tridentate at margin but not definitely striate radially; their marginal teeth broadly triangular and sharp pointed, the median tooth considerably the largest; denticles on the belly similar to those on sides and back; those on lower surface of head and on fins smaller than those on body, more close set, less erect, pointing rearward at an angle of about 45°, not tridentate or only weakly so.

First dorsal fin about as long at base as length of eye, its upper contour continuously rounded, the rear corner sharp pointed, the free lower margin about as long as the base; origin of first dorsal about opposite to the tips of the pectorals (when these are laid back). Interspace between first and second dorsal fins about as long as head. Base of second dorsal fin about 1⅕ times as long as base of first dorsal and its area correspondingly larger; its anterior margin weakly convex; apex broadly rounded, distal margin nearly straight; rear corner sharp pointed; free lower margin about as long as the base; origin about over rear ends of bases of pelvics. First and second dorsal fin spines with only their points exposed.

Interspace between base of second dorsal and origin of caudal about $\frac{1}{3}$ as long as interspace between first and second dorsals. Distance from rear corner of second dorsal to origin of caudal about $\frac{1}{2}$ as long as eye.

Caudal about as long as head to origin of pectoral and about $\frac{1}{2}$ as broad as long; upper margin nearly straight proximally but increasingly convex distally; the tip obliquely truncate; the lower rear margin with conspicuous subterminal excavation, a little more obtuse than a right angle; the lower anterior corner expanded as a broadly triangular lobe with slightly blunted apex; the lower anterior margin weakly convex, about $\frac{1}{2}$ as long as upper margin.

Distance from lower origin of caudal to rear ends of bases of pelvics a little less than $\frac{2}{5}$ as long as from origins of pelvics to axils of pectorals (38% on female of 462 mm.). Pelvics a very little longer at base than second dorsal; anterior margin weakly convex; distal margin nearly straight; their entire base anterior to origin of second dorsal. Pectorals with weakly convex margins and broadly rounded corners, reaching back very nearly as far as the origin of the first dorsal when the pectoral is laid back. The distal margins of all the fins are frayed; the dorsals and pelvics very narrowly, the pectorals somewhat more broadly so, the lower lobe of the caudal and the tip of the latter considerably more broadly still. On the 462 mm. specimen these fringes are rather regular. But they are irregular on the two smaller specimens, evidence that the present state of the fin margins is not normal, but was the result of rough treatment in the trawl.

Color. Uniformly almost black in life and after preservation in alcohol, below as well as above, without any evident pattern of darker and of paler markings. Lining of body cavity dark bluish gray, lining of mouth grayish white, teeth white.

Size. We dare not guess how large this shark may grow, for the largest specimen (the type) is a female.

Remarks. S. melas falls with *S. ringens* in shortness of snout, and large eyes, but differs quite sharply from *S. ringens* (according to available information as to the latter) in the shape of its caudal with truncate tip and definite lower anterior lobe; in the strong obliquity of the cusps of the lower teeth all along each side of the jaw from symphysis to outer corner;[33] apparently in pectoral fins considerably larger in area though perhaps no longer. It resembles *crepidator* more nearly in the shape of the caudal fin and in the shapes of the lower

[33]For an excellent illustration of the teeth of *ringens*, see Rey, 1928, p. 456, Fig. 152.

teeth, but differs conspicuously from *crepidator* (as the latter is pictured) in a much shorter snout, but much larger eyes, and in its smooth bladed but pronouncedly tridentate dermal denticles.[34] Furthermore, the upper labial furrows of *crepidator* are described by Günther (1870, p. 421) as nearly meeting in the mid line of the snout, and they are so shown in the sketch of the British Museum specimen, whereas their inner ends are separated by an interspace about as long as the eye in all three of our specimens of *melas*.

Among the members of the genus *Scymnodon* (as defined here) that have been named from the Pacific and Indian Oceans, *melas* shares its sharply tridentate dermal denticles with the Japanese *squamulosus* (Günther) 1877; also its very oblique lower teeth, the shape of its caudal, and its bodily proportions in general. But comparison with two excellent specimens of *squamulosus* from Japan, in the Museum of Comparative Zoology, shows that the two forms are clearly distinct, the lining of the mouth of *squamulosus* being blackish (grayish white in *melas*); its dermal denticles so much smaller than those of *melas* of a corresponding size that its skin feels velvety to the touch (rough in *melas*); and only the extreme tips of the dorsal fin spines of *squamulosus* are visible, if, indeed, they are not buried wholly in the skin, hence to be detected by touch only.

Habits and Range. The depths at which our three specimens were taken, added to the fact that it has never been taken any shoaler on grounds that are as intensively trawled as are the offshore parts of the Scotian Banks and of Georges Bank, are evidence that *melas* is restricted to depths greater than perhaps 300–350 fathoms. Nothing more is known of its habits. It is known so far only from the localities listed above (p. 233). But it may prove much more plentiful than the meagre record might suggest, for fishermen may well have confused it with the common black dogfish (*Centroscyllium fabricii*).

The discovery of this new *Scymnodon* extends the known range of this genus to the western side of the North Atlantic.

Genus ETMOPTERUS Rafinesque 1810

These little dark-colored deep-water squalids are characterized by having a prominent spine at the anterior margin of each dorsal fin,

[34] These are described and pictured as with up to seven radial ridges but with marginal teeth only weakly indicated in *crepidator;* and the sketch of the British Museum specimen mentioned above shows them as with three ridges only and no definite marginal teeth.

upper teeth with several cusps, but lower teeth with only one cusp, and those in each side of the jaw directed so sharply outward that the inner margins of the successive cusps form an almost unbroken cutting edge. Some members, also, of the genus, are luminescent; several of them are much darker colored below than above, and several have conspicuous dark markings of characteristic shape on the flanks, color-characters unusual among sharks.

The dozen species that had been described from one part of the oceans or another are divided by Fowler (1941, p. 246) into two subgenera, (a) *Etmopterus* Rafinesque 1810, with "second dorsal origin over or a little before ventral base; ventral origin slightly nearer subcaudal than pectoral origin," and (b) *Acanthidium* Lowe 1839, with "second dorsal origin behind ventral base; first dorsal origin midway between orbit and second dorsal origin." Examination of available material does not seem to us to justify subdivision of the genus on this basis. We think it likely, however, that the *E. paessleri* of Lönnberg 1907 from the Straits of Magellan and reported subsequently from Argentine waters by Lahille (1921, p. 63) will prove distinct generically, for its dermal denticles were described as having several smaller lateral spines surrounding the central spine, and the lateral cusps on its upper teeth as "nicht sichtbar". Further exploration, however, of this matter seems idle, since knowledge of *paessleri* is still limited to Lönnberg's original account, which did not include illustrations either of its dermal denticles or of its upper teeth.

Up to the present time, four species have been described from the North Atlantic with its tributary seas:— (a) *spinax* (Linnaeus) 1758 of North African and European waters from the Cape Verdes, Morocco and the Azores to Norway, including the Mediterranean and reported from southern Africa;[35] (b) *pusillus* (Lowe) 1839, Madeira (type locality), Cape Verde Islands, Canaries, Azores,[36] and also in Japanese waters or represented there by a very close ally;[37] (c) *hillianus* (Poey) 1861, West Indian-Cuban region, southern Florida, northward off the Atlantic slope of America to the offing of Chesapeake Bay;[38] and (d) *princeps* Collett, 1904, described originally from the Faroe region, and

[35] Gilchrist, 1922, p. 49.

[36] Goode and Bean's (1895, p. 11, Pl. 2, fig. 5) report of *pusillus* from St. Kitts, West Indies, is shown, by their illustration, to have been based in reality on a specimen of *hillianus*. And Jordan and Evermann's report of it from Cuba (1896, p. 219; 1896a, p. 55) doubtless refers equally to *hillianus*, which they did not recognize as a separate species.

[37] First described as *E. frontimaculatus* by Pietschmann (1907, p. 395; 1908, p. 654, Pl. 1, fig. 2, Pl. 2, fig. 2); subsequently as *E. pusillus* by Tanaka (1912, Vol. 5, Pl. 22; Vol. 6, p. 88).

[38] The *Etmopterus* reported from tropical West African waters by Poll (1951) as *hillianus* has proved to represent a new species described here as *E. polli* (pp. 240, 241).

reported subsequently from the offing of the Straits of Gibraltar.[39]

We thought it likely, earlier (Bigelow and Schroeder 1948, p. 488, footnotes 3, 4) that *princeps*, originally described from poorly preserved material, would prove to be identical with *spinax*. But receipt of the specimens listed below (p. 247), trawled on the continental slope off southern New England and off southern Nova Scotia, which agree in detail with Collett's account and illustrations, proves that *princeps* is in fact an easily recognizable species (p. 250).

The experimental trawlings of the "Oregon", in the northern part of the Gulf of Mexico have now brought to light two additional members of the genus that cannot be referred to any species of *Etmopterus* previously known, whether from the Atlantic or from the Indo-Pacific. They are described here as *E. schultzi*, n. sp. (p. 252), and as *E. virens*, n. sp. (p. 257). Examination, too, of the *Etmopterus* recently reported by Poll (1951) from tropical West Africa as *hillianus* has shown that a new specific name is needed for it also. We propose *polli* in honor of its discoverer (p. 241).

Final decision, whether the sharks that have been described as *spinax*, from southern African waters, and as *pusillus* from Japan, are actually identical with the *spinax* and with the *pusillus* of the North Atlantic must await a comparison of specimens from these widely separated seas. The status of *paessleri* is discussed above (p. 238). Other species, referable to *Etmopterus*, that have been named from seas other than the North Atlantic, are: *lucifer* Jordan and Snyder 1902,[40] reported originally from Japan, where it appears to be common, and subsequently off Natal, southeastern Africa, from the East Indies, and widespread in Philippine waters; *granulosus* (Günther) 1880,[41] reported originally off the Coast of Chile, and subsequently off Natal, southeastern Africa,[42] and credited by Barnard (1925, p. 50) to the Hawaiian Islands; *brachyurus*, Smith and Radcliffe 1912,[43] from the Philippines; and *villosus* Gilbert 1905[44] from the Hawaiian region, the last two of which are known from the type specimens only. *Lucifer* is the only member of the Indopacific-Southern African-southern South American list of species that we have seen.

[39]Koefoed, 1932, p. 21, Sta. 25, Lat. 35°46′N, Long. 8°16′W, 2055 meters; as "*Spinax princeps*".

[40]Jordan and Snyder, 1902, p. 79; for list of locality references up to 1941, see Fowler, 1941, Vol. 13, p. 246.

[41]Günther, 1880, p. 19, Pl. 2, fig. C.

[42]Cape Point; Gilchrist, 1922, p. 49.

[43]Smith and Radcliffe, 1912, p. 679, Pl. 52; Fowler, 1941, p. 248.

[44]Gilbert, 1905, p. 580, Pl. 66; Fowler, 1941, p. 250.

Key to Species of *Etmopterus* of the North and Equatorial Atlantic, Mediterranean and Gulf of Mexico

1. Upper side of caudal fin very nearly as long as from tip of snout to rear edge of pectorals when latter are laid back; margins of fins fringed normally . . . . *schultzi*, n. sp.
Gulf of Mexico, p. 252

Upper side of caudal fin very little longer, if any, than from tip of snout to origins of pectorals, and considerably shorter in some; margins of fins not fringed normally, though often much frayed out 2

2. Distance from rear ends of bases of pelvics to origin of lower side of caudal is about as long as from tip of snout to origins of pectorals 3

Distance from rear ends of bases of pelvics to origin of lower side of caudal is at least no longer than from tip of snout to first gill openings 4

3. Rear end of base of first dorsal is about as near to origins of pelvics as it is to axils of pectorals; black and pale markings on rear part of trunk as in Figure 6A . . . . *hillianus* (Poey) 1861
Cuban-West Indian region and northward along the American Atlantic slope to the offing of Chesapeake Bay.

Rear end of base of first dorsal is considerably nearer to axils of pectorals than it is to origins of pelvics; black and pale markings on rear part of trunk as in Figure 6D . . . . *virens*, n. sp., p. 257
Gulf of Mexico

4. Dermal denticles on back and sides of anterior part of trunk low, truncate, their apex either flat or weakly convex, without conspicuous median spine . . . . *pusillus* (Lowe) 1839
Eastern Atlantic from equatorial West Africa[45] to Canaries, Madeira and Azores.

Dermal denticles on back and sides of anterior part of trunk with conspicuous median spine, either conical, thorn-like or bristle-like in form . . 5

5. Distance from rear ends of bases of pelvics to origin of lower side of caudal nearly or quite as long as upper side of caudal, and about as long as interspace between first and second dorsals . . . . *polli*, n. sp.
Equatorial West Africa, p. 241

Distance from rear ends of bases of pelvics to origin of lower side of caudal is not more than ⅔ as long as upper side of caudal, and is shorter than interspace between first and second dorsals 6

6. Belly at least slightly but definitely darker than sides and back with abrupt line of transition; the black of the lower surface extending upward

[45] We have received a fine specimen of *pusillus*, 167 mm. long, from Dr. Max Poll, from equatorial West Africa, Lat. 6°08′S, Long. 11°24′E. For an excellent colored illustration of *pusillus*, see Braganza, 1904, Pl. 2, fig. 2.

on rear part of sides as a sharply outlined flank mark of shape shown in Figure 6C; dermal denticles slender, bristle-like. . .*spinax* (Linnaeus) 1758
Eastern Atlantic, including Mediterranean, from the Cape Verde Islands, Morocco and the Azores to Norway; also reported from southern Africa (p. 238, footnote 35)

Back and sides black or blackish brown like belly; no definite flank mark; dermal denticles low, conical to thorn-like . . . . . . *princeps*, Collett, 1904
Faroes-Hebrides region and offing of Straits of Gibraltar in Eastern Atlantic, American slope off southern Nova Scotia, off Georges Bank, and off southern New England in Western. p. 246.

Etmopterus polli, n. sp.
Figure 7

Type specimen. Male, 197 mm. long; tropical West Africa, Lat. 6°08′S, Long. 11°24′E, 350–380 meters, M.C.Z. No. 38001, received from Dr. Max Poll. *Additional material:* five males and five females, 106–232 mm. long from the above locality and from Lat. 10°45′S, Long. 13°10′E, 350 meters, also contributed by Dr. Max Poll and all in Museum of Comparative Zoology.

Description. Proportional dimensions, in per cent of total length, of male 197 mm. long (type), and male of 213 mm.

Trunk at origin of pectoral: breadth 12.2. 9.9; height 10.1, 9.4.
Snout length in front of: outer nostrils 1.3, 1.4; mouth 9.6, 9.4.
Eye: horizontal diameter 5.1, 4.7.
Mouth: breadth 7.1, 6.6.
Nostrils: distance between inner ends 3.5, 3.3.
Labial furrow length: 4.6, 4.7.
Gill opening lengths: 1st 1.8, 1.4; 3rd 1.8, 1.4; 5th 1.8, 1.6.
First dorsal fin: vertical height 4.6, 4.7; length of base 5.6, 6.1.
Second dorsal fin: vertical height 4.8, 5.2; length of base 7.6, 8.0.
Caudal fin: upper margin 21.9, 23.4; lower anterior margin 12.2, 9.9.
Pectoral fin: outer margin 10.1, 8.9; inner margin 6.6, 6.1; distal margin 7.6, 6.7.
Distance from snout to: 1st dorsal 34.6, 33.3; 2nd dorsal 57.5 54.5; upper caudal 78.1, 76.6; pectoral 23.9, 23.5; pelvis 49.3, 48.8.
Interspace between: 1st and 2nd dorsals 17.2, 15.0; 2nd dorsal and caudal 13.2, 14.1; pelvic base and caudal 15.7, 17.9.
Distance from origin to origin of: pectorals to pelvics 25.4, 25.3.

Trunk at first dorsal (where highest) between 1/6 and 1/7 (16%)

as high as it is long to origin of caudal; its thickness there about $^2/_3$ as great as height, narrowing thence rearward and increasingly flattened sidewise with caudal peduncle about $^1/_2$ as thick as high; trunk thickest anteriorly, breadth of head at level of first gill openings being about $1^1/_4$ times as great as breadth at first dorsal. Head, to origin of pectorals a little less than $^1/_3$ (30%) of length of trunk to origin of caudal; flattened above and narrowed only a little abreast of the eyes; dorsal profile of head nearly straight, sloping evenly forward. Snout fleshy as is usual in the genus its anterior outline forming an angle of a little more than 90°, with rounded tip. Length of snout to mouth opening about $^1/_2$ (53%) of head, its length to eye about $^1/_5$ (21%). Eye oval with pointed rear corner, between 2 and 3 times as long as high, its horizontal diameter about $^1/_2$ (51%) as long as snout in front of mouth opening. Spiracle about 29 per cent as long as eye; behind eye by a distance about $^1/_2$ as long as eye, and about level with upper edge of eye. Nostril close to outer anterior margin of snout; about 60 per cent as long as eye; anterior nasal flap narrowly pointed, much as in *schultzi* (p.253); crossing nasal aperture a little outward from mid-length of latter. Mouth moderately arched, the gape occupying about $^2/_3$ (63%) of breadth of head. Upper labial furrows extending inward about 30 per cent of distance toward mid-line of head; rearward extensions of labial furrows reaching back from corner of mouth about $^1/_2$ the distance toward first gill openings.

Gill openings about $^1/_2$ as long as distance between inner ends of nostrils, anterior margins concave, but not enough so as to expose tips of gill filaments.

Teeth smooth edged, of the usual etmopterid shapes; $\frac{29}{16\text{-}1\text{-}16}$ in type specimen, $\frac{27 \text{ to } 34}{28 \text{ to } 30}$ in other specimens 207–232 mm. long. Upper teeth mostly with 5-7 cusps, the median cusp much the longest, the outermost cusp on each side much the shortest; a few teeth with only 3 cusps. Lower teeth with the cusp directed so strongly outward that the inner cutting edges are practically parallel with the general contour of the jaw; median lower tooth in type but not in ten other specimens examined. Mostly three rows in function simultaneously in upper jaw, one row in lower jaw.

Dermal denticles slender, thorn-like, stiff, thus intermediate in shape between the conical thorn-like denticles of *princeps* and the bristle-like denticles of *hillianus* and *schultzi;* rising steeply, with the tips curving rearward, making the skin rough to the touch; the bases 4-angled but mostly hidden in the skin. The denticles are sparsely distributed, in random arrangement on the anterior parts in general, but are in about 12 regular longitudinal rows along the tail sector of the trunk. Space between nostrils, and mid-belt of snout thence rearward to mouth either entirely naked, or with only an occasional denticle, so that the skin there feels glossy smooth to the touch. Basal 1/3–1/2 of fins sparsely denticulate, but their marginal zones naked.

First dorsal fin at base about 1.1 times as long as eye in type, 1.3 times in specimen 213 mm. long, of the characteristic etmopterid shape; its origin posterior to origin of pectorals by a distance about 2/3 as long as from tip of snout to mouth. Interspace between first and second dorsals (to first sensible elevation above general profile of back) nearly 3/4 (73%) as long as head to origin of pectorals in type, nearly 2/3 (64%) in specimen 213 mm. long. Origin of second dorsal about over rear ends of bases of pelvics (in male); its base about 1 1/3 times as long as base of first dorsal; its rear margin moderately concave; free lower margin about 3/4 as long as base; its rear corner sharp. Dorsal fin spines slender and needle-sharp, the second about 1.7 times as long as the first, its tip about level with the apex of the second dorsal fin. Distance from rear end of base of second dorsal fin to origin of upper side of caudal fin a little shorter than interspace between first and second dorsals; and a little more than 1/2 (55%) as long as head to origin of pectorals in type, 3/5 as long in specimen of 213 mm. Upper side of caudal fin about as long as from tip of snout to third gill openings; the tip obliquely truncate; lower rear margin with subterminal excavation forming an angle of about 150°, the lower anterior corner forming a low, well-rounded lobe as pictured (Fig. 7). Lower anterior margin of caudal about 1/2 (56%) as long as upper margin. Distance from origin of lower side of caudal to rear ends of bases of pelvics nearly as long as from tip of snout to first gill openings, and about as long as interspace between first and second dorsals. Pelvics a little shorter at base than second dorsal; outer corner well rounded; rear end of pelvic bases about under second dorsal spine. Pectorals reaching a little beyond first dorsal fin spine when laid back, truncate at tip with rounded corners.

The horny rays along the distal margins of all the fins are frayed out, but in such varying degree as to suggest that their present state has resulted from rough treatment, rather than that it represents the normal condition.

Claspers of mature males cylindrical, tapering to slender tips, the latter fleshy with one sharp spur exposed on the outer side, when not in function.

Color. Back and upper part of sides dark grayish brown, merging into black along lower surface of head, on belly, and in a narrow median band along ventral side of tail sector of trunk. The upper parts are of nearly as dark a shade as the belly; the sides seem to be plain-colored at first sight. Close examination, however, under a strong light, shows that the black of the lower surface spreads upward and rearward in a narrow band along the lower edge of the anterior part of the caudal peduncle on each side; also upward close behind the respective pelvic fin, then rearward as a definitely outlined, flank mark of the shape illustrated (Fig. 7), which is preceded anteriorly, after a short gap, by a second narrow oval black band, corresponding to the anterior extension of the flank mark to be seen on *E. spinax* (Fig. 6C); *E. hillianus* (Fig. 6A), *E. lucifer* (Fig. 6B), and *E. virens* (Fig. 6D). The top of the head is marked with a small vaguely outlined pale yellowish spot, and there is a pale spot close above the rear part of the eye in some specimens, but perhaps not in all. The margins of the pectoral, dorsal and pelvic fins are pale and translucent, but the tip of the caudal is smoky. Teeth cream white; lining of mouth dark bluish gray; lining of body cavity black.

It is interesting that the black dots and dashes that mark the side of several other members of the genus (pp. 255, 261) either are not represented at all on *polli*, or if they are present, are entirely concealed from view by the dark and dense pigmentation.

Size. The claspers of males 212–232 mm. long appear to be fully formed, suggesting a maximum length of perhaps 250–300 mm. at most.

Remarks. The specimens described here as *E. polli* were reported originally by Poll (1951, pp. 65–69) as *E. hillianus*. But a comparison with the considerable series of *hillianus* in the Museum of Comparative Zoology, from the type region (Cuba), has shown that the West African form differs quite sharply from *hillianus* in stouter and more sparsely distributed dermal denticles resulting in a rougher skin; in the nakedness of the midzone of the lower surface of its snout (densely denticulate in *hillianus*); in a somewhat longer head relative to the tail sector of the body (head about 1.4 times distance from pelvic base in *polli* but only about 1.1 times as long in *hillianus*). *Polli* seems also to lack the pattern of black dots and dashes (perhaps luminescent) to be seen on the sides of *hillianus*, and while the anterior portion of the black flank mark is continuous with the posterior portion in *hillianus* it is separate from the posterior portion in *polli* (cf. Fig. 6A with Fig. 7). Neither is there any likelihood of confusing *polli* with the new species *virens* (p. 257), so noticeably does it differ from the latter in its uniformly dark coloration; in the shape of the black flank marks on the rear part of the trunk (cf. Fig. 7 with Fig. 10); and especially in the relatively much shorter tail sector of its trunk, to list only the most conspicuous differences. *E. polli* recalls *E. princeps*, *E. pusillus*, *E. schultzi*, and newly-caught specimens of *E. spinax* among North Atlantic species, and *E. granulosus* of mid-latitudes of the southern hemisphere, in its dark coloration and proportional dimensions in general. But it differs from *spinax* in the nakedness of the mid-zone of the lower side of its snout (denticulate in *spinax*), in the linear arrangement of the denticles on the tail sector of its trunk (random there in *spinax*), in that the interspace between its pelvics and the lower side of its caudal is about as long as from tip of snout to second gill openings (only about as long as from tip of snout to corners of mouth in *spinax*), and in the shape of its black flank marks (cf. Fig. 6C with Fig. 7). More slender dermal denticles, narrower nasal flap, somewhat shorter caudal relative to length of head, smaller, more truncate pectorals reaching considerably farther rearward, the presence of the black flank mark and of the pale interocular spot on the top of the head, and much smaller size at sexual maturity mark it off from *princeps*. Distinctive differences between *polli* and *pusillus* are the thorn-like dermal denticles of the former (mostly truncate in *pusillus*); nakedness of its internarial space and of the mid-belt of the snout thence rearward to the mouth (uniformly denticulate in *pusillus*); much shorter interspace between its first and second dorsal fins, relative to the length of the head and to the total length of the fish; pectoral fins reaching considerably farther rearward; also in the presence on the rear part of its trunk of definitely outlined black flank marks.[46] Comparison with our considerable series of *E. schultzi* (p.252)shows *polli* as differing from the latter in a considerably shorter caudal fin in relation to other proportional dimensions; in a longer head but shorter interspace between the first and second dorsals; in the truncate shape of its pectorals (rounded in *schultzi*); in the shape of its caudal fin with more prominent lower anterior corner; in stiffer and more thorn-like dermal denticles; in the nakedness of its inter-

[46]We have, for comparison, a female *pusillus* about 280 mm. long, in a fair state of preservation, from Madeira, and a female of 167 mm., in excellent condition, from tropical West Africa, Lat. 6°08'S; Long. 11°24'E, received from Dr. Poll.

narial space and of the mid-belt of the lower surface of the snout thence rearward to the mouth; in the presence of the definitely outlined black flank mark on the rear part of the trunk (indistinct in *schultzi*, p.255);and in that the present frayed out state of the margins of its fins seem not to represent the normal condition.

Polli falls with *granulosus* in the nakedness of the mid-belt of the lower surface of its snout. But our West African specimens differ from *granulosus* as characterized and pictured by Günther (1880, p. 19, Pl. 2, fig. C),[47] in that the distance from snout to lower jaw occupies only about 35–40 per cent of the length of the head (to pectoral fins) in them, but 1/2 the length of the head in *granulosus;* that the distance from the rear ends of the bases of the pelvics to the lower origin of the caudal fin is longer than the interspace between the first and second dorsal fins in *polli* but shorter than the interdorsal space in *granulosus*; and that the base of the second dorsal fin is about 1/2 as long as the interdorsal space in *polli* but only about 1/3 that long in *granulosus*. Günther also describes the skin of *granulosus* as "granular", suggesting that its dermal denticles resemble the truncate denticles of *pusillus* (p. 240) rather than the thorn-like or bristle-like denticles of other members of the genus — except on the tail where he characterizes them as "minute spinelets." And he adds that the back of the tail is "naked" in *granulosus*, which is not the case in our specimens of *polli*.

Range. Specimens referable to *polli* have been reported only off the coast of tropical West Africa, between latitudes 5°39′S, and 11°53′S; from depths of 164 to 279 fathoms (300–510 meters, Poll, 1951, pp. 65–68, as *E. hillianus*). But the species must be decidedly common there, at the proper depth, for trawl hauls at 9 stations, by the Belgian expedition of 1948–1949 yielded 162 specimens, most of which, at least, were of this species.[48]

Etmopterus princeps Collett 1904
Figure 8

Our good fortune in obtaining the excellent series listed below, during the experimental trawlings carried out by the Woods Hole Oceanographic Institution on "Caryn" during the summer of 1949 and on "Cap'n Bill II" during the summer of 1952, enables us to add to Collett's original account of this species which was based on rather

[47]This is all we have to go upon.

[48]One specimen, at least, proves to be a *pusillus* (p.245, footnote 46), so it is possible that there may have been others of that species that were overlooked among the more numerous *polli*.

poor material. They also extend the known range of *princeps* to the western side of the North Atlantic.

Study material. Forty-seven specimens, 7½–24 inches (190–605 mm.) long, of both sexes, including a male with fully formed claspers; trawled on the continental slope off southern Nova Scotia, off Georges Bank and off southern New England, as above, at depths of 310–520 fathoms, between latitudes 42°39′ and 39°52′N, and between longitudes 63°58′ and 70°05′W.

Description. Proportional dimensions, in per cent of total length, of mature male 545 mm. long and female of 593 mm., both in Museum of Comparative Zoology.

Trunk at origin of pectoral: breadth 10.3, 12.2; height 7.9, 9.3.
Snout, length in front of: nostrils 1.1, 2.0; mouth 9.4, 9.8.
Eye: horizontal diameter 4.0, 4.0.
Mouth: breadth 7.9, 7.7.
Nostrils: distance between inner ends 2.8, 3.5.
Labial furrow length from angle of mouth: upper 4.4, 6.1.
Gill opening lengths: 1st 1.8, 2.0; 3rd 1.8, 1.7; 5th 1.6, 1.4.
First dorsal fin: vertical height 3.1, 3.4; length of base 5.1, 5.4.
Second dorsal fin: vertical height 4.6, 5.1; length of base 7.5, 7.6.
Caudal fin: upper margin 22.8, 22.0.
Pectoral fin: outer margin 9.7, 9.8; width 5.7, 6.9.
Distance from snout to: 1st dorsal 31.7, 34.3; 2nd dorsal 60.3, 60.6; upper caudal 77.2, 78.0; pectoral 21.6, 25.0; pelvics 53.7, 55.3.
Interspace between: 1st and 2nd dorsals 23.5, 20.9; 2nd dorsal and caudal 9.4, 9.8; pelvic base and caudal 14.7, 11.8.
Distance from origin to origin of: pectorals to pelvics 32.1, 30.4.

Trunk at first dorsal (where highest) about 1/7–1/8 as high as its length to origin of caudal fin, moderately flattened sidewise rearward from pectorals, its thickness at first dorsal about 3/5–3/4 its height there. Head flattened above, narrowed somewhat abreast of eyes, and noticeably broad; its width at level of corners of mouth and of first gill openings a little less than ½ (47%) as great as distance from snout to origin of pectorals; its length (to pectorals) between ⅕ and ¼ of total length in specimens in which the snout is not distorted. Tail sector from center of cloaca to origin of caudal fin about between ⅕ and ¼ as long as body sector (snout to cloaca) and 45–70 per cent as long as head to origin of pectorals.

Snout thick, fleshy (as usual in this genus), low-wedge shaped in front with rounded tip, in specimen in which it is not distorted; its length in front of mouth 2/5–1/2 (39–50%) of length of head.[49] Eye about $2\frac{1}{2}$ times as long as high, its horizontal diameter about 2/5 as long as snout in front of mouth opening. Spiracles about $\frac{1}{3}$ as long as eye, at about level of eyes, and posterior to eyes by a distance about $\frac{2}{3}$ as long as eye. Mouth very low-arched or nearly straight, its corners with short but conspicuous labial furrows extending inward about $\frac{1}{3}$ of distance towards the respective symphysis, and continued rearward and outward, from each corner of mouth for a distance about as long as the eye. Nostrils close to front of snout, strongly oblique, about as long as eye; inner anterior margin expanded as a broadly triangular flap with blunted tip, crossing outer part of nasal aperture. First to third gill openings $\frac{1}{3}$–$\frac{1}{2}$ as long as eye, the fifth a little shorter. Anterior margins of first to third gills so deeply concave that the tips of the respective gill filaments are more or less exposed to view, at least on large specimens.

Teeth smooth edged; $\frac{32}{50}$ in adult male of 545 mm.; $\frac{30}{40}$ in male of 404 mm.; $\frac{29}{48}$ in female of 593 mm.; a range suggesting that the number tends to increase with growth; the lower jaw with or without a median tooth. Upper teeth mostly with 5 cusps in adults, the median cusp much the largest, the outermost much the smallest; those of middle sized specimens either with the outer pair of cusps minute, or with only 3 cusps; small specimens with 3 cusps only. Lower teeth with cusps directed outward at an angle of as much as 70–75° in some cases, in others almost parallel with jaw, the inner margins of successive teeth together forming a nearly continuous cutting edge; those toward corners of jaws much smaller than those along central part.

Dermal denticles low, thorn-like, with slightly blunted tip, and nearly erect except with points turning a little rearward; more or less prominently striate longitudinally, on quadri-radiate bases that are mostly hidden in the skin; the denticles so sparsely distributed that the skin is exposed between them, the arrangement random over the anterior part of the trunk, but giving place to longitudinally linear arrangement on caudal peduncle and out along caudal fin. On adults the entire trunk, including the skin around the gill openings, and between them, is rough with denticles except for the area between the nostrils on the lower side of the snout which is sparsely denticulate,

[49] On one of our larger specimens, an adult male of about 545 mm., the tip of the snout is shrivelled, having dried by accident; hence it is now shorter than when the specimen was first taken; see legend to Figure 8.

or on some specimens naked, and along the upper lip, which is naked and velvety to the touch. On half-grown specimens and smaller this naked labial belt is broader, the internarial area is wholly naked, and the mid-belt of the lower side of the snout thence rearward may bear only a few scattered denticles. In this case, the pattern of mucous pores (obscured by the denticles on adults) is clearly visible. All but the outermost zone of the pectoral, dorsal and pelvic fins is rough with denticles, also the upper side of the caudal out to its margin. But the lower side of the caudal, outward from the caudal axis, is mostly naked. The fins are of the ordinary type, i.e. the margins not normally fringed, though very thin and more or less frayed out on all the specimens we have seen. First dorsal of usual etmopterid shape, its base about ¼–⅓ (average 30% on four specimens) as long as interspace between first and second dorsals; its origin posterior to a perpendicular at axils of pectorals by a distance between ¼ and ⅓ as long as interspace between dorsals. Interspace between dorsals from a little shorter to a little longer than head. Base of second dorsal about 1½ times as long as base of first dorsal, including the respective fin spines (1.4 times on 545 mm. male); distal margin weakly concave, free lower margin about as long as anterior margin from point of emergence of fin spine. Second dorsal spine about twice as long as first dorsal spine, its origin slightly but definitely posterior to rear ends of bases of pelvics. Interspace between second dorsal and origin of caudal ⅖ to about ½ (40–47%) as long as interspace between first and second dorsals. Caudal about as long (0.9–1.1 times) as head and about as long (0.97–1.05) as interspace between dorsals; about ⅓ as broad as long, with definite lower anterior corner, not, however, extended as a separate lobe; lower posterior outline slightly sinuous with well marked subterminal indentation, the tip obliquely truncate. Pelvics a little longer at base than base of second dorsal; rear pelvic corners angular. Pectoral with nearly straight anterior margin merging into moderately rounded distal inner margin around to axil; extreme length of pectoral from origin about ⅓ to a little less than ½ (33–44%) as great as length of head, its base, from origin to axil, about as wide as from tip of snout to level of center of eye. Claspers of mature males moderately stout, attached to the pelvic fins very nearly to the tips of the latter, and extending only a little beyond; tips of the claspers widely expanded when in function, with 4 sharp thorns, one of them covered with skin. On one mature male (Fig. 8) the left-hand clasper, with its thorns, is spread, exposing the orifice of the sperm channel, but the tip of the other clasper is closed and conical, with the thorns concealed entirely.

Color. The trunk, as a whole, of half-grown specimens and adults is very dark, blackish brown, or uniform black; the belly is somewhat darker than the back on some specimens after preservation in alcohol, but not on others; no definite flank mark. The outer parts of all the fins are about as dark as the trunk (if the pigmented skin has not been rubbed off by rough treatment) except that the lower rear corner of the second dorsal fin is whitish over a larger or smaller area on some partly grown specimens, perhaps on all, though not on adults. The anterior surface of the outer part of each gill arch (exposed by the deeply excavated anterior contour of the respective gill opening), is whitish; the teeth white and therefore conspicuous against the sooty or black lining of the mouth; the lining of the body cavity sooty or black. It is interesting that no trace is to be seen of the rows of dark dots and dashes, or of the pale interocular spot, that characterize various other members of the genus.

Size. A male, about 545 mm. long, appears to be fully mature sexually, which suggests that the original specimens, about 750 mm. long, from the Faroe region, were about as large as the species grows.

Luminescence. There is no reason to suppose that *princeps* is luminescent — at least we have seen no evidence of light emission by any of the specimens that we have handled while they were still alive.

Remarks. Comparison of our series of *princeps* with two specimens of *spinax* from Norway and two from the Mediterranean, in good condition, bears out Collett's (1904, 1905) belief that the former differs from the latter in a wider head relative to the length of the snout, in longer gill openings, in shape of dermal denticles, and in color. Thus the breadth of the head is 1.2–1.4 times as great as the length of the snout (to the mouth) in four *princeps*, but only about as great as the length of the snout in the four specimens of *spinax;* the longest gill openings are $1/3$–$1/2$ as long as the eye in *princeps* but about $1/7$–$1/3$ only in the *spinax;* the conical, thorn-like denticles of *princeps* differ noticeably from the bristle-like denticles of *spinax;* and none of our *princeps* show any trace of the black flank marks to be seen on the rear part of the sides in *spinax*, more or less conspicuously, depending on whether the color of the upper parts of the specimens examined has faded.

Superficial examination is all that is needed to distinguish *princeps* from all the remaining North and Tropical Atlantic species of its genus. The most conspicuous features marking it off from *hillianus*, and from *virens* are its uniformly black or blackish brown color, without definite flank markings, and its large gill openings; likewise the much greater length to which it grows. Its short thorn-like denticles mark it off further from *hillianus*, and a relatively much shorter tail sector of its trunk from *virens*. It resembles *pusillus* and the new species *schultzi* (p. 252) and *polli* (p. 241) in its uniformly dark coloration. But a much shorter caudal fin, longer gill openings, much larger size at maturity, fins that are not fringed normally, and short, thorn-like denticles separate it from *schultzi;* its conical thorn like denticles, a caudal fin at least as long as the head, the shape of the caudal and a more rounded pectoral separate it from *pusillus*.

Turning now to the species of *Etmopterus* that have been named from more distant seas, we find *princeps* set apart from *E. paessleri* by the teeth and dermal denticles — if, indeed, *paessleri* falls properly in this genus at all (p.238); from *villosus* by the position of its first dorsal fin nearer to the spiracles than to the second dorsal (nearer to the second dorsal than to the spiracles in *villosus*); from *brachyurus*[50] by a much shorter tail sector of the trunk as compared with the body sector; from *lucifer* similarly by a much shorter tail sector, as well as by uniformly dark coloration, with neither black flank marks nor pale interocular spot. *Princeps* appears to agree very closely indeed with *granulosus* in relative dimensions, as it also does in color. But, to judge from Günther's (1880, p. 19) description, which is all we have to go upon,[51] the dermal denticles on the anterior part of the body of *granulosus* ("granules") differ in shape from those on the tail, where he characterized them as "in the form of minute spinules." That is to say, they reproduce the condition to be seen in *pusillus* rather than the condition in *princeps*, where the denticles are conical thorn-like on the posterior part of the sides as well as anteriorly. We cannot carry our comparison farther, lacking either a detailed description of *granulosus* or specimens of the latter, for comparison with *princeps*.

Habits. Evidently *princeps* is confined to deep water, recorded depths for it being 310–520 fathoms in the Western Atlantic, 410–602 fathoms in the region of the Faroes and Hebrides, and 1134 fathoms off the Straits of Gibraltar.

Range. The recent captures, listed above, extend the known range of

[50]As described and pictured for the type specimen of *brachyurus* by Smith and Radcliffe (1912, p. 679, Pl. 52) and by Fowler (1941, p. 249).

[51]The dermal denticles of *granulosus* have not been figured either by Günther (1880) or by Barnard (1925).

E. princeps from the Faroe-Hebrides region, and from the offing of the Straits of Gibraltar to the Western Atlantic slope off southern Nova Scotia, off Georges Bank and off southern New England.

ETMOPTERUS SCHULTZI, n. sp.
Figure 9

Type. Male, 270 mm. long, "Oregon" Sta. 279, Lat. 29°11'N, Long. 86°53'W; 305 fathoms, February 24, 1950 (U. S. Nat. Mus. No. 113,381). Also 38 males and females, 195 to 300 mm. long, from "Oregon" trawlings in northern part of Gulf of Mexico, 220 to 400 fathoms.[52]

Description. Proportional dimensions, in per cent of total length, of male of 270 mm. (type) and female, 255 mm.

Trunk at origin of pectoral: breadth 9.6, 10.2; height 7.8, 9.0.

Snout length in front of: outer nostrils 1.5, 1.6; mouth 9.4, 9.1.

Eye: horizontal diameter 4.8, 5.1.

Mouth: breadth 7.8, 7.5.

Nostrils: distance between inner ends 3.3, 3.1.

Labial furrow length: 4.1, 4.3.

Gill opening lengths: 1st 1.1, 1.6; 2nd 1.1, 1.6; 3rd 1.1, 1.6; 4th 1.1, 1.6; 5th 1.1, 1.6.

First dorsal fin: vertical height 2.6, 2.3; length of base 4.5, 4.3.

Second dorsal fin: vertical height 5.5, 5.1; length of base 8.2, 8.6.

Caudal fin: upper margin 25.5, 23.0.

Pectoral fin: outer margin 7.4, 7.5; inner margin 3.9, 4.3; width 5.9, 5.5.

Distance from snout to: 1st dorsal 31.1, 32.9; 2nd dorsal 54.1, 55.7; upper caudal 74.5, 77.0; pectoral 21.1, 19.6.

Interspace between: 1st and 2nd dorsals 18.5, 18.5; 2nd dorsal and caudal 12.2, 13.0; base of pelvics and caudal 15.2, 12.6.

Distance from origin to origin of: pectorals to pelvics 29.6, 33.3.

Trunk thickest opposite pectorals, narrowing rather evenly rearward, its height at first dorsal (where highest) about 15 per cent as great as its length to origin of caudal. Head about 28 per cent of trunk to caudal; body sector (snout to center of cloaca) about 3½

[52]"Oregon" Station 270, Lat. 29°23'N, Long. 82°25'W, 220 fath., Feb. 17, 1950; Sta. 271, Lat. 29°24'N, Long. 86°56'W, 300 fath., Feb. 18, 1950; Sta. 279, Lat. 29°11'N, Long. 86°53'W, 305 fath., Feb. 24, 1950; Sta. 319, Lat. 29°20'N, Long. 87°25'W, 315 fath., April 28, 1951; Sta. 321, Lat. 29°27'N, Long. 87°19'W, April 28, 1951; Sta. 482, Lat. 28°57'N, Long. 88°43'W, 210 fath., Sept. 7, 1951; Sta. 542, Lat. 27°41'N, Long. 94°59'W, 250–300 fath., April 16, 1952; and Sta. 549, Lat. 26°59'N, Long. 96°07'W, 300–400 fath., April 18, 1952.

times as long as tail sector from center of cloaca to origin of caudal. Head flattened above, slightly narrowed at eyes, its breadth abreast mouth and first gills about 1.4–1.5 as great as distance from front of snout to mouth. Snout thick, fleshy, soft, obtusely rounded in front, its length in front of mouth a little less than ½ (44%) of head to origin of pectorals. Eye about twice as long as high, its horizontal diameter about ½ (51%) as long as snout in front of mouth. Spiracles about ¼ as long as eye; a little above horizontal axis of eye, and behind latter by a distance about ⅕ (22%) as long as eye. Nostrils very close to anterior margin of snout, as characteristic of the genus; about ½ as long as eye; anterior (inner) margin expanded as a narrow pointed lobe crossing nasal aperture; inner subdivision of nasal aperture about twice as long as outer subdivision. Mouth very low arched, the gape occupying about ⅔ of breadth of head; labial furrows reaching inward about ⅕ of distance toward symphysis; extended as a conspicuous furrow outward and rearward beyond corner of mouth for a distance about 45 per cent as long as eye. Gill openings about ⅓ as long as distance between nostrils, and about ¼ as long as eye (about ⅓ as long in specimen of 254 mm.)[53], their anterior outlines concave. but not enough so as to expose the tips of the gill filaments.

Teeth smooth edged, $\frac{38}{32}$ in type specimen, $\frac{32}{32}$ in female of 254 mm.; uppers mostly with 7 cusps, a few with 8 (4 laterals on the one side, 3 on the other), a few with only 5 or 6; median cusp considerably the longest and stoutest, the lateral cusps on each side graded in length outward. Lower teeth with the cusp directed so strongly outward as to form a practically unbroken cutting edge approximately parallel with the jaw. Dermal denticles minute, bristle-like, curving so strongly rearward that the distal half of their length is approximately parallel with the skin; the tips hair-fine, and flexible; the bases quadriradiate, but mostly concealed in the skin. The denticles are close spaced over the trunk as a whole, including the entire lower surface of the head, excepting only along the upper and lower lips;[54] in random distribution, not in linear arrangement anywhere. All the fins, also, are closely denticulate out very nearly to the fringed marginal zone (Fig. 9E).

Base of first dorsal fin about ¼ (24%) as long as interspace between first and second dorsals; its upper contour rounded, the free lower margin about ⅔ as long as the base; its origin posterior to axils of

[53] The softness of the skin makes precise measurements difficult.

[54] On specimens preserved in alcohol the denticles are so covered with coagulated mucus that it is necessary to scrub them clean, to expose their shape and arrangement.

pectorals by a distance about as long as from corners of mouth to origins of pectorals. Interspace between first and second dorsals nearly as long as head, and a little less than ¾ (74%) as long as caudal fin. Second dorsal about 1½ times as large as first dorsal in linear dimensions, its anterior margin nearly straight, distal margin weakly concave, apex bluntly angular; free lower margin about as long as anterior margin from point of emergence of fin spine; origin about even with rear ends of bases of pelvics. Second dorsal spine extending out nearly to level of apex. Interspace between second dorsal and caudal about ⅔ (66%) as long as interspace between first and second dorsals. Caudal about 1.2 times as long as head, and 1.4 times as long as interspace between first and second dorsals; about 3½ times as long as broad, its tip rounded; the lower rear margin increasingly concave toward tip but without definite subterminal notch; lower anterior corner a little more obtuse than a right angle, not produced as a lobe; lower anterior edge nearly straight. Interspace between lower origin of caudal and rear ends of bases of pelvics about ½ as long as interspace between rear ends of bases of pelvics and axils of pectorals. Pelvics subquadrate, their anterior and distal margins nearly straight; anterior margin about as long as base. Pectorals with weakly convex anterior margin, grading insensibly into broadly and evenly rounded distal and inner margins around to axil; maximum length of pectoral about 2/5 as great as distance from snout to level of first gill openings, the rear margin falling considerably short of the first dorsal spine when the pectoral is laid back.

The outstanding feature of the species is that the outer ends of the horny terminal rays (ceratotrichia) of all the fins are not only thicker than in other species of the genus, but are free from the skin so that they form a conspicuous fringe. Since this is true of all the specimens examined, though some of them were still alive when we first handled them, we see no reason to doubt that this is the normal state. But the fact that the edges of the skin, whence the rays emerge, are somewhat ragged in varying degree from place to place, suggests that the fringe-like conditions may be a growth character. However, we have not been able to check the state of the fins either on unborn embryos, or even on very young free-living specimens. In the case of the pectorals, the fringe around the distal margin occupies about ⅕–⅙ of the length of the fin, grading down to nothing at origin and axil. The fringe is narrower (hence less conspicuous) on the dorsals and pelvics; very narrow indeed along the upper edge of the caudal, though it is evident even there on close examination.

Color. Back and upper parts of sides very dark sooty gray, with brownish cast, the top of the head with a vaguely outlined pale yellowish spot between the eyes; the belly black. On specimens preserved in alcohol the line of demarkation between the slightly darker belly and the slightly paler sides above is rather definite in most cases. On the type specimen — when slightly dried — the black of the lower surface extends upward and forward as a vaguely outlined band on either side above the paler base of the respective pelvic fin, reminiscent of the much more conspicuous and more definitely outlined black flank mark to be seen on several other members of the genus, such as *virens*, *lucifer*, *spinax* and *polli*. But some other specimens, which seem to have retained their normal coloration better, show no sign of this. The lower margin of the caudal axis, near the tip, is narrowly edged with black. The fins otherwise are paler generally than the trunk, except that the tip of the caudal is dark-margined at least on some specimens. Other than that, the free rays that edge the fins are colorless and nearly translucent so that the marginal fringe of the pectorals shows whitish against the dark sides when the fins are laid back. Faded specimens also show two irregular lines of short, very narrow, black dots and dashes along each side, the upper row extending from over the origin of the pectoral fin back to about opposite the tip of the second dorsal, the lower row from abreast the tip of the pectoral back about halfway toward a perpendicular at the origin of the pelvics. There also are a few black dots on the top of the head and others, wide spaced, in a single row along the mid-line of the back rearward to the caudal peduncle. But these black markings are so obscured by the generally dark color that those on the sides are discernible only here and there on the type, or on other specimens that have retained their color, while the dorsal dots are not to be seen on them at all. The teeth are white; the lining of the mouth is sooty to black, and the lining of the body cavity as well.

Size. A female 275 mm. long contains several large eggs (apparently not fertilized), and the claspers of the type specimen, of 270 mm., appear to be nearly full grown, suggesting a maximum length perhaps not much greater than 300 mm.

Luminescence. The black dots and dashes on the back and sides bear so close a resemblance to those of *E. spinax* and of *E. lucifer*[55] as to

[55]See Johann (1899, p. 136–160, Pls. 10, 11) for the luminescent organs and luminescence of *spinax;* Oshima (1911, p. 1) for *lucifer*.

suggest that they are luminescent in *schultzi* also. But we saw no sign of light emission by any of the specimens, even when first taken from the trawl.

Remarks. E. schultzi falls with *E. princeps* and with *E. pusillus*, among North Atlantic species, in its nearly plain dark coloration. But it differs conspicuously from *princeps* in a relatively much longer caudal fin, also in its fringed fins, in its bristle-like denticles, and in much smaller size at maturity; also in having the pale interocular spot which *princeps* lacks; from *pusillus* (with which it shares a uniformly denticulate internarial region and the pale interocular spot) in a considerably longer caudal, from both *princeps* and *pusillus* in its fringed fins and its soft, bristle-like dermal denticles. The nature of its denticles would seem to ally it to *spinax* and to *hillianus*, if this be regarded as a primary specific character. But it differs from both of these in its fringed fins; also in its plain coloration; further from *hillianus* in a much shorter tail sector of the trunk relative to the body sector; from *spinax* (which it resembles more closely in its proportional dimensions) in rounded pectorals, their outer margins falling far short of the first dorsal spine when the pectorals are laid back; and in that it lacks the black flank marks which are visible on *spinax* even in fresh specimens on which the back and sides are nearly as dark as the belly.[56] A relatively much longer caudal fin separates *schultzi* quite obviously from the new species *E. polli* (p.241); its lack of black flank marks is an equally precise differential character, though one less conspicuous, for these black markings are not easy to see on *polli* though regularly characteristic of that species.

Plain coloration, without conspicuous flank marks, combined with its bodily proportions, seem to ally *schultzi* the most nearly to *granulosus* and to *brachyurus*, among species of its genus of other seas. But its caudal fin is considerably longer, relatively, and the tail sector of its trunk relatively much shorter than those of *brachyurus;* while a longer caudal plus the fact that the space between its nostrils is denticulate separate it from *granulosus*. And there is nothing in the published accounts of *brachyurus* or of *granulosus* to suggest that the fins are fringed normally in either of these species, as they are in *schultzi*.[57]

[56]See Smitt (1895, p. 1163, Pl. 51, fig. 3) for description and excellent colored illustration of *spinax*.

[57]For descriptions and illustrations of *granulosus*, see Günther, 1880, p. 19, Pl. 2, fig. C; Barnard, 1925, p. 49; 1927, Pl. 2, fig. 8; and Smith, 1949, p. 58, fig. 50. For *brachyurus* see Smith and Radcliffe, 1912, p. 679, Pl. 52; and Fowler, 1941, p. 248.

Habits. Evidently this little shark is confined to water at least moderately deep, for the captures were all made at depths of between 210 and 400 fathoms. Beyond this, all that we know of its habits is that its food includes squids (field notes).

Range. So far known only from the northern part of the Gulf of Mexico, between latitudes 26°59′ and 29°20′N; and between longitudes 82°25′ and 96°07′W ("Oregon" Stations 270, 271, 279, 319, 321, 482, 542, 549). *E. schultzi* must be decidedly common at appropriate depths in this part of the Gulf for the total number of specimens taken was more than one hundred, of all sizes (field notes).

Etmopterus virens, n. sp.

Figures 6D, 10

Type. Adult male 203 mm. long, "Oregon" Sta. 501, northern part of Gulf of Mexico, Lat. 29°52′N, Long. 91°33′W, 220 fathoms, Dec. 11, 1951; U. S. National Museum No. 160,859. Also 42 others, males and females, including an embryo ready for birth, from the same general region, "Oregon" Stations 321, Lat. 29°27′N, Long. 87°19′W, 220 fathoms; Sta. 351, Lat. 29°13′N, Long. 88°00′W, 200 fathoms; Sta. 382, Lat. 29°12′N, Long. 88°08′W, 190–210 fathoms; and Sta. 489, Lat 27°44′N, Long. 85°09′W, 254 fathoms; in U. S. National Museum and Museum of Comparative Zoology.

Description. Proportional dimensions, in per cent of total length, of male of 203 mm. (type) and female, 153 mm.

Trunk at origin of pectoral: breadth 8.8, 7.8; height 8.4, 7.2.

Snout length in front of: outer nostrils 1.7, 2.0; mouth 11.1, 10.5.

Eye: horizontal diameter 5.7, 5.2.

Mouth: breadth 7.6, 6.9.

Nostrils: distance between inner ends 3.5, 3.3.

Labial furrow length: 4.0, 3.9.

Gill opening lengths: 1st 1.0, 1.0; 2nd 1.0, 1.0; 3rd 1.0, 1.0; 4th 1.0, 1.0; 5th 1.2, 1.3.

First dorsal fin: vertical height 2.5, 2.6; length of base 4.4, 4.6.

Second dorsal fin: vertical height 4.9, 3.9; length of base 6.9, 6.5.

Caudal fin: upper margin 23.2, 24.2.

Pectoral fin: outer margin 10.6, 9.5; inner margin 5.4, 5.2; width 7.4, 6.9.

Distance from snout to: 1st dorsal 32.5, 30.7; 2nd dorsal 55.6, 53.5; upper caudal 76.8, 75.8; pectorals 23.1, 21.5; pelvics 46.8, 47.0.

Interspace between: 1st and 2nd dorsals 18.7, 18.3; 2nd dorsal and caudal 14.3, 15.7; base of pelvics and caudal 21.2, 20.1.
Distance from origin to origin of: pectorals to pelvics 23.6, 25.4.

Body thickest at pectorals, narrowing rearward to thin caudal peduncle, its height at first dorsal (where highest) about 15 per cent as great as length of trunk to origin of caudal; its thickness at first dorsal about 75–80 per cent as great as its height there. Breadth of head at corner of mouth about as great as length of snout to mouth. Head to origin of pectorals a little more than 1/4 (30%) of trunk to origin of caudal fin, its length about 1.2 times as great as length of interspace between first and second dorsals. Body sector, to cloaca, about 2.3 times as long as tail sector from cloaca to origin of lower caudal. Head flattened above, the nape elevated a little. Snout fleshy, its anterior contour forming an angle of about 90° with broadly rounded apex, its lateral outlines narrowed a little abreast of eyes, the pattern of mucous pores on its lower surface visible thanks to the nakedness of the skin there (see below, p. 259). Eyes about 1.7 times as long as high, and about 1/2 as long as snout to front of mouth Spiracles about 1/3 as long as eye, a little above mid-level of eyes, and behind latter by a distance about 1/3 as great as length of eye. Nostrils close to anterior margins of snout as usual in this genus, about 60 per cent as long as eye, only slightly oblique, the lobe-like expansion of the inner anterior margin slender (even more so than in *E. schultzi*,) reaching across nasal aperture; inner subdivision of latter about twice as long as outer subdivision. Mouth very little bowed, occupying about 4/5 breadth of head, the labial furrows reaching inward only about 28 per cent of distance toward the respective symphysis, and each extending rearward and outward from corner of mouth as a well marked furrow for a distance about 2/3 as long as horizontal diameter of eye. First to fourth gill openings between 1/4 and 1/3 (29%) as long as distance between inner ends of nostrils and about 1/5–1/6 as long as eye; anterior margins concave but not enough so as to expose the gill filaments to view; fifth gill opening 1.2 times as long as first-fourth gills.

Teeth smooth edged, $\frac{34}{32}$ in type specimen, $\frac{29}{24}$ in female of 153 mm.; no median tooth in lower jaw in either case; upper teeth mostly with 5 cusps, occasionally with only 4 (1 lateral cusp on the one side, 2 on the other), the median cusp much the longest, the outermost cusp on each side very small. Lower teeth with cusps directed so strongly outward, toward the corner of the mouth, that the inner edges of the functional row form an almost continuous cutting edge parallel with the jaw. Dermal denticles low, conical to thorn-like, moderately to strongly curved rearward, recalling those of *E. princeps* (p.248,Fig. 8E), and of *E. lucifer*, rather than those of *hillianus*, of *spinax*, or of *schultzi* (p. 253);on moderately expanded quadri-radiate bases more or less concealed in the skin; the denticles rather sparsely distributed on anterior parts of trunk in general in random arrangement, but with indefinite indications of a linear arrangement on sides rearward from level of second dorsal; more closely crowded on lower part of the sides and on the black dotted area of the abdomen than above. Skin on lower surface of snout as a whole back to mouth naked (an important specific character); likewise lower lip as well as skin in region of gill openings. Caudal fin rather densely denticulate along fleshy axis but naked along margins; the other fins denticulate only close in to their bases.

The fins are of the ordinary type, i.e. the margins not regularly fringed, but with edges so delicate that they are more or less frayed on all our specimens. First dorsal fin evenly rounded along anterior upper margin; its base nearly as long as the eye, its free lower margin about as long as base, its rear corner rounded, its origin (first sensible elevation above general profile of back) posterior to origins of pectorals by a distance about as long as from spiracle to fifth gill opening. Interspace from rear end of base of first dorsal to first sensible elevation of second dorsal about as long as from snout to second gill opening; or about 3/4 as long as upper side of caudal fin. Anterior edge of visible base of second dorsal spine posterior to rear ends of bases of pelvics by a distance about 2/3 as long as eye on adult as illustrated by the type, but very close behind rear ends of pelvic bases on small specimens. Posterior margin of second dorsal fin deeply concave, its rear corner slenderly pointed, the free lower margin a very little shorter than the eye, the base (measured from anterior base of spine) about as long as from spiracle to second gill opening, and about 1.4 times as long as base of first dorsal measured from anterior base of spine. Distance from rear end of base of second dorsal to origin of upper side of caudal about as long as from tip of snout to rear of eye, or about 3/4 as long as interspace between first and second dorsals. Caudal about as long as head to origin of pectorals, its axis only slightly raised, its extreme breadth a little less than 1/3 as great (29–30%) as its length; its upper outline weakly convex, increasingly so rearward; the tip obliquely truncate with rounded corner; lower posterior margin moderately concave, without definite subterminal notch; the lower anterior corner rounded, a little produced; lower anterior margin weakly convex, about as long as from spiracle to fifth gill opening. Distance from origin of lower side of caudal fin to rear ends of bases of pelvic fins about $^9/_{10}$ as long as head to origins of pectorals, and a little longer than distance from origins of pelvics to axils of pectorals. Bases of pelvics about as long as base of first dorsal; the margins nearly straight, the outer anterior corner rounded, the rear corner narrowly pointed; rear end of bases of pelvics definitely anterior to anterior base of second dorsal spine on type specimen, but only slightly so on small specimens Pectorals nearly square-tipped, with rounded corners reaching when laid back nearly or quite to a perpendicular at base of first dorsal fin-spine; anterior margin of pectoral slightly convex, inner margin rather strongly so to axil; base strongly oblique, about ⅔ (68–69%) as wide as anterior margin of pectoral. Claspers of mature male cylindrical, free only at their extreme outer ends from inner margin of pelvic fin, the tip with three hard thorns.

Color. Perhaps the most striking feature of this new species is its pattern of darker and paler markings, easier represented pictorially (Figs. 6D, 10) than described verbally. In general, the upper parts of the trunk are sooty brown above the level of the origins of the pectoral fins, darkest along the back, but interrupted on each side by two narrow longitudinal stripes of pale bluish gray, the one stripe high up on the side, bowing down a little below the second dorsal fin and reaching forward to over the first gill opening; the other stripe (paler and hence more conspicuous) running rearward from close behind the upper end of the base of the pectoral fin past the base of the respective pelvic fin where it unites with the upper longitudinal pale stripe. The members of the lower pair of pale stripes (one on each side) are interconnected across the black belly by a pale belt close in front of the pelvics (conspicuous in ventral view); also by a pale area of considerable extent behind the pelvics. There also is a pale yellowish oval spot on the upper surface of the head between the orbits (as in *pusillus*, in *hillianus*, in *schultzi* and in *polli*). The region of the gill openings is pale brownish gray; so, too, are comma-shaped patches extending downward from before and behind the gill openings; there is a pale oval patch behind each eye, and a considerable pale area on the lower surface of the rear half of the tail sector of the trunk. Contrasting sharply with these pale areas, the lower surface of the snout is very dark bluish gray or blue black; the lower surface of the head, rearward from the mouth, is black, as is the belly also, back to the pelvics (except for the pale cross belt just mentioned). Other conspicuous black markings are: (A) a flank mark, in the form of a bar that extends above the pelvic along each side, forward to about even with the origin of the pelvics and rearward about as far as the rear end of the base of the second dorsal, with the flank marks of the two sides joining to form a black belt crossing the lower surface of the trunk a little rearward from the pelvics; (B) a second belt crossing the lower surface of the tail sector of the trunk a little in front of the origin of the caudal fin, and extending rearward along each side in the shape illustrated (Figs. 6D, 10); and (C) a narrow stripe on either side along the lower edge of the caudal axis near the tip of the latter. The tip of the caudal fin is blackish, also, as is its lower anterior corner. But the other fins as a whole are pale gray, and with their outer parts translucent. The lining of the mouth is sooty to black, also the lining of the body cavity; the teeth are white. One of the most interesting characteristics of *virens* is that the belly of fresh-caught specimens shines with bright green iridescence, hence the name we propose for it. But this is entirely lost after preservation in alcohol.

The dark hue of the upper parts of *virens* in general, of the lower surface of the snout, and of the corners of the caudal fin is due to ordinary pigmentation. But the dark hue of the lower surface rearward from the mouth to the pelvics, and of the markings on the sides on the tail sector of the trunk result chiefly from the presence of great numbers of inky black depressions of the skin, irregularly roundish in shape, and of various sizes, but large enough on the whole and loosely enough scattered, to be visible individually under an ordinary handlens. The paler skin between them is richly provided, too, with much smaller black spidery chromatophores. And the black peritoneum, showing through the body wall, plays its part, likewise, in producing the black of the belly. Besides the broad-scale black areas just outlined, each side of the trunk is marked from the origin of the pectoral fin back to the origin of the caudal fin, with a complex series of black dots and narrow black dashes as follows: A) in a longitudinal row (double for part of its length) following the upper edge of the lower of the two pale side stripes from close to the axil of the respective pectoral fin to above the origin of the pelvic fin; B) in a shorter longitudinal row midway up each side, from below the first dorsal fin to above the origin of the pelvic fin; C) in a double row running along, close above the upper pale side stripe from below the first dorsal fin to below the rear end of the base of the second dorsal whence it continues rearward as a single row as far as the origin of the caudal fin. There also are two groups of longitudinal black dashes on each side of the head between the eye and the first gill opening, the one group behind the other, with each group consisting of 3 dashes, one above another. Small specimens also have a mid-dorsal row of dots (the successive dots so close together as to form a nearly continuous line) extending forward from the origin of the first dorsal fin nearly as far as the spiracles; also a loose cluster of black dots close behind the pale interocular spot, with another such cluster in front of the latter and partially enclosing it. But the heads of the larger specimens show only faint traces of these mid-dorsal markings.

Microscopic examination shows that each of these black dots and dashes actually represents either a pit or a trough-like depression of the skin, in which they agree with the similar black markings on the sides and back of *E. spinax* and of *E. lucifer*.[58]

Size. The facts that the claspers of the type specimen 203 mm. long, and those of another male of 225 mm. appear to be fully formed and in functional condition, and that a female of 230 mm. contained an embryo 45 mm. long and about ready for birth show that this is one of the smallest of known sharks, and suggest a maximum length perhaps not greater than 300 mm.

Luminescence. The black pits and furrows on the back and sides of *E. virens,* like the similar structures on *E. schultzi* (p. 255) recall the luminescent organs of *E. spinax* and of *E. lucifer* (p. 255, Footnote). And while we saw no signs of the emission of light by *virens*, any more than by *schultzi* (p. 256), the possibility remains that they may so function, for the specimens that were in the best condition were all taken during the daytime.

Remarks. Among North Atlantic species, *virens* falls the most nearly with *hillianus* in its proportional dimensions and in its color. But it differs quite sharply from *hillianus* in its low, conical denticles (bristle-like in *hillianus*); in the nakedness of the skin on the lower surface of its snout and in the region of its gill openings (rough with denticles in *hillianus*); and in a shorter snout, the distance from its tip to the level of the spiracles being about as long as from spiracles to axils of the pectorals in *hillianus,* but only about as long as from spiracles to origins of pectorals in *virens*. A still more conspicuous difference lies in the shapes of the black markings on the sides of the rear part of the

[58] See footnote 55, p. 255.

trunk in the two species (Fig. 6), while the freshly taken specimens of *hillianus* that we have seen showed no trace of the green iridescence that is so conspicuous a feature of the belly of fresh-caught *virens* (p. 261). Among species of *Etmopterus* from other seas, *virens* falls the nearest to *lucifer* in the great length of the tail sector of its trunk, and in its color pattern. But it differs from *lucifer* a) in lower and stouter dermal denticles; b) in a longer caudal fin (about 1.3 times as long as interspace between first and second dorsals in *virens;* only about 90 per cent as long as interspace between dorsals in *lucifer*); c) in the shape of its nasal flap (Fig. 10C), that of *lucifer* being broadly triangular, i.e. more nearly as it is in *princeps* (Fig. 8C); d) more conspicuously in the shapes of the black markings on the posterior part of the trunk (Fig. 6).

Habits. All that is known of the habits of this little shark is that it appears to be confined to at least moderately deep water, all the specimens yet seen having been trawled between 190 fathoms and 254 fathoms; and that it feeds on squids.

Range. Known only from the northern side of the Gulf of Mexico, at the stations listed (p. 257); but evidently quite common there, at suitable depths, for we saw more than a hundred specimens taken from the trawl, of all sizes.

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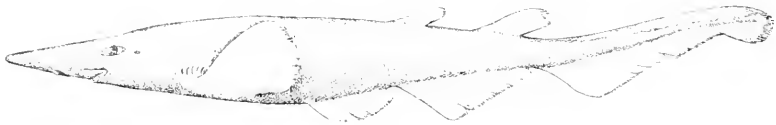

Fig. 1. *Apristurus atlanticus* Koefoed 1932. Female, 297 mm. long, northern part of Gulf of Mexico, Lat. 27°32′N, Long. 93°02′W, 400–450 fathoms, "Oregon" Sta. 534.

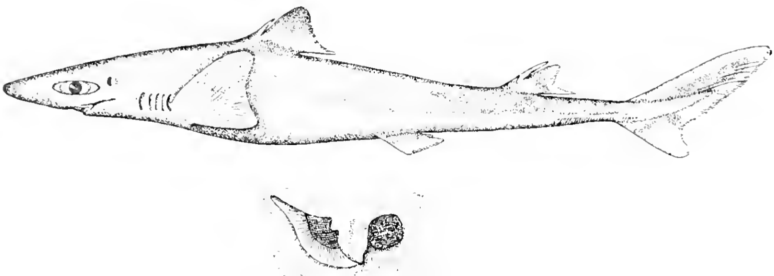

Fig. 2. *Squalus fernandinus* Molina 1782. Juvenile male, 395 mm. long, off South Carolina, Lat. 33°00′N, Long. 77°07′W, May 1949, collected by "Albatross" III. Below, left-hand nostril of same, x about 3.

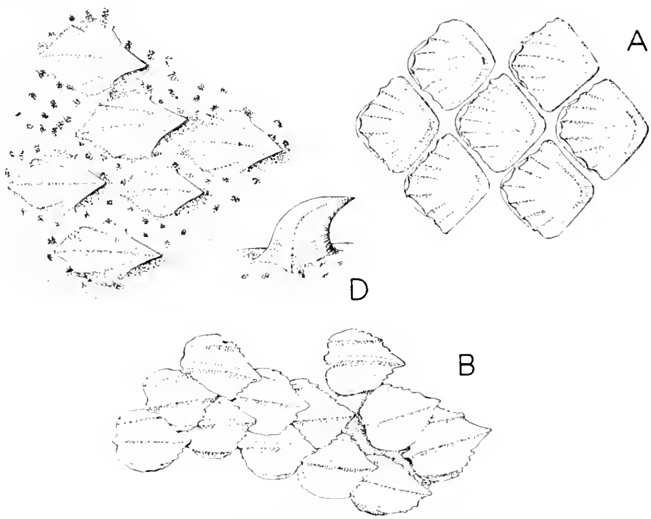

Fig. 3. Dermal denticles of three species of *Centrophorus*, from side, below first dorsal fin. A: *granulosus* Bloch and Schneider 1801, specimen in Museum of Comparative Zoology, x about 12. B: *squamosus* Bonnaterre 1788, 1200 mm. long; west of Iceland, specimen in Museum of Comparative Zoology, x about 6. C–D: *uyato* Rafinesque 1810, female, 445 mm. long, northern part of Gulf of Mexico, Lat. 29°17′N, Long. 87°42′W, 208 fathoms, "Oregon" Sta. 515, x about 40.

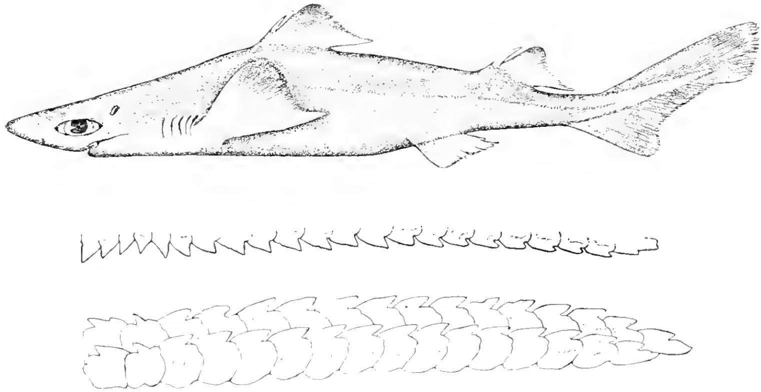

Fig. 4. *Centrophorus uyato*(Rafinesque)1810. Juvenile male, about 429 mm. long, northern part of Gulf of Mexico, Lat. 29°17′N, Long. 87°42′W, 208 fathoms, "Oregon" Sta. 515. Below: upper and lower tooth bands of left-hand side of mouth, viewed from anterior side,of female 445 mm. long, same specimen as in Fig. 3C, x about 3.4.

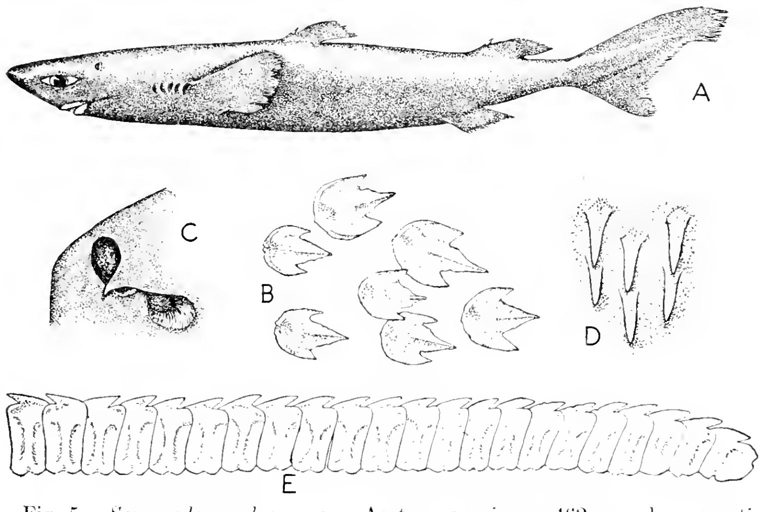

Fig. 5. *Scymnodon melas*, n. sp. A: type specimen, 462 mm. long, continental slope off Georges Bank, Lat. 40°00′N, Long. 68°52′W, 420–480 fathoms, July 12, 1952, Museum of Comparative Zoology No. 37452. B: group of dermal denticles of same from side below first dorsal fin, x about 10. C: right-hand nostril of same, x about 2. D: teeth of same from upper jaw, near center, x about 4. E: lower tooth band of same, from right-hand side of mouth, anterior view, x about 4.

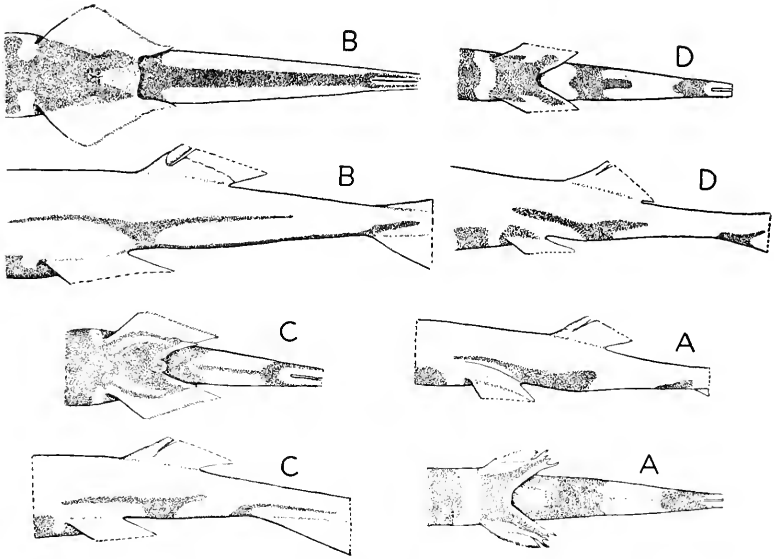

Fig. 6. Black pattern on posterior part of trunk in different species of *Etmopterus*. A: *E. hillianus* Poey 1861; north coast of Cuba, x about 0.4. B: *E. lucifer* Jordan and Snyder 1902, Japan, x about 0.4. C: *E. spinax* (Linnaeus) 1758, Norway, x about 0.4. D: *E. virens*, n. sp., type specimen; northern part of Gulf of Mexico, x about 0.4.

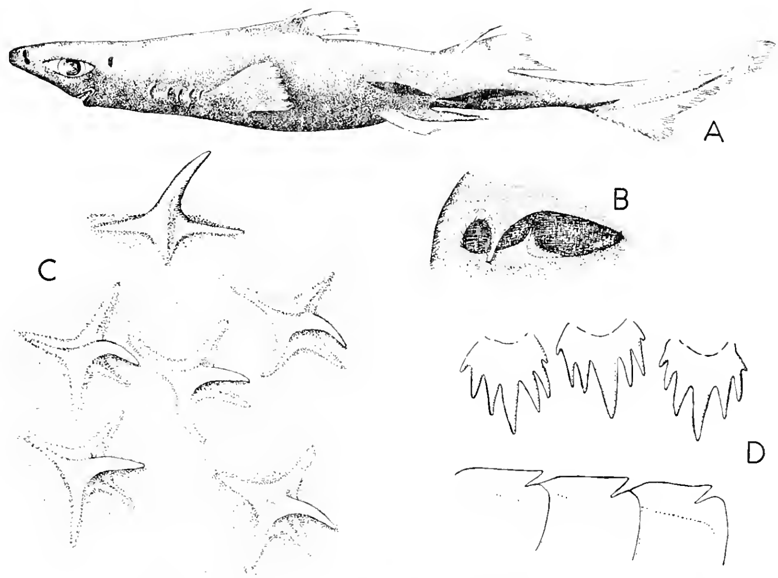

Fig. 7. *Etmopterus polli*, n. sp. A: type specimen, 197 mm. long, off equatorial West Africa, Lat. 6°08'S, Long. 11°24'E, 350–380 meters, Museum of Comparative Zoology No. 38001. B: right-hand nostril of same, x about 5. C: dermal denticles of male, 232 mm. long, from same locality as the type specimen, x about 45. D: upper and lower teeth of male, 197 mm. long, same locality as type specimen, about midway between symphysis and outer corner of mouth, x about 14.

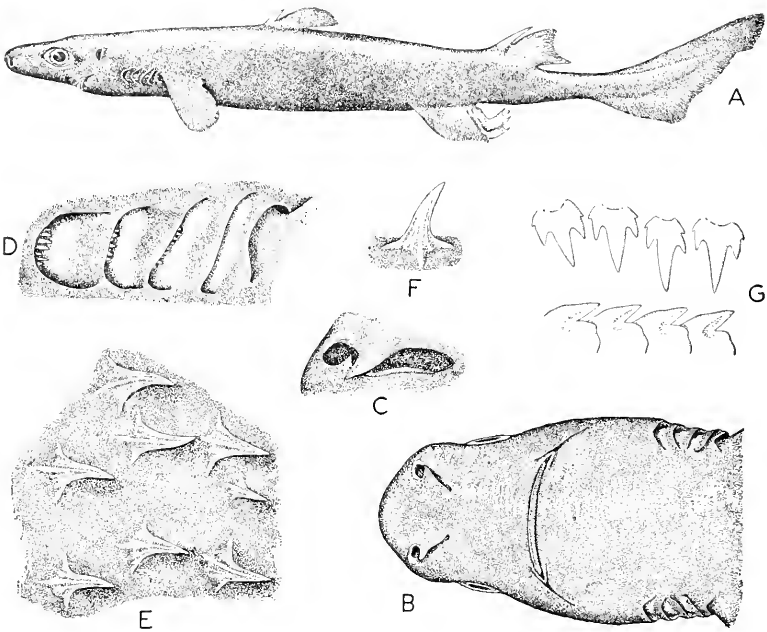

Fig. 8. *Etmopterus princeps* Collett 1904. A: adult male, about 545 mm. long, off southern Nova Scotia, Lat. 41°25'N, Long. 65°56'W, 400–490 fathoms, tip of snout somewhat restored from a slightly smaller specimen from nearby. B: lower surface of snout of same, x about 0.4. C: right-hand nostril of same, x about 1.2. D: gill openings of same, left-hand side, x about 1.2. E: group of dermal denticles of same, from side below first dorsal fin, x about 15. F: side view of a dermal denticle of same, x about 15. G: upper and lower teeth of same, about midway between symphysis and corner of mouth, x about 4.

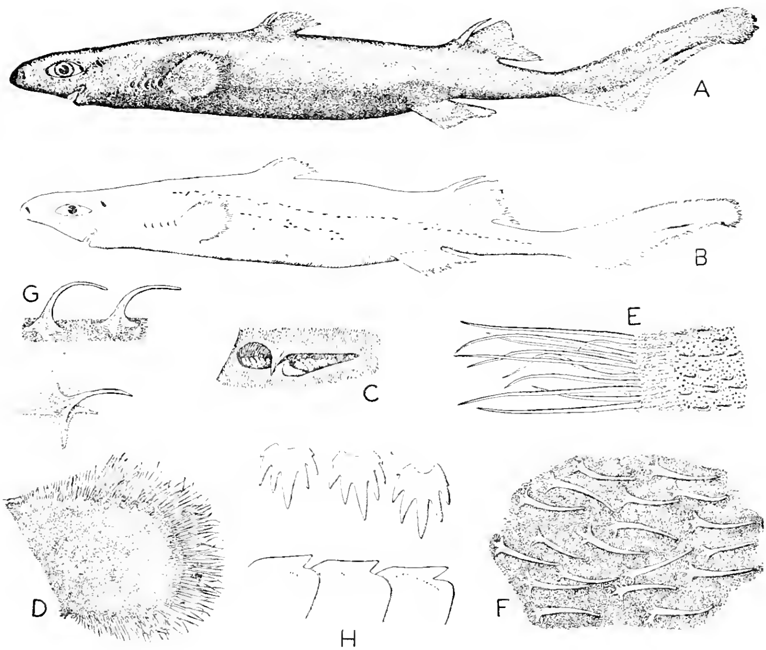

Fig. 9. *Etmopterus schultzi*, n. sp. A: type specimen, 270 mm. long, northern part of Gulf of Mexico, Lat. 29°11'N, Long. 86°53'W, 305 fathoms, "Oregon" Sta. 279, U. S. National Museum No. 113,381. B: outline drawing of same showing the black dashes and dots, perhaps luminescent. C: right-hand nostril of same, x about 3. D: left-hand pectoral fin of adult male about 280 mm. long, "Oregon" Sta. 549, x about 1.2. E: margin of pectoral of same, to higher scale, to show free, fringe-like terminations of the horny rays, x about 6. F: group of dermal denticles of same, from side below first dorsal fin, x about 22. G: dermal denticles of same in side view, and viewed obliquely with base freed from the skin, x about 24. H: upper and lower teeth of male 245 mm. long from about midway between symphysis and outer corner of mouth; "Oregon" Sta. 542, Lat. 27°41'N, Long. 94°59'W, x about 10.

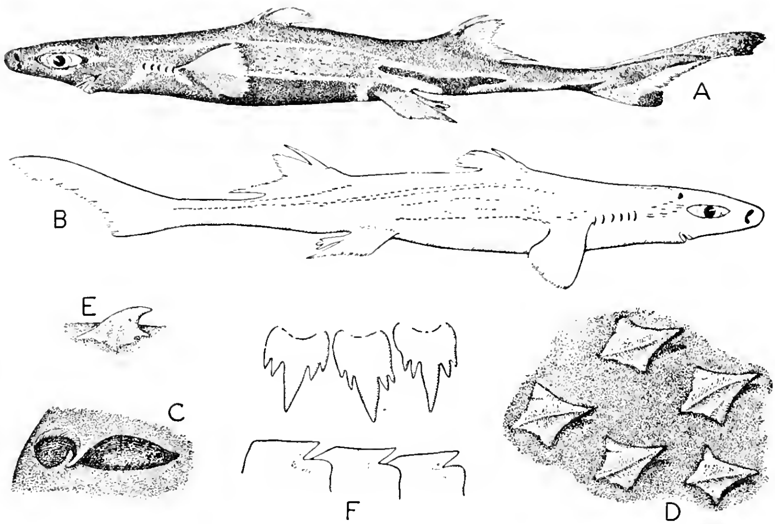

Fig. 10. *Etmopterus virens*, n. sp. A: type specimen, 203 mm. long, northern part of Gulf of Mexico, Lat. 29°52′N, Long. 91°33′W, 220 fathoms, "Oregon" Sta. 591; U. S. National Museum No. 160,859. B: outline drawing of right-hand side of same, to show the pattern of black dots and dashes, perhaps luminescent. C: right-hand nostril of same, x about 3. D: group of dermal denticles of another specimen of about the same size, from the side below the first dorsal fin, x about 36. E: dermal denticle of same in side view, x about 36. F: upper and lower teeth, from about midway between symphysis and corner of mouth, x about 10.

Bulletin of the Museum of Comparative Zoology

AT HARVARD COLLEGE

Vol. 109, No. 4

THE BIRDS OF JAPAN
THEIR STATUS AND DISTRIBUTION

By

Oliver L. Austin, Jr.
and
Nagahisa Kuroda

(Plate)

CAMBRIDGE, MASS., U.S.A.

PRINTED FOR THE MUSEUM

October, 1953

Publications Issued by or in Connection
with the

MUSEUM OF COMPARATIVE ZOOLOGY
AT HARVARD COLLEGE

Bulletin (octavo) 1863 — The current volume is Vol. 109.

Breviora (octavo) 1952 — No. 21 is current.

Memoirs (quarto) 1864–1938 — Publication was terminated with Vol. 55

Johnsonia (quarto) 1941 — A publication of the Department of Mollusks. Vol. 2, no. 31 is current.

Occasional Papers of the Department of Mollusks (octavo) 1945 — Vol. 1, no. 17 is current.

Proceedings of the New England Zoölogical Club (octavo) 1899–1948 — Published in connection with the Museum. Publication terminated with Vol. 24.

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PREFACE

One of the ironies of ornithology is the impossibility of producing a faunal work that is not out of date almost before it is off the presses. Not only are the birds themselves in a continuous state of flux, but human knowledge of the avifauna of no part of the world is complete, and the publication of the facts known to date in any area is often the best stimulus for further work there. It provides a standard for one's successors to work from, tells them which of their observations are new and worth recording, indicates what blanks in our knowledge can be filled by their efforts, and above all gives them a mark to shoot at and, all too often, the opportunity of proving the "authority" in error.

Accordingly this book is produced with the hope that, although it is as complete and accurate as the authors could make it at the time it was finished, it will soon be out of date.

OLIVER L. AUSTIN, JR.
NAGAHISA KURODA

CONTENTS

JUNIOR AUTHOR'S FOREWORD

I have been working under Dr. O. L. Austin, Jr., who came to Japan as Head of the Wildlife Branch in Natural Resources Section, GHQ, the Headquarters of the Occupation Forces in post-war Japan. I was greatly honored when he asked me to write with him, in English, a manuscript on the status of birds in Japan — too big a work for me! Fortunately enough I had already started my own manuscript on the same subject for publication in Japanese. This I translated into English and made many addenda, but before I could finish I made my first long trip to the waters of northeast Japan on the fur-seal investigations with Mr. Ford Wilke, which was a great privilege and allowed me to make many new additions available for this book.

On my return in June, 1950, I made the final corrigenda and addenda to the manuscript, had it typed, and sent it to Dr. Austin, who had by then returned to his home on Cape Cod, Massachusetts. It is with the greatest of pleasure that I present this work to him to be published by both of us, and I express on this occasion my hearty thanks for his leadership given to me, my appreciation for his own valuable contributions to Japanese ornithology based on his 3½ years experiences in post-war Japan, and for his great accomplishments in wildlife conservation during his sojourn here.

I am also very grateful to Colonel L. R. Wolfe who kindly read through the sections on the birds of prey and gave me valuable advice I was pleased to follow. Finally my cordial thanks are due to my sister Shizuko who typed my first manuscript for me, and to Miss S. Saito who did most of the final typing of my last long draft.

Nagahisa Kuroda
Tokyo, Japan
8 November 1950

SENIOR AUTHOR'S FOREWORD

As Head of the Wildlife Branch, Natural Resources Section, General Headquarters, Supreme Commander for the Allied Powers, from its inception in September 1946 until the successful completion of its mission in February 1950, I had opportunities for ornithological work in Japan such as no other outlander has enjoyed there since the days of Owston and Snow, a half-century and more ago. My chief technical assistant and frequent companion afield throughout that period was the junior author of this work, whose knowledge of Japan and its wildlife and whose willing cooperation and help contributed immeasurably to the accomplishments of the Wildlife Branch.

Though we started this book together in 1949, our individual fortunes have forced each of us to do his share of it alone, and without the benefit of the constant mutual contact usual in a collaboration. Though Nagahisa Kuroda did much of the original "spade work", the gathering of the references and the combing of the Japanese literature and collections, while I was still in Japan, he was not able to finish it and to write his draft of the species accounts (which has been the foundation of this book) until after I had returned to the United States.

Since receiving his typescript in January 1951, I have been able[1] to work up my own Japanese bird collection (now in the MCZ) and to compare this fairly complete recent material with the older skins, most of them 19th century, in the United States National Museum, American Museum of Natural History, and Philadelphia Academy of Natural Sciences collections. I have reworked the taxonomy entirely, added to his draft from my own field notes and those of a few others, rechecked all the occidental literature and as much of the Japanese as I had access to, re-evaluated the assessments of the past and present status of each species in the light of these findings, and rewritten the book completely.

The rewriting of this manuscript has posed a number of editorial difficulties, not the least of which have been those of "point of view" and the use of the proper personal pronouns. My solution has been to write it as much as possible in the first person, using the singular "I" for my own contributions, the plural "we" for those in which we both share, and referring to those of my collaborator by his full name, which is necessary to distinguish him from his illustrious father, Nagamichi Kuroda, to whose works many references are made in the text. "Kuroda" used alone in the following pages refers always to Nagamichi, except when in combination with Wilke; in the latter case the reference is to the valuable observations made by Nagahisa Kuroda and Ford Wilke on their productive fur-seal trips together.

Nagahisa Kuroda's typescript contains a section, written at my express request, on the recent history of Japanese ornithology which I have omitted only after much thought and with great regret. The

[1]Financed in part by a John Simon Guggenheim Memorial Foundation Fellowship.

history of ornithology in Japan up to the start of World War II has been presented in English most completely and admirably by Taka-Tsukasa in the introduction to his "Birds of Nippon." I summarized the war-time accomplishments of the Japanese ornithologists and told of the effects of that unfortunate period on Japanese collections and libraries in my "Japanese Ornithology and Mammalogy during World War II." It is not yet time, however, to write the story of ornithology in Occupied Japan, which I find cannot be written at this stage by two people who were as intimately connected with it as were Nagahisa Kuroda and myself. It is too difficult to eliminate personal bias and to be fair and objective. It could well be a book in itself and one which I will greatly enjoy writing when the perspective of time brings its true values into focus. Perhaps by then the substantiating documents in the Wildlife Branch files may be freed from their "restricted, confidential, and secret" classifications.

The Occupation brought many innovations to Japan, and made many changes in the customs and practices of centuries. The new constitution, the various land, educational, and labor reforms were perhaps among the most important innovations, but nowhere was the contrast between the two ideologies more marked than in the field of wildlife conservation. Here, two radically different concepts of man's relation to wildlife were brought together, those of the very old world and those of the comparatively new, and two radically different methods of attaining more or less the same ends. The degree of success attained by our attempted reconciliation of the two cannot be appraised as yet, and will have to wait for the judgment of time.

I do not believe, however, that anywhere in the occupation was harmony in aims and ideal attained more quickly and with more completeness of mutual understanding than between the Wildlife Branch and the ornithologists of Japan. They tried hard to understand my ideas, as I did theirs, and between us we immediately found common ground. Symbolic of their attitude was the Ornithological Society of Japan's election of me, a member of the Occupation, to membership soon after my arrival, an honor of which I am extremely proud.

I will always be grateful to my many friends in Japan who made my work and my stay among them so pleasant. Particularly am I indebted to Nagamichi Kuroda who, by bringing his son and me together, is responsible in the first place for our collaboration, to Nobusuke Taka-Tsukasa whose sage advice in all things Japanese was always at my disposal, freely and honestly given, and to Yoshimaro Yamashina with whom I spent so many pleasurable and profitable hours; also to Masuji Hachisuka whose excellent command of English helped me over many rough spots from the very start, and to Tetsuo Inukai of Sapporo University and Yukio Nakamura of Kofu, my companions on many productive field trips. Then there were Godo Nakanishi, Yukiyasu Kiyosu, Toku Taro Momiyama, Seinosuke Uchida, Abe, Kumagai, Kuzu, Koba, and many others with whom I worked and to whose names and works references are made in the following pages. In the larger sense this volume is that of all the Japanese ornithologists as much as it is Nagahisa Kuroda's and mine.

Of the several "Occupationaires" who have contributed directly and indirectly to this work, I would like to acknowledge the help of Colonel Lloyd R. Wolfe, U.S.A., Ret., who has given me many notes, particularly on the Raptores which are his primary interest, and H. G. Lumsden of Tweed, Ontario, who has sent me the field notes he made while on duty with the British Commonwealth Occupation Forces in southwestern Honshu and Kyushu. I thank particularly Dr. (then Lt. Col.) Hubert G. Schenck who, as Chief of the Natural Resources Section, was my commanding officer and the link in the chain between me and the "high brass", and who never-failingly supported and assisted the activities of the Wildlife Branch despite the political discomforts they often engendered.

On this side of the world it is my greatest privilege to acknowledge the help, encouragement and guidance of the late James Lee Peters, and my deepest sorrow to realize this is the last work in which I can profit by his friendship and criticism. I wish also to thank Dr. Herbert Friedmann of the U. S. National Museum, Dr. Ernst Mayr of the American Museum of Natural History, and Mr. Rodolphe M. de Schauensee of the Philadelphia Academy of Natural Sciences for making available to me the material I needed in the collections in their charge.

OLIVER L. AUSTIN, JR.
North Eastham, Cape Cod, Mass.
1 September 1952.

No. 4.— *The Birds of Japan — Their Status and Distribution*

By Oliver L. Austin, Jr. and Nagahisa Kuroda

INTRODUCTION

For its current knowledge of the birds of Japan the western world has been largely dependent on the three successive editions of "A Hand-List of Japanese Birds" published in English in 1922, 1932, and 1942 by the Ornithological Society of Japan. Most of the fairly extensive literature printed on the subject in the last half century is in Japanese, which practically no ornithologists other than the Japanese themselves can read. Until Jahn published his "Zur Oekologie und Biologie der Vögel Japans" in 1942, the most recent comprehensive account of the birds of Japan in an occidental tongue was Seebohm's "Birds of the Japanese Empire" of 1890.

From the western viewpoint the "Hand-Lists" leave much to be desired, primarily because their necessary brevity affords no accurate idea of the actual status of each species. In their systematics the Japanese ornithologists have been as hampered by the lack of world-wide comparative material in their collections as western workers have been by the paucity of Japanese specimen material at their disposal. Until the recent Occupation afforded an opportunity for collecting, most of the Japanese bird skins available in the United States and Europe were of ancient vintage with lamentably incomplete data.

This work is based on a review of the literature, on a study of specimen material in Japan and the United States, and on the field experiences of both authors. It attempts to fill the need for a more comprehensive reference book on the birds of Japan than the Hand-Lists provide, by summarizing the present knowledge of them with emphasis on their systematics, status, and local distribution. Their "Oekologie und Biologie" have been treated so adequately by Jahn, these aspects are touched on but lightly here. Notes on habits, life histories, and nesting are given more completely for the indigenous forms of restricted ranges which have not been well studied elsewhere.

Much material has been taken from other publications, particularly those in Japanese (see bibliography). Because the referencing and crediting of every previously published fact makes the text unreadable, bibliographic sources are given by year and page in the text only where it is felt that substantiation is advisable, and credit is hereby acknowledged to those sources which have been omitted for the sake of readability. Most of the dates of migration and song periods have been culled from the reports of field correspondents formerly published by the Ministry of Agriculture and Forestry in the "Choju Hokokushu" and "Choju Iho" series. Three other serial publications of this Ministry have been used extensively, the reports on food habits published in the "Choju Chosa Hokoku" series, the annual hunting statistics, and the annual banding statistics. Information on vertical distribution has been taken from the reports of Kiyosu in the Japan Alps (published in "Yacho"), and the studies of Yamashina at Mt. Daisetsu, Hokkaido (published in "Tori") which are considered the standards, augmented by the more recent contributions of Messrs. Shimomura and Jahn. The available data on nests, eggs, and incubation periods are largely from Kobayashi and Ishizawa's monumental "Nests and Eggs of Japanese Birds", and from Yamashina's "Birds of Japan and their Life Histories."

The territory covered is that under Japanese political control during the American Occupation from 1946 to 1952. It includes the four main islands of Hokkaido, Honshu, Shikoku, and Kyushu, and their immediate satellites, the islands of Sado, Tsushima, Tanegashima, Yakushima, the Okis, the Gotos, and the Izu chain south through Torishima to the Bayonnaise Rocks and Lot's Wife. All localities on the main islands are referred to by prefectures, which in most cases are restrictive enough for distributional purposes, and can be readily located on the accompanying map. Also used generally and loosely are such major geographic features as the Kansai, Kwanto, Sendai, and Ishikari plains, the northern and southern Japan Alps, the Mt. Fuji and Mt. Daisetsu areas, and the more prominent bodies of water.

All species and subspecies of birds known to have occurred within this territory are listed, but only forms of specific rank are numbered. When only one race of a polytypic species occurs, the trinomial is used; where more than one occurs, they are discussed under the binomial heading. No species is accepted as valid and numbered unless evidence of its occurrence is available in the form of a specimen collected, examined, and identified by competent authority. Species which have been attributed to Japan in the literature without such evidence are listed as hypothetical (unnumbered, and enclosed in brackets). The sequence of species used in Peters' "Check-List of Birds of the World" is followed through the non-Passeres. For the Passeres the sequence of families proposed by Wetmore (1951a) is used, but the sequence of species under them is arbitrary and of no systematic or evolutionary significance. In common with the current trend, the genus is employed as a collective rather than a distinctive category.

The synonymy is not complete, but includes all the specific and subspecific bird names known to have been proposed to date from Japanese territory. The English names have been altered somewhat from those proposed officially by the Hand-Lists. As anyone familiar enough with subspecies to need to talk or write about them is almost certain to know and be able to use the scientific terminology, which is frequently shorter and simpler, subspecific common names have been dropped as needlessly clumsy and of no practical use. Actually the English common names are used very little in Japan, and the English-speaking bird-student visiting there will soon find himself using the Japanese common names by choice in his conversation.

The Japanese common names given are those established as the official standard by the 1942 Hand-List. Brief notes on their etymology are included, partly for their cultural interest, partly as an aid to those who may want to learn and use them. They are the ones used in Japan today by all people familiar with birds, professional and otherwise. As with English common names the best of them are those which are autochthonous in the language and have no actual meaning other than the bird itself. These are usually the ones for the common, prominent species known to everyone, such as kamo the duck, suzume the sparrow, karasu the crow, for which a designation has been needed in ordinary speech as the language developed over the centuries. The common names that have had to be manufactured for the less well-known species as lay interest and knowledge of birds increased are frequently as unwieldy and difficult to use as their English counterparts. "Aka-eri hire-ashi shigi" (red-necked fin-footed snipe) and "Ashinaga koshijiro umitsubame" (long-legged white-rumped sea-swallow) are as hard to use in ordinary Japanese conversation as some of the similarly clumsy English counterparts. By and large, however, the Japanese common names are eminently satisfactory for their purpose, and a working knowledge of them is essential for anyone studying birds afield in Japan.

The assessments of status are of necessity generalized. The categories of seasonal presence and absence are those in common use today, summer resident, winter visitor, etc., and their usual variations. There being no accurate or convenient method of measuring relative abundance, the usual categories of rare, uncommon, common, and abundant are used rather loosely, and qualified in each case according to our bilateral judgment of the evidence. The known specimen records are given only for the rarities and for species whose status is otherwise uncertain. The present or former location of each such specimen is given when known, otherwise the earliest record for it we have been able to find in the literature. For the occidental collections the following abbreviations are used:

AMNH — American Museum of Natural History, New York City.

Brit. Mus. — British Museum (Natural History), London; references largely from "Catalogue of Birds."

Leyden Mus. — Museum des Pays-Bas, Leyden, Holland; references largely from Schlegel (1862–1880).

MCZ — Museum of Comparative Zoology, Harvard University, Cambridge, Mass.

PANS — Philadelphia Academy of Natural Sciences, Philadelphia, Pennsylvania.

USNM — United States National Museum, Washington, D. C.

Most of the specimen material in Japan is (or was) in the following collections:

Kuroda coll. — Nagamichi Kuroda's famous collection, destroyed in 1945.

Momiyama coll. — Collection of Toku Taro Momiyama, Tokyo; somewhat neglected and scattered after World War II; the remainder is now in the Yamashina Museum.

Norinsho coll. — In the Bird and Mammal Laboratories of the Ministry of Agriculture and Forestry, Tokyo; referred to in Austin's "Birds of Korea" as the Uchida collection.

Sapporo Mus. — At Hokkaido University, Sapporo; contains much of the historic Blakiston material.

Sendai Mus. — At Tohoku University, Sendai; built up largely by Kumagai and Ohfuchi.

Taka-Tsukasa coll. — Destroyed in Tokyo in 1945.

Yamashina coll. — The major and most complete collection in Japan today; contains elements of the old Tokyo Imperial University, Matsudaira, Hachisuka, and Momiyama collections.

Still other significant specimen material is in minor collections in out-of-the-way places in Japan, frequently in local high school or small college collections, often in private hands. These are referred to either by their locations and/or the names of their owners. Further details on them may be found if desired in references listed in the bibliography.

COLYMBIDAE

1. Colymbus stellatus Pontoppidan

RED-THROATED LOON

Japanese: Abi (autochthonous)

Colymbus Stellatus Pontoppidan, Danske Atlas, **1**, 1763, p. 621 (Denmark).

The Red-throated Loon is a not uncommon winter visitor to coastal Japan from central Honshu southward. Off northern Honshu and Hokkaido it is a spring and autumn transient. It seldom frequents inland fresh waters in Japan, as it does elsewhere in its circumpolar range, but stays in the shallow coastal bays. Nowhere is it as plentiful as the following species, even on its principal wintering grounds in the coastal waters of Kyushu and in the Inland Sea.

The species' known breeding grounds nearest to Japan are Paramushir Island in the northern Kuriles, and Kamchatka. Migrants first appear in Hokkaido waters in late September, but do not reach Honshu until November. It is not common in winter in the Tokyo area, but increases in numbers to the southward and westward, and is most abundant in the Inland Sea near Seto, where it is protected under the Natural Monument Law for its part in the local "abi" fishing (see under next species).

The northward flight starts early in spring. Kuroda and Wilke observed a few scattered among the other loons off northeastern Honshu in February, and collected two at Onahama, Fukushima Prefecture, still in winter plumage 28 March 1949. In Hakata Bay, Kyushu, we found small flocks and numerous single birds, some already showing the red throat of spring dress 27 March 1948. The individuals wintering in western Kyushu probably go north past Korea rather than up the Pacific coast of Japan as the Inland Sea birds seem to do.

Although loons are eaten in Japan whenever they come to hand, they are protected by the game laws as well as by the Natural Monument provisions, and are not hunted regularly. The fishermen regard them as an aid rather than a hindrance to the fisheries. There has been no apparent dwindling of their numbers in recorded time.

2. Colymbus arcticus Linné

BLACK-THROATED LOON

Japanese: O-hamu (autochthonous)

Colymbus arcticus Linné, Syst. Nat. ed. 10, **1**, 1758: 135 (Sweden).

Colymbus pacificus Lawrence, in Baird's Bds. N.A., 1858: 889 (California).
Urinator arcticus sushkini Sarudny, Orn. Mitt., 1912: 111 (Russian Turkestan). (Synonym of *pacificus*).
Gavia viridigularis Dwight, Auk, 1918: 198 (Gizhiga, northeast Siberia). (Doubtful form).

I have examined all the Black-throated Loons in the MCZ, AMNH, and USNM collections; Nagahisa Kuroda has measured and made color notes for me of all the material in Japan. Although most of these 198 specimens were taken on the wintering grounds or on migration, 107 of them are in nuptial plumage. Our measurements (in mm.) of the specimens in breeding dress (no significant sex differences are evident) are as follows:

		Wing			*Exposed culmen*		
No.		*Min.*	*Av.*	*Max.*	*Min.*	*Av.*	*Max.*
15	*C.a.arcticus* (Norway, Sweden, Finland, Lapland, Scotland)	294	309	332	51	61.5	70
59	*C.a.pacificus* (Alaska and western Canada and U.S.)	267	292	318	43	52	58
13	*C.a.pacificus* (eastern Siberia, Japan, and China)	281	293	307	46	51	64
4	"*C.a.sushkini*" (Turkestan and western Mongolia)	261	326	343	56	58.5	63
15	"*C.a.viridigularis*" (eastern Siberia, Japan, Alaska)	286	320	356	53	64.5	71

This material shows that two rather weak races are recognizable, *C. a. arcticus* breeding from northern Europe eastward to an undetermined point in western or central Siberia, and *C. a. pacificus* breeding from eastern Siberia to west-central North America. The eastern Asiatic and western North American specimens are not separable. Together, however, they are distinguishable from the European birds primarily by the color of the nape, and to a lesser extent by size. In nape color 80 per cent of the specimens listed above as *pacificus* are lighter than *arcticus*, and 80 per cent of *arcticus* are darker than *pacificus*. While *pacificus* averages smaller than *arcticus* in wing and bill lengths, the measurements overlap so that size is definitive only for the extremes, roughly half of each population.

The measurements of the four specimens from the territory assigned to *sushkini* are too erratic to be of significance. The wing of one is abnormally short, those of the other three seem abnormally long. On measurements alone these four specimens are nearer *arcticus*, but the napes of all four are light as in *pacificus*. A larger series might show this population to be distinct, but the scant material I have examined is doubtfully separable from *pacificus*.

The few known specimens with a distinctive green instead of purple sheen on the throat, tentatively designated as *viridigularis*, present a vexing systematic problem which, because of the scarcity of *bona-fide* breeding ground material, is very little nearer to solution than when Bent discussed it in 1919 (Auk **36**: 238–242). The unique green sheen of the throat varies but little, and shows no tendency to intergrade into the purple condition. They are all large birds; their bills average slightly longer than in *arcticus*, their wings considerably so, and the extremes are the largest of the Black-throated Loons. The napes of 13 of the 15 specimens I have examined are dark as in the darkest *arcticus*, the other two are light as in *pacificus*. The known specimens are all from territory occupied also by the smaller, lighter-naped, purple-throated *pacificus* — eight of the series are from northeast Siberia, five from widely separated localities in Alaska and Japan, the other two are old skins without data. Its nesting is unknown, but it is assumed to breed in northeast Siberia north of the Sea of Okhotsk, whence most of the breeding season specimens have been taken. A. H. Bailey (1943, 1948) found both green and purple-throated birds present during the breeding season along the shores of Bering Straits. If, as the evidence indicates, both green and purple-throated birds breed sympatrically, *viridigularis* cannot be a geographical race of *arcticus*, but the morphological differences do not seem sufficiently great to be of full specific rank. Until the relationship of the two forms on the breeding ground is determined, the systematic status of *viridigularis* must remain uncertain. A conservative interpretation of the evidence suggests these large, green-throated individuals are genetic aberrants which appear irregularly in the territory occupied by the subspecies *pacificus*.

As the nape and throat characters are discernible only in full breeding dress, no Black-throated Loons in winter plumage can be identified subspecifically except the few extremes in measurements. Except for a few immatures and very worn adults whose measurements are subnormal, all the European winter-plumage specimens I have examined are within the size range of breeding-dress *arcticus*; those from North America are within the size limits of *pacificus*.

The wintering population of Black-throated Loons in Japan is predominantly *C. a. pacificus*. The status there of other possible populations cannot be assessed. The only unquestionable record for "*viridigularis*" is a typical large, green-throated, dark-naped specimen in the Yamashina collection taken in Niigata, Honshu, in May 1914. Of 33 winter plumage specimens examined from eastern Asia, one from Fukien, China, and four from Japan are larger either in wing, bill, or both measurements than the maximum of breeding dress *pacificus*. As they are within the size ranges of either *arcticus*, "*sushkini*", or "*viridigularis*" they are subspecifically unidentifiable.

The Black-throated Loon is a common winter visitor to coastal Japan from Northern Honshu to Kyushu, and a common spring and autumn transient along the Hokkaido shores. The southward flight reaches Aomori in early November. A few remain in Mutsu Bay through the winter, but most of them move southward. We found them plentiful in Funka Bay in December, but Kuroda and Wilke observed none there in January. The species' main wintering area is along the Pacific side of central Honshu, from Suruga and Sagami Bays, through the Inland Sea, to Hakata Bay in Kyushu. Most of them leave by late April, although stragglers are occasionally observed in June, July, and August. The spring flight passes northern Honshu and Hokkaido in greatest abundance in late April and early May.

Loons are not considered game birds in Japan, and no open season is provided by the game laws for hunting them. *C. arcticus* and *C. stellatus* are given additional protection in the Inland Sea near Seto where, as the basis of a unique fishing method believed to have been developed at least 300 years ago, they were authorized as Natural Monuments in 1931. This fishery is known as "torimochi ajiro" (fishing with birds) or "ikari" fishing ("ikari" means angry and alludes to the water stirred into foam by the birds and schooling fish). The loon fishing begins at Seto in February when the birds appear in large numbers, according to the local accounts "by thousands", to feed on a lance, *Ammodytes personatus*. When the lance school, the loons form a circle around them, and keep them schooling where the fishermen can net them easily. The lance are used for bait to catch larger fish (bream of several species) which also follow the lance, feeding on them from the bottom. For their part in keeping the schooling lance encompassed within a small area, the loons are considered an essential part of the fishery, and have been protected accordingly for generations. The birds show no fear of the fishermen, and swim all around the boats close at hand while the lance are schooling. When a loon is caught in the nets by mistake, it is released quietly so as not to disturb the others. When, as sometimes happens, a loon drowns in the net before it can be rescued, it is hidden in the bottom of the boat and brought ashore to be offered to the village shrine in apology.

3. Colymbus adamsii G. R. Gray
YELLOW-BILLED LOON

Japanese: Hashijiro abi (white-billed loon)

Colymbus adamsii G. R. Gray, Proc. Zool. Soc. London, 1859: 167 (Alaska).

This fine big loon, the largest of all the Japanese coastal sea birds, is less common than its smaller relatives, and more northern in its distribution. From Kuroda and Wilke's observations in the winters of 1949 and 1950 it is a regular and not uncommon late winter visitor along the Pacific coast south as far as Miyagi Prefecture. Previous to their experiences so few valid records were available the species was regarded as of little more than casual occurrence in Japan. This was only because no ornithologists had visited its usual habitat during the rugged northern winter. Saunders (Ibis, 1883: 348) records a specimen from Nagasaki, the only one from Kyushu.

Its large size and particularly its immense, light-colored bill are excellent field marks, and prevent confusion with *C. arcticus* even in the nondescript winter plumage. The date of its arrival in Japanese waters is uncertain. We failed to find it during several days of cruising in Funka Bay in December 1948. The earliest record is the specimen taken by Blakiston at Hakodate 25 January 1877. Kuroda and Wilke found it not uncommon off Aomori in February, and observed small numbers from then on along the northeast coast of Honshu as far south as Kinkazan, moving in company with the more numerous Black-throated Loons. Its peak abundance in this region was from 18 to 30 April 1950. Their latest records were a few observed moving northeastward past Cape Erimo, Hokkaido, 25 May 1950. The specimens they collected contained the remains of large crabs, fish, and fish bones.

PODICEPIDAE

4. Podiceps ruficollis poggei (Reichenow)

LITTLE GREBE

Japanese: Kaitsuburi (autochthonous)

Colymbus nigricans poggei Reichenow, Journ. f. Orn., 1912: 125 (Chihli, China).
Podiceps ruficollis japonicus Hartert, Vog. pal. Fauna., II, 1920: 1455 (Tokyo). (Synonym).

I find six Little Grebes in breeding plumage from Japan, including the type of *japonicus*, not intermediate between the Chinese and European populations as suggested by Hartert, but inseparable from a large series of *poggei* from Eastern China. The bills of all these eastern birds are thinner and slightly longer than those of *ruficollis* of Europe, and the black of the lower face does not always extend as far back under the eye, but this color character is too variable to be diagnostic.

The Little Grebe is the common fresh-water grebe of Japan. In Hokkaido it is a summer resident from April to October. From the Tokyo area southward it is present throughout the year in the open inland waters. A flock of eleven Little Grebes wintered regularly in the outer moat at the busiest intersection in Tokyo from 1946 to 1950, and as regularly spring after spring a pair nested in the floating vegetation of the second moat under the palace wall, in full view of all passers-by.

Breeding starts in mid-March in Kyushu, in early April in Honshu, and continues into August and sometimes later. Its main breeding season in the Tokyo region is May to July, but there are numerous records of its nesting in September and October. Kumagai (Tori, 1934:281) found a pair incubating in Miyagi Prefecture 11 October, and Nagahisa Kuroda saw chicks still being carried on their parent's back at Habu Pond, Chiba Prefecture, on 7 November. Apparently the species raises at least two broods each year, possibly more in the warmer portions of Japan. The usual clutch contains 4 eggs, measuring 54 x 36 mm. in average, bluish white when fresh, but soon becoming stained by the wet vegetation the incubating bird pulls over them when she leaves the nest.

5. Podiceps auritus (Linné)

HORNED GREBE

Japanese: Mimi Kaitsuburi (eared grebe)

Colymbus auritus Linné, Syst. Nat., ed. 10, **1**, 1758: 135 (Sweden).

The Horned Grebe is a regular but not common winter visitor in the coastal bays south to the Tokyo area and northern Kyushu. I collected three specimens, a female changing into winter plumage at Nemuro, Hokkaido, 12 December 1948, and two males in winter plumage in Tokyo Bay 30 November 1947 and 15 January 1949 respectively. Only fifteen other specimens have been reported in the literature, as follows:

Hokkaido, Hakodate		26 Jan. 1865	Whitely, (Ibis 1867: 209)
" "		Oct.	Brit. Mus., *ex* Blakiston
" Kitami	(2)	undated	Kuroda coll. (Dob. Zas. 1914)
Honshu, Yokohama	(3)	"	Brit. Mus., *ex* Pryer
" Sagami Bay		22 June 1923	Tokyo Marine Univ. coll.
Kyushu, Nagasaki		undated	Sapporo Mus., *ex* Blakiston
" "	(4)	Nov. Dec. Jan.	Brit. Mus., *ex* Ringer
Tsushima	(2)	Feb. Mar.	Brit. Mus., *ex* Seebohm

More collecting and observing in the coastal bays in winter will probably show this Holarctic species to be more plentiful than the record indicates.

6. Podiceps caspicus caspicus (Hablizl)

BLACK-NECKED GREBE

Japanese: Hajiro kaitsuburi (white-winged grebe)

Colymbus caspicus Hablizl, Neue Nord. Beytr. **4**, 1783: 9 (Caspian Sea).

The Black-necked Grebe is not common along the coasts of central Honshu, but is far more plentiful than the preceding species as a winter visitor in the large bays of Kyushu and of northern Honshu. It is present in fair numbers in Mutsu Bay, Aomori from early November to late April. We found it rather common in Yatsushiro Bay, Kyushu and collected an adult male just assuming its nuptial plumage 18 March 1948. The species was scattered in singles, pairs and small flocks up to six birds here and there all over the bay, evidently preparing to move northward. Kuroda and Wilke noted an increase in the species' numbers along the northern Honshu coast indicating a northward movement in late March, when small groups were always to be seen in the bays and harbors of Miyagi and Iwate prefectures. Their latest records were two birds seen at Onagawa 6 May 1950.

7. Podiceps cristatus cristatus (Linné)

GREAT CRESTED GREBE

Japanese: Kanmuri kaitsuburi (crested grebe)

Colymbus cristatus Linné, Syst. Nat., ed. 10, **1**, 1758: 135 (Sweden).

This large elegant species is the rarest of the grebes in Japan. A resident of the milder Palearctic regions of the adjoining mainland, it is evidently commoner in Kyushu than elsewhere in Japan. A bird taken near Otaru 12 February 1940, now in the Yamashina collection, is the only record for Hokkaido; another Yamashina Museum bird taken in Ibaraki Prefecture in October 1892 is the only Honshu record. Kuroda had a specimen from Tokushima Prefecture, Shikoku, and two specimens are known from Kyushu, one from Nagasaki, undated, in the Yamashina collection, and one from Satsuma in the former Taka-Tsukasa collection.

There are a number of sight records in literature for the Inland Sea. We watched a fine specimen at close range from the coast road in Fukuoka Bay on 27 March 1948, which we were unable to collect, but the identification was beyond question. More field work in Kyushu will probably show the species to be of regular and not uncommon occurrence there in winter.

8. Podiceps grisegena holböllii Reinhardt

RED-NECKED GREBE

Japanese: Aka-eri kaitsuburi (red-necked grebe)

Podiceps Holböllii Reinhardt, Vid. Med., 1853: 86 (Greenland).

The Red-necked Grebe breeds in small numbers on inland fresh-water lakes in Hokkaido (Ishikari and Kitami) where its season is from April to October. Farther southward it is a fairly common migrant and winter resident along the coast, preferring deeper and clearer waters than those chosen by the Black-necked Grebe.

The first migrants from the north reach Aomori in early November, and a few remain there throughout the winter. Kuroda (Tori, 1922: 42) reports it winters in Suruga Bay from early January to early April. He observed individuals summering there twice in August. The species begins moving northward usually in March. Nagahisa Kuroda watched two Red-necked Grebes wintering in Onagawa Harbor, Miyagi Prefecture, from February through March. This nucleus increased to ten between 3 and 10 April, and to thirty by 18 April, after which the flock gradually decreased. The last he saw of them there was 6 May.

DIOMEDEIDAE

9. Diomedea albatrus Pallas

STELLER'S ALBATROSS

Japanese: Ahodori (fool bird)

Diomedea albatrus Pallas, Spicil. Zool., **1** (5), 1769: 28 (Kamchatka & the Kuriles).

Diomedea brachiura (sic) Temminck, Pl. Col., 1835: text to pl. 554 (seas of Japan and Ryukyu Islands). (Synonym)

This magnificent albatross is probably extinct. Its disappearance was caused partly by the volcanic eruptions which destroyed its former nesting grounds on Torishima, but primarily by the activities of the plume hunters of the late 19th and early 20th centuries. The most recent definite record is the one for the few birds banded on Torishima in 1933 and killed there in 1934 (cf. Austin 1949b: 283–295).

It formerly bred on Torishima in the southern Izus, on the northernmost of the Bonins, and on isolated islets in the southern Ryukyus and the Pescadores. Its nesting season was from November through April. After the young were on the wing the birds moved northward along the Japanese coast to summer in the Bering Sea, and down the west coast of North America as far as Baja California before returning to their breeding grounds in late autumn. The spring flight past Japan was marked by the numbers of dark-colored immature birds it contained, which were frequently confused with the Black-footed Albatross. The immature Steller's differs from the adult Black-foot only in its larger size and its lighter-colored bill, neither of which can be discerned at any distance. As the adult Steller's is almost equally hard to tell from the adult Laysan in the field, all sight records for the species are open to question.

The following specimens are known from Japan:

Hokkaido, Hakodate		5 skins	1874-1877	Sapporo Mus., Blakiston coll.
"	"	im ♂♂, ad ♂	Apr.-July 1883	Brit. Mus., *ex* Blakiston
"	"	ad ♀	8 Apr. 1884	USNM
"	"	im	29 June 1880	AMNH
"	Otaru	?	Apr. 1883	Sapporo Mus.
"	Shibashiri	ad ♂	Mar. 1907	AMNH

Honshu, Chiba	ad ♀	10 Mar. 1882	Yamashina coll.
" "	ad ♀	17 Feb. 1884	Yamashina coll.
" Tokyo Bay	im im	undated	Brit. Mus., *ex* Seebohm
" Tokyo Market	ad ♀ ♀	6 Mar. 1883	USNM
" Sagami Bay	?	pre-1913	Momiyama (Tori 1916: 36)
Kyushu, Nagasaki	im ♂	25 June 1887	USNM, *ex* Ringer
" "	?	"	Brit. Mus., *ex* Ringer
Tsushima	im ♂	2 June 1885	USNM
Izu Ids., Torishima	2 eggs	undated	Yamashina coll.
"Japan" (Voyage of Dr. Burger)	ad	"	Leyden Mus. (type of *D. brachiura*)
"Japan" (Voyage of Dr. Burger)	im	"	Leyden Mus. (fig. by T. & S.)

10. Diomedea nigripes Audubon

BLACK-FOOTED ALBATROSS

Japanese: Kuro-ashi ahodori (black-footed fool bird)

Diomedea nigripes Audubon, Orn. Biogr. **5**, 1899: 327 (Pacific Ocean).

This, the most wide-spread and abundant of the three North Pacific albatrosses, is the commonest of them in Japanese waters. Although not recorded from the Japan Sea side of Japan, it has been taken in both the Korean and Tsugaru Straits, and is a frequent summer visitor along the Pacific coast from April to November. It seldom comes within five miles of shore, but in season may be seen almost anywhere from that distance on out.

It nests on sub-tropical oceanic islets, and in the non-breeding season ranges well to the northward past the Kuriles. It formerly bred on Marcus Island, on Torishima in the Izus, and in the northern Bonins where, according to Momiyama (Bull. Bioge. Soc. Jap., 1930: 80), it started nesting in November and December, the eggs hatched in January and February, and the young were able to fly by late March or early April. At last reports none was breeding at any of these sites, nor anywhere else in the western Pacific. Because its black plumage was not as marketable, it did not suffer as did the other two species from the plume hunters, but passing fishermen always find it and its eggs edible. True to its Japanese name, it is a fool on land, and no more trouble to harvest by anyone so inclined than a plant growing in the soil.

Whatever the source of the Black-footed Albatrosses that visit Japanese waters today, the first ones usually appear in April (there are a few February and March records), and the species becomes much commoner in May. Most of the specimen records are for May and June. The birds linger off shore through the summer, and a few non-breeding individuals may remain through the winter. Kuroda and Wilke observed the first ones off Miyagi Prefecture 8 April 1949, after which they encountered single birds almost daily until May, when small flocks, the largest of ten birds, began to appear occasionally.

11. Diomedea immutabilis Rothschild

LAYSAN ALBATROSS

Japanese: Ko-ahodori (small fool bird)

Diomedea immutabilis Rothschild, Bull. B.O.C., **1** (9), 1893: xlviii (Laysan Island)

While not as plentiful as the Black-footed Albatross, this species is a regular and not uncommon visitor off the Pacific coasts of Honshu and Hokkaido from early spring to late autumn. In summer it wanders north past the Kuriles to Kamchatka and the Bering Sea. It does not come as close to shore as the Black-foot, and is seldom encountered within 15 miles of the coastline. Kuroda and Wilke observed single birds 20 miles and more off Fukushima Prefecture on 5, 18, 21, and 24 March 1949. In 1950 they saw singles and pairs from 25 to 50 miles off northeastern Honshu on 8, 24, 28 April and on 1, 12, and 24 May. Nagahisa Kuroda collected an adult off Iwate Prefecture 13 June 1951.

Its breeding season is the same as the other North Pacific albatrosses, from November to April. It formerly nested on Marcus and Wake Islands, and in the late 1920s a small colony started to build up on Torishima, which apparently was driven off by human persecution in the mid 1930s. Severe volcanic activity in the late 1930s and early 1940s wiped out whatever might have remained of the colony, and the occupation of the island by an aircraft warning outpost during World War II and by a weather station crew subsequently has prevented the birds from getting a foothold there again.

An adult male Laysan Albatross was taken alive some miles inland at Nopporo, Hokkaido, on 28 December 1934, struggling in the snow with several crows (Tori, 1935: 82). It had apparently been brought inland by an unusual warm spell, and been caught by a sudden drop in temperature. It is now in the Yamashina collection.

PROCELLARIIDAE

12. Fulmarus glacialis rodgersii Cassin

FULMAR

Japanese: Furuma kamome (fulmar gull)

Fulmarus Rodgersii Cassin, Proc. Acad. Nat. Sci. Phil., 1862: 326 (North Pacific Ocean).

The Fulmar is by no means a rare bird in Japanese waters, but it remains so far off shore that it is seldom observed. There are only about ten specimen records for Honshu, all storm driven stragglers or dead birds picked up after drifting ashore, and none for the other main islands. As it is not a distinctive or striking bird to the casual observer, the offshore fishermen do not know it well, or recognize it when they see it, as they do the albatrosses and shearwaters. Nevertheless the species is a fairly common winter visitor to the offshore waters of the Pacific coast as far south as the southernmost Izu Islands. I collected an adult female at Lot's Wife (Sofu-Gan) 2 April 1949, and saw another dozen or so single individuals during the next two weeks off Smith Rock, Bayonnaise Rock, Miyakejima, and as far north as Oshima. Kuroda and Wilke encountered "numerous individuals" east of Tsugaru Strait during very rough weather 14 February 1949, and in 1950 saw two birds 40 miles off Onagawa 23 April, three about 50 miles out on the 27th of which they collected one, and two more the next day 50 miles off Iwate. On 25 May they found five birds between Cape Erimo and Kushiro, Hokkaido and collected three of them, one of which (now in the Nagahisa Kuroda collection) is in the white phase. They saw two more white phase birds off Urakawa 28 May. The grey phase is by far the predominant one in the northeastern Pacific, and these are the first records of the white phase for Japanese waters.

The species formerly bred in large numbers in the central Kuriles. Although no recent information is available, there is no reason to suppose these colonies are not still prosperous, unless they have been extirpated by the local fox farmers who gather the young for food for their animals.

13. Puffinus leucomelas (Temminck)
STREAKED SHEARWATER

Japanese: O-mizunagadori (autochthonous, but means "large bird that 'mows' the water")

Procellaria leucomelas Temminck, Pl. Col. **5**, 1835, pl. 587 (seas of Japan).

This is the common shearwater of Japan. It breeds on small offshore islands from Hokkaido to Kyushu and winters in the waters from Tokyo southward, usually well out to sea. It is sometimes driven inland by storms and has been recorded from the highlands of central Honshu in May, August, and November. It occasionally appears with the loons in winter at Seto in the Inland Sea, and often flocks in large numbers in Suruga and Sagami Bays, especially in early spring. Kuroda and Wilke saw none off northeastern Honshu until 10 March; the birds then increased steadily until by May scores were observed offshore daily. They did not encounter the species north of Aomori until early June.

It is known to breed, or to have bred within the last few decades, on the following islands:

Hokkaido,	Kojima, off Fukuyama (destroyed by fox farmers)
"	Matsumae Oshima (Natural Monument since 1928)
Honshu,	Iwate Pref., Sanganjima (Natural Monument since 1935)
"	Kyoto Pref., Kamurijima (Natural Monument since 1924)
"	Shimane Pref., Shiroshima, Shukichigun
"	" Pref., Kojima, Minogun
"	" Pref., Oki Ids. (several islets in the group)
Shikoku,	Kochi Pref., Birojima
Kyushu,	Fukuoka Pref., Okinoshima
"	Kagoshima Pref., Yokoatojima
Izu Ids.,	Mikurajima, Toshima, Miyakejima, Hachijojima

Very little information is available on the present condition of these colonies. I visited Kamurijima in July 1948, found it undisturbed and prospering, and estimated about 3000 occupied burrows. The young were just hatching. Never will I forget the sight and sound of the adults leaving the island at crack of dawn. Suddenly, just as it was light enough to see, they poured down the sides of the islet in a concerted, bustling stream with a loud rushing of wings. Within two short minutes every bird had danced out of sight over the horizon, leaving the islet quiet and strangely still.

Kurimoto (Yacho 1937: 835–839) gives the following interesting account of the shearwater colony on Mikurajima in the Izu Islands in 1937:

"All the wooded area of the island below 1500 feet except near the village is occupied by the birds. The most densely populated part is owned by the village, and the cutting of timber and gathering of grass is prohibited there, and the disturbing of the adult birds and the collecting of eggs are forbidden. . . .

"The O-mizunagadori is a bird of the warm current, always flying over it following the tuna or bonito, sharing with them the same small fishes, sardines, mackerel, and the like, in such great numbers that the flocks sometimes cover the entire horizon. Thus the birds are in close contact with the fishermen, and the island's location in the middle of the current makes it a most important base for the birds. They are uncountable, and breed there by the millions.

"The birds spend all the daylight hours at sea, leaving the island at dawn, returning with the sunset. They swarm over the island with loud cries before going into their burrows to feed their young. This swarming is called the 'bird stream' or the 'snow-flurry of birds' or the 'bird hell'. To take wing in the morning they first congregate under a tree and climb up it one by one in a column to fly out from the high branches. The young birds follow down the brook to the shore when ready to leave, where one can easily kill many of them, but this is strictly forbidden.

"The most densely populated area covers 36 acres. The birds leave the island in late November and return again in February after an absence of about two months. Both sexes dig out the burrow, starting in April. They lay their eggs from late June to the middle of July, and hatch out in the middle of or late in August. The chicks are fed during the night and become very fat. In late autumn they begin to lose the fat so they can fly. It is at this time, from late October to early November, that the young are gathered for their meat and fat, both of which are not good in the adults. The catching is done under the supervision of the village master for a limited period of three days, or of two days if enough are taken in that time. The total number caught each year amounts to between 30,000 and 40,000 birds. The fat is used by the inhabitants, and the meat is salted and exported to Miyakejima."

When I visited Mikurajima in April 1947 the birds had not yet started to nest. I was told by the village master that the shearwaters now nest in only two small areas well back in the hills. I reached one of these in the few short hours I had ashore, and found only a few old burrows under the large trees. Undoubtedly the birds have been driven from many of their former nesting sites, and their numbers greatly reduced in others, but they are still quite common, and seem in no immediate danger of extirpation. They are now protected under the game laws, and several of the larger colonies are maintained as Natural Monuments as well, which augurs well for their continuance.

Uchida (1922: 1–16) reports that at Birojima the shearwaters start coming to land in March, lay in June and July, hatch in August, and leave in late November, and that the burrows measure 7–10 inches in diameter, and 3–5 feet in depth. At Sanganjima, Kumagai (Tori, 1949: 310) states the birds also lay in June and July, the incubation period is 64 days, and the chicks stay in the burrow another 66 days. He found quantities of the leaves of a shrub (*Coriaria*) in the chicks' crops, indicating the young are fed on vegetation as well as on regurgitated fish. The single egg is white, averages 68 x 45 mm., and weighs about 74 grams. Kuzu visited the Matsumae Oshima colony in 1929 and estimated "about 10,000" birds there.

14. Puffinus carneipes Gould

PALE-FOOTED SHEARWATER

Japanese: Aka-ashi mizunagadori (red-footed shearwater)

Puffinus carneipes Gould, Ann. Mag. Nat. Hist., **13**, 1844: 365 (West Australia).

Puffinus carneipes hakodate Mathews, Bds. Austr., **2**, 1912: 90 (Hakodate). (Synonym)

This species breeds in the southern hemisphere on islands off Australia and New Zealand, and visits the waters off Japan in the northern summer. It is not common, but probably more plentiful than the scant specimen record indicates:

Hokkaido,	Hakodate	(4)	19 May	Brit. Mus.
"	Akkeshi		16 Sep. 1941	Yamashina coll.
Honshu,	Aomori		1 June 1948	MCZ
"	Iwate, Kamaishi		7 May 1950	USNM
"	Miyagi, Kinkazan	(2)	23 Apr. 1950	USNM
"	" Onagawa		23 Apr. 1950	Kuroda coll.
"	Sagami Bay		20 May 1919	Yamashina coll.
"	" "	(2)	25 May 1921	" "
"	" "	(2)	2 May 1921	Norinsho coll.

Kuroda and Wilke found it not uncommon 30 or more miles off the coast of Miyagi and Iwate prefectures from 23 April on, either scattered widely over the sea surface, or swimming in small groups, frequently with Pomarine Jaegers in attendance. Specimens collected in May contained *Euphausia* and small squid. It was not observed in the waters off southern Hokkaido until mid May. The bird I collected off the west coast of Aomori in June, 1948, was one of three accompanying a large flock of Streaked Shearwaters.

15. Puffinus pacificus chlororhynchus Lesson
WEDGE-TAILED SHEARWATER
Japanese: Onaga mizunagadori (long-tailed shearwater)

Puffinus chlororhynchus Lesson, Traité d'Orn., **8**, 1831: 613 (West Australia).

For the most recent revision of this species see Murphy (Am. Mus. Nov., 1512, 1951: 1–21) who finds: "Pending criteria not yet pointed out, all examples of *Puffinus pacificus* other than birds from the Kermadecs, Norfolk Island, and Kandavu should be referred to a single subspecies, *chlororhynchus*. The populations of this form vary, but there is among them no adequate quantitative basis of taxonomic discrimination."

This species breeds in the Bonin and Volcano Islands where, according to Momiyama (Bull. Bioge. Soc. Jap., 1930: 83) it comes to land in late March or April and lays in mid June or early July, the young hatch from mid July to August and leave the nest in September and October, some remaining until the end of November. After breeding, a few stray northward to the waters off Japan, and it is at times not uncommon off the Izu Islands. I collected four in the northern Bonins in March 1949, and observed the species commonly from there northward in large scattered flocks as far as Torishima during the first week of April. Nakanishi (Yacho, 1935: 449) reports observing it near Oshima. The 1922 Hand-List gives the species for Sagami Bay, the only record for the main islands, which has been copied in the subsequent editions. However, we have been unable to locate the source of this record, and Matsudaira, who studied the oceanic birds in Sagami and Suruga bays for years never reported it.

16. Puffinus griseus (Gmelin)
SOOTY SHEARWATER
Japanese: Hai-iro mizunagadori (grey shearwater)

Procellaria grisea Gmelin, Syst. Nat., **1**, (2), 1789: 564 (New Zealand).

In its long travels from the southern hemisphere to the northern Pacific the Sooty Shearwater is periodically fairly common in Japanese waters. It remains well off shore, however, and most of the dozen or so specimens taken in Japan previous to 1948 were found dead on the beaches of eastern Honshu. It seems to be more plentiful during the northward flight in late spring than during the summer or autumn. Kuroda and Wilke first encountered it off Kinkazan, Miyagi Prefecture on 12 April 1949 and found it gradually increasing until mid May. They collected six off northeastern Honshu and Hokkaido between 12 April and 31 May 1950. Nagahisa Kuroda comments on its comparatively rapid wing-beats and its superior ability as a diver in comparison to the other shearwaters, possibly because of its stronger tarsus. He found that birds resting on the water are easily approached, but on the wing they have a habit of veering away from the ship before coming within shotgun range, and are not easily collected. The birds were found scattered sparsely over the high seas well off shore, occasionally in company with skuas.

17. Puffinus tenuirostris (Temminck)
SLENDER-BILLED SHEARWATER
Japanese: Hashi-boso mizunagadori (slender-billed shearwater)

Procellaria tenuirostris Temminck, Pl. Col., 1835: text to pl. 587 (seas of Japan).

Though described originally from Japan, this species is another of the antipodes breeders which make the long annual journey to "winter" in the North Pacific. As ornithologists seldom get to sea, and the fishermen do not often recognize the less distinctive Tubinares, the status of the more unusual species in Japan is not well known. As with others in this category, more specimens of the Slender-billed Shearwater have been found dead on the Honshu beaches than have been shot in Japan. The species is uncommon, and occurs only on migration, mainly in the spring months. There are some 20 specimen records for the Pacific coast of Honshu, mostly from Sagami and Suruga bays, the dated ones ranging from 4 May to 12 July.

On 22 April 1949, a cold, snowy day, Kuroda and Wilke encountered a flock of about 100 some 15 miles off Abashiri in the Okhotsk Sea, and on 1 May saw scores more off Muroran, but were unable to collect any of them. They saw the first few off Iwate Prefecture 30 April 1950, of which they collected one, and saw three more in Funka Bay 17 May.

Viscount Y. Matsudaira, the only Japanese ornithologist to study pelagic birds intensively in the field, spent much time off shore with the Sagami Bay fishermen. Of this species he wrote (Tori, 1924: 190–194): "It occurs in Sagami Bay for only a very short period from mid May to early June, and is not of as regular occurrence as the other species. These shearwaters show no fear of the boat, and sometimes can be approached closely enough to be killed with a club. Nor does the noise of a shotgun alarm them; if a bird is killed from a flock, the others gather around it. Usually observed in large flocks, they are sometimes seen singly, and often in pairs picking lice from each other's bodies. Because of their small size, they are often parasitized by the Great Skua, and dead birds are frequently found on the sea."

18. Puffinus nativitatis Streets
CHRISTMAS SHEARWATER
Japanese: Mizunagadori (shearwater)

Puffinus (Nectris) nativitatis Streets, Bull. U.S.N.M., **7**, 1877: 29 (Christmas Island).

According to Matsudaira (Tori 1924: 190) this species occurs very rarely in Sagami Bay, usually in company with *P. tenuirostris*. He collected two specimens there in 1924. The only other record for Japan is a single specimen collected in Tari-gun, Miyagi Prefecture by Kumagai (Tori, 1947: 31) in whose collection it still is.

19. Pterodroma leucoptera longirostris (Stejneger)
GADFLY PETREL
Japanese: Hime-shirohara mizunagadori (dainty white-bellied shearwater)

Aestrelata longirostris Stejneger, Proc. U.S.N.M., **16**, 1893: 618 (Mutsu Bay, Japan).

This form is still known only from ten specimens: the undated type and cotype in the Yamashina collection, both from Mutsu Bay, Aomori Prefecture, Honshu; two undated Owston skins from the type locality in the American Museum of Natural History in New York; and six specimens in the Chicago Museum of Natural History taken at sea by the Crane Expedition about 600 miles east of the type locality 29 August 1929 (Murphy, 1930: 14–15).

Its breeding ground is unknown. Mathews' erroneous statement (1934: 170) that it breeds in the Bonins, where the species has never been taken, probably stems from Godman's (1909: 250) misassignment of the two Owston skins to those islands. It probably nests on some island in the South Pacific or in the Antarctic Ocean and spends the non-breeding season in the North Pacific, as do so many of its relatives.

20. Pterodroma brevipes hypoleuca (Salvin)
BONIN GADFLY PETREL

Japanese: Shirohara mizunagadori (white-bellied shearwater)

Œstrelata hypoleuca Salvin, Ibis, 1888: 358 ("Krusenstern" = Laysan Island).

This Gadfly Petrel breeds in the Bonin and Volcano Islands, where it arrives in October and leaves in June. From the record it is only of casual occurrence in Japanese waters, though more offshore collecting may show it to come northward fairly regularly after the breeding season. The only records for Japan are:

Honshu,	Chiba, Choshi	12 May 1931	Norinsho coll.
"	Tokyo	8 Oct. 1929	Momiyama coll.
"	Kamakura	21 Aug. 1940	Yamashina coll.
"	Shizuoka	5 Aug. 1935	Norinsho coll.
Izu Ids.,	Miyakejima	undated	Kuroda coll.
Shikoku,	Tokushima	20 Aug. 1950	Tanizaki coll.
Kyushu		Nov. 1924	Kikkawa, Choju no Seitai, 1925: 108.

21. Bulweria bulwerii (Jardine & Selby)
BULWER'S PETREL

Japanese: Anadori (hollow bird)

Procellaria Bulwerii Jardine & Selby, Ill. Orn., **2**, 1828, pl. 65 & text (Madeira).
Bulweria bulweri pacifica Mathews & Iredale, Ibis, 1915: 607 (Volcano Ids.). (Synonym)

B.b.pacifica is based on a supposedly larger bill, which no subsequent reviewers of the group have been able to discern. I can find no recognizable differences between Atlantic and Pacific specimens in the large MCZ series.

This species, which breeds at widely separated and disconnected localities in the north Atlantic and Pacific oceans, nests in the Bonin and Volcano islands where it apparently is not uncommon. It strays rarely to Japanese waters, and is known here from only three records. The former Tokyo University collection had an old, undated specimen from Nikko which has been lost. There was another undated specimen in the Matsudaira collection from Nagano (Tori, 1913: 68). The 1942 Hand-List mentions a record for Osaka Bay, the original of which we have been unable to find.

HYDROBATIDAE

22. Oceanites oceanicus (Kuhl)

WILSON'S STORM-PETREL

Japanese: Ashinaga koshijiro umitsubame (long-legged white-rumped sea-swallow)

Procellaria oceanica Kuhl, Beitr. Zool., **1**, 1820: 136 (South Georgia, by desig.)

Oceanites oceanicus has been divided into four very weak races on the basis of measurements alone. These overlap so badly that it is impossible to assign any single specimen taken away from the breeding grounds to its proper subspecies.

This southern hemisphere breeder is a very rare bird in the northwest Pacific. The only record for Japan is a specimen in the Norinsho collection which was found dead after striking the lighthouse at Cape Inubo, Chiba Prefecture, Honshu, on 6 April 1932, and reported by Kiyosu (Tori, 1932: 269).

23. Oceanodroma castro (Harcourt)

MADEIRAN PETREL

Japanese: Kuro koshijiro umitsubame (black white-rumped petrel)

Thalassidroma castro Harcourt, Sketch of Madeira, 1851: 123 (Madeira).
Cymochorea castro kumagai Mathews, Bull. B. O. C., **58**, 1938: 63 (Hidejima, Honshu). (Synonym)

The Madeiran Petrel has been found in Japan only on Honshu. A few specimens have been taken off shore, two off Cape Shiriya, Aomori in July and August, and several others off Cape Inubo, Chiba, and Cape Omae, Shizuoka in October. Two have been taken inland, evidently storm-driven birds in November 1906, one at Nara, the other at Nikko. The rest of the specimens, of which good series are available in several Japanese collections, all come from Hidejima, a small island about a mile in circumference, lying some 500 yards off the Iwate coast just south of Takada, where a large colony arrives in late May, breeds through the summer, and leaves in October.

Hidejima was made a Natural Monument in 1935, the year after its petrel colony was first noted and investigated by Kumagai (Tori 1936: 142–154), who estimated it contained about 20,000 birds, their burrows averaging from two to seven per square yard in the densest parts of the colony. Nagahisa Kuroda was able to spend a short time during daylight hours on the island 14 June 1951, and found it still in excellent condition. He found the ground in some places honeycombed with tunnels. The burrows are from one to three feet in depth, frequently connected and with more than one entrance. The entrance holes are from three to seven inches in diameter, and each hole usually curves immediately toward another entrance. Seven occupied burrows which he dug out contained nine birds; two were pairs, the seven singles were all males. Laying had just commenced. The eggs are white with occasionally a few red-brown markings at the larger end. The extreme dimensions of 18 eggs measured was 31–34.8 x 23–25 mm.

Kumagai (*loc. cit.*) collected a single Madeiran Petrel from a burrow on Sanganjima, another famous Iwate sea bird colony, 25 miles north of Hidejima off Kamaishi. This colony reportedly is occupied predominantly by *Puffinus leucomelas* and *Oceanodroma leucorhoa monorhis*, and is also protected as a Natural Monument. Neither of these two breeding grounds has been studied intensively, and much remains to be learned of the local distribution and identity of the several species that inhabit them, and of their habits and life histories.

24. Oceanodroma leucorhoa (Vieillot)
LEACH'S PETREL

Japanese: Koshijiro umitsubame (white-rumped petrel) = *O.l.leucorhoa*
Himekuro umitsubame (dainty black petrel) = *O.l.monorhis*

Procellaria leucorhoa Vieillot, Dict. d'Hist., **25**, 1817: 422 (France).
Thalassidroma monorhis Swinhoe, Ibis, 1867: 386 (Amoy, China).

Although Japanese specimens of *O.l.leucorhoa* show some variation in the amount of white on the rump, they are inseparable from the Atlantic population. The Alaskan population of *O.l.leucorhoa* intergrades in an almost perfect cline down the west coast of North America with the black-rumped *O.l.chapmani* of San Benito Island, Baja California, but no intermediates exist in eastern Asia between white-rumped *O. l. leucorhoa* (breeding from Hokkaido northward) and the slightly smaller, black-rumped *O.l.monorhis* (breeding from central Honshu southward to Yakushima and westward to Korea). As *monorhis* is separable morphologically from *chapmani* only by its slightly smaller bill, and so far as known is completely allopatric to *leucorhoa*, it is best regarded systematically as a geographical race of the latter (Cf. Austin, 1952: 399).

O.l.leucorhoa breeds on small islands off Hokkaido and in the Kuriles. Farther south it has been taken as follows:

Honshu,	Aomori, Cape Shiriya	1 July 1933	Norinsho coll.
"	Miyagi, Kinkazan	24 May 1952	K. W. Kenyon coll.
"	Fukushima, Koriyama	29 Oct. 1946	Koriyama Yacho Soc. Rpt. No. 6:81
"	Chiba, Cape Inubo	3 July 1932	Norinsho coll.
"	" Hie Shrine	29 Sep. 1917	Dob. Zas., 1918: 309 (storm driven)
"	Gifu, Hida	15 July 1931	Tori, 1931: 183 (storm driven)
Izu Ids.,	Oshima	27 July 1935	Momiyama coll.
"	Hachijo	8 Oct. 1922	Momiyama coll.
"	Torishima	9 May 1932	Yamashina coll.
Bonin Ids.,	Chichijima	20 Dec. 1930	Yamashina coll.

The best-known breeding ground of *O.l.leucorhoa* in Japan is Daikokujima, a small island off Akkeshi on the east coast of Hokkaido. It is protected as a Natural Monument. Kobayashi and Ishizawa (1938: 213) summarize the findings of Takamatsu there as follows: The birds arrive in late April, and dig their burrows in May and early June, working only at night. Takamatsu estimated three to five nests per square meter in flat terrain, eight to nine on steep banks. Both sexes may be found in the nest in the daytime during the incubation period, which lasts 42 days. The white eggs, with occasional fine specklings of light purplish-brown at the larger end, average 34.6 x 24.9 mm. (79 measured). The young leave the island in September, eight weeks after hatching.

Chester M. Fennel (1953:38) spent a night and parts of two days on Daikokujima 20 and 21 June 1951. He believed the petrel population was then at least "several thousand individuals. The entire top of the island . . . seemed to be riddled with its nesting burrows. . . . Apparently they prefer to burrow in among the root systems of patches of *Artemesia* and along the extreme edges of the grass-overgrown tops of the sheer cliffs. . . . The burrows measured from 45.0 to 53.5 cm. in depth, sharply descending into the ground for the first eight or ten centimeters, then leveling off more gradually toward the end. In nearly all the burrows there was a sharp turn to the right or left within some 20 centimeters of the entrance. The entrances averaged 8.5 centimeters in width and 7.0 centimeters in height.

"Of approximately 25 burrows examined, all but one contained single birds each on one egg. The exception contained a bird but no egg. In all cases the floor of the end of the burrow was lined with short pieces of dry weed leaves, stems, and moss. Of ten eggs collected, five were fresh, three slightly developed, and two approximately half developed.

"Of a total of eight birds collected in burrows on eggs, four were males and four females. All were collected in broad daylight, at approximately 3:00 p.m. . . . "

The status in Japan of *O.l.monorhis* has not been well worked out. It is reported to breed in large numbers on Sanganjima, Iwate Prefecture, where *O.castro* also nests, but the presence there of *monorhis* is based apparently on three adult males collected by Kumagai 8 July 1935, the only petrels ever collected in this colony. Nagahisa Kuroda visited Sanganjima for a few short daylight hours 14 June 1951, and found a few petrel burrows among those of the shearwaters, but no petrels were present in those he dug out. He was unable to remain there after dark, and believes petrel burrows may be more numerous in the rocky parts of the island he did not have time to examine. A few days before his visit a party of Japanese, none of them bird men, visited Sanganjima at night and reported in a long article in the local paper (Iwate Shinpo, 7–9 June 1951) that both *monorhis* and Streaked Shearwaters were abundant. They said the petrels came in shortly after dark, disappeared immediately into their burrows under the rocks, and left about 2 a.m. They also claim to have caught a single *O. tristrami* there, which has not been verified. The identity and the status of the petrels on Sanganjima should indeed be investigated further.

O.l.monorhis has been reported breeding under the rocks on Okinoshima, an islet off Fukuoka in northern Kyushu (Kuroda 1934: 97). Araki (Tori 1918: 18) found petrels, presumably *monorhis*, breeding on Yakushima. While investigating the Streaked Shearwater colonies on Kamurijima and its satellite Kojima off Maizuru on the north coast of Kyoto Prefecture 22 August 1947, I found and collected a very small male *monorhis* in worn plumage under a shelving rock among the shearwater burrows on the east side of Kojima. It was the only petrel I encountered the night I spent there and, while the condition of its plumage and gonads indicated it was nesting, I could find no sign of burrow, egg, or chick other than those of shearwaters though I hunted till long past daylight.

The only specimen records of *monorhis* from Japan other than those mentioned above are:

Honshu, Aomori	undated	Yamashina coll. (cf. Proc. U.S.N.M., 1893: 622, & Ibis, 1922: 439)
" "	7 July 1935	Norinsho coll.
" Chiba, Cape Inuba (2)	8 Oct. 1937	" "
" Shizuoka, Cape Omae	9 Aug. 1926	" "
" " "	21 May 1931	" "
Izu Ids., Hachijo	7 Oct. 1932	Momiyama coll.

There are also specimens in the Japanese collections from Korea, from Quelpart Island, and from the Ryukyus.

25. Oceanodroma tristrami Salvin

STEJNEGER'S PETREL

Japanese: Oston umitsubame (Owston's Petrel)

Oceanodroma tristrami Salvin, Cat. Bds. Brit. Mus., **25**, 1896: 347 (in key) and 354. (Sendai Bay, Honshu).

Cymochorea owstoni Mathews & Iredale, Ibis, 1915: 581 (Okinose, Sagami Sea, Honshu). (Synonym)

Stejneger's Petrel is known to breed only on Torishima in the Izus and on Kita-Iwojima in the Bonin Islands. It nests in winter, the birds arriving on the islands in December, perhaps earlier, laying in January, and leaving in late March or early April. They then move northward and appear off the Pacific Coast of Japan usually about 10 April, but seldom come within 20 miles of land unless driven in by inclement weather. Kuroda and Wilke saw the first ones off Miyagi 11 April 1950, after which their numbers increased rapidly. Viscount Matsudaira (Tori, 1923: 190) found them commonest off Sagami Bay in late April and early May. When he first tried to collect petrels there in 1920, they were so shy he was able to get only a few. The next spring he baited them to the boat with sardine oil and *Neomyris*, to which they gathered "as though the collector were not there", and on ten trips he was able to collect 15 or more birds at a time. Strangely, all the birds he collected in this manner were males, and almost all were of this species, only five being of the next species which Kuroda named in his honor. In the stomachs of the birds he collected he found "fish meat, shrimp embryos, and a few small pebbles. One had a small piece of sponge."

The species has not been found north of Aomori or in the Sea of Japan. The Norinsho collection contains a large series of Stejneger's

Petrels picked up dead after striking coastal lighthouses. Their dates may be more indicative of periods of bad weather than of seasonal abundance of the species, but show its presence off the Pacific coast of Japan practically throughout the year:

Chiba Pref., Cape Inubo	: 7 Jan. 1937; 20 Jan. 1938; 10 Mar. 1927; 27 Apr. 1930; 15, 23 Apr. 1931; 23, 30 Apr. 1935; 16, 22 Apr. 1941; 10 May 1926; 26 May 1932; 30 Oct. 1937; 19 Nov. 1930; 17, 22 Nov. 1935; 15 Dec. 1931.
Shizuoka Pref., Cape Omae	: 26 Jan. 1930 (2); 8 Feb. 1926; 11, 21 Feb. 1931; 1 July 1932; 30 Nov. 1927; 28 Dec. 1932; 27 Dec. 1940.
Oita Prefecture, Cape Jizo	: 28 Feb. 1927.

26. Oceanodroma matsudairae Kuroda
MATSUDAIRA'S PETREL
Japanese: Kuro umitsubame (black petrel)

Oceanodroma melania matsudariae [misprint for *matsudairae*] Kuroda, Ibis, 1922: 311 (Sagami Bay, Honshu).

This species was described from a small series of five male birds taken by Viscount Matsudaira off Sagami Bay 4–28 May 1921, the only definite record for Japanese waters. It cannot be distinguished with certainty in the field from the preceding species, from which it differs only by the white bases of its primary quills, by having a lead "bloom" on the brownish black of the head and shoulders, and in lacking the pale scapular band that is more pronounced in *tristrami*. It is apparently more southern in its range than *tristrami*, with which it breeds sympatrically on Kita-Iwojima in the Bonin Islands. Very little is known of its distribution otherwise, or of its habits and life history.

27. Oceanodroma furcata furcata (Gmelin)
GRAY PETREL
Japanese: Hai-iro umitsubame (grey sea-swallow)

Procellaria furcata Gmelin, Syst. Nat. **1** (2), 1789: 561 (Bering Sea).

This species breeds from the central Kuriles northward into the Bering Sea and on the northwest coast of North America. It has been taken as far south as the Volcano Islands, Marcus Island, and San Pedro in California.

From the specimen record it seems of little more than casual occurrence off Japan, but it may be a fairly regular winter visitor or transient, seldom encountered because it remains well out to sea beyond the reach of most birders. The only specimen records for Japan are:

Hokkaido, Abashiri		5 July 1930	Yamashina coll.
Honshu, Aomori		late Oct. 1924	MCZ, *ex* Momiyama
"	Niigata, Iwafunegun	undated	Momiyama coll.
"	Kanagawa, Misaki	Mar. 1906	Yamashina coll.
"	Shizuoka, Sagami Bay	undated	Ogawa (Ann. Zool. Jap. 1908: 339)
"	" Abegawa	8 Mar. 1906	Yamashina coll.
"	" Suruga Bay	undated	Kuroda coll.
"	" Cape Omae	undated	Norinsho coll.
"	Hyogo, Kobe (2)	June 1895	AMNH

PHAETHONTIDAE

28. Phaëthon rubricauda rothschildi (Mathews)

RED-TAILED TROPIC BIRD

Japanese: Akao nettaicho (red-tailed tropic bird)

Scaeophaëthon rubricauda rothschildi Mathews, Bds. Austr., **14**, 1915: 303 (Laysan & Niihau Ids.).

Japan is not part of the usual range of this highly pelagic species, which breeds on oceanic islands from the Volcano Islands to Hawaii. Though it has appeared here six times, at least four of the following records are for spent, probably storm-driven birds picked up well inland:

Honshu, Iwate, Rikuchu		undated	1932 Hand-List
"	Saitama	May 1907	Tori, 1919: 199
"	Gifu, Mino	1885	Yamashina coll.
"	" Hida	20 Nov. 1934	Yacho, 1934: 945
"	Nagano, Shinano	1917	Dob. Zas. 1919:199
"	Yamanashi, Kofu	30 Aug. 1951	Tori, 1952: 30

29. Phaëthon lepturus dorotheae Mathews

WHITE-TAILED TROPIC BIRD

Japanese: Shirao nettaicho (white-tailed tropic bird)

Phaëthon lepturus dorotheae Mathews, Austr. Av. Rec., **2**, 1913: 7 (Queensland).

This species is somewhat more southern in its range than the Red-tailed Tropic Bird, and has strayed to Japan only twice:

Honshu, Ishikawa, Kaga	undated	Yamashina coll. (Stejneger 1892: 493)
" Nagano, Shinano	undated	1922 Hand-List

PELECANIDAE

30. Pelecanus crispus Bruch

DALMATIAN PELICAN

Japanese: Garancho (cathedral bird)

Pelecanus crispus Bruch, Isis, 1832, col. 1109 (Dalmatia).

This Pelican ranges from southeastern Europe across southern Asia to southern China. It has straggled twice to Japan in modern times, both times to Kyushu. Three birds were observed in Kagoshima in October 1919, one of which was collected 11 November 1919 (Uchida, Tori, 1920: 306). Its stomach was full of small shrimp. The other, a crippled or wounded bird, was caught alive near Fukuoka 17 November 1941, and kept alive for some time in the Fukuoka Zoo (Abe, Tori, 1914: 483). There is also a questionable record from Izumo (Dob. Zas., 1890: 206) of a Pelican reported in a local newspaper, but never verified by a competent ornithologist.

Old wood-cut books of the Tokugawa period show the species may have visited Japan fairly frequently in those days. Kumagai made a study of them (Yacho, 1941: 81–85) and considers many of them quite reliable. The bird is so distinctive, and the ancient drawings so accurate and lifelike there can be no question of their authenticity. They show it to have occurred at Omi on Lake Biwa, at Settsu and Yamashiro in the Hyogo-Osaka area, and at Tokyo when it was known as Edo.

PELAGORNITHIDAE

31. Sula leucogaster plotus (Forster)

BROWN BOOBY

Japanese: Katsuodori (bonito bird)

Pelecanus Plotus Forster, Des. An., 1844: 278 (near New Caledonia).
Sula leucogaster yamashinae Neumann, Anz. Orn. Ges. Bayern, **2**, (4) 1932: 146 (Bonin Ids.; type in MCZ). (Synonym)

The type of *S.l.yamashinae* seems at first glance to have a remarkably thick bill, but measurements show it well within those of an extensive series from the

Tuomotus in all dimensions, and the character is not constant. I can find no color differences between two Bonin birds including the type, two from the Ryukyus, one from China, five from the Philippines, and a long series from the southern Pacific.

The northern breeding limit of this species is the southern Izu Islands. I counted 14 half-grown young in the white down on an inaccessible ledge 100 feet above the water at Inambajima 10 April 1950, where some 200 adults were flying about. The previous day I saw about half as many adults on a similar cliff face at Smith's Island, but could see no young from the vessel (cf. Tori, 1950: 266). In the Bonins where it breeds commonly, Momiyama states it starts to lay in May, and the chicks do not appear until August.

The Brown Booby wanders commonly to the northern Izus. I observed scattered individuals north to the south side of Oshima in April 1950. It undoubtedly occurs more frequently along the southern Pacific coasts of Honshu, Shikoku, and Kyushu than the record suggests:

Honshu, Chiba, Cape Inubo	undated	Kuroda coll.
" Miyagi, 400 mi. s.e. of Kinkazan	23 July 1935	Kumagai coll.
Izu Ids., Mikurajima	7 Feb. 1936	Yamashina coll.
" Hachijo	undated	Okada, 1891
Shikoku, Kochi, Susaki	June 1925	Kuroda coll.
Kyushu, Nagasaki (2)	undated	Leyden Mus.
" "	undated	Seebohm, 1890: 212
" Kumamoto, Tatsuchiro Bay	Dec. 1938	Yacho, 1939: 3
" Miyazaki, Sumiyoshimura	2 Feb. 1933	" "
" Kagoshima	23 Apr. 1950	McClure coll.

PHALACROCORACIDAE

32. Phalacrocorax carbo hanedae Kuroda

COMMON CORMORANT

Japanese: Kawa-u (river cormorant)

Phalacrocorax carbo hanedae Kuroda, Tori, 1925: 240, 248 (Haneda, Tokyo, Japan).

A topotypical series of seven specimens in the MCZ shows the small measurements which differentiate this easternmost Asiatic race of the Common Cormorant from the populations of central and western China

The Common Cormorant is a common resident from the Kwanto

Plain southward. In northern Honshu it is a summer resident from late February through September. It wanders occasionally to southern Hokkaido and may winter rarely in the open salt waters of Aomori. It nests and roosts locally in colonies where suitable trees adjoin a food supply. In Tokyo long lines of cormorants fly daily in formation at dawn and dusk between their feeding grounds out in the bay and their roosts in the high oaks, pines, and cryptomerias around the ponds and inlets in the parks and shrine grounds well within the city. There are thriving colonies at the Imperial duck ponds, and at several shrines in nearby Chiba, where the farmers spread straw under the trees to catch the droppings for fertilizer.

Its nesting habits have been studied and reported in detail by Kuroda (Tori, 1925: 336–350) at Haneda where Tokyo's airport now replaces his once famous duck pond, and by Saito (Tori, 1931: 175–6) at the Daiganji Shrine colony in Chiba. According to their observations the white tips of the neck and thigh feathers in the breeding plumage appear from late November to early January. Those on the neck are shed from late March to May, but those on the thighs persist to late July. The nest is a crude, flimsy pile of twigs placed in a tree crotch from 6 to 75 feet above the ground. Its construction takes from 13 to 30 days. The birds usually start carrying nesting materials around New Year and lay their first eggs in late January or early February. Kuroda reports one exceptionally early nesting in December. The clutch varies from three to six pale blue eggs, averaging 62 x 39 mm. Both sexes incubate at intervals of from two to four hours apiece, and incubation lasts 47 days. The nestling's eyes open and the first feathers appear six days after hatching. They leave the nest in about 60 days. As soon as the first brood leaves, in late March or April, the parents begin their second and final brood of the year.

At the Suruga Shrine in Aomori, what is probably the northernmost colony of Common Cormorants nests in the trees around the shrine in company with two species of herons. The site is protected as a Natural Monument. The cormorant's nearest source of food is Lake Towada, 20 miles away as the birds fly. During the nesting season they conduct a steady airlift between the shrine and the lake, where they catch the artificially-propagated salmon for which the lake is famous. In the regurgitation process many of the fish are spilled out of the nest, and provide the priests at the shrine a fairly steady supply of fresh salmon while the young are being reared.

The cormorants are now protected under the game laws as well as by the Natural Monument provisions in certain favored localities. The Common Cormorant is used for cormorant fishing at Arakawa and Sagamigawa in the Kwanto area, but at the more famous fishing site at the Nagara River in Gifu, Temminck's Cormorant is preferred traditionally because of its larger size and consequent ability to hold more fish.

33. Phalacrocorax capillatus (Temminck & Schlegel)
TEMMINCK'S CORMORANT
Japanese: Umi-u (sea cormorant)

Carbo capillatus Temminck & Schlegel, *in* Siebold's Faun. Jap., Aves, 1850, pl. 83 (Japan).

This is the largest of the eastern Asiatic cormorants, readily differentiated from the other species by the shape of its gular patch, and in adults by the speckling of the facial white. It is a locally common winter visitor on the Honshu and northern Kyushu coasts, roosting on bold, rocky cliffs, sometimes in large numbers. At Kabeshima, a small rocky islet in Yamaguchi Prefecture, thousands congregate from November to March so thickly they leave some 2500 kilograms of guano to be gathered each spring after their departure. The island was made a Natural Monument in 1934. Other winter concentrations occupy coastal cliffs at Numashima, Hyogo, in the Oki Islands, at Awashima, Niigata, near Shinojima, Aichi, and at Takahagi, Ibaraki.

The species breeds in Korea, and from Sakhalin and the Kuriles south to the cliffy offshore islands of northern and eastern Hokkaido. Yukio Nakamura reported orally in 1952 to the Ornithological Society of Japan the presence of several large breeding colonies on Rebun Island. Fennel (1953: 39) estimated about 100 birds in the single occupied colony on Daikokujima, off Akkeshi, 21 June 1951. These birds were being disturbed constantly by the egging of the local fishermen, who gave him ten eggs, most of which contained embryos nearly fully developed. Its nesting south of these sites has yet to be verified. Kuroda states (1928: 327), "In Mutsu Bay [Aomori] it is a rather common resident, and it may breed on the cliffs of Tateishi, a small islet at the mouth of the bay, where several specimens were observed in end of April, 1927. Mr. Wada [Tori, 1922: 120] also stated that it is a resident."

As mentioned under the preceding species, Temminck's Cormorant is used traditionally in the cormorant fishery at the Nagara River in

Gifu, which is still carried on as a tourist attraction with all its medieval trappings under a subsidy from the Imperial Household. The fishermen claim the commoner and more easily procurable Japanese Cormorant is unsuitable for the purpose, and still obtain their birds as they have for centuries from a small clan of skilled limers in Ibaraki. These men decoy the "Umi-u" to a ledge on the Takahagi cliffs within reach of a blind, from which they entangle the birds in lime smeared on the end of a slender five-foot bamboo stick.

34. Phalacrocorax pelagicus pelagicus Pallas

PELAGIC SHAG

Japanese: Hime-u (dainty cormorant)

Phalacrocorax pelagicus Pallas, Zoogr. Rosso-Asiat., **2**, 1811: 303 (Kamchatka and the Aleutian Ids.).

The Pelagic Shag is the common coastal cormorant of northern Japan. It is resident in Hokkaido, and breeds on coastal cliffs as far south as northern Honshu, where Kuroda (1928: 328) collected a fledgling at Benten Island at the entrance to Mutsu Bay 23 April 1927. It has been reported as breeding on Tobishima in Yamagata Prefecture, but not verified. It winters southward commonly along the Pacific Coast of Honshu as far as Fukushima, and sporadically to the latitude of Chiba. The southerly wintering birds move northward after mid-March. Kuroda and Wilke saw a flock of 30 full-plumaged adults flying northward in their customary V-formation past Hosoura, Iwate Prefecture on 30 April 1950. It has been taken as late as 22 May 1889 (Yamashina coll.) in Chiba.

The species also winters along the coast of western Kyushu. Little is known of this population, which is possibly composed of individuals coming south along the mainland coasts of Ussuria and Korea.

35. Phalacrocorax urile (Gmelin)

BARE-FACED SHAG

Japanese: Chishima U-garasu (Kurile cormorant-crow)

Pelecanus urile Gmelin, Syst. Nat., **1**, (2), 1789: 575 (Kamchatka).

This boreal breeder has been taken only twice south of the Kuriles. Both specimens are in the Norinsho collection, and both are adult males, one taken at Echigo, Niigata Prefecture 3 January 1918, the other at Akkeshi, Hokkaido 1 May 1950.

FREGATIDAE

36. Fregata ariel ariel (G. R. Gray)

LEAST MAN-O'-WAR

Japanese: Gunkandori (warship bird)

Atagen ariel G. R. Gray, Gen. Bds., **3**, 1845, pl. 185 (Raine Id., Queensland, Australia).

This tropical species has occurred in Japan as follows:

Hokkaido, Hakodate	Oct.	Brit. Mus., *ex* Blakiston
" Kushiro	21 Aug. 1939	Toei School coll. (an immature caught alive in the local shrine grounds)
Honshu, Sado Id.	undated	Im., caught alive and kept at Ueno Zoo
" Tochigi, Naka River	July 1926	Momiyama coll.
" Hyogo, Itami-machi	26 Nov. 1937	Im., found dead (Yacho, 1938: 237)

There is also one reliable sight record, a single bird observed in Suruga Bay 1 August 1936 by both Nagamichi and Nagahisa Kuroda.

ARDEIDAE

37. Ardea cinerea jouyi Clark

GRAY HERON

Japanese: Ao-sagi (blue heron)

Ardea cinerea jouyi Clark, Proc. U.S.N.M., **32**, 1907: 468 (Seoul, Korea).

The Gray Heron is a locally common summer resident in Hokkaido, breeding southward to Shikoku, but more plentifully on the Japan Sea side of Honshu. A few individuals occasionally winter well northward throughout the breeding range, but most of the population moves southward to the warmer sections of Japan. It appears regularly in the Kansai area in January, but is a rare bird on the Kwanto Plain.

The species nests in colonies, usually where it receives some sort of protection, either under the Natural Monument statutes as at Saruga Shrine, Aomori, or under special provisions in the game laws, as on the game preserve in Yuri-gun, Akita. It is reported as particularly abundant on Oki Island, and smaller colonies are scattered locally from southern Hokkaido along the Japan Sea coast to Yamaguchi. It frequently nests in company with other species, with night herons and cormorants at the Saruga Shrine, and with the storks in Josaki-gun, Hyogo Prefecture. The northernmost colony in Japan is an extensive one in the isolated Yubari marshes near Tomakomai, Hokkaido.

The Gray Herons arrive at the northern colonies from mid March to mid April. According to Yamashina (1941: 920) the species lays 3 to 4 greenish-blue eggs, averaging 60.7 x 42.8 mm., at two-day, rarely four-day intervals. The sexes alternate incubating every four to six hours during the 25–28 day incubation period. The young remain in the nest six to seven weeks.

The species is relatively unimportant economically. It is not generally eaten, and its diet of small fish, reptiles, amphibia, insects, crustacea, and even some small rodents, does not interfere with human needs. However, the bird is regarded with disfavor by the rice farmers. In walking through the paddies it occasionally stamps down a young rice plant or two with its big feet.

38. Ardea purpurea manilensis Meyen
PURPLE HERON
Japanese: Murasaki sagi (purple heron)

Ardea purpurea var. *manilensis* Meyen, Nova Acta Acad. Caes. Leop. Carol., **16**, suppl., 1834: 102 (Philippines).

The Purple Heron is an occasional visitor to Japan, usually appearing in autumn during the post-nuptial wanderings for which many herons are noted. Its nearest known breeding grounds are in Formosa and central China. It has strayed as far north as Shirutoru, Sakhalin, where an immature specimen in the Yamamoto collection was taken 9 May 1936. The records for Japan:

Hokkaido, Uenai		26 Nov. 1932	Kobayashi coll.
Honshu, Kanagawa		undated	Momiyama coll.
"	Chiba, Naganuma	autumn 1937	Norinsho coll.
"	Chiba	29 Oct. 1941	Yamashina coll.
"	Shizuoka, Sagami (2)	Oct. 1918	Momiyama coll.
Izu Ids., Hachijo		29 Nov. 1923	" "
Kyushu, Kumamoto, Yatsushiro Bay		undated	Kusuda coll.
"	Kagoshima, Satsuma	"	1942 Hand-List

39. BUTORIDES STRIATUS AMURENSIS (Schrenck)
MANGROVE HERON
Japanese: Sasa-goi (Sasa is bamboo-grass, goi a suffix for the *Nycticorax* group)

Ardea (Butorides) virescens var. *amurensis* Schrenck, Reise Amur Lande, **1**, pt. 2, 1860: 441 (Amurland).

The Mangrove Heron is a fairly common summer resident in central and southern Japan, more plentiful in western than in eastern Honshu. It is not uncommon in the Tokyo area, where it usually feeds along the river banks. It arrives in central Honshu in mid April and leaves in late September or early October. A few sometimes winter in warmer areas, and it has been reported from Ito, Shizuoka Prefecture in January.

The only Hokkaido record is a specimen from Hakodate listed by Blakiston and Pryer in 1882. Kumagai (Tori, 1920: 292) saw a bird carrying nesting material 3 May, 1916 in Miyagi, probably close to its northern limit of breeding. In central and western Honshu it usually nests in small scattered colonies. It builds a crude nest of sticks thirty feet or more up in the densest parts of tall evergreens, preferably cryptomeria, sometimes pines. Yamashina (1941: 966) reports a colony of 20 to 30 nests at Edajima, Hiroshima. Enomoto (Choju Iho 1930: 155–159) describes a larger colony scattered in large ginkgos in 11 localities near Osaka. The birds were still incubating 18 July, and the young left by the end of August. He estimated between 60 and 70 nests in the group, which produced about 200 young. Kobayashi (Tori, 1948: 53, 57) describes a number of colonies in pine trees in the Kobe-Osaka area, where he found seven pairs incubating 4 May. The clutch contains 3 to 5, usually 4 greenish-blue eggs, measuring 38–43 x 29.8–31.4 mm.

40. ARDEOLA BACCHUS (Bonaparte)
CHINESE POND HERON
Japanese: Akagashira sagi (red-headed heron)

Bupphus bacchus Bonaparte, Consp. Gen. Av., **2**, 1855: 127 (Malacca).

A common breeding bird in southeast China, the Pond Heron is of rare occurrence in Japan. It seems from the record to wander in sporadically after the breeding season:

Hokkaido, Hakodate		14 Oct. 1879	USNM
Honshu, Miyagi		Oct. 1892	Yamashina coll.
"	"	1 Nov. 1935	Kumagai coll.
"	Yamagata	Dec. 1921	Ishizawa (Tori, 1922: 294)
"	Ibaraki	undated	1922 Hand-List
"	Nagano	undated	Kuroda coll.
"	Kobe	Feb. 1893	AMNH
Izu Ids., Hachijo (2)		13 Nov. 1931	Momiyama coll.

41. Bubulcus ibis coromandus (Boddaert)

CATTLE EGRET

Japanese: Shojo sagi (orang-utang heron)

Cancroma Coromanda Boddaert, Table Pl. enlum., 1783: 54 (Coromandel).

This small, white, tropical heron, easily identified among the egrets with which it usually associates in Japan by the buff wash on its head, neck, and back, reaches its northeastern limit of distribution in the Tokyo area. It breeds in colonies, usually with other white herons, and lays its 3 to 5 pale greenish-blue eggs in a flimsy nest 10 to 20 feet from the ground in the low branches of trees, shrubs, or bamboos. Little is known of its movements, for it is seldom observed except in the immediate vicinity of its few known breeding places, where it arrives with the other herons in April and departs in late summer or early autumn. It is believed formerly to have been more abundant, and to have decreased markedly in numbers since the Meiji restoration. It is known to breed, or to have nested recently in the following heronries:

Honshu,	Saitama, Noda	(three pairs in 1949, A. Jr.)
"	Chiba, Shinhama	(two pairs in July 1950, ten or more pairs in 1951, Nagahisa Kuroda.)
"	Tokyo, Haneda	(none since 1919)
"	Shiga, Takatsuki	(Udagawa, 1947)
"	Osaka, Sakai City	(Enomoto, 1930)
"	Hyogo, Himeji	(2 colonies, about 500 birds each, Kobayashi, 1948)
"	Hiroshima, Itsukushima	(Udagawa, 1947)

42. Egretta alba (Linné)

GREATER EGRET

Japanese: Dai sagi (great heron)

Ardea alba Linné, Syst. Nat., ed. 10, **1**, 1758: 144 (Europe).
Ardea modesta J. E. Gray, Zool. Misc., 1831: 19 (India).

The two races of the Greater Egret are not separable in the field, and can be told apart only by measurements. The larger one, *E. a. alba* with wing length more than 410 mm., breeds across northern Eurasia, and is an uncommon winter visitor to Japan between November and March, known definitely by the following specimens:

Hokkaido, no loc.		10 Oct. 1883	USNM
Honshu, Saitama, Soba		8 Jan. 1884	Yamashina coll.
"	Chiba	20 Feb. 1889	" "
"	"	Nov. 1918	" "
"	" , Naganuma	15, 20 Feb. 1950	Norinsho coll.
"	Tokyo	8 Jan. 1883	USNM
"	Shizuoka, Sagami	undated	AMNH
"	Osaka	undated	AMNH
"	Mie	23 Nov. 1938	Hashimoto coll.

The smaller race, *E.a.modesta*, with wing length less than 390 mm., breeds locally from the Kwanto Plain westward and southward in small numbers with other species in most of the large heronries. Udagawa (Tori, 1947: 35) lists it as nesting in the following colonies:

Honshu, Saitama, Noda
" " Koshigaya
" Ibaraki, Ryugasaki
" Chiba, Daiganji
" " Kisarazu
" Aichi, Nagoya
" Osaka, Sakai
Kyushu, Nagasaki, Seburiyama

It arrives from the south in March and April, and departs in September and October. Individuals occasionally winter. A specimen in the USNM was taken in Hakodate, Hokkaido 7 October 1884, one in the Udagawa collection in Chiba 11 February. Nesting begins at Daiganji in Chiba City in early April. The first hatching was noted 20 May, the first young left the nest 19 June, the last in early August (Saito, Tori, 1934: 248).

43. Egretta garzetta garzetta (Linné)

SNOWY EGRET

Japanese: Ko-sagi (small heron)

Ardea garzetta Linné, Syst. Nat. ed. 12, **1**, 1766: 237 (Orient, *ex* Brisson)

This is the smallest of the white herons in Japan. It nests commonly from the Kwanto Plain southward and westward in practically all the well-known heronries listed under the two preceding species. It wanders northward casually as far as Hokkaido after the breeding season, and winters fairly commonly in the coastal areas from Tokyo southward. Its breeding in Shikoku or Kyushu is not yet verified, though it probably does so. In the larger heronries, which it occupies with the other species, its nests are usually the nearest to the ground, frequently only eight or ten feet up. It lays the largest clutch of any of the Japanese herons, averaging 4 to 5, rarely 3 eggs.

44. Egretta intermedia intermedia (Wagler)

LESSER EGRET

Japanese: Chu-sagi (middle-sized heron)

Ardea intermedia Wagler, Isis von Oken, **22**, 1829, col. 659 (Java).

The Lesser Egret is the commonest of the white herons in Japan, the most abundant species in the mixed heronries from the Kwanto Plain southward. At one of the northernmost of these colonies, Noda in Saitama Prefecture, about 25 miles north of Tokyo, its nests fill every tree in an area about a quarter mile in diameter, embracing five or six small farmsteads. The colony was made a Natural Monument in 1938, but its birds have been protected for generations by the local farmers, who spread rice straw and wheat straw on the ground under the trees to catch the droppings, and gather it up at the end of the breeding season to scatter over their rice paddies.

The Lesser Egret arrives in the Tokyo area in April and leaves in October, but winters there not infrequently in small numbers. Its nesting is similar to that of the other species in these colonies. It builds a crude nest of sticks, and lays 3 to 5, usually 4 eggs. Individuals wandering northward after the breeding season have been taken in Hokkaido and Sakhalin.

45. Demigretta sacra sacra (Gmelin)

REEF EGRET

Japanese: Kuro sagi (black heron)

Ardea sacra Gmelin, Syst. Nat., **1**, (2), 1789: 640 (Tahiti).

Demigretta sacra ringeri Stejneger, Proc. U.S.N.M., **10**, 1887: 300 (Tsushima, Goto Ids., Ryukyu Ids). (Synonym).

The three distinct color phases of this heron, black (actually dark blue-grey), intermediate, and white, vary in prevalence in different populations throughout its range, and are of no significance systematically. The white phase is rare in the north and has never been taken in Japan. Mottled individuals are seen now and then in Kyushu, and a single intermediate bird in the Momiyama collection was taken there in January 1917. All the other specimen records are of dark birds:

Honshu, Kanagawa, Misaki	23 Dec. 1924	Kuroda coll.
" Wakayama, Kuroshima	undated	Enomoto coll.
Izu Ids., Hachijo	1926	Momiyama coll.
Kyushu, Goto Ids.	undated	Blakiston and Pryer 1882: 120
" Nagasaki	7 Nov. 1933	Norinsho coll.
" " (2)	undated	Leyden Mus.
" "	undated	AMNH
" Miyazaki (2)	31 Oct. 1951	McClure coll.
Tsushima (2)	undated	Brit. Mus. *ex* Ringer and Holst

The Reef Egret occurs more often on the southern shores of Japan than the specimen record indicates. After its breeding season in the Ryukyus it evidently wanders regularly northward and eastward. Sight records are numerous in the literature, most of them for late summer and early autumn, the northeasternmost being near Shimoda at the tip of the Izu Peninsula. The species is reported reliably and fairly frequently from the Inland Sea in Hyogo Prefecture, and along the rugged southwest coast of Wakayama Prefecture, where Jahn (1942: 246) believes it probably breeds on the inaccessible cliffy islets, but its occurrence in such likely localities during the summer months is the only evidence of its possible nesting within Japanese territory.

46. Nycticorax nycticorax nycticorax (Linné)

BLACK-CROWNED NIGHT HERON

Japanese: Goi sagi (heron of the fifth imperial rank)

Ardea Nycticorax Linné, Syst. Nat., ed. 10, **1**, 1758: 142 (southern Europe).

The Night Heron is one of the commonest and most wide-spread herons in Japan, breeding from northern Honshu southward through Shikoku and Kyushu. It is found occasionally in Hokkaido, usually in late summer or early autumn, but is not known to nest there.

The northernmost breeding colony is at the Saruga Shrine in Aomori where some 250 pairs were nesting in 1948 in company with Japanese Cormorants and Gray Herons. It is abundant in the Tokyo area, and nests in large numbers around the Imperial duck-netting ponds at Koshigaya and Shinhama, and with the other herons at Noda in Saitama. The famous heronry at Daigangi in Chiba City boasts at least a thousand pairs of Night Herons alone, and another thousand or more share the large heronry at Himeji, Hyogo Prefecture, for which the local "White Heron Castle" was named in medieval times. Another famous heronry, at Himeyama Park on Awaji Island in the Inland Sea has nests in 1700 to 1800 trees, sometimes 20 nests to a tree. There are smaller colonies of 200 to 300 pairs in many places in Shimane and Hyogo, on Oki Island, near Kochi City in Shikoku, and as far south as Kagoshima in Kyushu.

Though the species is highly migratory as the following banding returns show, it winters in small numbers as far north as Miyagi, and is frequently common in the Tokyo area throughout the winter:

	Banded	*Recovered*	
Saitama	7 Aug. 1927	Jan. 1928	San Pablo, Languna, Manila, P.I.
Hyogo	19 June 1929	15 Dec. 1929	Nonghram, Atpen, Annam, Fr. Indochina
Chiba	3 June 1930	24 Nov. 1931	Erola, San. Domingo, Ilocos, P.I.
"	11 June 1932	10 Dec. 1932	Shinchiku, Formosa
Toyama	25 June 1932	14 Apr. 1943	Shanghai, China
Fukui	19 July 1932	12 Dec. 1932	Taihoku, Formosa
Tokyo	29 May 1933	25 Jan. 1934	" "
"	27 June 1934	8 Dec. 1934	Miyako, Okinawa
Toyama	23 June 1934	10 Dec. 1934	Pangil, Languna, P.I.
Tokyo	21 May 1935	15 Feb. 1936	Cholla Namdo, Korea
Kagawa	22 June 1937	8 Dec. 1937	Taihoku, Formosa
Kumamoto	10 June 1937	1 Jan. 1938	Annam, French Indochina

The Night Heron occupies a unique place in Japanese history and folk-lore as the only bird ever raised to the Japanese peerage. The old tale is perpetuated in the popular Noh play "Sagi". In about 930 A.D. the reigning Emperor Daigo (LX), during a formal party in his new Kyoto gardens, noticed a beautiful heron gracing one of his pools, and ordered a courtier of the sixth court rank to catch it for him. When the bird started to fly away at his approach, the courtier admonished it, "His August Majesty orders that you must not fly away." Whereupon the bird stood still and allowed itself to be caught and presented to the Emperor. Daigo was so pleased with the bird's behavior and beauty that he appointed it to the fifth court rank, "Go-i", on the spot, and to this day the Night Heron bears the title as its common name.

The species no longer enjoys the immunity of its rank. It is most unpopular with pisciculturists because of its serious inroads on the young carp in the propagating and rearing pools, and equally so with foresters because its nesting frequently kills trees. Such agitation was raised by these groups when it was placed on the protected list in 1947 that it was removed the following year. But it is not generally considered a game bird, nor relished as good eating.

47. Gorsakius goisagi (Temminck)

JAPANESE BITTERN

Japanese: Mizo-goi (ditch bittern)

Nycticorax goisagi Temminck, Pl. Col., 1835, pl. 582 (Japan).

The endemic Japanese Bittern is a distinctive, well-marked, and doubtless an ancient species, with its only near relatives in southeast Asia and the Philippines. It is known to nest only in the Izu Islands, on the adjacent mainland of Honshu in Kanagawa, Shizuoka, and southern Yamanashi Prefectures, and in Tokushima Prefecture, Shikoku (Yacho, 1952: 105). Kobayashi and Ishizawa (1938: 153) claim it also breeds in Kyushu, which is reiterated by Jahn (1942: 252), but the 1942 Hand-List does not credit the unsubstantiated record. It arrives in Honshu usually in early April and departs in late October, but individuals have been collected in March and November, and once in southern Kyushu in February. It winters south to the Philippines, Formosa, and southern China.

The most nocturnal of all the Japanese herons, the Japanese Bittern is so shy and retiring that little is known of its habits. It lives in heavily forested areas, where its low, simple croaking can be heard repeated monotonously at intervals during the night. During the day it remains quietly in the thickest tree foliage, but sometimes in cloudy, rainy weather it ventures out in daytime to forage along wooded watercourses. It usually feeds only at night, and eats crabs and other crustacea, insects, and small fish.

It does not nest colonially, but several pairs may be found nesting in close proximity in favored localities. Hyuga (Yacho, 1949: 275) found six nests in one small swamp on a tributary of the Fuji River about 700 feet above sea level in Shizuoka Prefecture. He describes the nests as crude platforms of sticks, resembling those of the Turtle Dove but a little larger, built from 7 to 20 meters up and 1 to 4 meters out from the trunk in large cryptomeria, cypress, pine, or fir trees, less commonly in oaks or other deciduous trees. The species lays 3 to 4 white eggs which average 47.5 x 37 mm. in size. Egg dates from the Izu Islands are given by Yamashina (Tori, 1942: 237) as Toshima 4 July 1937, Miyakejima 10 July 1934, and Mikurajima 20 July 1934. These may be second nestings, for Hyuga (*loc. cit.*) found the eggs laid in Shizuoka between 9 and 17 May, and full grown young have been reported in Gifu and Yamanashi prefectures in early July. The incubation period is estimated as slightly more than 17 days, and the chicks remain 35–37 days in the nest. Incubating birds have the common bittern habit of holding their heads and necks rigidly erect in imitation of an upright branch.

48. Ixobrychus sinensis (Gmelin)

CHINESE LEAST BITTERN

Japanese: Yoshi goi (reed bittern)

Ardea sinensis Gmelin, Syst. Nat., **1**, pt. 2, 1789: 642 (China).

Ardetta luteola Stejneger, Proc. U.S.N.M., **10**, 1887: 290 (Hokkaido & Honshu). (Synonym).

I have compared the type of *Ardetta luteola* and nine other Japanese specimens with an extensive series of topotypical material from China, and find no recognizable differences between them.

This is the smallest and commonest of the bitterns in Japan, a fairly common summer resident breeding in fresh marshes on all major islands from Hokkaido to Kyushu. Its season in Hokkaido is May to October; farther southward it is slightly earlier and later. It migrates south to the Philippines and southern Asia, but occasionally winters in Japan. It has been taken in Akita 23 December 1930 and 14 February 1931, and is found quite frequently in midwinter in the coastal marshes of southern Honshu and Kyushu.

As its Japanese name implies, it is a resident of the marsh reed beds at the mouths of rivers and on the shores of muddy lakes. Well camouflaged, it flushes very close and flies slow and straight close to the tops of the reeds. Its black primaries are conspicuous when it drops again after its short flight. Its low, melancholy croaking is heard most often at dusk.

The breeding season lasts from mid May to late August. The nest is a shallow platform of reeds supported on stiff reed stems just above the ground or water. The eggs number 5 to 6, pale greenish-blue when fresh, drying to white, and average 32.7 x 24.4 mm. in size. Kuroda hatched a fresh clutch in an incubator and found the period 16 to 18 days.

49. Ixobrychus eurhythmus (Swinhoe)
SCHRENCK'S LEAST BITTERN

Japanese: O-yoshi goi (greater reed bittern)

Ardetta eurhythma Swinhoe, Ibis, 1873: 74, pl. 2 (Amoy, Shanghai).

Schrenck's Least Bittern is slightly larger than the preceding species, from which it can be told most readily in the field by its dark back. It is much less common, however, and its breeding distribution is more northerly both on the mainland and in Japan, where it is an uncommon summer resident from early May through October. It breeds in Hokkaido, on Sado Island, and in northern and central Honshu. It winters south to the Philippines, Indochina and the Malay Peninsula, but has not yet been taken in Shikoku or Kyushu. Its breeding habits apparently are identical to those of the Chinese Least Bittern. It occupies the same type of fresh marshes, and lays 4 to 5 white eggs, measuring 33 x 26.4 mm.

50. Botaurus stellaris stellaris (Linné)
GREAT BITTERN

Japanese: Sankano goi (house-in-the-mountains bittern)

Ardea stellaris Linné, Syst. Nat., ed 10, **1**, 1758: 144 (Sweden).

The Great Bittern is a rather rare transient and winter visitor. The specimen record (there are surprisingly few sight records in the literature) shows it to occur most frequently, and probably fairly regularly, in the Tomakomai marshes of Hokkaido (specimens 16 Feb. 1937, 25 Jan., 15 Mar., 4 Apr. 1950) and in the marshes of western Kyushu. It has been recorded only casually in Honshu (Yokohama, Sagami, Niigata), Shikoku, and the Izu Islands (Oshima, Hachijo).

CICONIIDAE

51. Ciconia ciconia boyciana Swinhoe

STORK

Japanese: Konotori (autochthonous)

Ciconia boyciana Swinhoe, Proc. Zool. Soc. London, 1873: 513 (Yokohama).

The Japanese Stork was a common and well loved bird in Japan during the Tokugawa period, and was well protected by the Shogunate. It remained fairly common in the early days of the Meiji restoration. Blakiston and Pryer (Ibis, 1878: 224) state it "is to be seen sailing on its immense spread of wings over the Susaki flats" (near Yokohama). In 1879 it still nested on the roofs of temples in Tokyo, and was reported breeding plentifully with the herons on pine trees at Shizuoka Castle.

The next two decades saw it decline abruptly. By the end of the century it was limited to a single breeding site in Hyogo Prefecture, a hill called "Tsuruyama" (crane mountain) near Murohani-mura, Izushi-gun, which had been set apart as holy ground by the local Daimyo about 1830. The storks had abandoned this site when disturbed by hunters early in the Meiji period, but returned there to nest in 1894. Japan then being at war with China, this was regarded as a good omen and the birds were not molested. A decade later in 1904 the prefectural governor declared the locality a preserve to protect the storks from the many visitors who came to see them, and the birds increased slowly until by 1920 they nested at six other places within the preserve. By 1931 there were 11 nests at Tsuruyama, some in neighboring Tosaki-gun, Asaki-gun, and Yofu-gun, and the entire area was declared a Natural Monument in 1935.

The disturbances of World War II and the occupation have well nigh extirpated this fine species. Hirakazu Kobayashi (Yacho, 1948: 8–13) visited Tsuruyama in 1944 and found the resident farmers had broken up the local heronry by shooting, encouraged to do so by the military and by the hunters' association on the grounds that the birds were harmful. Though they had shot none of the storks, they had frightened them from their usual nesting places. Kobayashi found about 50 storks and 6 nests on a nearby hillside. When he visited the place again in 1948 he found that the shooting of herons still continued every spring (this was prohibited by the revised game laws of 1947), and he saw no storks whatever in the 16 square kilometers comprising the sanctuary. In the entire region he found only 16 storks and 3 nests.

The most recent report on the status of the storks in Japan was delivered orally by Professor Tamezo Mori before a meeting of the Ornithological Society of Japan in 1950. Professor Mori, after being repatriated from Korea in 1945, settled in Hyogo and interested himself in the local Natural Monuments. He says the storks are no longer to be found anywhere near Izushi-mura, that the trees there have been cut down and no place is available for their nests. On investigating rumors that a few still were nesting at Araki-mura, Asahi-mura, and Isa-mura, small villages considerably south of Izushi, he found no eggs had been laid by the pair at Araki, but that three young were being raised in nests at the other villages. He is now trying to have these villages authorized as Natural Monuments, and is instructing and encouraging the villagers to protect the birds. Reports have come to hand of eggs being taken there by an amateur American egg collector connected with the occupation, but word was received too late for corrective action to be taken. Unless the Japanese authorities make a concerted effort to save this last remnant, the stork will soon be gone from Japan forever.

Its nesting habits, according to Kan, Kobayashi, and Mori, are as follows: The huge nest, about 1 meter high and 1.5 meters square, is built of sticks, from 10 to 15 meters up on a large tree, pine for preference, and centered with straw. The clutch numbers 2 to 5 white eggs, which measure 77–80 x 54–56 mm. The nesting season starts in early February, the eggs are laid from mid March to May, and the young appear in June. Incubation by the female alone lasts 30 days, and the young remain in the nest 53 to 60 days, disgorging pellets of waste twice daily. They are fed on fish, snails, frogs, and small rodents. Kobayashi (Yacho, 1948: 10) describes the well-known bill clattering, and a hissing sound like "heet" when the birds are playing overhead.

The specimen record:

Hokkaido, Tokechi		May 1923	1932 Hand-List, *ex* Momiyama
Honshu, Akita		undated	1942 Hand-List
" Shimosa		undated	1922 Hand-List
" Yokohama	(2)	undated	Brit. Mus., *ex* Pryer
" Chiba, Teganuma	(2)	9 Feb. 1884	Yamashina coll.
" Hyogo, Kobe	(2)	5 Mar. 1895	AMNH
" " Kinosaki		undated	1922 Hand-List
Shikoku, Tokushima		undated	1922 Hand-List
"Japan"		15 Jan.	Brit. Mus. *ex* Tweeddale
"		4 Apr.	" " *ex* Zool. Soc.

52. Ciconia nigra (Linné)

BLACK STORK

Japanese: Nabeko (pot stork)

Ardea nigra Linné, Syst. Nat., ed. 10, **1**, 1758: 142 (northern Europe).

The Black Stork is a rare and irregular winter visitor to southern Kyushu, where it is seen occasionally with the cranes at the Natural Monument Sanctuary in Kagoshima. It has never been a common bird in Japan, even in the pre-restoration days. There are only two old records for Honshu, a specimen taken at Sunamachi, Tokyo, 19 January 1892 and reported anonymously (Dob. Zas., 1892: 112), and a record of uncertain origin for Nishitama in Tokyo quoted by the 1922 Hand-List. The individuals that appear infrequently in Kyushu probably come from the one known nesting site in central Korea (Austin, 1948a: 46). Their chances of surviving the present fighting are slim.

THRESKIORNITHIDAE

53. Threskiornis melanocephala (Latham)

WHITE IBIS

Japanese: Kuro toki (black ibis)

Tantalus melanocephalus Latham, Index Orn., **2**. 1790: 709 (India).

The many medieval drawings of this species suggest that it visited Japan from its southern breeding grounds fairly commonly in pre-restoration times, and Kuroda (1934: 75) believes it may formerly have bred at Shinhama in Chiba Prefecture. If there ever was a local breeding colony, however, it was wiped out early in the Meiji period before any record was made of it. The only known records are:

Hokkaido, Hakodate	undated	Sapporo Mus., Blakiston coll.
Honshu, Saitama, Sagiyama	undated	1922 Hand-List
" " Iruma	undated	1922 Hand-List
" Chiba, Shinhama	undated	1922 Hand-List
" Tokyo, Kameido	22 Jan. 1833	Yamashina coll.
" "	undated	Brit. Mus., *ex* Blakiston
" Yokohama (2)	undated	Brit. Mus., *ex* Pryer

54. Nipponia nippon (Temminck)

JAPANESE CRESTED IBIS

Japanese: Toki (autochthonous. The bird's name has been adopted for a pale red color, called "toki-iro.")

Ibis nippon Temminck, Pl. Col., livr. 93, 1835, pl. 551 (Japan).

According to medieval accounts and drawings, the Crested Ibis was not uncommon in Japan in Tokugawa times, and probably bred in southern Hokkaido as well as in Honshu and Kyushu. In northern Honshu it was known locally as the "dau", probably from its voice. The priests at the Saruga Shrine in Aomori claim it nested there 75 years ago with the cormorants and herons. Just how common it was or how widespread we will never know, for it was killed out very quickly, early in the Meiji restoration. The specimen record:

Hokkaido, Hakodate	5 Oct. 1883	USNM, *ex* Henson
" "	20 Mar. 1884	" "
" "	29 Apr. 1874	Sapporo Mus., Blakiston coll.
Honshu, no loc.	28 Jan. 1893	AMNH, *ex* Owston
" Iwate, Miyako	undated	Sendai Mus.
" Niigata, Echigo (2)	Feb. 1893	Yamashina coll.
" Sado Island	undated	Norinsho coll.
" Ishikawa	undated	" "
" Nagano	6 Nov. 1917	Yacho, 1936: 923
" Gifu, Mino	15 Jan. 1918	Local coll., Tori, 1918: 54
" Saitama, Nishitama	undated	1922 Hand-List
" Chiba, Teganuma	undated	photo in Uchida's "Lecture on Birds".
" " Shimosa	29 Jan. 1883	USNM, *ex* Tokyo Ed. Mus.
" " "	21 Feb. 1895	AMNH, *ex* Owston
" Kanagawa, Yokohama	undated	Pryer coll.
Shikoku, Tokushima	undated	1922 Hand-List
Japan (5)	undated	Leyden Mus.
" (2)	undated	Brit. Mus., *ex* Leyden Mus.

The species was believed completely extirpated from Japan except for an occasional straggler until in 1932 Uchida (Tori, 1933: 93) found it still breeding in two isolated places, one at Yuchi-gata on the Ishikawa peninsula where "5 or 10" birds were found, the other on Sado Island where some "20 or 30" still remained. In 1940 Prof. Saito of Hiroshima Bunrika University (Yacho, 1940: 414) investigated its rumored survival on Oki Island. The inhabitants of the island told him it had been fairly plentiful there up to about 1920 but had since disappeared. They gave him feathers of one killed there in 1935.

The Crested Ibis has not been reported from any of the main islands in the last two decades. Its status on Sado Island has not been investigated since prior to World War II. The island is difficult of access, and no ornithologist has visited it recently, but word has been received from the inhabitants that a few ibises still nest there. The species receives the uncertain protection of being a "non-game" bird under the game laws. Probably through an oversight its last known nesting grounds at Sado Island have not been made a Natural Monument, which they most certainly should be.

The bird seems to prefer localities where there are fresh ponds, swamps, or paddy fields surrounded by low, well forested hills where it can nest in pine or chestnut trees. It builds a flimsy twig nest, but its nesting habits have not been studied. The eggs have not been collected, and are known only from a broken one Uchida obtained at Ishikawa in 1932. This measures 80 x 45 mm., and is pale greenish blue with small brown spots distributed evenly all over it.

55. Platalea leucorodia major Temminck & Schlegel

SPOONBILL

Japanese: Hera sagi (spatula heron)

Platalea major Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1849: 119, pl. 25 (Japan).

The Spoonbill probably was formerly a fairly regular winter visitor to the Japanese islands from its mainland breeding grounds. Since early Meiji time, however, it has been of rare and irregular occurrence. It is not known ever to have bred in Japan. Seebohm (1890: 229) called it a "somewhat rare bird in Japan, especially in Yezzo [Hokkaido]." Iijima (Dob. Zas., 1891: 309) stated it had "become rare in the Tokyo Area", implying it was formerly more abundant, but was disappearing with all the other fine big birds that were killed off at that time. The specimen record:

Hokkaido, Hakodate	13 Oct. 1866	Brit. Mus., *ex* Blakiston
Honshu, Niigata, Echigo	undated	AMNH, *ex* Owston
" Chiba, Shimosa	19 Feb. 1883	USNM, *ex* Tokyo Ed. Mus.
" " Lake Tega	11 Dec. 1883	Yamashina coll.
" " "	8 Jan. 1884	" "
" Tokyo, Mukojima	undated	" "

Honshu, Tokyo	8 Jan. 1883	USNM, *ex* P. L. Jouy
" " Yokohama	undated	Brit. Mus., *ex* Blakiston
" Osaka, Yamashiro (2)	18 Oct. 1918	Koyama coll. (D.Z., 1919: 200)
Shikoku, Tokushima	undated	1922 Hand-List
Kyushu, Saga, Ariake Bay, Chikugo R.	Mar. 1921	Fukuoka Mar. Lab. coll.
Kyushu, Kumamoto, Higo	Nov. 1932	Kawaguchi coll.
" " Yatsushiro	Nov. 1914	Yatsushiro Middle School coll.
Japan	undated	Leyden Mus. (type of *P. major* T. & S.)
" (3)	undated	Leyden Mus.

56. Platalea minor Temminck & Schlegel

BLACK-FACED SPOONBILL

Japanese: Kuro-tsura hera sagi (black-faced spatula heron)

Platalea minor Temminck & Schlegel, *in* Siebold Fauna Jap., Aves, 1849: 120, pl. 76 (Japan).

The Black-faced Spoonbill has probably never been more than a rare winter visitor to Japan from its mainland breeding areas. There is no evidence that it was ever much more plentiful than at present. In addition to the specimen record below, Kawaguchi (Dob. Zas., 1928: 482) reports a bird seen 4 December 1927 in Sanmon-gun, Fukuoka Prefecture, Kyushu. This bird was photographed by Shimomura 9 December 1927 (Tori, 1928: 518). There is also a specimen supposedly obtained at Yuchi-gata, Ishikawa Prefecture preserved at the Usaka Middle School, but its identity has not been verified by any ornithologist. The specimen record:

Honshu, Chiba, Shimosa	undated	1922 Hand-List
Kyushu, Saga, Nagasaki	Dec. 188?	Christiana Mus. (Proc. U.S.N.M. 1887: 283)
" " "	7 Nov. 1918	Tonomura coll.
" Goto Islands	1885	Tristram coll., (Ibis, 1889:57)
" Kumamoto, Udo-gun	Mar. 1923	Kumamoto Pref. Govt. coll.
Japan	undated	Leyden Mus. (type of *P. minor* T. & S.)

ANATIDAE

57. Cygnus cygnus cygnus (Linné)

WHOOPER SWAN

Japanese: O-hakucho (big white bird)

Anas cygnus Linné, Syst. Nat., ed. 10, **1**, 1758: 122 (Sweden).

The Whooper Swan has been recorded from all four main islands, but is now little more than a straggler south of northern Honshu. Formerly swans were abundant as far south as Tokyo and visited the lakes in Chiba Prefecture regularly. They were killed so extensively after the restoration that they soon became scarce. Their down feathers were prized for quilt-stuffing, and their quills were always in demand for ornaments and pens. They were close to extirpation when finally protected by the game laws in 1925. Then they began slowly to increase and appeared again in portions of their wintering grounds from which they had long been absent. They had made a good recovery by the end of World War II when illegal hunting, mostly by Americans during the occupation, again cut their numbers seriously.

The first migrant Whooper Swans reach Hokkaido from Sakhalin in November. One concentration winters on the eastern tip of the island near Nemuro, the vanguard arriving in late October. Flocks of 5000 to 6000 gather there in mid November and remain on the brackish inland waters until the lakes begin to freeze in December. Then most of them move to open salt water down the Pacific coast as far as Kushiro, visiting the open shores, marshes, and rivers in small parties. A few proceed on to the Ishikari Plain south of Sapporo in January, and are most plentiful there in February. In March they gather on the lakes and marshes of the Okhotsk Sea side of northern Hokkaido before moving northward again in early April.

A smaller concentration winters in northern Honshu. These swans evidently come straight to Akita and Aomori prefectures from the north without touching Hokkaido. The first few reach Mutsu Bay in early November, rarely in late October, and the main flight follows a week or so later. The swans reach their largest numbers here (200 to 400 in 1935) in late November and December. A few of them winter down the Japan Sea coast fairly regularly as far as Niigata. The spring departure from Honshu starts the second week of March, and by the end of the month all the swans have gone north. Each winter a few swans reach northern Kyushu and extreme western Honshu from Korea. Elsewhere in Japan they are still very rare and appear only in especially severe winters.

At Kominato on Mutsu Bay, Aomori Prefecture, the swans are traditionally the messengers of the God of Raiden (thunder and lightning). As the devotees of the Raiden Shrine believe that harming a swan will bring divine punishment on the offender's family, sick birds are nursed and released after their recovery, and dead swans are buried in the Shrine grounds. Swan hunting was first prohibited within the Shrine in 1896. The villagers organized a swan protection union, the Matsushima Hosho Kai, in May 1906, and in 1920 the entire village and harbor was established as a sanctuary by the Ministry of Agriculture and Commerce. In 1931 the swan wintering ground in Aomori was declared a Natural Monument and the birds have been protected there officially ever since.

Though swans were declared a "non-game" bird throughout Japan in 1925, the killing was never stopped entirely. With the relaxation of government controls over hunting during the occupation the killing of swans increased. In the autumn of 1946 the local Akita prefectural government opened the season on swans and recommended killing them to help alleviate the food shortage. This of course was quite beyond their powers, but they were encouraged in the action by local tactical units of the occupation forces, whose officers wanted to hunt the swans. The practice was stopped as soon as word of it reached headquarters in Tokyo, fortunately before the Kominato concentration was broken up. The swans still winter in the bay off the Raiden Shrine, and the Shrine ceremonies in their honor are still celebrated every winter.

58. CYGNUS BEWICKII JANKOWSKII Alpheraky
BEWICK SWAN
Japanese: Hakucho (white bird)

Cygnus bewickii jankowskii Alpheraky, Priroda i Okhota, Sep. 1904: 10 (Ussuria).

More information on the relative abundance of the two swans in Japan is needed. Many sight records for the essentially continental Bewick Swan have been reported among the concentrations of the commoner Whooper Swans in Hokkaido and along the northwest coast of Honshu. As it is extremely difficult to differentiate between the two in the field, records not authenticated by a specimen are not reliable. Nevertheless this species does occur in Japan fairly regularly and not infrequently. The specimen record:

Hokkaido, Numanohata		7 Nov. 1912	Sapporo Mus.
Honshu, Miyagi		Jan. 1912	" "
"	"	20 Jan. 1929	Sendai Mus.
"	Niigata, Echigo	undated	Taka-Tsukasa coll.
"	Ibaraki, Ushibori	undated	" "
"	Chiba, Lake Tega	9 Feb. 1884	Yamashina coll.
"	" "	1936	Kuroda coll.
"	Tokyo, Musashi	7 Dec. 1920	Momiyama coll.
"	" Tokyo Bay	undated	Ogawa (1908: 352)
"	" Yokohama	undated	Brit. Mus., *ex* Pryer
"	Aichi	undated	AMNH

59. Cygnus olor (Gmelin)
MUTE SWAN
Japanese: Kobu hakucho (wen swan)

Anas Olor Gmelin, Syst. Nat., **1**, pt. 2, 1789: 502 (Russia).

A swan collected on Hachijo in the Izu Islands in November, 1933, and originally identified as *Cygnus cygnus*, proved on recent re-examination by Yamashina to be the first and only record of *Cygnus olor* for Japan (Misc. Rpts. Yam. Inst., 1952: 32).

60. Anser hyperboreus hyperboreus Pallas
SNOW GOOSE
Japanese: Haku gan (white goose)

Anser hyperboreus Pallas, Spic. Zool., fasc. 6, 1769: 31 (northeastern Siberia).

According to old records the Snow Goose was once abundant in Japan. An article written about 1860 states it frequented Tokyo "like snow." In 1878 (p. 212) Blakiston and Pryer wrote, "It arrives in large flocks in winter about Susaki, Tokyo Bay." It seems to have been plentiful until about 1890. Then it suddenly vanished. This may have been the result of molestation on the breeding grounds. (The species' breeding in Siberia is not well authenticated, but it still nests in northwestern North America.) A nomad Eskimo or Indian tribe stumbling on a limited nesting area could easily wipe out such a population. The more likely cause of its sudden decline in Japan was persecution on the wintering grounds. When the firearms introduced in Meiji time drove the Snow Geese from their habitual wintering areas, the survivors perished.

Nowadays the Snow Goose is a very rare winter visitor in Japan, usually seen in company with the Bean Goose, never with the White-fronted. It is known to have occurred only three times since the last specimen was taken in 1899. A live bird caught near Tokyo in 1907 was kept in Dr. Kuroda's aviary for many years. A single bird was photographed at Koshigaya, Saitama, by Udagawa the winter of 1936–37, and another single bird, possibly the same one, was seen there and at Lake Wada, Lake Tega, and Shinhama in Chiba the following winter. The specimen record:

"Japan"		undated	Fauna Japonica, 1833, 125
"		"	Temminck, Man. d'Orn., 1840, lv, 516
"		"	Leyden Mus.
"		"	AMNH
Honshu,	Tokyo Bay (3)	"	Brit. Mus.
"	Tokyo, Matsudo	"	Yamashina coll.
"	Chiba, Lake Tega	16 Jan. 1884	" "
"	Tokyo, Sunamachi	10 Apr. 1886	" "
"	Chiba, Lake Tega	10 Apr. 1896	AMNH
"	Yokohama	1899	Sapporo Mus., Blakiston coll.

61. Anser anser (Linné)

GRAYLAG GOOSE

Japanese: Hai-iro gan (ash-colored, or gray goose)

Anas anser Linné, Syst. Nat. ed. 10, **1**, 1758: 123 (Sweden).

Graylag Geese occurring in Japan may be referable to the eastern *A.a. rubrirostris* Swinhoe, the validity of which is not entirely certain. However, none of the Japanese Graylags was ever to our knowledge compared with western Eurasian material to determine whether or not they showed the paler upper parts and wider white feather edgings characterizing the eastern race.

The Graylag Goose has been taken twice in Japan. A lone bird netted in January 1921 at Lake Tega, Chiba Prefecture, was kept alive in Dr. Kuroda's Tokyo aviary for many years. In the autumn of 1929 a small flock came to the Kwanto Plain. Six of these were shot in Saitama Prefecture between 27 October 1929 and 27 January 1930.

62. Anser albifrons frontalis Baird

WHITE-FRONTED GOOSE

Japanese: Ma-gan (true goose)

Anser frontalis Baird, Rep. Expl. Surv. R.R. Pac., **9**, 1858: 762 (New Mexico).

The eastern Asiatic White-fronted Geese I have examined are identical with northwestern North American specimens in size and color. Their upper parts are brownish rather than greyish as in European specimens (cf. Todd, Condor, 1950: 63–68; and Kuroda, Nat. Sci. & Mus., 1952: 43–48).

The White-fronted Goose, formerly phenomenally abundant in Japan is, like all the geese, continuing to decline rapidly in numbers as its wintering grounds dwindle and hunting pressure increases. Its status today is that of an uncommon winter visitor, rather less plentiful than the Bean Goose.

Most of the Japanese records of the White-fronted Goose are hopelessly confused with those of the Bean Goose (which see for further details). The two species seemingly follow the same flight routes to and from Japan, and often mingle on the wintering grounds, though keeping in separate flocks. Generally the White-front arrives earlier in autumn and departs earlier in spring, and tends to frequent upland fields less and wet coastal marshes more than the Bean Goose.

63. Anser erythropus (Linné)

LESSER WHITE-FRONTED GOOSE

Japanese: Karigane (literally goose-voice, meaning strong-voiced goose)

Anas erythropus Linné, Syst. Nat., ed. 10, **1**, 1758: 123 (Sweden).

According to Kuroda (1939: 19) the Lesser White-fronted Goose was formerly as common as the White-front at the Imperial preserves on the Edo River, but its numbers dwindled soon after the Meiji restoration. It is now rare throughout its range. Usually found in company with the White-fronted Goose, which it closely resembles, it is probably seldom recognized by most hunters. The old Japanese goose hunters, Dr. Kuroda tells me, knew it well from its voice, which is higher, shriller, and more penetrating than that of the other geese. The following are the only known definite records for Japan:

Hokkaido,	Nemuro	12 Oct. 1874	Blakiston coll.
"	"	25 Oct. 1934	Yamashina coll.
"	Kitami	1 Nov. 1933	Kuroda coll.
"	Zenibako	14 Dec. 1901	Sapporo Mus.
"	Chitose	9 Oct. 1943	Kuroda coll.
Honshu,	Aomori	15 Oct. 1916	Kuroda coll.
"	Niigata	20 Oct. 1932	Yamashina coll.
"	Ibaraki	1913	Kuroda coll.

Honshu	Iwate	8 Nov. 1927	Kumagai coll.
"	Saitama	Feb. 1939	Imp. Duck Pond coll.
"	Chiba, Lake Tega	23 Dec. 1903	Taka-Tsukasa coll.
"	Chiba	1913	Taka-Tsukasa coll.
"	Chiba	28 Dec. 1933	Kuroda coll.
"	Tokyo	Jan.	Brit. Mus., *ex* Blakiston
"	Yokohama	Jan. 1876	Brit. Mus., *ex* Seebohm
Izu Ids., Hachijo		10 Nov. 1933	Momiyama coll.
Japan (4)		undated	Leyden Mus.

64. Anser fabalis (Latham)

BEAN GOOSE

Japanese: Hishikui (eater of water-chestnuts)

Anas Fabalis Latham, Gen. Syn. Suppl., **1**, 1787: 297 (Great Britain). (Extralimital).

Anser middendorfi Severtzov, Vert. gor. ras. tark. zhiv., 1872 (1873): 149 (eastern Siberia).

Anser segetum var. *serrirostris* Swinhoe, Proc. Zool. Soc. London, 1871: 417 (Ningpo, China).

In his recent revision of this species Delacour (Ardea, 1951: 135–142) straightens out some of the systematic and distributional tangles in the western and central Palearctic, but is forced to treat the eastern populations very sketchily because of lack of material. The racial distribution of the eastern Siberian forms will not be delineated accurately until more breeding ground specimens are available. The Bean Geese wintering in Japan, Korea, and eastern China fall into two extremes, a larger, long-billed form, *A.f. middendorfi*, and a smaller, thicker-billed one, *A.f.serrirostris*. Many intermediates occur, impossible to assign definitely to either race, and possibly additional populations may be recognizable if adequate breeding ground material becomes available before the species disappears. Practically all the available Japanese specimens are assignable to *serrirostris*, but the larger bird occurs quite regularly. I measured three in hunters' bags during the winters of 1946–47–48 that were unquestionably *middendorfi*, and the following specimens are also so identified:

Hokkaido, Yubari		13 Apr. 1931	Yamashina coll.
Honshu, Aomori		undated	Blakiston coll.
"	Niigata	19 Feb. 1918	Momiyama coll.
"	Saitama	undated	Yamashina coll.
"	Ibaraki	18 Dec. 1909	Kuroda coll.
"	"	10 Feb. 1921	Momiyama coll.
"	Chiba, Lake Tega (2)	27 Nov. 1883	Yamashina coll.
"	Gifu	undated	Kuroda coll.

Most of the accounts of geese in the older Japanese literature refer to the birds simply as geese. Very few observers differentiated between the Bean Goose and the White-front. Although the two species mingle on the wintering grounds and occasionally are found together on migration, they tend to remain in separate groups, and mixed flocks are rare. The Bean Goose is the commoner of the two, arrives in numbers later in autumn, and departs later in spring. Both species formerly wintered extensively on all the plainslands of Japan. They are now restricted largely to the Tohoku, Kwanto, Gifu, and Kansai plains where the largest kills are reported. On migration many are still killed in Hokkaido and along the north coast of central Honshu between Fukui and Niigata.

The wintering goose population of Japan has been dwindling steadily since the Meiji restoration. The stories in the old records of their former abundance are almost unbelievable. Englebert Kaempfer wrote in 1692 that geese "are very common in this country, particularly the grey ones, and so familiar, that they might be taken for tame, for they will not fly up, nor get out of the way at any body's approach. They do a great deal of mischief in the Fields, and yet no body may disturb, or kill them, under pain of death, except those who have bought the privilege to shoot them on some tract of ground. The Country-people, to keep them off, surround their Fields with nets, tho' to very little purpose, for they will fly over the nets, as I have seen my self, to get at their Food."

Abandonment of feudal customs and controls at the end of the Tokugawa Shogunate signalled the decline of the geese, as well as of all other large game. The first marked shrinkage was noted between 1880 and 1890. The geese then practically disappeared from Kyushu, where they had formerly been plentiful but never have been since. Their numbers elsewhere in Japan have decreased steadily, though less marked by sudden disappearances.

The ponds at Ueno and Shinjuku in Tokyo were famous goose grounds until the city built up around them and destroyed them. Geese wintered regularly in Tokyo at Ueno and on the moats and lawns in front of the Imperial Palace grounds until 1923. Flocks of 50 or more wild geese were one of the regular winter sights on the main Imperial Plaza until the area was turned into a temporary tent city for refugees after the 1923 earthquake. The building of a road across Ueno Pond in 1924 drove the geese from that spot. These flocks have never returned to central Tokyo.

The principal remaining resorts of geese up to 1946 were Lake Shimoike in Gifu Prefecture where 10,000 were reported to winter, Lake Biwa with 2,000 to 3,000, and the Lake Wada — Lake Tega area in Chiba where about 5,000 gathered. Smaller flocks of 200 to 500 frequented the paddies near Shinhama game preserve on the outskirts of Tokyo, the Koshigaya Plain in Saitama, the Tohoku Plain near Sendai, and other scattered spots in Ibaraki, Niigata, Toyama, Ishikawa, Fukui, Aichi, Shiga, Hyogo, Saga, Nagasaki, and Oita prefectures. The Tokyo-Chiba-Saitama concentrations were effectively broken up in 1946–47 by illegal shooting on the preserves, mostly by American officers of the occupation, and almost no geese returned there in 1948 and 1949, although most of the illegal shooting had been curbed by then. Similar reports have been received from other former wintering areas. Unless a concerted effort is made by the Japanese to preserve them, the days of the geese in Japan are probably about at an end.

Geese reach Japan in autumn by three distinct routes. The first flight comes through Sakhalin to Hokkaido in September and early October, and moves southward to Aomori and Miyagi prefectures in November. The second flight crosses the Japan Sea from Ussuria and Amuria and arrives in late October on the north coast of Honshu between Fukui and Niigata prefectures, where the birds rest for a few weeks before moving on in late November. Part of this flight winters in the Lake Biwa area and the Kansai Plain in southern Hyogo Prefecture; the remainder winters in the Kwanto Plain, mainly in Chiba where it is joined in late winter by birds from the eastern flight moving southward. The third and smallest autumn flight reaches western Honshu by crossing Tsushima Straits from Korea in late October and November.

The northward spring flight is poorly delineated, but the absence of a reverse flight across the Japan Sea is noticeable. In Hokkaido the autumn flight is fairly heavy, but no marked spring movement occurs. In Korea the autumn flight is small, the spring flight very large. In general the spring departure from central and northern Honshu is earlier than from western Honshu. The last geese leave Miyagi and Aomori usually between 15–25 March. The latest dates for the Kwanto Plain and Lake Biwa are early April. Stragglers have been reported in northern Kyushu and western Honshu in late April and early May. This suggests a westward movement and spring return to the breeding grounds via Korea, for which there is no further evidence. No westerly movement across Honshu, or spring increase or concentration in western Honshu or northern Kyushu has ever been observed. Banding might determine the facts, but no goose has ever been banded in Japan. Every goose netted alive (and the number is not inconsiderable) is killed for food, and buying them from the netters for banding would be costly indeed.

65. Anser cygnoid (Linné)
SWAN GOOSE
Japanese: Sakatsura gan (tipsy-faced goose)

Anas Cygnoid Linné, Syst. Nat., ed. 10, **1**, 1758: 122 (Asia).

The Swan Goose has never been common in Japan, but is nevertheless a fairly regular though rare winter visitor, chiefly in Chiba Prefecture. It has been observed in Chiba 25 September 1928, 20 September 1930, and 25 September 1935, but usually arrives in October. Its departure in April is much later than that of the other geese. Seven birds were seen by Dr. Kuroda on the Ara River near Tokyo 6 May 1931. The most recent record is nine observed by Nagahisa Kuroda in Chiba 1 February 1948. The following specimens have been taken:

Honshu,	Chiba		11 Dec. 1883	Yamashina coll.
"	"		13 Mar. 1932	" "
"	"	(2)	Nov. 1935	Kuroda coll.
"	Yokohama		undated	AMNH, *ex* Owston
"	"		undated	Brit. Mus., *ex* Owston
"	Gifu		May 1937	Kuroda coll.
Japan			undated	Leyden Mus.

66. Branta bernicla orientalis Tougarinov
BRANT
Japanese: Koku gan (black goose)

Branta bernicla orientalis Tougarinov, Faune de l'URSS, Aves, **1** (4) 1941: 180 (north coast of Siberia).

The Brant was formerly a common winter visitor to Japan, coming south as far as Tokyo Bay. Blakiston and Pryer (1878: 212) called it "the winter sea-goose of Hakodate", and saw it offered for sale in the Yokohama game market. Like so many other fine large species abundant in feudal times, it vanished very suddenly soon after the restoration, and has been exceedingly scarce since the turn of the century. The specimen record:

Hokkaido, Akkeshi	Jan. 1929	Kuroda coll.
" "	5 Jan. 1941	Yamashina coll.
" Hakodate (3)	1879	Sapporo Mus., Blakiston col.
Honshu, Aomori	17 Feb. 1913	Kuroda coll.
" Miyagi	12 Feb. 1922	Momiyama coll.
" Akita	18 Mar. 1933	Sendai Mus.
" Chiba	14 Feb. 1884	Yamashina coll.
" "	Oct. 1939	Norinsho coll.
" Tokyo Bay (2)	undated	Brit. Mus., *ex* Pryer
" Chiba	15 Jan. 1893	AMNH
" Tokyo	2 Jan. 1933	Kuroda coll.
Izu Ids, Hachijo	17 Dec. 1895	AMNH
Shikoku, Kochi	24 Dec. 1917	Kochi Forestry Sta. coll.
Kyushu, Nagasaki	undated	Nagasaki Mus.
Tsushima	Jan. 1895	AMNH

The Brant that reach western Japan occasionally probably come across the straits from Korea. The species still winters not uncommonly on the coasts of Kyongsang and Cholla Namdo. A letter from J. S. Wilson, formerly a missionary at Junten, accompanying a specimen in the USNM taken in Cholla Namdo in January 1941 states "this goose was one of large flocks which often were seen a few hundred yards from shore, feeding in the salt water and honking much like geese."

67. Branta canadensis (Linné)

CANADA GOOSE, WHITE-CHEEKED GOOSE

Japanese: Shijukara gan (titmouse goose)

Anas canadensis Linné, Syst. Nat., ed. 10, **1**, 1758: 123 (Canada, Quebec). (Extra-limital).

Anser leucopareius Brandt, Bull. Sci. Acad. St. Pet., **1**, 1836: 37 (Unalaska, Aleutians).

Branta minima Ridgway, Proc. U.S. Nat. Mus., 8, 1885: 22 (St. Michael, Alaska). (Extra-limital?).

Branta canadensis asiatica Aldrich, Wils. Bull., **58**, 1946: 95 (Bering Island). (Synonym?).

The recent studies of Aldrich (Wils. Bull., 1946: 95) and of Delacour (Am. Mus. Nov., 1537, 1951: 1–10) suggest the former existence of two possibly recognizable populations of White-cheeked Geese, either or both of which could have, and probably did migrate to Japan: a larger *B.c.leucopareia* that nested in the Aleutians, and a smaller *B.c.asiatica* that bred in the Komandorskis and possibly in the northern Kurile Islands. However, none of the six existing specimens from Japan (three in Sapporo, one in Tokyo, two in England) has ever been compared with relevant material. On the basis of Hellmayr and Conover's (1948: 297–306) diagnosis of *leucopareia* as individually variable in size (contrary to both Aldrich and Delacour), Kuroda (Tori, 1952: 4–9) synonymizes *asiatica* with *leucopareia*, to which race he refers all but one of the Japanese specimens he has examined because of their white neck rings. The single exception is the Pryer skin from Tokyo Bay in the British Museum, which he originally (Tori, 1928: 2–3) identified as *B.c.minima*, and which R. A. Coombes of Tring recently confirmed on re-examination of the specimen at Kuroda's request. As the white neck-ring character also seems to vary somewhat individually, this diagnosis is difficult to accept until the Pryer skin, as well as the other scant Japanese material, is compared with Komandorski Island and Aleutian breeding birds. Unfortunately very few, if any, of these are available except in American collections.

The White-cheeked Goose was formerly a fairly common winter visitor to Japan. It disappeared in the latter half of the 19th century with the other large game birds, and is now extirpated. According to Kuroda (1939: 22) it visited Japan regularly and not uncommonly until 1922. In that year 101 birds were seen at Shinhama, 60 or 70 elsewhere in Chiba (possibly the same birds), and 10 at Saitama. The last definite occurrence of the species in Japan was in 1929, when one was taken at Saitama, and another seen in Aomori (Kumagai, Saito Mus. Bull., 1939: 21). One was reported with a flock of White-fronts in Chiba 19 October 1941 (Hirata, Yacho, 1942: 153) but the record is open to question. The specimen record:

Hokkaido,	Hakodate (3)	1875–1877	Sapporo Mus.
"	"	Nov.	Brit. Mus. *ex* Seebohm
Honshu,	Tokyo Bay	undated	Brit. Mus. *ex* Pryer
"	Tokyo market	13 Feb. 1885	Yamashina coll.
"	Chiba	Jan. 1913	Kuroda coll.
"	"	Jan. 1914	" "
"	"	Feb. 1915	" "
"	Saitama	Mar. 1915	" "
"	"	7 Feb. 1929	" "

68. Casarca ferruginea (Pallas)

RUDDY SHELDRAKE

Japanese: Aka tsukushigamo (red sheldrake)

Anas ferruginea Pallas, in Vroeg's Cat., 1764, Adumb.: 5 (Tartary).

Although the Ruddy Sheldrake is a common winter visitor on the southern coasts of Korea, it crosses Tsushima Strait so rarely and irregularly that it can be regarded as little more than of casual winter occurrence in Japan. It is so distinctively colored and so markedly different from all other waterfowl that is it almost certain to be noticed wherever it appears. Nevertheless the only definite records for Japan are:

Honshu,	Miyagi, Sendai	undated	Norinsho coll.
"	Yamagata	Nov. 1917	" "
"	Chiba	1 Jan. 1912	" "
"	"	16 Jan. 1918	" "
"	Tokyo, Haneda	17 Jan. 1918	Kuroda coll.
Kyushu,	Goto Islands	undated	" "
"	Nagasaki	28 Jan. 1847	Leyden Mus.
"	"	undated	Kuroda coll.
"	Kumamoto	undated	Namiye (1909: 42)
"	"	Dec. 1914	Yamashina coll.

69. Tadorna tadorna (Linné)

SHELDRAKE

Japanese: Tsukushigamo (autochthonous, means duck of ancient Kyushu)

Anas tadorna Linné, Syst. Nat., ed. 10, **1**, 1758: 122 (Sweden).

Though this essentially continental Eurasian species has occurred on all four main islands, the scarcity of records suggests it to be of casual rather than of regular occurrence in Japan. In addition to the 14 known specimen records below, Kuroda observed a single bird at Haneda 10–16 June 1916, and three more were photographed in Ariake Bay, Kyushu by Shimomura in 1930. The specimen record:

Hokkaido,	Akkeshi	20 Dec. 1919	Momiyama coll.
Honshu,	Tokyo Bay	undated	Brit. Mus., *ex* Pryer coll.
"	Yokohama	undated	Okada, 1891
"	Tokyo, Musashi	May 1910	Momiyama coll.
"	Suruga Bay	undated	Ogawa (1908: 350)
"	Gifu	undated	AMNH, *ex* Owston
Shikoku,	Tosa, Sukumo	Jan. 1917	Fujita, (Tori, 1922: 83)
Kyushu,	Nagasaki	undated	Blakiston coll.
"	" (2)	Jan., Nov.	Brit. Mus., *ex* Ringer
"	"	undated	Norwich (Eng.) Mus

Kyushu	Hizen	undated	Kuroda coll.
"	Kumamoto	Apr. 1924	Norinsho coll.
"	Ariake Bay	undated	Ariake Mus., Kuroda (Amoeba, 1932: 36)
Japan (?)		undated	Leyden Mus.

70. Tadorna cristata (Kuroda)
KURODA'S SHELDRAKE
Japanese: Kammuri tsukushigamo (crested sheldrake)

Pseudotadorna cristata Kuroda, Tori, **1**, 1917: 1, fig. 1 (Naktong R., near Fusan, Korea).

Kuroda's Sheldrake was a relict species of extremely limited range, confined for the last several centuries to a narrow distribution in eastern Asia, probably from Amuria to eastern China. Although rumors of hunters killing strange ducks which might have been this species have been reported occasionally from China, Manchuria, and Korea, the most recent in 1937, no verified specimen has been taken for the past 35 years. The species is probably extinct. It is known from three specimens, two descriptions in medieval Japanese natural histories, and seven contemporary Japanese drawings as follows:

Specimens:

1. A female taken near Vladivostok in April 1877 by Lt. Fr. Irminger, and at last reports in the Zoological Museum of Copenhagen, Denmark. A picture of the mounted specimen appears in Tori, 1925: 358. This specimen was described by Sclater in 1890 as a possible hybrid between the Ruddy Sheldrake and the Falcated Teal.

2. A female taken on the Naktong River near Fusan, Korea, December (3?) 1916, was the type of Kuroda's original description (Tori, 1917: 1–3), which fortunately escaped the destruction of most of the Kuroda collection in 1945. A photograph of the mounted bird was published with the original description.

3. A male taken at the mouth of the Kum River near Kunsan, Korea, by one S. Nakamura in late November or early December 1913 or 1914. This specimen is also still extant in the Kuroda collection in Tokyo. A photograph of the mounted bird and an excellent painting of it by Kobayashi were published, together with a description of the bird in English in Tori, 1924: 171–184.

Medieval descriptions:

1. The "*Kanmon Kimpu*" (descriptions of birds) written and

published anonymously about 1750 describes both sexes clearly in Japanese, calls it the "Chosen Oshi" (Korean Mandarin Duck), and states it was imported frequently to Japan from Korea between 1716 and 1736.

2. The "*Honzo Komoku Keimo*" (encyclopedia of plants and animals) published in 1803 by Ono Ranzan, one of the best and most famous of the medieval Japanese naturalists, describes the bird accurately, mentions its pink legs, and terms it a fine game bird, larger than other ducks.

Contemporary drawings:

1. An adult male, standing, was painted in the "Torizukushi" (collection of bird cards) by an unknown artist about 1700. The picture is inscribed "Chosen Oshi" (Korean Mandarin). The original was owned by the family of Viscount Taiko Matsudaira. Its present whereabouts is unknown. A photograph of it was reproduced by Uchida in Tori, 1918: 6.

2. A pair of birds, the female standing behind the male, appeared in the *Chorui Shaseizu* (bird sketches) drawn by an unknown artist about 1820. Formerly in the possession of Prince Juko Shimazu, it was inherited by Dr. Kuroda and destroyed with his library during World War II. Kuroda published a reproduction of the drawing in Tori, 1920: 241.

3. A pair drawn separately, the male very similar to that in drawing 2, by an unknown artist early in the 19th century. The picture was originally in the possession of the Shimazu family and later owned by Count Naosuke Matsudaira, who presented it to Dr. Kuroda. The original was destroyed in World War II, but it was reproduced in Tori, 1924: 174. The inscription on the drawing near the male says "a male mandarin, but not a real mandarin, probably a species introduced from China."

4. A male and female drawn separately by the artist Chikusai sometime late in the Tokugawa era, probably about 1850, appeared in part 2 of his "*Chorui Shaseizu*" (bird sketches). The only known copy of this unique work was destroyed by the 1923 earthquake in the library of the Ministry of Agriculture and Commerce, but a reproduction of the drawings was published by Kuroda in Tori, 1924: 176–177. The inscription labels the birds "Chosen Oshidori" and the artist noted on the picture of the male "drawn in February, 1/3 size."

5. A male and female were drawn separately in "*Torino Shurui*" (kinds of birds) of uncertain date by an unknown artist. The in-

scription on the upper right of the male says "a pair of these birds was caught by Kamenojo Murata, footman of the Shojiro Matani, by lime strings at Furubori, Ipponji, near Kametamura, Hakodate, in October 1822, and on 8 September the next year the birds were presented to Dewanokami Mizuno, a secretary of Kango Fujikura, the household manager of the Shogun, who presented them to the Shogun the next day, 9 September." At last report this drawing was owned by Mr. Sokan Yano of Fukuoka. Kuroda published a cut of it in Tori, 1940: 740.

6. A male and female were drawn in Tokyo by Kowa Yamamoto on a "Mizutori no Maki" (scroll of waterfowl) in December 1854. The only inscription on the drawings other than the sex labels states, "called either Korean or rock Mandarin Duck." This scroll is owned by Mr. Katsusaburo Sumiya of Tokyo, and was reproduced photographically in Austin's "Waterfowl of Japan", NRS Report No. 118, 1949: 24.

7. A contemporary copy of the male in drawing No. 5 was found on a scroll purchased in a second-hand shop in Tokyo in 1950 by Count Giovanni Revedin, and presented by him to the Houghton Library of Harvard University. The inscription on the drawing is the same as in No. 5, and at the start of the scroll Ono Ranzan's discussion of the bird (Medieval descriptions No. 2) is quoted.

71. Anas platyrhynchos platyrhynchos Linné

MALLARD

Japanese: Magamo (true duck)

Anas platyrhynchos Linné, Syst. Nat., ed. 10, **1**, 1758: 125 (Sweden).

The Mallard breeds commonly in Hokkaido, and a few scattered nesting records from Aomori Prefecture to the Japan Alps suggest that formerly it may have been a common breeding species as far south as central Honshu. It is widespread throughout Japan as a migrant and winter visitor, the most abundant of the larger dipping ducks. Large concentrations winter in a few favored spots, most of which are maintained as netting grounds, such as the Imperial preserve in Saitama Prefecture, Tega and Imba lakes in Chiba Prefecture, and small ponds in the Lake Biwa area, in Shikoku and in Kyushu. It is essentially a bird of fresh water marshes and shallow inland ponds, but it has learned, when driven from its preferred inland resting places by excessive shooting, to resort to open salt water during the daytime and to feed in the inland paddy lands after dark.

Migrating Mallards reach Hokkaido and northern Honshu in mid September. On the Kwanto plain near Tokyo the vanguard arrives in early October, the main flight in late October, and the peak population is reached in November. Mallards reach the Lake Biwa area and northern Kyushu simultaneously in early October. While the species is present in central Honshu all winter, part of the population moves farther southward in December and returns in late February, heralding the start of the spring flight. Most of them leave Kyushu, Shikoku, and Honshu between mid March and mid April, though stragglers are seen until May.

Banding evidence shows Mallards use all three of the major flyways to and from Japan. Birds from all three routes mingle on the wintering grounds, and constant interchange of individuals occurs through the winter between the favored concentration areas where banding has been done. However, most of the Kyushu and western Honshu populations use the Korean Peninsula route, the Kansai-Lake Biwa-Fukui-Toyama birds cross the Japan Sea directly northward to Ussuria, and those of the Kwanto Plain and northward travel the Hokkaido-Sakhalin flyway.

72. Anas poecilorhyncha zonorhyncha Swinhoe
SPOT-BILLED DUCK
Japanese: Karugamo (light-weight duck)

Anas zonorhyncha Swinhoe, Ibis, 1866: 394 (Ningpo, China).

The Spot-bill, the eastern race of the Indian Gray Duck, is native to Japan, Korea, Manchuria, Mongolia, and China. It is a common resident throughout Japan, and breeds in fresh water marshes on all four main islands from late April through July. The young are on the wing by September, the birds retire to the wintering areas in October and November and return to the nesting grounds in April.

Banding returns show the limited scope of the Spot-bill's movements. It is quite sedentary, though individuals migrate slightly southward throughout its range. The Hokkaido and northern Honshu breeding populations move south to central Honshu as the fresh waters freeze. Most of the birds breeding from central Honshu southward move from their nesting grounds in the inland marshes to winter on nearby open bays and inlets, though a few migrate farther southward. Though there may be some migratory interchange between Kyushu and Korea and between Hokkaido and Sakhalin, it is not yet proved by banding recoveries. Most of the Spot-bills wintering in Japan probably are raised within the four main islands.

The first northward migrants reach Hokkaido in early April and the last leave in December. Early flight birds from Hokkaido sometimes arrive in northern Honshu in early September. There they gather in considerable numbers in the wet paddies and inland lakes and marshes, and retire slowly southward or to open salt water as the fresh waters start to freeze in November. The species is common on the Imperial moats in Tokyo from October to April; in southern Kyushu it is most plentiful in January.

The Spot-bill's success in maintaining its numbers in Japan despite increasing hunting pressure and diminishing breeding territory speaks well for its productivity and its adaptability to environmental changes. Though by nature an inhabitant of fresh waters, it has learned to take refuge from hunters by spending its days on open salt waters and visiting its feeding areas on the inland marshes and paddies in the comparative safety of darkness. Because it seldom gathers in as large flocks as other more migratory species, it is more difficult to net or to shoot in wholesale quantities.

The Spot-bill is the only waterfowl present in any numbers in Japan during the rice season. Complaints are made frequently of its depredations in the rice paddies, but strangely enough these complaints are made always by hunters, and never by the rice farmers. The birds do eat some rice, but investigations have never proved their making serious inroads in the crops.

73. Anas querquedula Linné

GARGANEY TEAL

Japanese: Shima aji (striped teal, "aji" coming from "ajigamo", an old local name for *A. formosa*, meaning "tasty duck")

Anas Querquedula Linné, Syst. Nat., ed. 10, **1**, 1758: 126 (Sweden).

The Garganey occurs in Japan only as a migrant. As its main flight routes are continental, it is not overly common on the main islands. Nevertheless small numbers visit Honshu fairly regularly in spring and autumn. The southward flight passes Hokkaido from mid September to early October, and is at its peak in the Kwanto area from 10 October to 10 November. The earliest autumn record is a single bird taken at Haneda 17 September 1915 and the latest 19 November 1934.

It is absent from December to February, though taken once at Shinhama, Chiba on 12 January 1934. The earliest record for the return flight is a bird taken in Chiba 3 February 1926. The main spring flight appears in late March and is at its height the first two weeks in April. Stragglers have been taken as late as 2 and 8 May 1922 at Haneda duck pond.

74. ANAS CRECCA Linné
GREEN-WINGED TEAL
Japanese: Kogamo (little duck)

Anas Crecca Linné, Syst. Nat., ed. 10, **1**, 1758: 126 (Sweden).
Anas carolinensis Gmelin, Syst. Nat., **1**, (2), 1789: 533 (South Carolina).

The well-marked American subspecies, *A.c.carolinensis*, readily differentiated from the Eurasian race by the vertical white mark on the sides of the breast in front of the wing instead of the light horizontal stripe above the wing, and by the absence of the buffy margins between the green eye-stripe and the red of the head, occurs casually in Japan. Only the males can be recognized with certainty, but with more careful observation more individuals might be discovered than the five now known:

Honshu, Tokyo, Haneda		17 Feb. 1916	Kuroda coll.
"	" "	9 Mar. 1926	" "
"	Saitama, Koshigaya	5 Jan. 1950	Imperial Duck Pond coll.
"	Chiba, Shinhama	26 Jan. 1950	Yamashina coll.
"	" "	14 Jan. 1951	Shinhama ref. coll.

The Eurasian Green-winged Teal, *A.c.crecca*, is a summer resident in Hokkaido and northern Honshu, a common transient throughout Japan, and a common winter resident from central Honshu southward. It may once have bred fairly commonly throughout Honshu, but now only a few scattered pairs nest in the highlands of Nagano and Aomori prefectures. It is essentially a fresh water bird and is seldom found in numbers on salt water unless driven there by persecution on its more favored inland resting areas. It associates frequently with the Mallard on the wintering grounds, but is less shy and uses small inland ponds for daytime resting areas to a greater extent. It feeds largely by night. The flocks leave the resting grounds at dusk, scatter over the paddy lands during the darkness, and return to the daytime havens at dawn.

The first migrants reach northern and north-central Honshu about 10 September, the main flight appears in October and continues through December. The teal start to leave for the north again in mid

March, the flight increasing in tempo in April. Most have left before May, but a few stragglers sometimes remain to the end of that month, and crippled birds may remain all summer.

Banding recoveries show most of the teal wintering in Honshu go northward between the inland mountain ranges of northern Honshu to Hokkaido, where the flight splits, one group pushing northward to breed in northwestern Hokkaido and Sakhalin, the other swinging eastward over the Kuriles to Kamchatka, where nine have been recovered. A smaller flight goes northward from Kyushu and western Honshu via the Korean peninsula to Ussuria.

As it is the commonest waterfowl in Japan, as well as of excellent flavor and one of the easiest to net, more Green-winged Teal are marketed than any other species, though because of its small size the species brings only one-half to one-third the price of the larger Mallards and Spot-billed Ducks.

75. ANAS FORMOSA Georgi

SPECTACLED TEAL, BAIKAL TEAL

Japanese: Tomoegamo (swastika duck, from the resemblance of the facial markings to the Japanese swastika or "tomoe")

Anas formosa Georgi, Bemerk. Reise Russ. Reich., **1**, 1775: 168 (Lake Baikal).

The Spectacled Teal is a common winter visitor to southwestern Japan, at times almost unbelievably abundant. It seems to reach Kyushu and western Honshu from Korea, and to spread eastward from there commonly to the Kwanto Plain, occasionally to Toyama and Ishikawa prefectures, and rarely to Hokkaido. The vanguard reaches Lake Biwa in late September, but the species does not appear on the Kwanto Plain until a month later. Formerly about 3,000 visited Sakata and Wada ponds near Imba and Tega lakes in Chiba Prefecture regularly in late October and early November, remaining about a month before scattering or moving on. These concentrations were broken up by illegal shooting early in the occupation, and the species has not been observed there since. At the Imperial Preserve in Saitama about 2,000 arrive annually in mid December, most of which move on again shortly, but several hundred remain in the vicinity until about mid March. Large flocks occasionally appear in Tokyo Bay off Chiba from December until spring. They were numerous there in December 1947, but absent during the two following winters. North of the Kwanto Plain the species is rather rare.

In the Kansai area from Lake Biwa to the eastern end of the Inland Sea the species is usually the most numerous of the wintering ducks, and huge concentrations are reported from September to March. Flocks numbering 100,000 have been observed at Yamada Pond near Osaka, and rafts of 10,000 and more are not uncommon at Shimo Pond in Gifu Prefecture.

In southern Kyushu the species is generally uncommon, but a most unusual flight of these teal visited northern Kyushu in February 1947, and spread southward as far as Kumamoto. Hunters found them even inland on Mt. Aso. Some idea of their occasional abundance is afforded by the phenomenal catches made by one netting stand in the area this flight visited. Three men operating six throw-nets on a pond in southern Fukuoka Prefecture took 50,000 Spectacled Teal between 20 February and 10 March 1947. Their highest single day's catch was 10,000 birds, an almost incredible haul.

The species leaves Japan the way it comes, via the Korean flight route. Stragglers may remain until mid April, but most of them have gone by the end of March. A bird banded in Fukuoka 21 February 1931 was recovered at Lake Dabdal, Yakutsk, Siberia, 3 June 1931. One banded at Tokushima, Shikoku, 22 December 1931 was recovered the following year on the Inu River, eastern Birobidzhan, Yegeon, Amuria. Another banded in Shimane Prefecture 28 March 1938 was taken in Jada-gun, Hokkaido, 2 July 1938, one of the few Hokkaido records.

76. Anas falcata Georgi

FALCATED TEAL

Japanese: Yoshigamo (marsh-reed duck)

Anas falcata Georgi, Bemerk. Reise Russ. Reichs, **1**, 1775: 167 (Asiatic Russia).

To call this species a teal is misleading. Structurally it is nearest the Gadwall, and its appearance and habits are anything but teal-like. Though it breeds in inland marsh areas, it frequents open salt water on migration and on the wintering grounds more than any other of the dipping ducks. It dives with facility, and in winter acts much like a member of the scaup tribe. It is seldom found far from salt water in the winter, and while it does come inland to rest and feed in the nearby paddies and lakes, the main flocks usually remain in the shallow salt-water bays.

The Falcated Teal breeds not uncommonly in Hokkaido from the

Ishikari Plain northward, and winters commonly from southern Hokkaido southward through the main islands. It seems to use the northeast flyway almost exclusively, for though it winters in good numbers on the Pacific Coast of Honshu between Aomori and Tokyo, it is much less common elsewhere. It is most plentiful in winter in Matsushima Bay off Sendai and in Tokyo Bay off Chiba and Yokohama. A few appear at Lake Biwa and the Kansai Plain every year, and it also occurs sparingly in Shikoku and northern Kyushu, but the species is uncommon in the Inland Sea and on the coast of the Japan Sea.

The earliest migrants reach northern Honshu in mid September, and usually appear in the Tokyo area a week or two later. The main flights reach Sendai in mid October and Tokyo in early November. The birds start moving northward again in February, but the spring flight is most marked in March and April. Stragglers sometimes remain in Tokyo and Matsushima bays until early May.

77. Anas strepera Linné
GADWALL

Japanese: Oka yoshigamo (upland reed-duck)

Anas strepera Linné, Syst. Nat., ed. 10, **1**, 1758: 125 (Sweden).

The Gadwall is a not uncommon winter visitor in Japan, more plentiful than the infrequent records indicate. Because of its rather nondescript coloration and its lack of striking distinguishing marks other than the white speculum, it is seldom recognized by most hunters who, if they try to identify it at all, usually call it a female Wigeon or Falcated Teal. Like these two species, with which it frequently consorts on migration and on the wintering grounds, it is a vegetable feeder. It prefers fresh water marshes, sloughs, and ponds, but resorts to open bays when driven from its normal habitat by human persecution or freezing weather.

The autumn migrants appear in northern Hokkaido in late September and move southward as the season progresses, reaching the Tokyo area irregularly from late October to the end of November. The species winters from the latitude of Sendai southward and is taken not infrequently in the decoys around Tokyo. The spring flight goes northward in March, with occasional stragglers remaining near Tokyo until early April.

78. Anas acuta acuta Linné

PINTAIL

Japanese: Onagagamo (Long-tailed duck)

Anas acuta Linné, Syst. Nat., ed. 10, **1**, 1758: 126 (Sweden).

The Pintail is a fairly common transient and winter visitor in Japan. In Hokkaido it is a bird of passage only, arriving in late September, departing in November, and re-occurring on its northward flight in April. It arrives in northern Honshu a little later than the Mallard, usually in mid October. In the Tokyo area the main flocks arrive in mid November, and the species is most numerous in December. It winters from the latitude of Tokyo south through Kyushu, preferring fresh water lakes and marshes. During the shooting season it stays on the open bays with the diving and other dipping ducks, and comes inland to feed only at night.

Pintails become scarcer in central Honshu in January as the flocks move farther south during the coldest weather, but the spring movement starts early, and some migrants leave the Kwanto area in early February. All of them have usually disappeared by mid April except for the usual few stragglers which have been recorded as late as May.

Too few Pintails have been banded to delineate their flight routes accurately, and no banded ones have been recovered outside Japan. Bandings in Chiba have revealed a spring movement across Honshu to Niigata, suggesting a northward flight across the Japan Sea to their Siberian breeding grounds. The species seems to reach Japan by all three flight routes, others coming down from Sakhalin through Hokkaido and northeastern Honshu, and still more reaching Kyushu from the Korean peninsula.

79. Mareca penelope (Linné)

EURASIAN WIGEON

Japanese: Hidorigamo (red-bird duck)

Anas Penelope Linné, Syst. Nat., ed. 10, **1**, 1758: 126 (Sweden).

The Wigeon is a common spring and autumn transient. It winters in small numbers from Tokyo southward, but most of the birds move on to southern China where the species is one of the most common ducks in January and February. The southward flight reaches Hokkaido and northern Honshu during late September and early October. The species is most abundant in the Tokyo area in November, and becomes scarcer when the birds move southwestward after early December. The main northward flight in spring follows the continental flyway past Korea and so misses Japan. However, a few individuals do return northward via Japan, for a small increase is apparent among the wintering flocks in March just before they start to leave. The last birds may dawdle until late April or early May before departing northward via Hokkaido, Sakhalin, and Kamchatka. The few banding returns have all been taken within a short distance of the place of banding, most of them immediately thereafter.

During autumn and spring the Wigeon frequents fresh water lakes and ponds but retires to the shallow coastal bays as the weather grows colder and shooting drives it from the inland waters. It feeds largely at night over the paddy lands and marshes, and is taken frequently by the netters.

80. Mareca americana (Gmelin)

BALDPATE, AMERICAN WIGEON

Japanese: Amerika hidori (American Wigeon)

Anas americana (Gmelin), Syst. Nat., **1**, (2): 526 (Louisiana).

Despite the paucity of records which indicate it a straggler, the Baldpate may be of regular though rare occurrence in Japan, much as the Eurasian Wigeon winters regularly in small numbers on the Atlantic Coast of North America. The few *bona fide* Japanese records are all of males. The absence of a proportionate number of records of females is probably because they are insufficiently distinct from female Eurasian Wigeons to be recognized readily. It is significant that all six definite records were taken at netting stands in Tokyo and reported by Dr. Kuroda, the leading Japanese authority on waterfowl. Dr. Kuroda took four of them himself at his decoy in Haneda. The other two were taken at the Imperial decoys after Dr. Kuroda taught the keepers to recognize the species and asked them to watch for it. The keepers then remembered that at the Shinhama decoy they had taken three male Baldpates in the autumn of 1919, which were kept in captivity for some time at the Shinjuku Imperial Gardens. The specimen records for Japan are:

Honshu, Tokyo, Haneda	4 Dec. 1908	Kuroda coll.
" " "	16 Jan. 1918	" "
" " "	30 Dec. 1928	" "
" " "	5 Dec. 1931	" "
" " Hama Park	6 Jan. 1932	" "
" Chiba, Shinhama	19 Oct. 1934	" "

81. Spatula clypeata (Linné)

SHOVELLER

Japanese: Hashibirogamo (broad-billed duck)

Anas clypeata Linné, Syst. Nat., ed. 10, **1**, 1758: 124 (south Sweden).

The Shoveller is a not uncommon transient and winter visitor in Japan. It may nest in northern Hokkaido where Jahn (1942: 258) claims to have seen a female with half-grown young 27 July 1939. It is fairly common in Hokkaido from early September to November. The main flights reach the Kwanto and Kansai regions between mid October and early November. Their numbers increase in central Honshu through December but decrease again by January as some of the birds move southward and westward. They are scarcest in Honshu during February, most numerous in southern Kyushu in January and February.

The spring flight is much lighter, indicating that the birds which migrate to south China from Japan probably return north on the continent. In the Kwanto area the wintering flocks increase slightly in March and disappear by the end of April, rarely remaining into early May.

The Shoveller is a bird of the marshlands, very much at home in the wetter paddies and small fresh water ponds. It seldom visits salt water except when driven there by excessive shooting inland. It is not overly shy and is a fairly easy prey for both the gunner and the netter. Nevertheless, because it usually travels in scattered, small flocks, it is seldom taken in large numbers.

82. Aix galericulata (Linné)

MANDARIN DUCK

Japanese: Oshidori (autochthonous)

Anas galericulata Linné, Syst. Nat., ed. 10, **1**, 1758: 128 (China).

Aix galericulata brunnescens Clark, Proc. Biol. Soc. Wash., **27**, 1914: 87 (Kyushu, Japan). (Synonym)

Yamashina (1949: 154) has proposed separating the Mandarin Duck in the monotypic genus *Dendronessa* Swainson on cytological evidence which shows the species to be widely distinct from all other waterfowl in its chromosome formula. The cytological basis for systematics advanced by Yamashina (*idem*), which in brief adapts his recent discoveries in the nuclear morphology of hybrids to the Darwinian concept of species as those individuals able to produce fertile offspring of their own kind, has definite merits and advantages. However, this seems to be one instance where it breaks down for, from all but the cytological standpoint, the Mandarin and the Wood Duck, *Aix sponsa*, are most certainly congeneric. While the males are radically different in plumage, the females are almost identical. Furthermore the two species are almost exactly alike in their life histories, their nesting habits, voices, manners of flight, and general ecologies. They are so similar that to consider them a case of parallel evolution and to deny them a close common ancestor is too great a strain on our present concepts of systematic procedure. Yamashina's observations explain why it has been impossible to hybridize the Mandarin with any other waterfowl, but in view of the present tendency to use the genus as a collective rather than a distinctive unit, it seems ill-advised to separate these two species generically on the cytological evidence alone, when all other evidence points to their close relationship.

The Mandarin Duck was once a common resident bird in Japan but as it is not shy, and as it frequents small streams and lakes where it is an easy prey for hunters, it has now become very rare except in the few places where it receives complete protection. It formerly bred commonly from Hokkaido to Okinawa, but now nests only in the few widely scattered localities where large forests still exist and where shooting is prohibited, such as on the more remote National Park areas.

In northern Japan it is a summer resident only. Its season in Hokkaido is from late March to early November. In northern Honshu, where it breeds in early June in the National Forest lands near Lake Towada, the young of the year first appear on the lake with their parents in late July or early August. They remain in the vicinity until the lake starts to freeze in October and then retreat southward.

In winter the Mandarins gather in small concentrations from central Honshu southward through Kyushu but are seldom found except where they are rigidly protected. Perhaps their best known wintering grounds today are the ponds in the parks of central Tokyo. They occasionally nest on the Imperial Palace grounds, and the females bring their broods into the moat by the main plaza. Their numbers increase in the moats in October, and a flock of about 100 gathered there through the winters of 1946 to 1950. Another smaller flock, numbering from 20 to 30 birds, usually winters on the pond of the inner garden of the Meiji Shrine, and scattered individuals frequently are seen in other city ponds where the birds have learned they are comparatively safe.

South of Tokyo small flocks are reported to winter at Lake Ashi near Hakone, on Akamatsuga Lake at Daisen National Park in Tottori Prefecture, Takayama village pond in Gifu Prefecture, Yogo Pond near Lake Biwa, at Awaji Island in the eastern Inland Sea, and at a few other preserves in Hyogo, Nagasaki, and Kagoshima prefectures.

The Mandarin has had a strong influence on Japanese folklore and art. A favorite subject for paintings, scrolls, and prints, it appears frequently on screens, laquerware, china, fans, and fabrics. Very seldom is the startlingly handsome male depicted alone. Traditionally he is always accompanied by his dull-colored consort. Countless legends, as old as Japan itself, tell how one of the pair always refused to leave its mortally wounded or dead mate. So the species has become the Japanese symbol of marital fidelity, and Oshidori embroidered on a Japanese bride's kimono are as much a part of her costume as "something old, something new" are for her Western sister.

The Mandarin was declared a non-game bird by ministerial announcement 13 October 1925 but was not removed from the official list of legal game birds, which continued to include all ducks until 1947. A pond where the Mandarin winters near Nagasaki was made a Natural Monument in 1931, but its other haunts are protected only by the prohibition of shooting within city limits and in heavily populated places. The species has increased in recent years in these few sanctuary areas, but it is almost never seen elsewhere, as hunters still shoot it either in ignorance or in disregard of the law, and the bird is apparently just managing to hold its own. Unless effective protection is given it by an adequate warden service the Mandarin cannot be expected to increase again in its former haunts throughout Japan. Because of the bird's intimate bond with Japanese tradition and folklore its conservation should not be difficult to accomplish.

83. AYTHYA VALISINERIA (Wilson)
CANVASBACK
Japanese: O-hoshi hajiro (great pochard)

Anas valisineria Wilson, Am. Orn., **8**, 1814: 103, pl. 70, fig. 5 (North America).

Two male Canvasbacks have been taken in Japan, both in 1931. The first, shot 14 January at Akkeshi, Hokkaido, is now in the

Yamashina collection. The second, netted at Lake Tega in Chiba Prefecture 28 January, was kept in Kuroda's duck pond until it died two weeks later. The specimen was destroyed with the Kuroda collection in 1945.

84. Aythya ferina (Linné)

POCHARD

Japanese: Hoshi hajiro (star white-wing; "hajiro" is an autochthonous name for all scaup)

Anas ferina Linné, Syst. Nat., ed. 10, **1**, 1758: 126 (Sweden).

The Pochard is not a common duck in Japan but occurs regularly on all four main islands. The earliest flight reaches northern Hokkaido in early October and moves southward with the season. A larger flight evidently crosses the Japan Sea in late October and November to Lake Biwa, its principal resort in Japan, where flocks numbering several thousand have been observed and the species is most numerous in February. Smaller flocks visit the Chiba lakes and Tokyo Bay irregularly from late November to March. From specimen and sight records its inclusive dates in the Tokyo area may be estimated as from mid November (earliest 6 November 1903, Haneda) to late March (latest 10 April 1936, Shinhama).

Though a typical diving duck, the Pochard is almost exclusively an inhabitant of large fresh water lakes and normally visits tide waters only when driven there by weather conditions or excessive shooting on its preferred haunts. It is largely a daytime feeder, and as its diet is mainly vegetable matter it is considered one of the finest table birds. It does not trap or net well and has never been abundant enough in Japan to be of importance to the market hunters.

85. Aythya fuligula (Linné)

TUFTED DUCK

Japanese: Kinkuro hajiro (golden-black scaup)

Anas fuligula Linné, Syst. Nat., ed. 10, **1**, 1758: 128 (Sweden).

The Tufted Duck is a common spring and autumn transient throughout Japan, and a not uncommon winter resident from central Honshu southward. It breeds sparingly in Hokkaido where Yamashina (Tori, 1930: 230) collected downy young. Like the Pochard it is essentially a bird of the large freshwater lakes, and visits salt water only when forced to do so. It occupies the faunal niche in east Asia that the Lesser Scaup does in North America. When on salt water it is usually found in the shallows at the heads of the bays and estuaries instead of in the deeper waters frequented by the Scaup Duck.

Three flights reach Japan on the southward journey, one via Sakhalin and Hokkaido, the second and largest to central Honshu across the Japan Sea, and the third and smallest to Kyushu from Korea. The eastern flight reaches Aomori in the autumn about 20 October. A few remain to winter in Ogawara lagoon near Mutsu Bay while the rest continue southward and reach the Kwanto area in late October or early November. The Japan Sea flight is somewhat earlier. Birds have been observed at Lake Biwa in mid September, but the main flight usually appears there in early October. The Korean flight is slightly later, arriving in Kyushu from late October through November.

Though many remain in Honshu until spring, most are believed to migrate farther southward in midwinter, returning in March and April. At Lake Biwa, where the Tufted Duck is at times the most numerous of all the waterfowl, the following population counts were made during the winter of 1935–36 (Yamazaki, Yacho, 1937: 39–54):

5 Nov.	700	14 Dec.	500	6 Mar.	5,163
9 Nov.	13,400	16 Dec.	450	2 Apr.	1,790
15 Nov.	2,760	24 Jan.	542	18 Apr.	250
21 Nov.	10,000	10 Feb.	360	5 May	0
4 Dec.	80	27 Feb.	140		

The wintering flocks are augmented by arrivals from the south in early March, and most of them leave for the north by late March or early April. Of 111 Tufted Ducks banded in Japan, mostly in the Lake Biwa area, 30 returns have been taken, chiefly in the banding vicinity. Three were captured to the northward as follows:

Banded		*Recovered*	
Honshu, Shiga	3 Mar. 1931	Khutavi River, 15 km. NE of Okhotsk	27 May 1931
" Akita	27 Mar. 1931	Mikhailovka, Semenovka, Amur River	12 Sep. 1931
" Shiga	3 Mar. 1931	Onekotan Island, northern Kuriles	24 May 1932

86. Aythya baeri (Radde)

BAER'S POCHARD

Japanese: Aka hajiro (red scaup)

Anas (*Fuligula*) *Baeri* Radde, Reisen Sud von Ost-Sib., **2**, 1863: 376, pl. 15 (southeast Siberia).

Not much is known about this rare little duck. It is so similar to other scaups, except in the male spring plumage, that it is seldom recognized by hunters. It is apparently abundant nowhere, and the only information on its status in Japan is that manifested by the specimen record. While it has been recorded only from the Tokyo area and from Hokkaido, enough specimens have been taken to indicate the species to be of fairly regular occurrence, despite its rarity. It seems to be a winter visitor, arriving in late October and departing in early April. The specimen record:

Hokkaido, no loc.		undated	Sapporo Mus., Blakiston coll.
"	Iburi (2)	1 Apr. 1932	Sapporo Mus.
"	"	15 Mar. 1936	Yamashina coll.
"	"	9 Apr. 1936	"
"	"	12 Feb. 1937	"
"	" (2)	12, 30 Mar. 1937	"
"	" (2)	16, 20 Oct. 1937	"
"	Garagawa	1 Apr. 1949	MCZ
Honshu,	Aomori	25 Jan. 1911	MCZ
"	Tokyo	undated	Yamashina coll.
"	Tokyo market (2)	undated	" *ex* Imp. Univ. coll.
"	Yokohama mkt. (4)	undated	Brit. Mus., *ex* Seebohm
"	Chiba	undated	Matsudaira coll.
"	"	8 Dec. 1883	Yamashina coll.
"	Tokyo, Haneda	23 Nov. 1908	Kuroda coll.
"	" "	1 Nov. 1909	"
"	" "	22 Mar. 1912	"
"	Suruga Bay	undated	AMNH, *ex* Owston
"Japan"		undated	MCZ

87. Aythya marila mariloides (Vigors)

SCAUP DUCK

Japanese: Suzugamo (bell duck, from the whistle of the wings)

Fuligula Mariloides Vigors, Zool. Beechey's Voy. "Blossom", 1839: 31 (Bering Sea).

The Scaup is a common winter visitor in the three northern islands of Japan, rather less plentiful in Kyushu. It sometimes arrives in Tokyo Bay in the latter part of September, somewhat earlier than most fresh water ducks, but the main flights usually appear in late October and leave from the middle to the end of March, though stragglers have been taken as late as May.

Unlike the Pochard and the Tufted Duck, the Scaup prefers to winter on salt water bays and estuaries. At one of its main concentration areas, Tokyo Bay, huge flocks of 100,000 or more sometimes cover the shoals and are accused of inflicting considerable damage to the shellfish beds during winter and early spring. Smaller concentrations gather in Aomori Bay in northern Honshu, Hamanako in Shizuoka Prefecture, Mikawa Bay in Aichi Prefecture, and Hakata and Ariake bays in Kyushu. The species visits fresh water infrequently, and Dr. Kuroda reports taking only 29 birds at Haneda duck pond between 1908 and 1935; nevertheless it was formerly fairly plentiful at Murayama reservoir in Tokyo before illegal shooting by the occupation drove it away, and small numbers are taken occasionally at Tega Lake in Chiba and on Lake Biwa. On the wintering ground its food is predominantly animal matter, and as its flesh is less palatable than that of the other scaups, it is not as highly valued as a table bird.

88. Bucephala clangula clangula (Linné)

GOLDEN-EYE

Japanese: Hojirogamo (white-cheeked duck)

Anas Clangula Linné, Syst. Nat., ed. 10, **1**, 1758: 125 (Sweden).

The Golden-eye is a common winter resident. It seldom forms large flocks or joins other species, but is fairly evenly distributed singly or in small flocks along all coasts from Hokkaido to Kyushu. It appears in Hokkaido in late September, reaches the Tokyo area in late October or early November, and remains until late March or early April.

It is a salt water duck preferring open coastal bays and occasionally visiting the inland lakes and ponds near the coast. A daytime feeder, its diet is predominantly animal matter. Consequently its flesh is somewhat rank in flavor, though not as offensive to the palate as that of the scoters and mergansers. The Japanese hunters do not seem to know the bird well, even where it is common, and often misidentify it. It is not of great economic importance, though an excellent sporting bird for the bay gunner.

89. Bucephala albeola (Linné)

BUFFLEHEAD

Japanese: Hime hajiro (Princess [dainty] scaup)

Anas Albeola Linné, Syst. Nat., ed. 10, **1**, 1758: 126 (north Sweden).

In the Norinsho collection are two female Buffleheads, one taken near Miyako Village, Iwate Prefecture in mid December 1924, the other at Shinshiru Island in the Kuriles during the winter of 1925–1926. The only other record of its occurrence in Japan is a report by Ishizawa (Tori, 1925: 288) of one killed from a flock of six or seven on Lake Abashiri, Hokkaido on 28 October 1921, but the specimen is not traceable.

90. Clangula hyemalis (Linné)

OLD SQUAW, LONG-TAILED DUCK

Japanese: Korigamo (ice duck)

Anas hyemalis Linné, Syst. Nat., ed. 10, **1**, 1758: 126 (north Sweden).

The Old Squaw is a common winter visitor in Hokkaido and extreme northern Honshu. The first arrivals appear in Hokkaido in early November. The wintering flocks reach Mutsu Bay at the northern tip of Honshu sometimes in November, usually in December, and remain there until late March or early April before returning northward. South of Aomori the species is rare. It has been taken twice in Miyagi Prefecture, and once, the southernmost record, at Tega Lake in Chiba Prefecture 9 December 1917.

It is one of the most rugged of the sea ducks, riding out heavy weather on freezing, unprotected shores even when sheltered bays are available. A fast flier and not over-wary, it is a good sporting bird for hunters hardy enough to brave the rigorous climate it enjoys. But its flesh is oily and fishy and is enjoyed only by the initiate.

91. Histrionicus histrionicus (Linné)

HARLEQUIN DUCK

Japanese: Shinorigamo (aurora duck)

Anas histrionica Linné, Syst. Nat., ed. 10, **1**, 1758: 127 (Newfoundland).

Histrionicus histrionicus pacificus Brooks, Bull. Mus. Comp. Zool., **59**, 1915: 393 (Cape Shipunski, Siberia). (Synonym)

This is an indivisible, Holarctic species. I have studied and measured a series of ten male Harlequins from Japan and eastern Asia, including the type of *pacificus*, and a large series of birds from North America, Greenland, and Europe. The Asiatic Harlequins are inseparable from those of the rest of the world. The type of *pacificus* is an individual variant with a slightly thicker bill and redder crown stripes than the average.

The Harlequin is a not uncommon winter visitor in Japan off bold, rocky coasts, becoming rarer as one goes southward. While common in winter in the Kuriles, it is less so in Hokkaido, and least so in the more southerly islands. It winters fairly regularly on the Pacific coast of Honshu as far south as Chiba Prefecture, and occasionally reaches Sagami and Suruga bays and the central Izu Islands. It is rare on the Japan Sea side of Honshu, but has been taken twice in Tottori Prefecture. A few birds reach the northwest shores of Kyushu, evidently from the flight which comes down the continental coast to eastern and southern Korea and Quelpart Island.

The Harlequin arrives in Hokkaido in mid October, and in northern Honshu in late October or early November. It reaches the Tokyo area in late November and departs the end of March or early April. Though it is easy to approach and not at all shy, it is not often killed. Access to its usual haunts in the breakers on rocky shores is difficult, and as the Harlequin seldom gathers in large flocks and is not a prime table bird, it attracts few hunters.

92. Melanitta nigra americana (Swainson)

BLACK SCOTER

Japanese: Kurogamo (black duck)

Oidemia Americana Swainson, *in* Swainson & Richardson, Fauna Bor. Am., **2**, 1831 (1832): 450 (Hudson Bay).

The Black Scoter is a common winter visitor in Japanese coastal waters from Hokkaido south to Suruga Bay on the east coast of Honshu and to the Ishikawa Peninsula on the Japan Sea coast. It occasionally reaches Oki Island and Shimane Prefecture, and has been taken casually on Hachijo Island and at Tosa in Shikoku, but never in Kyushu. The species arrives in Tokyo Bay in mid November and remains until the end of March off Chiba City. Two birds banded in Ishikawa Prefecture on 8 November 1933 were recaptured, one in Toyama Prefecture 28 December 1933, and the other in Shimane Prefecture 17 October 1934.

As a whole the Black Scoter is less numerous than the Velvet Scoter and of more limited distribution on the wintering grounds. Both scoters are true sea ducks, but are fonder of sheltered waters than the Old Squaw and the Harlequin. Their favorite haunts in Japan are the large open bays, and they are almost never found inland. They feed mainly by day, and in winter subsist largely on shellfish.

93. Melanitta fusca stejnegeri (Ridgway)
VELVET or WHITE-WINGED SCOTER

Japanese: Birodo kinkuro (velvet gold-black)

Oidemia stejnegeri Ridgway, Man. N. Am. Bds., 1887: 112 (Kamchatka to Japan).

The Velvet Scoter is a common winter visitor to coastal Japan, generally more plentiful than the Black Scoter on the Pacific side of Honshu. It frequents such coastal waterfowl areas as Aomori, Tokyo, Sagami, Suruga, Mikawa, Hakata, and Ariake bays, and extends its winter range south through the Inland Sea to northern Kyushu on both coasts. Early arrivals may reach the Tokyo area in late September, but the large flocks do not come until early November. Its departure is somewhat later in spring than other diving species, usually in mid April, and late flocks may remain well into May.

As the scoters are tough and rank, they are not highly prized as food, and as they are not easy birds to shoot and cannot be netted or trapped readily, they are seldom hunted for market in Japan. However, both species are shot frequently for sport from motor boats in Tokyo Bay, where they are among the commonest of the wintering waterfowl.

94. Polysticta stelleri (Pallas)
STELLER'S EIDER

Japanese: Ko-kewatagamo (small quilt duck)

Anas stelleri Pallas, Spic. Zool., fasc. 6, 1769: 35 (Kamchatka).

Only two specimens of Steller's Eider have ever been taken in Japan, a male at Nemuro, Hokkaido 9 March 1894, and a female from nearby Akiyuri Island, Hokkaido 3 May 1894. Both were sent by Alan Owston to Lord Rothschild and are now in the American Museum of Natural History in New York.

95. Mergus albellus Linné

SMEW

Japanese: Miko aisa (son-of-god merganser)

Mergus Albellus Linné, Syst. Nat., ed. 10, **1**, 1758: 129 (Smyrna).

The little Smew is a not uncommon winter visitor to Japan, but is never very plentiful. It arrives in Hokkaido in mid October and leaves in mid April. Its season in the Tokyo region is from mid November to late March. It has been taken as far south as Kyushu. It occurs both on large fresh water ponds and in open salt water, but it is a fish-eating bird which few people relish eating, and is not hunted assiduously.

96. Mergus merganser merganser Linné

GOOSANDER

Japanese: Kawa aisa (river merganser)

Mergus Merganser Linné, Syst. Nat., ed. 10, **1**, 1758: 129 (Sweden).
Mergus Orientalis Gould, Proc. Zool. Soc. London, 1845: 1 (Amoy, China).

Heretofore I have followed the 1912 Hand-List in referring the Goosanders of Korea and Japan to *M.m.orientalis.* This is a very weak race, based on the smaller bills of the adult males (51–57 mm. as against 55–61 mm. in *M. m. merganser*), limited to the Russian Altai and Turkestan in its breeding range, and wintering to coastal China. Females and immature males cannot be assigned to either race with certainty. The Japanese authorities consider *merganser* only of casual occurrence in Japan and Korea, and have so identified only one Korean and five Japanese specimens (Austin, 1948a: 71; 1949a: 62). I have examined only three adult males from Japan. One of these, from Kyushu in the USNM, has a bill of 55 mm., and might possibly be considered *orientalis,* but as the bills of the other two, a USNM skin from Hokkaido and an AMNH bird from Osaka, measure 57.5 and 57 mm. respectively, all three seem more certainly referable to *merganser* than to *orientalis.* Bergman (1935: 231) refers his breeding specimens from Kamchatka and the Kuriles to *M.m.merganser,* which on geographical grounds should also be the wintering population of Japan. If *M.m.orientalis* occurs in Japan at all, it is perhaps a rare visitor to the westernmost parts.

The Goosander is an uncommon winter visitor in Japan, occasionally found in the shallow bays and brackish marshes but usually frequenting inland lakes. It has been taken on all four main islands, and occasionally winters in the southern Kuriles, but is nowhere plentiful. The specimen records indicate it occurs most frequently in late winter and spring. Very few autumn records exist. The earliest is 1 November 1926 at Aomori Prefecture. Most of the Kyushu and Honshu specimens were taken between January and March, the Hokkaido specimens from mid March to late April. Nothing definite is known of its flight routes.

97. Mergus serrator serrator Linné

RED-BREASTED MERGANSER

Japanese: Umi aisa (sea merganser)

Mergus Serrator Linné, Syst. Nat., ed. 10, **1**, 1758: 129 (Sweden).

The Red-breasted Merganser is a not uncommon winter visitor in Japan, more plentiful than the Goosander, especially in salt waters. It reaches Hokkaido in October, northern Honshu in early November, and the Kwanto Plain area in late November, evidently following down the Pacific coasts of Hokkaido and northern Honshu from farther north. It winters in the coastal bays from Hokkaido to Kyushu, seldom in large numbers, the flocks usually averaging from 10 to 30 individuals. The birds start pairing off in February and are seen courting and posturing in March. The last leave Honshu for the north in mid April, but stragglers have been observed in Tokyo Bay in early May. Like the other mergansers it is a daytime feeder, and exists almost entirely on fish, which imparts to its flesh a flavor relished by few palates.

ACCIPITRIDAE

98. Pernis ptilorhynchus orientalis Taczanowski

HONEY BUZZARD

Japanese: Hachikuma (bee bear)

Pernis apivorus orientalis Taczanowski, Faun. Orn. Sib. Or., **1**, 1871: 50 (eastern Siberia).

Pernis apivorus japonicus Kuroda, Dob. Zas., **37**, 1925: 225 (Japan). (Synonym)

In his extensive review of the Honey Buzzards, Stresemann (1940:137: 193) recognizes *japonicus* on the basis of measurements supplied by Yamashina which show the wing-lengths of 12 Japanese specimens to average smaller than those of 17 migrant *orientalis* from China. However, as the overlap between the two series of measurements is too great to allow even half the specimens to be identified with certainty, I see no practical value in recognizing the race.

The Honey Buzzard is an uncommon summer resident from May through October in central and northern Honshu and Hokkaido. It breeds in forested areas from 3000 to 4500 feet above sea level in Honshu, at lower altitudes in Hokkaido. It migrates south to Borneo and Sumatra, but occasionally winters in southern Japan. It has been taken in Kyushu, but not as yet in Shikoku. Jahn (1942: 236) found it "not rare" at the foot of Mt. Fuji, but we were never fortunate enough to encounter it in the field.

Kobayashi and Ishizawa (1934: 143) describe five nests they found in the Kitami region of Hokkaido. The nest is placed 10 to 28 meters above the ground, usually in an oak, occasionally in a pine or cedar, "the outer part was covered chiefly with pine twigs with green needles, besides withered twigs. The incubating bed was laid with plenty of green leaves of a broad-leaved tree." The clutch consists of 2 eggs, "broad oval or spherical with a weak lustre. The ground colour is light grey yellow with dense markings of dark red which [*sic*] overlapping one another and sometimes covering all ground colour." Fourteen eggs averaged 51.8 x 42.9 mm.

99. Milvus migrans lineatus (Gray)
BLACK-EARED KITE
Japanese: Tobi (autochthonous)

Haliaetus lineatus Gray, *in* Hardwicke, Ill. Ind. Zool., **1**, 1832: 1, pl. 18 (China).
Milvus melanotis Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1844: 14, pl. 5; 1845: 5B (Japan). (Synonym)

As it flaps and soars lazily around the wharves in Yokohama, the Black-eared Kite is one of the first birds the visitor to Japan sees. The species holds a unique place in Japanese tradition, which stems back to one of the oldest of Japanese legends, that of Jimmu Tenno (*circa* 660 B.C.). This historic warrior, the founder and first Emperor of Japan, was assisted in battle, so the story goes, by a golden kite which perched on his bow and gave off dazzling rays that blinded his enemies. Japan's highest military decoration, the Order of the Golden Kite, was founded on this legend. The descendants of Jimmu's ally have been protected under the game laws only since 1901, but probably have never been disturbed to any extent, for they are quite at home around the cities and towns where they are valued for their services as scavengers.

The Black-eared Kite is a common resident on all the main islands and lesser satellites, and is one of the most noticeable birds in Japan, though not as plentiful as the crows with which it shares the refuse near human habitations. It is a bird of the shores and plainslands, most numerous in the cities and especially around the busy harbors and fishing villages from southern Hokkaido southward where it does the scavenging in the absence of the gulls which usually perform this function in other parts of the world. One or two are always in sight gliding effortlessly over Tokyo, and in winter large flocks of several hundred or more gather to roost in the trees of the more secluded city parks. Less common inland, it occasionally follows the streams up into the mountains, but seldom goes above 2500 feet. However, it has been seen at 5000 feet near Nikko and at 7000 feet at Fuji.

It is not so noticeable in spring when the pairs scatter to breed. It nests high up in large trees in suburban Tokyo as well as in wilder localities, and builds a bulky nest about three feet in diameter 30 feet or more above the ground, of sticks and twigs centered with a mat of leaves, paper, rags, and waste on which the 2 to 4, usually 3 eggs are laid. The eggs are light bluish grey with small brown streaks and markings at the larger end, and measure 57–61 x 44–50 mm. The breeding season starts in late March and continues through May. It nests commonly throughout coastal Honshu, less so in Shikoku and southern Hokkaido, but has not yet been recorded breeding in Kyushu, though there can be little doubt that it does so. It sometimes eats snakes, frogs, rats, and other rodents, but waste fish, meat, and other human garbage and offal are its mainstay.

100. Accipiter gentilis (Linné)

GOSHAWK

Japanese: O-taka (great hawk)

Falco gentilis Linné, Syst. Nat., ed. 10, **1**, 1758: 89 (Swiss Alps). (Extralimital.)

Astur palumbarius Schvedowi Menzbier, Orn. Geog. Eur. Russl., 1882: 439 (Transbaikalia).

Astur gentilis fujiyamae Swann & Hartert, Bull. B. O. C., **43**, 1923: 170 (Sagami Bay, Honshu, Japan).

The breeding Goshawk population of Japan, *A.g.fujiyamae*, is appreciably smaller and much darker than the northern continental *A.g.schvedowi*. I have examined ten spring and summer specimens from Honshu and Hokkaido that agree with the type of *fujiyamae*. Winter specimens from Hokkaido, however, are larger, lighter, less heavily barred, and referable to *schvedowi*. The 1942

Hand-List assigns a single Honshu specimen from the Nagano highlands to *schvedowi*.

The Goshawk is a not uncommon resident in Hokkaido and Honshu. It is known to nest only in Honshu, and is rare in Hokkaido in summer, more plentiful in winter when migrants arrive from the continent. Whether the Japanese population is resident throughout its range or, more probably, moves southward or to lower altitudes after the breeding season, is unknown. It has been taken in Shikoku, but not in Kyushu. The species nests in forested areas, most frequently in the foothills, and has been observed near the summit of the Japan Alps above 7500 feet as well as in the plainslands at sea level.

This species was most highly prized for hawking in ancient and medieval Japan, and its nesting encouraged and rigidly protected by the feudal lords, who set aside large tracts of forest lands especially for its propagation. It is no longer as common as it once was for, in common with most other hawks, it has suffered from the guns of hunters who resent its preying on the pheasants and hares they would like to reserve for themselves.

101. Accipiter nisus nisosimilis (Tickell)

ASIATIC SPARROW HAWK

Japanese: ♂ Konori, ♀ Haitaka (both autochthonous, but haitaka means ashy hawk)

Falco Nisosimilis Tickell, Jour. Asiat. Soc. Bengal, **2**, 1833: 571 (Borabhum, India).

Accipiter pallens Stejneger, Proc. U.S.N.M., **16**, 1893: 625 (Hitachi, Honshu, Japan). (Doubtful form)

The 1912 Hand-List gives *A.n.pallens* as a winter visitor to Honshu from possible breeding grounds in Kamchatka. In the absence of any evidence linking them with a definite breeding locality, the few known very pale specimens to which this name has been applied are best regarded as individual variants or possibly a color phase which appears occasionally throughout the breeding range of the species.

The Asiatic Sparrow Hawk is a fairly common resident in Japan. It has been collected on all the main islands, but is known to breed only in central Honshu. During the nesting season it is found only in the forested mountain areas, most commonly between 2000 and 4500 feet, though it has been observed in summer in the Japan Alps as high as 8000 feet. In the fall and winter it comes down into the plains and lives along the outskirts of the forests or in sparsely wooded areas where it feeds almost entirely on small birds.

Its nesting season is from April through July. The nest is built from 12 to 25 feet up, usually in a pine, cedar, or larch, and constructed of twigs of the same trees. Four to five eggs form a clutch. They are bluish or grayish white with varying brown spots, and measure 40 x 34 mm. in average. According to Kiyosu (Tori, 1936: 124) the incubation period is 35 days and the young leave the nest 28 days after hatching. He found fully grown young in the Japan Alps 10 July. Nagahisa Kuroda found young still in the nest at Nikko 23 July.

102. Accipiter virgatus gularis (Temminck & Schlegel)

JAPANESE SPARROW HAWK

Japanese: ♂ tsumi, ♀ essai (both autochthonous)

Astur (*Nisus*) *gularis* Temminck & Schlegel, in Siebold, Fauna Jap., Aves, 1844: 5; 1845, pl. 2 (Japan).

The Japanese Sparrow Hawk is perhaps an uncommon summer resident in Japan. It has been taken on all four main islands, but in breeding season only in central Honshu. It seems slightly commoner as a transient, and a few occasionally winter, though the species migrates south to the Philippines and the East Indies.

Nothing seems to be known of its breeding other than Taczanowski's (1893: 112) record that Godlewski found its nest and eggs "on the shores of the sea of Japan", evidently on the continent. Yamashina has pointed out (1942: 866) that the three sets of eggs of this species reported by Stuart Baker (Ibis, 1917: 362) as sent him by Owston from Mt. Fuji are by size and color more likely those of *Accipiter nisus* which nests there commonly. Uchida and Ishizawa (Choju Chosa Hok., 1927: 6) report *virgatus* as a breeding bird at Mt. Fuji, but without evidence other than its occurrence there during the nesting season. Kiyosu (Yacho, 1936: 921) believes it possibly breeds in the Japan Alps at about 4500 feet altitude. He collected an adult female chasing a female Mallard at Kamikochi in late May, and has observed the species there several times in mid June.

103. Buteo rufinus hemilasius Temminck & Schlegel

UPLAND BUZZARD

Japanese: O-nosuri (great buzzard)

Buteo hemilasius Temminck & Schlegel, in Siebold, Fauna Jap., Aves, 1844: 18, pl. 7 (Japan).

Although this species winters not uncommonly in nearby Korea, the only record for Japan is the single type specimen in the Leyden Museum described by Temminck and Schlegel. It probably came from Kyushu, and near Nagasaki.

104. Buteo buteo burmanicus Hume
EURASIAN BUZZARD
Japanese: Nosuri (autochthonous)

Buteo burmanicus Hume, Stray Feath., **3**, 1875: 30, in text (Upper Burma).

This is the common large hawk of Japan. It breeds from Hokkaido through Honshu and Shikoku, and winters throughout its range as well as south to the Ryukyus, Formosa, and south China. It is largely a bird of the fields and open woods of the lowlands, plains, and foothills, rarely observed above 4500 feet altitude.

In Honshu it nests from May to July, usually in the lower hills from 2000 to 4000 feet, building its nest most often in pines from 20 to 30 feet above the ground. The clutch usually consists of 2 to 3 eggs, rarely 4, and the hatching time is given by Kiyosu (Yacho, 1936: 858) as 28 days.

A detailed study of its food habits by Ishizawa and Ikeda (1949) showed the contents of 84 stomachs to be by number: insects 43.5 per cent, mammals 27.9 per cent, amphibia 22.3 per cent, birds 4.9 per cent, reptiles 1.4 per cent, and by weight: rodents and moles 49.5 per cent, frogs 39.7 per cent, birds 8.4 per cent, snakes 2.4 per cent.

105. Buteo lagopus kamtschatkensis Dementiev
ROUGH-LEGGED BUZZARD
Japanese: Keashi-nosuri (hair-legged buzzard)

Buteo lagopus kamtschatkensis Dementiev, Orn. Monatsb., **39**, 1931: 54 (mouth of the Kikhchik River, Kamchatka).

Although but five specimens have been taken in Hokkaido, there are enough reliable sight records in the literature to establish this species as a regular but uncommon winter visitor there. It is observed most frequently along the coasts, but is occasionally found in the southern plains areas where it is accused of preying on the introduced pheasants. It has been taken as far south as the Ryukyus and Formosa, but is a rare winter straggler south of Hokkaido. There are three Honshu records:

Honshu, Yamagata		winter 1912	Ishizawa coll.
"	"	9 Jan. 1922	Ishizawa coll.
"	Nagano, Nagano City	14 Mar. 1918	Takamatsu coll.

106. Butastur indicus (Gmelin)

FROG HAWK

Japanese: Sashiba (autochthonous)

Falco indicus Gmelin, Syst. Nat., ed. 10, **1**, pt. 1, 1788: 264 (Java).

This species is a not uncommon summer resident in the wooded areas of the foothills from central Honshu southward. It nests in Honshu north to Yamagata Prefecture, usually below 2500 feet, in the Izu Islands and in Shikoku. The nesting season is from May through July. The nest is built from 15 to 40 feet up, usually in an evergreen. The clutch numbers 2 to 4 eggs, and the incubation period is reported by Kawaguchi (Tori, 1916: 11) to be 21 days.

The Frog Hawks are noted for their habit of migrating in large flocks, particularly in the autumn. Scattered pairs arrive in Japan in early April to select their territories and rear their broods. In mid September they start moving down the highlands of Honshu. By the time they reach southern Kyushu in early October the flight is so concentrated it is known in Kagoshima and Yakushima as the "taka-kudari" (descent of hawks). The birds are said to pass this area in tens of thousands, filling the sky for several days as they move steadily southward from 300 to 500 feet up (cf. Kawaguchi, Choju Iho, 1929: 72–98). After Yakushima their next stop is Tokunoshima, where they arrive so exhausted they can sometimes be caught by hand. They then fly past the Kerama Islands to Miyako Island in the southern Ryukyus, and are at first so weary they light on the open beach. After resting a week or so they again climb into the sky and continue on their way southward.

107. Spizaetus nipalensis orientalis (Temminck & Schlegel)

HAWK-EAGLE

Japanese: Kumataka (bear hawk)

Spizaëtos orientalis Temminck & Schlegel, in Siebold, Fauna Jap., Aves, 1844: 7, 1845, pl. 3 (Japan).

The northernmost race of this splendid bird, the largest of the hawks in Japan, is endemic to the four main islands, and has been found breeding on all but Shikoku. In Honshu it is a bird of the high mountain forests, usually remaining above 4000 feet except in winter when it comes lower down. In Hokkaido it occurs more commonly in the plains areas throughout the year. It is not uncommon in the Japan Alps, where it preys on ptarmigans and hares and can often be seen circling high over the topmost peaks, going higher and higher until it is small in the sky. Kiyosu (Yacho, 1936: 919) found a nest at 4800 feet in the Japan Alps, 30 feet from the ground in a large tree. The laying season is late March to late April. The normal clutch consists of 3 eggs which measure about 70 x 55 mm.

108. Aquila chrysaëtos japonica Severtzov

GOLDEN EAGLE

Japanese: Inuwashi (dog eagle)

Aquila fulva japonica Severtzov, Nouv. Mém. Soc. Imp. Nat. Moscou, **15**, livr. 5, 1888: 182 (Japan).

The Golden Eagle is a bird of the high altitudes in Japan, an inhabitant of the mountain fastnesses, remaining above 4000 feet throughout the year. It has been taken on all the main islands except Kyushu but is nowhere plentiful and is known to breed only in Honshu.

Its nesting was studied by Kiyosu (Tori, 1937: 301) in the Japan Alps in Nagano Prefecture. The nesting site is usually a ledge on a high cliff. The large, bulky nest, from four to seven feet in diameter and four feet high, is added to annually with sticks of spruce and fir, and lined at the center with grasses. It generally lays from mid March to early April, though there is one record for late February in the Kiso Mountains. The normal clutch contains two eggs, bluish white with irregular reddish-brown markings, measuring 65–77 x 56–60 mm. The young are fed on birds, mammals, fish, and snakes. Pheasants and rabbits are the chief items, and the remains of monkeys, carp, foxes, and night herons have been found in the nest.

109. Aquila heliaca ricketti Swann & Wetmore

IMPERIAL EAGLE

Japanese: Katajiro-washi (white-shouldered eagle)

Aquila heliaca ricketti Swann and Wetmore, Monogr. Bds. Prey, **2**, 1934, pt. 10: 42 (Foochow, China).

This continental species is known in Japan from a single undated specimen in the former Kuroda collection, taken at Miyako in Iwate Prefecture.

110. Haliæetus albicilla (Linné)

WHITE-TAILED SEA EAGLE

Japanese: Ojiro-washi (white-tailed eagle)

Falco Albicilla Linné, Syst. Nat., ed. 10, **1**, 1758: 89 (Sweden).

The White-tailed Sea Eagle is a not uncommon winter bird along the coasts of Hokkaido. Farther south it is quite rare, though it has been taken on all the main islands and as far south as Hachijo in the Izu Islands. Largely a fish eater, it usually forages along the ocean beaches, but occasionally it follows the larger rivers inland and visits lakes in the interior. Jahn (1942: 235) observed the species in the Akan region of Hokkaido 16 July 1939 and thought it might breed there, but there is no definite evidence of its so doing.

111. Haliæetus pelagicus pelagicus (Pallas)

STELLER'S SEA EAGLE

Japanese: O-washi (great eagle)

Aquila pelagica Pallas, Zoogr. Rosso-Asiat., **1**, 1811: 343 and pl. (Islands between Kamchatka and America).

This high northern species is a rare winter visitor to coastal Hokkaido. Specimen dates range from November to April. It occasionally straggles farther south. It has been taken in Honshu and Shikoku, and one was seen by Yamashina on Torishima, the southernmost of the Izu Islands, 15 February 1930, feeding on Steller's Albatrosses that were unable to fly out of the crater of the volcano (Tori, 1942: 235). Its main food, however, is fish.

112. Aegypius monachus (Linné)

CINEREOUS VULTURE

Japanese: Hage-washi (bald eagle)

Vultur Monachus Linné, Syst. Nat., ed. 12, **1**, 1766: 122 (Arabia).

This tremendous continental vulture has wandered casually to Japan as follows:

Hokkaido, Kushiro	Dec. 1925	Kushiro School coll.
Honshu, Fukushima, Iwashiro	undated	1932 Hand-List
Honshu, Shizuoka, Totomi	1 Dec. 1925	Kuroda coll.
Shikoku, Kochi, Tosa	13 Dec. 1935	Ito coll. (Yacho, 1940: 74)

113. Circus cyaneus cyaneus (Linné)

HEN HARRIER

Japanese: Haiiro chuhi (gray harrier)

Falco cyaneus Linné, Syst. Nat., ed. 12, **1**, 1766: 126 (London).

The Hen Harrier is a rather rare winter visitor to the lowlands of all four main islands. It usually appears in late October or early November, and leaves by March or early April.

114. Circus aeruginosus spilonotus Kaup

MARSH HARRIER

Japanese: Chuhi (autochthonous)

Circus spilonotus Kaup, Isis, 1847, col. 953 (eastern Siberia).

The Marsh Harrier is a rather uncommon summer resident in Hokkaido, and somewhat commoner as a winter visitor to Honshu and Shikoku, appearing along the coastal marshes in October and November and leaving in April.

Kobayashi (Tori, 1931: 169) collected a clutch of four eggs 17 May in Hokkaido; Yamashina (1941: 830) another of four eggs 3 June. The nest is on the ground in a marsh. The eggs are whitish with pale markings, and measure 51.5–54.5 x 37–40 mm.

115. Pandion haliaetus haliaetus (Linné)

OSPREY

Japanese: Misago (autochthonous)

Falco Haliætus Linné, Syst. Nat., ed. 10, **1**, 1758: 91 (Europe).

When he described *P.h.friedmanni* from the Kingan Mountains of northern Manchuria, Wolfe (Auk, 1946: 586) examined six Japanese specimens and found them to be typical *P.h.haliætus*.

The Osprey has been taken on all four main islands and most of the satellites, but is not a common bird in Japan, except locally where it nests on islets along the Honshu coast, sometimes in small colonies. Kawaguchi (Choju Iho, 1930: 166–188) saw nests at Tsushima, the Goto and Oki islands, and in the Kashiji Islands off Kagoshima Prefecture, Kyushu. Kobayashi (Chojo Hok., 1932: 464) reports a colony on Numashima, a steep rocky island off the coast of Hyogo Prefecture, where he saw 15 birds and counted 12 nests, 10 of them in pine trees overhanging the cliff, 2 in the middle of the cliffs on ledges about 120 feet above the sea. Colonel Wolfe (*in lit.*) writes me of another small colony on the islands just off Kobe in the Inland Sea. We saw a bird on her nest on top of a small but inaccessible bare rocky islet just a few hundred yards off shore on the west coast of Aomori in early June 1948. Jahn (1942: 238) observed the species in Hokkaido 10 July 1938, but its breeding there has yet to be verified. In southern Japan it occurs mainly as a bird of passage. It winters south to the Philippines and south China.

FALCONIDAE

116. Falco rusticolus uralensis (Severtzov & Menzbier)

GYRFALCON

Japanese: Shiro hayabusa (white falcon)

Hierofalco uralensis Severtzov & Menzbier, Orn. Geogr. Eur. Russl., 1882: 288, pl. 3 (Ural Mountains).

The 1942 Hand-List refers the few Japanese specimens of Gyrfalcons to *F.r.obsoletus*, the large, dark race of North America. The Gyrfalcons are notable for their individual variability, and large series are frequently necessary to determine the racial affinities of a population. On geographical grounds the Japanese Gyrfalcons should be *uralensis* which breeds across Siberia to Kamchatka and the coasts and islands of the Bering Sea. This race has been collected in Sakhalin in July 1930 and in the Kuriles in August 1924.

The Gyrfalcon is a rare winter visitor to Hokkaido. Koyama (Dob. Zas., 1935: 612) reported obtaining a Gyrfalcon in the Japan Alps in August, but the specimen is not traceable for verification. The specimen record:

Hokkaido,	Otaru	Feb. 1894	Sapporo Mus.
"	Yubutsu	25 Dec. 1919	Kuroda coll.
"	Abashiri	Jan. 1950	Nakazone coll.
"	Hakodate	15 Mar. 1884	USNM, *ex* Blakiston
"	"	undated	Henson coll. (Seebohm 1890: 192)

117. Falco peregrinus japonensis Gmelin

PEREGRINE FALCON

Japanese: Hayabusa (autochthonous)

Falco japonensis Gmelin, Syst. Nat., **1**, (1), 1788: 257, no. 44 (off the coast of Japan).

Falco rudolfi Kleinschmidt, Falco, **5**, 1909: 19 (Hakodate). (Synonym)

The racial affinities of the eastern Asiatic populations of this plastic and variable species have not yet been satisfactorily determined, and will not be until much more adequate breeding-ground material is available. However, there is no question of the validity of the Gmelin name for the Peregrine population of Japan (cf. Austin, 1948a: 79, and Stresemann, Ibis, 1949: 253). The 1942 Hand-List claims that *F. p. peali*, the dark Alaskan race, breeds in the northern Kuriles and winters casually southward. Two Hokkaido specimens in the Sapporo Museum, one from Akkeshi, one from Hakodate, have been attributed to *peali*, but whether these darker birds are actually of the Alaskan population, or are merely melanistic individuals from northeastern Asia cannot be determined.

The Peregrine Falcon is a fairly common winter visitor to all four main islands, and an uncommon summer resident in Hokkaido and northern Honshu. It has long been believed to breed on some of the smaller, cliffy offshore islands, for it nests near by in southern Korea and in the Kuriles, but definite evidence of its nesting in Japan was obtained only recently. Yacho, **17** (5) contains a photo of a nest and young found near the border of Tottori and Hyogo prefectures in 1952. Another nest with three young was found in the Kamo area of Niigata Prefecture in 1952 by Sgt. Moyer, USAF. Flight birds arrive in central Honshu from early September to October, and leave in March and April. It is met with most frequently along the rocky coasts of off-shore islets, and at the mouths of rivers or in lakes where waterfowl and shorebirds congregate. It is also seen frequently in the cities where tame pigeons are an easy prey for it, and is a habitual visitor to the Chiba duck ponds where its presence is not welcomed by the netters.

The Japanese valued the Peregrine equally with the Goshawk for falconry. They caught Peregrines for training along the dune lands of the Ibaraki and Fukushima coasts by luring the passing migrants in the autumn to a tethered plover decoy and entangling them on lime-strings.

118. Falco subbuteo subbuteo Linné

HOBBY

Japanese: Chigo hayabusa (child falcon)

Falco Subbuteo Linné, Syst. Nat., ed. 10, **1**, 1758: 89 (Sweden).

Colonel L. R. Wolfe has pointed out to me (*in lit.*) that Hokkaido specimens of the Hobby lack the buffy wash on the face, breast, and upper parts. This seems to be an age or sex character, for it is absent in all the good spring adult males I have seen from eastern Asia. Three of the four Hokkaido specimens

I have examined are indeed quite pale, but no more so than other northern specimens from Siberia and Europe.

The Hobby is a not uncommon summer resident in Hokkaido and a rare winter visitor farther southward. A few specimens have been collected in winter in Honshu and Shikoku, but its occurrence south of Hokkaido is so casual it suggests the Hokkaido summer residents probably migrate southward via the mainland.

In Hokkaido it inhabits the small oak woods interspersed with brush and pasture lands. Jahn (Yacho, 1939: 148) found it breeding near Shimoyubetsu, and Kobayashi and Ishizawa (1935: 234) describe two nests and clutches they found near Kitami. One nest "was placed 10 meters above the ground in a *Quercus glandulifera*. It was made chiefly of withered twigs. It was 50 cm. in outer diameter and 30 cm. in height. Inside it was laid plenty of twigs or green white birch leaves." The other nest was 15 meters up in the same kind of tree. A full clutch contains three eggs. These are "light grayish yellow with small spots all over the surface and more particularly about the obtuse end", and measure 38–40.8 x 30.5–33.5 mm.

Fennell found a pair of Hobbies apparently in residence 21 June 1951 at Daikokujima, Hokkaido, and thought they were preying on the Leach's Petrels breeding there. He writes (1953: 39), "Bloody remains of wings and feathers of the petrels were observed along the edges of the steep cliffs . . . and although I failed to see a Hobby in the act of capturing or devouring a petrel, the evidence indicated that they did." Such remains seem more typical of mammalian than avian predation, and as petrels almost never visit their nesting grounds in daylight or come out of their burrows except after dark, it is difficult to imagine a strictly diurnal bird of prey like the Hobby catching more than a rare stray individual or two.

119. Falco columbarius insignis (Clark)

MERLIN

Japanese: Ko-chogenbo (small kestrel)

Aesalon regulus insignis Clark, Proc. U. S. Nat. Mus., **32**, 1907: 470 (Fusan, Korea).

From the specimen record the Merlin is an uncommon but regular winter visitor to Japan, commoner in the northern sections than in the south. It has been taken on all the main islands, but is never plentiful.

Its season of occurrence is from October to April. Very little is known of its habits in Japan, which presumably do not differ from those elsewhere in its range. Jahn (1942: 230) reports he found it "not rare" in the Kobe district, where it courses over the paddy lands preying on Skylarks and Pipits.

120. Falco tinnunculus interstinctus Horsfield
KESTREL
Japanese: Chogenbo (autochthonous)

Falco interstinctus Horsfield, Proc. Zool. Soc. London, 1839 (1840): 154 (Assam).

Falco tinnunculus japonicus Temminck & Schlegel, in Siebold, Fauna Jap., Aves, 1844: 2, pl. 1 & 1b (Japan). (Synonym)

Cherchneis orientalis Brehm, Naumannia, **1**, 1855: 75 (Japan). (Synonym)

Falco tinnunculus japonensis Ticehurst, Bull. B. O. C., **50** (1), 1929: 10 (nom. nov.). (Synonym)

I find no recognizable differences between Japanese specimens and those of Korea and China. The Japanese population is inseparable from the southern race which breeds from north China, Manchuria, and southeast Siberia to central Korea and Honshu.

The Kestrel is a not uncommon resident in Japan, breeding in the highlands and wintering in the open lowlands. While it has long been suspected, its nesting in Japan has only recently been verified. Hosono (Yacho, 1950: 153–158) found an extensive colony in Nagano Prefecture, where some 20 or more pairs nest in a 75-foot clay cliff along the Chikuma River, and which he observed closely during the 1948, 1949, and 1950 nesting seasons. The eggs are chestnut in color with deeper spots all over the surface, and measure 39 x 30 mm. They are laid at the back of five-foot tunnels dug into the cliff. Those examined contained 3 to 6, usually 5 eggs to the clutch. The old birds forage far afield, mainly on small rodents. The remains of one Meadow Bunting were found at the foot of the cliff.

The Kestrel is observed in summer up to 7500 feet in the Japan Alps. Though some individuals migrate southward to Formosa and south China, a great many winter in the warmer parts of Japan where they course over the open fields and hover over straw-stacks in search of small rodents.

TETRAONIDAE

121. Lagopus mutus japonicus Clark

ROCK PTARMIGAN

Japanese: Raicho (autochthonous, but means thunder bird)

Lagopus japonicus Clark, Proc. U. S. Nat. Mus., **32**, 1907: 469 (Mts. of central Honshu, Japan).

The Rock Ptarmigan of Japan is an isolated, relict population limited to a few high peaks above the tree line at 7500 feet in the Alps of central Honshu. Taka-Tsukasa (1943: 293–314) gives an excellent and detailed account in English of its known distribution and ecology. It never comes below the tree line, but has been found during the last half century on 60 peaks in the northern, central, and southern Alps, eastward to Mt. Hakusan in Ishikawa Prefecture, north to Mt. Asahi in Toyama, west to Mt. Okagoyama in Yamanashi, south to Mt. Kamigochidake in northern Shizuoka, a rectangular area roughly 100 miles north and south, 80 miles east and west. It nests from May to July; the clutch varies from 5 to 12 eggs; incubation by the female alone lasts three weeks. It completes its post-nuptial molt into the pure white winter plumage in early November. The spring molt begins in March and is completed in June. In clear weather the ptarmigan remains under cover, probably in fear of its enemies, the hawks. Mountain climbers see it most often, and usually at close range, in rainy or foggy weather when it comes out into the open on the trails.

The Ptarmigan owes its survival in competition with mankind in present day Japan to its unique position in Japanese folk-lore, which credits it with divine powers. It is associated particularly with a temple on Mt. Hakusan believed to have been built in 716 A.D. Superstitions of its powers have been strong since medieval times, when it was believed to be the messenger of the Gods of the high mountains, and a particularly efficacious charm against the perils of thunderstorms, which come up quickly and without warning and can be dangerous to travelers on the treacherous trails at high altitudes.

The species was made a Natural Monument in 1922, which has prevented it from becoming a legal game bird and helped it to maintain its unique position. But the mountain tops are popular places for vacations, and more and more people are invading the birds' retreat every year. The old superstitions are dying, and enlightened present-day mountaineers have no religious or other scruples against killing the birds for a meal. The Ptarmigan population is gradually declining, and unless a determined effort is made to protect it in these times of changing ethics and morals, it may not last much longer.

122. Tetrastes bonasia vicinitas Riley
HAZEL GROUSE
Japanese: Ezo-raicho (Hokkaido ptarmigan)

Tetrastes bonasia vicinitas Riley, Proc. Biol. Soc. Washington, **28**, 1915: 161 (Hakodate, Hokkaido, Japan).

The Hazel Grouse population of Hokkaido is separable from the mainland *T.b.amurensis* on color, not on size. My series of eight Hokkaido males are redder brown on the head, back, and scapulars, and have darker centers to the breast and belly feathers than males from Korea, Ussuria, and Amuria. The females are slightly darker, but difficult to differentiate except in series. The white scapular character mentioned in Riley's original description is an individual, not a geographical variable. Sakhalin specimens (separated as *T.b.yamashinae* by Momiyama) are indistinguishable from the Hokkaido birds.

The Hazel Grouse is a common resident of forested areas throughout Hokkaido, and reaches its southern limit at Blakiston's line on the north shore of Tsugaru Straits. It was formerly much more abundant in the lowlands, but has decreased as the human population of Hokkaido has increased and cleared the lowland forests for cultivation. It is still fairly abundant in the less accessible mountain regions, where it breeds almost to the tree line. I saw 15 in a single day of climbing on Mt. Daisetsu. Kiyosu (1943: 107) gives its nesting season as late May and June, and its clutch from 6 to 14 eggs. So tame and stupid a bird needs to be prolific to survive. Its flesh is delicious, but it is anything but a good game bird for when flushed it usually lights in a nearby tree and looks down complacently at the intruder, within easy pistol range.

PHASIANIDAE

123. Coturnix coturnix japonica Temminck & Schlegel
QUAIL
Japanese: Uzura (autochthonous)

Coturnix vulgaris japonica Temminck & Schlegel, in Siebold, Fauna Jap., Aves, 1849: 103, pl. 61 (Japan).

The Quail is a common summer resident in Hokkaido and northern

Honshu south to the foothills of the Japan Alps, and a migrant and winter visitor elsewhere in Japan. A bird of grassy flatlands, cultivated or abandoned fields, pastures, and dry marshes, its habitat preferences cause it to be rather localized in its distribution. The species arrives in Hokkaido in April and leaves in early November. Early migrants reach the Tokyo area in mid September but the main flights do not appear until late October or early November. Its season in Kyushu is from October to late March.

A popular sporting and table bird in Japan, the Quail has decreased markedly in numbers in the last half century, and its steady decline is still apparent. The statistics collected and published by the Ministry of Agriculture and Forestry show the yearly harvest by hunters to vary considerably, but with a steady decline manifest from an average of more than 500,000 birds annually in the early 1930s to less than 200,000 in recent years. Hunters in Chiba 40 years ago could net 200 Quail per day. Today five or six is considered a good day's bag. In the Subashiri area near Mt. Fuji, netters at the turn of the century had no trouble catching 50 or more birds per day. Kuroda noted in 1926 that the species had become "very hard to find" there, and it is now even rarer. Hunters in southern Kyushu are complaining of the species' marked decrease in their area during the past ten years.

The Quail formerly nested commonly on the outskirts of Tokyo in Chiba Prefecture, but it has not been seen there in summer for several decades. The former breeding population of central Honshu seems almost to have disappeared. The species still nests fairly commonly in the plainslands of Hokkaido, however, in the Ishikari river basin and in the Tomakomai and Kushiro areas. It is somewhat less common in summer in northern Honshu in the Lake Ogawara district of Aomori and the Koiwai pasture lands of Iwate Prefecture. Its breeding season is from late May through September, and it is apparently multi-brooded. Young have been found as early as 2 June and as late as 28 September, fresh eggs as late as 30 August. It lays from 7 to 12 pale, yellowish-gray eggs with marking of dark chocolate brown, which average 28.8 x 22.4 mm. in size. Incubation by the female alone lasts 16 to 21 days.

Recoveries of banded birds have shown the Quail's movements in some detail. From birds banded on the Ishikari Plain near Sapporo in summer, 77 recoveries have been taken to the southward. Seventy-two of these were taken in Honshu, all but one on the Pacific side of Japan, most of them between Chiba and Wakayama prefectures.

Only four reached Shikoku, and a single bird was taken in Fukuoka, northern Kyushu. Of 14 recoveries of Quail banded in summer in Aomori, 12 were taken in Honshu between the Kwanto and Kansai plains, 2 in southern Shikoku. The birds that breed in Hokkaido and northern Honshu thus migrate southward along the Pacific coast of Honshu and winter mainly between Fukushima and Okayama prefectures, occasionally to southern Shikoku, and rarely to Kyushu.

Large numbers of wintering Quail were banded in southern Shikoku and southeastern Kyushu in the early 1930s. Most of their recoveries were obtained in the immediate vicinity, but of the Shikoku bandings 28 were taken in Honshu, most of them due north and east of Shikoku between Hiroshima and Shimane, and Shizuoka and Nagano; only one went as far east as Saitama; two were recovered on Hachijo Island, and 16 in Kyushu. Of the Quail banded in Miyazaki and Kagoshima prefectures, Kyushu, eight were taken in Shikoku, five in western Honshu, one in Mie, one in Saitama (the farthest eastward), and three in Korea. Some interchange is thereby evident between the wintering populations in Kyushu, Shikoku, and western Honshu. The birds wintering in Kyushu seem to come mostly from Korea and the Japan Sea side of Honshu, and not from the population breeding in Hokkaido and northern Honshu.

The heaviest flight is the movement down the Pacific side of Honshu. A smaller migration comes through the central highlands, a fairly light one along the Japan Sea coast (probably local resident birds or stragglers from the other flights) and a larger one again from Korea to Kyushu. This is reflected by the bags reported from the various prefectures to the Ministry of Agriculture and Forestry. A typical recent year, 1942, shows the following totals:

HONSHU

Pacific Coast		*Central Prefectures*		*Japan Sea Coast*	
Iwate	336	Aomori	25	Akita	35
Miyagi	637	Tochigi	7558	Yamagata	232
Fukushima	2545	Gumma	5931	Niigata	159
Ibaraki	13436	Yamanashi	4311	Toyama	36
Saitama	17028	Nagano	2645	Ishikawa	125
Chiba	24647	Gifu	6571	Fukui	905
Tokyo & Kanagawa	9054	Shiga	2771	Tottori	123
Shizuoka	21069	Kyoto	3075	Shimane	110
Aichi	19010	Osaka	5177	Yamaguchi	434
		Nara	1901		

Mie	8864	Hyogo	4712	KYUSHU	
Wakayama	4256	Okayama	2962	Fukuoka	4486
		Hiroshima	555	Saga	3917
SHIKOKU				Nagasaki	1621
Kagawa	724			Oita	3602
Ehime	2955			Kumamoto	8960
Tokushima	4700			Miyazaki	9884
Kochi	17253			Kagoshima	11292

The 1007 recoveries obtained from 12,554 Quail banded between 1925 and 1937 show a shooting and netting toll of only 8 per cent, which seems abnormally low for a game species. Either the ratio of birds reported to those actually killed is phenomenally low, or the Quail is subject to a much greater natural, that is non-hunting, mortality than hitherto suspected. As 89.4 per cent of the recoveries were taken within the first year after banding, 9.3 per cent the second year, and only 1.2 per cent survived into the third year, an average annual mortality of about 90 per cent is indicated, showing the Quail to be very short-lived in the wild, and the population "turn-over" to be practically complete every two years. Under such circumstances the survival of each year's crop of young is of critical importance, for even a single unfavorable breeding season can reduce the available breeding-stock to the danger point. The steady downward trend of the Quail population during the last several decades emphasizes the need of immediate remedial measures to restore the species to some semblance of its former abundance. Further limitation of the annual kill by a shorter season is certainly warranted; even better would be to close the season entirely until the downward trend is halted and the population safely on the upgrade again.

Quail are raised in captivity in Japan with great success, and have become the basis of a commercial egg business. As a food delicacy the tiny eggs take their place by the side of sturgeon roe as a gourmet's specialty in the city markets. The birds are kept in batteries of small wooden cages, each barely large enough for a bird to turn around in, and roofed with cloth netting to prevent head injuries. Under these conditions, and fed a bran mash with a high protein content they are most prolific, some females laying as many as 250 eggs per year.

124. Bambusicola thoracica thoracica (Temminck)

BAMBOO PARTRIDGE

Japanese: Kojukei (small ribbon-fowl; also imitative of the call-note)

Perdix thoracica Temminck, Pig. et Gall., **3**, 1813: 335, 723 (India = China).

A native of eastern China south of the Yangtse, the Bamboo Partridge was introduced to Japan only 30 years ago. Since then it has spread over much of Honshu, Shikoku, and Kyushu. It thrives in the warmer areas wherever there is brush growth or bamboo thickets to shelter it, and is now common in the parks and gardens of Tokyo, Yokohama, Nagoya, Kobe, and other coastal cities. Its loud, piercing, repetitive, whippoorwill-like call-note is the most insistent and noticeable bird voice to be heard in the Tokyo suburbs.

It was introduced fortuitously in Tokyo and Kanagawa in 1919 when a few birds escaped from the private aviaries of T. Iwasaki. These survived so well that the Ministry of Agriculture and Forestry propogated additional stock at its Hodogaya Game Farm and made additional plantings through the 1920s and early 1930s, at first near Tokyo, then near Nagoya, in the Lake Biwa area, in the Kobe Osaka region, and finally in Shikoku, in Kyushu, and on several of the Izu Islands. The bird took hold slowly at first, but with additional plantings it spread rapidly. The Tokyo-Kanagawa nucleus is now the center of a population that extends throughout the Kwanto Plain and into the foothills in Chiba, Ibaraki, Saitama, Yamanashi, and Shizuoka prefectures. The bird is common down the Izu Peninsula as far as Atami, and has pushed inland to the plains around the base of Mt. Fuji. A few have straggled northward to Miyagi, and it has been reported from Aomori, but it does not do well in the north and has not established a foothold there. Plantings on the Japan Sea side of Honshu in Toyama and in the highlands of Nagano have likewise been unsuccessful, probably because the winters are too severe for it.

From the game-management standpoint the introduction has been most worthwhile. The Bamboo Partridge is an excellent sporting bird, of fair size and fine flesh, flushing close and flying straight and fast. It thrives in covers long untenable for and deserted by the indigenous Green Pheasant, and so far shows no sign of dispossessing the latter from any of its present range. Short open seasons were first allowed in Kanagawa Prefecture in 1931, in Saga Prefecture, Kyushu, in 1935, and in other areas as the stock spread and increased until by 1942 ten prefectures had open seasons. The bags were small, however, and seldom were more than 5000 taken annually. The reported bag in 1939 was 1559; 4343 were reported in 1942, and 9134 in 1946. The species was added to the general list of game birds in 1947, and in that year 100,680 were reported killed by hunters. It is withstanding the onslaught very well so far, and probably will continue to survive in the suburban areas within city limits where it cannot be shot.

In some areas it has done considerable damage to upland crops such as tomatoes and hard grains. An outstanding example occurred at Miyake Island in the Izu chain where a few pairs were released just before World War II. They increased more rapidly than the few local hunters, hampered by lack of ammunition (they were allowed only 50 rounds apiece annually during the war years), could keep them under control. Ecological conditions apparently were ideal for the birds, and they became so numerous that the farmers complained of their inroads on the crops. A few complaints of crop damages have also been reported on the main islands, but none has been taken seriously, and no investigation of the bird's economic status has been made.

125. Phasianus colchicus karpowi Buturlin

RING-NECKED PHEASANT

Japanese: Korai kiji (pheasant of old Korea)

Phasianus karpowi Buturlin, Orn. Monatsb., **12**, 1904: 3 (Te-lin, southern Manchuria).

The Bird and Mammal Experiment Station of the Ministry of Agriculture and Forestry imported Ring-necked Pheasant stock from southern Korea in 1919, propagated it at its game farm, and started planting it in the wild a few years later. By 1930, after it had been introduced in Aomori, Ibaraki, Tochigi, Gumma, Saitama, Chiba, Tokyo, Kanagawa, Niigata, Toyama, Ishikawa, Fukui, Nagano, Shizuoka, Aichi, Shiga, Kyoto, Hyogo, Nara, Shimane, and Nagasaki prefectures, the plantings were discontinued as of no value. In the wild, the Ring-neck interbreeds freely with the indigenous Green Pheasant, and as the resulting F_1 generation has a very low fertility, the hybrids shortly disappear. The birds planted in Honshu and Kyushu interbred too freely with the native birds to maintain a pure stock, and the Ring-neck strain persisted only for a short time. Practically none of it remains today in the southern islands.

In Hokkaido, where there are no indigenous pheasants to breed it out, the Ring-neck has been more successful. It was first released in pasture lands at Urakawa and Oshamambe on the south coast in October 1930. More were planted in these same places in 1931, and around Uchiura Bay as well. In all only about 300 birds were released, but they thrived, and after 1935 began to spread. By 1940 the Urukawa planting had spread westward to Tomakomai, and by 1944 south to Noborobetsu, north to the Oiwake-Yuni district, and eastward past Cape Erimo into the Hiroo-Ikeda district. Some crop damage was reported south of Sapporo, and a short open season was allowed the winter of 1943–1944. The stock decreased so rapidly that complete protection had to be resumed immediately. Occupation troops accounted for so many between 1946 and 1950 that the bird is no longer plentiful, but a stock still remains along the south coast of Hokkaido where the winters are mild enough for it to survive. With continued protection and additional plantings when necessary to keep the stock vigorous, it should eventually populate the farm lands of this area from which the Hazel Grouse has been driven by cultivation.

126. Phasianus versicolor Vieillot

JAPANESE or GREEN PHEASANT

Japanese: Kiji (autochthonous)

Phasianus versicolor Vieillot, Gal. des Ois., **2**, 1825: 23, pl. 205 (Nagasaki).
Phasianus versicolor robustipes Kuroda, Dob. Zas., **31**, 1919: 299, 309 (Sado Id.).
Phasianus versicolor tanensis Kuroda, Dob. Zas., **31**, 1919: 300, 310 (Tanegashima).

Yamashina (1949) considers *versicolor* conspecific with *colchicus* because he found the F_1 hybrids between the two to be "totally fertile". While this may be true in the breeding pens and in the laboratory, it does not agree with the earlier observations of the crossing of these two forms in the wild (see under *P. colchicus*) which showed the hybrid offspring of the Green Pheasant—Ring-necked Pheasant cross to be only partially fertile. Delacour (1951: 231) notes that: "All forms of True Pheasants replace one another geographically and interbreed freely if brought together, producing completely fertile hybrids. They no doubt constitute the large complex which progressive taxonomists call a superspecies. . . . The males, however fall into two different types of color patterns. . . . Because of this striking difference it seems more appropriate to consider the two groups as separate species, *colchicus* and *versicolor*."

The Green Pheasants show a great deal of individual variation, and the dividing lines between the morphologically recognizable populations are not well marked. A large number of races have been described (for complete synonymy see Taka-Tsukasa, 1944) and the group has been badly oversplit.

There is no geographic size variation, but a general color cline runs from lighter in the north to darker in the south. The northern race, *P.v.robustipes*, which occupies all of Honshu except the western tip in Yamaguchi Prefecture and the Izu and Miura peninsulas, is gray-crowned. The nominate race, *P.v.versicolor* is green-crowned, and extends throughout Kyushu into Yamaguchi Prefecture in western Honshu. The third recognizable subspecies, *P.v.tanensis* is the southernmost bird, and has a disjointed range from the Izu Islands, the Izu and Miura peninsulas of Honshu, through most of Shikoku, to Tanegashima and Yakushima Islands south of Kyushu. This southern bird is characterized by being more purplish and bluish below, and with the back and rump grayer and bluer than the northern and western birds. It is likewise green-crowned. The females cannot be identified subspecifically with any certainty.

The Green Pheasant is a common resident throughout Japan except for Hokkaido, where it does not occur. It occupies the plainslands and foothills up to about 3500 feet, living in sparse woods and brush lands and feeding in the cultivated upland fields where its reported damages to crops are usually exaggerated. A game bird of the first rank, it is possibly the most popular and best known member of the Japanese fauna. It was adopted in 1947 as the "National Bird" of Japan. It has long been integrated into Japanese fantasy and folktales, some of which go back to the fifth century B.C. In Japanese allegories it is symbolic of masculine might and prowess and of maternal love and care of offspring. Japanese children's stories tell how the mother "Kiji" protects her young in the nest, and shields them with her wings even when the fields catch fire. It is also popularly credited with the power to foretell earthquakes. Pheasants always crow in alarm during the frequent Japanese quakes, and doubtless get their reputation as prophets for crowing at the first sign of the minor quakes, too gentle for humans to feel, which frequently precede the major ones.

The mating season starts in Kyushu in January, and progressively later to the northward. Eggs are laid in southern Kyushu in mid March, in Honshu in April. The clutch consists of 6 to 12 brownish to greenish-gray eggs which average 43 x 33 mm. in size and are incubated by the female alone for a period of 23–25 days in the wild. The chicks appear in May, sometimes as late as July. The species is easily raised in captivity, and has been propogated for stocking purposes by the Ministry of Agriculture and Forestry since 1919.

The Green Pheasant was formerly much more plentiful than it is today. Subjected to steadily increasing hunting pressure, its population has declined just as steadily for the last several decades. Although the number of hunters has increased, the annual bags they report have decreased. In 1928 when the figures were first collected, the average total reported was more than 400,000 per year. This declined to about 300,000 in the late 1930s, but the species increased again during World War II when ammunition was scarce and less hunting was done. In 1946 the reported harvest was 486,000; in 1947 (the most recent available) it was down to 319,000 with more hunters afield than ever before. However, the species is still common locally in the wilder parts of Japan and in the game reserves and other sanctuaries where it receives some protection. It is not uncommon in central Tokyo. It nests in the Imperial Palace grounds and in several other more secluded estates and parks, and can often be seen in the park lands ringing the moats behind the palace.

127. Syrmaticus soemmerringii (Temminck)

COPPER PHEASANT

Japanese: Yamadori (autochthonous, but means mountain bird)

Phasianus Soemmerringii Temminck, Pl. Col, **5**, 1830, pls. 8, 9, Nos. 487, 488. (Kyushu).

Phasianus (*Graphophasianus*) *scintillans* Gould, Ann. Mag. Nat. Hist., (3), **17**, 1866: 150 (Yokohama).

Phasianus ijimae Dresser, Ibis. 1902: 656, 657 (Hiuga & Osumi Prov., Kyushu).

Phasianus soemmerringii intermedius Kuroda, Dob. Zas., **31**, 1919: 304, 312 (Iyo Prov., Shikoku).

Phasianus soemmerringii subrufus Kuroda, Dob. Zas., **31**, 1919: 303, 311 (Suruga Prov., Honshu).

Delacour (1951: 220) has summed up most excellently the controversial systematic problems in this difficult species, and I agree with his conclusions: Although the above five races are generally recognized, with the usual cline running from lighter in the north to darker in the south, the changes are gradual and "mixed populations of unstable intermediates" occur everywhere. "It is quite possible that the subspecies *intermedius* and *subrufus* are actually not stable enough to be recognized, but we are not in a position to decide on that point and we provisionally maintain them."

For a complete synonymy see Taka-Tsukasa (1944).

The Copper Pheasant is one of the most striking and certainly the most exciting of all Japanese birds. Limited to Honshu, Kyushu, and Shikoku, its usual habitat is the mountain forests up to 4500 feet.

It occurs near sea level in favorable hilly areas such as in southern Chiba Prefecture and at the tip of the Izu Peninsula, but always in rugged country, and preferably where dark cryptomeria or cypress forests adjoin shrubby mixed woods or grassy hillsides. Its habits and life history have been described most adequately in English by Taka-Tsukasa (1943) and do not need repeating in detail here. The species' breeding season is from March to July, earlier in the south, later in the north. It lays a clutch of 7 to 12 yellowish-brown eggs in a crude nest on the ground near the base of a tree or a large rock, which is incubated by the female alone for a period of 20 to 23 days.

Because its natural habitat has been but little encroached upon by the ever-expanding human population, and because it is difficult to hunt, the Copper Pheasant still remains fairly plentiful. The annual harvest figures of the Ministry of Agriculture and Forestry show comparatively little change in its abundance over the last several decades. An as yet unpublished study of its status in 1949, made by K. Shirai of the Game Management Branch, shows the species had declined somewhat just before World War II, but has increased since, particularly in central Honshu. Shirai considers the Shikoku and Kyushu populations, and local populations in the Hokuriku and Ou districts of Honshu, still to be below normal. He blames this on weather conditions, on an increase of feral cats and dogs, on poaching, and on excessive hunting under the guise of "elimination of noxious birds and animals."

The Copper Pheasant has always been and still is one of the most important of Japanese game birds. It well deserves to be, for it is certainly one of the most sporting birds that exists anywhere. It lives in rough country and the hunter must follow it continually up and down hill. It is usually hunted with mongrel dogs trained to drive it up hill ahead of the hunters. The men pant along behind as the bird works up the draws to the edge of the cover at the very top. It then flushes and dives down the mountainside over the heads of the puffing climbers with amazingly deceptive speed. The hunter must be sound of wind and limb, and quick of eye to cope with it successfully. A brilliant, long-tailed Copper Pheasant running through the green undergrowth, plummeting down a mountainside, or scaling across a golden autumn valley, is one of the most magnificent and thrilling sights in Japan. With moderate protection the species should maintain itself indefinitely. Long may it survive to delight future generations of hunters and bird-lovers!

GRUIDAE

THE CRANES IN JAPAN

Of the six species of cranes known to have occurred in Japan only three, the Japanese (or Manchurian), the White-naped, and the Hooded, were ever more than rare stragglers. These three, however, were abundant throughout the country in feudal times, with the possible exception of northern Hokkaido. Two of them, the White-naped and Hooded, were winter visitors from their continental breeding grounds. The Japanese Crane bred in Hokkaido and Honshu, and perhaps in Shikoku and Kyushu as well. It has always been regarded as *the* crane in Japan, and has been an intimate part of Japanese legend, folk-lore, history, and superstition since earliest times. It is used symbolically in all household ceremonies, especially weddings, as a fetish of good luck and longevity, usually in company with the turtle which is said to live 10,000 years to the crane's 1000.

Cranes were respected in medieval Japan as the most regal of all birds, and were rigidly protected by the ruling classes. The Buddhist restrictions against the killing of animals and the eating of meat were a powerful factor in the preservation of wildlife in feudal times, and the absence of gunpowder and modern weapons and the dictates of long-established tradition were instrumental in maintaining a bountiful wildlife population despite a teeming human one. One of the influences behind the conservation measures which preserved such large game as the cranes was the rulers' favorite sport of falconry. The hunting of cranes was strictly reserved for the ruling classes, and the Japanese crane was considered too noble a bird to be hunted by anyone but the Emperor himself. Goshawks in the Imperial stables had to earn their rank, signified by the color of their jesses or leg-harnesses. Only the few which had killed a Japanese Crane were allowed to wear the coveted purple jesses, symbolic of the highest accomplishment and rank in falconry.

Almost every clan in medieval Japan established extensive preserves called "otomeba" (places to be kept unchanged). These were inviolate sanctuaries for the express purpose of maintaining game for the Daimyo's hawking. The local legal codes provided punishments, frequently death, for anyone who molested a crane in any way, and made it mandatory for commoners not only to report any crane nest they found, but to protect it from harm, and to aid and succor any wounded or helpless crane. Under such conditions all game throve, and the close of the Tokugawa period found the human population of Japan in as successful and happy a balance with wildlife as has ever been attained by mankind.

The impact of the Meiji Restoration on all wild birds and animals was immediate and disastrous. The abolition of feudal controls, the abandonment of large sanctuary areas, the introduction and wide distribution of modern firearms among the peasantry, the industrialization of the country and the phenomenal increase of the already overcrowded human population were all contributory factors. The subjugation of orthodox Buddhism to Shintoism was also of prime importance. With religious controls released, the people learned to eat meat and developed such a liking for it that hunting became profitable and a source of income for the "lordless samurai", a class of lower nobles who were made destitute by the Meiji reforms. The game began to diminish almost before the people were aware of it, and the larger, finer birds, with the cranes at the head of the list, were among the first to go.

The first crude game laws of the modern period, promulgated in 1892, came too late to save the best of the game in its former abundance. Significantly however, "*the* Crane" was the first species to be protected in Japan by these laws. Although Blakiston and Pryer state the Hooded Crane was "not uncommon" in the three southern islands in 1882, the ensuing decade practically wiped out all three species. The Japanese Crane managed to survive in one swamp area in eastern Hokkaido, inaccessible and sparsely populated, and two small groups of Hooded and White-naped Cranes have persisted, one visiting Kyushu, the other western Honshu. The prefectural government of Yamaguchi prohibited the catching of cranes in 1887, five years before protection became nation-wide, and thus succeeded in keeping the cranes returning there winter after winter. The conservation-minded local residents near the sanctuary regarded the birds so highly they organized a "Crane Protection Union" of their own in 1919. The two crane wintering grounds at Akune and Arasaki in Kagoshima Prefecture, Kyushu, which had been preserves for the local Daimyo's hawking in Shogunate days, were devastated by hunters about 1884, but the birds began to return again after protection was given them. When both areas (in Kagoshima and Yamaguchi prefectures) were made Natural Monuments in 1921, the cranes were again the first birds to receive the benefits of a newly-devised protective measure.

The Hooded and White-naped Cranes have been returning to these two sites winter after winter ever since. Their numbers have fluctuated slightly, but they increased slowly and steadily up to the beginning of World War II. The last accurate censuses at Kagoshima (Iio, Yacho, 1940: 603) were as follows:

	1936	1937	1938	1939
Japanese Crane	1	1	0	1
Hooded Crane	2381	2510	3217	3135
White-naped Crane	158	211	347	469
Common Crane	2	2	2	3

No such detailed census was ever made at Yamaguchi, where the crane population is much smaller, but it is believed to have been steady at about 300 birds, all Hooded Cranes. From all reports these sanctuaries were kept inviolate successfully through the war and the occupation, though some slight poaching by occupation personnel occurred at Kagoshima, and the crane populations at both sites are now rumored to be lower than before the war. This might be the result of local poaching, but probably reflects persecution of the cranes along the flight routes in war-torn Korea.

There is no more inspiring sight in the bird kingdom than a flock of cranes in flight. Let us hope they manage to find sanctuary somewhere, somehow, during the present unpleasantness, and survive to delight mankind when peace and settled conditions come again.

128. Grus grus lilfordi Sharpe
COMMON CRANE
Japanese: Kurozuru (black crane)

Grus lilfordi Sharpe, Cat. Bds. Brit. Mus., **23**, 1891: 250 (in key), 252 (eastern Siberia).

The Common Crane is of rare occurrence in Japan. The only specimen on record is a bird killed in Ibaraki Prefecture 10 November 1928, a photograph of which was published by Kuroda (Tori, 1929: 127). The specimen figured by Temminck and Schlegel (1849: 117 + pl. 72) is without locality, and may well have been taken in southern Korea where the species has occurred more frequently. However, the several published sight records for the species at the crane sanctuary in southern Kyushu are unquestionable. Kawaguchi (Yacho, 1934: 22) saw a single bird at Akune in Kyushu in 1928 and 1929, which was confirmed by Shimomura, the bird photographer who is so well known for his pictures of rare Japanese species. Iio (Yacho, 1940: 603) saw two single birds with the large flocks of Hooded Cranes at Arasaki, Kagoshima each winter in 1936, 1937, 1938, and three in 1939.

129. Grus monacha Temminck
HOODED CRANE
Japanese: Nabezuru (pot crane)

Grus monacha Temminck, Pl. Col., livr. 94, 1835, pl. 555 (Hokkaido and Korea).

The Hooded Crane was formerly a fairly common winter visitor throughout Japan from southern Hokkaido to Kyushu. It is the commonest of the cranes that still visit Japan, but its numbers are now reduced to the few handfuls that winter in the two sanctuaries in southern Kyushu and western Honshu. The species' season at Yamaguchi is from mid October to early March. At Kagoshima it is the earliest of the cranes to arrive. The first ones usually appear in early October about ten days ahead of the first White-naped Cranes, and small numbers keep coming until the main body arrives in late October or early November. They stay at the sanctuary in family groups of three or four birds, making flocks of 200 to 300, and roost at night in the open marsh. They begin their courtship in March, just before they leave. The specimen record:

Hokkaido	undated	Temminck, Pl. Col., pl. 555
Honshu, Tokyo	undated	1922 Hand-List
" Yokohama	undated	Pryer coll. (Seebohm, 1890: 354)
" Yamaguchi	undated	1922 Hand-List
Kyushu	undated	USNM, *ex* Ringer
" Nagasaki (2)	undated	Brit. Mus., *ex* Ringer
" Akune	undated	1922 Hand-List
"Japan"	undated	Brit. Mus., *ex* Leyden Mus.
"Japan" (4)	undated	Leyden Mus.

130. Grus japonensis (P. L. S. Müller)
JAPANESE CRANE
Japanese: Tancho (autochthonous, but means red-poll)

Ardea (*Grus*) *Japonensis* P. L. S. Müller, Natursyst., Suppl., 1776: 110 (Japan).

This, the noblest and finest of all the Japanese birds, was apparently a not uncommon breeding bird throughout Japan in feudal times. It was wiped out almost everywhere early in the Restoration, but a small group managed to survive in the extensive, almost inaccessible marshes just inland of Kushiro, Hokkaido, where it is still resident and non-migratory. This site was investigated for the first time by H. Saito in 1924 (Tori, 1926: 16–19). It is a deep, fresh-water marsh of about 3000 acres extending from Zesshin village north to the Kuteharo plain. It freezes from December to April, but a few spring holes remain open through the winter. The cranes that live there wander but little, which is their salvation. Occasionally in very severe winters when spring holes freeze over, a few birds stray past Cape Erimo to the Ishikari Plain, where they usually starve to death. Two birds were seen in Kitami in late September 1926, and again on 15–16 September 1937, probably post-nuptial wanderers.

In 1924 Saito estimated the population as fewer than 20 birds, and he found six nests, three of which were in use. On the strength of his report the site was made a Natural Monument in 1925. Thanks to its inaccessibility the birds are seldom disturbed. The population increased to about 30 in 1934. Saito was able to visit the area again in 1949, and found about 35 or 36 cranes still there. (He reports, incidentally, that they are now quite tame.) The breeding area can be reached easily in winter on skiis, but in spring, summer, and fall it is almost inaccessible. Saito and one or two others who have been able to reach it during the nesting season report the clutch is usually one, infrequently two eggs. Old birds are very rarely accompanied by more than one young each season, which is advanced as the reason for its very slow increase. The nest, 90 cm. at the base, 60 cm. at the top, is built on the ground on a base of heavy alder twigs with thinner ones on top, into which green reeds are entwined as they grow around it, and lined in the center with stems and leaves of grasses and the same reeds. The birds are reported to feed on aquatic grasses and minnows in summer, and on the minnows only in the winter. They have likewise been known to eat carrots from nearby gardens.

The specimen record:

Hokkaido	Jan. 1880?	Blakiston and Pryer 1882: 121
" Chitose	1876	Sapporo Mus. coll.
" Iburi	undated	1912 Hand-List
" Sapporo	undated	1912 Hand-List
Honshu, Miyagi	late Mar. 1922	Sendai Mus.
Kyushu, Nagasaki	undated	Brit. Mus. *ex* Ringer
" Satsuma	undated	AMNH
" Kagoshima	undated	AMNH
Japan	undated	Brit. Mus., *ex* Lilford

The specimen taken in Miyagi Prefecture in late March 1922 was one of a flock of five that appeared there that spring (Kumagai, Tori, 1928: 315). The sight records from the sanctuary in Kagoshima Prefecture, Kyushu (see introductory remarks on Cranes in Japan) are undoubtedly valid. The species is unmistakable in the field, and as it was still not uncommon as a wintering bird in southern Korea in 1946, a few could be expected to wander occasionally with the other cranes across Tsushima Straits to Kyushu.

131. Grus vipio Pallas

WHITE-NAPED CRANE

Japanese: Manazuru (autochthonous, but "mana" is fresh fish to be offered to deity, hence the crane to be offered to deity.)

Grus Vipio Pallas, Zoogr. Rosso-Asiat., **2**, 1811: 111 (Transbaicalia).

The White-naped Crane winters regularly in small numbers at the Kagoshima refuge in Kyushu. It arrives about ten days later than the Hooded Crane, but leaves in spring at about the same time. Much less common today than the Hooded, Blakiston and Pryer (1878: 225) said it was then "the most abundant crane in Japan, and found in all the islands." There are a few sight records from Hyogo, Shimane, Horishima, and Tokyo in Honshu, from Ehime in Shikoku, and from Nagasaki, the Shimbara Peninsula, and Fukuoka in Kyushu. As long as a nucleus keeps coming to Kagoshima, a few stragglers may be expected to appear elsewhere nearby. The specimen record:

Hokkaido, Chitose		1871	Sapporo Mus.
Honshu, Tokyo		undated	Sapporo Mus.
Kyushu, Nagasaki		undated	Faun. Jap., p. 119
" "	(2)	19 Feb.	Brit. Mus. *ex* Ringer
" Fukuoka		Mar. 1935	Tori 9: 264
"Japan"		undated	Brit. Mus., *ex* Lilford
"Japan"		undated	Leyden Mus.

132. Grus leucogeranus Pallas

SIBERIAN WHITE CRANE

Japanese: Sodeguro-zuru (black-sleeved crane)

Grus Leucogeranus Pallas, Reise versch. Prov. Russ. Reichs, **2**, 1773: 714 (swamps bordering the Ishim, Irtysh, and Ob rivers).

This species is known in Japan from four old records. Temminck and Schlegel (1849: 118 + pl. 73) mention three specimens, including one immature, taken at Nagasaki and sent to the Leyden Museum in Holland. They were still there in July 1949, as ascertained by Amadon (Tori, 1949: 271) who reports the fourth known Japanese specimen, an old mount of an adult male in the American Museum of Natural History which was obtained from the Verreaux brothers in Paris about 1870.

133. Anthropoides virgo (Linné)

DEMOISELLE CRANE

Japanese: Aneha-zuru (older-sister-feathered crane)

Ardea Virgo Linné, Syst. Nat., ed. 10, **1**, 1758: 141 (India).

There are only two specimen records for Japan of this elegant little western Asiatic crane. One bird (of two seen) was captured in Kuriharagun, Miyagi Prefecture, 5 June 1922, and deposited in the Kuroda collection where it was destroyed in 1945. The other record is a specimen in the Imperial Palace Museum, Tokyo, reportedly taken on the Izu Peninsula some time previous to 1920. The Hokkaido record given in the Hand-Lists is an uncertain one based on an old picture (Tori, 1923: 250). The species has also been reported from Hachijo in the Izu Islands, but without specimen verification (Kumagai, Tori, 1928: 316).

RALLIDAE

134. Rallus aquaticus indicus Blyth

WATER RAIL

Japanese: Kuina (autochthonous)

Rallus indicus Blyth, Journ. As. Soc. Bengal, **18** (2), 1849: 820 (India).

The Water Rail is not uncommon in Japan, but is so secretive it is seldom seen. Its presence is usually revealed by its note. It is a summer resident in Hokkaido, arriving in May and leaving in October. In Honshu and southward it is mainly a winter visitor from October to April, but it has been found in summer in the Fuji area, and perhaps breeds in suitable localities in northern Honshu. It is found principally in fresh water marshes, though sometimes in the salt and brackish marshes in winter. It nests in Hokkaido in May, building a saucer-shaped nest of leaves and reed stems in the dense marsh grasses, and lays 6 to 7 yellowish-brown eggs with brown and gray markings, averaging 33.7 x 25.9 mm. It migrates as far as southern China, but a few remain in the coastal marshes from central Honshu southward throughout the winter.

The Water Rail is hunted not infrequently, but it is difficult to flush and not plentiful enough to be of much importance. Only about 50,000 are reported killed annually according to the Ministry of Agriculture and Forestry, and this figure doubtless contains rails of other species which are not specified in the statistics.

135. Porzana pusilla pusilla (Pallas)

DWARF RAIL

Japanese: Hime kuina (princess or dainty rail)

Rallus pusillus Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776: 700 (Dauria).

The smallest and least common of the resident rails in Japan, the Dwarf Rail nests in fresh marshes in Hokkaido and southward through the highlands of northern Honshu to the Fuji area. Kiyosu observed it at the foot of the Japan Alps in August. Although it migrates to the Philippines and south China, it winters not uncommonly in the coastal marshes from the Tokyo area southward.

Its nesting habits are very similar to those of the Ruddy Crake, and it occupies the same biotope. It nests rather late, in July and August, laying a clutch of 6 to 8 dark brown, vaguely-marked eggs averaging 29 x 20.5 mm.

136. Porzana fusca erythrothorax (Temminck & Schlegel)

RUDDY CRAKE

Japanese: Hi-kuina (red rail)

Gallinula erythrothorax Temminck & Schlegel, in Siebold, Fauna Jap., Aves, 1849: 121, pl. 78 (Japan).

The Ruddy Crake is the commonest and best known of the rails in Japan, breeding in marshes and in the wilder paddies on all four main islands. Though it winters south to south China and Indochina, a few may be found in southern Japan in winter. It is usually a bird of the lowlands below 2500 feet, but Y. Nakamura (*in lit.*) observed it in breeding season at 4500 feet in Gumma Prefecture.

It occurs in Hokkaido from May to October, and nests there chiefly in July. Kobayashi (Tori, 1931: 167) found a nest with eight fresh eggs in Kitami on 10 September. In Honshu its season is longer and it nests earlier, the young hatching as early as 31 May. The nest is built in the reeds with the tips of the surrounding vegetation bent down to conceal it. It has been found nesting in Chiba Prefecture on the branches of a bush a few feet off the ground. The clutch varies from 3 to 9 grayish-white eggs with small brownish spots, measuring 30.2 x 22.3 mm.

137. Porzana noveboracensis exquisita Swinhoe
YELLOW RAIL

Japanese: Shima kuina (striped rail)

Porzana exquisita Swinhoe, Ibis, 1875: 135 (Chefoo, China).

Nothing is known of the Yellow Rail in Japan other than provided by the specimen record, which indicates it to be a rare and irregular transient or winter visitor from the continent, almost in the casual category.

The specimen record:

Hokkaido, Yubutsu	4 Aug. 1875	USNM, *ex* Blakiston
" "	undated	Sapporo Mus.
Honshu, Aichi, Mikawa	undated	1942 Hand-List
" Chiba, Cape Inubo	31 Oct. 1929	Norinsho coll.
" " "	22 Nov. 1929	Norinsho coll.
" Yokohama	undated	Seebohm, 1890: 358
" Shizuoka	13 Feb.	Yamashina coll.
" " Suruga (2)	undated	AMNH, *ex* Owston
Shikoku, Kochi	undated	Norinsho coll.
Kyushu	8 Jan. 1887	USNM, *ex* Ringer
"	4 Feb. 1887	USNM, *ex* Ringer

138. Amaurornis phoenicurus chinensis (Boddaert)
WHITE-BREASTED SWAMPHEN

Japanese: Shirohara kuina (white-bellied rail)

Fulica chinensis Boddaert, Table Pl. enlum., 1783: 54 (Hongkong, China).

This subtropical species of the southeastern Oriental region has been taken twice in Kyushu. Abe (Tori, 1949: 165) examined both specimens, a female shot 20 November 1931 and a male in January 1932, both at Hiwa village, Asakura-gun, Fukuoka Prefecture.

139. Gallinula chloropus indica Blyth

MOORHEN

Japanese: Ban (autochthonous)

Gallinula chloropus? var. *indicus* Blyth, Jour. As. Soc. Bengal, **11**, 1842: 887 (Calcutta).

The Moorhen is a fairly common summer resident throughout Japan, living in the marsh reeds bordering lakes and ponds, in the shallows at the mouths of rivers, and occasionally in the moats within city limits. It arrives in central and southern Japan in early April and leaves in late November. Reported in mid March in the Osaka area, it arrives in Aomori in late April and departs in early November. Its season in Hokkaido is May to October. Individuals may be found wintering from central Honshu southward, though most of the population migrates to Indochina and the East Indies.

The species nests in reed beds in the marshes, laying usually 5 to 10 (15 have been reported) creamy brown eggs with irregular clear darker markings. Their average size is 41.1 x 29.3 mm. Kiyosu (1943: 103) gives the incubation period as 19 to 22 days. It nests from May to August in Honshu, and from June to August in Hokkaido.

A game bird of some importance, the Moorhen was hunted with falcons by the Imperial Household regularly until World War II. Hunters kill about 100,000 annually according to the Ministry statistics, but this figure doubtless includes many Coots which are not listed separately.

140. Gallicrex cinerea (Gmelin)

KORA, OR WATER-COCK

Japanese: Tsuru-kuina (crane-rail)

Fulica cinerea Gmelin, Syst. Nat., **1**, pt. 2, 1789: 702 (China).

This elegant, slender crake of southern Asia is a rare summer resident and sporadic winter visitor to southern Japan. It has been taken only once in Hokkaido, a specimen in the Norinsho collection that struck the lighthouse at Shiribeshi 25 May 1932. On the other islands it has been taken fairly frequently; some 20 specimens are on record from the Kwanto Plain and southward, most of them collected in autumn and winter.

Little is known about its habits in Japan other than that it lives, as other rails, in grassy marshes or paddy fields, is shy, retiring, and partly nocturnal. A few specimens taken in summer in breeding condition suggested its possible nesting in Japan. This was verified 2 August 1950 when a schoolgirl found a nest with a clutch of four eggs in a rice field in Saga Prefecture, northern Kyushu. The nest was similar to that of the Moorhen. The eggs are now in the Yamashina collection.

141. Fulica atra atra Linné

COOT

Japanese: O-ban (great moorhen)

Fulica atra Linné, Syst. Nat., ed. 10, **1**, 1758: 152 (Sweden).
Fulica atra japonica Temminck & Schlegel, in Siebold, Fauna Jap., Aves: 120, pl. 77 (Japan). (Synonym)

• The Coot is a common summer resident in Hokkaido, breeding in the eastern marshes of the Kushiro, Kitami, and Ishikari areas. It also nests sparingly in northern Honshu south as far as Ibaraki Prefecture, where it formerly was common but has recently become rare. In spring and autumn it gathers in large flocks in the lakes of Hokkaido and northern Honshu. It winters south to the Philippines and south China, and occasionally in the southern main islands, but is rather uncommon south of central Honshu. A small flock is reported to winter regularly in the marsh adjoining the Shinhama duck decoy in Chiba Prefecture, and individuals are sometimes reported there in summer. It is seen occasionally in the Kansai area and at Lake Biwa, but has only once been reported from the Fuji lakes, and is quite rare in Shikoku and Kyushu.

In Hokkaido it breeds from May to July, laying 6 to 10, rarely 13 yellow-gray eggs with small dark spots, averaging 51.7 x 33.7 mm. The nest is a platform of reeds in shallow water. Both sexes incubate, and Kiyosu (1943: 105) gives the incubation period as 21 to 23 days.

OTIDAE

142. Otis tetrax orientalis Hartert

LITTLE BUSTARD

Japanese: Hime nogan (dainty bustard)

Otis tetrax orientalis Hartert, Nov. Zool., **23**, 1916: 339, pl. 2 (Sarepta, south Russia).

This species is not known to breed east of western Asia. It has been taken but once in Japan, a single immature bird shot on the shores of Ariake Bay in Fukuoka Prefecture, Kyushu, 4 January 1940. A picture of the mounted specimen, which was destroyed with the Kuroda collection in 1945, is figured in Abe's account of its capture (Tori, 1940: 693–696).

143. Otis tarda dybowskii Taczanowski

GREAT BUSTARD

Japanese: Nogan (field goose)

Otis Dybowskii Taczanowski, Jour. f. Orn., **22**, 1874: 331 (Dauria).

This Bustard breeds on the continent from Ussuria and Amuria westward, and winters commonly to central Korea. It has strayed to Japan a surprising number of times. Of course the casual presence of so noticeable a bird is much more likely to be reported than that of a less striking straggler. The specimen record:

Hokkaido, Ishikari	12 Nov.	Seebohm (1890: 356)
" Shiribeshi (2)	Nov. 1881	Sapporo Mus.
Honshu, Aomori	undated	Koyama (Dob. Zas., 1919: 101)
" Yamanashi, Hanawa	undated	1942 Hand-List
" Nagano, Shinano	undated	AMNH, *ex* Owston
" Gifu, Kawashima	21 Jan. 1940	Takeuchi (Yacho, 1940: 185)
" Hyogo, Takasago	17 Nov. 1939	Kobayashi (Yacho, 1940: 196)
" Hyogo, Maiko	1907	Kuroda coll.
" Mie, Kuwana	Sep. 1903	Yamashina coll.
Kyushu, Nagasaki	undated	AMNH
" " Izahaya	undated	Seebohm (Ibis 1884: 178)
" "	Dec. 1916	Kuroda coll.
" Goto Islands	6 Feb. 1917	Kuroda coll.
" " "	Dec. 1918	Kawaguchi (Dob. Zas., 1928: 478)

ROSTRATULIDAE

144. Rostratula benghalensis benghalensis (Linné)

PAINTED SNIPE

Japanese: Tama shigi (jewel snipe)

Rallus benghalensis Linné, Syst. Nat., ed. 10, **1**, 1758: 153 (Asia).

The Painted Snipe is an uncommon resident north to the eastern edge of the Kwanto Plain (Saitama, Ibaraki, and Chiba prefectures).

The only record for Hokkaido is Seebohm's statement (Ibis, 1884: 178) that it "has been only once found in Yezzo." It has been taken in Aomori, and has been found nesting as far northward as Chiba but is common nowhere in Honshu. It is apparently more plentiful in Kyushu, where it is resident throughout the year. It has been taken on the Kwanto Plain in November and December.

Very little is known about its movements. It seems to migrate irregularly southward throughout its range, but does not gather in flocks as do other shore-birds. As it is somewhat nocturnal, and retiring and skulking during the day, it is not a popular game bird. Its flight is slow, with the feet hung down rail-fashion, and it swims short distances with ease.

In Honshu and Shikoku it nests in May and June, occasionally in July. Eggs have been taken in Kyushu in April, and in Ise, western Honshu, on October 15th. The nest is built in wet paddies and marshes, frequently in lotus beds, of reed stems in semi-floating fashion much like a grebe's. The normal clutch has 4, but 5 and 6 eggs have been recorded. The eggs are smallish for a Limicoline, averaging only 35.9 x 25.5 mm., yellow-gray with irregular brown and purple markings. The incubation period is 19 days. Kawaguchi (Tori, 1922: 140) describes the courtship in which both birds bow to each other, moving the tail up and down. The female displays to the male who probably does most if not all the incubating and caring for the young.

HAEMATOPODIDAE

145. Haematopus ostralegus osculans Swinhoe

OYSTER-CATCHER

Japanese: Miyakodori (bird of the capital city, originally applied to *Larus ridibundus*, arbitrarily redesignated to this species in error)

Haematopus osculans Swinhoe, Proc. Zool. Soc. London, 1871: 405 (north China).

The Oyster-catcher was once fairly common in Japan but is now a rare winter visitor. Seebohm (1890: 313) says it was "resident on the Japanese coasts . . . It is found on the coasts of Yezzo [Hokkaido], but not in great abundance. There are eight examples in the Pryer collection from Yokohama." Nowadays the small Korean population visits the western Honshu and Kyushu coasts irregularly between

October and March, but the species is almost never reported elsewhere. The specimen record:

Japan		undated	Leyden Mus.
Hokkaido		undated	Brit. Mus, *ex* Tweeddale
"		undated	Kuroda coll.
" , Hakodate		1854	PANS, *ex* Perry Exp.
" "		Apr.	USNM, *ex* Blakiston
" Wakkanai		9 Oct. 1951	Nagahisa Kuroda coll.
Honshu, Chiba, Horie		26 Oct. 1883	Yamashina coll.
" " Choshi		undated	Kuroda coll.
" Yokohama		undated	Kuroda coll.
" "	(8)	undated	Brit. Mus., *ex* Seebohm
" "		undated	MCZ, *ex* Ward, 1882
" Yokohama market		1883	USNM, *ex* Blakiston
" Aichi, Owari (2)		undated	AMNH, *ex* Owston
" Shimane, Murotsu		undated	Kuroda coll.
Shikoku, Tokushima		Nov. 1912	Enomoto (Dob. Zas., 1913: 301)
Kyushu, Fukuoka		Mar. 1921	Kawaguchi coll.
" Kumamoto (2)		Dec. 1927	Kawaguchi coll.
Tsushima		30 May 1893	MCZ, *ex* Owston

CHARADRIIDAE

146. Vanellus vanellus (Linné)

LAPWING

Japanese: Tageri (paddy lapwing)

Tringa Vanellus Linné, Syst. Nat., ed. 10, **1**, 1758: 148 (Sweden).

In Hokkaido and northern Honshu the Lapwing occurs only as a migrant, from late August through October and from late February through April. From the Kwanto Plain southward it is a not uncommon winter visitor, found in the wet paddy lands and on grassy plains near streams and lakes, usually in flocks of from 50 to several hundred individuals. The flocks in the Lake Wada area of Chiba Prefecture dwindled steadily throughout the occupation from illegal hunting.

147. Microsarcops cinerea (Blyth)

GRAY-HEADED LAPWING

Japanese: Keri (autochthonous)

Pluvianus cinereus Blyth, Jour. As. Soc. Bengal, **11**, 1842: 587 (Calcutta, India).

The Gray-headed Lapwing is an uncommon summer resident in northern Honshu and a rare transient and winter visitor southward through Shikoku and Kyushu. It arrives in northern Honshu in late February and March, and usually retires southward in October.

It has been found nesting only in Akita and Aomori prefectures. Its nesting habits in Akita were studied by Nibe (Choju Iho, 1930: 189–223) who reports it nests from late March through June in open grassy plains along the rivers, or in cultivated fields near marshes or wet paddies. It lays 3 to 4 grayish brown eggs with large brown and purplish mottlings, 47.6 x 33.9 mm. in size, which it incubates from 27 to 30 days. In the autumn small family parties gather in the paddies and along the river banks. They feed mostly on aquatic insects. One stomach examined in October in Aomori contained dragon-flies.

148. Squatarola squatarola (Linné)

GRAY PLOVER

Japanese: Daizen (autochthonous)

Tringa Squatarola Linné, Syst. Nat., ed. 10, **1**, 1758: 149 (Sweden).

The Gray Plover is a fairly common transient, encountered along the open coasts of all the main island in both spring and autumn, frequently in company with Godwits and Turnstones. It is not as plentiful as the Golden Plover and is seldom met inland. The main spring flight passes Honshu from mid April to mid May, but early arrivals have been reported in late March. The first returning autumn birds arrive in mid July, and the main fall flight goes through in September A few sometimes winter along the southern coasts.

149. Charadrius dominicus fulvus Gmelin

GOLDEN PLOVER

Japanese: Munaguro (black-breast)

Charadrius fulvus Gmelin, Syst. Nat., **1**, pt. 2, 1789: 687 (Tahiti).

The Golden Plover is a common spring and autumn transient, frequently occurring in flocks of several hundred or more in the paddies and cultivated fields along the coasts, less commonly on the outer beaches. Early spring arrivals may appear in March, but the heaviest migration is from late April to mid May. Fall birds are present from mid August to early November, with the peak abundance during September and October.

150. Charadrius hiaticula tundrae (Lowe)
RINGED PLOVER

Japanese: Hajiro ko-chidori (white-winged small plover)

Aegialitis hiaticola tundrae Lowe, Bull. Brit. Orn. Cl., **36**, 1915: 7 (valley of the Yenisei).

Matsudaira (Tori, 1921: 231) collected a single specimen, the only definite record for Japan of this central and western Siberian species, from a flock of Little Ringed Plovers in Sagami Bay, Honshu, 17 September 1920. A series of 11 specimens in the American Museum of Natural History taken at Gizhiga shows the species is not uncommon at the northeast end of the Okhotsk Sea from May through August. It has been taken twice in Sakhalin and once in the Volcano Islands.

151. Charadrius dubius curonicus Gmelin
LITTLE RINGED PLOVER

Japanese: Ko-chidori (little plover)

Charadrius curonicus Gmelin, Syst. Nat., **1**, pt. 2, 1789: 692 (Kurland, Baltic).

Hartert's (1921: 1537) report of the nominate race, *C. d. dubius* of the Philippines, from Honshu is in error. All the known Japanese specimens are referable to *curonicus* (cf. Mayr, Am. Mus. Nov., No. 1417, 1949: 27).

This plover is one of the most conspicuous birds of the pebbly river beds and lake shores of the Japanese lowlands and foothills. It is a common summer resident in Hokkaido, arriving in late April and remaining until October; in Honshu and Shikoku it is partly resident; in Kyushu a transient and winter visitor only. Though the species migrates southward to the East Indies, a few always winter in the warmer sections of Japan.

It nests from late April through July from central Honshu northward, laying its 3 to 4 creamy-white eggs on the ground in the open among the pebbles of the gravelly river bottoms and along the lake shores, from sea level up to 3000 feet at Lake Yamanaka in the Fuji district. The incubation period is 22 to 24 days. Twelve stomachs examined by Nibe (Choju Iho, 1931: 429–455) showed its diet in spring and summer to be predominantly insects, mostly Coleoptera.

152. Charadrius alexandrinus nihonensis Deignan
KENTISH PLOVER

Japanese: Shiro-chidori (white plover)

Charadrius alexandrinus Linné, Syst. Nat., ed. 10, **1**, 1758: 150 (Egypt). (Extra-limital)

Aegialites dealbatus Swinhoe, Proc. Zool. Soc. London, 1870: 138 (S. China, Formosa, and Hainan). (Extra-limital)

Charadrius alexandrinus nihonensis Deignan, Jour. Wash. Acad. Sci., **31** (3), 1941: 106 (Aomori, Honshu, Japan).

C.a.dealbatus of coastal southeast Asia, to which the 1942 Hand-List refers the Kentish Plovers of Japan, differs from nominate *C.a.alexandrinus* of central and western Eurasia by a bright rufous wash on the back of adults in breeding plumage and by a thicker, heavier bill which cannot be measured but is readily apparent to the eye. Immatures and adults in fall plumage can be told by the bills, but the color character is not as manifest; their backs are somewhat lighter than those of the nominate form, but the rufous tinge is seldom evident. In the large series of Kentish Plovers from eastern Asia in the MCZ, AMNH, and USNM collections are 16 spring adults from Japan which show the race *nihonensis* to be recognizable. These birds are all large-billed like *dealbatus*, but lack its rufous tinge, and are darker backed than *alexandrinus*. A series of comparable spring and early summer material in the AMNH from Tanegashima, Yakushima, and the Ryukyus is intermediate between *nihonensis* and *dealbatus*, large-billed and approaching the ruddy back of the latter. A series of 11 May specimens from Wonsan, Korea in the AMNH is intermediate between *nihonensis* and *alexandrinus*, being slightly thinner billed than the former, darker backed than the latter.

The 1942 Hand-List recognizes the nominate race as a rare visitor to Japan. It is possible that birds breeding in central Asia reach Japan in autumn and winter, but immatures and winter plumage adults are difficult to separate racially, and the thinner-billed birds taken in Japan on migration are probably from the intermediate populations of the nearby mainland.

The Kentish Plover is a not uncommon summer resident along the outer beaches of the three southern main islands. It occurs fairly frequently in Hokkaido but has not yet been found nesting there. The first migrants arrive in Honshu from the south in early March, and the species becomes more plentiful in April. It breeds as early as March in Kyushu, but later in northern Honshu, in May and June. It nests on sandy beaches and along the banks of tidal rivers, usually laying 3 cream-colored eggs with brownish spots, averaging 32.5 x 23.9 mm. In August and September it gathers in flocks along the outer beaches fringing the bays and estuaries, and starts to decrease in

October. Most of the Japanese population migrates to southeast Asia, but a few individuals evidently winter, for the species has been taken in Iwate Prefecture in early February.

153. Charadrius placidus Gray & Gray
LONG-BILLED RINGED PLOVER
Japanese: Ikaru chidori (grosbeak plover)

Charadrius placidus J. E. & G. R. Gray, Cat. Mamm. Bds. etc. Nepal and Tibet in Brit. Mus., ed. 2, 1863: 70 (Nepal).

Noticeably larger than the Little Ringed Plover which otherwise it very closely resembles, the Long-billed Ringed Plover is a not uncommon summer resident in Japan. It breeds along the rivers and lake sides at higher altitudes than the former, and frequents paddy lands and cultivated fields more often. It winters along the coasts and marshy lowlands in southern Honshu, Shikoku, and Kyushu, and south to south China. It has not yet been found breeding in Hokkaido, though Kobayashi (Tori, 1931: 169) assumed it did so from its presence at Kitami during the nesting season. It nests in central Honshu and Shikoku from mid March to July, as high as 3000 feet, at Lake Yamanaka and the other Fuji lakes. Its 3 to 4 eggs are grayish white with fine speckling, and average 35.8 x 25.9 mm. in size.

154. Charadrius mongolus stegmanni Stresemann
MONGOLIAN PLOVER
Japanese: Medai chidori (large-eyed plover)

Charadrius mongolus stegmanni Stresemann, Orn. Monatsb., **48**, 1940: 55 (Bering Id.).

This plover is a common transient along the outer beaches, though never as abundant as the smaller Kentish Plover. It moves north in scattered flocks from mid April to early May, and returns southward from mid July to late October. The heaviest flight is in September and early October, and individuals occasionally remain into November.

155. Charadrius leschenaultii Lesson
LARGE SAND PLOVER
Japanese: O-medai chidori (great large-eyed plover)

Charadrius Leschenaultii Lesson, Dict. Sci. Nat., **42**, 1826: 36 (Pondicherry, India).

This species evidently migrates overland southeastward from its breeding grounds in central Siberia to the south China coast, where La Touche (1933: 151) considered it quite common. The only record for Korea consists of two males in the American Museum of Natural History taken by Robert Hall at Wonsan in May 1903. It has occurred in Japan four times, as follows:

Honshu, Tokyo, Rokugo River	undated	Kuroda coll.
" Kanagawa, Sakaoi River	7 Aug. 1919	Matsudaira coll.
Izu Islands, Hachijo	undated	Momiyama coll.
Kyushu	undated	Taka-Tsukasa coll.

156. CHARADRIUS ASIATICUS VEREDUS Gould
ORIENTAL DOTTEREL
Japanese: O-chidori (large plover)

Charadrius veredus Gould, Proc. Zool. Soc. London, 1848: 38 (northern Australia).

The only record of the Oriental Dotterel for Japan is a skin in the American Museum of Natural History in New York taken at Sagami, Honshu, by Owston's collectors, otherwise without data.

157. CHARADRIUS MORINELLUS Linné
DOTTEREL
Japanese: Kobashi chidori (small-billed plover)

Charadrius Morinellus Linné, Syst. Nat., ed. 10, **1**, 1758: 150 (Sweden).

The Dotterel is a continental species that has been taken once in Sakhalin and once in the Kuriles. It is included in the list of the Japanese birds on the basis of the following specimen records:

Hokkaido, Hakodate	1851	Perry coll. (Cassin 1858: 195) (specimen not traceable)
Honshu, Kanagawa, Sagami	29 Sep. 1915	Yamashina coll.
" Shizuoka, Suruga	undated	Yamashina coll.

SCOLOPACIDAE

158. NUMENIUS MINUTUS Gould
LEAST WHIMBREL
Japanese: Ko-shakushigi (small curlew)

Numenius minutus Gould, Proc. Zool. Soc. London, 1840 (1841): 176 (New South Wales).

This species breeds in northeastern Siberia and migrates to the Philippines and the East Indies. As its route is continental it is uncommon in Japan. Temminck and Schlegel figured it without data in the Fauna Japonica. H. G. Lumsden (*in lit.*) writes me, "On 22 April 1947 three Least Whimbrels appeared on the airstrip at Iwakuni [on Hiroshima Bay]. They were very confiding, and I watched them for more than an hour with a glass at ranges as close as 20 feet. Their calls were of typical whimbrel form, but pitched in the same key as that of the golden plover." He collected a specimen and made a painting of it which is preserved, though the specimen was lost in transit. The only other records for Japan are:

Japan	undated	AMNH, *ex* Owston
"	undated	Leyden Mus.
Honshu, Chiba, Gyotoku (5)	3 Oct. 1883	Yamashina coll.
" Tokyo	22 Oct. 1933	Yamashina coll.
" Nagano, Shinano	10 Sep. 1910	AMNH, *ex* Owston
" Yamaguchi, Nagato	22 Sep. 1930	Norinsho coll.
Kyushu, Fukuoka, Chikuzen	15 Apr. 1938	Abe coll.

159. Numenius phaeopus variegatus (Scopoli)

WHIMBREL

Japanese: Chu-shakushigi (middle-sized curlew)

Tantalus variegatus Scopoli, Del. Flor. et Faun. Insubr., **2**, 1786: 92 (Luzon).

The Whimbrel is a common transient in spring and fall, the commonest of the curlews, almost as abundant as the Bar-tailed Godwit with which it is sometimes found in mixed flocks along the outer beaches, in the sandy shallows, and occasionally on grassy plains near the coast. We saw an early arrival at Yatsushiro Bay, Kyushu, 18 March 1948. It occurs in the Tokyo area in spring from mid April to early July, most plentifully in May. Its autumn flight starts in mid August, is at its height in September, and dwindles off in October. More alert and shyer than the Godwit, the Whimbrel's hard, curved bill permits it to feed on small crustaceans and molluscs as well as on softer marine invertebrates.

160. Numenius tahitiensis (Gmelin)

BRISTLE-THIGHED CURLEW

Japanese: Harimomo chushaku (Needle-thighed curlew)

Scolopax tahitiensis Gmelin, Syst. Nat., **1**, 1789: 656 (Tahiti).

This Alaskan breeder migrates directly over water to the Pacific islands where it winters. There is a female in the American Museum of Natural History taken at Chichijima in the Bonins 21 September 1910. The only record for Japan is a specimen collected at Yamashiro, Shiga Prefecture, in July 1909 (Tori, 1916: 40), which was destroyed with the Kuroda collection in 1945.

161. Numenius tenuirostris Vieillot

SLENDER-BILLED CURLEW

Japanese: Shirohara chu-shakushigi (white-bellied middle-sized curlew)

Numenius tenuirostris Vieillot, Nov. Dict. Hist. Nat., **8**, 1817: 302 (Egypt).

Two undated specimens from Honshu (Dob. Zas., 1913: 18–20) in the former Kuroda collection are the only records of this species for Japan.

162. Numenius arquata orientalis Brehm

COMMON CURLEW

Japanese: Dai-shakushigi (great curlew. Shakushigi, the autochthonous term for all curlews, refers to the long, curved bill. A shaku is a wooden dipper with a long, curved wooden handle.)

Numenius orientalis C. L. Brehm, Handb. Naturg. Vög. Deutschl., 1831: 610 (East Indies).

The Common Curlew is a common transient in Kyushu and in western Honshu on the shores of the Inland Sea, but is rather scarce in the Tokyo area and elsewhere in Japan. A favorite stopping place is Ariake Bay in Kyushu, where flocks of from 20 to 100 are usually present from mid March until late June (one record 7 July), and in autumn from mid August to late September, a few occasionally remaining until mid November.

163. Numenius madagascariensis (Linné)

AUSTRALIAN CURLEW

Japanese: Horoku shigi (clay-pipe snipe)

Scolopax madagascariensis Linné, Syst. Nat., ed. 12, **1**, 1766: 242 (Celebes).

The Australian Curlew is a not uncommon transient, more plentiful during the autumn flight than in spring. It is slightly more abundant in the Tokyo area than the Common Curlew, from which it may be told by the lack of the white rump, but is much less so along the Inland Sea and in Kyushu where the Indian Curlew is the commoner. It appears occasionally in spring between late March and June, but is more plentiful on the return flight in August and early September. Early arrivals have been noted in Ariake Bay 7 July, and late stragglers of the flight into November.

164. Limosa limosa melanuroides Gould

BLACK-TAILED GODWIT

Japanese: Oguro shigi (black-tailed sandpiper)

Limosa Melanuroides Gould, Proc. Zool. Soc. London, 1846: 84 (Port Essington, Australia).

The Black-tailed Godwit occurs fairly commonly in Japan, usually in company with the far commoner Bar-tailed Godwit. The spring flight is a brief one from mid May to early June. The main autumn flight is in September, but birds may arrive in late July and some remain through October.

165. Limosa lapponica baueri Naumann

BAR-TAILED GODWIT

Japanese: O-sorihashi shigi (large up-curve-billed snipe)

Limosa Baueri Naumann, Naturg. Vög. Deutschl., **8**, 1836: 429 (Victoria, Australia).

Limosa lapponica var. *Novae-zealandiae* Gray, Voy. Erebus & Terror, 1846: 13 (New Zealand). (Synonym)

Limosa lapponica menzbieri Portenko, Auk, **53**, 1936: 195 (Indigirka delta).

As *baueri* of Naumann is not a *nomen nudum* as Steinbacher (1938: 481) claims, it takes priority over ***novae-zealandiae*** of Gray for the eastern race of the Bar-tailed Godwi . *L.l.menzbieri*, the poorly-marked and somewhat doubtfuly recognizable race of central and western Siberia, has been included in the Japanese Hand-Lists on the basis of a single specimen from Tokyo in the former Kuroda collection.

The Bar-tailed Godwit is one of the commonest and most plentiful of the larger shorebirds that migrate through Japan. It is often found in large flocks in the sandy shallows of the coastal bays and at the river mouths. During the migration seasons its note is heard at night along the coasts. It is rather slow of motion and fairly tame, and can be approached closely. In spring it passes through from early April to early June. In fall the species reappears in late August, is most plentiful from mid September to mid October, and a few remain to late October, rarely into November.

166. Tringa erythropus (Pallas)
DUSKY REDSHANK

Japanese: Tsuru shigi (crane sandpiper)

Scolopax erythropus Pallas, in Vroeg's Cat., 1764, Adumbr., p. 6 (Holland).

The Dusky Redshank is a common spring and fall transient, more plentiful in western than in eastern Honshu. In Tokyo it occurs regularly in small numbers, but in the Inland Sea region large flocks of 200 to 300 birds are met with frequently in the shallow marshes and paddy fields. Its spring flight is fairly early, from late February through May, the peak from late March through April. It reappears in late August and usually leaves by early November, though it has been taken in December.

167. Tringa totanus eurhinus (Oberholser)
REDSHANK

Japanese: Aka-ashi shigi (red-footed sandpiper)

Totanus totanus eurhinus Oberholser, Proc. U. S. Nat. Mus., **22**, 1900: 207 (Ladakh).

This continental species is a rare but apparently regular autumn transient, found usually in wet, grassy marshes preferred by the Green and Wood Sandpipers. Kiyosu (1943: 69) gives its season as mid April to early May, and early September to early October, but there are no spring records for Japan. The specimen record is scant. Seebohm (Ibis, 1885: 363) reported a young male taken at Gyotoku, Chiba, 4 September 1883. A specimen in the former Kuroda collection was shot at Haneda 11 October 1921, where Nagahisa Kuroda collected another 30 September 1951. Matsudaira is said to have collected several at Kanagawa but his specimens are not traceable. Nagahisa Kuroda describes its whistle as a clear *phee whee* without the falling intonation of the Tattler's call, and notes that the white back, rump, and secondaries and its orange legs are conspicuous in the field.

168. TRINGA STAGNATILIS (Bechstein)

MARSH SANDPIPER

Japanese: Ko-ao-ashi shigi (small green-footed sandpiper)

Totanus stagnatilis Bechstein, Orn. Taschenb. Deutschl., 1803: 292, pl. 29 (Germany).

Two specimens of this continental species in the MCZ were taken in Sakhalin 14 May 1914, but the only record of its occurrence in Japan is Seebohm's (1890: 322) note of "the one described from Mr. Owston's collection (Blakiston and Pryer, Trans. As. Soc. Japan, 1882, p. 109, No. 95½). It was probably obtained in the Yokohama market."

169. TRINGA NEBULARIA (Gunnerus)

GREENSHANK

Japanese: Ao-ashi shigi (green-footed sandpiper)

Scolopax nebularia Gunnerus, in Leem, Beskr. Finm. Lapper., 1767: 251 (Norway).

The Greenshank is a not uncommon transient in Japan, usually found singly or in small groups in the marshes and paddies, never in large flocks. Its spring flight is light, from late April through May. It is more plentiful during the fall migration. Early arrivals appear in late July, the main flight passes during September and October, and late departees remain until early November.

170. TRINGA OCROPHUS Linné

GREEN SANDPIPER

Japanese: Kusa-shigi (grass sandpiper)

Tringa Ocrophus Linné, Syst. Nat., ed. 10, **1**, 1758: 149 (Sweden).

This Sandpiper is a regular but uncommon transient, occurring singly or in small groups in the grassy marshes, wet paddies, or along the shores of rivers and ponds. Its season is from March to April and from mid August to October. A few occasionally winter; Kuroda had a specimen taken in Tokyo 27 January.

171. TRINGA GLAREOLA Linné

WOOD SANDPIPER

Japanese: Takabu shigi (hawk-patterned sandpiper)

Tringa Glareola Linné, Syst. Nat., ed. 10, **1**, 1758: 149 (Sweden).

The Wood Sandpiper is a regular but uncommon transient, found in the same habitat as the slightly larger Green Sandpiper, and in the same small numbers. It is seldom taken in spring, but occurs more frequently during the autumn flight from August to October.

172. Pseudototanus guttifer (Nordmann)

NORDMANN'S GREENSHANK

Japanese: Karafuto ao-ashi shigi (Sakhalin green-footed sandpiper)

Totanus guttifer Nordmann, in Erman's Reise, Naturh. Atlas, 1835: 17 (Okhotsk).

This little-known species was found nesting for the first time in south Sakhalin along the Tsui River coast 5 July 1936 by Nobuichi Okada, who collected three adults and three downy young which were described and figured by Kuroda (Tori, 1936: 238). Okada found the species not uncommon at the same place in Sakhalin the following year, when he observed some 50 or 60 there. Although the species may therefore migrate through Japan regularly, its occurrence there is known only from the following three specimens:

Hokkaido, Muroran	Sep. 1883	Sapporo Mus.
Honshu, Tokyo, Haneda	23 Sep. 1920	Kuroda coll.
Kyushu, Kagoshima	15 Sep. 1918	Taka-Tsukasa coll.

173. Xenus cinereus (Güldenstadt)

TEREK SANDPIPER

Japanese: Soribashi shigi (upward-curve-billed sandpiper)

Scolopax cinerea Güldenstadt, Novi Comm. Sci. Petrop., **19**, 1774: 473, pl. 19, (Terek River, Caspian Sea).

The Terek Sandpiper is an uncommon transient in Japan, usually found in company with the Wandering Tattler, but also observed in ones and twos along the shallows and on the beaches, sometimes perching on dead branches projecting over the shallow waters. It is rarely found in spring, but in autumn it occurs from late August to late October, most commonly in late September.

174. Actitis hypoleucos (Linné)

COMMON SANDPIPER

Japanese: Iso shigi (beach sandpiper)

Tringa hypoleucos Linné, Syst. Nat., ed. 10, **1**, 1758: 149 (Sweden).

This little sandpiper is a common summer resident, breeding from central Honshu northward through Hokkaido, and occupying a wide range of habitats. It is found along the coasts, on the shores of the shallow bays, and at the river mouths, also inland along the rivers and lakes. In Hokkaido its season is April to September. Farther southward it arrives earlier and departs later. In central Honshu it appears in mid March and moves inland with the advancing season to nest. Most of the population leaves by the end of October, but a few can always be found wintering along the southern coasts.

It breeds in Honshu from late April through June, nesting along the pebbly river banks and grassy lake shores, from sea level to as high as 4500 feet at Kamikochi in the Japan Alps. It has not been found nesting in Shikoku or Kyushu where apparently it is a common transient and occasional winter visitor.

175. Heteroscelus incanus (Gmelin)

WANDERING TATTLER

Japanese: Ki-ashi shigi (yellow-legged sandpiper)

Scolopax incana Gmelin, Syst. Nat., **1** (2), 1789: 658 (Moorea & Palmerston Ids.).
Totanus brevipes Vieillot, Nouv. Dict. Hist. Nat., **6**, 1816: 420 (Timor).

These two remarkably similar forms are regarded as specifically distinct by some authorities (A.O.U. Check-List 1931; Baker 1951: 145), largely because no intergradation can be demonstrated in their morphological differences, particularly in the length of the nostril and the scaling of the tarsus. This, however, is not necessarily a specific criterion, and the two are almost identical in all other features. *H. i. brevipes* has been found nesting only in Siberia; *incanus* is not known to breed west of central Alaska. In the absence of evidence showing them possibly sympatric in their breeding ranges, they are best regarded as geographic races of one another.

The two forms cannot be differentiated in the field with certainty. Almost all the Japanese specimens known are *H.i.brevipes.* During migration *H.i.incanus* occurs in small numbers on the coast of northeast Asia, but the only definite records for Japan are four specimens reported from Tokushima, Shikoku by Enomoto (Dob. Zas., 1913: 566) and a specimen collected in Hachijo in 1922 by Momiyama (Tori, 1924: 101). The Hand-List reference to the occurrence of *incanus* on Honshu is apparently based on Matsudaira's questionable record of the race from Sagami Bay (Tori, 1915: 79) where he lists only one tattler as "*Totanus incanus brevipes,* Meriken kiushi [*sic*] shigi", using the Japanese common name for *T.i.incanus.* His specimens are not traceable.

The Wandering Tattler is a common transient along the coasts of all four main islands, sometimes found in fair-sized flocks in the shallow bays, and as often found singly or in small wisps along the rocky coasts. Its characteristic note is often heard over the cities after dark during migration. Early arrivals reach the Kansai area in late March. The main spring flight in the Tokyo area is from late April through June. The autumn flight reaches Aomori in mid July, by which time the species is already plentiful in Ariake Bay, Kyushu. Apparently two flights pass Japan, one down the Pacific Coast, the other reaching Kyushu via the Korean peninsula. It is most abundant in September, but has been noted in some numbers in Miyagi Prefecture in early November.

176. Arenaria interpres interpres (Linné)
TURNSTONE
Japanese: Kyojo shigi (city-girl sandpiper)

Tringa interpres Linné, Syst. Nat., ed. 10, **1**, 1758: 148 (Sweden).

The Turnstone is a common transient along the outer coasts of Japan in both spring and autumn. The spring flight is from mid April to early July with its peak in mid May. The fall flight is from mid July to October with its peak in September. It is found on the sandy beaches, on the rocks, in the bay flats at low tide, frequently in small flocks by itself, often with other plovers and sandpipers. In the fall when it is fat and tame it is regarded highly by epicures, and was formerly netted in some numbers for market in the Tokyo area.

177. Limnodromus griseus (Gmelin)
DOWITCHER
Japanese: O-hashi shigi (big-billed snipe)

Scolopax grisea Gmelin, Syst. Nat., **1**, pt. 2, 1789: 658 (Long Island, N. Y.).

The Dowitcher has been taken twice in Japan. Swinhoe (Ibis, 1875: 454) records one "killed in company with Golden Plover" in Hokkaido on 13 October by Blakiston. The other was sent to Seebohm (Ibis, 1884: 33) by Owston, who obtained it in the Yokohama market 13 March. Although Seebohm (1890: 331) listed both specimens as *griseus*, all three editions of the Hand-List have carried the species erroneously as *Limnodromus semipalmatus*, the rare and little-known Siberian Dowitcher, apparently on the authority of Hartert (1921: 1605, 1606), who lists *semipalmatus* but not *griseus* as occurring in

Japan. However, the only *Limnodromus* known from Japan are the two Seebohm specimens. At my request J. D. Macdonald recently examined the two Japanese specimens listed in the Catalogue of Birds in the British Museum (1896: 757) and has written me: "These two specimens appear to be the two mentioned by Seebohm, both of which came here with his collection. They are *Limnodromus griseus* (according to the diagnosis of this species)."

178. Capella solitaria japonica (Bonaparte)

SOLITARY SNIPE

Japanese: Ao shigi (green sandpiper)

Spilura solitaria a *japonica* Bonaparte, Compt. Rend. Acad. Sci. Paris, **43**, 1856: 579 (Japan).

The Solitary Snipe is an uncommon transient or winter visitor, occurring from late October to early April. It is usually found in fresh marshes at high altitudes, and has been collected in the Japan Alps at Azumi and Kamikochi at 4500 feet, and at Togakushi at 2500 feet. It occurs less frequently in the lowlands, but has been taken near Chitose, Hokkaido 30 December, and in the marshes of Chiba Prefecture in November and January.

179. Capella hardwickii (Gray)

LATHAM'S SNIPE

Japanese: O-jishigi (large ground-snipe)

Scolopax Hardwickii J. E. Gray, Zool. Misc., 1831: 16 (Tasmania).

Known to breed only in Japan, Latham's Snipe nests from the highlands of central Honshu northward through Hokkaido. It has been taken on all the main islands, in the Izu and Borodino islands, and in Formosa, but nowhere else between Japan and its wintering grounds in Australia, Tasmania, and New Zealand. It arrives in Japan in early April and nests from late April into July. The actual date of its departure is uncertain. The exodus may begin at the end of the nesting season in late July or early August. There are few autumn records, the latest in early October.

It nests not uncommonly in the plateau at the base of Mt. Fuji, and in meadows in the Japan Alps up to 4500 feet. To the northward it breeds at lower altitudes. I found it courting on open dry hillsides in Aomori Prefecture 5 June 1947. In Hokkaido it nests in the plainslands, usually in partly-cultivated areas where pasture fields adjoin wet woodlands. I found eight pairs going through their mating antics near Chitose 25 June 1947. Nagahisa Kuroda saw it courting along the Shiraoi coast and around Cape Erimo in May 1950; he saw the first arrivals at Wakkanai at the northern tip of Hokkaido 26 April 1951; when he returned there the following 9 October, the species had left the area. Its dramatic courtship, involving sky-dances, power-dives, zooming, and harsh, discordant cries, has been described often and in detail (cf. Ingram, Ibis, 1908: 166; Jahn, 1942: 279-280; Burns, 1951: 139-140; Fennell, 1953: 40).

Latham's Snipe is a game bird in Japan, but little is known of it from the hunting standpoint. Probably most of the population leaves for the south before the season opens in October. The Ministry of Agriculture and Forestry has never gathered statistics on the various snipe. Few hunters can differentiate between them, and for that matter neither can many bird students tell them apart in the field. The most definitive and diagnostic features are the tail feathers, and to examine them one must have the bird in one's hands.

[*Capella stenura* (Bonaparte) — The Pintail Snipe is a fairly common transient along the adjacent continental coast, but there is no acceptable record of it for Japan. It has been included in all the Hand-Lists, apparently on the authority of Cassin (1856: 228) who says of it, "Both sexes are in the collection of the [Perry] Expedition, and are from Hakodadi. Mr. Heine observes: 'These specimens were obtained by Lt. Nicholson while engaged in surveying. He found this snipe very numerous near the rocky shore southwest of the entrance to the bay of Hakodadi. I had no opportunity of observing this species'." Cassin very likely, as Schlegel (1870: 13) suggests, confused the species with *C. megala*, but the record cannot be checked. Only one Pintail Snipe is entered in the U. S. National Museum catalogue from the Perry Expedition. This specimen, number 15817, is catalogued as *Gallinago stenura* in Cassin's handwriting. Unfortunately it was sent to the Chicago Academy of Sciences in 1870 and was destroyed in the Chicago fire. I can find no trace of the other specimen Cassin (*idem*) mentions. Uchida (1915: 152) lists the species as a "rare visitor", which is perhaps the source of the Honshu citation in the 1942 Hand-List, for which there seems to be no specimen verification.]

180. Capella megala (Swinhoe)

MARSH SNIPE

Japanese: Chu-jishigi (medium-sized ground-snipe)

Gallinago megala Swinhoe, Ibis, 1861: 343 (Takao and Peking, China).
Gallinago dubia Deichler, Jour. f. Orn., **45**, 1897; 152 (Japan). (Synonym)

The Marsh Snipe breeds in eastern Siberia from Ussuria and the Amur region to Dauria, southern Baikalia, Manchuria, and the upper Hoang-ho, and winters to Burma, the Philippines, Celebes, Moluccas, and northern Australia. Its exact status in Japan is not certain, for it is difficult to recognize in the field and is not often collected. It is probably an uncommon spring and early autumn transient. Jahn (1942: 89) states on the strength of a communication from Yamashina that it breeds "not seldom" in Hokkaido and in Sakhalin, where it has been confused with *C. hardwickii*, the common breeding snipe of that area. While this is a possibility, no definite evidence has yet been found of *megala's* nesting in Japan. The 1942 Hand-List gives the species simply as occurring on all four main islands. Kuroda (Tori, 1935: 340) had seven skins from Honshu in his collection. Kiyosu (1943: 89) states it is a transient in April and October. Nagahisa Kuroda collected one near Goi, Chiba Prefecture, in late August 1951, which is now in the McClure collection.

181. Capella gallinago gallinago (Linné)

COMMON SNIPE

Japanese: Ta-shigi (paddy snipe)

Scolopax Gallinago Linné, Syst. Nat., ed. 10, **1**, 1758: 147 (Sweden).

This snipe is a common transient throughout Japan, and a not uncommon winter visitor from the Tokyo area southward. The 1942 Hand-List credits it with breeding in Hokkaido, evidently on the strength of Uchida's unsubstantiated statement (in Kuroda, 1918: 401) that it "breeds in Hokkaido in May". Inoue (*in lit.*) says a few can usually be found in summer in the northern parts of the Ishikari Plain, but Kobayashi failed to find it in the Kitami area, and there is no definite breeding evidence for Japan. Kuroda (*idem*) mentions a set of eggs in the Tokyo University collection taken in Ibaraki Prefecture 10 April 1901, but these were wrongly identified and the record is not valid.

The species is common in Hokkaido from September to November. The forerunners of the fall flight sometimes reach Aomori in late August, and the main flight comes down the Pacific coast of Honshu from late September to November. The bird is a source of sport for gunners in the Tokyo area throughout the winter, though the wintering flocks are never large, usually small wisps of not over a half dozen birds, and frequent singles. The species becomes commoner in late March as migrants arrive from the south, and the main flight goes northward in April and early May.

The Common Snipe is an excellent sporting bird, but too difficult a target on the wing for the average Japanese pot hunter to waste ammunition on. More snipe are netted in the marshes than are shot in Japan.

182. Scolopax rusticola rusticola Linné
EURASIAN WOODCOCK
Japanese: Yama shigi (mountain snipe)

Scolopax Rusticola Linné, Syst. Nat., ed. 10, **1**, 1758: 146 (Sweden).
Scolopax rusticola iamasigi Momiyama, Ann. Orn. Orien., **1**, 1927: 76 (Echigo, Honshu). (Synonym)
Scolopax rusticola mira Hartert, Bull. B. O. C., **36**, 1916: 64 (Amami-Oshima, Ryukyu ids.). (Extra-limital)

The Handbook of British Birds (1946, IV: 184, footnote) lists this form binomially on the strength of Taka-Tsukasa and Hachisuka's erroneous statement (Ibis, 1925: 903) that both *rusticola* and *mira* breed on Amami-Oshima. *S.r.rusticola* occurs on Amami-Oshima only as a migrant and winter visitor. *S.r.mira*, the local resident race, is a valid and very strongly marked subspecies.

The Woodcock is a not uncommon summer resident from Izu Islands and central Honshu northward. Elsewhere in Japan it is a transient and winter visitor, at times not uncommon locally. I found it fairly plentiful in Hokkaido in June 1947, breeding in the small woodlands in the wetter parts of the central and southern Ishikari Plain near Chitose. It nests southward through the Honshu highlands as far as Mt. Fuji, but is rare in the Japan Alps. It is also believed to be resident on the larger of the Izu Islands, but its numbers increase there with the arrival of migrants, and it is most plentiful on Oshima in February. It starts nesting in Honshu in early April, in Hokkaido a month later. Kiyosu (1943: 84) gives the incubation period as 20-21 days.

Spring migrants reach Muroran, Hokkaido in late March and early April, and spread north to start nesting in the Sapporo area in May. The species leaves Hokkaido in October and comes down through Honshu in November, some passing on through, others wintering along the warmer southern coasts. It is occasionally encountered in the parks in central Tokyo in midwinter, and larger numbers, a hundred or more at a time, have been reported from Hyogo Prefecture in December.

183. Lymnocryptes minima (Brünnich)

JACK SNIPE

Japanese: Ko-shigi (little snipe)

Scolopax minima Brünnich, Orn. Boreal., 1764: 49 (Christiansö, Norway).

The Jack Snipe wanders to Japan irregularly from the westward but is apparently not of regular occurrence. The specimen record:

Hokkaido, Hakodate		3 Oct. 1856	Brit. Mus.
" Iburi		27 Oct. 1916	Kuroda coll.
Honshu, no loc.	(2)	undated	Yamashina coll.
" Fukushima, Iwaki		undated	1942 Hand-List
" Ibaraki, Hitachi	(2)	undated	AMNH
" Chiba, Sakura		8 Nov. 1896	Yamashina coll.
" "		Feb. 1889	Yamashina coll.
" " Shimosa		21 Jan. 1913	Kuroda coll.
" Saitama, Kawagoe		9 Jan. 1893	Yamashina coll.
" Tokyo		undated	Tokyo Univ. coll.
" Yokohama	(8)	undated	Brit. Mus.
" Shizuoka, Suruga		undated	1922 Hand-List

184. Calidris canutus rogersi (Mathews)

KNOT

Japanese: Ko-oba-shigi (little tail-feather snipe)

Canutus canutus rogersi Mathews, Bds. Austr., **3**, 1913: 270, 273, pl. 163 (Shanghai, China).

The Knot is a rare transient. Its known distribution elsewhere in eastern Asia indicates it should be of fairly regular occurrence. The specimen record:

Hokkaido, Hakodate		6 May 1884	USNM, *ex* Blakiston
Honshu, Ibaraki, Hitachi		undated	Yamashina coll.
" " "	(2)	undated	AMNH, *ex* Owston
" Chiba Gyotoku		undated	1922 Hand-List
" Tokyo, Haneda	(5)	undated	Kuroda coll.
" " Edo River		26 Sep. 1950	Norinsho coll.
" "		undated	Yamashina coll.
" Yokohama		undated	Brit. Mus.

185. Calidris tenuirostris (Horsfield)

ASIATIC KNOT

Japanese: Oba-shigi (tail-feather snipe)

Totanus tenuirostris Horsfield, Trans. Linn. Soc. London, **13**, 1, 1821: 192 (Java).
Tringa crassirostris Temminck & Schlegel, in Siebold, Fauna Jap., Aves, 1849: 107, pl. 64 (Japan). (Synonym)

This species is a rather uncommon transient, sometimes fairly plentiful in Kyushu, less so elsewhere in Japan. A specimen in the USNM was taken in Hakodate 6 May 1884; one in the AMNH at Sapporo 1 September 1906. According to Kuroda (1918: 370) small flocks usually appear at the mouth of the Rokugo River in Tokyo in mid April (earliest 10 April) but do not stay long. Its autumn flight is from late August to mid October. Lumsden (*in lit.*) saw several small flocks in a marsh near the airstrip at Iwakuni, Hiroshima Prefecture, and examined three shot by BCOF airmen 26 September 1946. At Ariake Bay, Kyushu, Kawaguchi (Choju Hok., 1929: 359) saw 12 birds on 21 July, 3 on 28 July, and about 100 on 7 September 1929.

186. Crocethia alba (Pallas)

SANDERLING

Japanese: Miyubi shigi (three-toed sandpiper)

Trynga alba Pallas, in Vroeg's Cat., 1764, Adumbr., p. 7 (coast of the North Sea).

The Sanderling is an uncommon transient along the Japanese coasts, limited by the scarcity of the clean, hard, sandy beaches it prefers. Small numbers can usually be found in season, wherever such beaches do occur, such as near Enoshima in Sagami Bay. It has never been taken on Shikoku, but has been recorded on all the other main islands. It may be looked for in May during the spring flight, and in the autumn from August to November, most commonly in September. It has been taken at Shimosa, Chiba Prefecture, in February.

187. Eurynorhynchus pygmeus (Linné)

SPOON-BILLED SANDPIPER

Japanese: Hera shigi (spatula sandpiper)

Platalea pygmea Linné, Syst. Nat., ed. 10, **1**, 1758: 140 (eastern Asia).

The Spoon-billed Sandpiper is a rare but probably fairly regular autumn transient in Japan, usually seen in company with flocks of

Little Stints. It has never been taken in spring. The specimen record:

Hokkaido, Hakodate		8 Oct.	Brit. Mus.
" "		14 Sep. 1884	USNM
" "	(2)	7, 8 Oct. 1885	USNM
" "	(3)	15 Oct. 1886	PANS
Honshu, Chiba, Gyotoku		17 Sep. 1887	Yamashina coll.
" "		16 Oct. 1883	Yamashina coll.
" " Shimosa		undated	AMNH, *ex* Owston
" Tokyo, Rokugo River	(3)	11 Oct. 1916	Kuroda coll.
" Yokohama		undated	Brit. Mus.
" Kanagawa, Uraga		21 Jan. 1914	Kuroda coll.
" Aichi, Owari		Nov. 1906	MCZ
" Nagano, Shinano-Koyama		undated	Dob. Zas., 1931: 612
Kyushu, Fukuoka		undated	Tori, 1917: 23
"		undated	AMNH
Japan		undated	MCZ

188. Erolia ruficollis ruficollis (Pallas)

LITTLE STINT

Japanese: Tonen (autochthonous, means this year)

Trynga ruficollis Pallas, Reise ver. Prov. Russ. Reichs, **3**, 1776: 700 (Transbaikalia).

This is the common small sandpiper of the beaches and flats of the coastal bays and inlets, the most abundant of the waders that visit Japan. Its spring passage is from late April to mid June, its autumn flight from late July to early November. The height of the autumn migration occurs in September in the Tokyo area.

189. Erolia temminckii (Leisler)

TEMMINCK'S STINT

Japanese: Ojiro tonen (white-tailed stint)

Tringa Temminckii Leisler, Nachtr. zu Bechstein's Naturg. Deutschl., 1812: 64 (Germany).

This continental species is a rare transient in Japan, possibly commoner than the record indicates because of the difficulty of identifying it in the field. Practically all the specimen records are from the Tokyo area, and taken during the autumn flight:

Honshu, Tokyo	1891	Yamashina coll.
" Kanagawa, Sagami Bay	Sep. 1914	Matsudaira coll.
" " "	Sep. 1920	Matsudaira coll.
" " "	25 Sep. 1949	Nagahisa Kuroda coll.
" " "	2 Oct. 1949	Nagahisa Kuroda coll.
" Shizuoka	undated	Yamashina coll.
Izu Ids, Hachijo	undated	Momiyama coll.

Nagahisa Kuroda's two specimens (Tori, 1952: 21) were collected on a wet, grassy marsh behind the beach at Tsujido, Kanagawa Prefecture. Both were young of the year, and were in company with Pectoral and Wood Sandpipers, and Common Snipes.

190. Erolia minutilla subminuta (Middendorff)
LEAST SANDPIPER
Japanese: Hibari shigi (lark sandpiper)

Tringa subminuta Middendorff, Reise Nord. und Ost. Siberien, **2**, Th. 2, 1853: 222, pl. 19, fig. 6. (Stanovoi Mts., and River Uda.)

The Asiatic race of the Least Sandpiper breeds along the northeast Asiatic coast from the northern Kuriles northward. Its eggs and young were first described by Yamashina (Tori, 1928: 86) from specimens collected by Orii at Paramushir. In Japan it is an uncommon transient, perhaps more plentiful than the record shows because it is so difficult to recognize among the other stints and sandpipers it travels with. There are specimen records for all the main islands except Kyushu. Kiyosu (1943: 81) gives its seasons as from April to May and August and September. It has been collected at Hakodate between 20 August and 3 November. Kumagai (Ann. Orn. Orien., 1928: 306) reports specimens from Miyagi on 25 August and 7 September, and Momiyama (Tori, 1924: 102) from Hachijo in the Izu Islands in 1922.

191. Erolia melanotos (Vieillot)
PECTORAL SANDPIPER
Japanese: America uzura shigi (American quail sandpiper)

Tringa melanotos Vieillot, Nouv. Dict. Hist. Nat., **34**, 1819: 462. (Paraguay).

This predominantly Nearctic species also breeds in northeastern Siberia and comes down the Asiatic coast regularly in small numbers. It has been collected in Korea and the Kuriles (Urup, Ushishir, Matua, Shinshir, Iturup), and in Japan as follows:

Hokkaido	Aug. 1902	Sapporo Mus.
Japan	undated	Petersburg Museum (Vog. pal. Fauna: 1585)
Honshu, Kanagawa, Tsujido (2)	25 Sep. 1949	Nagahisa Kuroda coll.

192. Erolia acuminata (Horsfield)
SHARP-TAILED SANDPIPER

Japanese: Uzura shigi (quail sandpiper)

Totanus acuminatus Horsfield, Trans. Linn. Soc. London, **13**, (1), 1821: 192 (Java).

The Sharp-tailed Sandpiper is a not uncommon transient, usually visiting the coastal marshes and seldom found on the open beaches and flats. Jahn (1942: 276) encountered it regularly in the Osaka area, and reports its migration in spring as from 7–18 May, and in autumn in October. It has been taken on all the main islands, frequently in Hokkaido in mid September.

193. Erolia alpina sakhalina (Vieillot)
DUNLIN

Japanese: Hama shigi (beach sandpiper)

Scolopax sakhalina Vieillot, Nouv. Dict. Hist. Nat., **3**, 1816: 359 (Sakhalin).

The Dunlin is one of the commonest of the waders in Japan, absent only for a short period between June and August while on its northern breeding grounds. Early arrivals reach Aomori in mid summer (26 July), the main flight comes in mid September, and the bird is common on all beaches and shallows in Honshu through October. It then diminishes in numbers as most of the population moves on, but it winters in quantity from Tokyo southward. The spring movement begins with the arrival of migrant birds from the south in mid April, and is at its height in May, the last stragglers disappearing northward in June.

194. Erolia ferruginea (Pontoppidan)
CURLEW SANDPIPER

Japanese: Saruhama shigi (monkey-beach sandpiper)

Tringa Ferruginea Pontoppidan, Danske Atlas, 1763: 624 (Denmark).

The Curlew Sandpiper is a rare transient in Japan, known only from the following specimen records:

Honshu, Chiba, Gyotoku		20 Sep. 1883	Yamashina coll.
" " "	(6)	23 May 1884	Yamashina coll.
" Tokyo, Haneda	(3)	9 May 1916	Kuroda coll.
" Kanagawa, Sagami		undated	Matsudaira coll.
Izu Ids., Hachijo		undated	Momiyama coll.

195. Limicola falcinellus sibirica Dresser
BROAD-BILLED SANDPIPER
Japanese: Kiriai (pair of gimlets)

Limicola sibirica Dresser, Proc. Zool. Soc. London, 1876: 674 (Siberia and China).

An uncommon autumn transient, the Broad-billed Sandpiper occurs in small numbers usually in company with flocks of Dunlins or Little Stints. Kuroda (1918: 380) says it usually appears on the flats off the Rokugo River in Tokyo in late August and remains until early October. He had three specimens collected there 26 August 1915, 7 September 1914, and 11 October 1916. There are old specimen records from Hakodate (August 1882) and undated ones from Chiba, Yokohama, and Suruga Bay in Honshu, and from Chikuzen in Kyushu.

196. Tryngites subruficollis (Vieillot)
BUFF-BREASTED SANDPIPER
Japanese: Komon shigi (dotted sandpiper)

Tringa subruficollis Vieillot, Nouv. Dict. Hist. Nat., **34**, 1819: 465 (Paraguay).

This Nearctic species has been taken four times in the Kuriles in August and September, and twice in Japan as follows:

Honshu, Tokyo	undated	AMNH, *ex* Owston
Honshu, Aichi, Owari	May 1891	Yamashina coll.

197. Philomachus pugnax (Linné)
RUFF (♂), REEVE (♀)
Japanese: Erimaki shigi (muffler snipe)

Tringa Pugnax Linné, Syst. Nat., ed. 10, **1**, 1758: 148 (Sweden).

The Ruff has probably never been of regular occurrence in Japan.

It is to be expected that more of its appearances should be noticed than those of less conspicuous rarities. The specimen record:

Hokkaido		undated	Brit. Mus.
Honshu,	Miyagi	25 Sep. 1921	Kumagai coll.
"	"	8 Sep. 1925	Kumagai coll.
"	Fukushima	undated	1942 Hand-List
"	Saitama	undated	AMNH, *ex* Owston
"	Chiba, Gyotoku	12 Oct. 1882	Yamashina coll.
"	" Horie	13 Oct. 1882	Yamashina coll.
"	Yokohama	undated	Brit. Mus.
"	Haneda	undated	Kuroda coll.
"	Aichi, Owari	undated	Yamashina coll.
"	Sagami	29 Sep. 1919	Matsudaira coll.
"	"	29 Sep. 1920	Matsudaira coll.
"		undated	Yamashina coll.

RECURVIROSTRIDAE

198. Himantopus himantopus himantopus (Linné)

BLACK-WINGED STILT

Japanese: Seitaka shigi (tall snipe)

Charadrius Himantopus Linné, Syst. Nat., ed. 10, **1**, 1758: 151 (southern Europe).

The Black-winged Stilt has been recorded in Japan as follows:

Hokkaido,	Hidaka	3 Apr. 1923	Photo in Tori, 1940: 723
Honshu,	Niigata, Echigo	undated	Taka-Tsukasa coll.
"	Ibaraki, Kasumigara	15 Oct. 1935	Photo in Tori, 1937: 323

PHALAROPODIDAE

199. Phalaropus fulicarius (Linné)

GRAY PHALAROPE

Japanese: Hai-iro hire-ashi shigi (gray web-footed snipe)

Tringa Fulicaria Linné, Syst. Nat., ed. 10, **1**, 1758: 148 (Hudson Bay).

Nagahisa Kuroda and Wilke found the Grey Phalarope a fairly common spring transient 30 miles and more off the coast of northern Honshu. On their 1950 fur-seal trips they first encountered it 23 April and collected one for the record (now in USNM) about 40 miles east of Miyagi Prefecture. Small numbers were then seen daily well off shore from Kinkazan up the Iwate coast, often with the flocks of the more plentiful Red-necked Phalaropes until on 9 May they actually outnumbered the latter 45 miles off southern Iwate. From then on they became scarcer, and the last were seen 13 May. They failed to find any during their several voyages off Hokkaido in late May.

This phalarope stays so far off shore and comes to land so seldom that previous to Kuroda and Wilke's experiences very little was known about its status in Japanese waters. Matsudaira (Tori, 1924: 230) encountered the species off Sagami Bay only once, a small flock on 9 April 1916. The only other information available was from the scant specimen record:

Hokkaido, Hakodate			undated	Sapporo Mus.
Honshu, Chiba, Boso Pa.			16 Apr.	Kuroda coll.
"	Kanagawa, Uruga		8 May	Kuroda coll. (lighthouse casualty)
"	"	Cape Inamuraga	9 Apr. 1916	Yamashina coll.
"	"		undated	AMNH, *ex* Owston
"	"		May	Yamashina coll.
"	Shizuoka, Suruga		Aug. 1899	Yamashina coll.
"	Aichi, Owari (2)		undated	AMNH, *ex* Owston
"	"		1890	Yamashina coll.
"	Hyogo, Kobe		undated	Yamashina coll.
Izu Ids., Hachijo			29 Feb. 1924	Momiyama coll.

The species' winter distribution is still a matter of conjecture. The single Hachijo record suggests it may winter in waters somewhere off the Bonins or the southern Izu Islands.

200. Phalaropus lobatus (Linné)

RED-NECKED PHALAROPE

Japanese: Aka-eri hire-ashi shigi (red-necked web-footed snipe)

Tringa lobata Linné, Syst. Nat., ed. 10, **1**, 1758: 148 (Hudson Bay).

This phalarope is a common spring and autumn transient off all the coasts of Japan. It comes closer to shore than the preceding species, and appears fairly regularly in the wide bays and on some of the large inland bodies of water. Matsudaira (Tori, 1924: 231) gives its spring migration in Sagami Bay from late April when the birds are still changing plumage, to early May when most of them have assumed nuptial dress, with a few occasionally remaining until early June. Kuroda and Wilke found it abundant off northern Honshu and Hokkaido in the spring of 1950. They observed the first few birds

12 April a few miles off Onagawa, Miyagi Prefecture. The flocks increased in number and size until 8 May, when they were plentiful 30 to 50 miles off Kinkazan. They found another large concentration in Funka Bay and off Cape Esan, Hokkaido, in late May and early June, but the birds became scarcer as the vessel moved eastward. They saw none after mid June.

The southward flight begins in early August. I saw three small flocks of six to twenty birds 10 August 1945 in Maizuru Bay on the north coast of Kyoto Prefecture. The species appears on Lake Biwa in late August and early September. Matsudaira (*idem*) reports it commonest in Sagami Bay from mid September to early October, his latest record being 10 October. Stragglers are sometimes seen later in the autumn and winter, but most of the population moves on to winter off the Ryukyus, Formosa, and south China.

GLAREOLIDAE

201. Glareola pratincola maldivarum Forster
SWALLOW PLOVER, PRATINCOLE

Japanese: Tsubame chidori (swallow plover)

Glareola (*Pratincola*) *Maldivarum* J. R. Forster, Faun. Indica, ed. 2, 1795: 11 (near Maldive Islands).

The Swallow Plover is an erratic wanderer, very irregular in its winter movements, and unpredictable in its comings and goings. A rare bird in Japan, it seems to wander casually from the mainland to Kyushu and western Honshu usually in early autumn. Lumsden (*in lit.*) encountered a small flight in western Honshu: "For a few days in September [1946] Pratincoles were very common on the airstrip at Iwakuni, but they soon disappeared. I shot one on 22 September. None at all were seen on the spring migration." The specimen record:

Honshu, Ibaraki, Hitachi	28 Sep. 1889	Yamashina coll.
" Kanagawa, Sakawa	undated	Uchida (1913: 269)
" Tokyo	1930	Momiyama coll.
" Shiga, Yamashiro	1927	Kuroda coll.
Izu Ids., Hachijo	1931	Momiyama coll.
Kyushu, Nagasaki, Ariake Bay	undated	1942 Hand-List
" Fukuoka	19 Sep. 1948	Abe coll.

STERCORARIIDAE

202. Catharacta skua maccormicki (Saunders)

GREAT SKUA

Japanese: O-tozoku kamome (great thief gull)

Stercorarius maccormicki Saunders, Bull. Brit. Orn. Cl., **3**, 1893: 12 (Victoria Land).

Catharacta matsudairae Taka-Tsukasa, Tori, **3**, (12, 13), 1922, unpaged (Sagami Bay). (Synonym)

This species is not known to breed in the North Pacific, and the birds which summer off Japan are probably from Antarctic nesting grounds wintering northward with shearwaters from the same area. Only six of the 32 specimens in Taka-Tsukasa's original type series of the proposed pale race *matsudairae* are still extant, four in the Yamashina collection, one in the Norinsho collection, and one in the MCZ. These birds were all collected by Matsudaira in Sagami Bay. The MCZ specimen is in very worn and bleached plumage and as Peters (1934: 311, footnote) points out, is probably *maccormicki*. The three fresh specimens collected by Wilke off northern Honshu and Hokkaido in 1950 are all within the size and color range of the series of *maccormicki* in the USNM.

The Great Skua is a not uncommon spring and summer visitor along the coasts of northern Honshu and Hokkaido, seldom met with because it rarely comes close to shore. Until recently the only records for Japan, other than the 32 specimens Matsudaira collected in Sagami Bay, 23 of them in May, 8 in June, one undated, were a few sight records in Tsugaru Straits by Yamashina (Tori, 1931: 192) and Kiyosu (Yacho, 1939: 901), and a specimen in the Fishery College at Kurihama near Yokosuka, doubtfully labelled "Sagami, Iwafuni gun, January 1921", which is reported by Kikkawa (Choju no Setai, 1949: 8) to have been taken at Iwafune gun, Niigata Prefecture, in May 1930.

While cruising in the Japan Sea off the west coast of Aomori we saw three Skuas among flocks of shearwaters near Kyurokujima 1 June 1948, but were unable to collect any of them. While the species is not overly shy, shows very little fear, and will come fairly near to the ship on strong bold wing-strokes, it is a hard bird to kill except with heavy shot at close range. Nagahisa Kuroda and Wilke were more successful in May 1950, and obtained four specimens off northeast Honshu and southeast Hokkaido. They first encountered the species 1 May 1950 about 30 miles off Iwate Prefecture, and saw single birds every day or so from then until 20 May as they worked northward past Miyagi. In late May they met ten single birds between Tomakomai and Cape

Esan, Hokkaido, and two more together just east of Esan. Nagahisa Kuroda collected a male in light, worn plumage off Ozuchi, Iwate, 13 June 1951, and three more 60 miles off Iwate in late May, 1952.

Skuas are almost always found off Japan singly among the flocks of various shearwaters, mostly with *leucomelas* and *carneipes*. Kuroda and Wilke only once saw Skuas attack one of these birds, but Matsudaira (Tori, 1924: 190) who watched them for years, reports they constantly attacked the shearwaters off Sagami Bay, dashing at single individuals in a low, straight flight, striking them on the neck or back with the beak and hitting with both feet and wings until the victim disgorges. He stresses the point that the Skua is never seen with gulls, and that the smallest shearwater, *tenuirostris* is its most frequent victim, though it will attack *leucomelas*, *griseus*, or *carneipes* just as readily. Yet the shearwaters do not seem to fear the Skua, and show no concern or alarm as the latter swim about among them when resting in flocks on the water.

203. Stercorarius pomarinus (Temminck)
POMARINE JAEGER
Japanese: Tozoku Kamome (thief gull)

Lestris pomarinus Temminck, Man. d'Orn., 1815: 514 (Arctic Europe).

This is the commonest of the jaegers visiting Japan, but is by no means plentiful. It visits the coastal waters of northern Honshu and Hokkaido irregularly from February to June, and is most abundant in April and May. It had never been recorded in autumn, nor westward or southward of Sagami and Suruga Bays.

Nagahisa Kuroda and Wilke first met it 35 miles southeast of Kinkazan on 7 February 1950, and observed occasional solitary individuals off the Ibaraki and Miyagi coasts through the next two months. It suddenly became more abundant 23 April off Onagawa about 30 miles at sea. Some 20 birds were seen moving northward one after another widely scattered over the sea, sometimes resting on the water in twos and threes, frequently with the flocks of shearwaters. They remained as plentiful as this only for three days, and from 27 April to 9 May only occasional single birds were observed. Sailing off the south coast of Hokkaido in late May they again encountered single birds moving northeastward, the latest on May 30. The first specimens they collected were thin and in poor condition. Those taken late in May had not only acquired their nuptial plumage, but had fattened noticeably.

The Pomarine Jaeger seldom comes close to shore, but Yamashina (Tori, 1924: 6) saw a flock of 20 from the beach 7 May 1922 near Senbon in Suruga Bay where Kuroda (Tori, 1922: 49) had found them common one April several years earlier when an exceptionally heavy run of sardines attracted the Kittiwakes close to shore, and the jaegers followed them in.

204. Stercorarius parasiticus (Linné)

PARASITIC OR ARCTIC JAEGER

Japanese: Kuro tozoku kamome (black thief gull)

Larus parasiticus Linné, Syst. Nat., ed. 10, **1**, 1758: 136 (Sweden).

The Parasitic Jaeger has been taken often in the Kuriles and in Kamchatka. It may visit the Japanese offshore waters more regularly than the record indicates, though Kuroda and Wilke did not find it during their offshore cruising in 1949 and 1950. The only definite record for Japan is a specimen in the former Kuroda collection taken near Aomori 14 September 1923. The source of the Suruga Bay locality listed for the species by the 1932 Hand-List is apparently the sight records of Yamashina (Tori, 1924: 6) who saw six birds near Senbon, Suruga Bay, on 6 May 1924, and several more on 15 May, both times harassing migrating flocks of Common Terns.

205. Stercorarius longicaudus Vieillot

LONG-TAILED JAEGER

Japanese: Shirohara tozoku kamome (white-bellied thief gull)

Stercorarius longicaudus Vieillot, Nouv. Dict. Hist. Nat., **32**, 1819: 157 (northern Europe).

The Long-tailed Jaeger was almost unknown in Japan until Kuroda and Wilke found it off Hokkaido and northern Honshu during the spring of 1950. The only previous record was a female blown inland to Nagano Prefecture 23 April 1925 (Kuroda, Tori, 1923: 390). Kuroda and Wilke found it much less abundant than the Pomarine Jaeger, but by no means uncommon. They report it as a shy bird, showing none of the curiosity about the ship other species exhibit, a hard one to approach within shotgun range, and as difficult to kill as the Skua, but they managed to collect four on foggy days when a few careless birds crossed their bow within range. They saw their first

Long-tailed Jaeger off Miyagi 26 April just after the main group of Pomarines had passed by. Two were seen off Onagawa the next day, and the species was slightly more plentiful off Miyagi between 1 and 8 May. Six were seen north of Iwate 13 May. In Hokkaido the Long-tails were again slightly behind the Pomarines; a single bird was seen west of Cape Erimo 24 May, and ten more about 20 miles off Tomakomai on 28 and 30 May when four fine adults were collected, all in full plumage and very fat. When Nagahisa Kuroda collected five more 60 to 80 miles off Iwate Prefecture in late May 1952, the Pomarines had practically disappeared.

LARIDAE

206. Pagophila eburnea (Phipps)

IVORY GULL

Japanese: Zoge kamome (ivory gull)

Larus Eburneus Phipps, Voy. N. Pole, 1774, App.: 187 (Spitsbergen).

The only records for Japan for this polar species are two specimens, a male and a female, taken at Nemuro, Hokkaido, by Shirio Nakazone 26 February 1934. Both are in the Yamashina collection (Tori, 1934: 326).

207. Larus crassirostris Vieillot

BLACK-TAILED GULL

JAPANESE GULL

Japanese: Umineko (sea cat)

Larus crassirostris Vieillot, Nouv. Dict. Hist. Nat., **21**, 1818: 508 (Nagasaki, Japan).

Larus melanurus Temminck, Pl. Col., livr. 77, 1828, pl. 459 (Japan).

The Black-tailed Gull is the common gull of Japan, and one of the commonest sea birds along all coasts. In Hokkaido it is mainly a summer resident. A few are found occasionally in winter in Hokkaido and northern Honshu, but most of the population moves southward after the breeding season and winters from Tokyo southward through the Ryukyus to about latitude 22° on the China coast. The species breeds from south Sakhalin and the southern Kuriles through coastal Hokkaido and Honshu, and along the continental coast from Manchuria and Korea to north China. In Japan it nests in colonies on islands along the coast, some of the most extensive and best known of which are protected as Natural Monuments:

Hokkaido, Teurajima (Nat. Mon. 1924)
" Koshima
Honshu, Aomori, Hachinoe, Kabushima (Nat. Mon. 1922)
" Iwate, Sanganjima and Tsubakishima (Nat. Mon. 1934)
" Miyagi, Ashijima (Nat. Mon. 1938)
" Yamagata, Tobishima (Nat. Mon. 1938)
" Shimane, Kyojima (Nat. Mon. 1922)
" Wakayama, Okurabara and Hijikijima

One of the most celebrated and amazing of these colonies is the one on Kabushima, a small islet in Hachinoe Harbor, Aomori Prefecture. It is only 150 yards off shore, formerly reached by a rickety wooden footbridge, now connected to the mainland by a wide causeway built by the Japanese navy, during the war, of rubble removed when tunnels were dug under the island to shelter midget submarines. One half of the islet is a busy whaling station; at the shore end of the causeway is a populous fishing village and a granite quarry. The islet has been occupied by the gulls continuously for a century or more, except for the few years it was a submarine base during World War II. The birds nested on other islets near by during the navy's tenancy, and returned immediately after the base was destroyed at the end of the war.

Long before the site was made a Natural Monument it was protected by the local people. The fishermen regard the gulls as their friends because they act as guides to the schooling fish. They deified the birds years ago and built a small shrine on the summit of the islet which is visited by scores of people daily. The designation of the site as a Natural Monument heightened the local pride in the colony. The local young men's association has undertaken guardianship over it, and assigns sentries from its membership to watch day and night during the nesting season to keep visitors within a roped-off area surrounding the shrine in the center of the islet. The birds are so accustomed to humans they have become remarkably tame, and can be approached on their nests within a foot or two.

Extensive studies of the gulls on Kabushima were made between 1926 and 1937 by Masami Komatsu, a biology teacher in the Hachinoe schools. Komatsu's several papers on his investigations (Yacho, 1934: 126 and 131; Tori, 1935: 448–461; Choju Iho, 1937: 1–38) provide an excellent and thorough picture of the species' breeding habits and life history. Over the 12 year period he banded 2500 gulls, both young and adult, which enabled him to determine their remarkable site-tenacity (76 per cent return to the colony, 48 per cent of which nest in exactly the same spot each year), their conjugal fidelity (96 per cent of those studied remained paired two years in succession, 41 per cent three years, with no evidence of birds taking new mates while old mates are still alive), and their distribution (grenade effect in scattering of young after leaving the island, and general movement in winter southwestward as far as western Kyushu).

The gulls start to gather in the neighborhood of the breeding islands long before the laying season. They arrive off Kyojima in Shimane in mid January, off Ashijima in Miyagi in February, at Kabushima in mid March. The egg laying dates are progressively later as one goes northward. The birds come to land in a body, select their nesting territories, go through their courtship, and start nest building about ten days before egg laying. They start to lay at Kabushima in early May. The normal clutch contains 2 to 3 eggs; 700 nests reported by Komatsu (*idem*) show two eggs in 43 per cent, three eggs in 36 per cent, with one egg apparently the result of accident, and four or five very rare, possibly from stolen or "appropriated" eggs. The eggs are laid one every other day until the clutch is complete. Incubation starts with the laying of the second egg. In an incubator, eggs hatch 21 days after laying. On the island, however, the period lasts 24 to 25 days, sometimes 27 days after incubation starts. Both sexes incubate, relieving each other after periods varying from five minutes to three hours. The young are able to fly 45 to 50 days after hatching. They start leaving the island in late July and early August, and have usually all departed by early September.

We visited the colony in June 1948. About 10,000 gulls were then in occupancy, cramming every available niche, even in the roped-off area around the shrine where visitors are allowed. The nests in the visitor's area and within an arm's length outside the fence were empty or contained a single egg; those out of reach of visitors two and three apiece. We saw 18 banded gulls among the hordes and were able to catch six of them by hand on their nests, but their bands were worn so smooth that the legends were undecipherable. They were undoubtedly Komatsu's birds, banded eleven or more years before, for no gulls have been banded in Japan since.

The Black-tailed Gull's main food is small fish, with sardines and lance heading the list. In May and June the Aomori gulls spend much time in nearby paddy fields catching the larvae and imagi of various land and fresh water insects. They are accused by the rice farmers of tramping down young rice plants, but their damages are well offset by their consumption of noxious insects.

208. Larus canus kamtschatschensis Bonaparte

COMMON GULL

Japanese: Kamome (autochthonous)

Gavina Kamtschatchensis Bonaparte, Naumannia, 1854: 212, 215 (Kamchatka). (nom. nud.)

Gavina hinc *Larus kamtschatschensis* [*sic*] Bonaparte, Consp. Av., **2**, 1857: 224. In synonymy of *Larus niveus* Pallas, 1811.

The Common Gull is a not uncommon winter visitor locally in Japan. Small numbers winter in Tsugaru Straits and northern Honshu as far south as Chiba Prefecture. It is almost never seen along the Pacific Coast westward from Sagami Bay but is not rare in the Kansai area, and is fairly common along the Kyushu coast. Its seasonal distribution is similar to that of the Herring Gull, but it is much less common. It appears in Hokkaido from its more northerly breeding grounds in late September and leaves in early May. Its season at Lake Biwa is from mid October to early April.

209. Larus argentatus vegae Palmén

HERRING GULL

Japanese: Seguro kamome (black-backed gull)

Larus argentatus Brünn. var. *Vegae* Palmén, *in* Nordenskiöld, Vega-Exped. Vetensk. Iakttag., **5**, 1887: 370 (northeast Siberia).

The Herring Gull is a common winter visitor along the Japanese coasts. It arrives in Hokkaido in September and October and moves southward with the season, small numbers remaining scattered all along the shores as far as the Marianas and Formosa. It is not uncommon in the southern fishing ports in winter, and can always be found in Kure harbor in January and February (Lumsden, *in lit.*). It is seldom seen in flocks, more often in singles and small groups of two or three. Kuroda (1928: 319) gives its season in Mutsu Bay, Aomori, as from December to the end of March. The adults move northward early, and only non-breeding young birds are seen after early April in the southern islands. Nagahisa Kuroda found a huge concentration, 10,000 birds or more, still feeding around the fish-processing factories at Wakkanai, northernmost Hokkaido, 26–27 April 1951. The species had not yet returned from the north when he revisited Wakkanai the following 9–10 October, and he saw the first Herring Gulls that autumn 20 October at Ohata, a fishing village on the Shimokita Peninsula, northern Aomori.

210. Larus schistisagus Stejneger

SLATY-BACKED GULL

Japanese: O-seguro kamome (large black-backed gull)

Larus schistisagus Stejneger, Auk, **1**, 1884: 231 (Bering Island).

This is the common winter gull of the northern Japanese coasts. It frequents the harbors and fishing villages of Hokkaido in large numbers from September to April, and winters down the Pacific coast of Honshu not uncommonly to the Tokyo area, but is less plentiful farther south. It winters infrequently in the Inland Sea and has been taken as far south as the Ryukyus and Formosa, but never in Kyushu. It starts moving northward in early March. Small numbers, mostly immature birds, summer along the southeast coast of Hokkaido.

Its southernmost known breeding colony is on Daikoku Island off Akkeshi, Hokkaido, where Fennell (1953: 41) estimated the breeding population in June 1951 at "approximately 500 birds, although it may have been considerably larger. The heaviest concentration of nests appeared to be on high, inaccessible shelves of eroded or grass-covered soil along the tops of the cliffs at the southwestern end of the island. The eggs are highly relished by the residents and by visiting fishermen who undertake great risks to obtain them. . .Large numbers of this species also nested on high, rocky cliffs along the headlands of Aikappu and Aininkappu at the entrance to Akkeshi Bay. A large transient population also frequented the waterfront area of the town of Akkeshi, seemingly attracted by the unloading of the fishing boats and the offal of the fish canning factories in the neighborhood."

211. Larus glaucescens Naumann

GLAUCOUS-WINGED GULL

Japanese: Washi kamome (eagle gull)

Larus glaucescens Naumann, Naturg. Vög. Deutschl., **10**, 1840: 351 (North America).

The Glaucous-winged Gull, known to breed only on islands in the Bering Sea, is a rare winter visitor to northern Japan. There are only five specimen records, two undated from Hakodate in the British Museum, and three immature birds in the AMNH taken by Owston's collectors 8, 11, 11 April 1899 respectively in the Teshio region of northeastern Hokkaido. The immature birds in their first and early second year plumages can be told from the identically feathered young of the more plentiful Glaucous Gull by their black instead of yellow bills.

212. LARUS HYPERBOREUS PALLIDISSIMUS Portenko
GLAUCOUS GULL
Japanese: Shiro kamome (white gull)

Larus hyperboreus pallidissimus Portenko, Ibis, 1939: 266 (Chukchi Peninsula.)

This northern gull is a common winter visitor as far as southern Hokkaido, but less abundant than the Slaty-backed Gull with which it is most often seen. A few individuals winter regularly down the northern Honshu coast from Aomori to Miyagi. South of that it is rather rare, though single birds occasionally reach the Izu Islands and Shikoku. It arrives in Hokkaido in late September or early October, and is usually the first of the northern-breeding gulls to appear. Nagahisa Kuroda found it the only species to have reached Wakkanai, northern Hokkaido, 9–10 October 1951. It leaves for its nesting grounds again in April.

213. LARUS RIDIBUNDUS SIBIRICUS Buturlin
BLACK-HEADED GULL
Japanese: Yuri kamome (lily gull)

Larus ridibundus sibiricus Buturlin, Orn. Mitt., **2**, 1911: 66 (Kolyma Delta & Ussuria).

The Black-headed Gull is a common transient in Hokkaido and northern Honshu, and a common winter visitor from Tokyo southward. Its old Japanese name, "Miyakodori" or metropolis bird (now applied arbitrarily to the Oystercatcher) attests its habit of frequenting the busy harbors and river mouths. During the cold months it is at times abundant in Tokyo harbor, gathering by the thousands in the late afternoon to roost for the night along the harbor walls and moats of Miyakesaka, and even on the buildings along the waterside. It also winters in large numbers in Osaka harbor, in Lake Biwa, in the Inland

Sea, and at Kagoshima in southern Kyushu.

The first fall migrants appear in Hokkaido in late August and early September. Its season in Tokyo is from mid October to mid May. The wintering birds start moving from the south in March. Nagahisa Kuroda saw the first few birds off Iwate 15 March 1950, evidently the vanguard of the northward flight. On 17 April he saw a flock of 50 in Aomori Harbor, on 20 April a flock of 100 at Abashiri on the Okhotsk Sea side of Hokkaido, which quickly decreased as the birds moved on. Young birds may remain southward considerably later, but usually all have left by the end of May.

214. Larus saundersi (Swinhoe)
SAUNDERS' GULL
Japanese: Zuguro kamome (black-headed gull)

Chroicocephalus saundersi Swinhoe, Proc. Zool. Soc. London, 1871: 273, pl. 22 (Amoy).

Saunders' Gull is a freshwater species breeding inland on the continent as far eastward as Manchuria. It is of rare and casual occurrence in western Japan. The only unquestionable records are an old specimen in the British Museum collected by Whitely at Omura Bay, Nagasaki Prefecture, and a specimen taken by Horii (Tori, 1917: 82) in Kagoshima Prefecture in December. Ogawa (1908: 368) lists it from Hokkaido, and the 1942 Hand-List adds Saga Prefecture, Kyushu, both records of uncertain source and validity.

215. Rissa tridactyla pollicaris Ridgway
KITTIWAKE
Japanese: Mitsuyubi kamome (three-toed gull)

Rissa tridactyla pollicaris "Stejneger" Ridgway, in Baird, Brewer and Ridgway, Water Bds. No. Am., **2**, 1884: 202 (Kotzebue Sound, Alaska).

The Kittiwake is a common transient off Hokkaido, and a common winter visitor off the Pacific coast of Honshu from Tsugaru Straits south to the latitude of Tokyo. Flight birds reach Hokkaido in October and gradually work their way southward as the weather gets colder. We found them common in Funka Bay in mid December 1948, but Nagahisa Kuroda saw almost none at all later in the winter off Muroran. The species winters most commonly off northern Honshu south to Fukushima Prefecture, south of which it is less plentiful.

It visits Sagami and Suruga bays irregularly, usually in March of good sardine years, but reaches Shikoku and Kyushu only casually. Though it follows the sardines into the large bays on occasion, it is rarely seen in the ports and harbors. Its favorite haunts are the waters from a few to a score of miles offshore, where it feeds on the sardines and other small fishes driven to the surface by the porpoises and glides shearwater fashion in rough weather between the foaming crests of the waves. The northward movement starts in early April. Nagahisa Kuroda watched a flight leave Kinkazan 12 April 1950. Up to that time he had encountered Kittiwakes in small numbers daily, scattered commonly over the neighboring waters. The weather suddenly became balmy and springlike, and the Kittiwakes massed in a flock of 1000 or more at the mouth of Onagawa Bay. They then vanished, to be seen no more in the vicinity that spring. As he worked northward later in the month Kuroda saw very few Kittiwakes, most of them immatures, the latest being a single bird off Iwate Prefecture 28 April, and five off Muroran Hokkaido 1 May.

216. Xema sabini (J. Sabine)

SABINE'S GULL

Japanese: Kubiwa kamome (ring-necked gull)

Larus Sabini J. Sabine, Trans. Linn. Soc. London, **12**, pt. 2, 1819: 522, pl. 29 (Sabine Ids., west coast of Greenland).

X.s.tschuktschorum Portenko, to which this species has been referred by the 1942 Hand-List, is a synonym of *X.s.palearctica* Stegmann, which in turn is separable from the nominate stock on such slender grounds that individual specimens cannot be identified racially with certainty. The only known Japanese specimen is no longer extant.

This high northern species has been taken in Japan but once. A specimen in the former Kuroda collection was taken at Kesennuma Bay, Miyagi Prefecture, in November 1909 (Kuroda, Dob. Zas., 1912: 55–56).

217. Chlidonias hybrida swinhoei (Mathews)

WHISKERED TERN

Japanese: Kurohara ajisashi (black-bellied tern)

Hydrochelidon leucopareia swinhoei Mathews, Bds. Austr., **2**, 1912: 320 (Fukien, China).

After its nesting season in southern China and Indochina the Whiskered Tern seems to wander northward fairly regularly as far as Chihli and Manchuria on the continent. It has occurred in Japan only twice. Kuroda (Bot. Zool., 1935: 143) took a specimen at the mouth of the Rokugo River in Tokyo 28 September 1934. The other was collected by Kumagai (Tori, 1936: 183) at Lake Izu, Miyagi Prefecture 24 October 1935.

218. Chlidonias leucoptera (Temminck)

WHITE-WINGED BLACK TERN

Japanese: Hajiro kurohara ajisashi (white-winged, black-bellied tern)

Sterna leucoptera Temminck, Man. d'Orn., 1815: 483 (Mediterranean coast).

This is an inland continental species, breeding across the milder Palearctic from central Europe to Mongolia and Manchuria, and straying rarely eastward to the coast. A specimen taken by Momiyama at Hachijo in the Izu Islands 11 November 1929 (Tori, 1932: 307) is the only definite record for Japan. Another specimen in the Momiyama collection was reportedly taken in Chiba Prefecture, but the collecting data are uncertain and the record is open to question. The species has also been found casually in Korea, Transbaikalia, and Amuria. An MCZ specimen was collected in Sakhalin 28 May 1914.

219. Sterna hirundo longipennis Nordmann

COMMON TERN

Japanese: Ajisashi (horse-mackerel tosser)

Sterna longipennis Nordmann, *in* Erman's Verz. Thier. Pflanz., 1835: 17 (Okhotsk Sea).

A specimen taken 19 July 1930 in Suruga Bay was referred by Kuroda (Bot. Zool., 1941: 563) to *S.h.minussensis* Sushkin on the basis of its brighter-colored feet and lighter bill. While the casual occurrence in Japan of this inland Siberian subspecies is quite possible, it is difficult to establish from a single specimen. The only diagnostic criteria are the evanescent colors of the soft parts, which not only vary seasonally and individually in life, but may change considerably as the dead specimen ages.

The eastern Siberian race of the Common Tern breeds south to Sakhalin and the northern Kuriles, and winters south to the southern Pacific Islands. Along the shores of Japan it is a common spring and autumn transient. The spring flight moves northward along the Honshu coast in May. Yamashina (Tori, 1924: 7) reports its arrival in Suruga Bay 6 May 1922. Nagahisa Kuroda first encountered it 8 and 9 May 1950 about 40 miles off Kinkazan, and found a few still present off Kushiro, Hokkaido, 25 May 1950. The vanguard of the fall flight reaches Honshu in late August (a specimen in the AMNH was taken at Sagami Bay 24 August 1916), but the main autumn migration is in September. The species is not uncommon in Tokyo Bay from 10 to 20 September, and Jahn (1942: 287) reports it as most plentiful in the eastern end of the Inland Sea during the latter half of that month. The bulk of the population moves southward quickly, but stragglers remain behind until late in the autumn. I collected five from a flock of several hundred in Kushiro Harbor 3 October 1948. A migrating flock of 1500 was reported in Toyama Prefecture 18 November 1930, which is unusually late. The main flight of this race seems to move southward at sea from Honshu and Shikoku rather than following the coast. It has never been reported from Kyushu or the Ryukyus, and is of doubtful occurrence in east China.

220. Sterna sumatrana sumatrana Raffles

BLACK-NAPED TERN

Japanese: Eriguro ajisashi (black-naped tern)

Sterna Sumatrana Raffles, Trans. Linn. Soc. London, **13**, pt. 2, 1822: 329 (Sumatra).

The Black-naped Tern breeds fairly commonly in the Ryukyus. Its northeastern limit is Makeno Island, off the southern tip of Kyushu just west of Tanegashima. Eggs collected there are illustrated by Kobayashi and Ishizawa in their "Eggs of Japanese Birds". The species has never been taken elsewhere in Japan.

221. Sterna aleutica Baird

ALEUTIAN TERN

Japanese: Koshijiro ajisashi (white-rumped tern)

Sterna aleutica Baird, Trans. Chic. Acad. Sci., **1**, pt. 2, 1869: 321, pl. 31, fig. 1, (Kodiak Island, Alaska).

This northern species breeds in the Komandorski Islands and as far south as Sakhalin, but has not been reported from Kamchatka or the Kuriles. It does not migrate southward as do most other terns, but remains in the northern seas throughout the year. It has occurred in Japan as follows:

Honshu, Miyagi	15 May 1931	Kumagai coll.
" Chiba, Choshi	undated	Brit. Mus.
" Sagami Bay	undated	1922 Hand-List

222. Sterna anaethetus anaethetus Scopoli

BRIDLED TERN

Japanese: Mamijiro ajisashi (white eye-browed tern)

Sterna Anaethetus Scopoli, Del. Flor. et Faun. Insubr., fasc. 2, 1780: 92 (Panay, Philippine Islands).

The Bridled Tern breeds locally in the China Sea from Formosa and Malacca eastwards. It has been taken in Japan as follows:

Hokkaido, Hakodate	4 Nov.	Brit. Mus., *ex* Seebohm
Honshu, Yokohama	undated	Seebohm (1890: 301)
" Shizuoka	18 Sep. 1894	Yamashina coll.

223. Sterna fuscata Linné

SOOTY TERN

Japanese: Seguro ajisashi (black-backed tern)

Sterna fuscata Linné, Syst. Nat., ed. 12, **1**, 1766: 228 (Santo Domingo). (Extra limital)

Sterna Oahuensis Bloxham, Voy. 'Blonde', 1826: 251 (Oahu, Hawaiian Islands).

Sterna nubilosa Sparrman, Mus. Carls., fasc. 3, 1788: no. 63 (eastern India).

The 1942 Hand-List assigns all the Sooty Terns of the eastern Pacific to *S.f.nubilosa*. However, as Peters (1934: 338) points out, the races of this species are "badly in need of revision". He tentatively limits *nubilosa* to the populations of the Ryukyus, the China and Sulu Seas, and the eastern Indian Ocean, and assigns the Sooty Terns of Marcus Islands and the Bonin Islands to *S.f.oahuensis*. The species is only of casual occurrence in Japan, and while most of these visitors probably come from the nearest breeding grounds in the Ryukyus, insufficient material is available to determine their racial affinities.

The Sooty Tern has strayed to Japan somewhat more often than the several other tropical terns which have occurred there. The specimen record:

Honshu, Kanagawa, Jogashima	10 July 1904	Yamashina coll.
" Shizuoka, Abe-gun	25 Apr. 1904	Yamashina coll.
" " "	24 Aug. 1907	Yamashina coll.
" Shiga, Yamashiro	undated	1942 Hand-List
" Kyoto, Fushimi	undated	1942 Hand-List
" Hyogo	4 Sep. 1950	H. Kobayashi coll.

Izu Ids., Aogashima	undated	Yamashina coll.
Shikoku, Ehime, Matsuyama	undated	Morikawa coll.
Kyushu, Fukuoka	undated	1942 Hand-List
" Nagasaki	undated	Temminck & Schlegel (1836)

224. Sterna albifrons sinensis Gmelin
LEAST TERN
Japanese: Ko-ajisashi (little tern)

Sterna sinensis Gmelin, Syst. Nat., **1**, pt. 2, 1789: 608 (China).

The Least Tern is a fairly common summer resident in Honshu, breeding as far north as Yamagata, southern Akita, and Miyagi prefectures. It is occasionally seen in Aomori in August after the breeding season, but has never been taken in Hokkaido. It nests on the gravel bars of dry streambeds southward along both coasts of Honshu and locally in Shikoku (Tokushima Prefecture), but has not been found breeding in Kyushu.

It arrives in the Tokyo region in late April or early May, its presence over the moats telling of the approach of summer. It soon retires to the pebbly river bottoms, sometimes well inland in the plains areas, where it nests in single scattered pairs or, in favorable localities, in small colonies of 15 to 20 pairs. In early June it lays 3 to 4 eggs, gray-white with brown and purple markings, averaging 24 x 32 mm., which so match their surroundings they are very difficult to find except by watching the parents return to them. The incubation period is 19 to 22 days, and the young take wing about four weeks after hatching.

In August family parties appear along the bay shores, the adults still feeding the newly-fledged young. They often gather in numbers at the inlets where sardines are netted, resting in flocks on the sand bars and perching in lines on the bamboo net poles and floats. They leave for the south in September, a few remaining to mid October, and winter below the equator from the Bismark Archipelago to Java and the Sunda Islands.

225. Thalasseus bergii cristatus (Stevens)
CRESTED TERN
Japanese: O-ajisashi (great tern)

Sterna cristata Stephens, *in* Shaw's Gen. Zool., **13**, pt. 1, 1826: 146 (China).

The Crested Tern is of regular occurrence north only to the Bonin and Ryukyu islands. The first record for Japan is a young of the year taken in Tokyo 31 August 1947 by N. Fukuda (Tori, 1952: 10). A male adult was collected by K. Kobayashi in the Inland Sea off Hyogo Prefecture 29 October 1950 (Tori, 1952: 11).

226. ANOÜS STOLIDUS PILEATUS (Scopoli)
COMMON NODDY
Japanese: Kuro ajisashi (black tern)

Sterna pileata Scopoli, Del. Flor. et Faun. Insubr., fasc. 2, 1786: 92 (Philippines)

This wide-spread species breeds as far north in the eastern Pacific as the Bonin Islands and the Ryukyus. The only records for Japan, however, are:

Honshu, Miyagi, Fukanuma	undated	Yasuda (Dob. Zas., 1906: 338)
" near Tokyo Bay	undated	Brit. Mus.
Izu Ids., Hachijo	26 Aug. 1928	Momiyama coll.
" "	undated	Yamashina coll.
Kyushu, Saga, Hizen	undated	AMNH

227. GYGIS ALBA CANDIDA (Gmelin)
WHITE TERN
Japanese: Shiro ajisashi (white tern)

Sterna candida Gmelin, Syst. Nat., **1**, pt. 2, 1789: 607 (Christmas Island).

For the most recent and authoritative analysis of the races of this difficult species see Baker (1951: 174–181). *G.a.candida* breeds in the northeast Pacific from the Hawaiian to the Marianas Islands. Hartert (1898: 68) believed the species would be found breeding on Marcus and the Bonin Islands, where it has been collected fairly often, and that the populations there would prove distinct, but there is no evidence of its nesting north of Guam and Saipan.

In Japan the White Tern is much rarer than the indefinite evidence previously published implies. It is known definitely only from the following records:

Japan	1892	Yamashina coll.
Honshu, Saitama, Isanuma	May 1907	Momiyama coll.
" Aichi, Owari	undated	Yamashina coll. *ex* Tokyo Univ.
" Shiga, Omi	undated	AMNH, *ex* Owston
" Osaka, Settsu	undated	AMNH, *ex* Owston

The 1942 Hand-List copies the previous two editions in listing the species as having occurred in Hokkaido, Shikoku, and Kyushu, but the records are no longer traceable. Blakiston and Pryer (Ibis, 1878: 217) mention a "wholly white Tern in the possession of the Yamashita Hakuraukai" which Seebohm (Ibis, 1879: 23) thought was "possibly *Gygis candida* (Gmel.)." This might be the third specimen listed above. Another specimen in the Yamashina Museum, obtained by purchase, is labelled "Kamchatka, March."

ALCIDAE

228. Uria lomvia arra (Pallas)

THICK-BILLED MURRE

Japanese: Hashibuto umigarasu (thick-billed sea-crow)

Cepphus Arra Pallas, Zoogr. Rosso-Asiat., **2**, 1811: 347 (Kamchatka).

The Thick-billed Murre is a fairly common winter visitor in Hokkaido and northern Honshu, coming south on both coasts regularly to Niigata and Iwate prefectures. It is more northerly in its breeding than the Thin-billed Murre, and does not nest within Japan proper. Its southernmost known breeding site is Tyuleni Id. (Kaihyo-to) in south Sakhalin where Inukai (Yacho, 1950: 34) found a small colony of 30 nesting in one spot among the some 300,000 resident Thin-billed Murres.

It arrives off northern Honshu in mid November and remains until late April. It usually occurs in company with the Thin-billed Murre, which is far more common, and from which it is readily identified by the white in the head of the winter plumages. A specimen taken in Suruga Bay 5 April 1938 (Kuroda coll.) is the southernmost record for the species.

229. Uria aalge inornata Salomonsen

THIN-BILLED MURRE

Japanese: Umigarasu (sea crow)

Uria aalge inornata Salomonsen, Ibis, 1932: 128 (St. Matthew Island, Bering Sea).

This species breeds abundantly in the Kuriles, at Tyuleni Island off south Sakhalin, and in smaller numbers on Teurejima off western Hokkaido, and on Koshima, a small islet off the western entrance to Tsugaru Strait. (Its reported nesting on Tobishima, an islet in the

Japan Sea off Yamagata Prefecture (Yacho, 1934: 916), is erroneous.) Nagahisa Kuroda found the species abundant in late spring in the waters off Cape Esan, eastern Hokkaido, and collected a female there with ovaries fully developed 31 May 1950, which suggests a possible colony on the Pacific side of Hokkaido in that vicinity.

The Thin-billed Murres come to land in the Hokkaido colonies in early April and lay in late May. The incubation period is about a month, and the young require another two months after hatching to fledge fully. When I visited the Teurejima colony 26 June 1949 the murres were still incubating, with no chicks yet in evidence. The main colony of murres there, some 3000 strong, occupies every available ledge of a sheer rock stack about 50 feet in diameter, rising vertically 200 feet out of the breakers at the shore line. Another 500 birds occupy four smaller ledges in the most inaccessible parts of the adjoining main island cliffs, where Black-tailed Gulls, Sooty Guillemots, and Horned-billed Puffins also nest. Teurejima is protected as a Natural Monument, but the birds persist there successfully despite the constantly passing fishermen only because of the inaccessibility of their nests.

The species is a common winter visitor in the waters around Hokkaido, and down both coasts of Honshu as far as Fukushima and Niigata prefectures. While seen frequently close to shore, it is more abundant in the waters where the fur seals congregate, probably following the same foods, from a few miles to as much as 50 or more miles off the coast. Winter gales frequently cast them ashore to die on the beaches. The farmers in Aomori retrieve the dead birds, eat their meat, and preserve their skins to hang over their rice seed-beds in spring as scare-crows. We obtained skins of both the Thick-billed and Thin-billed Murres being used in this fashion in Aomori, where practically every seed-bed was so protected, and apparently quite successfully. The land crows (*Corvus* spp.) seem just as shy of the dead remains of their unrelated aquatic namesakes as of freshly-killed carcasses of their kin.

230. Cepphus columba Pallas

PIGEON GUILLEMOT

Japanese: Umibato (sea pigeon)

Cepphus Columba Pallas, Zoogr. Rosso-Asiat., **2**, 1811: 348 (Kamchatka, Bering Str.).

Cepphus snowi Stejneger, Auk, **14**, 1897: 201 (Raikoke Island, Kurile Islands).

I have seen only two specimens of the Pigeon Guillemot from Japan, both of which have also been examined by Dr. R. W. Storer, who is monographing the group. One of these, a young of the year in the MCZ, taken by Wilke at the mouth of Muroran Bay 25 January 1949, has the white of the speculum greatly reduced and is unquestionably *C.c.snowi*, the resident race of the Kuriles. The other, in the AMNH, undated, taken at Nemuro by Owston's collectors, is also a young bird, and is identified as the more northerly-breeding *C.c.columba* by Storer who comments (*in lit.*): "The specimen is indistinguishable from specimens of *C.c.columba* in comparable plumage. There is no reduction of the white of the speculum to a series of narrow bands characteristic of some specimens of *snowi* (other specimens have the speculum entirely black). The under wing coverts are largely white, a condition I have not found in the specimens of *snowi* I have examined. (According to the literature this is not supposed to occur in any of the forms of *columba*, but it is not rare, especially in the northern populations.) There is a diffuse white area in the outer primary, a condition I have not seen in *snowi*. The fact that it is a young bird is suggestive, inasmuch as the young tend to move farther south in winter than do the adults."

The Pigeon Guillemot is an uncommon but probably a regular winter visitor to coastal Hokkaido. The specimen record is scant, for very little collecting has been done in the areas it frequents in winter. Nagahisa Kuroda and Wilke saw only two during their winter cruising, the one Wilke collected, and another they were unable to secure off Cape Esan 31 January 1949. The only other record for the species in Japan is the bird Seebohm (Ibis, 1884: 174) lists as sent him by Henson from Hakodate, which, *snowi* not yet having been recognized and described, he refers to *columba*. Ogilvie-Grant (Cat. Bds. Brit. Mus. 26, 1898: 588) refers this record to *snowi*, though he does not list the specimen as present with the rest of the Seebohm collection which by then was in the British Museum.

231. Cepphus carbo Pallas
SOOTY GUILLEMOT
Japanese: Keimafuri (autochthonous)

Cepphus Carbo Pallas, Zoogr. Rosso-Asiat., **2**, 1811: 350 (Kurile Islands).

This is a bird of the rocky northern coasts, breeding in isolated colonies on exposed cliffy shores in Hokkaido and extreme northern Honshu, and moving irregularly southward in winter along both coasts. While common locally at its breeding grounds, it is seldom plentiful elsewhere. It comes southward fairly regularly as far as Miyagi and Fukushima prefectures. South of that it is a rare bird, though it has been taken in Suruga Bay in December, January, March, and April, once at Hachijo on 19 November 1924, and once off the Shima Peninsula in Mie Prefecture 31 January 1950. Although individuals, probably from the Korean population, have been taken at Tsushima, the species has never been recorded from Kyushu or western Honshu.

It has been suspected possibly of nesting along the Iwate coast, but the most southerly breeding site known definitely is the rugged headlands and small rocky islets off the Shimokita Peninsula of northern Aomori. In Hokkaido it nests in similar localities near Cape Esan and Muroran. Its best-known breeding ground is Teurejima, a small island off the northwest coast of Hokkaido, whose western cliffs, under protection as a Natural Monument, support an excellent colony of sea birds, in which the Sooty Guillemots outnumber the Bering Island Murres, Horned-billed Puffins, and Black-tailed Gulls. I estimated about 7000 Sooty Guillemots there in late June 1949, scattered well throughout the colony, nesting in crevices in the cliffs 300 to 400 feet above the sea as well as at the shore line. The favored nesting site, however, is under the rocks of the talus slopes along the shore at the foot of the cliffs. The two spotted, pale greenish-blue eggs are laid under the rocks in no semblance of a nest. On 26 June 1949 the young had just begun to hatch, and the parents were trading back and forth to a tide-rip two miles away, bringing back five-inch lance and sardines to their young.

The actions of the Sooty Guillemot on the nesting grounds are exactly like those of the more familiar Black and Pigeon Guillemots. It has the same habit of swimming idly in small flocks just off the rocks where it nests, perking its head as it swims, and uttering the same clear, plaintive whistle. On the wing the bird's red legs are very prominent, as is the white mark on the side of the head. Otherwise it looks for all the world both in the water and in the air like a Black Guillemot without the white wing patches. The chicks are identical to those of the Black Guillemot, covered with soft black down.

Stomach examination of the specimens Nagahisa Kuroda collected along the northern Honshu coast in winter show the Sooty Guillemot eats somewhat larger fish than the other alcids do. The stomach of one contained a complete *Platycephalus indicus* 15 centimeters in length, a species seldom found above 15 fathoms; another contained the complete head and tentacles of an octopus, the body of which had been digested, but the remainder was 12 centimeters long; a third contained small crabs.

232. Brachyramphus marmoratus perdix (Pallas)
PARTRIDGE MURRELET
Japanese: Madara umisuzume (mottled sea-sparrow)

Cepphus Perdix Pallas, Zoogr. Rosso-Asiat., **2**, 1811: 351, pl. 80 (Bering Sea and Sea of Okhotsk).

This murrelet is a not uncommon winter visitor to the coastal waters of Hokkaido, northern Honshu, and northern Kyushu, usually encountered in pairs or small flocks. It is recognizable at a distance by its habit of floating high on the water and by the erect way it holds its head. As it has been observed in numbers in June, July, and August on the eastern coast of Hokkaido near Akkeshi, it is suspected of breeding in that vicinity, but its nest and eggs have not yet been found south of Kamchatka.

It has been collected in Hokkaido in spring, summer, and fall — off Abashiri 22 and 27 April 1950, off Akkeshi 2 August 1935 and 20 October 1940 — but Kuroda and Wilke did not observe it during their cruising between Muroran and northern Honshu in January, February, and March. They first saw the species in late April, and found it not uncommon between Cape Erimo and Kushiro in late May.

It appears in northern Honshu in November, and winters in Mutsu Bay (where Kuroda took six specimens 15 May 1927), down the Japan Sea coast of Honshu to Niigata Prefecture, and down the Pacific coast to the latitude of Tokyo. I collected a pair in Tokyo Bay 15 January 1949, and it has been taken in Sagami Bay in March and early May, which seems about its southern limit. Specimens Kuroda collected in winter in Hakata Bay, northern Kyushu, were probably from the Korean population which winters south to the northern Ryukyus. There are specimens from Kumeshima and Amami-Oshima in the Yamashina collection.

233. Synthliboramphus antiquus (Gmelin)
ANCIENT MURRELET
Japanese: Umisuzume (sea-sparrow)

Alca antiqua Gmelin, Syst. Nat., **1**, pt. 2, 1789: 554 (Bering Sea).

The Ancient Murrelet is a common winter visitor in the bays and coastal waters out to 20 miles off shore of all four main islands. It is not known to breed in Japan, the nearest colonies being in southern Korea (Shichihatsu Island) and in the southern Kuriles (Shikotan

Island). Apparently flights reach Japan from both sources, the Korean population wintering to Kyushu and possibly western Honshu and Shikoku, and the birds from the Kuriles and northward migrating down the coast to winter off southern Honshu, and down the Izu chain to the Volcano Islands. It is usually encountered in small flocks, often covering a considerable expanse of water, diving either in unison or in succession, and uttering its small note on emerging.

Birds reach northern Honshu in early November and remain from there southward until early May. Nagahisa Kuroda found the species absent from southern Hokkaido waters in midwinter, and met the first returning migrants off Abashiri 22 April. Its season in the Tokyo area is from late November to late April. Individuals occasionally linger later; it has been collected 25 May in Sagami Bay, and dead birds have been picked up in Suruga Bay in mid summer.

The Kyushu flight is somewhat earlier both in arrival and departure. The species arrives in Kagoshima in mid October and is observed in large numbers in Hakata Bay throughout the winter until March. when it starts to dwindle until the last leave in early April.

234. Synthliboramphus wumisuzume (Temminck)

JAPANESE MURRELET

Japanese: Kanmuri umisuzume (crested sea-sparrow)

Uria wumisuzume Temminck, Pl. col., livr. 98, 1835, pl. 579 (shores of Korea and to Japan).

This interesting little murrelet is endemic to Japan. It is nowhere plentiful, even on its little-known breeding grounds, and is steadily becoming scarcer. Two separate populations are known, the larger and more extensive in the Izu Islands and among the small islets off the adjacent coast of Honshu, and a smaller group in the waters and islets between Kyushu and Korea. It has never been taken between these two localities.

The Perry Expedition found it fairly plentiful at Shimoda on the southern tip of the Izu Peninsula in 1853 (one of the two specimens they collected is still in the USNM, the other in the PANS). It still occurs quite frequently in Sagami Bay and has been observed not uncommonly off Misaki between February and April. It is much less common in Suruga Bay to the westward. It is to be found most certainly at all times, however, in and around the Izu Islands from O-Shima southward. I collected three adults there 5, 11, and 16 May

1947, and saw four others in April 1949 when I searched unsuccessfully for its nest on Shikine, Kozu, and Sanbondake (near Miyake) islands. It has been found nesting in the past on these islands and on Torishima in the Izus, on Mikomoto Island near Shimoda, and at Ipponmatsu, Miura-gun, Kanagawa Prefecture, where Matsudaira collected a downy young on 21 May 1921 (now in the Yamashina collection). The young in down plumage may be told from those of *S. antiquus* by their paler heads, and by the presence of a whitish spot in the auricular region.

The Japanese Murrelet nests in scattered small groups or single pairs on rocky islets or headlands. It lays its two eggs in a shallow depression well under the rocks or in crevices at elevations of from 50 to 200 feet above the water. The nest is usually lined with a few grasses. The eggs are similar to those of *antiquus*, yellowish-brown to grayish-white with pale brownish markings, but are slightly smaller, measuring 49.2–56 x 32–36.5 mm. The collecting dates of eggs and young show the nesting season to be from February to May.

The former presence of a breeding population in the Tsushima and Korean Straits region is indicated by the number of specimens collected there — Temminck's type, Jouy's two Fusan specimens (which I have examined in the USNM and find correctly identified), and others from Tsushima (Iijima, 1892: 124) and northern Kyushu (Kuroda, Dob. Zas., 1914: 312). Two half-grown nestlings in the USNM were collected in Nagasaki Harbor by Jouy and Dall 30 May 1881, but the present breeding site or sites of this group of birds has yet to be discovered. Kuroda (*loc. cit.*) surmised it probably bred on Tsukue and Katsura islands off the north coast of Fukuoka where a number of adult specimens were taken. There is no recent information on the current status of this population, or any further knowledge of its nesting.

The species is remarkably sedentary and localized in its distribution. It has never been taken in Shikoku, on the Japan Sea side of Japan, in western or in northern Honshu. Nagahisa Kuroda collected two females 30 May 1952, 70 miles east of Ozuchi, Iwate Prefecture (Misc. Rpts. Yam. Inst., 1952: 18), and strays have been collected once in Hakodate, Hokkaido (Sapporo Museum, Blakiston coll.), and once, questionably, in Sakhalin (Nikolski, 1889).

The Izu Island population has recently suffered a set-back from the use of Sanbondake, its principal known remaining nesting site, as a bombing target by the U.S. Air Forces in 1951 and 1952. Although the target area was shifted elsewhere the moment the Air Command was informed of the harm being done, it is feared that the almost daily bombing of the site during two nesting seasons has done irreparable damage to the dwindling Japanese Murrelets.

235. Cyclorrhynchus psittacula (Pallas)
PAROQUET AUKLET
Japanese: Umi-omu (sea-parrot)

Alca psittacula Pallas, Spic. Zool., **1**, fasc. 5, 1769: 13, pl. 2, pl. 5, figs. 4–6 (Kamchatka).

Sakhalin and the northern Kuriles are the normal southern limits of this little auklet, which breeds abundantly in the Bering Sea region. It has strayed to Japan several times, strangely enough always to Niigata Prefecture on the shores of the Japan Sea. The first specimen (Tori, 1920: 313) was picked up dead at Kashiwasaki during the winter of 1919. A second (Niig. Ten. Shi., 1925: 353) was taken later (date unspecified) nearby off Shimoshiku. Then in December, January, and February, 1926–7, Momiyama obtained five specimens at Iwafune-gun, which are now in the Yamashina Museum.

236. Aethia cristatella (Pallas)
CRESTED AUKLET
Japanese: Etorofu umisuzume (Iturup sea-sparrow)

Alca cristatella Pallas, Spic. Zool., **1**, fasc. 5, 1769: 18, pl. 3, pl. 5, figs. 7–9 (Hokkaido to Kamchatka).

This North Pacific auklet breeds as far south as the central Kuriles. It visits northern Japan regularly in winter, mainly from Tsugaru Straits northward, sometimes in flocks of thousands. Kuroda and Wilke encountered large numbers south of Muroran 21 January 1949, and again in Tsugaru Straits 14 February 1949. Small numbers come down the Pacific coast regularly as far as Iwate Prefecture. Off Kamaishi and Hosoura, Nagahisa Kuroda saw a small flock 18 March, ten birds 21 March, and four 23 March 1950. The southernmost records are a specimen taken 25 February 1865 in the latitude of Yokohama (Whitely, Ibis, 1867: 193) and an undated bird labelled "Bay of Yedo" in the USNM. (The specimen Cassin reported from Shimoda in 1854 is not traceable.) The species is apparently rather rare on the Japan Sea side of Honshu. It has been collected in Niigata

Prefecture at Kashiwazaki (M. Nakamura) and at Iwafune-gun (Momiyama coll.), and once a storm-blown stray was found inland in the mountains of Nagano at Chikuma-gawa (Momiyama coll.).

237. Aethia pusilla (Pallas)

LEAST AUKLET

Japanese: Ko-umisuzume (small sea-sparrow)

Uria pusilla Pallas, Zoogr. Rosso-Asiatica, **2**, 1811: 373 (Kamchatka).

This smallest of the alcids is one of the commonest of the winter sea birds in the waters off southern Hokkaido where, especially in rough weather, it may be encountered in flocks of thousands. Kuroda and Wilke found it and the murres the commonest of the sea birds in the waters south of Muroran in January. They met large numbers again in late April off Abashiri on the Okhotsk Sea side of Hokkaido. The fishermen there informed them it is always most abundant in spring and leaves in June.

Small numbers come down the Pacific coast of Honshu regularly as far as Miyagi Prefecture (November 1923, 10 February 1924, February 1926, Sendai Mus. coll.). The many specimen records from Niigata (there are ten or more in various collections dated December through March) indicate it to be perhaps more plentiful on the Japan Sea side of Honshu. It has been taken once off Tokyo, 17 February 1924 (Kuroda coll.), once at Kurume, Kyushu, 27 January 1924 (Kyoto Univ. coll.), and once at Tanegashima, 10 January 1922 (Kuroda coll.).

All observers comment that it is seen most frequently in very rough weather. It flies swift and straight close to the sea surface in small flocks, and takes wing easily from the water when disturbed rather than diving as does the Ancient Auklet. On the water it holds its head high. Specimens collected by Nagahisa Kuroda had the crops filled with *Euphausia*.

[*Aethia pygmaea* (Gmelin) — The Whiskered Auklet (Shirahige umisuzume, or white-whiskered sea-sparrow in Japanese) breeds at Urup, Shimushir, and Raikoke Islands in the Kuriles, where apparently it is resident. It is reported as common there in winter, but there are no verifiable records for Japan proper, and Kuroda and Wilke failed to find it during their winter cruising in the Hokkaido waters where it should occur if it is not more than a straggler to Japan.

All three editions of the Hand-List give this species as occurring in Honshu and Shikoku, but the evidence is questionable. We have been unable to locate the source of the Shikoku record. The Honshu record evidently refers to the two specimens taken by the Perry Expedition at Shimoda in 1853 and reported by Cassin as *Uria mystacea*, which was synonymized by Ridgway with *pygmaea*. One of these specimens, labelled "Bay of Yedo", is now in the USNM. It is *cristatella*, and is so catalogued in Cassin's handwriting. The other specimen from Shimoda reported in Cassin's account was not catalogued with the rest of the Perry collection at the USNM, and as there is no trace of it in Philadelphia, it probably went to the Chicago Academy of Sciences and was destroyed in the Chicago fire. It also was probably *cristatella*.]

238. Cerorhinca monocerata (Pallas)

HORNBILLED PUFFIN

RHINOCEROS AUKLET

Japanese: Utou (autochthonous)

Alca monocerata Pallas, Zoogr. Rosso-Asiat., **2**, 1811: 382 (Cape St. Elias and Kodiak Island).

The Hornbilled Puffin is a locally common summer resident at its breeding grounds in Hokkaido and northern Honshu, and a winter visitor south to the latitude of Tokyo on the Pacific side of Japan. It probably winters down the coast of the Japan Sea as well, but no data are available on its status there. A few winter off northern Kyushu, evidently from the Korean colonies. On the Pacific coast it is rather rare south of Fukushima, but occasionally in good sardine years large flocks come to Suruga Bay, where Kuroda has observed them in February and early April. Kuroda (1928: 314) states it probably breeds "in or around the coast of Mutsu Bay [Aomori] for several female specimens were obtained there in April which contained very large ovarian eggs." It has been seen frequently in Mutsu Bay in May and July, but its breeding colonies there have not yet been located. Its most southerly known breeding site is on Ashi Island, one of the Eno Islands off Kinkazan in Miyagi Prefecture. Another smaller colony is reported on nearby Tsubaki Island. Kuroda and Wilke found it common in the neighborhood of Kinkazan in February 1949. The birds were then already paired, but they increased in numbers after mid March, and were quite plentiful through April. They observed it most frequently in the early morning on the sand-lance fishing grounds at the mouth of the bay, and found it only rarely off shore.

The species' nesting in the Kinkazan area has been studied by several Japanese observers, and reported on in some detail (Matsuyama, Choju Iho, 1934; Azumi, *idem* 1937). According to their accounts the nesting burrows are dug in the sandy soil under the roots of grasses and shrubs. The entrances measure about 10–15 x 15–23 cm. in diameter, extend from 40 to 150 cm. deep, and expand to about 30 cm. in diameter at the end, where the bottom is lined with a few dead leaves of pampas grass and miscanthus, on which the single white egg is laid. Six eggs measured 66–67.2 x 44.5–45 mm. The eggs are laid in mid April, and apparently are incubated mostly at night. The birds leave the burrows at dawn, feed at sea during the day, and return to the nesting ground in a large body just at dusk. On Ashi Island the puffin burrows cover about three acres; 39 nests were counted in a four meter square in the most densely populated part.

The species also breeds in Hokkaido on Daikoku Island near Akkeshi on the Pacific side, and on Teure Island off the west coast, where on 27 June 1949 I found about 500 burrows in an area of two acres at the top of the western cliff, 350 feet above the sea. No puffins were in evidence near the rookery during the daytime. Digging out a half dozen burrows yielded one adult bird and three downy young a few days old.

239. Fratercula corniculata (Naumann)
HORNED PUFFIN
Japanese: Tsunomedori (horn-eye bird)

Mormon corniculata Naumann, Isis von Oken, 1821, Bd. 2, col. 782, pl. 7, figs. 3 and 4, (Kamchatka).

This species, of more northerly distribution than the Tufted Puffin, is a very rare bird in Japanese waters. Its southernmost known breeding colony is on Paramushir Island in the northern Kuriles. It must occur off Hokkaido occasionally, but it has never been taken there. The only unquestionable record for the species in Japan is a bird in the USNM shot by Kuroda and Wilke 20 February 1949, near Cape Kashira, north of Hosoura Bay, Iwate Prefecture. The Hand-List reference to its occurrence in Honshu is based on two doubtful records, one by Momiyama (Dob. Zas., 1918: 123) of a specimen taken at Awa, Chiba Prefecture, February 1918, but which neither he nor any other competent ornithologist examined; the other by Kuroda (Tori, 1940: 661) of a bird hooked on a fish-line in Suruga Bay which was judged from the fisherman's description to be this species.

240. Lunda cirrhata (Pallas)

TUFTED PUFFIN

Japanese: Etopirica (from two Ainu words, eto — nose, and pirica — pretty)

Alca cirrhata Pallas, Spic. Zool., **1**, fasc. 5, 1769: 7, pl. 1, pl. 5, figs. 1–3 (Seas between Kamchatka, America, and the Kurile Islands).

The Tufted Puffin breeds plentifully in the Kuriles but is known to nest at only one place in Japan, on Daikoku Island near Akkeshi, Hokkaido, where a small colony maintains a dubious foothold, although protected as a Natural Monument. Fennell writes (1953: 41) of his visit to this colony 21 June 1951: "Although I was unable to see a single individual of this species during my stay on Daikokujima, Kyogo Yamamoto [his local guide] showed me a group of approximately ten large burrows located on a small, grassy plateau at the southwestern tip of the island and said that puffins had nested there. The plateau was separated from the top of the island by a very narrow, badly eroded, crumbling ridge of reddish soil and rock and was not safely traversible without the aid of ropes." The species may also nest on nearby Kiritappu Island (Yamashina, Tori, 1930: 229) which has yet to be verified. Its breeding habits are similar to those of the Hornbilled Puffin.

It winters fairly commonly along the Hokkaido coasts. I saw five and collected one off Nemuro 18 December 1948, and two more in Funka Bay 12 December 1948. It moves southward in winter fairly regularly down both coasts of northern Honshu as far as Niigata Prefecture on the Japan Sea side and Iwate Prefecture on the Pacific side. Kuroda and Wilke collected two young of the year off Hosoura Bay, Iwate Prefecture, 20 and 21 February 1949. Off Kinkazan, Miyagi Prefecture, only slightly farther south, Kumagai (Ann. Orn. Orien., 1928: 315) regards the bird as a rare straggler. Kuroda (Tori, 1922: 54) included the species in his list of the birds of Suruga Bay on the basis of a specimen said to have been taken near Cape Ose, 24 April 1909, but which he was not able to verify.

COLUMBIDAE

241. Sphenurus sieboldii sieboldii (Temminck)

JAPANESE GREEN PIGEON

Japanese: Aobato (green pigeon)

Columba sieboldii Temminck, Pl. Col., 1835, pl. 549 (Japan).

This beautiful woodland pigeon, endemic to Japan, was formerly fairly common but is now rather rare. A shy and retiring bird of the heavy mixed forests, its habits are not well known. Momiyama (Yacho, 1939: 943) listed known nesting areas on all four main islands. According to a recent survey (unpublished) by the Game Management Section, its breeding range now extends from central Shikoku northward through the Japan Alps and northern Honshu to Hokkaido. It winters in the warmer lowlands of western Honshu and south to southern Kyushu. It is a not uncommon winter resident in the Mt. Kirishima forests of Kagoshima Prefecture. It has been collected on Sado and Oki Islands, on Oshima and Niijima in the Izus, on Tsushima, Tanegashima, and Yakushima, and has been taken once (8 November 1935, Yamashina coll.) in the Bonins. It has been recorded several times in southeastern China (LaTouche, 1934: 204) where it is probably not of regular occurrence.

In Hokkaido it is a summer resident, arriving in early June, nesting in the large hardwood forests below 1200 feet in the Lake Shikotsu and Lake Akan regions, and leaving in early October. Farther south it ranges higher in altitude, to 1500 feet in the Lake Towada region of Aomori, to 3500 feet at the base of Mt. Fuji, and to 4500 feet in the Japan Alps. In Honshu it lays its two creamy-white eggs in June (average size 31.9 x 24.3 mm.) in a crude nest usually 50 or more feet above the ground. Its food consists of fruits, berries, and buds. It is occasionally observed on the open beaches apparently drinking salt water.

[*Sphenurus formosae permagnus* (Stejneger)—The Ryukyu Green Pigeon which breeds north to Yakushima, has been "recorded by Araki (1918) from Tanegashima but not collected", and was "observed by Horii in Kagoshima [Kyushu]" according to the 1912 Hand-List.]

242. Columba janthina janthina Temminck

JAPANESE WOOD PIGEON

Japanese: Karasu-bato (crow-pigeon)

Columba janthina Temminck, Pl. Col., 1830, livr. 86, pl. 503 (Japan).

This fine, big wood pigeon is limited to small islands off Honshu' Shikoku, and Kyushu, and south through the Izu Islands to Aogashima and through the Ryukyus to Okinawa. It is replaced by closely allied subspecies in the southern Ryukyus and in the Bonin and Volcano Islands. Despite old specimens in the British Museum and elsewhere labelled "Nagasaki" and "Yokohama", there is no evidence of its ever having occurred on any of the four main islands. Blakiston and Pryer (1882: 130) say it was formerly abundant on Saru Island off Yokosuka in Tokyo Bay; in the Kuroda collection was a specimen from Uwa Island off western Shikoku; and it is common on the Hime and Genkai Islands (designated as preserves in 1922 and 1932 respectively) and other islets close to the Kyushu coasts. It is reported as fairly common on the Oki Islands (its northernmost limit), on Tsushima, and on many of the Goto Islands. In the Izu Islands it ranges north to Oshima, but is now rare on the more densely populated islands. However, on the smaller wooded islands such as Toshima, Mikurajima, and Aogashima where it is not hunted, it is still common. Were it more prolific it would be an excellent game bird, but it cannot withstand hunting pressure, and disappears the moment it is subjected to persecution.

On Aogashima, the southernmost inhabited island of the Izu chain, I found it quite tame and actually abundant in 1947, for it is not bothered at all by the inhabitants. Birds feeding in the camellia trees paid no attention to me until I approached within a few yards of them, and then flew only a short distance. Its Japanese name is most apt, for it is crow-like in its flight as well as its color, and at first sight resembles a small crow flapping over the trees. Its note is an undistinctive cooing like that of other members of the genus. Its nest is built of tendrils and dead twigs, and the single white egg it lays measures 40.5–44 x 30–31 mm. Its usual breeding season in the Izu Islands is from February to September, but young have been found in the nest in winter on Mikurajima. It is said to live largely on camellia seeds, which have been found in the crops of most specimens collected in the Izus, but it doubtless eats other seeds, nuts, fruits, and buds.

243. Streptopelia orientalis orientalis (Latham)

EASTERN TURTLE DOVE

Japanese: Kijibato (pheasant dove)

Columba orientalis Latham, Ind. Orn., **2**, 1790: 606 (China).
Columba gelastis Temminck, Pl. Col., 1835, pl. 550 (Japan). (Synonym)

The Eastern Turtle Dove is a common resident throughout Japan, except in Hokkaido where it is a summer resident only. Probably the entire population moves somewhat southward every autumn, for it is found in numbers in winter only from central Honshu southward.

A bird of sparse woodlands, brush country, and open, cultivated fields, it occurs throughout the lowlands and up in the mountains of Honshu to about 4500 feet. Its soft melancholy *poooo, poooo, poo-poo* is one of the common bird songs of the spring countryside. In winter it is seen frequently within the towns and cities.

It builds its crude and fragile nest on tree branches, frequently near the trunk, and from five to fifteen feet above the ground. Its two white eggs average 33.5 x 25 mm. It has a long breeding season. The pre-nuptial cooing starts in February, and the first eggs are laid in March. The length of the breeding cycle is unknown, but probably not more than five or six weeks are required to mature each brood. Young have been found in the nest as late as early November in Akita, and the bird is often found breeding in October. Hence at least three, and probably more broods are reared annually in Honshu.

In Japanese tradition the Turtle Dove is the messenger of Hachiman, one of the war gods, and a symbol of filial piety because it is said always to perch three branches lower than its senior. It is a popular game bird, and accused by the farmers with some justice of depredations to upland grain crops. Its ability to withstand the heavy hunting pressure to which it has long been subject in Japan speaks well for its fecundity.

244. Streptopelia decaocto stoliczkae (Hume)
RING DOVE
Japanese: Shirako-bato (white child-dove)

Turtur stoliczkae Hume, Stray Feathers, **2**, 1874: 519 (Kashgar).

A continental species, the Ring Dove ranges widely across Asia from Manchuria, Mongolia, and China westward to Palestine and the southern Balkans. It is not indigenous to Japan, but no reliable record remains of its introduction. It was probably brought to Tokyo and released on the Kwanto Plain sometime in the 18th or early 19th century, perhaps fortuitously as an escaped cage bird, perhaps planted purposely for hawking by the feudal lords. In some mysterious fashion it attained religious significance, sharing with the Turtle Dove the duties of Hachiman's messenger. It was seldom molested in feudal times, and by 1867 at the end of the Tokugawa Shogunate it had spread abundantly throughout the 5000 square kilometers of the Musashi section of the Kwanto Plain. It has never been recorded elsewhere in Japan.

A tame, friendly little bird, fearless of man and a slow flier, its numbers declined rapidly the moment gun hunting became widespread after the Meiji Restoration. By the turn of the century it was limited to the small section of its former range just north of Tokyo, from central Saitama to western Chiba, centering on the Imperial hunting preserve at Koshigaya where it could not be hunted. It was given protection under the game laws to the extent that it was excluded from the list of legal game birds, but was never made a Natural Monument, though this has been recommended repeatedly. Nevertheless the small population maintained itself successfully in this limited area, never migrating nor expanding into equally suitable territory adjoining its range, until the occupation. The limited population received a serious set-back from persecution by American hunters to whom it was "just another pigeon." A careful census made by Udagawa (Tori, 1949: 267–268) showed "at the end of February 1948 a total of only 30 pairs in existence." Even if this small nucleus manages to survive, a planting of fresh stock from the mainland to strengthen the strain would be desirable if the species is to remain part of the Japanese avifauna.

245. STREPTOPELIA TRANQUEBARICA HUMILIS (Temminck)

RUDDY TURTLE DOVE

Japanese: Benibato (ruddy dove)

Columba humilis Temminck, Pl. col., livr. 44, 1824, pl. 259 (Bengal and Luzon).

This native of southeastern Asia has strayed to Japan at least three times. The first record (Seebohm, Ibis, 1884: 179) is of a specimen obtained by Owston from a Yokohama dealer "who asserted it had been shot in the neighborhood." Stejneger (1888: 428) reported the second as having been "obtained by Mr. Peterson" near Nagasaki. The 1922 Hand-List adds Saitama to its known localities, which has been copied by the two later editions, but we have been unable to find the source of the record. The most recent record is of two birds killed by a hunter in Mii-gun, Fukuoka Prefecture, Kyushu, 31 March 1936. Both were badly shot, but the bedraggled skin of one of them is preserved in the Abe collection in Fukuoka.

CUCULIDAE

246. Cuculus fugax hyperythrus Gould

HAWK CUCKOO

Japanese: Juichi (from the voice, but means eleven; the Chinese characters adopted to represent the bird in Japanese writing mean mercy-hearted bird)

Cuculus hyperythrus Gould, Proc. Zool. Soc. London, 1856: 96 (Shanghai, China).

The Hawk Cuckoo is a rather shy and secretive bird, seldom seen, but well known in Japan by the loud call which gives it its Japanese common name. It is the least abundant of the cuckoos in Japan, but nevertheless a not uncommon summer resident in central Honshu. It has been collected in Shikoku but never in Kyushu or Hokkaido. Blakiston & Pryer (1882: 132) claim it "occurs also in Yezo", and it has been reported from Hokkaido recently by reliable authority; Jahn (1942: 225) saw it near Sounkyo, Mt. Daisetsu, and Inoue (Yacho, 1949: 303) heard it calling near Hakodate.

In Honshu it is a resident of the heavier mixed forests in the mountain areas, found up to about 7500 feet in the Mt. Fuji and Japan Alps areas, where it arrives in early May and may be heard calling until late July or early August. It usually leaves in early September, but specimens have been taken in October. Its breeding, from May to July, is known only from Honshu. The eggs are pale blue with faint brownish spots, measure 28–30 x 19–20.5 mm., and have been found in the nests of the following species:

Alauda arvensis
Anthus hodgsoni
Siphia cyanomelana
Siphia narcissina
Turdus cardis
Turdus chrysolaus
Saxicola torquata
Erithacus cyanurus
Erithacus akahige
Erithacus cyane
Muscicapa latirostris

247. Cuculus canorus telephonus Heine

COMMON CUCKOO

Japanese: Kakko (autochthonous, from the voice)

Cuculus telephonus Heine, Journ. f. Orn., **11**, 1863: 352 (Japan).

This species is a common summer resident in Hokkaido and in northern and alpine Honshu, a transient elsewhere in Japan. Jahn (1942: 221) points out that it seldom breeds southwest of his Tsuruga-Nagoya line through central Honshu. From this point northward it nests commonly in the mountains, usually at the edges of the forest zones between 1500 and 5000 feet. In Hokkaido its clear, flutey call is one of the dominant bird notes of the broken farm lands in springtime, and it is more a bird of the plainslands, seldom occurring above 1500 feet. Yamashina (Tori, 1930: 220) found it nesting at the foot of Mt. Daisetsu, and again at the tree line just below the alpine zone between 4500 and 6000 feet, but noted its absence in the heavier forests between 1500 and 4500 feet.

The Common Cuckoo arrives in Honshu in late April, in Hokkaido in early May, and is heard calling through July, and in Honshu occasionally in August. It leaves Hokkaido in early September, Honshu in late September or early October. The breeding season is from late May through July, mostly in June, rarely into early August. Its interesting parasitic habits have intrigued many students, and much has been written about them in Japan. They do not differ materially from those of its far better-known European relative, the nominate race. In Hokkaido it most frequently parasitizes the Stonechat and White Wagtail, in Honshu the Bull-headed Shrike and Meadow Bunting. Its eggs have been found in nests of the following species:

Emberiza cioides	*Motacilla cinerea*	*Acrocephalus arundinaceus*
Emberiza fucata	*Motacilla alba*	*Acrocephalus bistrigiceps*
Emberiza spodocephala	*Lanius bucephalus*	*Turdus cardis* (rarely)
Alauda arvensis (rarely)	*Lanius cristatus*	*Turdus chrysolaus* (rarely)
Motacilla grandis (rarely)	*Lanius tigrinus* (rarely)	*Saxicola torquata*

248. Cuculus saturatus horsfieldi Moore
ORIENTAL CUCKOO
Japanese: Tsutsu-dori (piping bird)

Cuculus horsfieldi Moore, *in* Moore & Horsfield, Cat. Bds. Hon. East India Co., **2**, 1856–1858 (1857): 703 (Java).

This cuckoo is a fairly common summer resident in the mountain forests from central Honshu northward, generally found from the higher foothills up to about 7500 feet in the Japan Alps. It has been taken in Kyushu on migration, it has been observed in Shikoku in June, and Jahn (1942: 222) found it common in the Kobe area in the summer months. It arrives somewhat earlier than the other cuckoos, and usually appears in Honshu in mid April, in Hokkaido slightly later. It breeds from mid May to late June, and has been known to parasitize the following species (of which its most frequent host is *Phylloscopus occipitalis*):

Emberiza spodocephala	*Regulus regulus*	*Horeites diphone*
Anthus hodgsoni	*Terpsiphone atrocaudata*	*Urosphena squameiceps*
Zosterops japonica	*Siphia cyanomelana*	*Phylloscopus borealis*
Lanius bucephalus	*Siphia cyane*	*Phylloscopus occipitalis*

Its Japanese name is derived from its rather melancholy call, which sounds like the piping of a Japanese bamboo flute, a succession of monosyllabic notes, usually written "po, po, po, po, po . . . ", which can be heard at a considerable distance.

249. Cuculus poliocephalus poliocephalus Latham
LITTLE CUCKOO
Japanese: Hototogisu (autochthonous, from the voice)

Cuculus poliocephalus Latham, Index Orn., **1**, 1790: 214 (India).

The Little Cuckoo is a not uncommon summer resident on all four main islands north to southern Hokkaido. While no specimens have been collected in Hokkaido, its eggs have been taken there, and the species is reported regularly by reliable observers at Hakodate and Obihiro. It is rather shy and not often seen, but is well known by its song which it repeats monotonously for hours in the springtime, and which is popularly transliterated as "teppen kaketaka" (have you flown through the high sky). It is heard in the plains and in the outskirts of the cities in central Honshu when it first arrives from the south in late April or early May, but it soon retreats to breed in the sparse and shrubby woodlands of the foothills bordering the plains, usually below 4000 feet, though Kiyosu (Yacho, 1936: 854) recorded it at 7500 feet in the Japan Alps.

Its laying season seems somewhat later than the other cuckoos, usually in June and July in Honshu and the Izu Islands. A young bird just out of the nest was reported at Mt. Fuji 22 August. Its most frequent host is the Bush-Warbler, *Horeites diphone*, whose chocolate-colored egg differs from that of the Little Cuckoo's only in size. It has also been recorded as parasitizing the following species:

Troglodytes troglodytes	*Locustella ochotensis*
Turdus cardis	*Emberiza spodocephala*
Phylloscopus occipitalis	*Uragus sibiricus*

STRIGIDAE

250. Otus scops japonicus Temminck & Schlegel

SCOPS OWL

Japanese: Konoha-zuku (tree-leaf owl)

Otus scops japonicus Temminck & Schlegel, *in* Siebold's Fauna Jap., Aves, 1844: 27, pl. 9 (Japan).

The redder Ryukyu race, *O.s.elegans* (Cassin) is reported by the 1932 and 1942 Hand-Lists as a straggler to Nagasaki.

The Scops Owl has been collected on all four main islands and is a not uncommon summer resident from central Honshu northward through Hokkaido. It is found from the lowlands up to 4500 feet in the Japan Alps, but only in heavy forests with large, old trees. Its usual season in Honshu is from early May to late October, but it has been collected in Tokyo 9 November, on Sado Island 23 November, and in Nagano Prefecture in November and December. The latest record in Hokkaido is a specimen taken at Mt. Daisetsu 24 September 1931.

While it unquestionably breeds in Honshu and Hokkaido, its nest, eggs, or young have never been collected in Japan. In Korea and northern China the species lays two white eggs in a hole in a hollow tree. Y. Nakamura found a pair nesting in the Mt. Fuji area, but as the nesting hole was 60 feet above the ground in an unclimable tree, he was unable to do more than observe the species' feeding habits and confirm its note (see below). It apparently migrates to south China, where LaTouche (1932: 124) reports it as a transient and winter visitor.

The species is shy and strictly nocturnal, and hence hard to observe. Very little is known about its habits, and it is best known by its call, written by the Japanese as "Bupposo." This name, which means the three treasures or "Ratnas" of Buddhism (Buddha himself, the Dharma or law, and the Samgha or priest) first appears in Japanese literature in an ancient tome, the "Shyo-ryo-shu" (book of the soul) published in 1079 by the noted Buddhist high priest Kobodaishi, in a poem entitled "Koya kiku Bup-po-so cho" (Bupposo-bird heard in the wilderness). For centuries this well-known night call was mistakenly attributed to the Broad-billed Roller, *Eurystomus orientalis*, which shares its habitat in the big trees surrounding temples and shrines, and which probably will always be known to the Japanese as the Bupposo. The call was first correctly attributed to the Scops Owl instead of the Roller by Shimokoriyama in Korea in 1933, and verified by Yukio Nakamura in Yamanashi Prefecture, Honshu, on 12 June 1934 (Yacho, 1934: 353) when he found its nest in Japan for the first time. The question of which bird uttered the famous note made quite a stir at the time, as the new findings contradicted the beliefs of centuries. The matter finally was settled beyond question by Nagamichi Kuroda when he heard the note uttered by a Scops Owl in captivity in his aviary (Yacho, 1935: 598). Kuroda then wrote a complete resumé of the dispute in Tori (1935: 68–80), but to this day the ancient night call of "Bupposo" is still commonly attributed in Japan to the Roller, not to the Scops Owl.

251. Otus asio (Linné)

SCREECH OWL

Japanese: O-konoha-zuku (large tree-leaf owl)

Strix asio Linné, Syst. Nat., ed. 10, **1**, 1758: 92 (South Carolina). (Extra-limital)

Scops semitorques ussuriensis Buturlin, Orn. Mitt., 1910: 119 (Lake Khanka, Ussuria). (Extra-limital)

Otus semitorques Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1844: 25, pl. 8 (Japan).

Scops pryeri Gurney, Ibis, 1889: 302 (Okinawa, Ryukyu Islands).

Otus bakkamoena linae Floericke, Mitt. Vogelwelt, 1921: 103 (north Japan). (Synonym of *semitorques*)

Otus bakkamoena hatchizionis Momiyama, Dob. Zas., **35**, 1923: 400 (Hachijo, Izu Ids.). (Synonym of *pryeri*)

The Screech Owl of the Japanese main islands is *O.a.semitorques*. The resident form of the southern Izu Islands is much ruddier, and inseparable morphologically from *O.a.pryeri* of the Ryukyus. The 1932 and 1942 Hand-Lists state that the grayer mainland and Sakhalin race, *O.a.ussuriensis*, is a straggler to Honshu. This is difficult to establish in a species so variable individually on the basis of one or two specimens.

The Screech Owl is a fairly common resident throughout Japan, an inhabitant of the small forests and semi-open country. It breeds in Hokkaido in the plainslands, and in Honshu and Kyushu in the foothills and lower mountain zones up to about 3000 feet. In winter it descends to the plains and forages commonly around the coastal cities. It nests from May to July, laying its 4 to 5 white eggs usually in a hollow tree. Stomach examinations show that while it sometimes takes a few small birds, it prefers rodents and large insects.

252. Bubo bubo tenuipes Clark

EAGLE-OWL

Japanese: Washi mimi-zuku (eagle eared-owl)

Bubo tenuipes Clark, Proc. U. S. Nat. Mus., **32**, 1907: 470 (Fusan, Korea).
Bubo bubo yamashinai Momiyama, Dob. Zas., **42**, 1930: 329 (Obihiro, Hokkaido). (Synonym)

The few Eagle Owls taken in Japan have been referred by the Hand-Lists to the Korean race, *tenuipes*, with which Kuroda (Nov. Zool., 1932: 400) synonymizes the pale individual Momiyama described from Hokkaido.

Bubo bubo ranges widely across continental Eurasia, but has been taken only three times in Japan. In addition to the Obihiro, Hokkaido specimen in the Momiyama collection (above), Gurney (Ibis, 1886: 524) reported one taken in the Goto Islands off Kyushu, and Yamashina (Tori, 1929: 153) lists one, undated, from Hokkaido in the former Matsudaira collection.

253. Bubo blakistoni blakistoni Seebohm

BLAKISTON'S EAGLE-OWL

Japanese: Shima fukuro (island owl)

Bubo blakistoni Seebohm, Proc. Zool. Soc. London, 1883: 466 (Hakodate, Hokkaido).

Blakiston's Eagle-Owl is an uncommon resident in the heavier forests of Hokkaido. It has been taken twice in Sakhalin (1942 Hand-List, p. 98, footnote) and once on Kunashir in the southern Kuriles (Yamashina coll.). There are some 25 Hokkaido specimens in collections in Japan and the U.S., most of them collected in winter around Lake Shikotsu, the upper Ishikari basin, in the mountainous areas north of Hidaka, and in the forests of Mt. Daisetsu. Nothing is known of its habits. A half-grown nestling in the MCZ was collected in Hokkaido 10 June 1892 by Owston; another Hokkaido nestling in the AMNH, also from Owston, is undated.

254. Nyctea scandiaca (Linné)

SNOWY OWL

Japanese: Shiro fukuro (white owl)

Strix scandiaca Linné, Syst. Nat., ed. 10, **1**, 1758: 92 (Lapland).

The Snowy Owl is a fairly regular winter visitor to Sakhalin, but has been taken in Japan only seven times, as follows:

Hokkaido, Hakodate	29 Nov. 1879	Blakiston & Pryer (1882)
Hokkaido, Funka Bay, Ikurekawa	17 Jan. 1885	USNM
Hokkaido, Sapporo	winter of 1950–51	Seen by Nagahisa Kuroda in a Sapporo taxidermist's shop.
Honshu, Chiba, Funabashi	16 Jan. 1916	Yamashina coll.
" Gifu, Mino	undated	Yamashina coll.
" Tottori, Inaba	undated	AMNH
" Hiroshima, Bingo	undated	AMNH

255. Ninox scutulata scutulata (Raffles)

BROWN HAWK-OWL

Japanese: Aoba-zuku (green-leaf owl)

Strix scutulata Raffles, Trans. Linn. Soc. London, **13**, 1822: 280 (Sumatra).
Strix hirsuta japonica Temminck & Schlegel, in Siebold, Fauna Jap., Aves, 1847: 29, pl. 9B (Japan). (Synonym)

The Brown Hawk-Owl is a common summer resident throughout Japan, arriving in the Tokyo area in mid April and leaving between mid October and early November. It rarely stays later, but has been found apparently wintering in Wakayama Prefecture, Honshu (Yacho, 1952: 7). A bird of the small woodlands in the plains, its distinctive two-syllable call note can be heard nightly near the towns and even in the wooded city parks. It is more diurnal in its habits than most other owls, especially during migration. It nests from late May to late July, laying its 3 to 4 white eggs (average size 37 x 31 mm.) in a hollow tree from 15 to 30 feet above the ground. Incubation, by the female alone, lasts 25 days; the chicks leave the nest 28 days after hatching. Examination of the contents of 15 stomachs by Ishizawa (Yacho, 1934: 26–31) show the diet to be predominantly night-flying moths. Dragonflies, beetles, grasshoppers, and other insects were found in smaller quantities, also one *Plecotus*, one *Murina*, one Coal Tit, and one Wren.

256. Strix uralensis Pallas

URAL OWL

Japanese: Fukuro (autochthonous)

Stryx uralensis Pallas, Reise versch. Prov. Russ. Reichs, **1**, 1771: 455 (Ural Alps). (Extra-limital)

Strix uralensis coreensis Momiyama, Jour. Chos. Nat. Hist. Soc., (4), 1927: 1, (Taianzan, Hamgyong Pukto, Korea).

Syrnium uralense hondoense Clark, Proc. U. S. Nat. Mus., **32**, 1907: 472 (Iwaki, Honshu).

Strix uralensis momiyamae Taka-Tsukasa, Tori, **7**, 1931: 14 (Shinano, Honshu).

Strix fusceseens Temminck & Schlegel, in Siebold, Faun. Jap., Aves, 1845: 10 (Kyushu, Japan).

Syrnium uralense japonicum Clark, Proc. U. S. Nat. Mus., **32**, 1907: 471 (Hokkaido). (Preoccupied)

Strix rufescens Temminck & Schlegel, in Siebold Fauna Jap., Aves, 1845: 30 (Japan). (Preoccupied)

Strix uralensis pacifica Kuroda, "On an Apparently New Form of Ural Owl etc.", Author's ed., Tokyo, 1924: 15–16 (Kusumi, Honshu). (Synonym of *fuscescens*)

Strix uralensis nigra Momiyama, Bull. Brit. Orn. Cl., **48**, 1927: 21 (Osumi, Kyushu). (melanistic, synonym of *fusecscens*)

Strix uralensis media Momiyama, Auk, 1928: 183 (Kimitsugun, Kazusa, Honshu). (Synonym of *fuscescens*)

The 1942 Hand-List recognizes four races of this plastic and variable species as occurring in Japan, *coreensis* in Hokkaido, *hondoense* in northern Honshu, *momiyamae* in central Honshu, and *fuscescens* in southern Honshu, the Izu Islands, Shikoku and Kyushu. The cline runs from smaller and lighter in the north to larger and darker in the south. I do not have enough material to judge the validity of these races, but it seems that at least one, and possibly two of the intermediate forms now recognized are rather slim and superfluous.

The Ural Owl is a not uncommon resident in the wooded areas of the plainslands. It occurs in the mountains of Honshu up to 5000 feet, but is almost never found in the urban areas. It is said by the Japanese to say "Noritsuke-ho-se", meaning "starch and dry" because its call in rainy weather is a certain sign of clearing. It also has a loud cry like a dog's bark, believed to be uttered only by the female at nesting time.

It nests in hollow trees in late March or early April in Kyushu and southern Honshu, and late April or early May in northern Honshu and Hokkaido. According to Yamashina (1941: 695), its clutch has usually from 2 to 4 white eggs, occasionally 5 to 6 when food is abundant. The eggs are laid at three to five day intervals; incubation by the female alone takes 27 to 29 days; and the young leave the nest 34 days after hatching. Its food is mostly rodents, from small mice up to flying squirrels and rabbits. It is also known to eat insects and an occasional small bird.

257. Asio otus otus (Linné)

LONG-EARED OWL

Japanese: Torafu-zuku (tiger-striped owl)

Strix Otus Linné, Syst. Nat., ed. 10, **1**, 1758: 92 (Sweden).

This widespread circumpolar species is a rather uncommon resident in Japan, seldom seen because of its strictly nocturnal habits. It is an inhabitant of the wooded areas, ranging from the lowlands and foothills up to the subalpine zone in the mountains in summer, and is reported to forage occasionally in the alpine zone. Very little is known of its habits and ecology in Japan. It has been collected on all the main islands, but is known to breed only from central Honshu northward. Eggs have been taken at Tomakomae and Ishikari in Hokkaido, and in Honshu near Mt. Fuji and at Kamikochi in the Japan Alps. It usually preëmpts abandoned nests of other species, but the Ishikari clutch was found in a hollow tree 20 feet above the ground.

258. Asio flammeus flammeus (Pontoppidan)

SHORT-EARED OWL

Japanese: Komimi-zuku (small-eared owl)

Strix flammea Pontoppidan, Danske Atlas, **1**, 1763: 617, pl. 25 (Sweden).

The Short-eared Owl is a rather uncommon winter visitor throughout Japan, frequenting the marshes, grassy plains, and cultivated fields of the lowlands, usually seen cruising along the roadsides at dusk. It arrives in Hokkaido in early November, and somewhat later in the southern islands where most of the records are for mid winter. Most of the wintering birds depart for the north by April, but Jahn (1942: 228) reports seeing one near Osaka 14 May.

259. Aegolius funereus sibiricus (Buturlin)

TENGMALM'S OWL

Japanese: Kinme fukuro (golden-eyed owl)

Cryptoglaux tengmalmi sibirica Buturlin, Nasha Okhota, **4**, 1910: 78 (Lake Khanka).

The only record of Tengmalm's Owl for Japan is an undated Hokkaido specimen reported by Hatta and Murata (1905: 62), formerly in the collection of the Sapporo Agricultural School, now presumably in the Sapporo Museum. It was referred to the eastern Siberian race by the Hand-List Committee, presumably on geographical grounds.

CAPRIMULGIDAE

260. Caprimulgus indicus jotaka Temminck & Schlegel

JAPANESE NIGHTJAR

Japanese: Yotaka (night hawk)

Caprimulgus jotaka Temminck & Schlegel, in Siebold, Fauna Jap., Aves, 1847: 37, pls. 12, 13 (Japan).

The Nightjar is a fairly common summer resident in the partly wooded areas of Hokkaido, Honshu, and Shikoku. In Hokkaido it is a bird of the lowlands. In Honshu it ranges from the foothills up to 4500 feet in the Japan Alps, and occasionally to 6500 feet where Jahn (1942: 210) found it at Mt. Fuji. It arrives in Honshu in late April or early May, but does not reach Hokkaido until June. It leaves Hokkaido in early September, but may remain in Honshu until mid October or early November. It has been collected in Kyushu in December and February.

Its monotonous "chuck-chuck-chuck" is heard in the Honshu foothills at twilight and dawn from May to August. It lies quietly during the daytime and comes out at dusk to feed over the cultivated fields and woodland clearings, taking insects on the wing. Ishizawa (Yacho, 1941: 200) analyzed the contents of 18 stomachs in which he found 40 species of flying insects, comprising 20 families and 9 orders. It nests from May to July, laying its two white eggs with pale brown markings on the open ground, usually in the shelter of evergreens.

APODIDAE

261. Hirund-apus caudacutus caudacutus (Latham)

NEEDLE-TAILED SWIFT

Japanese: Hario ama-tsubame (needle-tailed rain-swallow)

Hirundo caudacuta Latham, Index Orn., Suppl., 1801: lvii (New South Wales).
Hirundapus caudacutus caudacutus var. *uchidae* Ishizawa, Ann. Orn. Orien., **1**, 1928: 145, 146, fig. 1 (Nikko, Honshu). (Synonym)

This big swift, probably one of the fastest flying of all birds, is a fairly common summer resident in Hokkaido and in northern Honshu south to the Japan Alps. It has never been recorded in Shikoku or Kyushu. It arrives in Honshu from mid to late April, and in Hokkaido in May. It leaves Hokkaido in September, but may linger in Honshu through October. Kiyosu (Yacho, 1936: 707) found ten birds frozen in the snow in the Japan Alps in late November.

It usually flies close to the ground and, unlike the following species, it seldom gathers in large numbers, though Yamashina (Tori, 1930: 228) once saw more than 200 over Lake Abashiri, and groups of a hundred or more are frequently reported on the Ishikari and Asahikawa plains in Hokkaido. Kiyosu (Yacho, 1938: 1095) saw some 90 birds at once flying over Lake Towada, Aomori Prefecture, in June. Farther south in Honshu it occurs usually in ones and twos; an individual or two may often be seen with the large flocks of White-rumped Swifts and House Martins that circle continuously all summer over Kegon Falls in Nikko.

It nests in hollow trees and in rocky cliffs. Yamashina (1941: 448) describes a tree nest he found 30 feet up in an elm in the Sapporo Botanical Gardens. The clutch has 2 to 3 white eggs measuring 27.5–31.2 x 17.5–19.3 mm. Yamashina reared one young bird in captivity, which took 40 days to become fledged.

262. Apus pacificus pacificus (Latham)
WHITE-RUMPED SWIFT
Japanese: Ama-tsubame (rain swallow)

Hirundo pacifica Latham, Index Orn., Suppl., 1801: lviii (New South Wales, *terra typica* = Vladivostok).

Cypselus squamosus, Verreaux, undated ms., (Okhotsk Sea, 54°40′N, 159°10′E). (Type, dated 19 May 1853, in Phil. Acad. Nat. Sci.). (Synonym)

?*Micropus pacificus kurodae* Domaniewski, Acta Orn. Mus. Zool. Polonici, **1** (3), 1933: 80 (Japan, *ex* Berlepsch Museum). (Synonym)

Examination of my own series of fresh spring skins from Japan, and older specimens from Japan, Korea, and Vladivostok in the USNM and AMNH collections, indicates that the "darker" character claimed by Domaniewski (above) in his description of *kurodae* is an age or seasonal variation. Young birds and worn adults are not as light colored as freshly molted specimens.

The White-rumped Swift is a common summer resident in Honshu and Hokkaido, locally abundant in the neighborhood of its breeding cliffs. The forerunners of the spring flight sometimes reach Honshu in late March, but the main migration does not arrive until mid April. The species breeds from June to August, and starts to leave in late September. It migrates in loosely-knit flocks, feeding as it goes. Nagahisa Kuroda watched such a flight in central Tokyo 29 September 1950, and I saw a similar one along the shores of the Izu Peninsula 7 October 1946, a steady stream of birds moving southward along the coast for hours at a time. The flight continues through October into early November, and individuals have been collected along the south coast of Honshu in early December.

It nests in large colonies in high, inaccessible cliffs, sometimes along the coast and as often in the mountains. Most of the colonies in the Japan Alps, according to Kiyosu (Yacho, 1936: 706) are between 7500 and 10,000 feet in altitude, and the birds forage down in the valleys to about 1500 feet. Frequently *Delichon dasypus* occupies the same cliffs with it, as at Osawajiri at Mt. Fuji at 7000 feet, and at the same altitude at Mt. Konsei, Nikko. I visited a similar mixed colony occupying a cliff facing the sea and overhanging the highway just outside Otaru, Hokkaido. The swifts seemed to occupy the higher parts of the cliff, the swallows the lower, both nesting in crannies in the rocks.

The White-rumped Swift builds its dish-shaped nest of twigs and leaves glued together and to the rocks with its own saliva. It lays 2 to 3 longish white eggs, measuring 25.5–28 x 16.1–18 mm. At breeding time the birds fill the air around their nesting cliffs like so many flies, chattering continually for hours at a time. They forage farther afield in rainy weather, and on dark days or summer evenings when thunderstorms threaten.

ALCEDINIDAE

263. Ceryle lugubris (Temminck)

PIED KINGFISHER

Japanese: Yama-semi (mountain kingfisher)

Alcedo lugubris Temminck, Pl. col., livr. 92, 1834, pl. 548 (Japan — Nagasaki).

Ceryle lugubris pallida Momiyama, Annot. Orn. Orient., **1**, 1927: 70 (Ishikari, Hokkaido).

Ceryle lugubris sikokiana Momiyama, Annot. Orn. Orient., **1**, 1927: 67 (Tosa, Shikoku). (Synonym of *lugubris*)

Ceryle lugubris jamasemi Momiyama, Annot. Orn. Orient., **1**, 1927: 69 (Echigo, Honshu). (Synonym of *lugubris*)

This handsome kingfisher is limited to Japan and the contiguous mainland of southeastern Asia, and is more or less resident throughout its range. The nominate race, *C.l.lugubris*, is not uncommon locally in Honshu and Shikoku along the wider mountain streams up to 4500 feet altitude. It occurs less commonly in Kyushu, where it is not known to breed. The markedly lighter Hokkaido subspecies, *C.l. pallida*, is considerably scarcer and is believed to have decreased markedly during the present century. It is reported from the Hakodate area, from the Sapporo-Chitose district to the Akan and Kutcharo regions, and in the Kitami hills where it winters around the hotsprings and unfrozen spring holes.

In Honshu the Pied Kingfisher nests from April to July, digging its burrow in a clay bank five or ten feet above a mountain stream. The V-shaped tunnel is about 10–15 cm. wide at the entrance, goes straight back about three feet, and expands to a room 30 to 50 cm. wide where the 5 to 7 white eggs (37.3–40.4 x 31–33.2 mm.) are laid. Incubation is reportedly by the female alone, but both sexes feed the young, which leave the nest about 40 days after hatching. The species' food consists exclusively of fish and crayfish. It may remain at higher altitudes as long as the streams remain open, but when they freeze it comes down lower, and has been observed in winter at the river mouths along the south coast of Honshu. It is a noisy bird and conspicuous wherever it occurs, but shy and hard to approach.

264. ALCEDO ATTHIS BENGALENSIS Gmelin
RIVER KINGFISHER
Japanese: Kawa-semi (river kingfisher)

Alcedo bengalensis Gmelin, Syst. Nat., **1**, pt. 1, 1788: 450 (Bengal).
Alcedo japonica Bonaparte, Ateneo Ital., no. 11, 1854: 320 (Japan). (Synonym)

Steinbacher (1935: 360) recognizes *japonica* as distinct from *bengalensis* on the strength of its allegedly longer wing (*japonica* 77 mm., *bengalensis* 74–75 mm.). My measurements of 20 Japanese specimens show no significant differences from those of a much larger series from continental eastern and central Asia.

The little River Kingfisher is widely distributed throughout Japan. It is found along the rivers, on small streams in the cultivated fields, in the marshes, on the shores of lakes and ponds, along the rocky coasts, and inland on the mountain streams up to about 3000 feet. In Hokkaido it is a summer resident only, arriving in late April or early May and leaving in mid September. From central Honshu southward it tends to be resident, and can be found in the plains areas throughout the year.

The nesting season begins in Honshu in late March and lasts through August, so two or more broods may be raised annually. The bird digs its burrow two to three feet laterally into a mud bank, usually near the water but occasionally at some distance from it, at the back of which it lays its 5 to 7, rarely 10 white eggs, which measure 20–23.2 x 17–19 mm. Incubation by the female alone requires 14 to 16 days, and the young leave the nest 24 days after hatching. The nest becomes carpeted with disgorged fish bones during the rearing period.

265. Halcyon coromanda major (Temminck & Schlegel)
RUDDY KINGFISHER
Japanese: Aka shobin (red kingfisher)

Alcedo (*Halcyon*) *coromanda major* Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1848: 75, pl. 39 (Japan).

A species of tropical origin which has extended its range northward as far as Hokkaido, the Ruddy Kingfisher is an uncommon summer resident from central Honshu northward. It is a bird of the wet, heavy forests, and usually remains close to the ground, preferably near small mountain streams and springs. Its brilliant cinnamon-red plumage is not nearly as conspicuous in the dark green undergrowth as one might expect, and it is astonishingly hard to see. Its high, shrill voice betrays its presence, however, and as it is not shy it can usually be approached closely. In Japanese folk tales it is called the "mizukoidori" or "water-begging bird" because it is always thirsty. It seems that in fine weather the reflection of its beautiful colors in the water so astonishes the bird that it cannot drink, so it cries continually for dull weather so it can slake its thirst.

The species arrives in Kyushu in late April, probably via the Ryukyu chain, reaches Honshu in early May, and Hokkaido in late May. It leaves Hokkaido in late August, but a few may remain in Honshu until early October. Its breeding season is generally June and July, but newly-fledged young have been found in Yamanashi Prefecture 16 September. The Ryukyu race, *H.c.bangsi*, nests in a burrow in a bank in true kingfisher fashion, but the only nests found in Japan have been in holes in tree trunks or branches five to ten feet above the ground. No nest materials are used, and the 4 to 6 eggs measure 34 x 30 mm. (Hokkaido, Yamashina, 1941: 496) and 31 x 27 mm. (Japan Alps, Kiyosu, 1936: 708).

266. Halcyon pileata (Boddaert)
BLACK-CAPPED KINGFISHER
Japanese: Yama shobin (mountain kingfisher; "shobin" is autochthonous for the *Halcyon* group, "semi" for the other kingfishers)

Alcedo pileata Boddaert, Table Pl. enlum., 1783: 421 (China).

The Black-capped Kingfisher is a continental species. It is admitted to the Japanese list on the strength of the following records:

Honshu,	Shizuoka	8 Apr. 1891	Yamashina coll.
"	Aichi, Owari	Apr. 1911	Matsudaira coll.
Kyushu,	Fukuoka, Mt. Takara	1921	Kurume College coll.
"	Saga, Tosa-machi	undated	Hirano (Kurume) coll.

CORACIIDAE

267. Eurystomus orientalis abundus Ripley

BROAD-BILLED ROLLER

DOLLAR BIRD

Japanese: Bupposo (autochthonous, see below)

Eurystomus orientalis abundus Ripley, Proc. Biol. Soc., Wash., **55**, 1942: 170 (Nom. nov. for *E. calonyx*, Sharpe, Nanking, China).

Another of the tropical species which reach their northernmost breeding limits in Japan, the Roller is a rare and local summer resident from Niigata and Gumma prefectures southward. It has been taken once in Akita Prefecture, five times casually in Sakhalin, but never in Hokkaido, though it was reported as seen there in 1950. It is found almost exclusively in the giant cryptomeria trees around old temples and shrines. Several of these sites, as well as the species itself have been made Natural Monuments, and thanks to this protection the population is now believed to be slowly increasing.

It is a unique and interesting species, striking both in appearance and habits, a large, bluish bird with a light patch on its primaries that looks transparent in flight. It perches on high dead branches and darts out in swift pursuit of insects like a large flycatcher. Its English name comes from its aerial acrobatics for it loves to dive steeply and swoop upward in amazing barrel-rolls, meanwhile uttering a loud, guttural "khya khya-a". Its Japanese name, now well ingrained in the language, was given it in error in the belief that it uttered the cry "bupposo" heard at night in its favorite haunts around the temples, and which has only recently been rightly attributed to the little Scops Owl (which see).

The Roller arrives in the Kirishima area of southern Kyushu in late April and appears in central Honshu in mid May. It lays 3 to 4 white eggs, measuring 29–35 x 22–30 mm., usually in a hollow tree, frequently in old woodpecker nests 30 to 50 feet above the ground. Incubation by the female alone lasts 22 to 23 days, and the young leave the nest about 23 days after hatching. The eggs are laid in June, and the chicks leave the nest by mid August. The exact time of departure is unknown, probably late September or early October.

Ishikawa (Tori, 1948: 1–8) notes that the Roller has recently developed the peculiar habit of playing around tall factory chimneys, which he believes to be part of the courtship. He cites some 26 cases of it in widely separated areas, in Tokyo, Kanagawa, Saitama, Kofu, Nagano, Niigata, and Akita prefectures. Yellow or brown brick chimneys are always selected for these maneuvers and never red ones; hence the chimney may be substituting for a dead tree stub. Usually a single bird appears and circles over and around the chimney, calling in flight. A few others soon join it and continue the aerial aerobatics as if in courtship flight. Then one or more of them dash up to the chimney and sometimes perch on it or on the ladder along its side. Ishikawa attached nesting boxes near the top of a chimney in 1950 which a pair appropriated for their nest, but he has not yet published the details.

UPUPIDAE

268. Upupa epops saturata Lönnberg
Hoopoe

Japanese: Yatsugashira (eight-headed bird)

Upupa epops saturata Lönnberg, Ark. Zool., **5**, 1909 (9): 29 (s.Transbaicalia).

The Hoopoe strays to Japan rarely from the mainland. Its nearest known breeding area is northern Korea. The specimen record:

Hokkaido, off southeast coast	19 Sep.	USNM, *ex* Blakiston
" Kobato	Mar. 1890	Sapporo Mus.
Honshu, Aichi, Nagoya	Dec. 1892	AMNH, *ex* Owston
" Mie, Ujiyamada	8 Apr. 1891	Yamashina coll.
Shikoku, Tokushima	winter 1949	Tanizaki coll.
Kyushu, Fukuoka	30 Mar. 1919	Abe coll.
" "	8 Apr. 1936	Abe coll.
Tsushima	5 Dec. 1894	AMNH, *ex* Owston

PICIDAE

269. Jynx torquilla japonica (Bonaparte)

WRYNECK

Japanese: Arisui (ant-sucker)

Yunx japonica Bonaparte, Consp. Av., **1**, 1850: 112 (Japan).
Jynx torquilla hokkaidi Kuroda, Auk, **38**, 1921: 582 (Yubetsu, Hokkaido). (Synonym)

The Wryneck is a fairly common summer resident in the brushwood plains lands of Hokkaido where it feeds on the ground in most unwoodpeckerlike fashion, and is rather shy and not easily observed. It arrives there in late April, breeds from May to August, and leaves in September. In Honshu it is an uncommon migrant in April and May and in September and October. It winters from late October to April in the sparse woods and brushy forests of the plains and foothills of southern Shikoku and Kyushu, as well as farther south to Indochina and Burma.

The Wryneck has been known to use man-made nesting boxes within city limits in Sapporo, (Yamashina, 1941: 571) but it usually lays its 6 to 9 white eggs (18.8–20.7 x 14.3–15.8 mm.) in an abandoned woodpecker hole. The incubation period is given as 12 to 14 days; the chicks are fed on beetle larvae and ants, and remain in the nest another 21 to 24 days.

270. Picus awokera Temminck

JAPANESE GREEN WOODPECKER

Japanese: Ao-gera (green woodpecker)

Picus awokera Temminck, Pl. col., livr. 99, 1826, pl. 585 (Honshu, Japan).
Picus awokera horii Taka-Tsukasa, Dob. Zas., **30**, 1918: 412 (Kagoshima, Kyushu).
Picus awokera takatsukasae Kuroda, Auk, **38**, 1921: 576 (Anno, Tanegashima).
Picus awokera etigo Momiyama, An. Orn. Orient., **1**, 1927: 56, 94 (Niigata, Honshu). (Synonym of *awokera*)
Picus awokera tosa Momiyama, An. Orn. Orient., **1**, 1927: 58, 95 (Kochi, Shikoku). (Synonym of *horii*)

This endemic species is the geographic representative of *Picus canus* on the islands between the Tsugaru and Korean straits. It has been isolated from its parent stock long enough to become specifically distinct and to develop a marked north-south cline of its own, from the large, light *P.a.awokera* of northern Honshu through the smaller, darker *P.a.horii* of Shikoku and Kyushu, to the smallest and darkest *P.a.takatsukasae* of Tanegashima and Yakushima.

The Japanese Green Woodpecker is a fairly common resident throughout its range. It occurs most commonly in the mixed forests between 1000 and 4500 feet altitude, less so in the lowlands and in the higher mountains, but is nowhere plentiful. Its habits are similar to those of *P.canus*, and the call notes of the two species, a loud, monosyllabic "piyo" are identical. However, it does not feed on the ground as often, and though its diet is mainly insects, it consumes some fruits and berries in autumn and winter; *Sambucus*, *Sorbus*, *Akebia*, and *Taxus* have been found in its stomach. It nests from April to June, laying 7 to 8 white eggs, measuring 29.5 x 15 mm., in a hole it digs out of a tree trunk from 6 to 30 feet above the ground, and usually about 5 cm. in diameter at the entrance.

271. PICUS CANUS JESSOENSIS Stejneger
EURASIAN GREEN WOODPECKER
Japanese: Yama-gera (mountain woodpecker)

Picus canus jessoensis Stejneger, Proc. U. S. Nat. Mus., **9**, 1886: 106 (Sapporo, Hokkaido).

Gecinus canus griscoviridis Clark, Proc. U. S. Nat. Mus., **32**, 1907: 473 (Seoul, Korea).

Picus canus perpallidus Stejneger, Proc. U. S. Nat. Mus., **9**, 1886: 107, footnote, (Sidemi, Ussuria). (Unique)

Comparison of the now extensive and adequate series of Green Woodpeckers in the MCZ, AMNH, and USNM collections, including the types of the three forms listed above, shows that the populations of Hokkaido and Korea are recognizably distinct, and the Korean form should stand as *P.c.griseoviridis*, not *P.c.jessoensis* as I stated previously (1948a: 159). Only fall and winter birds can be compared, for spring specimens vary individually from feather wear and staining. In series comparable both in time of year taken and in age of the specimens themselves, Hokkaido birds are a lighter, brighter, yellower green on the back than Korean birds, and their underparts have a marked yellower cast. This can be seen only in specimens of approximately equal age. Post-mortem aging so pales out the colors that Korean specimens collected twenty-five or more years ago resemble recently-taken Hokkaido skins. The type of *perpallidus* is very pale and agrees with no other specimen I have seen.

The Eurasian Green Woodpecker is a not uncommon resident in the forested lowlands of Hokkaido, ranging from the coast at Muroran to about 2500 feet elevation at the foot of Mt. Daisetsu. South of Blakiston's Line at Tsugaru Straits it is replaced by the specifically distinct *Picus awokera*, and its closest affinities are to continental forms across the Sea of Japan. A single female in the Momiyama collection taken in November 1929 at Nikko, Tochigi Prefecture, Honshu, where several others reportedly have been seen, has led to speculation of the possible former existence of relict colonies south of Hokkaido. However, these few Honshu records have resulted more probably from individuals straying southward from the species' normal range.

The life history of the Green Woodpecker in Hokkaido has not been well studied. It is largely a ground feeder, and its favorite food is ants. It nests in mid June in a hole it chisels out of a tree trunk, the entrance about six cm. in diameter. It lays 5 to 6, rarely 9 white eggs, which measure 29.1 x 21–22 mm.

272. Dryocopus martius martius (Linné)
GREAT BLACK WOODPECKER
Japanese: Kuma-gera (bear woodpecker)

Picus martius Linné, Syst. Nat., ed. 10, **1**, 1758: 112 (Sweden).
Dryocopus martius sylvifragus Riley, Proc. Biol. Soc. Wash., **28**, 1915: 162 (Hokkaido). (Synonym)

The Great Black Woodpecker is a rare resident in the heaviest forests of northern Japan. Small numbers still survive in the large timber areas of Hokkaido at Mt. Daisetsu, around Lake Shikotsu, and in the Akan National Forest. It is also still a rare resident in northern Honshu. Kawaguchi (Tori, 1935: 411) collected a pair in the Hachimandaira forest in northern Akita Prefecture in April 1935, which made quite a stir in Japanese ornithological circles at the time. In 1936 Nibe (Choju Iho, 1937: 54–58) made a survey trip of this area, found an old nest hollow probably made by this species, and corroborated Kawaguchi's report that the local woodsmen see a few there every year. Evidently the species was of wider distribution and commoner southward as recently as the middle 19th century. Kumagai (Yacho, 1941: 78–80, 275–282) unearthed old records in the local medieval literature showing the species was known in Yamagata in 1830 and near Sendai in 1803 and 1843, authenticated by unmistakable drawings labelled "kurogera" (black woodpecker) and "miyama-gera" (deep-mountain woodpecker). There are no more recent data on its present status in Honshu, and it is decidedly rare in Hokkaido. I was given a specimen taken near Akkeshi 22 December 1948, and there are two old Owston skins in the AMNH labelled Sapporo, September 1896 and March 1902. Nothing is known of its breeding in Japan, but the species apparently is resident wherever it is found.

273. Dryocopus javensis richardsi Tristram
TRISTRAM'S WOODPECKER

Japanese: Kitataki (tree tapper)

Dryocopus richardsi Tristram, Proc. Zool. Soc. London, 1879: 386, pl. 31 (Tsushima).

The population of Tristram's Woodpecker on Tsushima, its type locality, was probably never large, for there was not enough heavy forest there to support more than a few pairs. The early collectors never found more than a specimen or two at a time. The type specimen, a female collected by Captain Richards in 1878, remained unique (except for the few collected in Korea by Kalinowsky in 1886 and named in his honor by Tacznowski as a separate species) until Namiye and Tsuchida, assistants in the zoological laboratory of Science College of Tokyo Imperial University spent two and a half months on Tsushima in 1891 and collected three specimens, among them the first male known. Dr. I. Ijima (1892: 119–121) published the following notes on the collectors' experiences with this species, which are worth repeating because of the rarity of the original publication:

"On March 3rd, while passing through the deep forest of Tadera (about 15 miles to south-west of Izuhara), their attention was called to a strange piercing cry repeated a few times. Whence it emanated they could not tell, but imagined it was something like the shriek of some hawk's nestling. They waited for many minutes expecting to hear it once again, but in vain, and as no sign of any animal was discernible, they moved on, little thinking that they had just heard the long-sought *Thriponax richardsi*, as subsequent experience taught them. A few days later, the bird itself was sighted for the first time at a village called Kune-inaka. Its cry is very characteristic and sounds somewhat like a prolonged "kyah", alike in both sexes, very loud and heard for a great distance. This it repeats at intervals when on the wing as well as when climbing trees. Only in the latter case, each single "Kyah" is less prolonged. Besides the localities already mentioned, Messrs. Namiye and Tsuchida observed the bird also in the villages of Nii, Takeshiki, Mitsune, Sago, Sumo, etc. The specimens now in the Science College were shot, a pair at Kune-inaka and a second female at Nii, as will be seen from the list I have given. It is needless to say that the collectors made special endeavors to secure more specimens; but the wariness and the rapid movements of this bird made approach difficult and offered but little chances of a shot. The collector's own observations and the answers of natives to inquiries made at various localities, prove that this fine woodpecker is by no means rare on Tsushima.

"It finds its abode in dense, more or less extensive forests of tall pines, firs, cryptomeria, oaks, camphor-trees, etc. Such a forest usually exists in valleys between hills, and is known to natives as *kuromi* (a dark place). The bird is never found in any numbers together; perhaps a pair is the utmost that a *kuromi* might harbour. Standing on the hill-top, one hears its peculiar cry and loud tappings at some considerable distance in the wooded valley beneath; he descends to the spot probably to find the bird gone, but some chippings of bark or wood strewn on the ground, and some bare places on the tree-stem above tells him the work it was recently busy at. Dead trees or branches naturally attract it when in search of food, and it is said that the bird goes regular rounds to its favourite trees every day. Should one of its trees be recognized, a collector would do well therefore to lie in ambush awaiting its arrival. Its manner of flight is similar to that of other woodpeckers. The collectors have often marked the spot where the bird alights, and on more than one occasion, they discovered it again *on the ground*, whence it climbed up a tree-trunk in the usual manner on their approach. I do not know whether a similar habit has ever been noticed in any other woodpecker.

"The lower classes of the inhabitants of Tsushima hold this bird in some degree of religious awe. Some natives, as Mr. Namiye tells me, indulge in the superstition that when Buddha was in the process of creating man, a certain being called *ama-no-jakuma* pressed to have a certain part put on his forehead instead of much lower down on his body, and that that being was none else than the woodpecker in question. Hence the natives call this bird by that name. In ordinary Japanese, *ama-no-jaku* or *ama-no-jakuma* (evidently of buddhistic origin) is an appelation given to a cross-minded [perverse] person."

These three specimens are now in the Yamashina collection, together with another skin (ad. ♂) purchased in 1923, doubtfully from Tsushima, and a mounted specimen without data.

The extirpation of Tristram's Woodpecker from Tsushima has been blamed on the activities of collectors which, as the population was so limited and every collector took all he could, may well be true. The AMNH has five, an old mount without data and four undated Owston skins. The PANS has another Owston skin collected 15 February 1901, purchased from Canon Tristram. The last known Tsushima specimens were a pair shot by Kuroda's collector, Teraoka, at Nita-mura 9 October 1920. Abe (Tori, 1935: 500–509) accompanied Uchida to Tsushima in search of the bird in 1935, but all they found was an old mounted specimen in a local girls' school.

The rarity of this unique subspecies and its odd local religious significance suited it ideally for protection as a Natural Monument, which it was given in 1920, too late to do any good. Hope has always been held for its return to the island from the Korean mainland, and the Natural Monument designation is still maintained. The species was still extant in Korea (Wolfe, Auk, 1950: 449) until the start of the current hostilities, which have evidently torn much of its little remaining habitat to bits. Unless a few pairs manage to survive in remote forest areas which the combatants have not penetrated or levelled, Tristram's Woodpecker may now be extinct.

274. Dendrocopos major (Linné)
GREAT SPOTTED WOODPECKER
Japanese: Akagera (red woodpecker)

Picus major Linné, Syst. Nat., ed. 10, **1**, 1758: 114 (Sweden). (Extra-limital)
Picus japonicus Seebohm, Ibis, 1883: 24 (Hakodate, Hokkaido).
Dryobates major hondoensis Kuroda, Auk, **38**, 1921: 577 (Shinano = Nagano, Honshu).
Dryobates major tusimensis Momiyama, Ann. Orn. Orient., **1**, 1927: 60, 96, (Tsushima). (Synonym of *hondoensis*)
Dryobates major kurosio Momiyama, Kagakuno Nogyo, **20**, 1939: 13 (Hachijo). (Nom. nud.)

Here again is a gentle cline in evidence, from the larger, lighter *D.m.japonicus* of Hokkaido southward to the smaller, darker *D.m.hondoensis* of Honshu, paralleling the situation in Korea. The northern and southern populations of the two countries are inseparable.

The Great Spotted Woodpecker breeds in Hokkaido from the lowland and coastal forests into the lower mountain zones. In Honshu it occurs most frequently in the forests between 1500 and 7500 feet, moving down to lower levels in winter. Its southern limit is the highlands of central Honshu, at Jahn's Tsuruga-Nagoya line. While not uncommon in the mixed forests, it is shy and harder to approach in Japan than in Korea. It chisels its nesting hole in a tree trunk from 5 to 50 feet above the ground, and lays 5 to 6, rarely 7 to 8 white eggs. Hokkaido eggs (*japonicus*) measure 25–26 x 19–20 mm., Honshu clutches (*hondoensis*) 23.5–26 x 16–19.5 mm. Both sexes incubate, and according to Yamashina (1941 : 517) the male usually incubates during the night, the female during the daytime.

275. Dendrocopos leucotos (Bechstein)
WHITE-BACKED WOODPECKER
Japanese: O-akagera (great red woodpecker)

Picus leucotos Bechstein, Orn. Taschenb., **1**, 1803: 66 (Silesia). (Extra-limital)

Dryobates subcirris Stejneger, Proc. U. S. Nat. Mus., **9**, 1886: 113 (Sapporo, Hokkaido).

Dryobates leucotis [*sic*] *stejenegeri* [*sic*] Kuroda, Auk, **38**, 1921: 579 (Shinano = Nagano, Honshu).

Dryobates namiyei Stejneger, Proc. U. S. Nat. Mus., **9**, 1886: 116 (Yamato, Nara Pref., Honshu).

Dryobates leucotis [*sic*] *intermedius* Kuroda, Auk, **38**, 1921: 580 (Yamato, Nara Pref.). (Preoccupied; synonym of *namiyei*)

Dryobates leucotos kurodae Götz, Jahresh. Ver. vaterl. Naturk. Württemberg, **81**, 1925: 95 (nom. nov. for *intermedius*, preoccupied).

Dryobates leucotos uchidai Momiyama, Ann. Orn. Orient., **1**, 1927: 62, 96 (Hyuga, Miyazaki Pref., Kyushu). (Synonym of *namiyei*)

Dryobates leucotos tookaidonis Momiyama, Ann. Orn. Orient., **1**, 1927: 66 (nom. nov. for *intermedius*, preoccupied). (Synonym of *namiyei*)

This species ranges from Sakhalin south to Formosa, with the same well-developed cline in the Japanese islands from large and light in the north to small and dark in the south. The intergradation from *subcirris* of Hokkaido through *stejnegeri* of north and central Honshu to *namiyei* of southwest Honshu, Shikoku, and Kyushu is continuous, and it is impossible to draw exact dividing lines between the races, even at the usual sharp geographical breaks and Blakiston's and Jahn's lines. Unlike the situations in *D.major* and *D.kizuki*, the Korean forms are separable from the Japanese, and there are distinctive races on Dagelet, Quelpart, and the Ryukyus.

The White-backed Woodpecker occurs sympatrically with *D.major*, and occupies the same ecological niche in the woodlands. Its voice and habits differ very little from the smaller species, and their nesting habits apparently are identical. It is commoner in the north, however, and less so in the south, more plentiful in Hokkaido than *major*, scarcer in central Honshu. It's movements are somewhat slower than those of *major*, and in the heavy northern forests it seems less shy.

276. Dendrocopos minor amurensis (Buturlin)

LESSER SPOTTED WOODPECKER

Japanese: Ko akagera (small red woodpecker)

Xylocopus minor amurensis Buturlin, Ann. Mus. Zool. Acad. Imp. Sci. St. Petersbourg, **13**, 1908: 243 (Little Khinghan Mts., Amuria).

The Lesser Spotted Woodpecker is perhaps a rare resident locally in northern Hokkaido where the 1942 Hand-List assumes it breeds, though its nest, eggs, or young have not yet been found there. In the USNM are three specimens labelled Sapporo and dated 28 April 1877, 10 May 1877, and 1 October 1882 respectively; in the AMNH are six more from Sapporo, one dated 4 September 1882, one 25 June 1890, and four of them March 1896. Seebohm (1890: 155) lists a specimen he received from Blakiston taken in Hakodate 11 May. There is a single bird in the old Blakiston collection in Sapporo collected there in 1877. The localities on these old specimens are not reliable, for the birds may have been taken anywhere on the island and labelled from the shipping point. Nevertheless the lowland forests extended much farther south in those days, and the species apparently was more plentiful before the central plains were cleared for agriculture. It has not been collected in Hokkaido in recent years, and nothing is known of its habits. If it is found eventually to nest there, it will probably be in the lowland forests still remaining in the northern sections of the island which have not been well worked ornithologically.

277. Dendrocopos kizuki (Temminck)
PIGMY WOODPECKER
Japanese: Ko gera (little woodpecker)

Picus kizuki Temminck, Pl. Col., livr. 99, 1836 (Kyushu).
Iyngipicus seebohmi Hargitt, Ibis, 1884: 100 (Hokkaido).
Yungipicus kizuki nippon Kuroda, Ibis 1922: 88 (Gotemba, Shizuoka, Honshu).
Yungipicus kizuki matsudairai Kuroda, Auk, **38**, 1921: 576 (Miyakejima, Izu Ids.).
Yungipicus kizuki shikokuensis Kuroda, Ann. Zool. Jap., **10**, 1922: 115 (Shikoku).
Yungipicus kizuki kotataki Kuroda, Ibis, 1922: 86 (Tsushima).
Yungipicus kizuki toohokuensis Kumagai, Ann. Orn. Orient., **1**, 1928: 292 (Miyagi Pref., Honshu). (Synonym of *nippon*)
Yungipicus kizuki harterti Kuroda, Bull. Brit. Orn. Cl., **43**, 1923: 108 (Yakushima). (Preoccupied; synonym of *matsudairai*)
Dryobates kizuki petersi Kuroda, Bull. Brit. Orn. Cl., **50**, 1929: 18 (nom. nov. for *harterti*, preoccupied). (Synonym of *matsudairai*)

Dendrocopos kizuki ranges widely from Sakhalin and the Kuriles through the Japanese islands to the southern Ryukyus, and on the adjacent mainland from Ussuria and Korea to northern China. It is very plastic, and Peters (1948: 200–202) recognizes 13 of the many proposed races. Most of the six races listed by Peters (*idem*) and the 1942 Hand-List from the area we are concerned with are fairly well marked; two of them are intermediates of doubtful systematic value, but larger series, particularly from the main islands, will have to be collected before the species can be revised authoritatively. The usual cline runs through the main islands from the large and light *seebohmi* in Hokkaido south to the smaller and darker nominate race in Kyushu. It is impossible to draw sharp dividing lines between these extremes and the two intergrade forms recognized between them, *nippon* of northern and central Honshu, and *shikokuensis* of southern Honshu and Shikoku. The population of central and northern Korea is indistinguishable from *nippon*. The peripheral forms on the satellite islands, however, are quite distinct. *D.k.matsudairai* of the Izu Islands and Yakushima is a rufous bird, unlike the grayer main island populations, and somewhat intermediate between them and the darker and browner Ryukyu races. I have not seen specimens of *kotataki* of Tsushima and the Oki islands.

This smallest and commonest of the Japanese woodpeckers is a fairly common resident throughout Japan. It is apparently sedentary and non-migratory, and may be found on the smaller islands almost wherever woods occur. In Hokkaido it ranges from the wooded plains into the foothills. In central Honshu it is most plentiful above 2000 feet, though found from the lowlands to the subalpine zone. Kiyosu (Yacho, 1936: 778) found it in midwinter at 7000 feet in the Japan Alps. In Shikoku and Kyushu it lives in the small woods from the foothills upwards.

Many authors have noticed that it is usually found in pairs, even in the non-breeding season. A pair or two often accompany the roving bands of titmice of several species through the autumn and winter woodlands. The woodpeckers work the small branches out to their ends, then hop to another, uttering their sharp "khit", or "khit-khit-khit" in flight. In southern Japan the species starts breeding in March. In central Honshu it nests from April to May, digging a nest hole 3 to 4 cm. in diameter and 15 to 30 cm. deep in a tree trunk 5 to 30 feet above the ground. The 5 to 7 white eggs measure 17–20.3 x 13.4–15.3 mm.

278. Picoides tridactylus inouyei Yamashina

THREE-TOED WOODPECKER

Japanese: Yezo miyubi-gera (Hokkaido three-toed woodpecker)

Picoides tridactylus inouyei Yamashina, Bull. Bioge. Soc. Japan, **13**, 1943: 43 (Mitsumata, Tokachi Province, Hokkaido).

Yamashina compared the three known specimens of this race with specimens of *sakhalinensis* from Sakhalin, *kurodai* of northern Korea, nominate *tridactylus* from Europe and northern Manchuria, and *crissoleucus* of the Yakutsk and Yenisei regions. According to his diagnosis the Hokkaido birds are considerably darker than *sak-*

halinensis and more closely resemble *kurodai*, from which they differ in having more white markings on the back, a paler yellow crown-patch in the male, and more numerous black cross-bars on the underparts.

The presence of a small resident population of Three-toed Woodpeckers in the highlands of east-central Hokkaido was not discovered until 19 September 1942, when N. Inouye of the Hokkaido Forestry Experiment Station saw a male bird in the state forest at Mitsumata, Kato District, Tokachi Province. In November he collected a female, and in December a pair, all three of which are now in the Yamashina collection. No more have been collected since this type series, but Inoue has observed the species several times since in the same locality.

PITTIDAE

279. Pitta brachyura nympha Temminck and Schlegel

FAIRY PITTA

Japanese: Yairocho (eight-colored bird)

Pitta nympha Temminck and Schlegel, *in* Siebold, Fauna Jap., Aves, 1850: 135, suppl., pl. A (Korea).

The Fairy Pitta is one of the most beautiful and unique as well as one of the rarest birds native to Japan. It is a tropical species which has extended its breeding range northward as far as southern Shikoku. Its disrupted breeding distribution suggests it may be a relict species formerly more widespread over coastal eastern Asia. It is known to nest in Japan definitely only at one locality, in Kochi Prefecture, Shikoku, but it may breed elsewhere in Japan for Kawaguchi (Dob. Zas., 1928: 478) collected alive a female accompanied by two newly-fledged young in Kumamoto, central Kyushu, 25 July 1925. It also breeds on the south side of Quelpart Island, and sporadically and disruptedly in eastern China.

That it is of regular, though rare occurrence in southern Japan is attested by the number of records. It is so striking, unusual, and unmistakable a bird that its presence is usually noticed, and it possibly comes to hand more frequently than a less conspicuous species might. There are a score or so of sight records in the Japanese literature, most of which are probably acceptable, and the following specimen records:

Honshu,	Nagano (2)	1926	Momiyama coll.
"	Mt. Fuji	11 June 1899	AMNH, *ex* Owston
"	Shizuoka, Omaezaki	25 May 1938	Norinsho coll.
"	Wakayama, Sauri-mura	late May 1927	Wakayama school coll.

Honshu, Wakayama, Shionomisaki	23 May 1924	Norinsho coll.
" Tottori, Inaba	undated	Yamashina coll., *ex* Tokyo University
Shikoku, Kochi, Tosa-gun, Kagami	26 May 1929	Kuroda coll.
" Ehime	undated	Ehime school coll.
Kyushu, Fukuoka, Eboshidai	6 June 1937	Kido (Fukuoka) coll.
" " Mt. Hiko	11 June 1900	Takachiho coll.
Oki Island	undated	1922 Hand-List

Its nesting in the National Forest in southern Shikoku was discovered in 1937 by Ito (Yacho, 1938: 751), and reported on in detail by Uchida (Yacho, 1937: 735–742) with photographs of the bird and its nest by Shimomura. According to these accounts the bird is well known to the inhabitants, who call it the "akadanna" (red belly-band) or the "shiropen kuropen" (from its note). It lives in thick, mixed woodlands, preferably near a stream. It feeds and spends most of its time on the ground, but sings from a high branch, flirting its tail as it calls. Its flight is straight and fast. It arrives about 12 May every year, and sings to the end of the month when it starts nesting, is silent during the nesting period, and begins to sing again in mid July and continues until it leaves in September.

Its peculiar domed nest was found in the fork of a cherry tree 15 feet from the ground, and contained 6 creamy white eggs with pale purple-brown spots. The nest was made of cherry twigs over a moss lining, which in turn was lined with pine needles. It measured 15 x 26 cm. outside, 16 cm. in diameter inside, and the lateral entrance 6 x 8 cm. Ito (*idem*) found four other old nests, one in a cleft in the rocks, the other three in tree forks from 6 to 25 feet above the ground.

ALAUDIDAE

280. Alauda arvensis (Linné)

SKYLARK

Japanese: Hibari (autochthonous)

Alauda arvensis Linné, Syst. Nat., ed. 10, **1**, 1758: 165 (Sweden). (Extralimital)

Alauda pekinensis Swinhoe, Proc. Zool. Soc. London, 1863: 89 (Peking).

Alauda arvensis lönnbergi Hachisuka, Bull. B. O. C., **47**, 1926: 23 (Sakhalin).

Alauda japonica Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1848: 87 (Japan).

Alauda intermedia Swinhoe, Proc. Zool. Soc. London, 1863: 89 (Shanghai).

Alauda arvensis quelpartae Momiyama, Ann. Orn. Orient., **1**, 1927: 14 (Quelpart Id.). (Synonym of *japonica*)

Alauda arvensis kagoshimae Yamashina, Bull. B. O. C., **59**, 1939: 134 (Kagoshima Pref., Kyushu). (Synonym of *japonica*)

The determination of the racial affinites of this species will probably remain unsettled for some time to come. Despite fine series of Japanese skylarks and specimens from the contiguous mainland, I am not entirely satisfied with my own diagnosis. From the material I have examined I can recognize the following subspecies:

A.a.pekinensis. This is the largest of the eastern Asiatic Skylarks, with a distinct ruddy cast in the breeding plumage, less manifest in winter. It apparently breeds across northern Siberia from the Yakutsk region to the Chukchi Peninsula, and down through Kamchatka and the Kuriles, perhaps to northeastern Hokkaido. It winters southward in small numbers. Specimens referable to it have been taken on all four main islands of Japan, as far south as Kagoshima, Kyushu.

A.a.lönnbergi. The breeding bird of Sakhalin and the adjacent mainland south of the range of *pekinensis* is slightly smaller and as dark, but lacks the ruddy cast to the plumage. It winters fairly commonly in Honshu, usually in the highlands above 1000 feet. Specimens have been taken in Fukushima, Nagano, Kyoto, and Tokyo prefectures from 15 October through 23 March; also in Shikoku and Kyushu.

A.a.japonica. This is the breeding form of Japan, smaller and lighter than either of the preceding, nesting from central Hokkaido through Honshu and Shikoku to southern Kyushu and Quelpart Island. I cannot distinguish either *quelpartae* or *kagoshimae* from it.

A.a.intermedia. My breeding series of Korean skylarks, while of the same size as *japonica*, are browner in comparable plumages, and indistinguishable from a large series of northeastern China and southeastern Manchuria breeding birds.

The Skylark is a common bird throughout Japan, found in summer in the plainslands and cultivated upland fields up to 3000 feet, in winter in the dry paddies and along the coastal beaches where some grasses grow. The breeding populations of Hokkaido and northern Honshu move southward in late October and return in March. From central Honshu southward it is more or less resident.

The species always nests on the ground, usually in or near a cultivated field, and lays 3 to 5 grayish-white eggs densely spotted with brown, which measure 19–24 x 15.5–17.5 mm. Incubation by the female alone is given as 10 to 13 days (Nibe in Yamashina, 1933: 255), and the species is probably multi-brooded in the southern parts of its range. In Honshu it nests from late March through July, in Hokkaido in June and July.

As it is almost everywhere throughout its range, the Skylark is a familiar and popular bird in Japan, celebrated in literature and poetry for its attractive song-flight, which starts in March in Honshu, in April in Hokkaido. While practically never hunted for food, it is frequently kept in captivity in special tall cages in which it can sing on the wing. The most successful cage birds are taken from wild nests and reared by hand. Song competitions have been held between captive birds.

281. Calandrella cinerea (Gmelin)

SHORT-TOED LARK

Japanese: Karafuto kohibari (Sakhalin small lark)

Alauda cinerea Gmelin, Syst. Nat., **1** (2), 1789: 798 (Cape of Good Hope).

The Short-toed Lark is not of regular occurrence in Japan. Two specimens in the former Taka-Tsukasa collection taken on Sado Island in 1932 are the only records. As these were destroyed in 1945 they can no longer be checked for subspecific identification. The 1942 Hand-List referred them to *C.c.puii* Yamashina of northwestern Manchuria, which Meinertzhagen (1951: 97) refers to *dukhunensis* (Sykes) and Vaurie (1951: 472) to "*orientalis*" Sushkin, which he considers doubtfully separable from *longipennis* (Eversmann) of Turkestan.

282. Melanocorypha bimaculata (Ménétries)

SPOTTED CALANDRA LARK

Japanese: Kubiwa kotenshi (collared angel)

Alauda bimaculata Ménétries, Cat. Rais. Cauc., 1832: 37 (Azerbaijan, Caucasus).

The only Japanese record for this species is an adult female, which had strayed a long way indeed from western Asia, to reach Hachijo Island where Momiyama collected it 22 March 1923. The 1942 Hand-List refers the specimen to *M.b.bimaculata*, meaning the eastern race for which Vaurie (1951: 384) has revived the name *torquata* Blyth.

283. Eremophila alpestris euroa (Thayer and Bangs)

HORNED LARK

Japanese: Hama hibari (shore lark)

Otocorys alpestris euroa Thayer & Bangs, Proc. N. E. Zool. Cl., **5**, 1914: 43 (Kolyma).

The eastern Siberian race of this circumpolar species has been taken in Japan as follows:

Hokkaido, Sapporo		10 Feb. 1907	Sapporo Museum
Honshu, Nagano, Shinano		Dec. 1914	Matsudaira coll.
" " "	(2)	Feb. 1915	Matsudaira coll.
" Shiga, Omi		1921	Momiyama coll.
Tsushima Island		16 Oct. 1920	Kuroda coll.

The Momiyama specimen was purchased alive from a bird shop in Tokyo, the proprietor of which stated the bird was caught at Omi, near Hikone, Shiga Prefecture. The species has also been taken in Sakhalin and the Kuriles, but does not winter regularly south of Kamchatka and Amuria.

HIRUNDINIDAE

284. Hirundo rustica Linné

HOUSE SWALLOW

BARN SWALLOW

Japanese: Tsubame (autochthonous)

Hirundo rustica Linné, Syst. Nat., ed. 10, **1**, 1758: 191 (Sweden). (Extralimital)

Hirundo gutturalis Scopoli, Del. Flor. et Faun. Insubr., **2**, 1786: 96 (Philippines).

Hirundo rustica mandschurica Meise, Abh. Ber. Mus. Tierk. Volkerk., Dresden, **18**, 1934 (4): 46 (Charbin, Manchuria).

The breeding population of Barn Swallows in Japan is the light-bellied *H.r.gutturalis*. The dark-bellied northern continental form, *H.r.mandschurica*, occurs infrequently on migration. Specimens have been taken at Hachijo Island (Momiyama coll.), Kagoshima, Kyushu (Taka-Tsukasa coll.), and Fukuoka, Kyushu (Kuroda coll.). A specimen I collected at Aomori 31 May 1948 is very close to *mandschurica*, not nearly as dark as *tytleri*, and considerably darker than the Amurian birds which Stegmann (1931: 211) calls *tytleri* ⋛ *gutturalis*.

The Barn Swallow is a common summer resident throughout most of Japan, abundant in the three southern islands, but much less plentiful in Hokkaido. It is perhaps the only bird in Japan that is never killed or caught by the Japanese. It is beloved as a harbinger of spring and universally valued as a catcher of insects. A swallow nest under the eaves is a sign of good luck. It is usually found near water and over open lands, in the cities and villages as well as over the rice paddies and upland fields, and is common up to about 3500 feet in

Honshu.

Its mud and straw nest is built usually under the eaves of human dwellings. (A pair nested every spring during the occupation on the dome of the hanging electric light in the foyer of the Mitsubishi Shoji Building, my headquarters in central Tokyo. Their presence was not appreciated by the Public Health and Welfare Section, which occupied the same building, when the species was suspected of carrying Japanese—B encephalitis!) Breeding starts in central Honshu in mid April. Nest building takes a week to ten days, after which the 4 to 5, rarely 7, eggs are laid a day apart. Incubation by the female alone requires 14 to 15 days; the young leave the nest in another 20 days. A second brood is usually raised, the clutch averaging smaller, 2 to 3 eggs, and the last young leave the nest in early August.

In its northward migration in spring the Barn Swallow appears to follow the 8° isotherm (Okabe, Choju Iho, 1930: 282–288). It arrives in southern Kyushu during the first ten days of March, reaches Shikoku by mid March, and the Kwanto Plain the end of the month. The first migrants reach Aomori in mid April, and Hokkaido the first of May. At the end of the breeding season in August the swallows start gathering in large flocks and roost nightly in the reedy marshes until ready to migrate southward. The exodus begins in the north in August or early September, and the last birds are seen in Aomori in late September. The main flight leaves the Kwanto Plain in early October, a few birds remaining until early November. In southern Kyushu a few sometimes stay until late November. The species has been taken in winter in the Bonin, Volcano, and Marianas Islands, but winters more commonly through the Ryukyus and Formosa to the Philippines, and southward through Malaya and the East Indies to New Guinea and Australia. Nevertheless the species has been seen in January at Odawara, Shizuoka Prefecture, at Kochi in southern Shikoku, and at Fukuoka and Kagoshima in Kyushu. Since the mid 1930s small flocks have been wintering regularly on a lake near Kyoto, and at Lake Hamana near Hamamatsu in southern Shizuoka (Nakamura, Yacho, 1939: 299), and near Togane, Chiba (Nakanishi, Kagaku no Jiken, 1953: 75–79). These hardy individuals maintain themselves by feeding on the insects that swarm over these waters even in winter, and roost huddled together for warmth on the roofs of nearby houses.

285. Hirundo striolata japonica Temminck & Schlegel
MOSQUE SWALLOW

Japanese: Koshiaka tsubame (red-rumped swallow)

Hirundo alpestris japonica Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1847: 33, pl. 11 (Japan).

The Mosque, Striated, or Red-rumped Swallow is a common summer resident from south-central Honshu southward and westward. In western Honshu, Shikoku, and Kyushu it is often as common as the Barn Swallow, particularly in the foothills. It is less plentiful in the plains. In the Kyoto-Osaka area it is abundant in summer, and hundreds nest in the temple on Mt. Koya. East of the Kansai Plain it is generally rare. It has been taken north to Akita and Miyagi prefectures, and formerly there were colonies in Tokyo (Kuroda, Tori, 1931: 152) and in Chiba (Saito, Tori, 1941: 143). Today there are scattered colonies along the warm southern coast of Honshu as far east as the Izu Peninsula, where a dozen or so pairs nest in the firehouse in the center of Atami City and swoop up and down the narrow, thronging streets to feed through the day. The northernmost known breeding colony was discovered in 1951 in Ishinomaki, Miyagi Prefecture (Yacho, 1952: 109).

It arrives in spring slightly later than *H.rustica*, reaching Honshu rarely in late March, usually from mid to late April. It starts nesting in early May and, as nestlings are found in early September, apparently rears two broods. It nests in colonies, and builds a large, characteristic, retort-shaped nest with the entrance through a tube at the bottom edge. Temples are favorite nesting sites. The species starts flocking in early September and begins to leave toward the end of the month. The main migration departs in mid October. A few may remain until mid November, and it is sometimes seen in winter (Hyogo Prefecture, Yacho, 1952: 25). It winters south to south China, Burma, and Assam, but evidently does not pass through the Ryukyus, where it has been taken but once.

286. Delichon dasypus dasypus (Bonaparte)
HOUSE MARTIN

Japanese: Iwatsubame (rock swallow)

Chelidon dasypus Bonaparte, Consp. Av., **1**, 1850: 434 (Borneo).

The House Martin is a locally abundant summer resident from

Hokkaido south to central Honshu, seldom found far from its nesting colonies. A few breed west of Jahn's Tsuruga-Nagoya line in Honshu and in Kyushu, but it has never been taken in Shikoku. It covers a wide altitudinal range from sea level to at least 6000 feet in the mountains. Its season in central Honshu is from mid March to late October, in northern Honshu from early April to mid September, in Hokkaido from late April to early September. Although it migrates southward to south China, the Moluccas, Borneo, and Java, a few winter in favorable localities in southern Japan where insects are available from unfrozen waters or hotsprings, as at the "Tsubame" hotsprings in Niigata and Wakayama prefectures, Honshu, and in Oita and Kumamoto prefectures, Kyushu.

It nests in large colonies in rocky cliffs, frequently in company with the White-rumped Swift. These colonies are sometimes at sea level as the one in the road-side cliff facing the sea at Otaru, Hokkaido, more frequently inland along river gorges as at Kegon Falls above Nikko, sometimes within volcano rims as at Mt. Meakan, Hokkaido, and on sheer mountain cliffs at Mt. Fuji and in the Japan Alps. Comparatively recently, probably within the last half century, the species has taken to nesting on high buildings in the mountains. The lofty eaves of temples, shrines, power plants, and particularly the large resort hotels furnish ideal sites for its closed mud nests. The banding of House Martins in Nagano has shown that individuals return to the same colony year after year. Two colonies were established artificially at Asakawa Station, near Hachioji, where the birds were wanted as an added tourist attraction, by rearing and releasing at the new site young birds hatched 75 miles away at Asama.

In central Honshu the House Martin lays its first clutch in late April and its second in late June or early July. The clutch has usually 3 to 4 white eggs, less frequently 2 to 6, averaging 19–21 x 14–15 mm. The incubation period is given as 14 to 15 days, the rearing period 26 to 28 days, and the first egg of the second brood is laid about ten days after the first brood leaves the nest.

287. Riparia riparia ijimae (Lönnberg)

BANK SWALLOW

Japanese: Shodo tsubame ("small cave" or burrow swallow)

Clivicola riparia ijimae Lönnberg, Jour. Coll. Sci. Tokyo, **23**, 1908, art. 14: 38 (Sakhalin).

The Bank Swallow is a not uncommon summer resident in Hokkaido, and a rare migrant in Honshu (Nagano, 28 May 1913, AMNH). Most of the Hokkaido population probably crosses the Japan Sea and follows the continental coastline southward to its wintering grounds in southeastern Asia. The species arrives in Hokkaido in May, breeds from June to early August, and leaves in late September. It nests in small colonies, digging nest holes in sand banks along the rivers or facing other waters. Colonies have been reported on the Ishikari River, on Lake Shikotsu, and near Akkeshi, Naka-Yubetsu, Shimo-Yubetsu, Togaru, Kunnep, and Mihoro. What little is known of its nesting and other habits in Japan does not differ from those reported for the species elsewhere.

CAMPEPHAGIDAE

288. Pericrocotus roseus (Vieillot)

ASHY MINIVET

Japanese: Sanshokui (eater of the prickly ash, *Xanthoxylum piperitum*)

Muscicapa rosea Vieillot, Nouv. Dict. Hist. Nat., **21**, 1818: 486–487 (Bengal). (Extra-limital)

Lanius divaricatus Raffles, Trans. Linn. Soc. London, **13**, 1822: 305 (near Sumatra).

Pericrocotus cinereus intermedius Clark, Proc. U. S. Nat. Mus., **32**, 1907: 474 (Seoul, Korea). (Synonym of *divaricatus*)

Pericrocotus tegimae Stejneger, Proc. U. S. Nat. Mus., **9**, 1887: 648 (Okinawa).

I synonymize *intermedius* with *divaricatus* because I can find no recognizable color or size differences between the two disconnected populations of Ashy Minivets breeding in Honshu and Korea. The Ryukyu population, *P.r.tegimae* is a strongly-marked subspecies, dark-backed, dark-breasted, and smaller (wing 83–86 mm. as against 92–101 in *divaricatus*). Though *tegimae* seems to occur fairly regularly in Tanegashima and Yakushima, and casually in southern Kyushu, it is not known to nest north of Okinawa. Hence the breeding ranges of the two subspecies are not contiguous, and the forms show no morphological intergradation.

The Ashy Minivet is a fairly common summer resident in central and northern Honshu north to Aomori, a transient farther south. An inhabitant of the deciduous woodlands, it is usually seen perching in the top of a tall tree, a neat slender, gray bird with long wings and sharply graduated tail, or flying high in the sky, announcing its presence with its pleasant, far-carrying note, cool as the clang of a bell. It arrives in Honshu between 15 and 25 April and starts nesting in

May. It visits the lowlands and the city parks on its arrival, but breeds only in the wooded foothills below 4000 feet. It builds a very small, thin-walled, delicate nest of lichens, mosses, leaves, pine-needles, and small twigs, cleverly fastened together with spider webs. It lays 4 to 5, rarely 7, bluish-gray eggs, spotted heavily with purplish-brown at the larger end, and measuring 20–22 x 15.5–16.5 mm. It rears but a single brood. Incubation is by the female alone, and the young are on the wing in late July. The minivets then come down to the plains-lands in family groups and form small flocks before migrating. They usually disappear by mid September.

CORVIDAE

289. Corvus corax kamtschaticus Dybowski

RAVEN

Japanese: Watari-garasu (migrant crow)

Corvus corax kamtschaticus Dybowski, Bull. Soc. Zool. France, 1883: 362, 363 (Kamchatka).

The Raven is a regular but not plentiful winter visitor along the shores of northern and eastern Hokkaido. More are observed in severe winters than in mild ones, foraging along the cold, open coasts for animal matter cast up by the sea. A few appear almost every winter at Akkeshi, where they join the crows and gulls scavenging on the offal from the whaling station by day, and roost nightly on the offshore cliffs. The earliest record is a specimen taken at Rebun Island in October 1887 (Sapporo Museum), and the latest for individuals observed at Akkeshi in April. Most of the specimen records are for January and February. It seldom comes southward beyond Cape Erimo on the south coast, and Otaru on the north, though it has been taken once at Hakodate, and once inland at Sapporo. It does not nest south of the northern Kuriles and northern Sakhalin.

290. Corvus levaillantii japonensis Bonaparte

THICK-BILLED CROW

Japanese: Hashibuto-garasu (thick-billed crow)

Corvus japonensis Bonaparte, Consp. Av., **1**, 1850: 386 (Hokkaido).
Corvus coronoides hondoensis Momiyama, Jour. Chosen Nat. Hist. Soc., **5**, 1927: 4 (Tottori Pref., Honshu). (Synonym)
Corvus coronoides tikzenensis Momiyama, Jour. Chosen Nat. Hist. Soc., **5**, 1927: 8 (Fukuoka Pref., Kyushu). (Synonym)

Corvus levaillantii shows a gradual cline in measurements from a larger bird in the north to a smaller one in the south. There are wide age and sex differences in individual birds and none of the populations, even the extremes, can be recognized as distinct except by averages in large series. The names proposed for the intermediate populations on Honshu and Kyushu have been synonymized by the 1942 Hand-List. The mainland race *mandschuricus*, which also occurs on Tsushima, is recognizable as smaller than *japonensis*, and the Ryukyu races are smaller still.

The Thick-billed Crow is an abundant resident, commoner than the following species around the coastal cities and fishing villages, scarcer inland, and seldom found above 3000 feet. Wide-ranging throughout the lowlands and an omnivorous scavenger, it finds life easiest near human dwellings. It shares the bounty around the fishing villages and harbors with the Black-eared Kite, and is a common resident on the small offshore islands where the Carrion Crow is seldom found. It is also found in smaller numbers in the cultivated lowlands and around the country villages, sometimes well back in the forests and highlands, but seldom far from human habitations. It winters in large numbers in the cities of Hokkaido and northern Honshu and, as it is not bothered, becomes very bold. At such times it can be a nuisance, for it will steal fish from unguarded drying racks and any other unprotected food, but by and large it does good service by removing garbage and offal. A favorite roost for the wintering flocks in Tokyo is the Imperial Palace grounds at Aoyama, where thousands gather nightly, scattering abroad to feed in the daytime and returning at dusk in successive small flocks. There are similar roosts in or near every major city. Where convenient sites are not available within the cities, the birds retire to the nearest woodland for shelter during the winter nights.

With the advent of spring the flocks disperse as the pairs spread out to breed, again near human dwellings and commonly in the urban areas. Their rough, bulky nests, high up in large trees, are a familiar sight in suburban Tokyo. The species may be multi-brooded, for the nesting starts in early March in southern Honshu, in late April in Hokkaido, and lasts into July. The clutch is 3 to 5 bluish-green eggs with pale brownish markings, averaging 46.7 x 35.5 mm.

The crows owe their abundance in Japan to food prejudice, for in this land where almost all other birds are eaten with gusto, crows are not considered good food. As with similar prejudices throughout the world, this one is unfounded in fact. Crow flesh is good human sustenance and not of bad flavor, certainly preferable to the rank, oily meat of cormorants, gulls, and other sea birds. The prejudice doubtless stems from the birds' scavenging habits and from its color, and has become deeply ingrained. The Japanese claim that crow meat "smells bad" and refuse to touch it, though I have seen them eat it with relish when they didn't know what was being served.

Japanese tradition claims that young crows feed their parents in return for bringing them up, so the bird has become symbolic of filial piety. The crow is also associated with fire in Japanese folk-lore, because it is said to be the only bird that can fly toward the sun without minding its rays. It never feels the sun's heat because it is already scorched black, so it flies to the west in the evening and toward the rising sun in the morning. And in Japanese the crow does not "caw" as in English, but say "kaa kaa".

291. CORVUS CORONE ORIENTALIS Eversmann
CARRION CROW
Japanese: Hashiboso-garasu (thin-billed crow)

Corvus orientalis Eversmann, Addenda Pallas Zoogr., fasc. 2, 1841: 7 (Bukhtarma).

The Carrion Crow is resident throughout Japan, somewhat less common than the Thick-billed Crow with which it lives side by side in the cities and villages, but more plentiful in the inland fields and upland woodlands. It is an inland rather than a coastal species, and though a few can always be found with the commoner Thick-billed Crows in the shore villages, it is rare on the offshore islands and has been found nesting only on the largest of them, Sado and Tsushima. The ecological differences between these two species which exist together through so much of Japan are not entirely clear. Their food habits are apparently identical in winter around the towns, but the Carrion Crow depends less on scavenging for its sustenance at other times and places.

The two crows can be told apart in the field most easily by their bill sizes and by their notes. The greenish gloss of the Thick-billed and the purplish of the Carrion are distinguishable only with the birds in the hand. The bill character is useful when the birds are close enough, but is not always conclusive, for young Thick-bills may have almost as thin (though differently shaped) bills as old Carrion Crows. In general the Carrion Crow is a slenderer, sleeker, smoother bird, and its notes are clearer and sharper, not as low-pitched or as coarse and rough, and considerably less varied than those of the heavier bird.

The Carrion Crow breeds on all four main islands, not infrequently in the cities, more commonly inland in or near the upland mixed forests. It lays 3 to 6 eggs, usually 4 to 5, similarly colored but slightly smaller than those of the Thick-billed crow, 41–45 x 28–33 mm. Incubation by the female alone takes 18 to 19 days. It starts nesting as early as February in southern Kyushu, in April in Hokkaido, and the season lasts through June. Whether more than one brood is reared annually is unknown.

292. Corvus frugilegus pastinator Gould

ROOK

Japanese: Miyama-garasu (mountain-country crow)

Corvus pastinator Gould, Proc. Zool. Soc. London, 1845: 1 (China).

Part of the flight of Rooks that comes down the Korean peninsula from the Manchurian breeding grounds crosses Tsushima Straits and terminates in northern Kyushu and western Honshu and Shikoku. The first arrivals usually reach Kyushu in November, but Lumsden (*in lit.*) saw the first Rooks "in Kyushu near Itazaki 23 October 1946 when a large flock flew across the road in front of us. Another flock appeared at Iwakuni [Yamaguchi Pref., Honshu] 20 November 1946. They were quite tame and easy to approach." The flocks remain in western Japan through the winter, though not as plentifully as in southern Korea, and vary from year to year in abundance, some years appearing in thousands, at other times only in hundreds. They seldom go farther south than Fukuoka Prefecture in Kyushu or east of Hiroshima Prefecture in Honshu, though stragglers have been taken in Tokyo and in Miyagi (January 1931, Kumagai coll.). They remain in Fukuoka regularly until March and generally leave for the north before April. Nagahisa Kuroda collected one at Kagoshima, Kyushu, 26 March 1951 (Misc. Rpts. Yam. Inst., 1952: 15).

293. Corvus monedula dauuricus Pallas

JACKDAW

Japanese: Kokumaru-garasu (black-ball crow)

Corvus dauuricus Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776: 694 (Baikalia).

The Jackdaws found so frequently in company with the Rooks wintering in Korea do not accompany them regularly to Japan. The species appears rarely and casually, and from the record may occur almost anywhere instead of only in the western parts as does the Rook. The specimen record:

Hokkaido, Ishikari, Yamahan-mura		Nov. 1888	Sapporo Mus.
" Kametagun		1878	Sapporo Mus., Blakiston coll.
" Hakodate		9 June 1878	Tori (1929: 250)
Honshu, Yamagata, Tsuruoka		20 Oct. 1893	Dob. Zas. (1895: 46)
" Fukui, Wakasa	(2)	undated	Kuroda coll.
" Shizuoka, Suruga		undated	Taka-Tsukasa coll.
" Niigata		undated	Nii. Ten. Shi. (1925: 344)
Kyushu, Nagasaki	(2)	undated	Leyden Mus.

294. Pica pica japonica Temminck & Schlegel

MAGPIE

Japanese: Kasasagi (autochthonous)

Pica varia japonica Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1848: 81 (Japan).

According to the contemporary records of the Hizen clan of Saga and the Higo clan of Fukuoka, the Magpie was introduced to Kyushu at the time of the Japanese invasion of Korea in 1598. It has remained extremely localized in northern Kyushu ever since, and although it has maintained itself in Saga, in western Fukuoka, and in parts of Nagasaki prefectures, it has not spread, nor been taken as a straggler elsewhere in Japan. It was made a Natural Monument in 1923, and has increased somewhat in Saga since then, occasionally doing some damage to orchard and field crops. It starts nesting there in late January or early February, and its immense nests, used and added to year after year, are one of the local sights of the region.

295. Cyanopica cyanus japonica Parrot

BLUE MAGPIE

Japanese: Onaga (long tail)

Cyanopica cyanus japonica Parrot, Orn. Monats., 1905: 25 (Japan).

The Blue Magpie is an irregular and locally common summer resident in central and north-central Honshu and in northern Kyushu.

This strangely disrupted distribution has not yet been explained satisfactorily. The bird is believed formerly to have been of continuous and possibly more widespread occurrence, and to have been extirpated from much of its ancient range by natural enemies. Indigenous names for it are found in the local dialects in southern Kyushu, Shikoku, and western Honshu, where the species has not been recorded in modern times. It is known to have decreased in abundance in the Mt. Fuji area in the last two or three decades, but it is still common in northwest Yamanashi Prefecture in the neighborhood of Kofu. It is commonest today on the Kwanto Plain, and is a fairly plentiful backyard and park resident in suburban Tokyo. It has also been recorded recently in Aomori, Miyagi, Gumma, and Nagano prefectures, and westward as far as Hyogo Prefecture. In northern Kyushu it is found only in Fukuoka and Saga prefectures, and is said to breed commonly near Saga castle.

A bird of the brush areas and small woodlands, in the non-breeding seasons it roves widely in small industrious and noisy bands of from 10 to 100 individuals. Its call is a screeching "ray-it, wit-wit-wit." In late spring and summer its diet has been shown to be 87–100 per cent animal food, of which noxious insects form 95 per cent, and small lizards and mammals, and even eggs and young of other birds the balance (Kuzu, Choju Chos. Hok., 1942: 129–242). In winter its food is about 75 per cent vegetable, particularly fruits and berries, but it does almost negligible damage to cultivated varieties, and has never been complained of by the agriculturists.

It breeds from mid May to late July, building a typical corvine nest of twigs lined with moss or dead leaves, from 5 to 50 feet above the ground in thick brush or conifers. It apparently is single-brooded, laying 5 to 7, occasionally 8 grayish eggs with sparse brownish markings, measuring 24.5–28.7 x 19.5–21.5 mm.

296. Nucifraga caryocatactes (Linné)

NUTCRACKER

Japanese: Hoshi-garasu (star [spotted] crow)

Corvus Caryocatactes Linné, Syst. Nat., ed. 10, **1**, 1758: 106 (Sweden). (Extralimital)

Nucifraga caryocatactes japonicus Hartert, Nov. Zool., 1897: 134 (Japan).

Nucifraga macrorhynchus Brehm, Lehrb. Nat. europ. Vög., **1**, 1823: 103 (n. Europe and Asia).

The Nutcracker population of Honshu and Hokkaido, *N.c.japonicus*, is intermediate in bill size between *macrorhynchus* of continental Asia and nominate *caryocatactes* of northern Europe. The single Kyushu record of this species, a bird in the former Kuroda collection taken in Fukuoka 5 February 1922, was identified by Kuroda as the thinner-billed *macrorhynchus*, and probably strayed there from Korea.

The Nutcracker is a fairly common resident on mountain tops at and above the tree line. It feeds chiefly on the seeds of *Pinus pumila* which it hoards in small caches under stones in the dense, matted thickets of this low, spreading, mountain evergreen. It also eats other seeds and fruits, acorns, and some insects. It is common at Mt. Fuji and on practically all the barren peaks of the Japan Alps. Its distribution is more or less continuous on the higher peaks from there through northern Honshu and Hokkaido to the southern Kuriles. In western Honshu there are no peaks high enough for it. It was unknown in Shikoku until Jahn (1942: 77) reported its presence on two peaks there, and Kiyosu (Yacho, 1949: 137) found it on Mts. Tsurugi and Ishizuchi above 3500 feet, and collected in late June a young of the year "about a month out of the nest."

The Nutcracker remains on the mountain tops throughout the year, but may come to lower altitudes in search of food during the worst of the winter. At Mt. Fuji (Jahn, *idem*) it ranges from 6000 to 9000 feet, and descends in winter occasionally to 3000 feet. It rarely visits the plains, but has been taken in winter once at Haneda in Tokyo, once in Chiba, and once on Oshima in the Izu Islands. Although adults with groups of young just out of the nest have been seen frequently (Honshu 2 June, Kuroda; Hokkaido 10 July, Jahn), its nest and eggs have never been discovered in Japan.

297. Garrulus glandarius (Linné)

JAY

Japanese: Kakesu (autochthonous, but means hang-nest)

Corvus glandarius Linné, Syst. Nat., ed. 10, **1**, 1758: 106 (Sweden). (Extralimital)

Garrulus brandtii Eversmann, Add. Pallas Zoögr., fasc. 3, 1842: 8 (Altai).

Garrulus glandarius pallidifrons Kuroda, Bull. B. O. C. **47**, 1927: 149 (Uenai, Hokkaido).

Garrulus glandarius tokugawae Taka-Tsukasa, Tori, **7**, 1931: 110 (Sado Island).

Garrulus glandarius japonicus Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1848: 83 (Japan).

Garrulus glandarius hiugaensis Momiyama, Bull. B. O. C., **48**, 1927: 19 (Miyazaki Pref., Kyushu).
Garrulus glandarius namiyei Kuroda, Ibis, 1922: 102 (Tsushima).
Garrulus glandarius orii Kuroda, Bull. B. O. C., **43**, 1923: 86 (Yakushima).
Garrulus japonicus nakaokae Momiyama, Bull. B. O. C., **48**, 1927: 19 (Kochi Pref., Shikoku). (Synonym of *japonicus*)
Garrulus japonicus kakes Momiyama, Ann. Orn. Orient., **1**, 1927: 6 (Iwate Prefecture, Honshu). (Synonym of *japonicus*)
Garrulus japonicus shimoizumii Momiyama, Dob. Zas., **51**, 1939: 380 (Shimoda, Izu Pen., Honshu). (Synonym of *hiugaensis*)

The 1942 Hand-List recognizes six races of this plastic species, as above, from the main islands and their satellites. The Hokkaido race, *pallidifrons*, with its brown forehead, is a very fine split from *brandtii* of Korea, Sakhalin, and the Kuriles. I cannot discern any of the characters given in the original description, but my series of fresh Hokkaido and Korean skins shows *pallidifrons* to have a lavender-brown cast to the gray of the back which is lacking in *brandtii*. These colors fox and fade so with time that care must be taken to have age-comparable material. The birds of the southern main and satellite islands are all white- instead of brown-fronted. The main island populations show a slight cline from light in the north to darker in the south. I have seen no Tsushima or Sado Island material, but one specimen of *orii* from Yakushima in the AMNH is very dark and with less white on the secondaries than southern Kyushu specimens. The populations of Honshu, Shikoku, and northern Kyushu are inseparable. The Jays in southern Kyushu, *hiugaensis*, show darker heads, the result of wider black centers and narrower white edgings to the crown feathers. As in *Syrmaticus soemmerringii*, individuals from the southern tip of the Izu Peninsula in Honshu are indistinguishable from the birds of southern Kyushu.

The Jay is a common resident throughout most of woodland Japan, on all the main islands and major satellites except the Izu chain, from which it is inexplicably absent. It is widely distributed, from the small open woods of the plains well up into the forested mountains, occasionally to 7000 feet, though usually breeding below 5000 feet. The mountain populations move down into the lowlands in autumn, and forage in the foothills in small flocks through the winter.

Its nesting season begins in mid March in Kyushu, April in Honshu, and May in Hokkaido. The nest is placed from 10 to 30 feet up, usually in an evergreen, and the clutch has from 4 to 6 olive-brown eggs with small pale markings, measuring 28.5–30.5 x 21.5–23 mm. The incubation period is 16 to 17 days (Yamashina, 1933: 47).

The Jay shows a wide latitude in its choice of food, predominantly insects and other animal food such as eggs, nestlings, and occasional frogs in spring and summer, mainly fruits, seeds, and other vegetable matter the rest of the year. In common with other corvines, it hoards its food and distributes plants by hiding seeds.

Considered a game bird in Japan, and shot for food whenever opportunity offers, the Jay manages to hold its own against the hunters. Though noisy, active, and not overly shy, its habits do not make it easy to net in quantity, and only 50,000 to 75,000 are reported killed every year.

PARIDAE

298. Parus major Linné

GREAT TIT

Japanese: Shijukara ("forty" titmouse, alliterative from the call-note)

Parus major Linné, Syst. Nat., ed. 10, **1**, 1758: 189 (Sweden). (Extra-limital)
Parus major minor Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1848: 70, pl. 32 (Japan).
Parus major kagoshimae Taka-Tsukasa, Dob. Zas., **31**, 1919: 55 (Kagoshima Pref., Kyushu).
Parus major artatus Thayer & Bangs, Bull. M.C.Z., **52**, 1909: 140 (Hupeh, China). (Extra-limital)
Parus wladiwostokensis Kleinschmidt, Falco, **9**, 1913: 33 (Vladivostok). (Synonym of *artatus*)
Parus major quelpartensis Kuroda, Tori, **1**, 1917: 3, pl. 6 (Quelpart Id.). (Synonym of *minor*)
Parus major ogawai Momiyama, Tori, **3**, 1923: 207 (Oshima, Izu Ids.). (Synonym of *minor*)
Parus major chimae Momiyama, Dob. Zas., **35**, 1923: 410 (Hachijo, Izu Ids.). (Synonym of *minor*)
Parus major sidsiukara Momiyama, Ann. Orn. Orient., **1**, 1927: 25 (Tokyo). (Nom. nov. for *minor*)
Parus major gotoensis Kleinschmidt, Falco, **18**, 1922: 2 (Goto Ids.). (Synonym of *kagoshimae*)

Delacour and Vaurie (1950: 115–116) synonymize all the proposed races of the Great Tit from the nearby mainland with *P.m.minor*. My extensive series shows comparable fresh birds of Japan to be separable from Korean specimens by their brighter and more extensive yellow wash on the backs, and lighter edgings to the tail feathers. The populations of Korea, Ussuria, and northern China are inseparable, the differences I previously noted (1948a: 189) being caused by age-foxing, so *wladiwostokensis* becomes a synonym of *artatus*. *P.m.kagoshimae* from extreme southern Kyushu is doubtfully smaller than *minor* as claimed, but closer to *minor* than *artatus* in its yellow back, and recognizably darker on the flanks than either. I have seen no specimens from the Goto Islands, and follow the 1942 Hand-List in synonymizing *gotoensis*, but four specimens from Quelpart are referable to *minor*, as are six birds I collected on Miyakejima in the southern Izus.

This is the commonest and most widespread of the titmice in Japan, and is resident throughout the main islands. In wide forest areas it is frequently the only bird to be found, especially in the extensive pure stands of planted *Cryptomeria*. It breeds in the parks and suburbs of the cities in the plains, and in the mountain forests up to about 6000 feet in the Japan Alps. Banding results show that individuals in Honshu move but little, practically all the recoveries being taken at or near the place of banding, some of them three and four consecutive years thereafter. A pronounced migration has been noted in Hokkaido, however, the birds moving southward in September to the tip of the Tishima Peninsula, where they wait in large flocks for favorable weather to cross Tsugaru Straits to northern Honshu. A nestling banded in Ishikari, Hokkaido, 15 June 1936, was recovered in Akita Prefecture, northwest Honshu, 20 December 1936.

Its natural nesting site is in a hollow tree, rarely more than 10 or 15 feet above the ground, in which it lays its 6 to 10 eggs. It uses man-made nest boxes freely. Incubation by the female alone lasts 12 to 14 days. It is multi-brooded in Honshu, where it starts to nest in late March; the first young appear in late April, and later broods come along until late August or early September.

As it is highly insectivorous and one of the most beneficial of the forest birds, the Japanese government has spent large sums erecting bird boxes in forest areas to increase its abundance to help combat the bark-beetle epidemics. But wherever mist nets are used, many titmice are caught and none released alive, and the bird is so tame and trusting it is an easy prey for small boys with air rifles. It holds its own only because of its great fecundity; with normal protection it would soon become abundant.

299. Parus varius Temminck & Schlegel
VARIED TIT
Japanese: Yamagara (Mountain tit)

Parus varius Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1848: 71, pl. 35, (Honshu, Japan).
Sittiparus varius ijimae Kuroda, Ibis, 1922: 98 (Tsushima).
Parus varius namiyei Kuroda, Dob. Zas., **30**, 1918: 316, 322 (Niijima, Izu Ids.).
Parus owstoni Ijima, Dob. Zas., **5**, 1893: 445 (Miyakejima, Izu Ids.).

Parus varius sunsunpi Kuroda, Dob. Zas., **31**, 1919: 230, 232 (Tanegashima).
Parus varius yakushimensis Kuroda, Dob. Zas., **31**, 1919: 230, 232 (Yakushima)
Parus rubidus Blakiston, Ibis, 1862: 321 (nom. emend.).
Parus sieboldi Seebohm, Bds. Jap. Emp., 1890: 85 (nom. nov. for *varius*).
Parus varius hakodatensis Momiyama, Dob. Zas., **30**, 1918: 315 (Hakodate). (Synonym of *varius*)
Parus varius saisinensis Kuroda & Mori, Tori, **2**, 1920: 272, 279, pl. v, fig. 5 (Quelpart Id.). (Synonym of *varius*)
Sittiparus rubidus masaakii Momiyama, Amoeba, **3**, 1931: 141 (nom. nud.).
Parus rubidus masaakii Momiyama, Kagaku no Nogyo, **20**, 1940: 41 (Hachijo, Izu Ids.). (Synonym of *owstoni*)

Parus varius is a plastic, insular species with no near relatives. It ranges from the southern Kuriles to Formosa, occurs on the Asiatic mainland only on the Korean Peninsula, and is resident wherever found except in the extreme northern portions of its range. The 1942 Hand-List recognizes eleven races, six of them from present-day Japan. The nominate northern race is wide spread, from the southern Kuriles and southern Hokkaido through Honshu to northern Shikoku, Quelpart Island, and Korea. On the islands to the southward the species exhibits two separate clines, a remarkable color variation down the Izu chain, and a combined size and color cline from Kyushu down the Ryukyus to Formosa. The population of Oshima, the northernmost and largest of the Izus, is inseparable from *varius* of mainland Honshu, but south of Oshima two strongly marked races occur, *P.v.namiyei* on Toshima, Niijima, and Kozushima, and *P.v.owstoni* on Miyakejima, Mikurajima, and Hachijo. *P.v.owstoni* is the darkest of all the Varied Tits, the buff of the head and underparts being replaced by deep chestnut. *P.v.namiyei* is intermediate in color between *owstoni* and *varius*, but there is no intergrading between these insular forms, and the breaks between the easily recognizable subspecies are sharp and distinct. In southern Shikoku, Kyushu, and Tsushima is the slightly smaller and darker *P.v.ijimae*, which intergrades with nominate *varius* in central Shikoku. The populations of Tanegashima (*sunsunpi*) and Yakushima (*yakushimensis*) are also smaller birds, and each exhibits distinctive variations in body color. The buff of the head changes very little in the Ryukyu-Formosa cline, and the variations from Kyushu southward are mainly in size and in shading of the underparts, which become progressively smaller and darker respectively to the southward.

An inhabitant of the deciduous and subtropical forests, the Varied Tit is essentially a bird of the foothill woodlands. It is common throughout the main islands from southern Hokkaido through Kyushu and down the Izu chain to Hachijo, but less so than the Great Tit, and, unlike it, is seldom found in the villages or city suburbs nor in the pure stands of conifers. Small bands roam the mixed woodlands from the plains up to about 4000 feet in the highlands, frequently in company with the flocks of other titmice, nuthatches, and pigmy woodpeckers. So far as known it is resident throughout its range with the exception of the extreme northern portion. Though reported to breed on Iturup and Kunashir in the southern Kuriles, it is absent from the northern and eastern parts of Hokkaido, and occurs as a breeding bird only in the southern portions. The Hokkaido population probably migrates to northern Honshu in winter. Nagahisa Kuroda failed to find it there in January and February of 1950, and there are no Hokkaido winter records for it. In the Ishikari Plain it is seldom abundant, usually seen in singles and pairs in the spring, and in small family groups in the fall (Murata, Dob. Zas., 1901: 232).

Its call is a high-pitched, loud *ssii-ssii*, usually repeated four times, and its song a thin *tse-tse-peee*, slower than that of the Great Tit. It also has a faint but delightfully melodious, burbling little subsong it starts singing in early February, difficult to hear in the field, and best heard in the aviary.

Its breeding season starts in early April in south Kyushu, mid April in west Honshu, and early May in central Honshu. As fresh eggs have been reported in Honshu in early July, it is probably multi-brooded except in the northern parts of its range. The nest is usually built in a hollow tree, occasionally in nesting boxes and under the eaves of buildings. The eggs, 4 to 8 per clutch, measure 17.1–19.4 x 13.5–14.4, and are white with fine red-brown spots on the larger end. Matsuyama (Bot. Zool., 1934: 125) gives the incubation period as 12 to 13 days.

The "Yamagara" is very popular in Japan as a cage bird, sharing top honors with the Bush-warbler and the White-eye. It is hardy, easily kept healthy on a diet of hemp seeds with an occasionally worm or grub, always bright, cheerful, and alert, but loved mostly for its clowning antics. Special tall cages are built for it so it can exercise at will by hopping up from its perch in series of aerial backward somersaults. It can be taught all manner of tricks, one of the favorites being to pull up its food in a small basket on a string into a balcony at one side of its cage. Its teachability is made use of commercially. This is the little bird that tells fortunes at shrine festivals and street fairs. At the command of its master it hops to its perch, takes your coin from your fingers, drops it into the cash box, hops into a miniature shrine, takes out your fortune, turns it over between its toes with its beak as many times as you wish, and even tears open the wrapping for you so you receive it ready to read, for all of which it is rewarded with a single hemp seed.

300. Parus palustris hensoni Stejneger

MARSH TIT

Japanese: Henson hashibuto-gara (Henson thick-billed tit)

Parus hensoni Stejneger, Proc. U. S. Nat. Mus., **15**, 1892: 342 (Hakodate).
Parus seebohmi Stejneger, Proc. U. S. Nat. Mus., **15**, 1892: 343 (Sapporo). (Synonym)

The Hokkaido population of *P.palustris* differs from *P.p.crassirostris* of Ussuria and northern Korea by being lighter above and below and by having an average shorter tail.

This Marsh Tit is endemic to Hokkaido and the southern Kuriles, and is resident and common throughout its range. We found it the commonest of the titmice in autumn in the Mt. Daisetsu area, and in winter in the Noboribetsu-Shiroi and the Abashiri regions. In winter it frequently flocks with the Long-tailed Tits in the shrubby sparse woods of the plainslands. In summer it lives from the foothills up to 3500 feet, just below the alpine zone on Mt. Daisetsu. It can be told in the field from the less common (in Hokkaido) but very similar *P.atricapillus*, most easily by its note which, though of the same syllables, is shorter, coarser, and not as finished. Likewise it utters the single groundnote more frequently. The nesting habits of this bird have never been studied in Hokkaido, nor its nest and eggs collected. Presumably they do not differ greatly if at all from those of the mainland races.

301. Parus atricapillus restrictus Hellmayr

WILLOW TIT

Japanese: Ko-gara (little tit)

Parus borealis restrictus Hellmayr, Orn. Jahrb., 1900: 215 (Japan).
Parus palustris japonicus Seebohm, Ibis, 1879: 32 (Japan). (partim)
Parus atricapillus sachalinensis Lönnberg, Jour. Col. Sci. Imp. Univ. Tokyo, **23**, 1908: 20 (Sakhalin). (Extra-limital)
Poecila kamtschatkensis Bonaparte, Consp. Av., **1**, 1850: 230 (Kamchatka). (Extra-limital)

The occurrence in Hokkaido and accidentally in Honshu of the slightly paler Sakhalin subspecies, *P.a.sachalinensis* as given by the 1912 Hand-List is questionable. The races are a fine split, *sachalinensis* being an intergrade between *restrictus* which is quite dark and cream-colored below, and *kamtschatkensis* which is very light. The species is not highly migratory, and the specimens in question could well be extremes of the resident race.

The Willow Tit is resident in Hokkaido and Honshu, rather more plentiful on Honshu, but not overly common on either island. In Honshu it is a bird of the mountain forests, ranging from 2500 to about 6500 feet at Mt. Fuji and the Japan Alps, retreating to the lower foothills in winter. In Hokkaido it lives in the wooded plains and low mountains, where it is not as abundant as *P.palustris* with which it is occasionally found in company. There are very few data on its breeding and other habits in Japan. Kobayashi and Ishizawa (1938: pl. 13) collected its nest and eggs on Mt. Fuji 10 June.

302. Parus ater Linné

COAL TIT

Japanese: Hi-gara (sun tit)

Parus ater Linné, Syst. Nat., ed. 10, **1**, 1758: 190 (Sweden). (Extra-limital)
Parus ater insularis Hellmayr, Orn. Jahrb., **13**, 1902: 36 (Suruga, Honshu).
Periparus ater teraokai Kuroda, Ibis, 1922: 100 (Tsushima).
Parus ater amurensis Buturlin, Ornith. Monats., 1907: 80 (Amur and Ussuria). (Synonym of *ater*)
Parus ater takatsukasae Bergman, Arkiv. för Zool., **23**B, 1931: 3 (Kamiikotan, Iturup, Kuriles). (Synonym of *insularis*)
Periparus ater takahashii Momiyama, Ann. Orn. Orient., **1**, 1927: 31 (Quelpart Id.). (Synonym of *insularis*)

P.a.insularis of Sakhalin and Japan differs from nominate *P.a.ater* of Europe and Siberia only in being slightly darker below; a cream tint is observable in the white spots on the wing coverts of some but not all specimens. Korean and Ussurian specimens (cf. Austin 1948a: 190) are intermediate between *ater*, *insularis*, and the slightly lighter-bellied, longer-crested *P.a.pekinensis* of China; *amurensis* is a very fine split, nearest to *ater*, and doubtfully worth recognizing. I have seen no material of *teraoki* from Tsushima.

The Coal Tit is a fairly common resident throughout the main islands, breeding from Hokkaido to Yakushima, though its nesting in Shikoku and Kyushu has not yet been verified. It occurs at sea level in the wooded plainslands in the northern part of its range, but from central Honshu southward it does not come below 3000 feet except in winter. It is regarded as resident on the Ishikari Plain in Hokkaido, but its abundance in spring, summer, and fall, and comparative scarcity in winter suggest that part of the population at least migrates southward.

It shows a preference for evergreen forests, and in mixed woodlands is never as common as the other titmice. In the Kitami area of

Hokkaido, Kobayashi (Tori, 1931: 58) found it one of the commonest birds in the breeding season, though elsewhere there it is not as abundant as the Marsh Tit. It starts its spring song in late March while still at low altitudes, and continues it through September, a clear, weak *tse-tse-peen, tse-tse-peen*, usually given from the top of an evergreen. It nests in hollow trees, laying a large clutch of 7 to 11, rarely 13 white eggs with reddish spots, measuring 15–17 x 11–13 mm. The incubation period is reported as 12 days.

303. Aegithalos caudatus (Linné)
LONG-TAILED TIT
Japanese: Enaga (long handle)

Parus caudatus Linné, Syst. Nat., ed. 10, **1**, 1758: 190 (Sweden). (Extra-limital)

Aegithalus caudatus japonica Prazák, J. f. O., 1897: 291 (northern Japan).

Parus (Megisturus) trivirgatus Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1848: 71, pl. 39 (Japan).

Aegithalos caudatus kiusiuensis Kuroda, Auk, **40**, 1923: 313 (northern Kyushu).

Acredula trivirgata magna Clark, Proc. U. S. Nat. Mus., **32**, 1907: 475 (Seoul, Korea). (Extra-limital)

Aegithalos caudata enaga Momiyama, Ann. Orn. Orient., **1**, 1927: 33 (Tokyo). (Synonym of *trivirgatus*)

Aegithalos caudata tarihoe Momiyama, Ann. Orn. Orient., **1**, 1927: 34 (Quelpart Id.). (Synonym of *trivirgatus*)

The white-headed *A.c.japonicus* of Hokkaido is distinguishable in series from nominate *caudatus* of Europe, Siberia, and northern Koréa by its smaller bill and paler vinaceous wash on the flanks. The striped-headed populations which extend southward from northern Honshu and central Korea are separable into three subspecies. *A.c.magna* of southern Korea is the largest of the three and has a distinct chest spot. It intergrades with *caudatus* in northern Korea. The dividing line between *japonicus* and *trivirgatus* of Honshu at Tsugaru Straits is sharp and there is no intergradation. *A.c.trivirgatus* is slightly smaller than *magnus*, and has the chest spot less well defined. *A.c.kiusiuensis* of Kyushu and Shikoku is smaller and darker than *trivirgatus*, and lacks the chest spot entirely. I have seen no material from Quelpart, and follow the 1942 Hand-List in synonymizing *tarihoe* with *trivirgatus*.

The Long-tailed Tit is a common resident throughout Japan from the lowlands commonly up to about 3000 feet elevation, less commonly to 5000. It is very tame and confiding, and can be approached to within a few feet. It is usually encountered in small parties, frequently with other species of tits in the non-breeding season, working vagrantly through the lower slopes of the mountain woods, calling each other with their distinctive *jirr jirr* . . . It moves more rapidly than the other titmice, and usually leads the mixed flocks.

Its peculiar nest has often been described, a beautiful bag of mosses and lichens woven with spider webs, lined with feathers, and with an entrance at one side. Two to three weeks are spent building it, and it is placed from 3 to as high as 60 feet from the ground. The species lays 7 to 12 eggs, white with small red spots, measuring 14–15 x 11–12 mm. Incubation by the female alone requires 12 to 13 days, and frequently curves her tail noticeably in the cramped quarters. The nesting season starts in mid March in Honshu and ends in June. At Abashiri, Hokkaido, Nagahisa Kuroda found an almost completed nest, the birds still building it, on 26 April 1950. Kobayashi (Tori, 1931: 58) collected eggs in the Kitami area from 20 May to 18 June.

304. Remiz pendulinus consobrinus (Swinhoe)

PENDULINE TIT

Japanese: Swinho-gara (Swinhoe's tit)

Aegithalus consobrinus Swinhoe, Proc. Zool. Soc. London, 1870: 133 (Yangtse-kiang, China).

R[emiz] c[onsobrinus] japonicus Clark, Proc. U. S. Nat. Mus., **32**, 1907: 475 (Japan). (Synonym)

This continental species is only of casual occurrence in Japan. Ringer took four specimens in Nagasaki (Seebohm, 1890: 88), two of which, cotypes of *R.c.japonicus*, are in the USNM and are dated 12 and 25 February 1877 respectively. The other two are presumably in the British Museum with the rest of the Seebohm collection. The species has been taken twice in Honshu, an undated specimen from Chiba in the former Kuroda collection, and another taken in Sunamachi, Tokyo, 3 January 1899, and now in the Yamashina collection.

305. Panurus biarmicus russicus (Brehm)

BEARDED TITMOUSE

Japanese: Higegara (bearded tit)

Mystacinus Russicus Brehm, Handb. Nat. Vög. Deut., 1831: 472 (Russia).

A single specimen of this European and central Asiatic titmouse was taken in a mist net in Mogamigun, Yamagata Prefecture, 22 October

1920, and identified as of the eastern race by Uchida (Tori, 1921: 7). Though it is the only record for Japan, the bird was probably not an escape from captivity.

SITTIDAE

306. Sitta europaea Linné

EURASIAN NUTHATCH

Japanese: Gojugara (autochthonous and of unclear etymology, but means "fifty tit")

Sitta europaea Linné, Syst. Nat., ed. 10, **1**, 1758: 115 (Sweden). (Extra-limital,
Sitta baicalensis Taczanowski, Bull. Soc. Zool. France, 1882: 386 (Irkutsk) Daúria).
Sitta amurensis Swinhoe, Proc. Zool. Soc. London, 1871: 350 (Amur). (Extra-limital)
Sitta europaea hondoensis Buturlin, Trav. Soc. Nat. Petrograd, **44**, 1916: 171 (Honshu).
Sitta roseilia Bonaparte, Consp. Av., **1**, 1850: 227 (Kyushu).
Sitta amurensis clara Stejneger, Proc. U. S. Nat. Mus. **9**, 1886: 390, 392 (Hokkaido). (Synonym of *baicalensis*)
Sitta europaea kumagaii Momiyama, Ann. Orn. Orient., **1**, 1928: 274, footnote (Iwate Pref., Honshu). (Synonym of *hondoensis*)
Sitta europaea harterti Momiyama, Kaidori, **2**, 1931: 4, 23, fig. K and color plate (eastern Kyushu). (Synonym of *roseilia*)
Sitta europaea nakaokae Momiyama, Kaidori, **2**, 1931: 4, 23, fig. L (Shikoku). (Synonym of *roseilia*)

The Eurasian Nuthatch cline in the Japanese Islands runs from the white-bellied *baicalensis* in Hokkaido to the dark chestnut-bellied *roseilia* in Kyushu, Shikoku, and southwestern Honshu. For the intermediate population of northern and central Honshu, which is inseparable from the nuthatches of central and south Korea, I retain the name *hondoensis* provisionally, though *amurensis* has priority over it, and it is doubtful that both races are worth recognizing. The nuthatches of Amuria and northern Korea are intermediate between *hondoensis* and *baicalensis*, nearer the former, but a very fine split. They intergrade completely, and the variations in each series so overlap that no sharp boundaries can be drawn between them. The color of the underparts on which the races are based varies with altitude as well as with latitude. Three of the 20 Hokkaido skins I have examined show traces of rust color on the belly and flanks; birds taken above 5000 feet in the Japan Alps, and some at lower levels in northern Honshu, are sufficiently white-bellied to be referable to the northern race.

The Eurasian Nuthatch is a not uncommon forest resident throughout Japan. In Hokkaido it lives in the mixed woods from sea level up to about 3000 feet on Mt. Daisetsu. In northern Honshu it is seldom found below 1000 feet; in the Alps of central Honshu its usual range is between 2500 and 7000 feet in the higher mountain and subalpine zones. Kiyosu (Yacho, 1949: 136) found it in Shikoku in June between 4500 and 5000 feet on Mt. Tsurugi. Nothing is known of its movements, but it seems to be resident wherever found, and shows no seasonal migration either altitudinally or latitudinally.

In the non-breeding season it frequently accompanies the flocks of titmice moving through the forests. Its voice is like that of the European race, a trill and a whistle like the anxious peep of a lost baby chick, and it lacks the peculiar nasal "peent" so distinctive of the American Nuthatches. In both Honshu and Hokkaido it starts its spring song in April and breeds in May and June. It nests in hollow trees, usually appropriating old woodpecker holes in which it places leaves and bits of bark, and has a curious and well-known habit of reducing the size of the entrance by pasting it with mud. It lays 5 to 8 white eggs with brown markings. Honshu sets average 19–20 x 14–15 mm.

CERTHIIDAE

307. Certhia familiaris Linné

TREE-CREEPER

Japanese: Kibashiri (tree runner)

Certhia familiaris Linné, Syst. Nat., ed. 10, **1**, 1758: 118 (Sweden). (Extralimital)

Certhia familiaris orientalis Domaniewski, Arch. Nauk. Biol. Warsaw, **1** (10), 1922: 5 (Sidemi, Ussuria).

Certhia familiaris japonica Hartert, Nov. Zool., 1897: 138 (Honshu).

Certhia familiaris ernsti Kuroda, Bull. B. O. C., **45**, 1924: 17 (Uenai, Hokkaido). (Synonym of *orientalis*)

Certhia familiaris kurilensis Momiyama, Ann. Orn. Orien., **1**, 1927: 21 (Kunashir, Kuriles). (Synonym of *orientalis*)

Certhia familiaris kawamurai Momiyama, Ann. Orn. Orien., **1**, 1927: 22 (Seoul, Korea). (Synonym of *japonica*)

C.f.orientalis ranges from the Kuriles and Hokkaido (and probably south Sakhalin from whence I have seen no material) to Ussuria and northern Korea. I have seen only two Kurile skins, and these are indistinguishable from a series of 18 Hokkaido specimens, two from Ussuria, and three from northern Korea. This group of birds differs from nominate *familiaris* of Sweden and northern Europe in being grayer, with more sharply-defined white spots on the back, and with no trace of a reddish cast. The breeding form of Honshu, *C.f.japonica*, is slightly smaller than *familiaris* and *orientalis*, slightly redder than the former, and markedly redder than the latter. Four specimens from southern Korea (Kyonggi Do 16 Oct., 5 Nov. 1930, Kyongsang Namdo 15 Nov. 1884 (2)) are identical with a series of eight Honshu skins. Momiyama's *kawamurai* (type Seoul, Kyonggi Do, 16 Oct. 1925) is probably a synonym of *japonica*, not of *familiaris* (1912 Hand-List: 33; Austin 1948a: 198) or of *orientalis* (Steinbacher, 1933: 156), though typical *orientalis* reaches Kyonggi Do in winter as shown by an MCZ specimen taken in Songdo 6 Feb. 1930. The breeding range of *japonica* is thus apparently Honshu, Shikoku, and Korea south of about lat. 38°, though the species has not yet been demonstrated to nest in south Korea or Shikoku.

The Tree-Creeper is not a very common bird in Japan. In Honshu it is resident in the mountain forests, usually between 3500 and 7000 feet though Jahn (1942: 114) found it at 2400 feet in the Kansai area. I collected it at 3000 feet on Mt. Daisetsu in Hokkaido in September, and it is found in the lowland forests of Hokkaido in winter. It has been taken in the highlands of Shikoku, but never in Kyushu or western Honshu. From central Honshu northward it breeds from May to July, building a nest of fine roots, grasses, moss, and feathers in tree hollows, or in crevices in rocks, and has been known to nest in a crack in a house wall. It lays 5 to 7, rarely 9 eggs, whitish with red-brown markings heaviest at the larger end, and which measure about 16.5 x 12 mm.

PYCNONOTIDAE

308. Ixos amaurotis (Temminck)

BROWN-EARED BULBUL

Japanese: Hiyodori (autochthonous)

Turdus amaurotis Temminck, Pl. Col., **2**, 1830, pl. 497 (Japan).

Hypsipetes amaurotis hensoni Stejneger, Proc. U. S. Nat. Mus., **15**, 1893: 347 (Hakodate).

Microscelis amaurotis matchie Momiyama, Dob. Zas., **35**, 1923: 401 (Hachijo, Izu Ids.). (Error for *matchiae*, herewith amended)

This plastic species is known to breed only on the chain of islands off eastern Asia from Hokkaido south to the Bonins and Volcanos, the Ryukyus, Formosa, and the Philippines. It shows the usual cline from larger and lighter in the north to smaller and darker (generally browner in this case) in the south. The most widespread race is nominate *amaurotis* which breeds on Honshu, Tsushima, Quelpart, Kyushu, perhaps Shikoku (no breeding evidence), and down the Izu chain to Mikurajima. The population of Hokkaido, *hensoni*, which winters to Korea, is slightly paler, particularly on the flanks as Stejneger pointed out in his original description. Breeding birds from Hachijo, *matchiae,* are somewhat darker and browner than *amaurotis* but without significant size difference, and are inseparable from the populations of Tanegashima and Yakushima.

The Brown-eared Bulbul is a common and conspicuous bird of the deciduous and mixed forests from southern Hokkaido southward through all the main and satellite islands. It tends to be resident in the southern part of its range, but is migratory elsewhere, both latitudinally and altitudinally. A daytime migrant, the moving flocks, sometimes of hundreds, fly a few hundred feet up over the Honshu plains in spring and autumn. Flights have been observed across the Straits of Shimonoseki between Kyushu and Honshu, and across Soya Straits between Kyushu and Shikoku, often followed by Asiatic Sparrow Hawks, which the bulbuls try to elude by flying close to the water (Kawaguchi, Yacho, 1934: 500). Migrating flocks of thousands are reported in southern Kyushu flying between Kagoshima Prefecture and Tanegashima. Nevertheless the species winters commonly in the plains and lower foothills throughout Honshu, and is one of the most familiar winter birds of the parks and gardens of Tokyo and other cities, where its variety of whistles and calls — it has no well-defined song as such — calls attention to its presence as the small flocks forage through the trees and shrubbery searching for remaining berries and fruits.

In Hokkaido it is limited to the southern peninsula, its northern limit being the Ishikari plain, where it is not uncommon in spring, summer, and early fall. A few birds winter in the neighborhood of Sapporo, but most of the population moves southward, most of them apparently across the Japan Sea to Korea, where the Hokkaido race is a common winter visitor, but not known to breed. Others cross Tsugaru Straits to winter in northern Honshu. How far south these individuals move is unknown, for specimens definitely referable to the Hokkaido race have not been taken south of Aomori.

In Honshu the species breeds in the woodlands from sea level up to about 3500 feet, and has been observed in the Japan Alps as high as 7000 feet. It moves down into the lower foothills and the plains in winter and remains in the city suburbs until late April and mid May, feeding on the nectar of camellias, cherry blossoms, and other spring-blooming flowers. It then moves to the woodlands to breed. It builds a deep cup-shaped nest of leaves, grasses, bark, and moss lined with pine needles, rootlets, and the slender leaves of the sasa bamboo, usually from 5 to 15 feet up on the lower branches of trees or bushes in dense thickets. The nest is cleverly concealed, and hard to find. The clutch contains 3 to 5, usually 4 eggs, of a ruddy, grayish white marked with red, black, and purplish spots, measuring 26–32 x 20–22 mm. The nesting season extends from April through July.

Until the recent post-war changes in the game laws, the bulbul was always included among the game birds. It is seldom netted because it is not overly abundant in the netting areas, but it is shot very frequently, both by hunters with shotguns in the woods, and by small boys with air-rifles in the suburbs. Skilled hunters lure it by imitating its call, sometimes with a small metal whistle. The species has withstood this persecution remarkably well, which suggests it may be multi-brooded in parts of its range. Away from human dwellings it is wild, shy, and hard to approach, but in the cities it becomes fairly unafraid of man. Its diet consists mainly of berries and fruit in fall and winter, buds and nectar in spring. The young are fed insects and some fruit.

CINCLIDAE

309. Cinclus pallasii hondoensis Momiyama

PALLAS'S DIPPER

Japanese: Kawagarasu (river crow)

Cinclus pallasii hondoensis Momiyama, Ann. Orn. Orien. **1**, 1927: 52 (central Honshu).

Cinclus pallasii itooi Momiyama, Ann. Orn. Orien., **1**, 1927: 54 (Shikoku). (Synonym)

Cinclus pallasii hiugaensis Momiyama, Ann. Orn. Orien., **1**, 1927: 55 (Kyushu). (Synonym)

The nominate race of Pallas's Dipper, *C.p.pallasii*, spreads over much of eastern Siberia from north Manchuria through the Amur and Ussuri regions to Sakhalin and Kamchatka. *C.p.hondoensis* is a poorly marked but slightly pale southeastern subspecies, breeding in the Kuriles, south through the Japanese islands, and on the Korean Peninsula. Other forms have been described from China and Formosa.

The dipper is a bird of the clear, fast, rushing mountain streams, and is not uncommon in its preferred habitat throughout Japan. In Honshu it occurs usually from about 1500 feet elevation to 6000 feet, sometimes lower down in the northern part of its range. It is never seen in flocks, but usually singly, in pairs, or in small family groups after the young have hatched, flitting over and through the white waters, uttering its single, sharp *djiii* when flying up and down stream and when alarmed. This call note is so penetrating it can be heard plainly above the roar of the waters that drowns out all other sounds. Each pair seems to have its own section of river which it works. When the streams flatten out and slow down as the mountains give way to the plains, the dippers disappear.

It is a very early nester, and multi-brooded. In Kyushu young have been found in the nest in January. It starts breeding in Honshu in February, and the first young are found in late March. A second brood appears in May. It nests in characteristic dipper fashion, building a big, bulky, dome-shaped structure of moss hidden under rocks along the stream banks. It lays 4 to 5 eggs, white with a few small brownish spots, and measuring 25–27 x 18–20 mm.

It feeds mainly on aquatic insects which it pursues walking under water as easily and casually as on land. It also eats small amphibians which it kills by striking them on stones, and small minnows. It is very much of a nuisance at fish hatcheries in the mountains where trout and salmon are reared, and if unchecked will consume alarming quantities of small fry. Most hatcheries in Japan protect their rearing pools with mist-nets, which must be kept constantly in operation, as there seems to be a constant movement of dippers through the country, and they are never extirpated completely from one locality.

TROGLODYTIDAE

310. Troglodytes troglodytes (Linné)

WREN

Japanese: Misosazai (autochthonous)

Motacilla Troglodytes Linné, Syst. Nat., ed. 10, **1**, 1758: 188 (Sweden). (Extra-limital)

Troglodytes fumigatus Temminck, Man. d'Orn., **3**, 1835: 161 (Japan).

Troglodytes troglodytes mosukei Momiyama, Dob. Zas., **35**, 1923: 402 (Hachijo).

Troglodytes troglodytes utanoi Kuroda, Ibis, 1922: 96 (Tsushima).

Troglodytes troglodytes ogawae Hartert, Vög. pal. Faun., **1**, 1910: 784 (Yakushima).

Olbiorchilus fumigatus peninsulae Clark, Proc. U. S. Nat. Mus., **32**, 1907: 474 (Fusan, Korea). (Extra-limital)

Troglodytes troglodytes isizawai Momiyama, Ann. Orn. Orien., **1**, 1927: 46 (Sapporo, Hokkaido). (Synonym of *fumigatus*)

Troglodytes troglodytes ikomai Momiyama, Ann. Orn. Orien., **1**, 1927: 48 (Tottori, Honshu). (Synonym of *fumigatus*)

Troglodytes troglodytes quelpartis Kuroda & Mori, Dob. Zas., **37**, 1925: 311, 313 (Quelpart Id.). (Synonym of *peninsulae*)

Troglodytes troglodytes kawagutii Momiyama, Ann. Orn. Orien., **1**, 1927: 49 (southern Kyushu). (Synonym of *utanoi*)

The color cline shown in Japan by this wide-ranging, circumpolar species runs as usual from light in the north to darker in the south. The most widespread race is *fumigatus*, breeding from the southern Kuriles south through Hokkaido and Honshu to Shikoku. *T.t.utanoi* of Kyushu is darker with a sooty cast to the brown. *T.t.mosukai* of the Izu Islands is a redder brown, with smaller and fewer white markings on the head and neck. Six skins of *ogawae* in the AMNH from Tanegashima and Yakushima are similar to *mosukei*, but are a deeper red brown, with more white markings on the neck. Four Quelpart specimens in the MCZ are referable to *peninsulae* of Korea, which is closest to *fumigatus* in color but recognizable by the more extensive and brighter white centers of the feathers on the sides of the body, neck, and head.

The Wren is a not uncommon resident on all the Japanese islands, breeding in the highlands in summer, and migrating altitudinally only, coming down the slopes to find more element surroundings in winter. Its summer habitat is the forest floor in thick, damp woods, particularly along gorges and mountain creeks, where it works through the undergrowth from stone to stone and stump to stump, in and around and under fallen logs and exposed roots. In Hokkaido it ranges in summer from 1000 feet to about 4500 feet, just below the alpine zone at Mt. Daisetsu, and comes down to the plains and seacoast in winter, just as it does in Korea. In the Japan Alps in central Honshu its summer range is from 3000 to 7000 feet, and it sometimes goes even higher into the *Pinus pumila* zone after the breeding season. It winters from 1000 to 4000 feet, seldom coming below the higher foothills, and visits the country villages at this elevation, flitting around the farmyards and investigating the eaves of the thatched cottages.

On warm winter days it bursts into short snatches of its loud and complicated song, which increase in frequency and length as spring advances. By March it starts moving upward into its breeding grounds. Eggs have been found 14 March in Honshu, but it nests more commonly in April, and the first young usually leave the nest in late April or early May. A pair I found just completing a nest in an undercut bank along a mountain trail at 2000 feet altitude on Hachijo 10 May 1947 were probably starting their second nesting.

The Wren's nest is a large, dome-shaped structure of moss with the entrance near the top, built on the ground, usually under wet roots or near running water. The eggs number 4 to 6, are white with small light brown spots at the larger end, and measure 16–19 x 12.5–14 mm.

TURDIDAE

311. Zoothera dauma aurea (Holandre)

TIGER THRUSH

Japanese: Toratsugumi (tiger thrush)

Turdus aureus Holandre, Faune dep. Moselle, in Ann. Mos., 1825: 60 (Metz).

The largest and most striking of the thrushes in Japan, this species has become rather rare during the last few decades. Though protected under the game laws, as were all the thrushes that breed in Japan, it owes its scarcity to the mist-netters. The netting season always opened in early October to coincide with the arrival of the first migrant thrushes, which were legal game. Unfortunately very few of the resident species had departed by this time, and many were caught during the early part of the season. The netters were never known to release any of the birds they caught despite the law, for it was not enforced rigidly on the netting grounds, and those protected species that were not legally marketable could always be eaten at home. The Tiger Thrush was always a special prize because of its size, almost twice that of the other species in body weight, which is what counts for eating. Now that the practice of mist-netting has been curbed, it is hoped that all the thrushes, and especially the rare Tiger Thrush, will increase once more to some approximation of their former numbers.

The Tiger Thrush breeds from central Hokkaido south to the highlands of central Honshu in the forests from 1000 to 4500 feet elevation. An inhabitant of the dense mixed forests, it is very shy and hard to observe, but its presence in spring is revealed by its song, a melodic, melancholy piping, characteristically of two ascending whistles, a higher *hyeee* . . . followed by a lower *jeweee* . . . , which it sings at dawn and dusk, and occasionally at midday in cloudy, rainy weather. It also has a throaty chuckle or ground note which cannot be heard at any distance. The song period starts at Mt. Fuji in early March and lasts until late July.

The species migrates southward to the Philippines, Indochina, Siam, and the Sunda Islands, but many individuals used to remain in Shikoku, Kyushu, and along the warm south coast of Honshu through the winter, where the gun hunters took their toll. It lives on or near the ground in the dense undergrowth of *Sasa*, where it walks rather than hopping like other thrushes, and feeds on insects, worms, fruit, and miscellaneous vegetable matter. The nest is placed in a forked branch or crotch near the trunk of a tree, from 5 to 15 feet above the ground. It is a large, bulky affair, measuring 17 to 23 cm. in diameter, 7 to 9 cm. in depth, woven of twigs, covered with moss on the outside, and lined with pine needles and rootlets. The species lays 3 to 5 eggs, varying from pale reddish brown to pale bluish or olive with light mottlings of brown, and measuring 30–34.2 x 21–24.5 mm. Eggs are laid in late April, and the young appear from early May to early August.

312. Zoothera sibirica davisoni (Hume)
SIBERIAN GROUND THRUSH
Japanese: Mamijiro (white eye-brow)

Turdulus Davisoni Hume, Stray Feathers, **5**, 1877: 63 (Mooleyit).

The Japanese race is separable from nominate *sibiricus* of continental east Asia by its darker color, particularly of the upper parts, which are almost black in adults instead of slaty gray, by having less white on the belly, and averaging slightly larger.

This species is a rare summer resident from central Honshu northward, and is not known to breed south or west of Jahn's line. It seems to live at higher altitudes than the other thrushes, from 2500 to 8000 feet in the Japan Alps and at Fuji, and nests most commonly at around 5000 feet. It is much less numerous than any of the other breeding thrushes in Honshu, and has not been found by any recent investigators in Hokkaido. In common with other summer resident thrushes, each year's natural increase was wiped out by the mist netters before the birds left in the fall.

The Siberian Ground Thrush reaches central Honshu in late April or early May, breeds through July, and departs in September, a few remaining until mid October. It migrates in winter to southeast Asia. It lives and feeds on or near the ground, and is less active than the Gray Thrush. It keeps its comparatively heavy body parallel to the ground when it hops. Its voice is pleasant, but the song is simple and short, uttered mostly at dawn and dusk in a uniform series of whistled strophes which Yamashina (1941: 211) writes *kyoro-tsu*. The nest is built of small twigs, tendrils, and bark, lined with moss, leaves, and rootlets. Some mud is used in its construction. It is placed usually in shrubby undergrowth, rarely more than 15 feet from the ground, and usually well hidden among creeping vines. The clutch contains 3 to 4 pale blue eggs with red-brown spots and larger irregular dark markings sparsely distributed. The eggs measure 26.8–31 x 19.5–22 mm.

313. Turdus cardis cardis Temminck
GRAY THRUSH
Japanese: Kuro tsugumi (Black thrush)

Turdus cardis Temminck, Pl. Col., livr. 87, 1831, pl. 518 (Japan).

The mainland form, *T.c.lateus*, which breeds in Hupeh and Anhwei in central China, is larger and darker than the Japanese race. The two subspecies are widely separated in their breeding ranges, and do not intergrade in the slightest, but there is no question of their conspecificity.

The Gray Thrush is a not uncommon summer resident in the mixed forests of Honshu from Jahn's line northward. In Honshu it inhabits the lower mountains from about 1000 to 4500 feet, and is most abundant between 2500 and 3000 feet. It comes lower down as it goes northward, and in Hokkaido breeds from the lowlands at sea level near Hakodate up to about 2000 feet on Mt. Daisetsu. It arrives in central Honshu in early April, in northern Honshu and Hokkaido in late April (Nagahisa Kuroda found a male singing at Abashiri 24 April). Elsewhere in Japan it occurs only as a migrant. A few occasionally winter in southern Japan, but most of the population migrates to the mainland and winters in south China. It leaves Hokkaido from mid September to mid October. It disappears from the higher Japan Alps in September, but may remain at lower altitudes until late October or early November before moving on.

It lives in the deciduous forests and prefers areas of sparse undergrowth where it can feed on the ground, turning over fallen leaves on the forest floor in search of insects. Its nest is built on a branch from 3 to 15 feet above the ground, and is a mud-plastered affair of twigs, grasses, and vines, with much moss on the outside, and lined with hair, rootlets, and pine needles. The eggs number 3 to 5 and are quite variable in color — from pale green-blue to a gray-brown with variable vague markings — and in size. They are rather larger than those of the Red-bellied Thrush, 24–30.5 x 18–22 mm. Egg dates in Honshu range from 27 May to 29 June, and as newly fledged young have been found as late as 25 August, more than one brood may be raised.

The Gray Thrush is a fine singer, one of the most musically melodious of all the Japanese birds. It sings in the early morning from a high branch a series of pleasing, typically turdine phrases which vary individually, the strophes both ascending and descending. Its warning note is a hollow *chuck*. Despite its abilities as a songster it is seldom kept in captivity, though late departees were netted frequently. It is protected under the game laws, but the young are difficult to tell from some of the migrant species, and Lumsden (*in lit.*) noted it is still shot commonly by the hunters in western Honshu.

314. Turdus musicus Linné

REDWING

Japanese: Wakiaka tsugumi (red-flanked thrush)

Turdus musicus Linné, Syst. Nat., ed. 10, **1**, 1758: 169 (Sweden).

The only eastern Asiatic record for this European species is an adult female taken at Hoda, Chiba Prefecture, in the autumn of 1933. Formerly in the Momiyama collection, it is now in the Yamashina Museum.

315. Turdus hortulorum Sclater

GRAY-BACKED THRUSH

Japanese: Kara akahara (Korean red-belly)

Turdus hortulorum Sclater, Ibis, 1863: 196 (Amoy, China).

This continental species is a not uncommon transient in Korea. The only records for Japan are a specimen reported by Koyama (Dob. Zas., 1931: 697) taken in Nagano Prefecture, Honshu by mist netters, date unspecified, and two specimens in the Yamashina Museum from Ishikawa Prefecture, one of them taken in 1890, the other a female without data from the former Tokyo University collection.

316. Turdus pallidus Gmelin

PALE THRUSH

Japanese: Shirohara (white-belly)

Turdus pallidus Gmelin, Syst. Nat., **1**, pt. 2, 1789: 815 (Lake Baikal).

The Pale Thrush is a transient throughout Japan and a winter resident from south-central Honshu southward. It breeds in northeastern Siberia from the Amur and Ussuri regions northward, and migrates to south China and rarely to Indochina and Assam. It is still fairly common in Japan but no longer as plentiful as it once was, the annual toll of the mist-netters having reduced the population markedly. It was probably never as abundant as the Dusky Thrush, which now outnumbers it two or three to one. It occurs usually in small scattered flocks, is more a ground than a tree feeder, and found more in the open than in the woodlands. It occasionally comes into the gardens and parks of the suburban areas, but is rather shy and wary, and hard to approach. The white tips of the outer tail feathers are a good field mark to differentiate it from the other migrant thrushes.

The main flight to Japan crosses the Japan Sea and lands at the Noto Peninsula in Ishikawa Prefecture and along the Toyama and Niigata coasts from mid October to early November, early arrivals sometimes appearing in late September. From there the birds spread southward across the highlands of Nagano and Gifu prefectures to the Kwanto and Kansai plains where a few winter, but most proceed on southward. Another flight comes south through Hokkaido and Aomori, but the species is seldom plentiful on this flyway. The spring flight is never as pronounced as the autumn migration. Wintering birds seem to leave from mid April to early May, and it has been collected in Hokkaido in June, though it is not known to breed there.

317. Turdus obscurus Gmelin
WHITE-BROWED THRUSH
Japanese: Mamichajinai (autochthonous, but means brown-eyebrowed bird)

Turdus obscurus Gmelin, Syst. Nat., **1**, pt. 2, 1789: 816 (Lake Baikal).

The White-browed Thrush is a fairly common transient, though not as plentiful as either the Dusky Thrush or the Pale Thrush with which it occurs on migration. In song, habits, and habitat it is very much like *Turdus chrysolaus*, which it also resembles in general appearance, but the white eyebrow is diagnostic in the field. It breeds in small numbers in the Mt. Fuji area, which was suspected for some time but not proved until 1930 when its nest and eggs were discovered by Takada and Matsuyama (Matsuyama, Chojo Iho, 1931: 418–427) at about 4000 feet elevation near Subashiri. The nest was on a branch eight feet above the ground in a small pine tree, and both the nest and the four eggs it contained resembled closely those of *Turdus sibiricus*. The breeding population is very small, and whether or not it nests in Japan regularly is not known. It is believed also to breed in Hokkaido, where it has been collected in June and August in the alpine zone of Mt. Daisetsu, but where its nest, eggs, or young have not yet been found.

The main flight of transients comes across the Japan Sea with the other thrushes and reaches the Ishikawa, Toyama, Niigata shores in early October, spreads down through the highlands to the south coast, and then goes on southward. A few specimens have been taken in Japan in mid winter, but these are probably stragglers, for the main flight winters in the Philippines and southeast Asia.

318. Turdus chrysolaus Temminck
RED-BELLIED THRUSH
Japanese: Akahara (red-belly)

Turdus chrysolaus Temminck, Pl. Col., livr. 87, 1831, pl. 537 (Japan).
Turdus chrysolaus orii Yamashina, Tori, **6**, 1929: 74 (Paramushir, Kurile Ids.).
Turdus jouyi Stejneger, Proc. U. S. Nat. Mus., **10**, 1887: 4 (Honshu). (Synonym of *chrysolaus*)

T. c. orii is a slightly larger and darker race breeding in the central and northern Kuriles. It has been taken in winter in Honshu, and as far south as Ishigaki in the Ryukyus.

The Japanese "Red-belly" is a fairly common summer resident from Jahn's Tsuruga-Nagoya line in central Honshu northward through the highlands of Honshu and Hokkaido to Sakhalin. It is the commonest of the thrushes breeding in Japan. In summer it lives and breeds in the open forests, usually in mixed woodlands with some shrubby growth. In winter it prefers denser surroundings and stays largely on the ground in heavy thickets or bamboo groves. With the approach of spring it is seen more often in the trees, from the tops of which it sings its spring song, a much simpler and less varied melody than that of *Turdus cardis*, but just as cheerful and pleasing. Yamashina (1941: 238) writes it as *Kyoron, kyoron, tsu* . . . in constant repetition. It reminds me of the song of the American Robin, but with a longer final note.

In Hokkaido it breeds from sea level up to the tree line at Mt. Daisetsu, about 4000 feet. In the Japan Alps it is found during the breeding season from 2000 to 7000 feet, but its main nesting zone there and at Fuji is between 2500 and 4500 feet. It leaves the highlands for the plains in early October, and while it winters in some numbers on the Kwanto Plain, most of the population migrates farther south and west to western Honshu, Shikoku, Kyushu, and the Ryukyus, less commonly to south China and the Philippines. Returning migrants appear on the plains and in the foothills in April, and it starts nesting in May. The nest is similar to that of *Turdus cardis*, of mud, grasses, and pine needles, fairly close to the ground in a deciduous or evergreen tree or shrub, seldom over 15 feet up, and characterized by its lining of dry leaves. The eggs number 3 to 4 and are very variable. In measurements they range from 24–30 x 18–21 mm. and in color from pale blue to olivish in ground color with wide variation in the spotting.

319. Turdus celaenops Stejneger
SEVEN ISLANDS THRUSH
Japanese: Akakokko (autochthonous)

Turdus celaenops Stejneger, Science, **10**, 1887: 108, and Proc. U. S. Nat. Mus., 1887: 484 (Miyakejima, Izu Ids.).

Merula celaenops yakushimensis Ogawa, Ann. Zool. Jap., **5**, 1905: 180 (Yakushima).

Merula celaenops kurodai Momiyama, Dob. Zas., **35**, 1923: 404 (Hachijo, Izu Ids.). (Synonym of *celaenops*)

I have examined six specimens of *T.c.yakushimensis* in the AMNH and MCZ, including the type, and compared them with a series of 20 *T.c.celaenops* from the Izu Islands. The wing measurements of *yakushimensis* average slightly larger, but there is too great an overlap for the character to be diagnostic. The Yakushima race is claimed to be generally darker but the color character does not hold up in the series; some Izu individuals are fully as dark as the Yakushima specimens. The tail and bill measurements likewise show no differences. The one valid character seems to be the color of the bills of the males. In *yakushimensis* males the upper mandible is almost black, the lower one very dark. In *celaenops* males the upper bill is dark, but much lighter than in the Yakushima birds, while the lower bill is yellowish. I can find no bill difference in the females.

The origin and systematic relationships of this interesting thrush have been the subject of considerable discussion in Japanese literature. Endemic to the Izu Islands and Yakushima, it is apparently a young species. Its present status on Yakushima is unknown; it has not been reported there since the MCZ specimen was collected 14 September 1911. It is still fairly common in the Izus, however, and ranges on all the larger islands from Oshima to Aogashima. On the smaller southern islands, Miyakejima and Mikurajima, and especially on Aogashima where it is not hunted and seldom bothered, it is plentiful and tame, and acts like the Robin in New England suburbs. On the northern islands and those garrisoned during the war it is scarce and very wild. It is resident throughout its range, but has been collected six times in adjacent Honshu, at Tajima and Shimoda on the Izu Peninsula, at Omaezaki and at Abe-gun in Shizuoka Prefecture, at Minami-Tama-gun in Saitama, and near Hachioji in Tokyo.

In habits as well as appearance it resembles *T. chrysolaus*, and lives from choice in deciduous woodlands, but it is not very gregarious. It feeds along the roadsides, in tilled fields, and in yards and gardens when undisturbed. Its diet is largely small fruits, but it eats other vegetable material and some insects.

Its breeding season is from mid April to early June, at its height in May. The nest is similar to that of *Turdus cardis*, of grasses and leaves plastered with mud and covered with moss, built on a branch from 5 to 10 feet up. The eggs number 3 to 4 and show considerable variation. The ground color may be almost white, or pale brown, or pale green, with markings of red brown to purple, sometimes heavily, sometimes lightly spotted, either all over or only at the larger end. They measure 27.5–32 x 20.3–22 mm.

320. Turdus naumanni Temminck

DUSKY THRUSH

Japanese: Tsugumi (autochthonous)

Turdus naumanni Temminck, Man. d'Orn., **1**, 1820: 170 (eastern Asia).
Turdus eunomus Temminck, Pl. Col., livr. 87, 1831, pl. 514 (Japan).
Turdus eunomus ni Momiyama, Ann. Orn. Orient., **1**, 1927: 116, 125, 141 (near Tokyo, Honshu). (Synonym of *eunomus*)

Typical *T.n.naumanni* is common on the adjoining mainland in Korea, but very rare in Japan, though a few appear irregularly, and it has been taken on all the main islands and major satellites. The Japanese migrants and winter visitors are almost entirely *T.n.eunomus*, which breeds in northern Sakhalin and in northeastern Siberia south of the tree line.

The Dusky Thrush is a common transient and winter visitor, sometimes abundant locally during migration, but no longer as plentiful as it was before market hunting developed in the mid nineteenth century. The terrific toll taken for food, especially by the mist-netters, which reached at least five million thrushes annually until 1917 when these species were removed from the list of legal game birds and mist-netting prohibited, had a marked effect on the species' abundance. That the Dusky Thrush survived the slaughter at all speaks well for its powers of recuperation. It is still by far the commonest of all the thrushes in Japan. (For an account of the mist-netting business cf. Austin, 1947.)

The largest flight of Dusky Thrushes crosses the Japan Sea from the Soviet Maritime Territory of Ussuria and lands on the north coast of Honshu at Fukui, Ishikawa, and Toyama prefectures. Early arrivals may reach the coast in late September; the height of the flight is in late October and early November; the last have passed by the end of November. From there the flight works southward through the highlands of Nagano and Gifu prefectures where most of the mist-netting was done, and on to its wintering grounds from the south coast of Honshu southward. A similar flight lands in Tottori and Shimane prefectures in western Honshu, and a third and still smaller comes down through Sakhalin and the Kuriles through Hokkaido and northern Honshu. This flight passes Hokkaido in late September and reaches the Miyagi-Akita latitude in early October. The normal northern limit of the species' wintering area is the northern edge of the Kwanto Plain in Tochigi and Fukushima prefectures, but scattered individuals may remain through the winter as far north as Sapporo. From the Kwanto Plain the species winters southward along the south shores of Honshu, in Shikoku and Kyushu, and south through the Ryukyus to south China.

In contrast to the other Japanese thrushes, the Dusky Thrush is a field bird on the wintering grounds, living in the open plains, especially in cultivated fields and in the grassy parks in the cities. It feeds on the ground and on low berry bushes, usually in small flocks of less than a dozen birds. Toward the end of winter it gathers in larger flocks, and starts to leave in mid March. There is no pronounced northward flight in spring such as occurs in Korea. The last disappear from Honshu by late April or early May.

321. Monticola solitarius magnus (LaTouche)

BLUE ROCK THRUSH

Japanese: Isohiyodori (beach bulbul)

Petrophila solitaria magna LaTouche, Bull. B. O. C., **40**, 1920: 97 (Japan).
Monticola solitaria latouchei Kuroda, Ibis, 1922: 92 (Tsushima). (Synonym)

A bird of the rocky, boulder-strewn coasts, the Blue Rock Thrush is one of the few passerine species that has adapted itself completely to a littoral life. It seems strange at first to encounter this typical land bird so at home in the haunts of the waders. One does not expect to see a thrush flying over the surf, perching on the boulders in the salt spray, and feeding among the kelps and seaweeds exposed at low tide. It is never found inland any distance, though it does forage at times in cultivated fields near the shore. In the little coastal fishing villages it is often a dooryard bird, and perches on the ridgepoles of the thatched huts to sing its simple *pe-pe-pe-pil-pil* in the sun, characteristically pumping its tail slowly up and down the while.

It is a common resident of the rocky coastlines of all the islands, large and small, from Hokkaido to the Ryukyus. The northern segment of the population moves southward and the species is absent from Hokkaido in winter. Individuals may be found throughout the year along the warmer shores from Aomori southward, never in flocks, but usually singly, in pairs, or in small family parties. It starts singing in April from the vantage point of a high rock or the roof of a fisherman's hut. In central Honshu it breeds in May, building a nest of grasses and rootlets in a crevice in the rocks at the edge of the beach. It lays 4 to 5 unmarked pale blue eggs which measure about 27 x 20 mm.

322. Oenanthe isabellina (Temminck)

ISABELLINE WHEATEAR

Japanese: Inaba hitaki (Inaba [place] chat)

Saxicola isabellina Temminck, Pl. Col., livr. 79, 1829, pl. 472, fig. 1 (Nubia).

A specimen of this north-central Palearctic species in the Momiyama collection was taken in Tottori Prefecture sometime between 1905 and 1910. Originally reported as *Oenanthe o. oenanthe*, the identity of the specimen was corrected on subsequent examination by Yamashina (1941: 289).

323. Saxicola torquata stejnegeri (Parrot)

STONECHAT

Japanese: No-bitaki (field chat)

Pratincola rubicola stejnegeri Parrot, Verh. Orn. Ges. Bayern, **8**, 1908: 124 (Iturup and Hokkaido).

This small, restless chat is a common summer resident in the plainslands of Hokkaido, and to a lesser extent on the high plateaus and mountain meadows of northern and central Honshu above 3000 feet. It has been collected on migration in Kyushu, but never in Shikoku. It is an active bird, always moving about busily with a scolding *kukkuk* among the low shrubs and grasses of the neglected fields and meadows it inhabits. The male sings a chattering, formless song without any particular melody from a high branch or a telephone wire.

It breeds plentifully in the fields of coastal Hokkaido, and has been found nesting in the grassy alpine zone of Mt. Daisetsu above 4000 feet. It arrives on its breeding grounds in late April and early May, and nests from late May through July, rarely into August. It builds its nest on the ground, concealed under a grass clump, mostly of leaves and twigs into which pieces of cloth, feathers, and moss are mixed, and lined with fine rootlets. The eggs number 5 to 7, usually pale greenish blue, rarely pale brownish, sometimes with a few pale brown spots scattered in a ring around the larger end. They measure 18–20 x 13.5–14.5 mm. The incubation period is given as 12 days, and the chicks leave the nest 11 to 13 days later (Yamada, in Yamashina, 1941: 299). The species leaves for the south in late September but a few individuals may remain through October.

324. Phoenicurus auroreus auroreus (Pallas)

REDSTART

Japanese: Jo-bitaki (common, or usual chat)

Motacilla aurorea Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776: 695 (Lake Baikal).

The Redstart is a common winter visitor in the warmer parts of Japan from central Honshu southward. Its migration route apparently crosses the Japan Sea from the continent. The species arrives in Kyushu and Honshu simultaneously about 20 October, crosses the highlands, and winters in the southern foothills and plains to the southward. It is of rare, almost casual occurrence in Hokkaido, the few records being for the southern parts in spring during the northward flight. Nor is it common in Aomori, but first appears regularly on its autumn flight in Miyagi. A bird of the open, shrubby hillsides, it is quite hardy and not very shy. It comes commonly into the wooded parks and gardens of the city suburbs, and flits through the bare branches in the cool winter sunshine, swinging its tail and calling its short *teik-teik* as it quests for late berries and dormant insects. It disappears from Honshu in late March or early April.

325. Erithacus cyanurus cyanurus (Pallas)

BLUESTART

Japanese: Ruribitaki (azure chat)

Motacilla cyanurus Pallas, Reise versch. Prov. Russ. Reichs, **2**, 1773: 709 (Yenisei).

Although not overly conspicuous, this beautiful bird is fairly common in Japan. In Hokkaido and central and northern Honshu it is a summer resident, breeding in the subalpine evergreen forests from 4500 feet to the tree line in the Japan Alps, from 2500 feet to the alpine zone at 4000 feet on Mt. Daisetsu. It reaches its breeding grounds from mid March to mid April and starts its courtship immediately. It stays on or near the ground, the male singing from a low branch at dawn and dusk a rather loud but tinkling melody, a short *Hyririri* . . . which it repeats continuously with accompanying tail-quivering as do all this group. It breeds from June into August, building its nest of moss and leaves on the ground concealed under or between rocks or roots. It lays 4 to 5 pale blue eggs with small light brown spots at the larger end, and measuring 17–18 x 14 mm.

In August it stops singing and becomes silent except for its call note, an unimpressive *tak-tak*, uttered with the usual flirted tail as it flits through the dark underbrush. It comes down into the foothills in October and reaches the Honshu plains in November, where it remains quietly and unobtrusively through the winter in the brushy edges of the woodlands. It also winters in the warmer lowlands from the Kwanto Plain southward to Formosa and south China.

326. Erithacus calliope (Pallas)

RUBY-THROAT

Japanese: Nogoma (field steed)

Motacilla calliope Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776: 697 (Yenisei).

Turdus camtschatkensis Gmelin, Syst. Nat., **1**, pt. 2, 1789: 817 (Kamchatka).

I have not seen enough breeding ground material to judge the validity of the proposed race *camtschatkensis* of the Kuriles and Kamchatka. It is based on measurements alone, and apparently a gentle size cline runs from southwest to northeast, with no sharp demarcation between the extremes, and many intermediates impossible to identify racially. All the available Japanese specimens except a few migrants are well within the size range attributed to the nominate race.

The Ruby-throat is a fairly common summer resident in the open shrubby lowlands of northern and eastern Hokkaido, and in the dwarf pines at the edge of the alpine zone on Mt. Daisetsu. Elsewhere in Japan it occurs only as a migrant on route to and from its wintering grounds in the Philippines and southeast Asia. It is shy and retiring, keeps itself well concealed in the underbrush, and is thus not often observed. It passes through Honshu during late April and early May in spring, and from late October to mid November in autumn. As it is a not infrequent lighthouse casualty on migration, it probably travels mostly at night. Kobayashi (Tori, 1931: 53) found it nesting quite commonly in the grassy plains of the Kitami area of Hokkaido, the males singing their *chil chil chil-li chilli* from fence posts and shrub tops, while the shyer females keep out of sight in the undergrowth. He describes the nest as built on the ground of dried grasses, moss, and rootlets, and the 4 to 5 eggs as greenish blue with sometimes a few small spots at the larger end, and measuring 19.5–22.5 x 14.8–16.5 mm.

327. Erithacus akahige (Temminck)

JAPANESE ROBIN

Japanese: Koma-dori (Steed bird)

Sylvia akahige Temminck, Pl. Col., 1824, pl. 571 (Ryukyus, error, restricted type locality Honshu, by Kuroda).

Erithacus akahige tanensis Kuroda, Bull. B. O. C., **43**, 1923 (5 March): 106, (Tanegashima).

Erithacus akahige sgectatoris [misprint for *spectatoris*] Momiyama, Dob. Zas. **35**, 1923 (18 Dec.): 403 (Hachijo). (Synonym of *tanensis*)

Luscinia akahige kobayashii Momiyama, Dob. Zas., **52**, 1940: 463 (Yakushima). (Synonym of *tanensis*)

As my eight specimens from the Izu Islands (Miyake, Hachijo, and Aogashima) are undistinguishable from a series of 12 Yakushima specimens in the AMNH, I can recognize only two races of this endemic species: *E. a. akahige* breeding in Hokkaido, Honshu and Shikoku, and *E. a. tanensis* breeding on the Izu Islands and Yakushima. Males of *tanensis* differ from nominate *akahige* males in lacking the narrow blackish stripe between the orange of the throat and the gray of the breast, in having the throat and underparts paler, and the brown of the back darker and less ruddy; the females of *tanensis* are equally distinct in having the orange of the throat markedly paler and duller, and the upperparts slightly darker. The tail-feather character mentioned by Hartert and Steinbacher (Vög. pal. Faun. Erg. 1935: 326) is influenced by the feather wear and is not as reliably diagnostic.

This species is endemic to the Japanese islands as a breeding bird, and migrates south in winter to Formosa and south China. Its wintering ground is not well worked out. It inhabits the mountain forests, both mixed and evergreen, in Shikoku from 5000 to 6000 feet, in Honshu from 3000 to 7000 feet, in Hokkaido from 2000 to 4000 feet. Yukio Nakamura has reported it orally as "extremely abundant" in summer on Rebun and Rishiri Islands off northwestern Hokkaido. It is commonest on Mt. Fuji between 4500 and 5500 feet. Its usual haunts are the forest floor in areas of dense undergrowth where the ground is damp, preferably near little mountain streams. It moves about actively, moving its short tail up and down continuously, but is hard to see in the thick cover. Its presence is usually revealed by its song, a loud, pleasing trill preceded by a high note, *peen-karararararara*. It arrives in central Honshu in mid April, sings until early August, and disappears after October. Its breeding season is from late May to mid July. It builds its nest of leaves and roots on the forest floor, and lays 4 to 5 blue eggs, averaging 12.5 x 16.1 mm. The Izu Island birds have been found nesting in hollow trees as well as on the ground.

The Japanese Robin is a popular cage bird in Japan, but has not been raised in captivity. Dealers obtain their stock from the wild, usually netted adults, though hand-reared nestlings are tamer and make better cage birds.

328. Erithacus komadori komadori (Temminck)

RYUKYU ROBIN

Japanese: Akahige (red whiskers)

Sylvia komadori Temminck, Pl. Col., 1824, pl. 570 (Korea, error? restricted type loc. northern Ryukyus, by Kuroda).

The distribution and systematic relationships of *E. komadori* and *E. akahige* are in need of further study and clarification. Though regarded as distinct species, they are allopatric, and apparently are geographically representative forms, *komadori* replacing *akahige* south of the main islands. *E.k.komadori* breeds from Tanegashima (but not on Yakushima where a race of *akahige* breeds) to Amami-Oshima, and is replaced by two other well marked races farther south in the

Ryukyus. Morphologically *komadori* is quite distinct from *akahige*, having a black instead of an orange throat. Likewise its eggs are markedly different, being creamy buff instead of blue, and with brownish markings at the larger end. However, it resembles *akahige* closely in habits and actions, and its song is very similar, though weaker in volume.

329. Erithacus svecicus weigoldi (Kleinschmidt)

BLUETHROAT

Japanese: Ogawa komadori (Ogawa's robin)

Luscinia svecica weigoldi Kleinschmidt, Abh. Ber. Mus. Tier-u. Volkenk. Dresden, **16**, 1923 (2): 43 (northern Chihli).

The only Japanese record for this mainland species is a single specimen in the Yamashina Museum caught by Ogawa at Abegun, Suruga, Shizuoka Prefecture, on 9 December 1906.

330. Erithacus sibilans (Swinhoe)

SWINHOE'S BUSHROBIN

Japanese: Shima-goma (striped steed)

Larvivora sibilans Swinhoe, Proc. Zool. Soc. London, 1863: 292 (Macao, China).

This is another continental species, of very rare occurrence in Japan. Though it breeds in Sakhalin, it migrates down the mainland, and while common as a transient in northern Korea, it is rare on the southern tip of that peninsula. Specimens have been taken both in Honshu and Shikoku and though the 1942 Hand-List questions these as possibly escaped cage birds and of doubtful natural occurrence, there is no evidence that they were not bona fide stragglers from the mainland. The species is also listed by Nakamura (1925: 340) as having been obtained at Cape Kashiwa, Niigata Prefecture, where a flock was seen in May 1922, which seems improbable and of dubious identity.

331. Erithacus cyane bochaiensis (Shulpin)

BLUE GROUNDCHAT

Japanese: Koruri (lesser azure)

Larvivora cyane bochaiensis Shulpin, Ezheg. Zool. Muz. Acad. Nauk SSSR, **27**, 1927: 404, 405 (southern Ussuria).

Adult male breeding specimens from Japan in the MCZ, AMNH, and USNM collections are inseparable from those of Sidemi, Ussuria. These northeastern birds are darker and less grayish than breeding material from north China.

This pretty little blue and white songster is a not uncommon summer resident in the deciduous forests of Honshu between 2000 and 5000 feet. It is also found in summer, though less commonly, in similar areas in Hokkaido, Shikoku, and Kyushu, but its nest and eggs have been found only in Honshu. It reaches Honshu in mid April and leaves in late September for its wintering grounds in southeast Asia, Malacca, and Borneo. Its habitat is the dense shrubby undergrowth in mixed woods, where it is quite active on or near the ground, and flicks its tail up and down in robin fashion. The male is a good singer, and the song is of the same type as that of the Japanese Robin, but not as loud or as rich in volume and tone. It has considerable variety, but always begins with a few short chirps, *zit, zit, zit . . . lolololo . . .* etc. It nests on the ground, building a loose structure of leaves, grasses, and rootlets concealed under tree roots or a fallen branch. The eggs number 4 to 5, are clear blue, and measure 19–21.5 x 14–15.5 mm.

SYLVIIDAE

332. Phylloscopus tenellipes Swinhoe

CONIFER WILLOW WARBLER

Japanese: Ezo mushikui (Hokkaido insect-eater)

Phylloscopus tenellipes Swinhoe, Ibis, 1860: 53 (Amoy, China).

This species is a not uncommon summer resident, breeding in the moist fir-hemlock forests from the highlands of central Honshu northward through Hokkaido to Sakhalin. In the Japan Alps it occurs most abundantly between 3000 and 4500 feet, occasionally reaching 6000. In Hokkaido it has been observed at 4800 feet, and on the low plains in migration. Though its brownish upper parts are diagnostic, it is so hard to see in the thick forest growth it inhabits that it is most readily recognized by its notes. The ground-note is a sequence of transparent *pee-pee-pee*'s, the clear, thin song a titmouse-like *hee-tsu-peee*.

It arrives in Honshu from the middle to the end of April. It is in song on arrival, and its singing increases in intensity as nesting gets under way in May. Five nests found in the Alps by Kiyosu (Yacho, 1936: 378) were all located under roots overhanging steep banks along paths or streams, and made chiefly of mosses with some leaves and fine roots. Both sexes incubate and rear the young. The eggs are 5 tc 6, pure white, and measure 15–16 x 12–12.5 mm. The species leaves Japan in September and winters to south China, Burma, and the Malay Peninsula.

333. Phylloscopus borealis (Blasius)
ARCTIC WILLOW WARBLER
Japanese: Mushikui (insect-eater)

Phyllopneuste borealis Blasius, Naumannia, 1858: 313 (Sea of Okhotsk).
Phylloscopus xanthodryas Swinhoe, Proc. Zool. Soc. London, 1863: 296 (Amoy, China).
Phylloscopus borealis examinandus Stresemann, Nov. Zool., 1913: 353 (Bali).

Three races of this difficult species occur in Japan. The breeding form of Honshu, *P.b.xanthodryas,* sometimes called "meboso" (slender eye) in Japanese, is characterized by its yellowish underparts and by its first primary being 1–3 mm. longer than the primary coverts. The breeding population of Hokkaido is intermediate between this form and the lighter-bellied *P.b.borealis* of the adjoining continent and Sakhalin, which occurs in Japan only on migration, and in which the first primary is less than 1 mm. longer than the coverts. The northernmost race, *P.b.examinandus,* is the lightest of the three, has a greenish cast to the upperparts, and its first primary equal to or shorter than the coverts. It has been collected on migration in Honshu and Hokkaido.

The Arctic Willow Warbler is a common summer resident in the birch-conifer forests of the high mountains of central Honshu, somewhat less plentiful in northern Honshu and Hokkaido. It may also breed in Shikoku where Kiyosu (Yacho, 1949: 136) found it in June above 5000 feet. It occurs lower down and in the plainslands only on migration in spring and autumn. It reaches the sub-alpine zone in the Japan Alps in early May and breeds from June to August from 4500 feet up to the limit of trees. It starts down again in early October, but does not leave Japan entirely until early November. It migrates to the Philippines and southeast Asia.

Its singing period is very long, from its arrival in May until late September. It sings throughout the day a thin but penetrating *tsirichi-tsirichi-tsirichi* which is frequently hard to trace to its owner, perched high in the leafy branches, but which is frequently the dominant bird song in the high Alps. The nesting season, from mid June into August, is somewhat later than that of the other Willow Warblers. It builds a cup-shaped nest, sometimes opening laterally, of mosses, leaves, and roots, lined with fine rootlets, and concealed on the ground under a grass tuft or the root of a shrub. It lays 4 to 5 white eggs spotted with red-brown at the larger end, and measuring 16.8–19.5 x 13.5–14.2 mm.

334. PHYLLOSCOPUS OCCIPITALIS CORONATUS (Temminck & Schlegel)
CROWNED WILLOW WARBLER
Japanese: Sendai mushikui (Sendai insect-eater)

Ficedula coronata Temminck & Schlegel, in Siebold, Fauna Jap., Aves, 1847: 48, pl. 18 (Japan).

The Crowned Willow Warbler is a common summer resident from Hokkaido through northern and central Honshu to Shikoku. It inhabits the more open, lighter, deciduous woodlands on the lower slopes of the mountains, rarely higher than 1200 feet in Hokkaido, 2500 feet in northern Honshu, 3000 feet in the Japan Alps and at Mt. Fuji. Like the other willow warblers it is hard to observe and to identify in the field, but its voice is unmistakable. Its song varies somewhat individually, but usually consists of two repeated short syllables followed by a lengthier drawn-out one, *djip-djip, djip-djip, jeee.* It arrives in central Honshu in mid April, reaches Hokkaido in early May, and sings from its arrival until late July. It breeds from May through July and, like other Phylloscopi it is a ground nester. It builds a domed nest of mosses, leaves, and bark, lined with hair and rootlets, with a lateral entrance, and well hidden at the base of a grass clump or a small shrub. It lays 3 to 6, rarely 7 white eggs which measure 15–18 x 12–13 mm. An incubation period of 16 days has been recorded. It disappears from Japan in early October and winters southward to southeast Asia, Malaya, Sumatra, and Java.

335. PHYLLOSCOPUS IJIMAE (Stejneger)
IJIMA'S WILLOW WARBLER
Japanese: Ijima mushikui (Ijima's insect-eater)

Acanthopneuste ijimae Stejneger, Proc. U. S. Nat. Mus., **15**, 1892: 372 (Miyakejima, Izu Ids.).

The 1942 Hand-List follows Ticehurst (1938: 162) in making this form a race of *P. occipitalis.* However, it not only lacks the two dark cranial bands of the Crowned Willow Warblers, but is so vastly different from them in its song and its nesting habits that it seems better to regard it as specifically distinct, even though the forms are allopatric and the absence of morphological intergradation is common between insular subspecies.

Ijima's Willow Warbler is known to breed only on the Izu Islands, where it is a common summer resident. It arrives there in late March and nests on all the islands from Oshima to Aogashima in the mixed woodlands, especially in the alder thickets and in the shrub growth around human dwellings where it is very tame. Instead of nesting on the ground as does the Crowned Willow Warbler, it builds its elliptical nest with either a top or lateral entrance of *Sasa* and other leaves, roots, stems, and mosses, lined with slender grasses, roots, fibers, and a few feathers, on the low branch of an alder or bamboo from two to six feet up. Six such nests collected by Yamashina (Tori, 1935: 431) contained three white eggs each, which measured 17–18.7 x 13–13.6 mm. Yamashina (*idem*) records its call note as a simple, thin *phi-phi-phi*, and its song, delivered by the male from a high perch, as *pee-chopi-chopi-chopi*. It leaves the Izu Islands in October and migrates via Tanegashima, Yakushima, and the Ryukyus to winter in the Philippines (cf. Phillips, Auk, 1947: 127, and Gilliard, 1950: 473, 496). Its distribution and migration parallel those of *Turdus celaenops* and *Erithacus akahige tanensis*. It is strange that in their apparent movements between the Izu Islands and Tanegashima and Yakushima there are no records for these birds occurring in southern Shikoku or Kyushu.

336. Horeites diphone (Kittlitz)

BUSH WARBLER

Japanese: Uguisu (autochthonous)

Sylvia diphone Kittlitz, Mem. Acad. Imp. Sci. St. Petersburg, 1830: 237 (Bonin Islands). (Extra-limital)

Horornis cantans sakhalinensis Yamashina, Dob. Zas., **39**, 1927: 281 (Nayoro, Sakhalin).

Salicaria cantans Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1847: 51, pl. 191 (Japan).

Horornis cantans ijimae Kuroda, Ann. Zool. Jap. **10**, 1922, Art. 11: 117 (Miyakejima).

Horeites cantans panafidinicus Momiyama, Bull. Biogeogr. Soc. Jap., **1** (3) 1930: 175, footnote (Torishima).

Horornis cantans medius Momiyama, Dob. Zas., **35**, 1923: 408 (Hachijo). (Synonym of *ijimae*)

Four races of this plastic species have occurred on the Japanese Islands. Specimens referable to the pale northern race of Sakhalin and the Kuriles, *H.d.sakhalinensis* have been taken in Hokkaido, Honshu, and Kyushu on migration. The breeding form of the main islands from Hokkaido to Kyushu is *H.d.cantans*. A browner subspecies, *H.d.ijimae* is resident in the Izu Islands from Toshima to Aogashima (Oshima birds being inseparable from the main island *cantans*) and on Tanegashima. The very brown Torishima race, *panafidinicus*, is now probably extinct, as the volcanic eruptions a decade ago destroyed all the vegetative cover there. Other races are recognizable on the islands south to the Bonins and Formosa, and on the adjoining continental mainland.

The Uguisu is one of the best-loved birds in Japan, and has achieved a particular niche of its own in Japanese literature, folk-lore, and art. In conventional painting it is always pictured with the peach blossoms which flower in spring when it starts to sing. Though not particularly beautiful or striking in appearance, it is extremely popular as a cage bird because of its song. It is not easy to keep in captivity, but special techniques of feeding it on mashes have been developed, and connoisseurs keep it for its song and train it to sing by manipulating the light with special cage covers. Its loud, melodious notes, once heard on the spring hillsides ablaze with azaleas, are never forgotten. The Japanese translate its notes as *Ho-hokekyo* which is of religious significance, the *Ho* referring to the "Ho" or Buddhist doctrine, and the *hokekyo* meaning the Sutra of the Lotus. A better transliteration of the common song is *Hohoho-ho-khekyo-hokhekyo*, which of course varies slightly in different individuals. Besides this melody the species has a characteristic series of short call notes much admired by its devotees, called the "Uguisu no tani wateri", (the uguisu's valley-crossing call). In Kyushu and the warmer parts of Honshu it starts singing in January, in the Tokyo area in mid March, in Hokkaido in early May. It sings throughout the summer and all through the day, in the hot noon hours as well as at dawn and dusk, until late August and sometimes into early September.

In northern Honshu and Hokkaido it is a summer resident only, arriving in late April or early May and disappearing in late October. In central Honshu it enjoys a wide distribution in summer, from the shrubby lowlands well up into the alpine zone in the highlands. It seldom breeds above 4500 feet, but I collected a newly fledged juvenal evidently just out of the nest 5 September 1948 at the 9000 foot timber line in the Japan Alps. The highland birds start moving downward in September, and there is evidently some migratory movement throughout the species' range, for it winters south to the Philippines and Indochina. How far south the Japanese population moves is unknown, but it winters in small numbers in the plains and along the warmer coasts from Tokyo southward, working the brush growth actively but quietly in search of insects, and uttering only its plain unobtrusive ground-note, *chat-chat.*

It is a bird of the brushlands and bushy hillsides, and comes frequently into the wooded suburban gardens where its presence is always welcome. It likes the second-growth thickets, and also the thick *Sasa paniculata* undergrowth of the mountain forests. It builds its nests usually less than three feet off the ground in a low shrub, with the entrance facing the light, a domed structure woven of *Sasa* and other leaves and lined with hair and rootlets. The eggs number 4 to 6, are a bright chocolate in color, and measure 16.3–19.2 x 13–15 mm. It starts nesting in late March in Kyushu and progressively later to the northward. As the nesting continues on into August, it may be multibrooded.

337. UROSPHENA SQUAMEICEPS (Swinhoe)
SHORT-TAILED BUSH WARBLER
Japanese: Yabusame (bamboo shark)

Tribura squameiceps Swinhoe, Proc. Zool. Soc. London, 1863: 292 (Canton).
Cettia ussurianus Seebohm, Cat. Bds. Brit. Mus., **5**, 1881: 143 (Ussuria). (Synonym)

The recognition of two subspecies of this unique little bush warbler is not supported by the series I have examined. Seebohm (*loc. cit.*) characterized *ussurianus* as having "olive-brown" upper parts instead of "chocolate-brown" as in *squameiceps,* which is accounted for by his having compared his scant Ussurian material, which was in worn spring plumage, with winter birds from Formosa and south China, which were freshly molted. The brown pigments in this species are not at all stable, and fade markedly both seasonally and with the age of the specimen. I can find no differences between the Japanese and the continental specimens I have studied that are not attributable to feather wear or age-foxing, although one small series of Chinese migrants were remarkably light and grayish—until the plaster of Paris with which they had been made up was beaten out of their feathers.

This peculiar little wren-like bush warbler is a monotypic genus limited in its breeding to Japan and the adjacent mainland in Ussuria and probably northern Korea, and wintering south to Indochina, Burma, and Malaya. In Japan it is a not uncommon summer resident, a dweller of the underbrush in the deep forests from central Honshu north to southern Hokkaido. In central Honshu it breeds most commonly from 2000 to 5000 feet in the Japan Alps. In Aomori, northern Honshu, it is not found above 2700 feet. In Hokkaido it nests from sea level up to about 2500 feet in the southern sections, but is not known north or east of the Ishikari Plain, though it has been collected once in Sakhalin.

It is strikingly wren-like in its habits, always skulking on or near the ground in the darkest forests, usually along the base of the high valley slopes. It is difficult to observe, but its presence is easily ascertained by its song, an insect-like, high-pitched series of buzzing notes, *zee-zee-zee . . .*, weak at the start, and ascending in pitch and volume. Its season in Honshu is April to October, in Hokkaido May to late September. Its breeding season is May to July. It builds a fragile nest in a depression in the ground, frequently in the shelter of an exposed root, of loosely woven leaves and moss and lined with rootlets and hair. The clutch has 5 to 7 white eggs with small reddish spots, measuring 16–17 x 12.5–13 mm.

338. Locustella fasciolata (Gray)
GRAY'S GRASSHOPPER WARBLER

Japanese: Ezo sennyu (Hokkaido 'sennyu', of uncertain derivation, perhaps from 'sennin' a hermit, fairy, or gnome, and 'niu' to enter)

Acrocephalus fasciolatus Gray, Proc. Zool. Soc. London, 1860: 349 (Bachan).

This largest of the Locustellas is a locally common summer resident in Hokkaido, rather rare in the southern parts, more plentiful north and east of the Ishikari Plain. It has been taken only once in Honshu, a migrating stray that struck the Cape Shiriya lighthouse, and never on the other islands. It winters south to the Philippines, the East Indies, and New Guinea, and though it has been taken on Yakushima and in the Ryukyus, its route is evidently continental. The Hokkaido population arrives in May, evidently crossing the Japan Sea from Ussuria, and leaves in September by the same route.

Its particular habitat is the dense alder and willow thickets of the lowland riverbanks. Shy and hard to see, its presence is betrayed by its call — it sings by night as well as by day — which is so similar to that of the Little Cuckoo, *Cuculus poliocephalus* (a rare bird in Hokkaido) that it is known locally in Hokkaido as the "hototoguisu." It builds a fragile nest, loosely woven of grasses and leaves, from five to fifteen feet up in the willow or alder thickets (Yamada, Tori, 1942: 438). Its eggs are grayish white with small brown and purplish specklings, number 3 to 5, and measure 20.3–22.8 x 15.2–17.6 mm.

339. Locustella ochotensis (Middendorff)

ISLAND GRASSHOPPER WARBLER

Japanese: Shima sennyu (island grasshopper warbler)

Sylvia (Locustella) Ochotensis Middendorff, Sibir, Reise, **2**, (2), 1853, Pl. 16, fig. 7 (Islands in Udskaya Guba).

Locustella pleskei Taczanowski, Proc. Zool. Soc. London, 1889: 620 (Inchon, Korea).

Lusciniopsis japonica Cassin, Proc. Acad. Nat. Sci. Philadelphia, 1858: 193 (Hakodate). (Synonym of *ochotensis*)

Locustella subcerthiola Swinhoe, Ibis, 1874: 154 (Hakodate). (Synonym of *ochotensis*)

Arundinax blakistoni Swinhoe, Ibis, 1876: 332, pl. 8, fig. 1 (Hakodate). (Synonym of *ochotensis*)

Locustella hondoensis Stejneger, Proc. U. S. Nat. Mus., **16**, 1893: 957 (Honshu). (Synonym of *pleskei*)

Locustella styani LaTouche, Bull. B. O. C., **16**, 1905: 21 (Fukien, China). (Synonym of *ochotensis*)

Locustella ochotensis is limited to coastal east Asia and adjacent islands. Recent revisers (cf. Meise, 1938: 173, and Delacour and Mayr, 1946: 197) have considered it conspecific with the allopatric and quite similar *L.certhiola* of east-central Asia, but in the extensive series I have examined in the MCZ, AMNH, and USNM, all the forms of *certhiola* have the back feathers centered with black, giving the upper parts a streaked appearance, whereas the backs of *ochotensis* are plain, without black centers to the feathers. There being no evidence of any intergrading of the character between them, I agree with Wetmore (1951b: 206) that the two groups are best considered specifically distinct. *L.ochotensis* breeds almost exclusively on small off-shore islands, and is divisible into two well marked races on the color of the upperparts. Nominate *ochotensis* breeds from Kamchatka through Sakhalin and the Kuriles to Hokkaido, and is much browner. *L.o.pleskei* breeds in Korea, Kyushu, and the Izu Islands, and is distinctly grayer.

The Island Grasshopper Warbler is not uncommon locally at its very restricted breeding sites, but is almost never found elsewhere. It inhabits open, wet swales of thick grasses, reeds, or low bushes, almost exclusively on small offshore islets. One such site consists of the few acres of bamboo grass, *Phyllostachys simoni*, just behind the small lighthouse on Miyake Island in the Izus. In this small area several pairs of *pleskei* can always be found during the breeding season. They are hard to observe, for they skulk through the thick grass close to the ground and are very shy. The females seldom come out into the open where they can be seen, but the males perch momentarily on the reed tops to sing their short, thin, unimpressive little chirping song, which is more like a series of alarm notes than a song. They stay in sight only a few moments while singing, and then dive down out of sight into the cover below them.

Yamashina (Tori, 1935: 435–439) describes a nest of *pleskei* from Miyake as a rather fragile structure of dried leaves and stems, lined with rootlets, and built a foot off the ground around two or three stems of bamboo grass. The eggs average four to the clutch, rarely 3 to 6, and measure 19.5–23 x 15–16.2 mm. According to Kobayashi and Ishizawa (1938: 171) they are of two distinct types, both with a purplish gray ground color, one being mottled evenly with very fine dots, the other blotched with irregularly shaped and sized heavier markings, chiefly at the larger end. The latter type, which closely approaches the egg coloring of *L.fasciolata* and *L.lanceolata*, is rare in *pleskei* and appears more commonly in *ochotensis*. *L.o.pleskei* has also been found nesting on Niijima and Hachijo in the Izus, and on islets off northern Kyushu (Kuroda, Tori, 1919: 356). *L.o.ochotensis* breeds on Daikoku Island off Akkeshi (Yamashina, 1941: 148) as well as farther north and east.

L.o.ochotensis has been taken on Honshu and the Ryukyus in passage, and migrates to south China, Formosa, and the Philippines. From the specimen record *pleskei* arrives at the Izus in late April, nests in May and June, sometimes into July, and leaves in September or October, but its wintering ground is unknown. All the wintering ground specimens I have seen (including the type of LaTouche's *styani* which he synonymized [1925: 227] with *pleskei*), are distinctly brown and referable to *ochotensis*.

340. Locustella lanceolata (Temminck)
STREAKED GRASSHOPPER WARBLER
Japanese: Makino sennyu (pasture grasshopper warbler)

Sylvia lanceolata Temminck, Man. d'Orn., ed. 2, **4**, 1840: 614 (Russia).
Lusciniopsis Hendersonii Cassin, Proc. Acad. Nat. Sci. Philadelphia, 1858: 194 (Hakodate). (Synonym)

From the specimen record this species is an uncommon transient along the Pacific coast of Honshu, known principally from some score of records of birds killed striking lighthouses in migration in late May and early June and in late September and October, and an uncommon (possibly locally common) summer resident in the central Honshu highlands and in eastern and northern Hokkaido. It migrates along the China coast and winters to Burma, India, Malaya, Borneo, and Java. It is a bird of wet, marshy fields, and remains hidden unobtrusively in the undergrowth. Its song is weak and insect-like, and it is anything but conspicuous, which partially explains the dearth of summer records.

In Honshu it has been found breeding only in the Fuji area. Kobayashi (Tori, 1931: 167) found two nests at the base of Mt. Fuji in 1931, one on 13 August, the other on 14 September. More recently, on 19 June 1950, Y. Nakamura (unpublished) collected a specimen at 5000 feet near Osenuma, and estimated about 30 pairs present in the vicinity. It breeds more commonly in Hokkaido, a few on the Ishikari plain, but more abundantly in eastern sections from Kitami to Nemuro. Kobayashi (Tori, 1931: 167–169) collected seven clutches of eggs at Kitami between 22 June and 24 July. He describes the nest as being crude and fragile, of slender leaves and grasses, placed under grass clumps on the ground on open prairies near the coast, sometimes a foot or two above the ground when it is wet. The 3 to 5 eggs are grayish white, speckled with small, irregular spots and streaks of purplish and reddish-brown particularly at the larger end, and measure 17.2–19.5 x 12.6–14.2 mm.

341. Locustella certhiola minor David & Oustalet
SIBERIAN GRASSHOPPER WARBLER
Japanese: Shiberiya sennyu (Siberian Grasshopper Warbler)

Locustella minor David & Oustalet, Ois. de Chine, 1877: 250 (Pekin, China).

The presence of this continental species within Japanese territory was first reported at the September, 1952, meeting of the Ornithological Society of Japan by Yukio Nakamura. According to his oral statements, the bird is apparently a regular summer resident on Rebun and Rishiri islands off the northwest coast of Hokkaido. He heard it singing on both islands during short visits there in 1949 and 1950, but it is so shy and retiring that he was unable to collect a specimen until the summer of 1952 on Rishiri Island. As it is a continental migrant, unknown in southern Korea or elsewhere in Japan, it must reach these islands by a direct, over-water flight from the Ussurian mainland.

342. Phragamaticola aedon rufescens Stegmann
THICK-BILLED REED WARBLER
Japanese: Hashibuto oyoshikiri (big-billed large reed-cutter)

Phragamaticola aedon rufescens Stegmann, Jour. f. Orn., **77**, 1929: 230 (Amuria).

The only record for Japan of this continental species is a specimen in the former Momiyama collection taken at Kitasaku-gun, Nagano Prefecture, in May 1927 (Tori, 1932: 316).

343. Acrocephalus arundinaceus orientalis (Temminck & Schlegel)
GREAT REED WARBLER
Japanese: Oyoshikiri (large reed-cutter)

Salicaria turdina orientalis Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1847: 50, pl. 20B (Japan).

The Great Reed Warbler is a common summer resident on all the main islands. Its loud but pleasant chattering song is heard almost wherever reeds grow. In the Honshu plains it is commonest in the reedy marshes along the rivers. On the higher plateaus of Honshu (up to 3500 feet) and in the Hokkaido lowlands it lives in wet thickets, but always near growths of reeds. On migration it occurs in drier places and occasionally visits the suburban and city gardens. It arrives in Honshu in late April and in Aomori a little later, usually around 10 May. In Hokkaido its sojourn is from mid May to early September. It leaves Honshu in late September, a few remaining into mid October, and winters to the Philippines, southeast Asia, Malaya, Celebes, Borneo, and Java.

The species breeds in Honshu from mid May to early August, in Hokkaido in June and July. The nest is cup-shaped, made of reed leaves, and supported by two or three, sometimes four or more reed stems, from three to five feet above the ground or water. The clutch contains 3 to 6 bluish or greenish-white eggs, with irregular marking densest at the larger end, and measuring 19.5–22.5 x 14–17 mm. The incubation period is given as 12 to 13 days; the chicks leave the nest 10 to 13 days after hatching.

344. Acrocephalus bistrigiceps Swinhoe
BLACK-BROWED REED WARBLER
Japanese: Koyoshikiri (lesser reed-cutter)

Acrocephalus bistrigiceps Swinhoe, Ibis, 1860: 51 (Amoy, China).

This species is more northerly in its distribution and less plentiful than the preceding species, less aquatic in its habits and not as closely bound to the marshes and reed beds. It is a fairly common summer resident in Hokkaido, somewhat less so in central and northern Honshu. In Hokkaido it occurs on the grassy and brushy plains with the Stonechat, usually in the tall grass and brush along the roadsides. In Honshu it inhabits grassy plateaus from 500 to 5000 feet elevation at Mt. Fuji, to about 1000 feet in Aomori, and is occasionally found living side by side with the Great Reed Warbler in the coastal marshes. Nagahisa Kuroda saw and collected singing birds in July and August in the reed beds near Haneda airport and on the Koiwa flats near Shinhama duck pond in Chiba. It reaches central Honshu about 10 April, and Hokkaido in early May. Most of the population leaves in September, but a few remain until mid October. It has been collected in Kyushu on migration but never in Shikoku. It winters south to Burma and Indochina.

In Honshu it breeds from May to July, in Hokkaido from June to August. The nest is similar to that of the preceding species but smaller, and with a greater variety of vegetation used in its construction. The clutch contains 4 to 5, less commonly 3 to 6, pale olive eggs heavily marked with dark olive, and measuring 15.3–19 x 12–14 mm.

345. Megalurus pryeri pryeri Seebohm
JAPANESE MARSH WARBLER
Japanese: O-sekka (autochthonous)

Megalurus pryeri Seebohm, Ibis, 1884: 40 (Yokohama, Japan).

The following account of the Japanese race of this rare and little-known species, endemic to the Pacific coastal marshes of central Honshu, is largely abridged from Momiyama's excellent summation of the available information (Tori, 1949: 115–143). Between the time of its discovery in 1884 and the 1930s nothing was known of its life history or of its distribution other than that it occurred in marshes near Tokyo, around Suruga Bay, and in Miyagi Prefecture. Only ten specimens existed, the original type series of three in the British

Museum being the only ones outside Japan, and of the seven early specimens in Japanese collections all but two were destroyed by the 1922 earthquake and the fire raids of World War II.

The bird began to be better known in the early 1930s when it started to appear in the Tokyo markets. At this time grilled small birds were becoming a popular dish in the restaurants, and particularly in the little sidewalk grills in Tokyo. The demand for them was supplied by mist-netters, who concentrated on catching the various species of small sparrows that winter in the marshes near Tokyo. Looking over the strings of birds these hunters brought to market, Momiyama discovered in December 1931 a Japanese Marsh Warbler recently netted in the marshes of the Arakawa River just north of Tokyo. Four more were found the same way in February 1932, and two more from the same place in November 1932. Growing aware of the attention these birds were receiving from the ornithologists, the netters brought in at least 20 of them alive in 1933, which commanded high prices from the aviculturists patronizing the Tokyo bird shops. It is not a good cage bird, however, and its popularity as an avicultural novelty died out as quickly as the local wild stock apparently did from the attention of the netters. Only a desultory few have appeared since, the most recent one a specimen Momiyama bought from a taxidermist who said it was taken at Lake Tsuda, Chiba Prefecture, 25 March 1947.

Its nest and eggs were found for the first time 9 August 1936 in marshes near a river mouth just north of Sendai, Miyagi Prefecture. Its nesting was observed there again 18 May the following year. The nest is built 27–35 cm. off the ground, a bowl shaped structure with a small entrance hole on one side, made by bending the tips of standing grass together, weaving dead leaves and stems through them, and lining the result with a few feathers or hair. The clutch contains 5 to 6 pure white eggs, averaging 18.9 x 14.2 mm., extreme measurements 18–19.5 x 14–14.5 mm. The incubation period was not determined, but the young left the nest 13 to 14 days after hatching. Judging by the extreme nesting dates, probably two broods are raised per year.

The species has been recorded in Miyagi only between early May and late October. It has not yet been found breeding farther south, though the possibilities of its so doing were suggested by a specimen in the former Kuroda collection that had very well developed testes when collected in Shizuoka 12 April. However, all the known specimens from the Tokyo and other southern marshes were taken in late fall, winter, and early spring. So far it has been reported from 18 localities: two in Miyagi, three in Shizuoka, one (Owari) probably near Nagoya, and the remainder near Tokyo in Saitama, Chiba, Tokyo, and Kanagawa prefectures, most of them in the marshes along the Arakawa River. The evidence indicates that it breeds in coastal marshes of northeastern Honshu in the Miyagi area, and winters in the same type of habitat from the Kwanto to the Kansai plains, a very limited distribution indeed. Its nesting grounds are constantly threatened by floods, and between such natural mishaps and the activities of the mist-netters, its existence is a precarious one.

It is a shy little skulker, quite furtive and hard to observe. It seems weak-winged, and when flushed seldom flies more than a few hundred yards in low, level flight over the marsh grass before dropping again into the cover. During the breeding season the male chatters an unobtrusive, low-pitched *djuk-djuk-djuk* . . . from a perch low in the grass, and makes little, short, dashing flights in an inverted V five or ten feet into the air, and returns to its perch to continue its chattering So little is known about its habits that it is certainly deserving of more research and study. It is hoped that some of the rising generation of bird students in the Tokyo area will turn their attention to it before some catastrophe, either natural or man made, wipes it out of existence.

346. CISTICOLA JUNCIDES BRUNNICEPS (Temminck & Schlegel)
FAN-TAIL WARBLER

Japanese: Sekka (autochthonous, but means under the snow)

Salicaria (*Cisticola*) *brunniceps* Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1850: 134, pl. 20C (Japan).

Cisticola cisticola djadja Momiyama, Dob. Zas., **35**, 1923: 408 (Hachijo). (Synonym)

The Fan-tail Warbler is a common summer resident from Honshu southward, particularly along the Pacific coast and the shores of the Inland Sea, in open grassy fields preferably near water. North of Tokyo it begins to be less common; it is rather rare in northern Honshu and has never been taken in Hokkaido. It breeds commonly in the plains-lands and in the dry, grassy river-bottoms around Tokyo, and summers in similar biotopes in the foothills and plateaus up to 3500 feet. It has not been found nesting in Kyushu, but probably does so as it breeds commonly in the Ryukyus. The race of the Chinese mainland, *C. j. tinnabulans*, winters southward to southeast Asia and the Philippines, but the wintering ground of the Japanese subspecies has not yet been determined. It undoubtedly moves southward throughout its range in Japan for, while a few find shelter in the thick scrub of the Kwanto and Kansai areas in winter, it is not nearly so common then as in spring and summer. The central Honshu population increases in late March and April, breeds from May to August, and shrinks again at the end of September or early October.

The male has an interesting song-flight. Starting from its perch on a grass stem, it circles 50 to 100 feet in the air with a series of whistles which change to a guttural *dja-dja-dja* . . . in its gradual, fluttering, descent. It builds a bulky, bottle-shaped nest in meadow grass or in wheat fields, of slender leaves, fine roots, and the cottony flower of *Imperata arundinacea* which it weaves together with spider webs. The eggs number 4 to 6, are white with a reddish or bluish cast, with or without red-brown spots at the larger end, and measure an average 16 x 12 mm.

REGULIDAE

347. Regulus regulus japonensis Blakiston

GOLDCREST, GOLDEN-CROWNED KINGLET

Japanese: Kiku itadaki (chrysanthemum-crown)

Regulus japonensis Blakiston, Ibis, 1862: 320 (Hakodate, Hokkaido).

The Goldcrest is an uncommon summer resident in the fir-hemlock forests above 5000 feet in central Honshu and northward. It is more common as a transient and winter visitor on all the main islands at lower levels, frequently found in company with the bands of titmice, particularly with the Coal Tit. In the Japan Alps according to Kiyosu (Yacho, 1936: 291) it is resident in the subalpine zone from May to August, sings from May to June, nests from May to July, lays in June and July and rears its young in July and August. During the latter part of August it begins to move downward and reaches the lower foothills in October. It is occasionally found in winter near the tree line at 7000 feet. It has been observed frequently in summer in the upper coniferous forest zone at Mt. Daisetsu, Hokkaido, and probably breeds there though concrete proof is lacking. On the Ishikari Plain it is a common transient in October and November and in April and May, and becomes less plentiful in winter when most of the population moves southward to Honshu. Though the species goes south commonly to Kyushu and has strayed as far as Formosa, it is rare in the Ryukyus.

Its nest and eggs have been found in the Japan Alps and at Mt. Fuji, but as yet nowhere else in Japan. The nest is a ball-shaped structure with a lateral entrance, made of moss and bark tied together with spider webs, lined with hair and feathers, usually on an evergreen branch from 10 to 20 feet above the ground. It lays 7 to 8 yellow-white eggs with red-brown spots forming a ring at the larger end, and measuring 13.5–14.7 x 10.5–10.7 mm.

MUSCICAPIDAE

348. Terpsiphone atrocaudata atrocaudata (Eyton)

JAPANESE PARADISE FLYCATCHER

Japanese: Sankocho (autochthonous, means bird of three rays)

Muscipeta atrocaudata Eyton, Proc. Zool. Soc. London, 1839: 102 (Japan).

Muscipeta principalis Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1847: 47, pl. 17E (Japan). (Synonym)

Terpsiphone owstoni "Jouy" Stejneger, Proc. U. S. Nat. Mus., **37**, 1910: 654 (Mt. Fuji, Honshu). (Synonym)

Terpsiphone illex Bangs, Bull. M.C.Z., **36**, 1901: 264 (Ishigaki Id.). (Extralimital)

The 1942 Hand-List refers a few specimens from Kagoshima in extreme southern Kyushu to the slightly larger and darker Ryukyu race, *T.a.illex*. The cline is a gradual, gentle one, and the two races intergrade in southern Kyushu and the northern Ryukyus.

This invader from the oriental tropics is a common summer resident in the sub-tropical forests of Kyushu, Shikoku, and southern Honshu to the latitude of Tokyo. North of that it is less plentiful, but it summers regularly as far as Aomori. Murata (Dob. Zas., 1892: 293) collected a pair near Hakodate in June 1887, but the species has not been found in Hokkaido since. Spring arrivals reach Honshu in early May, nest from late May into August, and leave in September, rarely staying into October. The species migrates southward along the east China coast and winters to Indo-China and Malaya.

It inhabits the forested lowlands and the foothills, and is rarely found above 3000 feet. During migration it appears occasionally in the denser woodlands of the city parks. It builds a small, cup-shaped nest in the fork of a thin branch from five to ten feet off the ground, of moss, bark, and thin stems fastened together with spider webs, and lined with fine rootlets. The eggs number 3 to 5, are white or creamy with brownish spots, and measure 19–21.9 x 14.5–16.5 mm. According to Yamashina (1941: 7) they are incubated by both sexes for 12 to 14 days.

The bird is appreciated and well loved by the Japanese both for its song and for its beauty, as well as for its services as an insectivore. It has a pleasingly querulous and distinctive call-note that sounds like *jouey*, and a three-part song which the Japanese transliterate as "tsuki-hi-boshi" (moon, sun, and stars), very much like that of the Japanese Grosbeak (which see). Its strikingly cobalt-blue bill and thick eyelids are quite conspicuous in the field. The long, trailing tail of the male, more than twice the length of the body, does not attain its full length until the third winter plumage is acquired (Yamashina, *idem*).

349. Muscicapa latirostris Raffles

BROAD-BILLED FLYCATCHER

Japanesi: Ko-samebitaki (small shark flycatcher. "Hitaki" is autochthonous for small members of the flycatcher and chat tribes).

Muscicapa latirostris Raffles, Trans. Linn. Soc. London, **13**, (2), 1822: 312 (Sumatra).

The Broad-billed Flycatcher is a fairly common and widely distributed summer resident, breeding in the light deciduous and mixed woodlands from Hokkaido to Kyushu. Though it may do so, it has not yet been found nesting in Shikoku. Spring migrants reach Honshu in mid April and leave the end of September. The species winters to the Philippines, Borneo, Malaya, Sumatra, Burma, and Java.

Seldom found in the flat lowlands, nor above 5000 feet in Honshu, 3500 feet in Hokkaido, its favored habitat is the sparser forests of the foothills, where it sits erect and still on a high leafy branch, leaving its perch momentarily in short swift dashes at passing insects. It has a habit of snapping its bill, producing a noise like the cracking of a twig that can be heard at some distance in the quiet woodlands. Its song is an unmelodious and undistinctive little warble.

The nest is a small, neat cup well camouflaged with an outer covering of lichens, usually fairly high up, from 10 to 30 feet, in tall trees. The 3 to 5 eggs are bluish gray, with or without brownish spots, and measure 16–18 x 12.5–14 mm. Incubation by the female alone takes 11 to 12 days, according to Yamashina (1941: 20). The young leave the nest 10 to 14 days after hatching, and sometimes two broods are reared. They troop through the woodlands in small family groups previous to migrating in late summer and early fall, the young of the year easily recognizable by the whitish spotting of their body feathers.

350. Muscicapa griseisticta (Swinhoe)

GRAY-SPOTTED FLYCATCHER

Japanese: Ezo-bitaki (Hokkaido flycatcher)

Hemichelidon griseisticta Swinhoe, Ibis, 1861: 330 (Amoy and Taku, China).

This species is of uncertain status in Japan, most probably a regular but not common late spring and early autumn transient. Most of the specimen records are for late May, early June, September and early October. Kiyosu (Yacho, 1936: 196) reports observing it in mid May and late August between 3500 and 4500 feet in the Japan Alps. Nagahisa Kuroda collected one in Miyazaki Prefecture, Kyushu, 1 November 1951. Its known breeding range is from northeastern Manchuria and Ussuria to Sakhalin and Kamchatka. It winters south to the Philippines, Celebes, Moluccas, and New Guinea. Its nest and eggs have never been found in Japan. The Kyushu breeding status given it by the 1942 Hand-List is based on four birds, a pair and two young males collected by Kuroda at Hikosan, Fukuoka Prefecture, 5 September 1918, which could well have been early migrants.

351. Muscicapa sibirica sibirica Gmelin

SIBERIAN FLYCATCHER

Japanese: Same-bitaki (shark flycatcher)

Muscicapa sibirica Gmelin, Syst. Nat., **1**, pt. 2, 1789: 936 (eastern Siberia).

The Siberian Flycatcher is a not uncommon summer resident in the northern islands, breeding southward in limited numbers in the subalpine zone to Mt. Fuji and the Japan Alps. It breeds on the Ishikari Plain in Hokkaido in small numbers, and more plentifully in the fir-hemlock zone on Mt. Daisetsu. Elsewhere in Japan it occurs only as a transient from mid April to early May and from mid September to mid October. Though it has been taken on migration in Shikoku, Tanegashima, Yakushima, and the Ryukyus as well as on the China coast in transit to its wintering grounds in Indochina, Malaya, and the southern Pacific Islands, it has never been recorded from Kyushu.

In habits it is much like *M. latirostris*, perching on high branches and flying out and back after its prey, but it is more partial to evergreen forests. It nests well up in an evergreen, as high as 50 feet, and builds a typical muscicapid nest camouflaged with *Usnea*. It lays 3 to 5 pale blue or greenish eggs with dark cloudy markings, which measure 17.2–18 x 12–13.4 mm.

352. Siphia mugimaki (Temminck)

MUGIMAKI FLYCATCHER

Japanese: Mugimaki (autochthonous, but means wheat-sower)

Muscicapa mugimaki Temminck, Pl. Col., livr. 97, 1835, pl. 577, fig. 2 (Japan).

The Mugimaki Flycatcher has been popular among Japanese aviculturists ever since medieval times, and is well known among the cage-bird dealers as the "ko-tsubame" (small swallow). Nevertheless it is a rather rare transient in Japan, inconspicuous on migration, somewhat irregular in its occurrence, and not often observed. Its main migration route between its northern Siberian breeding grounds and its Malayan and Papuan wintering grounds is farther westward on the continent. It has been recorded, however, from all four main islands. A few pass northward in May, often in company with *S. narcissina*. It is sometimes more plentiful in the autumn flight from late September to November, usually in small family groups of adults with their young.

353. Siphia narcissina (Temminck)

NARCISSUS FLYCATCHER

Japanese: Kibitaki (yellow flycatcher)

Muscicapa narcissina Temminck, Pl. Col., 1835, pl. 577, fig. 1 (Japan).
Muscicapa Zanthopygia Hay, Madras Jour., **13**, (2), 1845: 162 (Malacca).
Muscicapa narcissina jakuschima Hartert, Vög. Pal. Fauna, **1**, 1907: 491 (Yakushima).
Zanthopygia narcissina shonis Kuroda, Bull. B. O. C., **43**, 1923: 107 (Amami-Oshima). (Extra-limital)

The breeding form of Tanegashima and Yakushima, *S.n.jakuschima*, has olivish instead of black upper parts and less orange in the yellow of the breast than the nominate race of the main islands, and is slightly darker than the very similar *S.n.shonis* of the central Ryukyus. The cline runs from darker in the north to lighter in the south, culminating in the still lighter *S.n owstoni* of the southern Ryukyus. The well marked Korean race, *zanthopygia*, which has a white instead of a yellow supraorbital stripe, has been taken once in Nagano Prefecture, Honshu.

This bird is a common and widespread summer resident in the forests from central Honshu northward, a common transient elsewhere. It breeds from the deciduous forests at 1500 feet in the Honshu foothills well into the subalpine evergreens at 5500 feet in the Japan Alps. Its breeding zone loses altitude as it gains latitude; in Aomori the species nests from near sea level to 3500 feet, in Hokkaido from the forests of the plains to about 2500 feet at Mt. Daisetsu. It arrives in Honshu in mid April, in Hokkaido slightly later, and leaves in late October, a few lingering into November. It winters south to the Philippines, Indochina, Malaya, Borneo, Sumatra, and Java.

It is an indefatigable singer, and possesses a pleasant song of a repeated phrase interspersed with flutey whistles, which varies both locally and individually. One of its most common melodies resembles the sound of one of the Japanese cicadas, and is syllabalized by Yamashina (1941: 46) as *O-shin-tsuk-tsuk*. . . . Despite its beauty and its ability as a songster, it is not a popular cage bird, as it does not survive well in captivity.

It builds a nest of dead leaves, moss, and rootlets, usually on a thickly-leaved branch, sometimes in a crotch at the tree trunk, from 5 to 15 feet above the ground. It is known to use man-made nesting boxes occasionally. The clutch usually numbers five cream-colored or pale bluish eggs with small brown spots at the larger end, which measure 16.5–19 x 13.5–14 mm.

354. Siphia cyanomelana cyanomelana (Temminck)
JAPANESE BLUE FLYCATCHER
Japanese: O-ruri (large azure)

Muscicapa cyanomelana Temminck, Pl. Col., livr. 79, 1829, pl. 470 (Japan).

Muscicapa gularis Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1847: 43, pl. 16 (Japan). (Synonym)

Cyanoptila caeruteiceps Momiyama, Ann. Orn. Orient., **1** (3), 1928: 319; **1** (4), pl. 16 (Hachijo). (Synonym)

The Blue Flycatcher is a common summer resident on all four main islands. The spring flight reaches southern Kyushu in early April, middle Honshu in mid or late April, Hokkaido early in May. It leaves in October for its winter quarters in the Philippines, southeast Asia, and the islands south of it. It is a familiar and conspicuous bird, for it is not shy, and the male chooses an open perch on a tree top from which to pour out its lovely, melodious song throughout the breeding season. The song is full and flutey, and consists of repeated descending phrases. Unlike the Narcissus Flycatcher, it is easily kept in captivity on a diet of bran mash, and has long been a favorite cage bird in Japan, both for its beauty and its song.

It is a bird of the low mountain forests, nesting from the foothills up to about 5500 feet in Honshu. In Hokkaido it breeds not too abundantly from the plains up to the lower subalpine zone on Mt. Daisetsu. In the breeding season it lives by preference in rocky, forested valleys, for its favorite nesting site is near the ground in crevices in a rock cliff, or in the tree roots exposed by a mud slide under a trailside bank. It has also been known to build its nest of moss, lichens, and roots on the beams of abandoned dwellings. It lays 4 to 5 white or pale brownish eggs with pale markings at the large end which measure 20–22.5 x 15–17 mm. Incubation is by the female alone, but both sexes rear the young. In September the species wanders through the forests in small family groups, often with the Narcissus Flycatchers, sometimes with the bands of titmice.

PRUNELLIDAE

355. Prunella collaris erythropygia (Swinhoe)

ALPINE, OR ROCK ACCENTOR

Japanese: Iwa hibari (rock lark)

Accentor erythropygia Swinhoe, Proc. Zool. Soc. London, 1870: 124, pl. 9 (north China).

Limited to the rocky summits of the highest peaks in central and northern Honshu, this alpine bird is not uncommon, but is very localized in its distribution. It occurs regularly in summer in the rocks above the tree line between 7000 and 10,000 feet in the Japan Alps, between 8000 and 9000 feet at Mt. Fuji, and at 5000 feet at Mt. Hakkota in Aomori, where Wada (Tori, 1923: 30) found a nest with four eggs in August 1921. It has also been recorded in summer on peaks in the Kiso region, at Nikko, and at Mt. Kurikoma in Miyagi Prefecture. According to Kiyosu (Yacho, 1936: 622) it appears on the summits of the Alps in mid May, breeds in June and July, and disappears in late September. Its winter range is not well defined, but apparently it moves irregularly to lower levels. It is reported to forage for waste food around the weather station at the top of Mt. Fuji throughout the year, but it is generally absent from the snow-covered summits in the winter months. It has been taken in January at 3000 feet near Komoro, Nagano Prefecture, and elsewhere at the foot of the Japan Alps. Nakamura (Choju Hokoku, 1926: 101) tells how three birds appeared at Mitsutoge, at about 5000 feet in Yamanashi Prefecture, on 17 October 1926. Their numbers increased steadily until by December there were several hundred in the vicinity, flying about with a chattering *kyichichi-jiri-jirii*. It is not shy, and gathers closely around summer mountain climbers to feed on the crumbs from their lunches. It makes short, lark-like song flights, and also sings its warbling song from the tops of rocks. It builds its nest of leaves, roots, grass stems, and a few feathers in crevices between the rocks, in which it lays its clear blue eggs. A single egg from Fuji in the Yamashina collection (the only specimen in Japan) measures 23 x 17 mm.

356. PRUNELLA MONTANELLA (Pallas)

SIBERIAN ACCENTOR

Japanese: Yama hibari (mountain lark)

Motacilla montanella Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776: 695 (Dauria).

Prunella montanella badia Portenko, Compt. Rend. Acad. Sci. USSR, May 1929, A, No. 9: 220 (Chokotski Pa., northeast Siberia).

The 27th Supplement to the A.O.U. Check-List (Auk, 1952: 311) recognizes *badia* from northeast Siberia, which on geographical grounds should be the race occasionally reaching Japan. None of the Japanese specimens, however, has been examined for subspecific determination.

This continental species is a rare bird and probably not of regular occurrence in Japan. Several sight records of doubtful validity have been published, but only the following specimens have been recorded:

Hokkaido		undated	Hatta & Murata (1905)
"	, Sapporo	20 Mar. 1899	Yamashina coll.
Honshu, Akita		1937	Norinsho coll.
"	Nagano, Shinano	undated	Matsudaira coll. (Tori, 1915: 68)
"	Tottori, Yonago	7 Jan. 1936	Kuroda coll.
"	"	27 Nov. 1942	Yamashina coll.

357. PRUNELLA RUBIDA (Temminck & Schlegel)

JAPANESE ACCENTOR

Japanese: Kayakuguri (kaya is a dwarf yew, kuguri one who goes through)

Accentor modularis rubidus Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1850: 69, pl. 32 (Japan).

Accentor fervidus Sharpe, Cat. Bds. Brit. Mus., **7**, 1883: 653 (Hakodate).

P.r.fervida of Hokkaido and the Kuriles is a shade darker above and below than the nominate race of Honshu. The difference between the two subspecies is very slight, but the break is sharp at Tsugaru Straits and there is no apparent cline or intergradation between them.

Endemic to the Japanese Islands, this accentor is a common resident from the highlands of central Honshu northward through Hokkaido to the southern Kuriles. It moves slightly southward in winter throughout its range, as well as to lower altitudes, the Honshu birds migrating to western Honshu and northern Kyushu, but the northern population does not seem to cross Tsugaru Straits. The species has been taken in Shikoku only once, at Ehime, 14 February 1937.

In summer it ranges below the haunts of *P.collaris* on the rocky summits, and is most plentiful in the zone of dwarfed pines and birches. It reaches these altitudes in early April, but waits for warmer weather in June and July to breed. It sings at its best in these months, and the inconspicuous trill it utters from its perch atop a dwarf pine greets the first climbers of the season through the wet morning fog on the Alps. In the autumn it starts moving downward, and by mid November is working through the *Sasa* underbrush of the foothills singly or in small groups. In midwinter it sometimes reaches the shrubby hillsides near sea level, particularly in Hokkaido and northern Honshu, but it never comes out onto the plains, and during the hardest winters it is usually encountered feeding on the ground along the hillside trails of the foothills until the first sign of spring urges it to move upward again toward the peaks.

It builds a solid, cup-shaped nest of mosses, leaves, and lichens, from two to six feet up in a dwarf evergreen. It lays 3 to 4 eggs, dark blue in color, which measure 18.5–20.7 x 13.8–15.2 mm.

MOTACILLIDAE

358. Anthus novaeseelandiae richardi Vieillot

RICHARD'S PIPIT

Japanese: Mamijiro tahibari (white-eyebrowed paddy-lark)

Anthus Richardi Vieillot, Nouv. Dict. Hist. Nat., **26**, 1818: 491 (France).

A single undated specimen in the Momiyama collection taken on Hachijo in the Izu Islands is the only record of this continental species for Japan.

359. ANTHUS HODGSONI Richmond
ORIENTAL TREE PIPIT
Japanese: Binzui (autochthonous)

Anthus hodgsoni Richmond, Publ. Carn. Inst. Wash., **54**, 1907: 493 (China, nom. nov. for *A. maculatus* Jerdon, preoccupied).

Anthus maculatus yunnanensis Uchida & Kuroda, Ann. Zool. Jap., **9**, 1916: 134 (restricted type locality, Yunnan).

True *A.h.yunnanensis* is a pale northern form breeding in eastern Siberia from Kolyma to Tomsk, south to the Altai, Baikal, Transbaicalia, Amuria, and Ussuria, and along the coast from Kamchatka to Sakhalin and the Kuriles. It is lighter above and more thinly streaked below than the nominate form of Honshu and Korea, and occurs in Japan only on migration and in winter. The cline is gentle and the intergradation between the two complete. Hokkaido breeding birds are somewhat intermediate, but closer to the darker southern form.

The Oriental Tree Pipit is a fairly common bird in Japan. It breeds from central Honshu northward in the subalpine and alpine zones between 5000 and 9000 feet in the Japan Alps, from 2500 to 5000 feet in northern Honshu, and from 1000 to 4000 feet in Hokkaido. It is a common transient in the lowlands of all the main islands, and winters in small numbers from the central Honshu plains southward, though most of the population migrates to the Philippines and southeast Asia. The small wintering population in southern Japan is increased by arrivals from the south in March and April, and starts moving upward into the mountains. The species breeds in Honshu from May through July, and leaves the breeding grounds in September. It has not yet been demonstrated to nest in Shikoku, but Kiyosu (Yacho, 1949: 138) found it in late June on a grassy plain 6000 feet up on Mt. Tsurugi, where he presumed it was nesting.

Unlike most other pipits, this species prefers the thin woodlands and is seldom found in open country. On migration it moves through the sparse open stands of mixed deciduous and evergreen trees in small bands of two to ten birds, feeding on the ground and flying up into the low branches when disturbed. The male sings in breeding season a short, lark-like song both from an exposed perch on a tree top and in a short, fluttering song-flight. It nests on the ground, under vegetation at lower levels, frequently under rocks above the tree line. The nest is made of dead leaves and pine needles, and lined with roots and hair. It lays 3 to 5, rarely 2 to 6, dark blue to white eggs with variable spottings of brown and purple, and which measure 18–23 x

14.5–16.5 mm. According to Jahn (1942: 107) it raises two broods annually in Honshu.

360. Anthus cervina (Pallas)
RED-THROATED PIPIT

Japanese: Muneaka tahibari (red-breasted pipit)

Motacilla cervina Pallas, Zoogr. Rosso-Asiat., **1**, 1811: 511 (Siberia).

The Red-throated Pipit breeds in the arctic zone of continental Eurasia from Scandinavia to Kamchatka, but its migration is almost entirely continental and it is of very rare occurrence in Japan. The only records are an undated bird taken on Hachijo in the Izu Islands (Momiyama collection), and another without data from Sado Island in the former Taka-Tsukasa collection. The species is of casual occurrence on other islands off eastern Asia. It has been taken several times in the Kuriles, and on the Bonins, Ryukyus, Borodinos, and Quelpart.

361. Anthus spinoletta japonicus Temminck & Schlegel
WATER PIPIT

Japanese: Ta hibari (paddy lark)

Anthus pratensis japonicus Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1847: 59, pl. 24 (Japan).

This race of the Water Pipit breeds across northern Siberia from the Lena River to Kamchatka, and south to Sakhalin and the Kuriles. It is a common transient in Hokkaido and northern Honshu, and winters equally commonly from the Kwanto Plain southward and westward to coastal China. It arrives in Honshu in late October and November, and leaves for the north again in late March, a few stragglers sometimes remaining behind until May. As its Japanese name implies, it is most often encountered foraging over the bleak rice lands of winter, usually in small flocks of from 10 to 50 birds. It feeds also in cultivated fields, and is found frequently on the beaches near the river mouths, gleaning insects and small marine life from the line of seaweed at high tide mark.

362. Motacilla alba lugens Gloger
PIED WAGTAIL
Japanese: Haku sekirei (white wagtail)

Motacilla lugens Gloger, Isis, 1829: col. 771 (Kamchatka).
Motacilla leucopsis Gould, Proc. Zool. Soc. London, 1837: 78 (India). (Extralimital)
Motacilla japonica Swinhoe, Ibis, 1863: 309 (Japan). (Partim)
Motacilla blakistoni Seebohm, Ibis, 1883: 91 (Japan). (Synonym of *lugens*)
Motacilla mutabilis "Blakiston" Stejneger, Proc. U. S. Nat. Mus., **15**, 1892: 305 (Hokkaido, *ex* Blakiston ms.). (Synonym of *lugens*)

The Korean race, *M.a.leucopsis*, which lacks the black eye-stripe of *lugens*, has been taken once on Hachijo (Momiyama coll.), once on Tsushima (1942 Hand-List), and once at Kagoshima, Kyushu, 26 March 1951 (Nagahisa Kuroda coll.).

The Pied Wagtail breeds commonly in northern and eastern Hokkaido, less commonly in southern Hokkaido and in extreme northern Honshu. Small numbers winter from southern Hokkaido south along the coasts of the main islands, but most of the population moves on to the Ryukyus, the China coast, and Formosa. The first migrants appear in central Honshu in late September. Their numbers increase through October, and decline in November as the flight passes on, but a few birds remain through the winter and join the return flight in late March and early April. Its season in southern Kyushu is from November to March. Returning birds reach Hokkaido in late March, and nest there from May through July. It is occasionally found inland, but it is much more a coastal bird than the Japanese Wagtail, both in its breeding and on its wintering grounds.

Its nest, eggs, and breeding habits are identical to those of *M.grandis*, and it is much the same bird in its general actions, a black and white bird with a long tail flitting along the beaches and watercourses with a sharp, metallic, two-syllable call and alarm note, *tzit-tzit*, which is generally considered less metallic and harsh than the notes of *grandis*, but can be recognized as different only with difficulty by the average ear.

363. Motacilla grandis Sharpe
JAPANESE WAGTAIL
Japanese: Seguro sekirei (black-backed wagtail)

Motacilla grandis Sharpe, Cat. Bds. Brit. Mus., **10**, 1885: 492 (Japan).

Motacilla lugubris Temminck, Man. d'Orn., **3**, 1835: 175 (Japan). (Preoccupied)
Motacilla japonica Swinhoe, Ibis, 1863: 309 (Japan). (Partim)

This endemic form is given full specific rank because its breeding range overlaps that of *M.a.lugens* in northern Honshu and Hokkaido, and no interbreeding or intergrading occurs. Nonetheless in morphology, habits, and all other characteristics it differs no more from the various strongly marked races of *M.alba* than they do from one another.

The Japanese Wagtail is a common and conspicuous resident on all the main islands, one of the most familiar and best-known birds in Japan. Never found far from water, its habitat is nevertheless extensive, from the open coastal beaches, particularly near the river mouths, through the paddies of the cultivated plains, and up the rivers of the foothills to the open lands around the highland lakes in summer. It is especially common along the dry, boulder-strewn river-bottoms of the lowlands, and flits tamely around the fishing villages along the shores. In central Honshu its maximum altitude is about 4500 feet, and it is never found along the wooded mountain streams where *M.cinerea* dwells.

It breeds on all the main islands, north commonly to southern Hokkaido, less plentifully in central and northern Hokkaido. A few occasionally winter near open waters in southern Hokkaido, but it is usually absent north of Miyagi Prefecture, Honshu, from mid October to late March. It is common at all seasons in the lowlands from the Kwanto Plain southward, and is generally considered a permanent resident, but individuals probably migrate somewhat southward throughout the species' range. It has been taken in south Korea, the Ryukyus, in coastal China, and casually to Formosa.

It has a long breeding season, from mid March through July in central Honshu, and is probably multi-brooded. It is a ground nester, building its coarse but fragile nest of straw, grasses, and roots, lined with hair, feathers, and bits of paper and rags usually in the stones along a watercourse, occasionally under a fallen log or grass clump, and sometimes in the crumbled thatched roof of a deserted house. It lays 5 to 6 eggs, rarely 7, of a dirty white ground color spotted with brown, and measuring 19.5–23 x 16–17 mm.

364. Motacilla cinerea caspica (S. G. Gmelin)

GRAY WAGTAIL

Japanese: Ki sekirei (yellow wagtail)

Parus caspicus S. G. Gmelin, Reise d. Russl., **3**, 1774: 104, pl. 20, fig. 2 (south coast of the Caspian Sea).

Pallenura robusta Brehm, Jour. f. Orn., 1857: 32 (Japan). (Synonym)

The Gray Wagtail is common and widely distributed throughout Japan. Seldom found far from water, its favorite haunts are the middle and upper reaches of the rivers. It works farther inland up the watercourses than the other wagtails, and a pair or family group occupies almost every small mountain stream below the subalpine zone in breeding season. It breeds from the edge of the plains up to about 4500 feet in the mountains, and occurs even higher in summer up to 9000 feet. It winters in the lowlands from northern Honshu southward to the Philippines, southeast Asia, and through the East Indies to New Guinea. Despite the far southward trek made by many individuals, the species ranges widely in the Honshu foothills and throughout the lowlands in fall, winter, and spring, and is always present except in the colder and higher areas. It feeds in winter in the marshes and cultivated fields as well as along the waterways, and its sibilant, two-syllable call note, somewhat thinner and sharper than that of the other two species, is a familiar sound in the city parks and gardens as well as farther afield.

In Hokkaido its season is from late April to mid October, and it breeds in June and July. Farther south on Honshu it nests earlier, starting in April. It has not yet been proved to breed in Shikoku or southern Kyushu. In the rural villages, where it frequently nests in the eaves of the thatched roofs, it is quite tame and friendly, and can often be approached within a few feet. It also nests on the ground between the rocks along streams, sometimes in the shelter of a hollow tree, occasionally in the lower branches of a small evergreen. It builds a simple nest of dead leaves, grasses, mosses, and roots, and lined with hair and feathers, which it makes no great effort to conceal. It lays 4 to 6, rarely 7, heavily spotted brownish eggs, which measure 17–21x 13.2–15.5 mm. The incubation period is about 14 days, the male occasionally assisting in the brooding as well as rearing of the young.

365. Motacilla flava simillima Hartert
YELLOW WAGTAIL

Japanese: Mamijiro tsumenaga sekirei (white-eyebrowed long-clawed wagtail)

Motacilla flava simillima Hartert, Vög. pal. Faun., **1**, 1905: 289 (Kamchatka, Korea, China, etc.).

The Yellow Wagtail is known in Japan only by the specimens listed below. The 1942 Hand-List refers them to the northeastern race:

Honshu, Tokyo	(2)	15 Dec. 1900	Ogawa, K. (Dob.Zas.,1901: 90–93)
" " Musashi		Nov. 1890	Ogawa, M. (Dob. Zas., 1901: 214)
" Shizuoka, Suruga		14 Sep. 1894	" "
" Shiga, Yamashiro		undated	" (1908)
Izu. Ids., Hachijo	(2)	undated	Momiyama coll.

366. Motacilla indica Gmelin
FOREST WAGTAIL
Japanese: Yokofuri sekirei (sideways-swinging wagtail)

Motacilla indica Gmelin, Syst. Nat., **1**, 1788: 962 (India).

Ogawa (Dob. Zas., 1905: 11–17) reports a single specimen of this continental species taken at Abe-gun, Shizuoka Prefecture, Honshu, 10 October 1905. There is also an undated specimen from Hachijo, Izu Islands, in the Momiyama collection.

BOMBYCILLIDAE

367. Bombycilla garrulus centralasiae Poljakov
BOHEMIAN WAXWING

Japanese: Ki renjaku (yellow waxwing; 'renjaku' is autochthonous, but means flocking sparrow)

Bombycilla garrulus centralasiae Poljakov, Mess. Orn., 1915: 137, 138 (Altai, Turkestan).

The Bohemian Waxwing is an uncommon winter visitor, very irregular in its occurrence and distribution. It is somewhat more abundant in Hokkaido than the following species, and winters fairly regularly on the Ishikari Plain from December to March. In the southern islands it is usually less plentiful than *B. japonica*. In central Honshu it tends to remain more in the highlands. Kiyosu has recorded it in the mountains of Tochigi Prefecture from November to April, most commonly in February. It has been taken in Shikoku, and as far south as the Izu and Bonin islands. Small numbers visit Kyushu erratically, perhaps from the Korean Peninsula. Its habits in Japan are identical to those of the Japanese Waxwing.

368. Bombycilla japonica (Siebold)
JAPANESE WAXWING
Japanese: Hi renjaku (red waxwing)

Bombicivora japonica Siebold, De hist. nat. in Japon statu etc., 1824: 13 (Higo and Chikuzen = Kumamoto and Fukuoka prefs., Kyushu, Japan).
Bombycilla phoenicoptera Temminck, Pl. Col., **2**, 1827, pl. 450 (Japan). (Synonym)

Although slightly more abundant than the preceding species, except in Hokkaido where it is usually less plentiful, the Japanese Waxwing is not a common bird anywhere in Japan. It is a winter visitor only and, like waxwings the world around, is most irregular in its comings and goings. Its nomadic movements cannot be predicted, and some years it does not visit Japan at all. It has been taken several times in Ishikawa Prefecture in mid October, but appears more often between late November and early April. The latest spring record is 18 May, Nagano Prefecture (Kiyosu). Waxwings seem to reach Japan in three separate groups by three separate routes from the mainland, the first to Hokkaido either via Sakhalin or across the northern part of the Sea of Japan, the second crossing the Japan Sea from Ussuria to central Honshu, the third via the Korean peninsula to Kyushu. They are usually encountered in small flocks of from 10 to 40 or 50 individuals in the open woodlands. They are not overly shy, and sometimes visit the parks in cities and towns. They feed mainly on various berries, and are particularly fond of those of the mistletoe.

LANIIDAE

369. Lanius excubitor Linné
GREAT GRAY SHRIKE
Japanese: O mozu (large shrike)

Lanius excubitor Linné, Syst. Nat., ed. 10, **1**, 1758: 94 (Sweden). (Extralimital)
Lanius excubitor bianchii Hartert, Vög. pal. Fauna, **1**, 1907: 424 (Sakhalin).
Lanius mollis Eversmann, Bull. Soc. Imp. Nat. Moscou, **26**, 1853: 498 (s. Altai).

The Hokkaido specimens of this species are all *L.e.bianchii*, the lighter, less buffy, less barred race of Sakhalin. The Nikko specimen in the AMNH, however, is darker-backed and more heavily barred below, and referable to the mainland race, *L.e.mollis*. Yamashina (Tori, 1930: 244–245) says the other known Nikko specimen in the former Kuroda collection, and the Taka-Tsukasa specimen from Kyushu are also *mollis*, which apparently reaches the southern islands occasionally from the Altai.

The Great Gray Shrike is an uncommon but fairly regular winter visitor to Hokkaido from its Sakhalin breeding grounds; the mainland population is a rare and perhaps accidental visitor to the southern islands. In Hokkaido, Murata (Dob. Zas., 1902: 403) wrote, "It is seen rarely on the plains in late autumn, and in the woods in early spring, but is never plentiful. It is a bold bird and swift, and preys on small birds. It is often caught in the mist-nets when it comes to eat the decoys. Its food consists mainly of shrews and insects." Possibly from the attentions of the mist-netters, it is no longer as common as it was apparently at the turn of the century. Wada (Tori, 1922: 130) lists it as occurring rarely at Aomori, but there are no specimen records or other sight records for northern Honshu. The known specimens are:

Hokkaido		undated	Sapporo Mus.
"	Chitose	2 Nov.	" "
"	Sapporo	9 Sep.	" "
"	"	Nov. 1894	Murata (Dob. Zas., 1902: 403)
"	"	Sep. 1898	" "
"	"	10 Jan. 1907	AMNH, *ex* Sapporo Mus.
"	Hakodate	1873	Seebohm (Ibis, 1884: 37)
"	"	Mar.	AMNH, *ex* Blakiston
"	Tomakomai	31 Dec. 1947	MCZ
"	"	4 Feb. 1948	"
"	Iburi	20 Jan. 1915	Kuroda coll.
"	"	12 Feb., 26 Mar.	Yamashina coll.
Honshu, Nikko		undated	AMNH, *ex* Owston
"	"	undated	Kuroda coll.
Kyushu		undated	Taka-Tsukasa coll.

370. Lanius sphenocercus sphenocercus Cabanis

CHINESE GRAY SHRIKE

Japanese: O kara mozu (large shrike of old China)

Lanius sphenocercus Cabanis, Jour. f. Orn., 1873: 76 (Canton, China).

Although it is a not uncommon winter visitor nearby in Korea, the Chinese Gray Shrike has been known to reach Japan only five times, as follows:

Honshu, Kyoto, Inaba		undated	1932 Hand-List
"	Hyogo, Kobe	11 Feb. 1889	Yamashina coll.
Shikoku, Ehime, Sukumo		Jan. 1920	Fujita (Tori, 1921: 92)
Tsushima		undated	Tsushima school coll. (Ibis, 1922: 97)
Hyogo, Kozaki-gun		winter, 1935	H. Kobayashi coll.

371. Lanius bucephalus bucephalus Temminck & Schlegel
BULL-HEADED SHRIKE
Japanese: Mozu (autochthonous)

Lanius bucephalus Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1844: 39, pl. 14 (Japan).

The Bull-headed Shrike is a very common and conspicuous bird in open country throughout Japan, and a permanent resident except in the north and at high altitudes. It breeds commonly in the plainslands on all the main and most of the lesser islands, and frequently in city parks and gardens. In Honshu it extends its range in spring up into the mountains where it occupies clearings in the forest, and nests from May to August. Its normal altitudinal limit is the upper subalpine zone at about 5000 feet, but it has been observed considerably higher, at almost 9000 feet in the Alps. It descends to lower levels again in September. In Hokkaido its season is from mid April to late October. A bird banded near Tokyo in April 1935 was recaptured in October 1938 in the same village.

It is a very early nester, and starts breeding in southern Honshu in late February, later to the northward and at higher altitudes. As nesting continues into early August, perhaps it rears more than one brood. Despite its ferocity it is frequently parasitized by the Common and Oriental Cuckoos. It builds a large, rough, bulky nest of twigs, bark, leaves, and moss, lined with hair and rootlets, usually from 5 to 15 feet up in a dense thicket of shrubbery or bamboo. The clutch numbers 3 to 6 eggs measuring 19.5–25.8 x 16–18.8 mm., dirty white, rarely pale red brown in ground color, with gray-brown spottings heaviest at the larger end. Incubation is by the female alone and lasts 14 to 15 days. The young leave the nest about two weeks after hatching.

During the breeding season these shrikes are very quiet, and go about their business inconspicuously, but by September they become extremely vocal, and announce the oncoming autumn by their constant, noisy chattering. Quite sensitive to the weather, they sing but little when it is overcast and wet, and are noisiest during cool, fine days. While singing from the usual conspicuous perch on a wire or the top of a tree or shrub, they move their tails actively as though balancing themselves. Their usual call is a series of unmelodious cries and rattles, *ju-ju-ju* . . . or *gi-gi-gi* . . . , but they have a wide range of expression, and are quite skillful at imitating the calls of other species.

In winter they are almost always in evidence in the farm lands and rice paddies of the plains, frequently the only birds to be seen. They never occur in flocks, and seldom even in pairs until late winter and early spring, but the single birds are scattered evenly all over the open lowlands. They are believed to stake out individual hunting territories, each bird occupying about ten acres. They perch conspicuously on telephone wires where they are easy to see, and their characteristic undulating flight, with a steep climb on rapid wing-beats between gliding swoops is unmistakable even at a distance.

Their main food consists of insects, preferably the larger crickets, grasshoppers, dragonflies, and locusts. When these become scarce in cold weather they attack smaller birds such as the Meadow Bunting and Greenfinch, sometimes species larger than themselves, and have been known on rare occasions to kill thrushes and cuckoos. They impale their excess kill on thorns and frequently on barbed-wire fences against a hungrier day. Their well-known habit of establishing larders while food is plentiful to eat later when it is scarce has been studied extensively. Mishima (Tori, 1948: 90–91) records one shrike making 68 such caches, another 48 during the autumn and early winter, and consuming them gradually during January and February.

372. Lanius tigrinus Drapiez

TIGER SHRIKE

Japanese: Chigo mozu (child shrike)

Lanius tigrinus Drapiez, Dict. Class. Hist. Nat., **13**, 1828: 523 (Java).

This dainty little shrike is a not uncommon summer resident locally in northeastern Honshu from the Kwanto Plain to Aomori. It has been collected on Tangashima and Yakushima and seen in southern Kyushu on migration, but has never been taken elsewhere in Japan than on its limited breeding grounds. It arrives in Honshu in mid May, nests in June and July, and disappears in early September. It winters to Malaya, Sumatra, Celebes, and Borneo.

Though it has been found at 3500 feet in the mountains, it is essentially a dweller of the more open mixed forests of the lowlands and the foothills below 2500 feet. It is sometimes seen perched on telephone wires in the plains, and is partial to the outskirts of woods where it can hunt along their edges. It is not uncommon in suburban Tokyo. A pair perched day after day every summer on the telephone wire across my lawn in Shibuya watching for an insect to show itself, and Yamashina (Tori, 1947: 2) writes that it nested on the grounds of his museum for ten successive years.

Its diet so far as known is almost entirely small insects. It builds a typical shrike nest, rather crude and bulky, usually fairly high up in a large tree. It lays 3 to 6 eggs, white with a faint wash of red, with purple-brown markings at the larger end, and measuring 21–24.7 x 16.2–18.8 mm.

373. Lanius cristatus superciliosus Latham
RED-TAILED SHRIKE

Japanese: Aka mozu (red shrike)

Lanius superciliosus Latham, Ind. Orn. Suppl., 1801: xx (Batavia, Java).

The Red-tailed Shrike is a fairly common summer resident from southern Hokkaido to south-central Honshu. In Hokkaido it is confined to the plains and lower foothills, but it increases its altitudinal range to the southward. Although it nests regularly within the city limits of Tokyo, it is not common on the Kwanto Plain, and is more plentiful along the edges of the broken mixed forests on the cooler plateaus of central Honshu between 1500 and 2500 feet, occasionally reaching 3000 feet. The vanguard of the spring flight arrives in Honshu in early April, but it does not reach its maximum abundance until May. Eggs have been found at the base of Mt. Fuji in late April, but its main breeding season is from late May to July. It leaves for the south in late August and early September, migrating through eastern China to southeast Asia, the Philippines, Malaya, Sumatra, and Java.

Much commoner and wider ranging than *L.tigrinus*, it is not nearly as plentiful as *L.bucephalus*. It is a slenderer bird than the latter, and can be recognized at once by its white forehead and underparts. Rather silent during its season in Japan, its voice is not as harsh and raucous as that of the Bull-headed Shrike. Otherwise its habits are very similar. It has the same propensity for sitting on electric wires. Its nest is of the same type, perhaps slightly smaller. Its eggs differ only in having larger markings. The clutch numbers 4 to 6 eggs, and they measure 19.5–25.9 x 15.3–18.3 mm. It almost never preys on small birds in Japan but feeds largely on insects.

STURNIDAE

374. Sturnus cineraceus Temminck

ASHY STARLING

Japanese: Mukudori (bird of the muku tree, *Aphananthe aspera*)

Sturnus cineraceus Temminck, Pl. Col., livr. 194, 1835, pl. 556 (Japan).

The Ashy Starling is one of the commoner birds of the cultivated lowlands, an inhabitant of the villages and farm lands, often seen in the cities and seldom found far from cultivation. It breeds on all the main islands and winters from north-central Honshu to south China.

The breeding season begins fairly early. In central Honshu birds start gathering nesting material in late March. Nesting continues normally through June, and a few pairs rear late or second broods into mid July. Like most starlings it is a hole-nester, and builds a loose bulky pad of anything at hand — dead leaves, straw, scraps of paper, sticks, feather, hair — in hollow trees, nesting boxes, under the eaves of buildings, and in the ornate tile roofs and cornices of temples. It lays 4 to 9 pale blue eggs measuring 26.8–32.3 x 19.5–22 mm. Incubation is mainly by the female, the male assisting occasionally, and takes 14 to 15 days. The young leave in another 13 to 15 days.

When the young are on the wing, anytime after late June, the Ashy Starlings start moving about in small family groups and gather to roost toward evening in wooded groves, frequently on temple grounds, in steadily enlarging companies, chattering inconspicuously but incessantly a monotonous, creaking *chir-chir-chay-cheet-cheet* which is delivered without the usual starling wing-quivering. The southward movement starts in Hokkaido and northern Honshu in late September, and by November very few remain north of Miyagi Prefecture. Farther south the autumn flocks, augmented by influxes from the north, move out into the open marshes and barren paddies, scattering by day to feed in small groups of 10 to 50, gathering to roost at night sometimes in phenomenal swarms. At one roost in the marshes bordering Lake Tega, Chiba Prefecture, they gather in countless thousands nightly during December and January, and rise in a cloud at dawn to forage over the dormant rice fields. The wintering flocks start to break up in late February as the birds pair off and leave for their breeding grounds.

They eat some berries and fruit, but are essentially insectivorous. As they are one of the few species to eat the rice stem-borer in quantity, they are a decided asset economically, and have been protected under the game laws since the 1920s. Nevertheless they appear regularly and in quantity in the Tokyo markets. When plucked they are cooked and sold as thrushes, and taste about the same when grilled with soy sauce.

375. Sturnia philippensis (Forster)
RED-COLLARED STARLET
Japanese: Ko mukudori (little starling)

Motacilla philippensis Forster, Indian Zool., 1781: 41 (Philippines).

The Red-collared Starlet breeds only in northern Japan. A common summer resident in Hokkaido and northern Honshu, it is a common, at times abundant transient farther south. The spring flight is not especially marked. The species arrives in southern Japan in late March, and in April moves up the lowlands of southern Honshu in small flocks of 20 to 50 birds, feeding in transit in the orchards and cultivated fields. The latter part of the month some climb up into the highlands of central Honshu to find suitable breeding grounds between 3000 and 5000 feet, more push on to Hokkaido where they nest at sea level and in the low foothills.

On the breeding grounds they are exclusively inhabitants of the deciduous and mixed woodlands, and become tree rather than ground feeders. They consume some fruit, but their diet is now mainly insectivorous and they are especially fond of beetles. They nest in hollow trees, lining the cavity with grasses and leaves, and laying 4 to 6, rarely 3 to 7 deep blue eggs which measure 23–25.5 x 17–18 mm. According to Yamashina (1933: 65) the incubation is by the female alone and takes 13 to 14 days.

The starlets start moving down the mountains and southward in late August. They travel down through Honshu in September in small, not particularly noticeable bands, a few remaining into October. By the time they reach Kagoshima Prefecture in southern Kyushu they congregate in immense flocks (Okajima, Choju Iho, 1933: 607–617) to await the right moment to take off southward on their first "water hop." The waiting birds swarm in tens of thousands at dawn and dusk in noisy clouds which are known locally as "bameki" (from "wameki," a clamoring). These flocks are at their peak in mid September, and gradually decrease as the birds leave from then on. They migrate through the Ryukyus (first arrivals reach Ishigaki in early October) and down the China coast to winter in the Philippines, Borneo, Celebes, and Java. Their notes are much like those of the preceding species, but higher pitched and thinner.

376. Sturnia sinensis (Gmelin)

CHINESE STARLET

Japanese: Kara mukudori (starling of old China)

Oriolus sinensis Gmelin, Syst. Nat., **1**, 1788: 394 (China).

As the Chinese Starlet is imported fairly frequently in the cage bird traffic, the four specimens taken wild in Japan may have been escapes from captivity. However, they could just as well have strayed from the Chinese mainland — like other birds they have wings — and there is no evidence they did not. All four specimens are in the Yamashina Museum: two taken near Tokyo 10 February 1889 (Dob. Zas., 1891: 408); one collected in Ibaraki Prefecture 11 December 1934; and the fourth from the Momiyama collection shot at Iwatsuki, Saitama Prefecture, 10 December 1934.

ZOSTEROPIDAE

377. Zosterops japonica Temminck & Schlegel

JAPANESE WHITE-EYE

Japanese: Mejiro (white eye)

Zosterops japonicus Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1848: 57, pl. 22 (Japan).

Zosterops stejnegeri Seebohm, Ibis, 1891: 273 (Hachijo, Izu Ids.).

Zosterops palpebrosa ijimae Kuroda, Tori, **1** (5), 1917: 4, pl. 6, fig. 3, text fig. 2, No. 3 (Tsushima).

Zosterops palpebrosa insularis Ogawa, Ann. Zool. Jap., **5**, 1905: 186 (Tanegashima and Yakushima).

Zosterops palpebrosa yesoensis Nagahisa Kuroda, Bull. Biogeogr. Soc. Jap., **15**, 1951: 5 (Muroran, Hokkaido).

Zosterops palpebrosa ohsimensis Momiyama, Bull. Biogeogr. Soc. Jap., **1**, 1930: 172, footnote (Oshima, Izu Ids). (Synonym of *stejnegeri*)

Z.j.japonica ranges widely over the main islands from northern Honshu through Shikoku to eastern and southern Kyūshu. The Izu Island population, *Z.j.stejnegeri* has a consistently larger bill. *Z.j.insularis* of Tanegashima and Yakushima has a deeper yellow throat and presages the color cline which becomes progressively darker through the several races recognized down the Ryukyu chain to Formosa. *Z.j.ijimae* of northwestern Kyushu and the islands of the Korea Straits is slightly larger and paler throated then nominate *japonica*. The small Hokkaido population, for which *yesoensis* has been proposed, differs from *japonica* in being darker on the upper parts, lacking the buffy wash on the flanks, and having lighter yellow under tail coverts and throat patch. It was described from a single specimen, a female taken at Muroran 19 May 1950, but the small USNM series from Hakodate, though they are very old skins and possibly faded (May 1854, November 1883, and December 1885), agree with the diagnostic criteria on comparison with a large series from Honshu.

The Japanese White-eye is a common resident in the subtropical parts of Japan, found throughout the year from Tokyo southward. In northern Honshu and southern Hokkaido it is a summer resident from April to November, less common in northern Honshu, rather rare in Hokkaido. In central Honshu it breeds in the foothills below 3000 feet, and moves out to the plains in winter. Probably some seasonal movement occurs throughout the species' range, except among the populations endemic to small islands.

The nesting season in Honshu lasts from April to July. Full grown young have been found in early May, and eggs still being incubated in August, so possibly more than one brood may be raised annually in the southern areas. The species builds a dainty nest of mosses and bark, lined with hair and fastened with spider webs in a horizontal fork of a branch in the undergrowth, from three to ten feet up. It lays 4 to 5, rarely 6, bluish-white eggs which measure 15.5–17.5 x 12–13 mm.

Immediately after the breeding season it starts to wander through the deciduous woodlands of the foothills in small bands, possibly family groups, frequently in company with the titmice, and uttering its characteristic, thin *tsee, tsee* as it actively gleans small insects from bush to bush in the underbrush. It is very fond of ripe persimmons in the fall, and gathers in the gardens of the country houses to pick at them both on the tree and on the drying racks. In winter it works through the mixed woods of the lowlands in the same small troops. In spring it feeds frequently on flower nectar, and visits the camellias, cherry blossoms and other flowers. At this time it begins to sing its sweet and melodious little song, which is quite varied, and sometimes includes imitations of other species.

The Mejiro is a familiar and well-loved bird to the Japanese. It appears often in Japanese art, traditionally painted with the camellia flowers whose nectar it sips in the spring. Its cheerful song in spring and the ease with which it is kept in captivity on a mash diet account for its extreme popularity as a cage bird. In captivity the birds frequently sit on a perch touching each other side by side, a habit seen occasionally in the wild, and the source of the Japanese idiom "mejiro-oshi" or "white-eye huddle." The professional netters supply the pet shops and bird stalls with a continuous supply of White-eyes from the wild, but the traffic has not seemed to affect their abundance seriously. They are too small and too difficult to net in large quantities to be used as food.

PLOCEIDAE

378. Passer montanus (Linné)

TREE SPARROW

Japanese: Suzume (autochthonous)

Fringilla montana Linné, Syst. Nat., ed. 10, **1**, 1758: 183 (north Italy). (Extra-limital)

Passer montanus saturatus Stejneger, Proc. U. S. Nat. Mus., **8**, 1885: 19 (Ryukyus).

Passer montanus kaibatoi Munsterhjelm, Nyt. Mag. Nat. v. Kristiania, 1916: 170 (Sakhalin).

Passer montanus orientalis Clark, Proc. U. S. Nat. Mus., **38**, 1910: 69 (Hakodate and Korea). (Type loc. restricted by Deignan (1952, 171) to Korea, throwing *dybowskii* Dom. into synonymy.)

Passer montanus sititoi Momiyama, Kag. nog., **20**, 1940: 5 (Izu Ids., no type established). (Synonym of *saturatus*)

Passer montana rikuzenika Kumagai, Ann. Orn. Orien., **1**, (3), 1928: 272 (Wakayanagi, Miyagi Prefecture). (Synonym of *saturatus*)

The Tree Sparrow cline runs from lighter in the north to darker in the south. The dividing line arbitrarily established between the two recognized races in Japan is Tsugaru Straits. *P.m.kaibatoi* of Hokkaido and northward is very slightly paler than *P.m.saturatus* which breeds from northern Honshu southward through the main and satellite islands to the central Ryukyus.

The Tree Sparrow is the "house" sparrow of Japan, a weed species abundant in and near every city, town, and village, resident throughout its range, and by far the commonest bird in Japan. It starts breeding in Kyushu in February, in Honshu in March, and in Hokkaido in April. Nesting continues through July and it normally raises two broods annually, sometimes three in the south. The nest is usually built under the eaves or in the thatch of dwelling roofs, rarely in hollow trees or stone crevices, and it usurps nesting boxes from the more desirable titmice. Its eggs number 4 to 6, occasionally 8, are a pale brownish white densely spotted with grayish brown, and measure

17–21.5 x 13.5–15.5 mm. The last egg laid of the clutch is often much lighter in color than the others. The incubation period takes 11 to 12 days, and the young leave in another 12 to 14 days.

In the autumn the Tree Sparrows gather in large flocks to feed on the ripening rice, and the paddies are covered with all sorts of devices to scare them away. Where they are numerous their depredations are sometimes serious. After the harvest large flocks roost nightly in the dead reeds of the marshes and riversides, where they are netted in tremendous numbers for market — an average of about five million is reported annually by the netters to the Ministry of Agriculture and Forestry. They are sold in the markets in strings of ten birds each, and are a common delicacy in season at course dinners in Tokyo. They are also sold in little stalls along the streets, broiled over charcoal after dipping in soy sauce. The heavy annual toll makes no apparent inroad on their numbers. Their breeding potential is high and they maintain their abundance despite constant efforts to keep them down. In the spring and summer they are largely insectivorous, and as such are beneficial to the agriculturist. Whether the good they do outweighs the bad depends on your point of view, whether you are a rice farmer or a bird lover. By and large the attitude of the Japanese to the Suzume is one of friendly tolerance. The bird is of great significance in Japanese folk-lore and art. In traditional drawings and designs it is always associated in some fashion with bamboo. It is symbolic of loyalty, for it chirps *chu*, which among other things means fidelity. It appears in countless fables, fairy-tales, and legends, one of the best known being the fable of "Shitakiri Suzume", the "Tongue-cut Sparrow", a tale with a moral familiar to all children.

379. Passer rutilans rutilans (Temminck)

RUSSET SPARROW

Japanese: Nyunai suzume (go-inside sparrow)

Fringilla rutilans Temminck, Pl. Col., livr. 99, 1835, pl. 588, fig. 2(Japan).

The Russet Sparrow breeds irregularly in the highlands of central and northern Honshu, more commonly on the plainslands of Hokkaido and northward. There are scattered records of its nesting in Nagano, Gumma, Tochigi, and Iwate prefectures, at altitudes from 2500 to 5000 feet. It is not at all common in Aomori, and rare in summer on the southern peninsula of Hokkaido, though it is abundant at Hakodate on migration in October. It breeds regularly on the Ishikari Plain, however, in the Kitami region, and on the flatlands of eastern and northern Hokkaido, but even there is not plentiful. Its nesting habits have not been well studied, and little more is known of them than that the species usually nests in hollow trees, rarely under the eaves of dwellings, and lays 5 to 7 bluish-white eggs with fine brown markings which measure 17.7–20 x 14–14.5 mm.

It is noted particularly for its amazing autumn concentrations along the northwest coast of Honshu, where it does considerable damage to the rice crops and is netted for market in its roosts in the marshes. The birds start to appear in Akita Prefecture in small numbers in late July, and increase steadily through August until by September flocks of literally thousands feed daily in the rice fields and roost by night in the groves of large trees such as surround shrines and temples (Nibe, Yacho, 1934: 522–526). After late September they shift their nightly roosts with the first sign of cold weather to the reed beds in the marshes, where they are easily netted. The flocks leave Akita by early November. A similar concentration is reported from the rice-lands east of Niigata City, where its habits are the same.

Its movements the rest of the year are not too well known. The large flocks seem to disperse as the species swings southward across Honshu from Niigata to Shizuoka and the Kansai Plain, where it is commonest from late October to mid November, and the species winters vaguely southward in Shikoku and Kyushu. A few birds straggle down the east coast of Honshu each fall, but it is a rare bird on the Kwanto Plain. Its northward movement in spring is not pronounced, but is apparently more rapid than its southward flight. The last transient birds leave the Kansai area in late April, and the species disappears from coastal northwest Honshu by mid May, to reappear again in its usual phenomenal numbers late the next summer.

FRINGILLIDAE

380. Coccothraustes coccothraustes japonicus Temminck & Schlegel

HAWFINCH

Japanese: Shime (autochthonous)

Coccothraustes vulgaris japonicus Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1850: 90, pl. 51 (Japan).

The Japanese race of the Hawfinch breeds in open mixed and deciduous woods in Hokkaido, rarely south to central Honshu, and winters throughout its breeding range and southward irregularly through all the main islands to the Izus, Bonins, and Ryukyu islands. A bird of the foothills and lowlands, it is seldom found above 3000 feet in Honshu, or above correspondingly lower altitudes to the northward. While not rare, it is rather uncommon, and is usually observed in winter in small flocks of ten or fewer birds, which not infrequently come into the country towns and villages, perch high on the bare branches, and utter the short call note, *tsi* or *tsitsi tsi.*

Its general behavior and habits apparently are identical to those of the better known European race, but it has a much more pronounced migration. It is found occasionally on its breeding grounds in winter, but its seasonal presence and absence show that, though its movements are irregular and its abundance in any given locality varies greatly from year to year, the species has established a fairly definite pattern of migration. Flight birds generally appear in northern Honshu in mid October, reach central and southern Honshu from early November to early December, and winter from central Honshu to southern Kyushu. The van of the spring flight reaches Hokkaido in early April, and the wintering population has left southern Japan by mid April, though stragglers may be observed there through May.

In Japan the Hawfinch is a tree bird, and does not often feed on the ground, where its movements are rather clumsy. It is essentially a seed, bud, and fruit eater, although it adds insects to its diet to increase its protein intake in the breeding season. The Japanese regard it as a "bad bird" because of its occasional depredations to upland field crops. It shows a particular fondness for the red adzuki beans, which has earned it the vernacular name "bean shrike". It is caught for food by the mist-netters, but not in as large quantities as some of the other large fringillids. Although frequently offered for sale by the live-bird dealers, it is not popular as a cage bird because neither its plumage nor song is outstanding or appealing. Its chief virtues as an avicultural subject are its hardiness and the ease with which it is kept in captivity.

A few breeding records have been reported from Honshu. Its eggs have been collected in mid April near Gotemba at the foot of Mt. Fuji, and it was found nesting in Fukushima Prefecture in May 1949, the young hatching in June. It breeds regularly but not too commonly in the lowlands and foothills of Hokkaido. It builds a shallow, cup-shaped nest, often in a forked branch, usually five to ten feet up, sometimes higher, in deciduous trees or large shrubs, rarely in evergreens. The normal clutch contains 5 eggs; sets of 3 to 6 have been reported. The eggs are ashy grey with brown markings, and measure 20–26 x 15.8–18.5 mm. The incubation period takes 9 to 10 days, and the young remain in the nest another 10 to 11 days. Incubation is reported as by the female alone. She is sometimes fed on the nest by the male while incubating, and both parents feed the young.

381. Eophona personata personata (Temminck & Schlegel)

JAPANESE GROSBEAK

Japanese: Ikaru (autochthonous)

Coccothraustes personatus Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1850: 91, pl. 53 (Japan).

The Japanese Grosbeak is a fairly common inhabitant of the deciduous and mixed forests of central and northern Japan. It breeds in the lowlands and foothills of Hokkaido, up to about 2000 feet in northern Honshu and to 4000 feet in central Honshu, and winters southward to the warmer parts of Japan from October to mid April, migrating in small flocks of 20 to 30 birds through the wooded foothills, occasionally reaching the southern Izus, the Bonins, south China, and Formosa. A larger-billed race breeds on the adjoining mainland in Manchuria and eastern Siberia.

Its habits are much like those of the Hawfinch. It is essentially a tree bird, eating fruits, berries, buds, and seeds, but it feeds on the ground more often than the Hawfinch. It does some damage to leguminous crops, particularly beans of various kinds, and so is commonly known as the" bean cracker", or "bean-spinner". It is well known in Japan for its beautiful song, a loud, clear, three-syllabled whistle which is easy to imitate, *did-lee-yee* or *dy-dy-dee*, to which the Japanese give the words "Tsuki-hi-boshi" (moon, sun, stars) and the appelation "Sankocho", confusing it with the Paradise Flycatcher whose song is similarly syllabled. As it is easy to keep in captivity it is a popular cage bird, and netted for that purpose as well as for food. In the wild the male sings throughout the breeding season from the top of a high tree, usually early in the morning. The call note is a sharp, strong *chit*.

It nests from April to July in Honshu, in May and July in Hokkaido, building a cup-shaped nest of twigs, leaves, mosses, and vine tendrils on the branch of a deciduous tree from 5 to 30 feet up. Its 3 to 4 eggs are pale greenish blue marked with irregular lines and spots of dark brown, and measure 24.4–27.2 x 18.3–19.5 mm.

382. Eophona migratoria migratoria Hartert
MIGRATORY CHINESE GROSBEAK
Japanese: Ko ikaru (small grosbeak)

Eophona melanura migratoria Hartert, Vög. pal. Fauna, **1**, 1903: 59 (Sidemi).

This continental species strays to Japan but rarely. There are several old records of doubtful validity for Miyagi, Tokyo, and Miyazaki prefectures (Kumagai, Ann. Orn. Orien., 1928: 284), and Kawaguchi (Dob. Zas., 1920: 95) gives a sight record for Kumamoto, Kyushu in January 1920. The only definite records are a specimen taken in the Japan Alps in November 1933 (Kiyosu, Yacho, 1934: 885), two specimens in the Momiyama collection from the Izu Islands (Niijima 4 March 1923, Hachijo 22 March 1923), and a female which was taken alive in Saitama Prefecture 29 October 1917 and kept for a year in Momiyama's aviary before it died. Momiyama says the song of this captive bird was identical to that of the Japanese Grosbeak.

383. Chloris sinica (Linné)
ORIENTAL GREENFINCH
Japanese: Kawarahiwa (riverside finch)

Fringilla sinica Linné, Syst. Nat., ed. 12, **1**, 1766: 321 (China). (Extra-limital)
Fringilla kawarahiba Temminck, Pl. Col., 1835: 588, fig. 1 (Japan).
Fringilla kawarahiba minor Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1850: 89, pl. 49 (Japan).
Fringilla kawarahiba major Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1850: 88, pl. 48 (Japan). (Synonym of *kawarahiba*)
Chloris sinica sitchitoensis Momiyama, Dob. Zas., **35**, 1923: 413 (Hachijo). (Synonym of *kawarahiba*)

The larger, lighter *C.s.kawarahiba* breeds from Kamchatka and the islands in the Bering Sea south through Sakhalin and the Kuriles to Hokkaido, and winters casually southward throughout the main islands. *C.s.sitchitoensis*, described from a winter specimen from Hachijo, which the 1942 Hand-List recognizes as the breeding form of Hokkaido and Sakhalin, is an intermediate form nearer to *kawarahiba* than to the smaller, darker *minor* of the southern main islands. The dividing line in the cline is best drawn at Tsugaru Straits, for Hokkaido breeding specimens cannot be separated with certainty either in size or color from the more northern populations.

The Greenfinch is a common resident of the plains and the cultivated areas below 3500 feet throughout Japan. It winters in small numbers in Hokkaido, more commonly from northern Honshu southward to the Ryukyus. On migration and in winter it is quite gregarious, and forms flocks of fifty to several hundred individuals which forage over the open fields and grassy flats of the river basins, and perch in long lines on the electric wires. The species does some damage to the rice fields at harvest time, and is netted in considerable numbers both for food and for cage bird purposes. It occurs frequently in the suburbs and the city parks, and is one of the few common birds on the coastal pine hillsides.

Its actions in winter are much like those of the American Goldfinch. It has the same wavy flight, twittering a *kyr-kyr* in cadence with each dip, and a similar call note, a querulous *jeeen* with a rising inflection at the end. It starts nesting fairly early, in late March in Honshu, in mid April in Hokkaido. Though there is no definite evidence of more than one brood annually, as the breeding season lasts until August, the species may be multi-brooded. The nest is built most often in an evergreen, from 10 to 20 feet up. The 3 to 5 eggs are pale bluish white with purplish markings at the larger end, and measure 17–19.5 x 12.7–14.5 mm. The incubation period takes 12 to 13 days.

384. Carduelis spinus (Linné)
SISKIN
Japanese: Mahiwa (true finch)

Fringilla spinus Linné, Syst. Nat., ed. 10, **1**, 1758: 181 (Sweden).

The Siskin is an uncommon to rare summer resident in the subalpine evergreen forests above 5000 feet in central Honshu, and between 2000 and 4500 feet in Hokkaido. It is a common but irregular transient and winter visitor elsewhere in Japan. A few winter in Hokkaido, but most of the birds move southward to the southern islands and beyond to the central Ryukyus. The height of the autumn migration goes through central Honshu in mid and late October. Some remain there in small flocks which work through the pine forests of the foothills until the northward movement in late April or early May. It is netted commonly during the autumn flight, but the catch varies considerably. In some years more than a million are reported by the hunters, but the usual harvest is about half that.

The species probably breeds at high altitudes in central Honshu and in the subalpine conifer belt in Hokkaido. There are plenty of summer records from the highlands, including young of the year taken in late July in Nagano Prefecture, and we watched a pair copulating in western Aomori in early June, 1948, but its nest and eggs have yet to be found in Japan.

385. Carduelis flammea (Linné)

REDPOLL

Japanese: Beni hiwa (rouge finch)

Fringilla flammea Linné, Syst. Nat., ed. 10, **1**, 1758: 182 (Norway, Sweden).
Linaria Holboellii Brehm, Handb. Naturg. Vög. Deutsch., 1831: 280 (Germany)

The common wintering Redpoll in Japan is *C.f.flammea*. The larger-billed *C.f.holboellii* occurs uncommonly but fairly regularly in Hokkaido, and has been taken as far south in central Honshu as Nagano Prefecture (Kiyosu, Yacho, 1936: 8).

This northern finch is a fairly common winter visitor, though as with so many high northern species, its abundance fluctuates greatly from year to year. It is almost always found in small flocks, and is partial to the birch woods. In some years sizeable flights pass through Aomori and Ishikawa prefectures from mid October to early November, and winter regularly to southern and western Honshu, less commonly to northern Kyushu. The southernmost record for the species is a specimen of *C.f.flammea* in the AMNH taken in Hahajima, Bonin Islands, by Owston's collectors 25 January 1904.

386. Carduelis hornemanni exilipes (Coues)

HORNEMANN'S REDPOLL

Japanese: Ko beni hiwa (small rouge finch)

Aegiothus exilipes Coues, Proc. Acad. Nat. Sci. Phil., 1861: 385 (Ft. Simpson).

This species occurs fairly regularly in winter only as far south as Sakhalin. The only credible records we have been able to find for Japan are a specimen from "North Japan" listed by Ogawa (1908: 408), and one collected by Kiyosu (Yacho, 1938: 8) at 1600 meters on Mt. Norikura, Nagano Prefecture, in late March 1935.

387. Uragus sibiricus sanguinolentus (Temminck & Schlegel)

LONG-TAILED ROSY-FINCH

Japanese: Beni mashiko (red rosy-finch. Mashiko, literally "monkey-child", is autochthonous for *Uragus*, *Erythrina*, *Pinicola*, and *Leucosticte*.)

Pyrrhula sanguinolenta Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1844–1850: 92, pl. 54 (Japan).

This beautiful little finch is a not uncommon summer resident in Hokkaido, where it breeds on the plains and in the low foothills. It migrates southward regularly to coastal Iwate and Miyagi prefectures, less commonly to the highlands of central and southern Honshu. It reaches Shikoku occasionally, but has not been taken in Kyushu since Temminck and Schlegel recorded it (1848: 92) probably from Nagasaki. Its season in Honshu is from October to late March or early April. In the winter it is usually encountered in small family troops of four to ten birds, moving through the brush with active tail-flirts in search of seeds, small fruits, and in springtime buds and insects.

It breeds in Hokkaido from late May through July, building a firm, compact, cup-shaped nest of flax fibers, bark, grass, and small twigs, and lined with fine grasses, horsehair and feathers, in the willows or alders along a stream from 3 to 15 feet above the ground. It has been known to nest occasionally on the ground, and in rose thickets or other shrubbery along the coast, and in hedgerows in cultivated areas. The eggs are greenish blue with a few dark brown spots on the larger end. They measure 17.5–20.5 x 12.5–14.5 mm.

388. Pyrrhula pyrrhula (Linné)
BULLFINCH
Japanese: Uso (autochthonous)

Loxia Pyrrhula Linné, Syst. Nat., ed. 10, **1**, 1758: 171 (Sweden). (Extralimital)

Pyrrhula coccinea var. *cassini* Baird, Trans. Chic. Acad. Sci., **1**, 1869: 316, pl. 29 (Nulato, Alaska).

Pyrrhula kurilensis Sharpe, Zoologist, 1886: 485 (Kuriles).

Pyrrhula griseiventris Lafresnaye, Rev. Zool., 1841: 241 (Japan).

Pyrrhula rosacea Seebohm, Ibis, 1882: 371 (Yokohama).

Pyrrhula orientalis Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1850: 91, pl. 53 (Japan). (Synonym of *griseiventris*)

The Japanese breeding population of Bullfinches, *P.p.griseiventris*, is separable from the resident race of the Kuriles, *kurilensis*, on measurements alone, the latter being slightly larger. Both races are pink-throated, but lack any trace of red or pink on the bellies of the males. The breeding form of Sakhalin and the adjacent mainland, *rosacea*, is intermediate in color between these gray-bellied birds and the larger, deep red-bellied *cassinii* of Kamchatka and northeastern Siberia. In measurements *rosacea* agrees with *griseiventris*, but the males exhibit varying degrees of pink on their under parts, which, incidentally, they tend to lose in captivity. This form breeds from Sakhalin westward across the mainland from Amuria to central Manchuria and winters south to Korea and Japan. *P.p.cassinii* has been recorded three times in Honshu, all three birds taken by mist-netters: Toyama Prefecture, early November 1909 (Norinsho coll.); Shimane Prefecture, 28 November 1935 (Kuroda coll.), and late October 1929 (Wada coll.). In the Momiyama collection in the Yamashina Museum are six specimens attributed to *P.p.kurilensis*, taken as follows: Hokkaido, Ishikari, 25 Sept. 1908; Honshu, Tochigi, Nikko, 1926 (2); Honshu, Shimane, Nogi-gun, Nov. 1937; Honshu, Niigata, Iwafune-gun, 1 Apr. 1927.

The Japanese Subspecies, *P.p.griseiventris*, is a not uncommon summer resident, breeding in the highlands of central Honshu above 5000 feet and northward in the subalpine zone through Hokkaido. It winters at lower altitudes throughout its range, and southward to Shikoku and Kyushu. The continental race, *P.p.rosacea*, is a common transient and winter visitor south to southern and western Honshu and the Izu Islands. The species' winter habitat is the sparse mixed woodlands of the lowlands and foothills, usually near conifers, where it is most often encountered in small flocks. It does some harm to crops locally, especially in northern Honshu when it is abundant in spring, by eating the buds and sprouts of fruit trees, especially the cherry. Though occasionally seen in the suburbs and not uncommon in the country villages in winter, it seldom comes into the parks of the large cities.

Mid October finds the fall migration of northern Bullfinches at its height in the mist-netting areas of the Honshu highlands. The total catch reported by the netters has varied considerably from year to year, from as low as 10,000 in 1925 and 15,000 in 1924, to a high of 112,000 in 1935. The average annual take reported, which is probably a half or a third of the actual, is about 50,000. Most of these are killed for food and marketed in the usual strings of ten birds each. Many are kept alive for sale as cage birds, and the species is as popular for this purpose in Japan as it is in continental Europe.

The familiar and distinctive "song" of the Bullfinch is actually its call-note, uttered throughout the year, and in flight as well as when at rest. It is a sweet, soft, fluty whistle, variously syllabized as *deu* or *phee*, pleasing to the ear, and with considerable carrying power. Birds in the wild will answer a similar human whistle, and can sometimes be induced to raise or lower their pitch.

The Bullfinch breeds in Japan in the fir and hemlock forests of the subalpine zone, mostly between 6500 and 8500 feet in central Honshu, at lower altitudes farther north. The bowl-shaped nest is built of dried twigs, dead runners, *Usnea* and other mosses, lined with fine roots, hair, or feathers, and placed on an evergreen branch from three to ten feet above the ground. The eggs are quite variable, usually greenish blue with purple-brown spots of varying size chiefly at the larger end, and measure 17.2–22.1 x 13.6–14.5 mm. Incubation by the female alone lasts 12 to 14 days and the young leave the nest 12 to 16 days later. The breeding season starts in April or early May and continues through July. Other races are known to rear two broods annually, but there is no evidence that *griseiventris* does so.

389. Pinicola enucleator urupensis Buturlin

PINE GROSBEAK

Japanese: Ginzan mashiko (silver-mountain rosy-finch)

Pinicola enucleator urupensis Buturlin, Mess. Orn., 1915: 239 (Urup, Kurile Ids.).

This large, handsome grosbeak of boreal origin is an uncommon resident in Hokkaido. The race is known to breed, other than in the Kuriles, only in the *Pinus pumila* zone at the top of the Daisetsuzan peaks, where Jahn found and photographed young of the year 5 August 1939 (1942: 90). Its nest and eggs have yet to be found in Hokkaido. In winter the bird descends to lower levels, and is reported as fairly common in the foothills of eastern Hokkaido, where Inoue saw it near Kushiro 16 November 1949, and as not uncommon in the Asahikawa area. By old accounts (Dob. Zas., 1892: 293) it formerly wintered in the Sapporo area, but it has not been taken on the Ishikari Plain since then. It has been taken once in Honshu, a straggler collected in Ishikawa Prefecture in late November, 1948, now in the Norinsho collection.

390. Loxia curvirostra japonica Ridgway

RED CROSSBILL

Japanese: Isuka (autochthonous)

Loxia curvirostra japonica Ridgway, Proc. Biol. Soc. Wash., **2**, 1885: 101 (Japan).

Loxia curvirostra ruberrima Floericke, Orn. Beob., **24**, 1926: 7, 8 (Japan). (Synonym)

The Japanese race of the Crossbill is an uncommon summer resident in the spruce, fir and larch forests of northern Honshu and Hokkaido, and an irregular transient and winter visitant farther south, fairly common in some years, rare in others. It seems to pass Hokkaido on migration in October, November, March and April, and occasionally winters on the Ishikari Plain. The flight appears in the Aomori and Miyagi areas of northern Honshu in early October, and reaches the mountains of central Honshu the latter part of the month. Small flocks winter from central and western Honshu southward, usually below 3500 feet, and always in the conifers. It has also been taken in Kyushu, Shikoku, and the southern Izus and the Bonin Islands. It feeds almost exclusively on conifer seeds, to reach which its bill is so specially adapted, and it is usually so engrossed in its operations when feeding that it can be approached and observed very closely. Its call note, uttered constantly when in flight, is a loud, sharp *jip-jip*.

Although its nest and eggs have not yet been collected in Japan, there is good evidence of its breeding in Honshu. It has never been found in summer at Mt. Fuji or in the high Alps where so many northern forms reach their southern limit, but seems to breed at Yatsugadake in Yamanashi Prefecture, and near Karuizawa in Nagano. Moriyama (Yacho, 1941: 737) found a few present from July to September near Karuizawa in 1940 and 1941. At Yatsugadake, Y. Nakamura (Choju Hokoku, 1936: 21) saw an apparent family group with young of the year 13 July 1934, and watched a pair courting 9 April 1935. The species is more common in summer in the spruce-larch forests of Iwate, Akita, and Aomori prefectures. Fujita (Choju Hokoku, 1932: 31) reported a possible crossbill's nest with four eggs ten feet up in a pine tree at Noheji, Aomori, in March 1931. Red Crossbills have also been observed between 4000 and 5000 feet on Mt. Daisetsu, Hokkaido, from June to August.

391. Loxia leucoptera bifasciata (Brehm)
WHITE-WINGED CROSSBILL
Japanese: Naki isuka (crying crossbill)

Crucirostra bifasciata Brehm, Ornis, **3**, 1827: 85 (Austria).

This species is a rather rare winter visitor to Hokkaido and northern Honshu, and comes southward casually in the highlands to Tochigi, Nagano, and Shiga prefectures. It seems to occur fairly regularly in southern Hokkaido, for it appears quite frequently in the live bird shops in Hakodate. Nagahisa Kuroda saw two in a shop in Muroran in November 1948 which had been caught recently nearby. The specimen record:

Hokkaido, Sapporo		1937	Momiyama coll.
Honshu, Miyagi, Sendai	(2)	Nov. 1911	Norinsho coll. (lighthouse casualty)
" "	(3)	Nov. 1930	Kumagai coll.
" Fukushima, Iwashiro		autumn 1916	Momiyama coll.
" Tochigi, Nikko		10 Dec. 1903	Momiyama coll.
" " "		autumn 1910	Matsudaira coll.
" " "		autumn 1921	Momiyama coll.
" " Shimotsuke		25 Oct. 1911	Momiyama coll.
" " "		15 Nov. 1911	Momiyama coll.
" Nagano		12 Oct. 1911	Yamashina coll.
" "	(2)	1, 7 Nov. 1911	Yamashina coll.
" "		30 Oct. 1912	Yamashina coll.
" "		Nov. 1919	Momiyama coll.
" Shiga, Yamashiro		29 Nov. 1911	Momiyama coll.
Izu Ids., Hachijo		29 Nov. 1930	Momiyama coll.

392. CARPODACUS ERYTHRINUS GREBNITSKII Stejneger
SCARLET FINCH
Japanese: Aka mashiko (red rosy-finch)

Carpodacus erythrina grebnitskii Stejneger, Orn. Expl. Comm. Ids. and Kamtschatka, 1885: 265 (Kamchatka).

The sole claim of this northern species to inclusion in the Japanese list rested on the live bird bought in the Yokohama market by Blakiston and Pryer (1882: 175) and which was doubtfully of Japanese origin, until one was taken in a mist-net near Kyoto in November 1936 (Yacho, 1937: 187), and another in Nikko, Tochigi Prefecture, 4 December 1940, which was sent to Kuroda alive and kept in his aviary until killed by a rat two months later (Tori, 1941: 141).

393. CARPODACUS ROSEUS (Pallas)
PALLAS'S ROSY FINCH
Japanese: O-mashiko (large rosy finch)

Fringilla rosea Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776: 699 (Siberia).

This species is an uncommon but fairly regular winter visitor to Hokkaido and to the highlands of northern and central Honshu.

It has been taken on all the main islands except Kyushu, but its habits in Japan have not been studied. The specimen record shows its season in Hokkaido is from early November to mid April, in the Japan Alps from mid November to early March.

394. Fringilla montifringilla Linné

BRAMBLING

Japanese: Atori (autochthonous)

Fringilla Montifringilla Linné, Syst. Nat., ed. 10, **1**, 1758: 179 (Sweden).

The Brambling is a common transient and winter visitor throughout Japan, though no longer as tremendously abundant as it apparently was formerly. Medieval accounts tell of flocks on migration "darkening the sky" and "concealing the sun for a whole day", which was perhaps hyperbolic exaggeration. Nevertheless the species remained abundant enough so the mist-netters could report taking more than a million Bramblings annually through the 1930's, and it is still one of the commonest of the wintering fringillids. It winters southward through all the main islands to the Ryukyus, coastal China, and casually to Formosa and the Philippines (one record).

Bramblings reach Japan by two main routes, one via Hokkaido, the other across the Japan Sea to the Ishikawa-Niigata coast. They migrate in flocks, apparently at considerable altitude, for they first appear in early autumn at the tree line in the highlands, above 4000 feet in Hokkaido, at 8000 feet in the Japan Alps. Most of the flight has left Hokkaido by late October, though a few birds remain there until the following April. The Japan Sea flight starts in late September, reaches its peak on the mist-netting grounds of the Nagano and Gifu highlands in mid October, and continues into mid November. With the advent of snow the birds descend to lower levels and frequent the more open mixed woodlands. In winter they scatter over the warmer foothills and open plains, feeding in the cultivated fields and brushlands, occasionally visiting the city parks and gardens. The northward movement starts in late March, and most of the population leaves during April for their northern breeding grounds, though a few may remain until May.

395. Leucosticte arctoa pustulata (Lichtenstein)
ARCTIC ROSY FINCH

Japanese: Hagi mashiko (lespedeza rosy finch)

Fringilla pustulata Lichtenstein, Verz. ausg. Saugeth. Vog., 1818: 24 (Kurile Ids.).

This species is a rather uncommon but regular winter visitor to Hokkaido and to the highlands of northern and central Honshu, south to Nagano and Yamanashi prefectures. Small flocks appear sporadically in the Honshu mountains between 2500 and 5000 feet from late November to early March, most frequently in January and early February. In Hokkaido the Rosy Finches gather on the open hillsides, take shelter in the low brush growth, and forage over the cultivated fields where the ground is bare of snow.

396. Passerella iliaca insularis Ridgway
FOX SPARROW

Japanese: Gomafu suzume (sesame-spotted sparrow)

Passerella iliaca insularis Ridgway, Auk, **17**, 1900: 30 (Kodiak Id.).

A single specimen of this New World species, taken in a mist-net at Nikko, Tochigi Prefecture, 3 November 1935 and now in the Yamashina Museum, is referred by Yamashina (Tori, 1936: 119) to the Kodiak Island race.

397. Zonotrichia atricapilla (Gmelin)
GOLDEN-CROWNED SPARROW

Japanese: Kigashira shitodo (yellow-headed bunting. "Shitodo" is an ancient name for bunting.)

Emberiza atricapilla Gmelin, Syst. Nat., **1**, pt. 2, 1789: 875 (Prince William Sound, Alaska).

The only Japanese record of this straggler from North America is a specimen in the Momiyama collection (now in the Yamashina Museum) taken at Arakawa, Tokyo, 10 December 1936 (Tori, 1937: 253).

398. Zonotrichia leucophrys gambelii (Nuttall)
WHITE-CROWNED SPARROW
Japanese: Miyama shitodo (mountain-country bunting)

Fringilla gambelii Nuttall, Man. Orn. U. S. and Canada, ed. 2, **1**, 1840: 556 (near Fort Walla Walla, Washington).

This Nearctic species is known from Japan by a single male specimen in the Momiyama collection, now in the Yamashina Museum, taken at Kiserazu, Chiba Prefecture.

399. Emberiza citrinella citrinella Linné
YELLOW BUNTING
Japanese: Ki aoji (yellow green-bunting)

Emberiza citrinella Linné, Syst. Nat., ed. 10, **1**, 1758: 177 (Sweden).

A single male specimen of this European bird taken in a mist-net at Minai-azuma-gun, Nagano Prefecture, in January 1936 was identified and reported by Kiyosu (Bot. Zool., **5**: 716–717).

400. Emberiza leucocephalos leucocephalos S. G. Gmelin
PINE BUNTING
Japanese: Shiraga hojiro (white-haired bunting)

Emberiza leucocephalos S. G. Gmelin, Nov. Com. Acad. Sci. Imp. Petrop., **15**, 1771: 480, pl. 23, fig. 3 (Astrakhan).

This Siberian species is only of casual occurrence in Japan. One of the largest of the Emberizas, it is so strikingly colored that it is almost certain to be noticed whenever it appears. Most of the known specimens were taken in mist-nets, kept alive, and brought to the attention of the ornithologists by their captors who wanted to know the identity of the strange sparrow they had caught. The specimen record:

Hokkaido, Sapporo		30 Jan. 1890	Yamashina coll.
Honshu, Yamagata		autumn 1923	Ishizawa coll.
"	"	autumn 1924	Ishizawa coll.
"	Tochigi, Nikko	autumn 1921	Ishizawa coll.
"	Tokyo, Tamagawa	Mar. 1924	Ishizawa coll.
"	Nagano	Oct. 1909	Yamashina coll. *ex* Matsudaira
"	"	Mar. 1914	Yacho (1936: 11)
"	"	Mar. 1915	Yacho (1936: 11)
"	"	Dec. 1926	Yacho (1936: 11)

Honshu, Gifu, Kiso		Nov. 1941	Yacho (1942: 769)
" Shizuoka, Abe-gun		4 Nov. 1884	Yamashina coll. *ex* Ogawa
" " "		5 Jan. 1908	Yamashina coll. *ex* Ogawa
Izu Ids., Hachijo	(2)	autumn 1921	Momiyama coll.

401. Emberiza melanocephala Scopoli

BLACK-HEADED BUNTING

Japanese: Zuguro chakincho (black-headed brownish-yellow bird)

Emberiza melanocephala Scopoli, Annus **1**, Nat. Hist., 1769: 142 (Carniola).

Momiyama collected two immature males at Hachijo in the Izu Islands, one 6 November 1928, the other 21 November 1930. Both are now in the Yamashina Museum, the only records for Japan of this resident of central Asia.

402. Emberiza rutila Pallas

CHESTNUT BUNTING

Japanese: Shima nojiko (island yellow bunting)

Emberiza rutila Pallas, Reise versch. Prov. Russ. Reichs., **3**, 1776: 698 (Mongolia).

This continental bunting is not uncommon in Korea on migration, but has occurred in Japan only three times to our knowledge. A specimen from "Japan" was figured by Temminek and Schlegel (1848: 95 + pl. 56). The second specimen was taken in Shinano, Nagano Prefecture, sometime prior to 1915 and reported by Matsudaira (Tori, 1915: 68). The third and last, now in the Norinsho collection, was taken at Hakodate, Hokkaido, 16 May 1939.

403. Emberiza aureola ornata Shulpin

YELLOW-BREASTED BUNTING

Japanese: Shima aoji (island green-bunting)

Emberiza aureola ornata Shulpin, Ann. Mus. Zool. Acad. Sci. USSR, **28** (3), 1927 (1928): 401 (southern Ussuriland).

The Yellow-breasted Bunting is a fairly common summer resident in northern and eastern Hokkaido, rather rare from the Ishikari Plain southward. It reaches Hokkaido, and adjacent Sakhalin and the Kuriles where it also breeds, directly from the continent, and is only of casual occurrence in Honshu (three records). Its migration is continental, and it winters south to Malaya. It arrives in Hokkaido in late April, breeds from late May through July, and leaves in late September.

It is a bird of the grasslands and meadows, and sings its melancholy *tsui, tsui, tee-e tee-e, tsee-tee* from the top of bushes, haystacks, and telephone wires. It nests on the ground, usually under a protecting grass clump, and lays 4 to 5, rarely 6, pale bluish eggs with small brown spots and streaks, measuring 19.8–22.5 x 14.7–16.1 mm.

404. Emberiza elegans elegans Temminck

YELLOW-THROATED BUNTING

Japanese: Miyama hojiro (mountain-country bunting)

Emberiza elegans Temminck, Pl. Col., livr. 98, 1835, pl. 583, fig. 1 (Japan).

The Yellow-throated Bunting migrates down the Korean Peninsula and crosses Tsushima Straits to Kyushu and western Honshu, where it is a not uncommon winter visitor from November to early April. It works through the light woodlands and brushy hillsides in small parties of four or five birds, feeding on the ground in open woodland clearings and in the underbrush alongside the foothill streams. The 1942 Hand-List carries the species as breeding in Hokkaido, for which there seems to be no evidence. The bird has been collected in Hokkaido and Shikoku, but is of regular occurrence eastward only to the Japan Alps and the Fuji area, where it is not at all common. Elsewhere in Japan it is of rare, almost casual status.

405. Emberiza spodocephala personata Temminck

BLACK-FACED BUNTING

Japanese: Aoji (autochthonous, literally 'green small bird')

Emberiza personata Temminck, Pl. Col., 1835, pl. 580 (northern Japan).

One of the commoner Japanese buntings, this species breeds from the highlands of central Honshu northward through Hokkaido, leaves the breeding grounds in September and October, and winters in the plains and foothills from northern Honshu southward through Shikoku and Kyushu to the Ryukyus. In winter it is a bird of the brushlands and feeds on the ground in thickets, not in open fields. It comes commonly into the parks and gardens of the suburbs but usually remains well hidden in the shrubbery and is quiet except for its call note, a single, forced *jit*. Among the indigenous buntings it is second in abundance only to the Meadow Bunting. Netted frequently with the other finches in migration and on the wintering grounds, from a quarter to half a million were reported taken annually in the 1930s.

It starts to sing in March, a pleasant series of tinkling notes each of a different pitch, as it moves towards its breeding grounds. Some climb into the Honshu hills to summer between 3000 and 5000 feet. Others head north to Hokkaido, where they arrive in late April and spread out over the lowlands and foothills to nest in the sparse, brushy woodlands, the borders of the heavier forests, and in groves in the open fields. It also breeds in the alpine birch forests, but not in the denser forests of the subalpine zone. The nest is built usually on the ground, less commonly a few feet up in a low bush. The clutch contains 4 to 5, rarely 3 to 7, bluish-white eggs, variously marked with dark purplish brown, and measuring 18.5–23 x 13.5–17.8 mm.

406. Emberiza sulphurata Temminck & Schlegel
JAPANESE YELLOW BUNTING

Japanese: Nojiko (autochthonous, literally "field-path child")

Emberiza sulphurata Temminck & Schlegel, *in* Siebold, Fauna Jap., Aves, 1848: 100, pl. 60 (Japan).

This bunting is a rather uncommon and inconspicuous summer resident, endemic to Japan in its nesting, and of limited distribution. It is known to breed only in the higher foothills of central Honshu between 2000 and 4000 feet. It is not plentiful in the lower Japan Alps, and only slightly more abundant in the Fuji area where it is best known. Farther north in Honshu it is quite rare, and in Hokkaido it seems to be only of casual occurrence. The species winters from the warmer parts of southwestern Honshu southward through Kyushu to coastal China, Formosa, and the Philippines.

The species has not been well studied. It lives in shrubby clearings and low second growth, and is frequently seen in the same areas as the Black-faced Bunting, which it closely resembles in its habits and actions. It breeds from May to July, building a nest like that of *E. spodocephala* but slightly smaller, and always in the lower branches of a bush from two to five feet off the ground. It lays 3 to 4 grayish-white eggs with irregular dark markings at the larger end, and which measure 16.5–19.9 x 13.5–15 mm.

407. Emberiza cioides ciopsis Bonaparte

MEADOW BUNTING

Japanese: Hojiro (autochthonous; literally "white cheek")

Emberiza ciopsis Bonaparte, Consp. Av., **1**, 1850: 466 (Japan).
Emberiza cioides namiyei Momiyama, Tori, **3**, 1923: 210 (Oshima, Izu Ids.). (Synonym)
Emberiza cioides tamemoto Momiyama, Dob. Zas., **35**, 1923: 412 (Hachijo, Izu Ids.). (Synonym)
Emberiza cioides neglecta Kuroda, Bull. B. O. C., **43**, 1923: 88 (Yakushima). (Synonym)

This race of the Meadow Bunting is common, conspicuous, and widely distributed from Hokkaido to Yakushima, an inhabitant of the open country, the shrubby hillsides and the young second-growth woodlands, never found in the heavy forests. It likes the thickets along the roadsides and the hedgerows between the cultivated fields, and follows the open lands up to 5000 feet in central Honshu and to 3000 feet in Aomori. In Hokkaido it is a summer resident in the plains, and somewhat less common than it is in central Honshu. Most of the Hokkaido population moves to Honshu in October and November and returns in April, though a few may winter in the sheltered lowlands along the south coast. From northern Honshu southward it is resident except in areas of heavy snowfall in the highlands and on the shores of the Sea of Japan. Birds breeding in these areas move down to the open plains of the Pacific coast for the winter.

The Hojiro's pleasant song is familiar to everyone in the rural and suburban areas. The male sings from a telephone wire along the roadside, or from the top of a bush or a tree, repeating his melody over and over, sometimes for hours at a time. The species sings more or less throughout the year, though most ardently of course in spring and summer. Singing starts in mid January in Kyushu, in early March in Honshu, and continues until late summer. During the post-nuptial molt the singing quiets down, and one hears a burst of it only now and then on fine mornings. As soon as the molt is completed in September a second song period starts and continues through November. Like the American Song Sparrow, *Melospiza melodia*, each individual bird has its own particular melody and phraseology, many of which have been recorded (cf. Ogawa, Dob. Zas., 1962: 267–283). Very popular as a cage bird, the Japanese say it usually sings "Ippitsu keijo tsuka matsuru" which means in formal, ancient style "I'm writing you a short letter."

Nesting starts in mid April and continues to July or early August. It builds a cup-shaped nest of leaves, grasses, and vine tendrils, lined with fine roots and hair, from one to five feet up in a thicket. It lays 3 to 5, usually 4 eggs, bluish, greyish, or reddish-white with varying dark spots and lines at the larger end, and which measure 17.5–22.8 x 14.5–17.8 mm. No data are available on the number of broods, the incubation period, or the sharing of duties by the sexes, which is surprising for so common and well-known a bird.

408. Emberiza fucata fucata Pallas
GRAY-HOODED BUNTING
Japanese: Hoaka (red cheek)

Emberiza fucata Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776: 698 (southeastern Siberia).

Emberiza fucata laubmanni Stachanow, Anzeig. Orn. Ges. Bayern, **2**, 1929: 6 (Fuji, Japan). (Synonym)

This species is a common summer resident from central Honshu northward, and a common transient and not uncommon winter visitor in the warmer parts of Japan. Like the Meadow Bunting which to some extent it replaces in Hokkaido, its habitat is the open fields and brush lands. It winters from the Kwanto Plain southward to coastal China, Formosa, Hainan, and Indochina. At this season in southern Japan it moves singly or in small groups of three to five birds, and shows a preference for the thickets along the streams of the grassy plains.

Returning migrants reach Honshu in early April and Hokkaido the latter part of the month. It breeds in central Honshu on the cultivated plateaus from 2000 to 4500 feet above sea level. From Aomori northward through Hokkaido it prefers the coastal plains, where it is much more plentiful than it is farther south. The male sings his modest spring song from the top of a shrub or a fence post. It resembles that of *E. cioides*, but is weaker and shorter, and always ends in a three-syllable phrase, *chip chip chil-ri-wit*. The song period lasts until late August.

Its breeding season in Honshu is from mid May to mid July, in Hokkaido from June into August. The nest resembles that of *cioides*, but is built as often on the ground as in the lower branches of a bush. The eggs number 3 to 6, usually 4, are bluish-white with spots and lines at the larger end, and measure 17.5–21 x 15–17 mm.

409. Emberiza rustica Pallas
RUSTIC BUNTING

Japanese: Kashiradaka (autochthonous, literally "high head")

Emberiza rustica Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776: 698 (Dauria).
Emberiza rustica latifascia Portenko, Auk, **47**, 1930: 206 (Kamchatka). (Synonym)

The proposed eastern race, *latifascia*, is of doubtful validity. My series of winter birds from Japan is indistinguishable from a large series of winter specimens from Korea and China. The characters given by Portenko (loc. cit.) are not discernible in any of these, nor in two Kamchatkan spring specimens in the MCZ which are inseparable from three skins from Dauria and Lake Baikal taken the same time of year. I can see no differences in the length or thickness of the bills, and all the color variations can be accounted for by age of the individual and by seasonal feather wear. I have seen no material from farther west, but if the western population is distinct there are names available for it in synonymy.

The Rustic Bunting is a common winter visitor in Japan, arriving in late October or early November and moving northward again in late March, a few remaining until early May. It is found on all the main islands, but is commonest in the coastal regions of northern and central Honshu, usually below 2500 feet, the heaviest concentration centering in Fukushima Prefecture. It is encountered most often feeding on the ground in open cultivated fields and dormant paddies along the edges of woodlands, in flocks of 20 to 30 or fewer birds. As winter wanes and the spring movement begins, the flocks join together until they contain several hundred or more birds. Its call note is a high, sweet, somewhat plaintive *tweet*, and just before it leaves in the early spring snatches of its melodious little song can be heard.

410. Emberiza pusilla Pallas
LITTLE BUNTING

Japanese: Ko hoaka (lesser red-cheek)

Emberiza pusilla Pallas, Reise versch. Prov. Russ. Reichs, **3**, 1776: 697 (Dauria).

From the specimen record this smallest of the Emberizas is a rare casual visitor to Japan. As it is not noteworthy in appearance it may occur more frequently but remain unnoticed among the other similarly colored species taken by the netters. The record:

Honshu, Aichi, Nagoya	1890	Ogawa (Dob. Zas., 1906: 157)
" Shizuoka	10 Nov. 1904	Yamashina coll.
" Nagano	Aug. 1921	Kiyosu (Yacho, 1936: 152)
" Tokyo	mid-Jan. 1947	MCZ
Shikoku	Jan. 1917	Fujita (Tori, 1921: 94)
Kyushu, Goto Ids.	22 Jan. 1929	Yamashina coll., *ex* Momiyama

411. Emberiza variabilis Temminck

GRAY BUNTING

Japanese: Kuroji (black small bird)

Emberiza variabilis Temminck, Pl. Col., livr. 98, 1835, pl. 583, fig. 2 (northern Japan).

Tisa variabilis kurodai Momiyama, Ann. Orn. Orient., **1**, 1927: 10 (near Lake Biwa, central Honshu). (Synonym)

The Gray Bunting is limited to the peninsulas and islands along the northeast Asiatic coast from Kamchatka to the Ryukyus, and is only of casual occurrence on the mainland. In Honshu, Shikoku, and Kyushu it is a not uncommon winter visitor from October to April, frequenting the undergrowth in the coastal mixed woodlands and the thickets in the cultivated fields, parks, and gardens. It is netted with other fringillids on migration and on the wintering grounds, but the netters reported fewer than 50,000 taken annually.

It is believed to nest in Hokkaido, and sporadically in the highlands of northern and central Honshu, but its nest, eggs, or young have not yet been collected in Japan and the evidence is far from satisfactory, being based entirely on the presence of the species in breeding season. The only unquestionable eggs in Japanese collections is a set of five collected by Orii on Paramushir Island in the Kuriles in 1929, of which Yamashina writes (Tori, 1929, 68): "There were a large number of this species on Paramushir Island during the summer making their nests on the branches of *Alnus* and *Salix* not exceeding a height of one meter from the ground. There were found laid five eggs in nests, which were collected on June 26, the measurements being 21.5 x 16, 21.5 x 16, 22 x 16, 22.5 x 16.5 mm. The ground colour of the egg-shells is glossy greyish white, with pale purplish grey underlying streaks, constituting a long curved line. In the upper part there are overlying spots of varied shapes, of which can be noticed sometimes streaks." The three sets of eggs from the Kitami region of Hokkaido which Kobayashi and Ishizawa (1933: pl. 7) attribute to this species are a dark blue-green in ground color, and in no way resemble the Yamashina set. In their accompanying text the authors make no mention of these eggs, which are undoubtedly mislabeled, and state that the only eggs of the species known are the Yamashina specimens.

The Japanese literature contains a number of summer sight records. Kobayashi (Yacho, 1941: 736) saw Gray Buntings at 2800 feet at Kitamitoge, Hokkaido, 31 July 1929; Kiyosu (Yacho, 1936: 774) found the species singing at 5500 feet above Nikko 15 August 1936, where Jahn (1942: 102) also saw it in the summer of 1940. Jahn (Tori, 1939: 612) found 12 singing males at Sounkyo, Mt. Daisetsu, on 11 July 1939, several more at Mt. Akan 15 July, and states it was "certainly" breeding in Hokkaido in the thick sasa bamboo undergrowth in the virgin forests between 2300 and 4800 feet altitude. The southernmost summer records are unpublished reports by Y. Nakamura, a most careful and reliable field man, who saw it and heard it singing in the mountains above 5000 feet near Ozenuma, Gumma Prefecture, in July of 1949 and 1950. The only summer specimen from Japan is an adult male I collected just below the melting snow at 3000 feet on Mt. Hokkata, Aomori Prefecture, 2 June 1949.

412. Emberiza yessoënsis yessoënsis (Swinhoe)

JAPANESE REED BUNTING

Japanese: Ko jurin (small reed bunting)

Emberiza minor Blakiston, Ibis, 1863: 99 (Hakodate). (Not of Middendorff, 1851.)

Schoenicola yessoënsis Swinhoe, Ibis, 1874: 161 (new name for *minor* Blakiston).

Cynchramus yessoënsis minamijatschi Kumagai, Ann. Orn. Orien., **1**, 1927: 105 (Miyagi Prefecture, Honshu). (Synonym of *yessoënsis*)

No size difference as claimed by Kumagai (above) is apparent between the Honshu and Hokkaido populations of this bunting. The mainland race, *E.y.continentalis* Witherby (Bull. B. O. C., 1913: 74) which winters to southern Korea and central China and probably breeds in the Manchuria-Ussuria-Amuria region, differs from the nominate race very slightly in the lighter and redder chestnut of its upperparts.

This rare little bunting is known only from Honshu, Hokkaido, and the Kuriles. It formerly wintered in small numbers in the coastal marshes on the Pacific side of Honshu westward as far as Osaka, particularly on the shores of Lake Ukishima in southern Shizuoka Prefecture. The coastal marshes have been netted heavily since the early 1930s to supply small birds for the restaurant trade (cf. under

Megalurus pryeri, p.552) which may account in part for the species' present rarity, but apparently it has never been common. It has been taken in winter or on migration in Aomori, Miyagi, Niigata, Nagano, Saitama, Tokyo, Kanagawa, Shizuoka, and Osaka prefectures, but never in western Honshu, Shikoku, or Kyushu, and there are no recent records.

When Blakiston first described the species (above) he reported it summered in the marshes of southern Hokkaido. Later (1880: 280) he obtained July specimens from the Mt. Fuji area. The first nests and eggs known were reported by Ingraham (Ibis, 1908: 155) as taken 19 June 1907 near Lake Yamanaka at the foot of Mt. Fuji. The nests Ingraham's collector found "were within five or six inches of the ground and placed between the stems of small shrubs." He describes one as "small in size . . . composed of dead grass-blades and stalks and is lined first with fine rootlets and then with horse-hair", and the eggs as "unusually round in shape (for a Bunting) measuring 0.65 x 0.55 in. [16.5 x 14 mm.] . . . dirty white in ground-colour, profusely blotched and spotted with yellowish-brown or umber-brown marks . . ." Allan Owston obtained two complete clutches in the same area two days later. One of these he sold to a Swedish collector named Ottoson, who describes the four eggs (Arkiv för Zoologi, Stockholm, 1908: 2) as "strongly rounded" and measuring 17 x 14.5 (2), 17.3 x 14.4, and 17.2 x 14.4 mm.

The marshes at Lake Yamanaka where the species used to nest were drained for agricultural purposes shortly after this, and later investigators (Kuroda in 1926, Uchida in 1927, Jahn in 1940 among others) have searched the Fuji lake district for the bird in vain. The species has been collected in spring and summer in the Kuriles and in Hokkaido, where it probably bred, though there is no other evidence of its so doing. It certainly bred in the marshes of Miyagi Prefecture. Kumagai (Ann. Orn. Orien., 1927: 106) collected 16 specimens there near Minamiyachi between March and August 1923, 1924, 1925, 1926, and 1927. A female he collected 1 July 1925 contained in its oviduct an egg which was unfortunately broken, but which was almost spherical in shape, and pale blue with a few dark spots at the larger end.

413. Emberiza schoeniclus nortoniensis (Gmelin)
COMMON REED BUNTING
Japanese: O jurin (large reed bunting)

Fringilla nortoniensis Gmelin, Syst. Nat., **1** (2), 1789: 922, *ex* "Norton Finch"

of Pennant, **2**: 376 (Kamchatka).
Emberiza pyrrhulinus Swinhoe, Ibis, 1876: 333, pl. 8, fig. 2 (Hakodate). (Synonym)

This race of the Reed Bunting is a fairly common summer resident in Hokkaido, breeding in the reed beds of fresh water marshes and in wet, grassy meadows from the Ishikari Plain to Sakhalin and the Kuriles. It leaves Hokkaido in October and winters along the coastal marshes and in the phragmites bordering the lowland lakes and rivers of the other main islands from the Kwanto Plain southward. It has been netted in quantities near Tokyo for the winter restaurant trade, but no figures are available on the annual harvest. Flocks of 50 to 100 birds can still be found in the marshes bordering the Chiba lakes in December, January, and February.

The northward movement starts in March, and it arrives on its Hokkaido breeding grounds from mid April (earliest record 8 April) to mid May. It nests from early June into August, and according to Yamashina and Inoue (Tori, 1941: 52) rears two broods. The first brood leaves the nest from late June to mid July, the second from late July to early August. The nest is built on the ground under a protecting grass clump. The 4 to 5 eggs are brownish olive or greenish in ground color with varied dark brown markings, and measure 18.5–21.0 x 14.5–15.6 mm. In general its habits are similar to those of the better-known European races.

414. Calcarius lapponicus coloratus Ridgway
LAPLAND LONGSPUR
Japanese: Tsumenaga hojiro (long-clawed bunting)

Calcarius lapponicus coloratus Ridgway, Auk, **15**, 1898: 320 (Copper Island, Komandorski Islands, Kamchatka).

The 1942 Hand-List refers the known Sakhalin, Korean, and Japanese specimens to the nominate race, and recognizes as *coloratus* only the winter specimens from the Kuriles. As they are based mainly on the color of the breeding plumage, the races of the Lapland Longspur are difficult to determine in wintering birds. I have seen only one eastern Asiatic specimen referable to *lapponicus*, a male in the MCZ taken in Amuria 3 May. All the other specimens I have examined, including 9 from Shaweishan, coastal China, 1 from Korea, and 4 from Sakhalin seem closest to *coloratus*. They are darker than *alascensis*, the breeding range of which extends into northeastern Siberia, and distinctly ruddier than seasonally comparable European and North American material.

The Lapland Longspur is an uncommon and sporadic winter visitor to Hokkaido, and has been recorded south of there only four times as follows:

Honshu, Nagano, Shinano	Jan. 1915	Matsudaira coll.
" Shizuoka, Suruga	undated	Kuroda coll.
" Shiga, Yamashiro	undated	Kuroda coll.
Izu Ids., Hachijo	undated	Momiyama coll.

415. Plectrophenax nivalis pallidior Salomonsen
SNOW BUNTING
Japanese: Yuki hojiro (snow bunting)

Plectrophenax nivalis pallidior Salomonsen, Dansk Orn. For. Tids., **41**, 1947: 136 (Amurland).

The 1942 Hand-List refers wintering specimens from the Kuriles to *P.n. townsendi*, and those from Sakhalin and Japan to the nominate race. The two Hokkaido specimens I have examined are shorter-winged than *townsendi*, and agree in measurements and color with the pale-backed form of eastern Siberia.

The Snow Bunting is of sporadic occurrence in Hokkaido. Judging from its reported abundance in Sakhalin and the Kuriles, it may appear more frequently and regularly in winter on the northern coast of Hokkaido than the specimen record implies:

Hokkaido	(2)	undated	Blakiston & Pryer (1882)
" Hakodate		Dec.	USNM, *ex* Blakiston, 1884
" Teshio Prov.		undated	Dob. Zas. (1897: 166)
" Sapporo		10 Feb. 1907	AMNH
" Chitose		15 Sep. 1932	Yamashina coll.
" Odaito (e. coast)		4 Feb. 1947	Inoue coll.
Honshu, Yamagata, Uzen		late Dec. 1914?	Saito (Dob. Zas., 1918: 37)

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During the past 120 years an extensive literature has been published on the birds of Japan. References to the subject of varying importance may be found in many languages, and in books and journals all over the world. This bibliography makes no attempt to be exhaustive, and beyond listing all the sources referred to in the text by author, year, and page, is limited to the few other more important works that might be consulted.

For the past half century by far the greater part of the literature has been written in Japanese, and published in one or another of the Japanese scientific periodicals. Because many of these publications are practically unavailable outside Japan, and the language barrier makes it difficult (if not impossible) for most westerners to consult them, the titles of papers in the periodical literature have been omitted from the bibliography. To facilitate the locating of material in these sources, the Japanese periodicals are listed below in English, together with the abbreviations used for them in the text references.

Further information on the Japanese periodical and other literature is available in English in three comparatively recent bibliographies. The most useful of these is the comprehensive list of references compiled by Taka-Tsukasa and published in the introduction to his "Birds of Nippon" (1935–1943). With a few minor omissions this gives the English titles of all the papers in the major Japanese periodicals up to 1937. For the waterfowl alone, Kuroda's annotated "Bibliography of the Duck Tribe" is even more exhaustive, and complete up to the start of World War II. Finally, all the essential wartime publications on birds are abstracted in Austin's "Japanese Ornithology and Mammalogy during World War II" (1948b).

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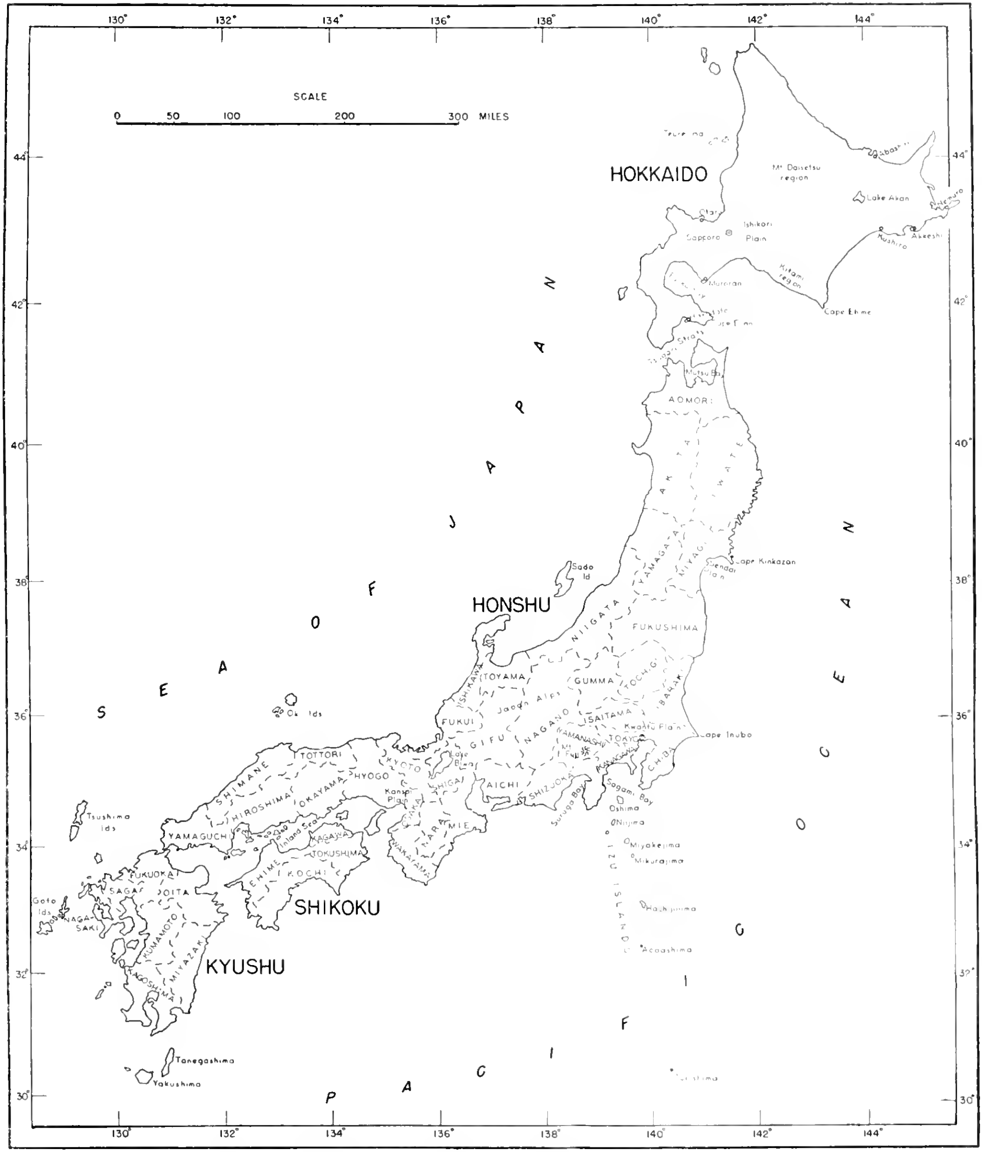
SCALE
0 50 100 200 300 MILES
HOKKAIDO
HONSHU
SHIKOKU
KYUSHU
SEA OF JAPAN
PACIFIC OCEAN
Mt Daisetsu region
Lake Akan
Ishikari Plain
Sapporo
Muroran
Kitami region
Cape Erimo
Kushiro
Akkeshi
Mutsu Bay
AOMORI
AKITA
IWATE
YAMAGATA
MIYAGI
Cape Kinkazan
Sendai Plain
Sado Id
NIIGATA
FUKUSHIMA
TOCHIGI
IBARAKI
GUMMA
TOYAMA
ISHIKAWA
Japan Alps
NAGANO
SAITAMA
YAMANASHI
TOKYO
KANAGAWA
CHIBA
Kwanto Plain
Cape Inubo
FUKUI
GIFU
SHIZUOKA
Suruga Bay
Sagami Bay
AICHI
SHIGA
Lake Biwa
KYOTO
MIE
NARA
WAKAYAMA
Kansai Plain
HYOGO
TOTTORI
SHIMANE
OKAYAMA
HIROSHIMA
YAMAGUCHI
Inland Sea
KAGAWA
TOKUSHIMA
EHIME
KOCHI
Oki Ids
Tsushima Ids
FUKUOKA
SAGA
OITA
NAGASAKI
Goto Ids
KUMAMOTO
MIYAZAKI
KAGOSHIMA
Tanegashima
Yakushima
Oshima
Niijima
Miyakejima
Mikurajima
IZU ISLANDS
Hachijojima
Aogashima
130° 132° 134° 136° 138° 140° 142° 144°
30° 32° 34° 36° 38° 40° 42° 44°

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