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DIAGNOSIS AND RELATIONSHIPS OF THE NORTH AMERICAN TUNDRA-INHABITING PEREGRINE FALCONS

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HARTERT (1913, 1915), in his reviews of the Peregrine Falcons (*Falco peregrinus*), speculated on the existence of an undescribed race of North American Peregrines, characterized by less heavy markings than *F. p. anatum*. He felt that they were possibly of southern origin. Since then, several authors (Bailey, 1948; Snyder, 1957; Beebe, 1960; Cade, 1960) have commented on both lightly marked and dark populations of Peregrines in North America. Some of these researchers have suggested that the light birds probably represent an undescribed geographic race. They have indicated, however, that the lightly marked birds are of northern origin. North American falconers, trapping falcons along the eastern seaboard, have long distinguished the pale, fall migrant by such name as "arctic," "beach," or "blond" Peregrine from the dark, locally raised "rock" Peregrine. Even in the small sample of 11 American Peregrines in the Berlin Museum it was evident to Dementiev and Stresemann (1955) that two "groups" were represented; lightly marked, pale colored birds, and dark, richly pigmented birds. Manning *et al.* (1956) postulated that all lightly marked far northern Peregrines belong to one holarctic geographic race to which they apply the name *leucogenys*, which most recent authors consider a synonym of *calidus*. Despite all this, Vaurie (1961) the most recent reviewers of the species, denies the existence of a distinct northern North American race on the basis that pale specimens with extensive white auriculars have been taken in New York and Texas in the "breeding season," though such birds could be nonbreeding.

I have had to concern myself with this problem as part of a larger study on the biosystematics of North American Peregrines. It seems desirable, in the light of a recent critical decline in numbers of resident, temperate latitude North American Peregrines, as well as of Peregrines in general, to present certain findings at this time, especially as they pertain to the North American arctic populations.

VARIATION IN PEREGRINES IN NORTH AMERICA

The Pacific Coast region of North America between about 50° N to 58° N (principally the islands), the Aleutian chain, and perhaps other coastal areas between about 138° and 150° W is occupied by a large, dark, and heavily pigmented form. Immatures from the Queen Charlotte Islands and Alexander Archipelago vary in color from a lightly pigmented to a dark, heavily pigmented form. Those of the Aleutians appear to be principally of the dark type. Also many adults from the Queen Charlottes have conspicuous and wide (up to 12 mm) light forehead bands. These birds are perhaps best characterized by their grayed tones and extensive heavy ventral markings. They are primarily resident in their range and have been given the racial name *pealei* (see also Beebe, 1960).

Peregrines from the continental United States and Canada vary in size and color both from east to west and from north to south. In the populations that formerly bred in the eastern U. S. and southern Canada, adult specimens are on the average dark plumbeous black above with much graying on the sides and considerable rufous below with extensive spotting and barring. On the average they lack a whitish forehead band, have broad malar stripes and reduced amounts of white in the auricular area. Average immatures have an overall rich, rufous wash. The feather edgings of the dorsum are, if present, much reduced. In worn plumage the back of the immature appears uniform due to the general lack of edgings. Below the striping is dark. It becomes especially wide and triangular or wedge-shaped on the thighs and flanks. In these regions the entire dark midline of the feather is wide. As a result, in worn plumage the thighs and flanks tend to have a mottled appearance owing to the width of the streaking. Heads are usually dark with rufous edgings. The malar stripe varies but seldom has a vertical light area extending from the corner of the mouth (gape) through the stripe. These birds tended to be generally resident or even sedentary. Their former distribution corresponded roughly with Aldrich's (1963) life areas of the northern hardwood conifer, eastern deciduous, oak savannah, and central and eastern parts of the closed-boreal.

North and west through the Canadian taiga the adults tend to be lighter dorsally, although the heads are still dark and the faces rather extensively marked. Below the barring tends to be less extensive, and the markings appear more in the form of broad spots, than in birds to the south. The underparts also lose some of the rich effect of the grayed rufous wash. The immatures are dark and the edgings on the dorsal feathers are lighter, but not so rufous. The breast wash is lighter rufous, more cream colored. Falcons through the taiga appear to be short to medium range migrants.

West of the Great Plains the birds are still smaller. Average adults show a slight brownish cast to the dorsum. The light gray wash on the sides and flanks is heavily suffused with rufous. The spotting and barring below is generally not so dark as in birds in the east. Immatures, although smaller, are like birds from the east but a larger proportion of them represent the lighter extremes. On the Pacific Coast below 50° N, the birds appear to become large again like those of the east. These falcons are generally resident within their range.

Falcons from interior boreal Alaska are larger than those of the west and similar in color but lack much of the brownish cast. They average darker overall than falcons farther north. This is especially true of females. The dark dorsum results not only from a deeper ground color but heavier dark bars. The bars on the dorsal surface are often considerably accentuated in males, reminiscent of this condition in the resident Peregrine of southern South America (*cassini*). Ventrally the barring is blacker, heavier, and closer-set than in the more northern birds. Also the wash is more rufous and thus similar to falcons from western regions. Variation in the young is considerable and presents an interesting problem. Those seen by Cade (1960, plate 17) in 1951 were apparently characteristically pale, light headed birds (although some dark headed birds were seen) while the average immature in 1966 was phenotypically a richly pigmented, very dark headed bird. Only the odd pale headed bird occurred in 1966. This variation will be discussed in detail later. Although interior Alaska is far north, wintering falcons are occasionally seen there in mild winters (Heinrich Springer, pers. observation).

The tundras of North America are inhabited by small Peregrines. These falcons in all plumages are more lightly marked with paler browns or blues, on the average, than other North American populations. They characteristically lack the rufous wash of the continental populations and the sooty and yellowish wash of the Pacific Northwest Peregrines. The tundra-inhabiting falcons are highly migratory.

North America, then, supports three rather distinct groups of Peregrines: 1. The large, dark populations of the islands (and some coastal mainland) of the humid Pacific Coast and Aleutians. This is generally a resident population. 2. The populations of the continental North America which, though variable, are richly pigmented with rufous. These are also generally resident in their range although they show migratory tendencies in the more northern populations. 3. The populations of the arctic and subarctic tundra area which are small, pale, and highly migratory.

NOMENCLATURAL CONSIDERATIONS

All the Peregrines from North America, except the Pacific Coast *pealei*, have heretofore been considered as one geographic race with the name

anatum. The probable type specimen of *anatum* (Bangs, 1930), number 67,848 in the Museum of Comparative Zoology, is a December-taken specimen wintering in New Jersey where the eastern population was generally resident. The specimen appears to be in its first adult plumage (or perhaps second) as several immature feathers remain in its rump, upper back, and wing coverts. Morphologically it is the same as breeding birds from the southern Canadian forests. It is darkly pigmented dorsally with extensive spotting and barring on the ventral surface, although not so dark as average adults from the Appalachian region. I see no reason for not considering the eastern forest birds to represent, then, *anatum* (*sensu stricto*). Manning *et al.* (1956) suggest that the type specimen of *anatum* has a thin malar and large white auricular area, but the specimen actually has about 16 mm of black behind the eye (see Table 1).

Two other names, *nigriceps* and *naevius*, given to the North American populations and thus available merit brief comment. The type specimen of *F. p. nigriceps* is number 2070 in the Philadelphia Academy of Sciences. Although Grinnell (1932: 267) reported it was "not found [at the Academy]," I found it there in 1964 and examined it. Taken at Bear Creek, California, 18 June 1846, it is a dark, richly pigmented immature bird typical of the specimens coming from California eyries, and it typifies average western Peregrines.

Although the average adult characters in the western populations differ from those of the eastern populations, the immatures of the two populations are essentially the same. In assigning the name *nigriceps*, Cassin apparently intended to separate eastern from western North America Peregrines (Grinnell, 1932), but the type of *nigriceps* does not differ significantly from the average eastern North American immature Peregrine. Thus the name *nigriceps* for the western bird is probably best left as a synonym of *anatum* (*sensu lato*).

F. p. naevius (Gmelin, 1788–1789) is based on the description of *Falco maculatus* of Brisson (1760) which in turn is based on the Spotted Falcon, *Falco tachete* of Edwards (1748). I was unable to locate the type of this form. Brisson's (1760) description is of a falcon taken in the region of Hudson Bay. It is apparently undergoing its first molt (prebasic) from the immature to adult plumage, with a brown dorsum and a blue rump as Brisson (page 330) states "Les parties supérieures de la tête & du col, le dos & les petites . . . sont brunes. Le croupion . . . sont d'un centré obscur, varié de lignes transversales, noirs." From further description the immature plumage that remains on the specimen is apparently rather dark while the fresh adult plumage appears to be somewhat light. If indeed this specimen was taken near its breeding grounds (the time of the year seems to be in question), then it comes from an area where

intergradation occurs. The immature plumage is apparently not characteristic of the falcons of the tundra portions of North America. Since the description is inadequate to affix the specimen to one or another population it would seem best to place the name *naevius* (= *maculatus*, = *tachete*) in the category of *nomen dubium*.

Thus, in the course of the overall biosystematic study of the North American Peregrines based on 1121 specimens to date, I consider that the tundra-inhabiting falcons represent a well defined and biologically distinct geographic race which merits nomenclatural status. It is accordingly described as:

Falco peregrinus tundrius new subspecies

Type.—Adult male, No. 46581 National Museum of Canada, near NW Sherman Basin, Adelaide Peninsula, Northwest Territories, Canada, 15 August 1957; collected by T. H. Manning, original number M. 409; weight 616 g; no fat; testis 6 mm, (breeding).

Diagnosis of Adults.—Compared to other North American peregrines *tundrius* is smaller, more pale bluish above, especially noticeable on the crowns and rumps of males. The bars on the dorsal feathers are less contrasting compared with the ground color. The rufous basal portion of the nape feathers are often visible in the form of spots or give a mottled effect to the nape (a feature rarely seen in *anatum* or *pealei*). The ventral surface is less extensively marked while the wash is lighter rufous to pinkish and often lacking, being immaculate, in some males. The white forehead band is generally conspicuous and up to 10 mm wide in some individuals. The white auricular area is extensive, extending nearly to the eye in some individuals. The malar stripe is characteristically narrow and columnar-shaped often with a light break running through it near its base. Females are on the average less distinct from *anatum* (*sensu lato*) than are males of *tundrius*.

Immatures.—The immature is on the average a lighter fuscous to light chaetura brown on the dorsal side than in *anatum* (*sensu lato*) with extensive whitish buff edgings, not rich rufous as in *anatum*. The entire bird often has a sandy buff effect. In worn plumage the dorsal edgings are still usually present. The under parts are lighter sepia to fuscous black color than average *anatum* and dark examples of *pealei*. The ventral stripes on the average are more linear to lanceolate being especially narrow on the thighs. The rectrices, especially median pair, are usually more conspicuously barred with vineaceous buff. The malar stripe is much reduced and often has a light break running from the corner of the mouth (gape) through the stripe. The color of the crown varies. Average individuals have an extremely pale head, the color being confluent with the

ocelli; the latter not distinguished by darker boundaries. The paleness of the head and nape gives them a uniform ochraceous buff to sandy brown aspect, a character lacking in average examples of *anatum* and *pealei*. A darker stripe running posterior to the eye, below, and parallel to the much lighter superciliary stripe is usually present in these light headed examples. Specimens with dark heads possess the same characters as do light headed examples although they may have a slightly darker overall pigmentation. Females are on the average more heavily pigmented and more grossly marked than are males of *tundrius*.

Measurements.—Adult males (64 specimens): wing (chord), 292–330 (308.3) mm; tail, 134–154 (140.5); tarsus, 40–50 (44.3); bill without cere, 15–20 (18.7); bill with cere, 22–25 (24.0); weight, (12 breeding specimens), 550–647 (610.9) g. Adult females (62 specimens): wing 331–368 (351.8); tail, 138–180 (167.8); tarsus, 42–57 (49.8); bill without cere, 21–24 (22.7); bill with cere, 26–30 (27.8); weight, (19 breeding specimens), 825–1094 (952.0). Immature males (27 specimens): wing, 295–319 (311.1); tail, 135–162 (151.8); tarsus, 38–50 (44.0); bill without cere, 17–19 (18.3); bill with cere, 22–25 (22.7); weight (4 specimens, fully fledged, hard penned), 477–662 (570.0). Immature females (30 specimens): wing, 320–367 (349.6); tail, 155–189 (175.6); tarsus, 44–45 (49.1); bill without cere, 19–24 (21.4); bill with cere, 23–28 (26.4); weight (3 specimens, fully fledged, hard penned), 844–925 (889.0).

Geographic Distribution.—Breeds in the tundra biome from about 77° N south to the tree line; east to at least north of the mouth of the Whale River, Ungava Peninsula, Quebec and in Greenland from at least Sukkertopper (atypical) to Thule (no specimens from eastern Greenland available); west to Cape Prince of Wales, Alaska. Along southern limits intergrading characters occur in examples from Gothaab District, Greenland; Nain, Labrador; southern Southampton Island, Northwest Territories; south of Fort Chimo, Quebec; north of Churchill, Manitoba; Fon du lak, Saskatchewan; Fort Good Hope, Northwest Territories; Romanzoff Mountains, Alaska, and some examples, especially females from the upper reaches of the Colville River Drainage, Alaska. Highly migratory. Winter range: north (sparingly) from at least Cape Sable, Florida and Cameron Bayou, Louisiana (probably along entire gulf coast) and Baja, California (occasionally); south to 40° S in Chile (Valdivia), and probably as far south in Argentina, at least to the Buenos Aires province (35° S). (See also Kuyt, 1967.) May also occur on the islands in the central Pacific Ocean in the general region of 0° to 20° N, 170° W (specimens, taken at sea, in the U. S. Natl. Mus. not compared in series and may be light example of *japonensis*, see below).

Geographically adjacent forms.—*F. p. cassini* from southern South

America, which comes into contact with examples of *tundrius* that migrate into South America, is readily distinguished from the latter by size and color; *cassini* is small, darker in all plumages, and much more extensively marked and barred.

The Nearctic *tundrius* is similar to *japonensis* of northeastern Asia, but not so dark and extensively marked in the adult plumage. From *japonensis* the immatures of *tundrius* differ rather markedly in being less hair brown, lighter, and lack the ashy appearance to the dorsum, a color that gives *japonensis* a more grayed overall appearance. *Tundrius* has a more extensive feather edging dorsally and lacks the ventral "yellow-white" wash of *japonensis*. Light areas of the nape, occiput, and crown are more extreme and extensive, characters which in *japonensis* are more restricted or nearly wanting. The races *tundrius* and *japonensis* are similar in size. As adults of *tundrius* and *japonensis* are rather similar and as few specimens of *japonensis* are available in this country for comparison, it has been difficult to determine whether regular genetic exchange occurs between them. Immatures from the two populations are so markedly different, that any exchange that may occur is minimal. The one specimen (breeding?) from Cape Prince of Wales, Alaska, reported by Hanna (1940), has been called *harterti* (Friedmann, 1950; A.O.U., 1957). *Harterti* is properly considered a synonym of *japonensis* but has also been placed in synonymy with *calidus*. The Cape Prince of Wales specimen was apparently compared with specimens of *calidus* (Hanna, 1940; Friedmann, 1950: 665) when it was reported as being the first North American record of the Asian population. The Cape Prince of Wales bird is notably paler blue above than specimens of comparable sex and age of *japonensis* from Ryukyu Islands, China, and the Philippine Islands. It is darker than a series of average breeding *calidus* from the center of its range. This specimen is identical to average specimens of *tundrius* from the Colville River, Alaska, Baffin Island, Adelaide Peninsula, Southampton Island, Victoria Island, and Boothia Peninsula, Northwest Territories. Several specimens from the eastern Canadian arctic are lighter, as are a few from Alaska. Although specimens from the western Alaskan coast may have some genetic influence from the Asian birds, they are average examples of *tundrius*. *F. p. harterti* should probably be deleted from the North American Check-list. The Pacific Ocean specimen mentioned above is just completing the first prenuptial (prebasic) molt and is thus difficult to assign racially as the first adult plumage is usually darker than later ones. This specimen is slatier and darker than average *tundrius* but lighter than the average *japonensis*. On the basis of measurements, plumage, and locality it is provisionally referred to *tundrius* pending a more extensive analysis of *japonensis*.

Because of the considerable color variation in *calidus* of the Palearctic tundras, it is difficult to characterize the average *calidus*. Since *F. p. tundrius* is similar to *calidus* in all plumages, the question has been raised as to whether the entire Holarctic tundras are occupied by one form only, but that is doubtful. *Calidus* is separated geographically in the eastern part of its range from *tundrius* by the darker form *japonensis*. In the west, as Peregrines generally do not breed north of Scoresby Sound area of eastern Greenland, Iceland, Jan Mayen, nor Spitsbergen, apparently a large hiatus separates *tundrius* from Eurasian forms. There is probably no, or at least very limited, gene flow between the two tundra forms. The nominate form, *peregrinus*, from the British Isles and Scandinavia is as close geographically to the North American birds as is *calidus*. Even the range of *calidus* in the Scandinavian tundras is apparently restricted (F. Salomonsen, pers. comm.). Boris Stegmann (in litt.) believes the western limits of the range of "typical" *calidus* to be near the Kanin Peninsula and specimens from the Kanin area are very light, much lighter than Nearctic birds.

The race *tundrius* differs generally from *calidus* in the following aspects: Average adult *calidus* have a uniform (not contrasting) color to the head, shoulders, and back while *tundrius* usually have a contrasting darker head and shoulders than back. The malar stripe of *calidus* is generally gray to blue; in *tundrius* it is blue to blackish. The center of the belly in *calidus* is usually only sparsely marked and more spotted than barred while the *tundrius* are usually barred, albeit sparsely. The immature *calidus* is less rich in overall color, more whitish in light areas. The differences here are ones of comparative richness of color and are most difficult to see in worn plumage.

The only adult North American individuals as lightly marked as the average light *calidus* from the western and central portion of its range is a male from the Chipps River, Alaska, and a male from Victoria, N.W.T., Canada. I consider the morphological similarity between North American tundra-inhabiting falcons and *calidus*, as well as some adult *japonensis*, to be a parallelism resulting from similar selection pressures in their ecological and evolutionary features rather than from a common gene pool.

REMARKS

Name.—The latinized adjectival form of tundra was chosen to signify the ecological biome in which these birds breed. The population has long been referred to as the "arctic" Peregrine but this name is somewhat misleading as considerable forested terrain north of the Arctic Circle, especially in western North America, is occupied by a different type of

TABLE 1
AVERAGE WIDTHS¹ OF FACIAL MARKINGS IN TUNDRA- AND
NONTUNDRA-INHABITING PEREGRINES²

	Width of black between eye and white auricular		Width of malar stripe at base	
	Tundra	Nontundra	Tundra	Nontundra
Adult males	8.5 mm	20.4 mm	18.5 mm	28.0 mm
Adult females	10.6	21.1	21.1	33.5
Immature males	3.0	11.1	11.0	21.5
Immature females	6.8	12.5	20.0	29.5

¹ In samples of 25 specimens of each, 100 in all.

² Pacific Northwest birds are excluded.

Peregrine. In eastern North America the tundra habitat occupied by *tundrius* extends south of the Arctic Circle. This relationship of habitat and racial affinity is not to be construed as a hard and fast condition with fixed lines. Rather, there is dynamic interpopulational gene exchange along the ecotonal facies of tundra and taiga that are the zones of contact. In these zones of contact the extent and degree of intergradation varies from region to region.

Face and head characteristics.—As pointed out by Vaurie (1961) and Friedmann (1950), American Peregrines show considerable individual variation in color and marking, especially in the facial markings. In large samples of the various populations, the individual variation tends to range within definite limits. Adults also vary according to age. Birds in the first adult plumage tend to be darker than older birds in their respective populations. All adults from the tundras are characterized by the extension of the white auricular area. Also the malar stripe is relatively narrow and columnar-shaped. As a relative index to the greater extent of the large white auricular and slighter more narrow malar stripe of the tundra birds, Table 1 compares their average measurements in tundra birds with those of the forested area to the south.

Many fully adult birds from the Canadian arctic have such lightly marked crowns and napes that they appear to have mottled heads and portions of the superciliary stripe are visible. This results from either the light tips and edgings on dark feathers or the buffy basal portions of the feathers showing through. These adults frequently have a slight break in the malar stripe similar to that described for the immatures of this population.

The light head characters of some immatures from the far north are nearly identical to the head characters of some immatures from the Pacific Northwest (at least those from the Queen Charlotte Islands) and also some of the birds from the west. These birds of the latter two types are

generally lighter overall than the average of their respective populations.

Migration.—A significant biological feature of *tundrius* is its migratory pattern. Most North American Peregrines, except perhaps *pealei*, show a leapfrog pattern of migration as discussed by Salomonsen (1955). From the presently known southern limits of the species in central Mexico at about 22° N to about 50° N, the Peregrines appear to be generally resident or show latitudinal movement (U.S.F.W.S. banding returns, see Enderson, 1965). Peregrines of continental taiga areas and southern Greenland tend to move over the resident Peregrines and winter as far south as Central America and occasionally northern South America. However, some individuals remain in southern Greenland also. *Tundrius* makes the longest movement, its winter range overlapping the southern limits of the resident populations sparingly and extending to southern South America. Some year old birds of *tundrius* and an occasional adult are known to loiter in summer as nonbreeding birds in the winter range, even being recorded in Central and South America in our summer months. Small individuals of the population apparently tend to move farthest south. The bulk of the migrants appearing along the Atlantic seaboard appear to be from the *tundrius* population. Fewer individuals of *tundrius* pass through the plains and midwestern states. Still fewer pass southward west of the Rocky Mountains and along the west coast. Only a moderate percentage of the migrants passing along the Louisiana and Texas Gulf Coasts are *tundrius*. In contrast the individuals wintering there correspond to falcons from breeding populations in western areas and the Canadian taiga (see Hunt, 1966).

Other data.—In habits and morphology *tundrius* is a New World counterpart of the Palearctic *calidus*. The validity of *calidus*, however, is questioned by some authors, notably Mackworth-Pread and Grant (1934) and Voous (1965), apparently because of what they consider the lack of morphological distinctiveness from other Eurasian forms. I agree with Vaurie (1960) that, aside from morphological grounds, the important biological aspect of lengthy migrations (and, *a priori*, the related physiologically dictated differences such as breeding cycles, etc.) in *calidus*—and likewise *tundrius*—is an important argument in favor of nomenclatural distinctiveness. *Tundrius* is in effect reproductively isolated from the southern taiga populations by its gonad cycle. Some *tundrius* arriving on the breeding grounds (specimens from N.W.T., Canada) have gonads still in the process of enlarging and yet have passed over populations with well advanced eggs. The entire courtship cycle of *tundrius*, and thus factors regulating pair bonding, is at variance with southern latitude Peregrines (see Cade, 1960).

The ratio of wing to individual primary length (numbers 10 to 5) tends

to indicate that *tundrius* has slightly longer primary feathers than *anatum* (*sensu stricto*). This difference may not prove to be statistically significant, but may nonetheless be a reflection of the migratory habits of *tundrius*. Although Peregrines in the Old World tend to conform with Bergmann's Rule, the New World Peregrines do not. Here northern breeding Peregrines are smaller than southern breeding Peregrines. This may result from greater selection pressure for small size imposed on *tundrius* while on the South American wintering quarters rather than during the relatively short time spent on their breeding grounds (Salomonsen, 1955).

Specimens examined.—Museum specimens of *Falco peregrinus tundrius* examined to date number 213. They are from the following localities: Alaska: Cape Prince of Wales, 1 (May); Colville River, between Etiviluk River and Ocean Point, 14 (June–August); Pitmegea River, 5 (July); Carbon Creek, 2 (June); Romanzoff Mountains, 2 (June); Collinson Point, 4 (June); Ikpikuk River, 2 (July); Nome, 1 (June); Brownlow Point, 1 (May); Ice Cape, 1 (September); Meade River, 1 (June); Chipp River, 1 (July); Chandler River, 1 (August); Chimisso Island, 1 (Summer); Endicott Mountains, 3 (June); Barter Island, 1 (June); Barrow, 1 (July); 30 miles S Barrow, 1 (October); Russian Mission, 1 (September); St. Lawrence Island, 1 (September). British Columbia: Riska, 1 (September). Alberta: Peace River, 1 (September). Northwest Territories: Boothia Peninsula, 4 (May–September); Baffin Island, 16 (May–September); Victoria Island, 6 (June, August); Southampton Island, 1 (June); Melville Peninsula, 1 (August); Banks Island, 4 (June); Coronation Gulf, 4 (June); Simpson Peninsula, 1 (June); Adelaide Peninsula, 17 (June–September); Summerset Island, 1 (September); Franklin Bay, 1 (July); Anderson River, 2 (August); Handbury River, 1 (July); Frazier Island, Hudson Bay, 1 (June); Lockhart River, 1 (June). Ontario: Moosonee, 7 (August, October); James Bay, 4 (October); Toronto, 2 (September, October?). Quebec: Scoter Lake, 1 (July); Nastapoka River, 1 (May); Whale River, 1 (July); False River, 2 (May, August); Koksoak River, 1 (September). Greenland: Sukkertopper, 2 (October); Rekertarsuatsiak, 1 (July); Akunak, 1 (October); Godtaab, 1 (October); Ikanuit, 1 (November); Thule, 1 (June). Connecticut: New Haven 1 (September). New York: Fisher Island, 15 (September, October); Savannah, 1 (October); Long Island, 1 (October). Maryland: Chapel Hill, 1 (October). Pennsylvania: Philadelphia, 1 (November). Indiana: Ripley, 1 (October). Ohio: no specific locality, 2 (October). Michigan: Point Peele, 2 (October); Isle Royal, 1 (September); Muskegon County, 1 (September); Imlar City, 1 (October); Bay Shore, 1 (October). Wisconsin: Ripon, 1 (September); Cedar Grove, 2 (October); Lake Church, 1 (October). Minnesota: Carlos Avery Refuge, 1 (October). Illinois: Lake Forest, 1 (October). Iowa: no specific locality, 1 (October). Texas: Padre Island, 4 (October); Nueces County, 1 (November). Louisiana: Timbalier Island, 1 (October); Cameron Bay, 1 (April). Florida: Chatham Bay, 1 (October); West Jupiter, 1 (October); Florida Keys, 1 (October). Utah: Farmington Bay, 1 (December). Washington: Nisqually Flats, 1 (November). California: Del Ray, 1 (March). Mexico: Tamiahua Lake, 1 (April); Jalisco, 1 (April); Chihuahua, 1 (May). Baja California: San Geronimo Island, 1 (March); San Benito Island, 2 (March); Navidad Island, 1 (April). Jamaica: Spanish Town, 1 (December). Lesser Antilles: Antigua, 1 (October); Grenada, 1 (November). Bermuda: Warwick, 1 (November). Trinidad: no specific locality, 1 (May); Cocal, 1 (October). Guatemala: at sea off coast, 1 (December). Costa Rica:

15 miles off shore at sea, 1 (December); Cocos Island, 1 (April). Panama: Los Santos, 1 (March); La Jugna River, 1 (January). Columbia: Bolivar, 1 (March); Bonda, 1 (October). Surinam: Nickerie, 1 (December). Ecuador: Oriente, 1 (February); El Muenta Island, 1 (February); Baños, 1 (April). British Honduras: Half-moon Cave, 1 (March). Peru: Junin, 1 (March); Chinchá Island, 1 (December); Lima, 1 (November?). Chile: Dumas de Llico, 3 (January); Temucho, 1 (March). 14° 10' N, 171° 42' W, Pacific Ocean, 1 (November).

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