The *Larus* Gulls of the Pacific Northwest's Interior, with Taxonomic Comments on Several Forms (Part II — Conclusion)

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Unless otherwise indicated, specimens mentioned herein are deposited in Washington State University's Conner Museum (WSUCM).

GLAUCOUS-WINGED GULL *Larus glaucescens*

Burleigh (1972) lists this species as casual in the northern part of Idaho, presumably on the basis of an immature bird photographed by J. Acton along the Spokane River at Coeur d'Alene, Kootenai County, on 22 February 1963 (LaFave 1965). Two other records are known: an adult bird observed by the writer at Coeur d'Alene, Kootenai County, on 28 December 1977; one seen at Nampa, Canyon County, on 17 February 1978 (Rogers 1978).

Apparently eastern Washington's first records of this primarily marine, west coastal species are of adult birds seen in the Potholes Reservoir region of Grant County by Johnsgard (1954) on 22 April 1954 and 4 May 1954; the first documented record is of three gulls photographed by LaFave (1965) on 5 February 1956, presumably at Spokane, Spokane County. By the winter of 1974-75, this species had become a regular winter visitor along the Columbia River in south-central Washington, where it was present from 7 December 1974 to at least 17 February 1975 (Rogers 1975). An adult female was collected by the writer along the Columbia River at Pasco, Franklin County, on 20 November 1978 (WSUCM No. 79-120); its measurements: wing, 420.0mm; tail, 180.0mm; exposed culmen, 55.0mm; depth of bill at angle of gonys, 22.1mm; tarsus, 72.0mm; weight, 1298.0g. To the best of the writer's knowledge, No. 79-120 is the first specimen of *glaucescens* from the interior of the Pacific Northwestern United States. Two additional specimens were collected by the writer at Pasco: an adult female intermediate *(L. glaucescens* toward Western Gull *L. o. occidentalis;* see discussion under *L. occidentalis)* on 28 December 1979; a first-year immature female *glaucescens* (WSUCM No. 80-278) on 3 January 1980.

This species remains unrecorded from the region of the confluence of the Snake and Clearwater rivers in Washington and Idaho.

WESTERN GULL *Larus occidentalis*

Status in the interior of the Pacific Northwest

In the Pacific Northwest, this species is known with certainty only from marine environs. The specimen purportedly documenting the occurrence of *L. occidentalis* from the Pacific Northwest's interior has been reidentified by the writer as a first-year immature California Gull *L. californicus* (Weber 1979), leaving one record from this region's interior: an undocumented sighting of two adults by W.A. Hall and L.D. LaFave (LaFave 1965) at O'Sullivan Dam, Grant County, Washington, on 16 January 1959.

An intermediate from eastern Washington

Hybridization between the Glaucous-winged Gull *L. glaucescens* and *L. o. occidentalis* (northern race of the Western Gull) has been known from Pacific Northwestern coastal waters since the turn of the century (Dawson and Bowles 1909) but has only recently been studied in detail (Hoffman *et al.* 1978). Both species are typically marine, with *glaucescens* breeding from the Aleutian and Pribilof islands and the southern Bering Sea coast south to the central Washington coast, and *occidentalis* from the southern Washington coast to Baja California and the Gulf of California (A.O.U. check-list 1957). Hoffman *et al.* found extensive interbreeding of these two forms within their range of sympatry (180km) along the Washington coast.

On 28 December 1979, the writer collected an intermediate *(L. glaucescens* toward *L. o. occidentalis;* adult female; WSUCM No. 80-253) from a mixed flock of Herring *L. argentatus* and Ring-billed *L. delawarensis* gulls at the Pasco, Franklin County, Washington, garbage dump. This gull had the yellow-orange orbital ring of *L. o. occidentalis,* and iris coloration showed a combination of *L. glaucescens* and *L. o. occidentalis;* that is, irides were brown and flecked with dark brown melanin. Typical *L. glaucescens* have purple or magenta eye-rings and dark brown irides, while typical *L. o. occidentalis* have yellow to orange eye-rings and yellow irides flecked with brown melanin (Hoffman *et al.* 1978). An attempt to quantify mantle and wing tip darkness by the same standard (Kodak density-calibrated neutral gray scale) used by Hoffman *et al.* was unsuccessful. With only ten shades of color from white to black, the writer found the Kodak scale inadequate for measuring the nuances in relative darkness among gulls of the two forms. Instead, a sensitive electronic device (Photovolt reflection meter, model 670, with red filter) was employed for colorimetry. The mantle and wing tip reflection values of WSUCM No. 80-253 as measured by the Photovolt meter are 23.5 and 13.5, respectively (increasing numbers represent decreasing darkness). As shown in Table 3, mantle darkness of this specimen is within the range of typical *L. glaucescens* but outside that of typical *L. o. occidentalis;* wing tip darkness falls between the ranges for typical examples of these forms. But it should be noted that the data in Table 3 for typical *L. glaucescens* and typical *L. o. occidentalis* are based only upon darkness of mantle and wing tips; coloration of iris and eye-ring for the typical specimens on which the data in Table 3 are based is unknown. The writer's tendency is to consider as *L. o. occidentalis* those specimens with blackish wing tips and those with gray to dark gray wing tips as *L. glaucescens.*

Of the combined total of 22 adult specimens of these two species in the collections at Washington State University and the University of Idaho (UIM), two others (UIM No. 674 and WSUCM No. 40-63, both from coastal Washington) show evidence of either interbreeding or introgression (gene flow). UIM No. 674, designated as *L.*

TABLE 3. Mantle and wing tip darkness for adults of *L. glaucescens, L. o. occidentalis, L. a. smithsonianus,* and intermediates between *glaucescens* and nominate *occidentalis.* Data are for specimens in the collections at Washington State University and the University of Idaho. Reflection values were obtained by a Photovolt reflection meter (model 670) with red filter. Increasing darkness is represented by decreasing reflection values. Mean values are in parentheses.

	No. of specimens	Mantle reflection value	Wing tip[1] reflection value
Typical *L. glaucescens*	11	22.2-27.0 (25.7)	17.0-27.0 (21.2)
Typical *L. o. occidentalis*	5	14.9-19.9 (16.6)	7.0-10.5 (8.0)
Typical *L. a. smithsonianus*	7	25.9-33.0 (29.9)	4.5-8.0 (6.1)
WSUCM No. 80-253 *(L. glaucescens* toward *L. o. occidentalis)*[2]	1	23.5	13.5
UIM No. 674 *(L. o. occidentalis* toward *L. glaucescens)*[2]	1	23.5	10.0
WSUCM No. 40-63 *(L. o. occidentalis* toward *L. glaucescens)*[2]	1	23.0	16.0

[1]Readings taken about 4-5cm below tip of second outer primary on outer vane.

[2]Additional data for these specimens are given in Table 4.

TABLE 4. Bill measurements for adults of *L. glaucescens, L. o. occidentalis, L. a. smithsonianus,* and intermediates between *glaucescens* and nominate *occidentalis.* Data are based upon specimens in the collections at Washington State University, the University of Idaho, and the University of Washington. Mean values are in parentheses.

	Exposed culmen, *l* (mm)		Bill depth, *d*, at angle of gonys (mm)		*l*/*d*	
	male	female	male	female	male	female
L. glaucescens; 7 males and 7 females	55.0-64.0 (60.0)	47.5-56.1 (53.3)	19.4-22.6 (21.2)	18.1-22.1 (19.6)	2.66-3.09 (2.84)	2.49-2.96 (2.71)
L. o. occidentalis; 4 males and 5 females	51.0-60.2 (54.6)	51.0-52.9 (52.0)	19.9-21.6 (21.1)	18.2-19.8 (19.3)	2.40-2.79 (2.59)	2.58-2.86 (2.70)
L. a. smithsonianus; 5 males and 5 females	53.8-66.0 (58.7)	51.8-59.0 (54.4)	19.2-21.2 (19.8)	17.2-20.6 (18.3)	2.79-3.09 (2.96)	2.85-3.11 (2.97)
WSUCM No. 80-253 *(L. glaucescens* toward *L. o. occidentalis;* adult female; 28 December 1979; Franklin County, Washington)		52.0		18.7		2.78
UIM No. 674 *(L. o. occidentalis* toward *L. glaucescens;* adult male; 7 June 1949; Grays Harbor County, Washington)	52.8		19.4		2.72	
WSUCM No. 40-63 *(L. o. occidentalis* toward *L. glaucescens;* adult male; 15 July 1940; Clallum County, Washington)	59.0		21.3		2.77	

occidentalis on its museum tag, is considered to be *L. o. occidentalis* toward *L. glaucescens* by the writer (see Table 3). WSUCM No. 40-63 bears the identification *L. argentatus smithsonianus* on its museum tag (collected and initially identified by G.E. Hudson); however, its mantle and wing tip reflection values are outside the ranges for *smithsonianus* but within (or between) those for *glaucescens* and nominate *occidentalis* (see Table 3). Moreover, this specimen's bill shape index (as indicated by the ratio of exposed culmen length to depth of bill at angle of gonys, the *l/d* ratio) is slightly less than the range for *smithsonianus* but within those for *glaucescens* and nominate *occidentalis* (see Table 4). Although WSUCM No. 40-63 has more white in its wing tips than is present in typical Glaucous-winged and Western gulls, some hybrids of these species have more white in their wing tips than either parental form (Hoffman *et al.* 1978). The writer considers this specimen closer to nominate *occidentalis* than to *glaucescens* primarily because of the extent, rather than intensity, of gray-black in its primaries.

If the reflection values of the three intermediates (WSUCM No.'s 40-63 and 80-253, and UIM No. 674) were included in the data to determine mean and extreme mantle and wing tip darkness for *L. glaucescens* and *L. o. occidentalis,* both mantle and wing tip darkness of the two forms would overlap (see Table 3). When six or seven of the 22 adult specimens examined by the writer are arranged in a series from lightest to darkest, there is an unbroken gradation from one form to the other, making it difficult to discern where *glaucescens* ends and nominate *occidentalis* begins (see Figure 1).

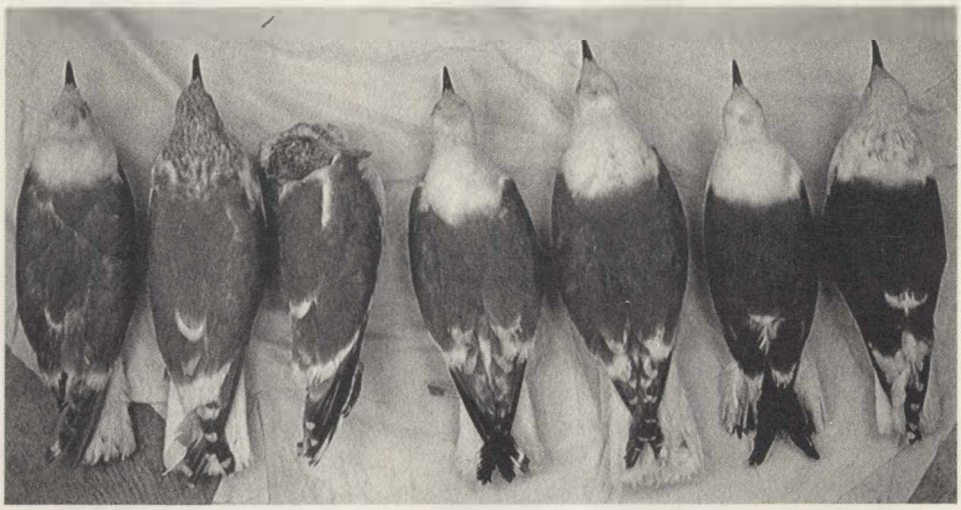

Figure 1. Series of Glaucous-winged and Western Gulls. From left to right: WSUCM No. 49-178, *L. glaucescens;* WSUCM No. 75-229, *L. glaucescens;* WSUCM No. 80-253, *L. glaucescens* toward *L. o. occidentalis;* UIM No. 674, *L. o. occidentalis* toward *L. glaucescens;* UIM No. 692, *L. glaucescens;* WSUCM No. 48-208, *L. o. occidentalis;* WSUCM No. 55-33, *L. o. occidentalis.* No. 80-253 was not yet prepared as a specimen when the photograph was taken. From left to right, the mantle and wing tip reflection values, respectively, for these specimens: 26, 20; 26,17; 23.5, 13.5; 23.5, 10; 22.2, 18; 19.9, 7.5; 14.9, 7.

Taxonomic discussion of the* glaucescens-occidentalis-argentatus *complex

Hoffman *et al.* (1978) treat *glaucescens* and nominate *occidentalis* as semispecies; that is, as borderline cases in speciation. They conclude that the two forms do not satisfy

the criteria for conspecificity as proposed by Mayr (1969) and Short (1969). In zones of overlap and hybridization, these criteria include the complete breakdown of isolating mechanisms (random mating), the filtering of introgressed genes into adjacent parental populations, complete intergradation (cline formation), and the absence of parental phenotypes.

The establishment of either the presence or absence of isolating mechanisms is crucial to the determination of the relationship between *L. glaucescens* and *L. o. occidentalis*. Total breakdown of these mechanisms would result in random mating, almost assuring that the remainder of the above-mentioned criteria be met. The other extreme, complete reinforcement of isolating mechanisms, would preclude interbreeding and therefore ensure the specific identity of the two forms. In the midst of the zone of hybridization, Hoffman *et al.* found hybrids to outnumber the combined total of pure Glaucous-winged and Western gulls in four colonies (Destruction Island; Sand and Whitcom islands, Gray's Harbor; South Rock, Hoh River); they also observed assortative mating (preference for similar mates) and that pure pairs of the two forms hatched significantly fewereggs than pairs containing at least one hybrid. Presumably the presence of apparently pure mated forms in this zone partially sustains the isolating mechanisms, thereby impeding a free exchange of genes between adjacent parental populations. Thus, interbreeding breaks down isolating mechanisms, while assortative mating tends to reinforce them. In some instances, a standoff conceivably occurs, and the two interbreeding forms neither merge into a continuous population nor diverge to the point of reduced hybridity. Despite the preponderance of intermediates in some colonies and their apparent reproductive advantage over pure parental phenotypes, Hoffman *et al.* believe such a stalemate possibly exists between *glaucescens* and nominate *occidentalis*. They analyzed an assumed equilibrium condition by means of a mathematical model of the Destruction Island gull population (29% Western, 19% Glaucous-winged, 52% hybrid). With immigration, density-dependent fecundity, pairing and reproduction, and mortality as parameters and a gull population of 1300, Hoffman *et al.* determined that an annual influx of 20 Western and 13 Glaucous-winged gulls would be required to maintain equilibrium, which was assumed to be represented by the above percentages of morphological classes. Thus, an annual immigration of small numbers of pure types into the colony (and therefore into the hybrid zone) can theoretically balance the reproductive advantage of the intermediates. In actuality, however, the yearly number of pure forms either entering or leaving the colony is unknown.

Interbreeding of *glaucescens* and nominate *occidentalis* does not fall within the five categories of population contact described by Mayr (1969:194), who includes zones of overlap with occasional interbreeding (semispecies) and those with complete intergradation but does not consider intermediate conditions. By treating *glaucescens* and nominate *occidentalis* as semispecies, Hoffman *et al.* expand the semispecies concept so as to include persistent interbreeders in a presumed state of equilibrium, a condition perpetuated by the operation of partial isolating mechanisms.

The conclusions drawn by Hoffman *et al.* regarding speciation of Glaucous-winged and Western gulls conform to the data they gathered and its somewhat narrow interpretation of Mayr's and Short's criteria for conspecificity. These criteria are not satisfied because of assortative mating among the large percentage of parental phenotypes within the zone of overlap, resulting in partial rather than complete intergradation. But for reasons to be discussed later, the writer believes there is no convincing argument for assuming that interaction of the three morphological classes within this zone has stabilized; it is also possible that the zone is imperceptibly being driven toward complete intergradation. If this were the case, a less restrictive interpretation of Mayr's and Short's criteria, one weighing introgression against assortative mating, would allow a different perspective on the taxonomy of these forms.

The relationship between *glaucescens* and nominate *occidentalis* can perhaps be better understood by a brief discussion of the three subspecies (nominate *occidentalis*, *wymani*, and *livens*) of *L. occidentalis*. Nominate *occidentalis* breeds along the Pacific Coast from Washington south to central California and is replaced by *wymani* along the coast from central California south to central western Baja California; the race *livens* breeds in the Gulf of California (A.O.U. 1957). Presumably nominate *occidentalis* intergrades with *wymani* in central California, but just where this occurs was not clear to Grinnell and Miller (1944). However, there appears to be a discontinuity in range between *wymani* and *livens*, and the writer is unable to find evidence in the literature for interbreeding of these subspecies. Although the two forms have deep neutral gray mantles (all of the forms in this discussion, including *glaucescens*, have white heads and bodies), *wymani* is flesh-footed and has an orange-yellow eye-ring, while *livens* is yellow-footed and possesses a yellow orbital ring (Dickey and Van Rossem 1925). In addition, downy young of the two races are significantly different: ground color of *livens* is almost white and that of *wymani* a rich brown (Bancroft 1929). Thus, along the coast from Washington to western Baja California, there exists a gradation from nominate *occidentalis* to the slightly smaller *wymani* (Jewett *et al.* 1953) with its darker mantle. So far as the writer knows, there appears to be a gap, both geographical and morphological, between *wymani* and *livens*. If *livens* does not interbreed with *wymani*, the criteria employed by Hoffman *et al.* to test conspecific status of *glaucescens* and nominate *occidentalis* cannot be used to assess conspecificity for *livens* and *wymani*. Without intergradation with *wymani*, *livens* would presumably qualify as a race of the Western Gull for other reasons: morphological characters and behavioral similarities *livens* shares with *wymani* and nominate *occidentalis;* the marine habitat preferred by each of the three forms; *livens'* geographic proximity to *wymani*. But the combination of dark mantle and yellow legs in *livens* suggests it is perhaps closely related to other yellow-legged, dark-mantled marine species (such as *L. dominicanus*). On the other hand, if *livens* is indeed a geographical isolate of *occidentalis*, it might have crossed the threshhold of speciation; the possibility that it is a distinct species *(Larus livens)* is worthy of attention. Because of intergradation (though not complete) and extensive hybridity between nominate *occidentalis* and *glaucescens*, nominate *occidentalis* may be taxonomically closer to *glaucescens* than to *livens*.

Aside from the criteria for conspecific status proposed by Mayr and Short, other factors could reasonably be considered in assessing borderline cases in speciation. In particular, would merging two or more forms into one species enhance our understanding of the relationship of the forms, or would it reduce our comprehension of the differences among them? In the case of *glaucescens* and *occidentalis*, the writer believes the former proposition is more persuasive than the latter. It is appealing to speculate that from *wymani* (and possibly *livens*) in the south to nominate *occidentalis* and *glaucescens* in the north, these forms represent *L. occidentalis*, the marine gull of North America's Pacific Coast. Mantle color of these forms varies clinally from dark to light in the northerly direction, and average size increases in accordance with Bergmann's rule.

As with *glaucoides* and *thayeri* (see Part I), Pleistocene glaciation figures prominently in the evolution of *glaucescens* and *occidentalis*. Hoffman *et al.* note the coincidence of *glaucescens'* present distribution with the coastal edge of the Cordilleran glacier complex during the last Pleistocene maximum and the present range of *occidentalis* to the south of these glaciers. They speculate that a floating ice-shelf in the vicinity of Vancouver Island might have separated ancestral populations of Glaucous-winged and Western gulls. The writer, carrying their reasoning a step further, suggests that these forms were conspecific before the last glacial advance (Wisconsin stage) of the Pleistocene. Divergence to the point of complete speciation as a result of reproductive isolation during this era might not have occurred. Subsidence of the Cordilleran ice-sheet with climatic amelioration brought the formerly isolated populations in contact again,

resulting in the extensive hybridization observed by Hoffman *et al.* Therefore, the zone of secondary intergradation possibly extends 10,000 years into the past, back to the close of the Pleistocene. Hoffman *et al.* believe that the biological species concept would predict that the two forms would have evolved to, or at least approached, either complete intergradation or complete reproductive isolation if the zone of contact is, in fact, old; because neither has occurred, they suggest that the zone of contact is in a balanced condition. If, on the other hand, the shortest estimated time for speciation in birds is from 10,000 to 18,000 years (Selander 1971:106; Selander also mentions that shorter periods might be possible), there would be no convincing reason for assuming equilibrium in the hybrid zone, and a different interpretation of the data presented by Hoffman *et al.* becomes possible. The degree of interbreeding and apparent reproductive advantage of hybrids suggest that *glaucescens* and nominate *occidentalis* are merging, albeit slowly, into a zone of complete intergradation; concomitantly, the writer postulates that introgression (as demonstrated, for example, by some darkening of the primary tips of Glaucous-winged Gulls examined by Hoffman *et al.* at Greater Chain Island, British Columbia) may outweigh the effect of assortative mating in the zone of hybridity. If, in cases of doubtful speciation, taxonomic philosophy could be broadened so as to reflect evolutionary direction, conspecific treatment of the two forms under consideration would perhaps be more consonant with their current status.

As mentioned earlier (see Part I), Smith (1966) believes that pigmentation of eye and orbital ring is the principal sexual isolating mechanism of the arctic *Larus* gulls he studied; moreover, he reasons that the resultant eye-head contrast pattern (either light against white or dark against white) appears to have the same functional significance in species discrimination for all large *Larus* gulls of the northern hemisphere. Notwithstanding the differing eye-head contrast patterns of *occidentalis* (light against white) and *glaucescens* (dark against white), Smith's theory can be used to elucidate this anomaly in these two possibly conspecific forms. Assuming that the previously discussed separation of ancestral forms of Glaucous-winged and Western gulls during the Wisconsin glacial did occur and that the original pre-Wisconsin conspecific *glaucescens-occidentalis* form had the eye-head contrast pattern of modern *occidentalis*, *glaucescens* conceivably evolved a dark against white eye-head pattern to isolate it sexually from another *Larus* form (possibly *hyperboreus* or *argentatus*) which also frequented the coastal edge of the Cordilleran ice-sheet and which possessed a light against white eye-head pattern. Retention of the light against white eye-head pattern of the ancestral Western Gull population to the south of the Cordilleran suggests that the range of this population did not overlap that of a closely related *Larus* form with a similar eye-head contrast pattern. Distribution of present-day *Larus* gulls lends credence to this view. The writer believes that extensive interbreeding of *glaucescens* and nominate *occidentalis* would be difficult to reconcile with Smith's cogent hypothesis on the primacy of the eye-head contrast pattern as a reproductive isolating mechanism unless these forms were conspecific before the last glacial.

The case for possible conspecificity of Glaucous-winged and Western gulls is clouded by interbreeding of *L. glaucescens* and Herring Gulls *L. argentatus smithsonianus* in Alaska (Williamson and Peyton 1963; Patten and Weisbrod 1974). Of 157 nests examined by Patten and Weisbrod on North Marble Island in southeastern Alaska, only four were of mixed pairs, in marked contrast to the massive hybridization between *glaucescens* and nominate *occidentalis* along the Washington coast. However, it is also possible that further study of *glaucescens* and *smithsonianus* in their zone of sympatry will yield evidence of more extensive interbreeding; intermediate specimens collected in the Cook Inlet region by Williamson and Peyton suggest that this may be the case. Whereas *glaucescens* and nominate *occidentalis* occur in the same biotype, *glaucescens* and *smithsonianus* differ in habitat preference, *glaucescens* having a proclivity for the coast

and *smithsonianus* occurring primarily on inland bodies of freshwater. All three forms have pink legs, but color of irides and eye-rings varies. As with *glaucescens* and nominate *occidentalis*, *glaucescens* and *smithsonianus* overlap in size. However, the writer believes that *glaucescens* is morphologically closer to nominate *occidentalis* than to *smithsonianus*. Of the three forms (see Table 3), *smithsonianus* combines the lightest mantle with the darkest wing tips; in the *glaucescens-occidentalis* group, the trend is for darker-mantled forms to have darker wing tips. In addition, the Herring Gull shows more white in its tips than Glaucous-winged and Western gulls (Dwight 1925). Although *glaucescens* generally has more white in the wing tip than *occidentalis*, the two forms occasionally have the same number (two) of subapical spots; moreover, Dwight shows that the wing tip pattern for these two forms is sometimes similar. Another morphological character of use in comparing these forms is bill shape. Both *glaucescens* and nominate *occidentalis* have stockier bills than *smithsonianus*. When the *l*/*d* ratio of Table 4 is used as an index of bill shape, the data show that *smithsonianus* has the thinnest bill of the three forms. Average bill depths for *glaucescens* and nominate *occidentalis* are very close; interestingly, the *l*/*d* ratios for females of these two forms are nearly identical, while male nominate *occidentalis* tend to have stockier bills than male *glaucescens* (see Table 4).

In summary, the combination of major factors — limited interbreeding, differing habitats, and clear morphological differences — mitigates against conspecificity for *glaucescens* and *smithsonianus*, and on the basis of data presently available, the writer favors treating them as semispecies. *L. glaucescens* is ostensibly more closely related to *L. o. occidentalis*. Because of persistent and extensive interbreeding (in which the evidence suggests evolutionary convergence), comparable habitat niches, and morphological similarities, the writer is inclined to favor conspecific designation for Glaucous-winged and Western gulls; there appears to be little, if any, practical advantage in treating *glaucescens* as a separate species. In this framework, *glaucescens* is merged with *L. occidentalis* to become *L. o. glaucescens;* as a result, *L. occidentalis* and *L. argentatus* become semispecies, and their binomial distinction is retained.

The breeding range of *glaucescens* extends into coastal northeastern Asia, where it partially overlaps that of the Slaty-backed Gull *L. schistisagus* (A. O. U. 1957, Smith 1966), the dark-mantled, pink-legged marine gull of northeastern Asia. Dwight (1925) indicates that *schistisagus* averages larger than *glaucescens* but that measurements of the two forms overlap. Although one mixed breeding pair of *glaucescens* and *schistisagus* is known from eastern Siberia (W. Hoffman, pers. comm.), extensive interbreeding has not been reported. However, the natural history of *schistisagus* is poorly known; Dement'ev *et al.* (1969) have little to report on this species' breeding habits. The Slaty-backed Gull appears to be the Asian counterpart of North America's Western Gull, and it may be conspecific with Glaucous-winged and Western gulls. Further study of *glaucescens* and *schistisagus* in their zone of sympatry is needed to assess this possibility.

Because of the taxonomic complexity of the large *Larus* gulls, the discussion herein has extended beyond the relationship between *glaucescens* and nominate *occidentalis*. Bearing on the question of speciation in both *glaucescens* and *schistisagus* are two other important considerations: apparent interbreeding between *hyperboreus* and *glaucescens* in Alaska (Swarth 1934) and between *schistisagus* and *argentatus* in Siberia (Portenko 1963). In both cases, evidence based upon intermediate specimens suggests interbreeding; so far as the writer knows, hybridization has not been documented by nesting studies. Moreover, the ranges of *hyperboreus* and *glaucescens* are not known to overlap in Alaska, the former breeding farther north than the latter; however, the forms may occasionally come in contact in the Pribilof Islands (Ingolfsson 1970). Therefore, anything more than a tentative assessment of the relationship between *hyperboreus* and *glaucescens* and between *schistisagus* and *argentatus* would be premature. Because *hyperboreus* and *glaucescens* differ in both habitat preference and morphology, the

writer suggests that conspecific treatment might overstate their relationship even if interbreeding is verified, but that the two forms may prove to be semispecies. For the same reasons, *schistisagus* and *argentatus* are likely to be no more than semispecies. Less qualified statements on speciation await data drawn from the breeding grounds of these forms.

HERRING GULL *Larus argentatus*

Burleigh (1972) describes *argentatus* as a "rare fall transient and winter visitant" in the northern part of Idaho. This species is now a common winter resident at Coeur d'Alene, Kootenai County, and is extending its range farther south in Idaho. The writer's first winter records of *argentatus* at Lewiston, Nez Perce County, Idaho, and in Asotin and Whitman counties, Washington, were during 1977-78, when about a dozen gulls were seen in the vicinity of the confluence of the Snake and Clearwater rivers from 20 October 1977 to 23 April 1978; before 1977 this species was known only as a rare migrant in this region (Weber and Larrison 1977). Herring Gulls were again present in this region the following winter (1978-79), and just as in the preceding year, first-year immatures arrived on the wintering grounds before adults. Post-1977 extreme dates of the writer are 11 October (1979) and 26 April (1979) along the Snake in Whitman County, Washington. Elsewhere in eastern Washington, *argentatus* is a fairly common winter resident about larger bodies of open water. Prior to the 1950's, there was only one record of this species from eastern Washington: a specimen (WSUCM No. 42-100, adult female) taken by J.L. Sloanaker at Spokane, Spokane County, on 10 December 1941 (LaFave 1965).

The writer collected a first-year immature female *argentatus* (WSUCM No. 77-625) on the Snake River 7.5km south of Lewiston, Nez Perce County, Idaho, on 20 October 1977 and an adult male (WSUCM No. 78-19) at Coeur d'Alene, Kootenai County, Idaho, on 28 December 1977.

Though Burleigh (1972) "carefully scrutinized" the gulls at Lake Coeur d'Alene in northern Idaho, he found no Herring Gulls. Thus, *argentatus* presumably became a common winter resident at this location sometime after Burleigh's 1958 departure from Idaho. His sole Idaho record is of two immatures seen along the Palouse River, Latah County, on 13 August 1951. This is an unusually early fall migrational date for *argentatus* in Idaho (over the past decade, the writer's earliest record is 9 October), and perhaps Burleigh's record is in error. Since California Gull *L. californicus* birds of the year arrive in this region in July and August, and since these juveniles closely resemble juvenile *argentatus* (both are gray-brown with largely dusky bills; most first-year immature *californicus* in this region do not acquire the characteristic black-tipped bill with pink base until fall), the writer suspects that Burleigh might have observed juvenile California Gulls on the above date. The four *argentatus* seen by Polumsky along the Snake River in southeastern Washington on 19 August 1974 (Weber and Larrison 1977) are also doubtful; these gulls were possibly *californicus*.

Until documented by a specimen, records of *argentatus* during summer from any region of Washington are dubious. The specimen supposedly documenting the presence of *argentatus* in summer from this state (15 July 1940, Clallum County) has been reidentified by the writer as an intermediate between *occidentalis* and *glaucescens* (see discussion under *L. occidentalis*). Such intermediates possibly account for the few published summer records (see Jewett *et al.* 1953) of *argentatus* from Washington's coastal waters.

THAYER'S GULL *Larus thayeri*

The A.O.U. check-list (1957) and Burleigh (1972) do not list this species as occurring in Idaho. Apparently the state's first record of *thayeri* is of one adult and one immature seen at Coeur d'Alene, Kootenai County, on 19 February 1977 by D.R. Paulson and others (Rogers 1977; D.R. Paulson, pers. comm.).

A second record is of an adult seen by the writer in a flock of about 80 Herring Gulls at Coeur d'Alene, Kootenai County, from 31 December 1977 to 30 January 1978. This gull, which was collected by the writer and on the latter date, is an adult female (WSUCM No. 78-29) with an ossified skull and has the following measurements: wing, 384.0mm; tail, 161.0mm; exposed culmen, 46.0mm; depth of bill at angle of gonys, 15.2mm; tarsus, 64.0mm; weight, 866.0g. Dimensions of this specimen are in close agreement with those given by Dwight (1925) for female Thayer's Gulls (see Table 1, Part I). Irides were speckled brown, eye-ring red, and legs pink. No. 78-29 is Idaho's first specimen record of *thayeri*.

Although *thayeri* has long been known as a winter resident along coastal waters of the Pacific Northwest (Brooks 1937), it has heretofore been unrecorded from east of the Cascades in Washington (Jewett *et al.* 1953; Weber and Larrison 1977). Eastern Washington's first record is of a first-year immature (WSUCM No. 77-543) collected by the writer along the Snake River at Clarkston, Asotin County, on 6 October 1977. The measurements of this specimen: wing, 399.0mm; tail, 154.0mm; exposed culmen, 50.0mm; depth of bill at angle of gonys, 15.1mm; tarsus, 60.0mm; weight, 884.0g. Since the gonads of No. 77-543 were destroyed, this specimen is of undetermined sex; however, its measurements compare closely with those of Dwight for female *thayeri*. In addition, two other bill measurements (bill anterior nares to tip, 20.0mm; bill depth at posterior nares, 14.6mm) fit more closely with Smith's extreme measurements for female *thayeri* (see Table 2, Part I) than those he gives for female *argentatus* (22.0-25.9mm and 15.5-18.8mm; Smith 1966, pages 12 and 17). Plumage coloration is considerably darker than that of the previously described *glaucoides* specimen (No. 66-129) and more closely matches a first-autumn *argentatus* in coloration, except that No. 77-543 has primaries with a silvery sheen on the undersides, unlike the darker color of *argentatus*. The bill of this specimen is entirely dark (blackish).

CALIFORNIA GULL *Larus californicus*

Burleigh (1972) designates this species as a "scarce summer visitant and fall transient in the northern part of the state, and a common summer resident in southern Idaho." He observed *californicus* on only three occasions in northern Idaho: along the Snake River at Lewiston, Nez Perce County, on 13 August 1954, 30 September 1954, and 24 October 1955.

The recently constructed Lower Granite Dam on the Snake River impounded water upstream to Lewiston, Idaho, in 1975, and since 1977, the writer has observed this species year-round near the confluence of the Snake and Clearwater rivers in Asotin and Whitman counties in Washington and in the Lewiston area of Nez Perce County in Idaho, where it was formerly rare (Weber and Larrison 1977) but is now common in summer and rare in winter. The writer has only one winter record from this region: an adult bird seen along the Clearwater River 21-28 January 1978. During late summer of the past two years, there has been an influx of juvenile *californicus* into this region. These birds of the year, quite dark and with largely dusky bills, were first seen on 22 July in 1978 and on 25 July in 1979 and possibly represent an annual western

movement of this species through southeastern Washington and northern Idaho from breeding grounds east of the Lewiston region to Pacific coastal wintering areas. Color-banded *californicus* birds of the year from breeding colonies in Utah have been recovered along the Snake River along the Washington-Idaho border and along the Columbia River in south-central Washington (Woodbury and Knight 1951).

The writer has three specimens from the Snake River near its confluence with the Clearwater: a third-year male (WSUCM No. 77-427) taken 7.5km south of Lewiston on 9 July 1977; a second-year immature male (WSUCM No. 77-862) collected at Lewiston on 10 November 1977; a juvenile male (WSUCM No. 78-399) taken in Whitman County, Washington, about 7.3km west of Lewiston, on 22 July 1978.

Farther north in Idaho (Kootenai County), *californicus* now occurs throughout the year. This species is common about larger bodies of water in summer; in winter, it is irregular and much less numerous. The writer saw a flock of six at the Coeur d'Alene garbage dump on 30 January 1978 but observed none at this location during the following winter.

Jewett *et al.* (1953) list this species as a common migrant and winter resident along coastal Washington and as a rare and local summer resident in south-central Washington; they list no winter records for eastern Washington. Since 1953, *californicus* has evidently increased its numbers as a summer resident in eastern Washington. Although this species is not known to breed in northern Idaho or along the Snake River in southeastern Washington, breeding colonies are known from south-central Washington along the Columbia River (Weber and Larrison 1977, Conover *et al.* 1979) and at the potholes-sand dune area near O'Sullivan Dam (Rohwer *et al.* 1979). Mattocks (1979) lists five published records for this species in winter (December through February) for eastern Washington. Apparently the first specimen record for winter from this region is of a subadult male (WSUCM No. 80-279) taken by the writer from a flock of 10 at Pasco, Franklin County, on 2 January 1980.

RING-BILLED GULL *Larus delawarensis*

Burleigh (1972) classifies this gull as an "uncommon spring transient and a common fall transient in the northern part of the state, a few individuals occurring during the winter months when there is open water on the lakes and rivers. An uncommon and rather local summer resident in southern Idaho."

The Ring-billed Gull is now a common summer resident on larger lakes and rivers in northern Idaho. In winter, *delawarensis* is uncommon at Lewiston, Nez Perce County, but is quite common at Coeur d'Alene, Kootenai County, where the writer has observed flocks of 50 or more in winter. The writer has two specimen records from northern Idaho: an adult female (WSUCM No. 79-161) from Coeur d'Alene on 26 December 1978 and an adult male (WSUCM No. 79-226) from the Snake River 6.5km south of Lewiston on 22 June 1979.

This species is not known to breed in northern Idaho or along the Snake River on the Washington-Idaho border; however, it is known to breed in south-central Washington, as at the potholes-sand dune area near O'Sullivan Dam (Rohwer *et al.* 1979). Other breeding localities, as well as a history of the increasing numbers of this and the preceding species in Washington since the turn of the century, are discussed by Conover *et al.* (1979). The state's first saltwater breeding record (June 1976 at Willapa Bay) of *delawarensis* is noted by Penland and Jeffries (1977).

The recent history of *delawarensis* in Washington is noteworthy: less than three decades ago, it was known as a spring and fall migrant along the coast and as a summer resident (and breeder) in the eastern part of the state; in winter, it was thought to be of casual occurrence anywhere in the state (Jewett *et al.* 1953). The Ring-billed Gull now occurs throughout the year in both eastern and western Washington but is more common east of the Cascades, particularly in summer; in western Washington, *delawarensis* is more common about freshwater localities than along the coast (writer's observations).

MEW GULL *Larus canus*

Burleigh (1972) does not list this species for Idaho. Since it is known to occur in adjacent eastern Washington as a rare spring and fall migrant (LaFave 1965), the Mew Gull heretofore has probably been overlooked in Idaho. The writer saw two adult *canus* in a mixed flock of California, Herring, and Ring-billed gulls on a gravel bar in the Clearwater River at Lewiston, Nez Perce County, on 23 April 1978. The two gulls, viewed through a 40X spotting scope, displayed field marks characteristic of adult *canus:* unmarked, short greenish-yellow bill; greenish-yellow legs; dark eyes. In addition, the two Mew Gulls were slightly smaller and noticeably darker-mantled than nearby Ring-billed Gulls. Since the writer has often seen Mew Gulls in winter along coastal Washington, identification was positive. An attempt to collect one of the gulls was unsuccessful. So far as the writer knows, this is Idaho's first record of *canus.*

LaFave collected an adult male (WSUCM No. 62-30) at Spokane, Spokane County, Washington on 27 October 1961.

FRANKLIN'S GULL *Larus pipixcan*

Burleigh (1972) describes this species as a local summer resident in the southern part of the state and as apparently accidental in northern Idaho. He lists only one record for the northern part of the state, a subadult female collected at the reservoir east of Lewiston Orchards on 14 July 1956. A second record of *pipixcan* from northern Idaho is of a first-year immature (WSUCM No. 79-227) of undetermined sex taken by the writer along the Snake River, Nez Perce County, 3km south of Lewiston on 25 July 1979; its measurements: wing, 257.0mm; tail, 88.0mm; exposed culmen, 26.5mm; depth of bill at angle of gonys, 6.7mm; tarsus, 39.2mm; weight, 188.0g. This gull was also seen on the Washington side of the Snake River in Asotin County before it was collected. Since *pipixcan* has been reported from adjacent southeastern Washington as a rare but regular migrant (Weber and Larrison 1977), this species is probably of more than accidental occurrence in northern Idaho.

BONAPARTE'S GULL *Larus philadelphia*

Burleigh (1972) lists *philadelphia* as a scarce spring transient and an uncommon fall migrant throughout Idaho. In Nez Perce County, he found this species to be a "rather uncommon" migrant in spring and fall, citing several records for this locality: 25 April 1953 and 30 June 1955 in spring, and several fall records from 24 October (1955) to 1 November (1953 and 1956). Recent records suggest that *philadelphia* is a more common migrant in northern Idaho than previously known.

Although Bonaparte's Gull is a fairly common migrant through south-central Washington (writer's observation), heretofore there has been only one record of this species from the state's southeasternmost block of counties (Asotin, Columbia,

Garfield, and Whitman): one seen by S.H. Lyman and P.C. Dumas near Dayton, Columbia County, on 9 August 1948 (Lyman and Dumas 1951). The writer reports the following additional records, all from the vicinity of the confluence of the Snake and Clearwater rivers (Asotin and Whitman counties in Washington and Nez Perce County in Idaho): from one to three immatures from 1 September to 6 November 1977 (WSUCM No. 77-424, female, collected on 2 September 1977 along the Snake River, Whitman County, Washington); from one to eight immatures and adults in winter plumage from 30 August to 4 November 1978, with high counts of eight on 22 October and 4 November. The writer's extreme dates in fall for eastern Washington are 26 July (1979) at a scabland pond near Lamont, Whitman County, and 18 November (1978) at Pasco, Franklin County. The gull seen near Lamont, an adult female in summer plumage, was collected by the writer three days later, on 29 July (WSUCM No. 79-228).

The writer has no spring records of Bonaparte's Gull for this region.

SABINE'S GULL *Larus sabini*

Following the convincing analysis of Moynihan (1959), the writer merges *Xema* with *Larus;* therefore, *Xema sabini* is treated as *Larus sabini* herein.

This pelagic species apparently occurs as a rare but fairly regular migrant, principally in fall, in eastern Washington. Extreme dates in autumn are 11 September (1977) along the Columbia River near Richland, Benton County (R.E. Woodley, pers. comm.) and 6 October (1962) at Soap Lake, Grant County (LaFave 1965). WSUCM No. 62-31, a first-year immature male, was taken by LaFave (1961) on 23 September 1961 at O'Sullivan Dam, Grant County. While the writer knows of seven autumnal records from Washington's interior, there are only two for spring. LaFave (1965) saw an adult bird at O'Sullivan Dam, Grant County, on 12 June 1964 and also reports a remarkable occurrence of this species from the interior: a flock of more than 300 was seen by Hall and LaFave on 9 June 1963 at Blue Lake, Grant County, and what was apparently the same flock was seen later in the day at Reardan Slough, Lincoln County.

The writer knows of no records of Sabine's Gull from Idaho.

BLACK-LEGGED KITTIWAKE *Larus tridactyla*

The writer follows Moynihan (1959), who merges *Rissa* with *Larus;* consequently, *Rissa tridactyla* is treated as *Larus tridactyla* in this discussion.

There are only three records of this pelagic species from the interior of the Pacific Northwestern United States (Idaho and east of the Cascades in both Oregon and Washington): 1) one adult seen by J. Verner (1974) at O'Sullivan Dam, Grant County, Washington, on 15 January 1972; 2) one seen along the Snake River at Clarkston, Asotin County, Washington, by R. Ramsey on 29 February 1976 (Weber and Larrison 1977); 3) an immature male (WSUCM No. 80-233) taken by J. Connelly in Butte County, Idaho, on 13 February 1980.

In New York state, *tridactyla* has been noted to occur along coastal areas after storms (Bull 1974). It is therefore conceivable that inland records (such as the above-listed for the interior Northwest) may also be storm-related.

TABLE 5. Mantle and wing tip darkness for typical adult specimens of the medium- to large-sized *Larus* gulls[1] (except *glaucoides*) known to occur in the Pacific Northwest's interior. Darkness was electronically measured by a Photovolt reflection meter (model 670) with red filter. Increasing darkness is represented by decreasing reflection values. Mean values are in parentheses. No. of specimens, n. Species are listed in order of increasing darkness of mantle.

Species	Mantle reflection value	Wing tip[2] reflection value
L. hyperboreus barrovianus, n = 4	37.0-42.2 (38.3)	44.0-52.0 (49.2)
L. delawarensis, n = 8	29.2-32.8 (30.3)	2.9-6.5 (5.0)
L. argentatus smithsonianus, n = 7	25.9-33.0 (29.9)	4.5-8.0 (6.1)
L. thayeri, n = 1	26.0	7.0
L. glaucescens[3], n = 11	22.2-27.0 (25.7)	17.0-27.0 (21.2)
L. canus brachyrhynchus, n = 9	20.2-24.2 (22.5)	6.5-8.5 (7.5)
L. californicus, n = 9	20.5-25.1 (22.4)	3.2-6.0 (4.8)

[1]Reflection values for *L. o. occidentalis* are given in Table 3.

[2]Readings taken about 4-5cm below tip of second outer primary on outer vane.

[3]Reflection values for intermediates between *L. glaucescens* and *L. o. occidentalis* are given in Table 3.

STATUS OF *LARUS* GULLS IN EASTERN OREGON

The most recent distributional account of Oregon birds (Bertrand and Scott 1973) lists only four species of gulls from eastern Oregon: *californicus, delawarensis, pipixcan,* and *philadelphia*. Because of their occurrence in eastern Washington or Idaho, it is possible that one or more of the following has been overlooked in eastern Oregon: *hyperboreus, glaucescens, argentatus, thayeri, canus, sabini, tridactyla,* and perhaps *glaucoides*.

MANTLE AND WING TIP DARKNESS

Mantle and wing tip darkness for the medium- to large-sized *Larus* gulls (except *glaucoides*) known to occur in the Pacific Northwest's interior are given in Table 5. Data are based upon typical adult specimens in the collections at Washington State University and the University of Idaho; all specimens are from both coastal and interior regions of the Pacific Northwest and Alaska. Since *occidentalis* is not known (with certainty) to occur in the interior, it is not included in Table 5. Data for both *occidentalis* and intermediates between *glaucescens* and nominate *occidentalis* are presented in Table 3. Data were not included for *glaucoides* since there are no adult specimens of this species in the aforementioned collections. For the species examined, mantle and wing tip darkness did not appear to be sex-related; however, examination of larger numbers of specimens could alter this observation. It is hoped that the information in Tables 3 and 4 will be of use to both birdwatchers and professional ornithologists.

SUMMARY (Parts I and II)

First specimen records of *Larus glaucoides, L. glaucescens,* and *L. thayeri* from the interior of the Pacific Northwestern United States (all of Idaho and east of the Cascades in both Oregon and Washington) are discussed. To the best of the writer's knowledge, the specimen of *glaucoides* is also the first from west of the Rocky Mountains in North America. Idaho's first specimen record of *L. hyperboreus* and first sight record of *L. canus* are described, and specimen records of *L. argentatus, L. californicus, L. delawarensis, L. pipixcan,* and *L. philadelphia* provide new information on the distribution of these species in northern Idaho and eastern Washington. In addition, a specimen of an intermediate between *L. glaucescens* and *L. o. occidentalis* from eastern Washington is described.

The author follows Moynihan (1959) in merging *Xema* and *Rissa* with *Larus*. The occurrence in the Pacific Northwest's interior of *L. (Xema) sabini* and *L. (Rissa) tridactyla,* both pelagic species, is documented by specimens: *sabini* from eastern Washington, and *tridactyla* from Idaho.

For reasons presented herein, the writer is inclined to favor merging *thayeri* with *L. glaucoides,* and *glaucescens* with *L. occidentalis*.

Mantle and wing tip darkness of the medium- to large-sized *Larus* gulls (except *glaucoides*) of the Pacific Northwest's interior were determined by an electronic reflection meter. Reflection values are given in Table 5. Comparable data for nominate *occidentalis* and intermediates between *L. glaucescens* and *L.o. occidentalis* are given in Table 3.

ADDENDUM TO PART I:

In addition to photographic documentation, the occurrence of *L. hyperboreus* in eastern Washington is documented by a specimen. Verner (1974) mentions a Glaucous Gull (Central Washington University collection) taken at O'Sullivan Dam, Grant County, on 13 February 1970.

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