

HABITAT SELECTION BY WATERFOWL OF ARGENTINE ISLA GRANDE

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Isla Grande is the main island of the archipelago at the tip of South America known as Tierra del Fuego. Current knowledge of the birds of Isla Grande has been ably summarized by Humphrey et al. (1970). As part of a study of austral waterfowl, I spent the period from 10 January to 9 February 1972 at three locations on Isla Grande. I recorded 84 of 108 bird species recorded by Humphrey et al. (op. cit.), including 15 of the 17 known species of waterfowl. The purpose of this paper is to discuss habitat selection of Isla Grande waterfowl. Observations are also presented on their parental care, brood sizes and reproductive behavior. Data on stage of the reproductive cycle were gathered by age classification of broods according to the system described by Taber (1969:330): Class I = downy young; II = partly down and partly contour feathers; III = full juvenal body plumage but not yet flying.

Observations spanned two major study areas, the southern mountainous beech forest along the Beagle Channel and the open steppe zone of northern Isla Grande. Nineteen days were spent at Estancia Harberton on the Beagle Channel, four days from Ushuaia west to Lapataia, and nine days at Estancia Viamonte and the region west and north of Rio Grande (Fig. 1).

STUDY AREAS

Estancia Harberton is along the Beagle Channel in an area of shoreline highly dissected with estuaries, bays and offshore islands. The terrain is rolling at sea level, rising in a series of hills to mountains of nearly 915 m. Treeline is reached at about 518 m. The vegetation near the sea is meadow of bluegrass (*Poa* spp.) and tall rush (*Marsippospermum grandiflorum*) a few meters wide, changing to heath of fachine (*Chiliodictyon diffusum*), barberries (*Berberis ilicifolia*, *B. empetrifolia*, and *B. buxifolia*), and diddle-dee (*Empetrum rubrum*). In protected areas or high elevations, three species of beech (*Notojagus* spp.) surround bays, lakes, streams and bogs; in very wet places only the smallest southern beech species, *N. antarctica*, is common.

The flooded upper reaches of estuaries (creeks) are silt-covered gravel or pure silt. Extensive salt meadow may be adjacent. Seashores are gravel, with occasional large boulders but no exposures of extensive rock outcrops at low tide. There are no true barrier ponds along the coastline, but alluvial materials deposited at the mouths of larger streams slow the current and produce lake-like conditions or wet meadows attractive to waterbirds.

Lakes that I encountered were shallow, with gravel or rock bottoms and edges, the water was stained with tannin, acid (pH 4.8-5.0 for three tested) and cold. Rivers meander in broad valleys near the sea, but cut more restricted channels in the extensive gravel beds. There is one series of waterfalls on the Rio Lashifashaj that produces

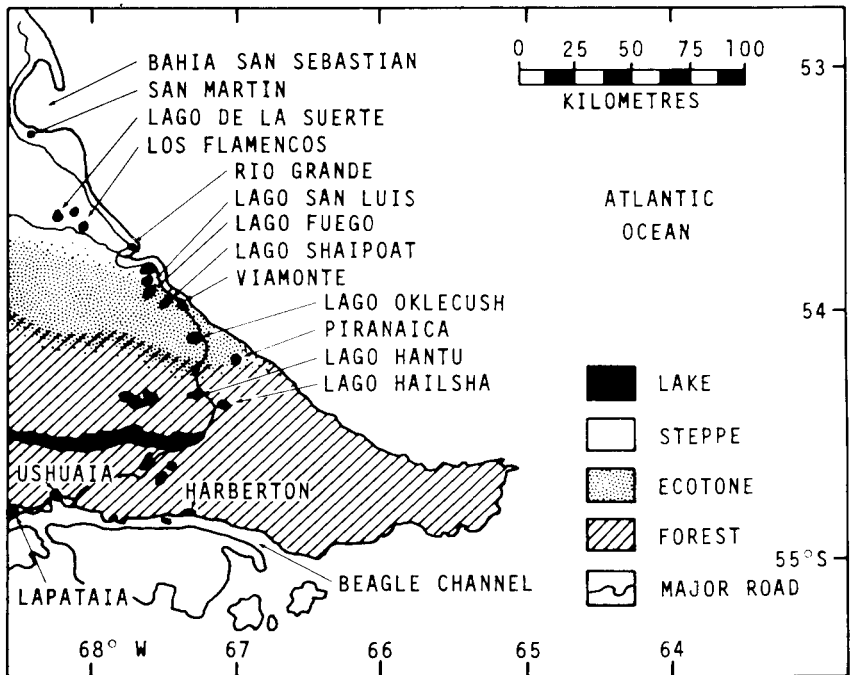


FIG. 1. Map of place names mentioned in the text on Argentine Isla Grande. After Humphrey et al. (1970) and Goodall (1970).

cascading water over a stretch of 100 m; otherwise, torrents were not encountered at low altitudes near the coastline. Smaller streams meander through rather dense forest and often are overgrown by trees, as such sheltered valleys induce tree growth by affording protection from the wind. Oxbow lakes are rare, but were present on the Rio Cambaceres; some meadow-bog areas obviously are overgrown oxbows.

The introduction of beavers into Tierra del Fuego in the 1940s, and their spread to the Harberton area in the 1950s, has resulted in dams along numerous small streams. The ponds so formed are extensive, linear patches of flooded and dead timber, which often are rich in invertebrates and attractive to birds. Unflooded bog meadows rarely have sufficient standing water to be attractive to ducks but they are used by grazing Upland Sheldgeese (*Chloephaga picta*).

The habitat from Ushuaia to Lapataia is similar in character to that at Harberton, but the Beagle Channel is broader, the coastline less sheltered, and the lakes are larger.

Estancia Viamonte, located along the east coast at 54°40'S, is in the transition zone between southern forest and northern steppe. The land is rolling grassland with some sizable patches of southern beech, often of dwarfed growth form on hilltops. Lakes and marshes are found in depressions in the morainal hills. Approximately 10 km north of Viamonte is the last grove of forest along the coast; the northern part of Isla Grande is treeless grassland extending to the Straits of Magellan and west to the border of Chile.

ANNOTATED LIST

Coscoroba Swan (*Coscoroba coscoroba*).—This bird was seen only on Lago Rio Fuego, a large and sparsely vegetated marsh about 10 km WNW of Estancia Viamonte. Five seemingly flightless birds were sitting in open water and two fully-winged birds were sitting on shore.

Black-necked Swan (*Cygnus melanocoryphus*).—This species was seen regularly at large marshes or marshy lake edges in open country from Lago Fagnano northward. The largest number was 81 at Lago Hantu, 15 km north of Lago Fagnano. A total of four broods was seen at Lago Shaipoat, Lago Rio Fuego, and Lago Oklecush, and ranged from 1 to 4 young (mean = 2.8).

Ashy-headed Sheldgoose (*Chloephaga poliocephala*).—Although considered a bird of forested regions (Humphrey et al. 1970), flocks of these geese were common both in forest clearings along the Beagle Channel and at barrier ponds and grassy ecotones near Viamonte. The species was not seen in the open steppe north of Viamonte although nonbreeding birds probably occur there. A pair and five Class II young were seen in meadow-like islands where the Rio Cambaceres winds through dense forest east of Harberton.

Ruddy-headed Sheldgoose (*Chloephaga rubidiceps*).—The disappearance of this species from the entire steppe area where it once was considered the most abundant (Scott 1954) or second most abundant sheldgoose (Ripley 1950) is cause for great concern. No broods or young were seen, and only five pairs and a single were observed. These were in dry grassland near the Rio San Martin on San Sebastian Bay. This decline may be a product of intensive control and bounties paid by the government and rural societies which, in the summer of 1972–73, spent about \$7500 U.S. for 150,000 eggs collected and destroyed (Mrs. Tom Goodall, pers. comm.). Although most eggs probably were those of the more abundant Upland Sheldgoose, eggs of the Ruddy-headed Sheldgoose also would have been destroyed. Another possible influence may be intentional introduction of the Patagonian race of the fox, *Dusicyon griseus* which now is very common in the steppe country. Currently, this sheldgoose is doing well only on the Falkland Islands (Weller 1972), but control programs there could threaten the survival of the entire species.

Upland Sheldgoose (*Chloephaga picta*).—This species was ubiquitous and abundant. A total of 122 broods of all ages was seen in all areas during January and early February, with Class II predominating. Broods ranged up to 13 young with a mean of 4.4. Both parents were associated with the brood in 82% of my observations. Some males wait or feed some distance from the brood on a prominent site from which they alert the female by their quiet whistling call. Such males usually fly to the female and young as they move to open water where the brood waits until the potential danger has passed. Depending on the number of broods involved and the observer's approach, males sometimes are difficult to associate with specific broods. This may also account for unusual cases where two males accompany one female and brood. Occasionally, two hens with broods join, and this may be responsible for the broods with up to 22 young of mixed ages, but having only one female. Such pooling also may explain the unusual pattern of increasing rather than decreasing brood size with advancing age class (Table 1).

One nest of an Upland Goose was discovered on 14 January on a hill overlooking a large bay. The nest was under a barberry bush, known locally as calafate (*Berberis buxifolia*), in open forest. The male waited about 10 m away where a mound of droppings indicated a loafing site providing clear visibility of a wide area.

TABLE 1

MEAN SIZES OF BROODS OF UPLAND SHELDGEESE ARRANGED BY AGE CLASSES, ARGENTINE ISLA GRANDE, 10 JANUARY TO 9 FEBRUARY 1972

Age Class		Beagle Channel	Forest-Steppe Ecotone	Total
I	Mean (N)	3.65 (40)	4.55 (11)	3.84 (51)
	S.D.	1.94	1.97	1.96
II	Mean (N)	4.70 (87)	4.28 (18)	4.63 (105)
	S.D.	2.29	2.08	2.25
III	Mean (N)	5.57 (7)	5.25 (4)	5.45 (11)
	S.D.	3.91	0.96	3.08
TOTAL	Mean (N)	4.43 (134)	4.48 (33)	4.44 (167)
	S.D.	2.34	1.92	2.26

Kelp Sheldgoose (*Chloephaga hybrida*).—Contrary to the general statement in Humphrey et al. (1970), I did not find this species abundant on the Beagle Channel during the breeding season. My only records were two pairs and a male seen loafing on the barrier sand at the mouth of the Rio Lashifashaj, west of Harberton, and a pair seen east of Harberton feeding in the very narrow *Porphyra* zone along the Beagle Channel. I suspect that breeding pairs are on still more exposed coastlines where suitable marine algae grow on rock outcrops. The species becomes common in Ushuaia in fall and winter (Mrs. Tom Goodall, pers. comm.). On the Viamonte coastline, flocks of up to 150 were present on the extensive tidal flats in early February, when other sheldgeese were still rearing young.

Crested Duck (*Lophonetta specularioides*).—Humphrey et al. (1970) found little evidence of breeding, but I noted numerous broods at Harberton in estuaries and quiet bays, and others were seen at Lago Fuego and Lago Shaipoat, west of Viamonte. The 11 broods seen ranged from 1 to 7 young (mean = 3.4) mostly of Class I and II, suggesting that most had hatched in early to mid-January. Concurrently, large flocks of adults were present both in Harberton and along the northeastern coast, suggesting that birds here, as on the Falkland Islands, may not breed at one year of age. Although Crested Ducks were found mainly along the coast of the Beagle Channel, they also were common in brackish, inland lakes such as Laguna de la Suerte, 8 km west of Estancia Los Flamencos.

Flightless Steamer-Duck (*Tachyeres pteneres*).—This species was abundant and well-spaced along virtually all coastline and bays in the Harberton area, but was not seen on the northeastern coast. Nine pairs had broods in January (range = 1 to 6 young; mean = 3.4), and territorial behavior was common. One nest hatched on 12 January on the Harberton peninsula. The broods were seen in all types of coastal areas except estuaries. About 100 flightless birds, probably nonbreeders, were seen along the Beagle Channel on 14 January.

This species is not known at Viamonte (Humphrey et al. 1970) due perhaps to the extreme tides and to the rock shelves bordered by abrupt cliffs that extend seaward for kilometers at low tide. Not only would the extensive shelves strand flightless birds at low tide, but the cliffs might prevent movement of females into the uplands for nesting.

Flying Steamer-Duck (*Tachyeres patachonicus*).—This species occurred on both southern and northeastern coasts, but was the only steamer-duck found on the northeastern coasts. Along the southern coast, it occurred only in estuaries, quiet channels or in large freshwater lakes. There, all six broods seen were in or near estuaries, whereas pairs without broods frequented other habitats. Little interspecific aggressiveness was noted, and breeding pairs seemed to be isolated in part by habitat preference. Habitat conditions on the eastern coast are not conducive to brood rearing, and the four broods seen were in large lakes in the steppe zone. The 10 broods observed in both areas had from 1 to 6 young (mean = 3.4).

Spectacled Duck (*Anas specularis*).—Although this bird often is associated with large, slow-moving streams and their valleys (Humphrey et al. 1970, Weller 1968), the only birds seen were in natural or beaver-formed lakes in the forested mountain area near Lapataia and Harberton. Two were seen loafing on an island shore at the outlet of Lago Roco, where the species also had been seen by Keith (1970). A pair was observed on an unnamed lake north of Harberton, and two were seen on the Beaver Lakes east of the Rio Cambaceres at Harberton. The female of one pair gave the dog-like *arf-arf* call, and the male weakly whistled *wee, wee, wee*. T. L. Bridges states (pers. comm.) that they are very rare in the ecotonal area near Viamonte.

Speckled Teal (*Anas flavirostris*).—This adaptable teal was present in flocks of up to 175 in the northern freshwater marshes and lakes, where a few flightless adults were observed. Most Speckled Teal in the coastal zone were found as small flocks of 4 to 24 birds feeding at low tide on the mud flats of upper estuaries. This teal, known locally as "mud" teal, characteristically feeds at the edges of lakes or marshes and on the mud flats of streams and estuaries. Five broods (range = 3 to 5; mean = 3.4) were seen, three in the steppe marshes and two in forested beaver ponds near Harberton.

Southern Wigeon (*Anas sibilatrix*).—This herbivorous duck was seen in both habitat regions, but was uncommon to rare in the forest zone. It occurred along slow-moving rivers, where one brood was seen, or on lakes with adjacent meadows. The species was seen on many lakes in the ecotonal area. About 5000 molting birds were seen on Lago Hantu. Three pairs with broods were seen at Lago Oklecush and one brood was seen in the meadows along the Rio Varela. The four broods ranged from 2 to 7 young and averaged 4.0.

Yellow-billed Pintail (*Anas georgica spinicauda*).—The distributional pattern of this species was comparable to that of Speckled Teal except that flock size averaged larger and that birds used more diverse types of steppe lakes. Like that species, this pintail occurred in estuaries in the Harberton area, but it dabbles and upends in deeper water than do teal. One brood of four young and four flightless adults also were seen at Lago Oklecush. Yellow-billed Pintails seem to be an early nesting species, and I suspected that many of the birds seen were flying young-of-the-year.

Silver Teal (*Anas versicolor*).—I noted this species on only one occasion near Viamonte, when two or three were seen at Lake Shaipoat. Residents consider the bird uncommon to rare, and breeding records are lacking. It has not been reported in the forest zone.

Red Shoveler (*Anas platalea*).—The shoveler did not occur in the forest lakes along the Beagle Channel, but flocks of 40 to 80 were seen at rather open lakes, such as Lago Shaipoat and the San Luis lakes near Viamonte. These birds were filter feeding.

Torrent Duck (*Merganetta armata*).—Humphrey et al. (1970) noted that this species had been extirpated in some areas and no extant populations were known to them on Isla Grande. Although I did not see the birds, I saw suitable habitat north of Harberton on the cascades of the Rio Lashifashaj. Mr. and Mrs. Tom Goodall have seen Torrent

Ducks there many times, including as late as January 1972 (R. N. P. Goodall and J. Boswell, ms.).

BROOD REARING

Mid-January to mid-February obviously is the brood rearing period among waterfowl of Tierra del Fuego. I found only two active nests (Upland Goose and Flightless Steamer-Duck) and most young already were several weeks old and in Age Class II. Four Yellow-billed Pintails, at least three Speckled Teal, 100 or more Flightless Steamer-Ducks, and thousands of Southern Wigeon were flightless in the post-nuptial molt. Based on this sampling period, there was little evident range in chronology of nesting although the sheldgeese, Yellow-billed Pintail, Speckled Teal, and Southern Wigeon probably nested earliest.

Males of southern hemisphere anatids tend to remain with and assist in protecting the brood whereas northern hemisphere ducks rarely do so. A total of 218 broods of nine species of waterfowl were seen. The pair was in attendance in all broods observed of five species: Ashy-headed Sheldgoose (one brood observed), Yellow-billed Pintail (one brood), Black-necked Swan (four broods), Flightless Steamer-Duck (nine broods), and Southern Wigeon (four broods). In other species, attendance by both members of the pair ranged from 60 to 91%: Speckled Teal (60.0), Flying Steamer-Duck (80.0), Upland Sheldgoose (82.0), and Crested Duck (90.9). The remaining broods had only the female attendance except for 2.4% of Upland Sheldgoose broods in which males alone were in attendance. One brood of Upland Sheldgoose seemed unattended.

DISCUSSION

Recent studies of many groups of birds demonstrate that habitat selection forms one of the major means of avoiding competition among closely related species (MacArthur 1958, Lack 1971). Little work has been done on waterfowl, though Lack (1971) has pointed out general differences in habitat and feeding behavior which may isolate different species. Frith (1959) noted the manner in which Australian ducks not only specialize on different foods but breed at different times of year in relation to water availability.

Most species of waterfowl on Isla Grande breed concurrently during the warm summer season but seem to be habitat-segregated, and probably differ in food use. This pattern is comparable to that observed on the Falkland Islands (Weller 1972), but I was unable to collect birds to support observations on feeding habits of waterfowl on Isla Grande. The distribution of the sheldgeese is a good example of presumed ecological isolation during the breeding period. Kelp Sheldgeese occur only along exposed, rocky seashore.

Upland Sheldgeese occur on shortgrass meadows in open or semiwooded country. Ashy-headed Sheldgeese nest in more densely forested areas along streams or lakes, but post-breeding flocks or nonbreeders use open meadows and at times associate with Upland Sheldgeese. Ruddy-headed Sheldgeese are found only in the drier steppe areas of northern Isla Grande, but how they are isolated from Upland Sheldgeese is not clear. On the Falkland Islands, Ruddy-headed Sheldgeese are most prevalent on the drier, western islands than in the eastern, wetter areas (Weller 1972), and probably occur in the taller grasses.

Greatest overlap in habitat use occurs among ducks that use concentrated food resources, as seems true in freshwaters of the Falkland Islands (Weller 1972) and in estuaries in England (Olney 1963). Even in food-rich habitats, the species tend to have different feeding adaptations and behavior so that direct competition may be reduced. The Speckled Teal feeds in very shallow and often muddy areas where its short neck is efficient and the finely lamellated bill strains minute organisms (Weller 1972). Yellow-billed Pintail feed in deeper water and they can reach benthic organisms that few other ducks could obtain. Red Shovelers are more often in open and unvegetated marshes or lakes, presumably where crustaceans are abundant. In deeper lakes, Flying Steamer-Ducks feed on the bottoms by diving. Southern Wigeon seem to be strictly herbivorous and frequent dense beds of submergents in open water.

In estuaries, Speckled Teal and Brown Pintails in the post-breeding season often segregate in much the same manner as do breeding birds or flocks in freshwater. Crested Ducks, which are more common in estuaries than lakes, favored gravel-silt areas of more saline sites and thus do not feed in areas used by pintails or teal. Because they feed by diving, steamer-ducks probably overlap little in food use with dabbling ducks. The preference of Flying Steamer-Ducks for estuaries may not reflect a preference for saline areas but for quiet waters because nonbreeding pairs of this species were seen only in protected marine bays and channels. Magellanic Flightless Steamer-Ducks, with or without broods, were the species seen in open and often rough water along unprotected shorelines.

Two species of ducks reported as formerly breeding (Torrent Duck by Humphrey et al. 1970) or possibly breeding (Rosy-billed Pochard, *Netta peposaca*, by Olrog 1968) were not seen. Obviously, habitat and foods of the Torrent Duck would not overlap with any of the above species. Rosy-billed Pochards feed in a manner similar to Flying Steamer-Ducks but are restricted to freshwaters where some competition could occur. However, this pochard is dominantly a bird of pampas marshes and is rare in Tierra del Fuego. Although these observations need to be supported by detailed studies

of food habits, observations during the brood rearing period infer that most species are isolated by habitat selection and feeding behavior.

SUMMARY

During a month-long study of habitat selection and feeding behavior of waterfowl on Argentine Isla Grande, 15 of the 17 species of waterfowl were seen. Habitat segregation of breeding waterfowl was quite distinctive and resembled the pattern of the same species in the Falkland Islands. Dabbling ducks of the genus *Anas* overlapped most in freshwater marshes but, even there, seemed to be segregated by feeding sites and feeding behavior.

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