gratefully acknowledge the Ministerio de Agricultura, Direccion General Forestal y Fauna of Peru for the opportunity to work in the Manu National Park.

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Wilson Bull., 101(1), 1989, pp. 137–141

Diet of the Surfbird in southern Chile.—The Surfbird (*Aphriza virgata*) migrates during the boreal winter to the Pacific coast of Central and South America, mainly to Peru and Chile, and as far south as the Magellan Strait (Araya and Millie, Guía de Campo de las Aves de Chile, Edit. Universitaria, 1986). This report describes the diet of the Surfbird in the southern part of its wintering grounds, near Valdivia, Chile, and compares diet with food availability.

Foraging surfbirds were studied on rocky shores at Mehuín (39°24'S, 73°13'W), Valdivia, Chile. Diet could not be determined by direct observation, so 25 birds were collected in late February 1983 (18 males and 1 female) and in early March 1984 (3 males and 3 females).

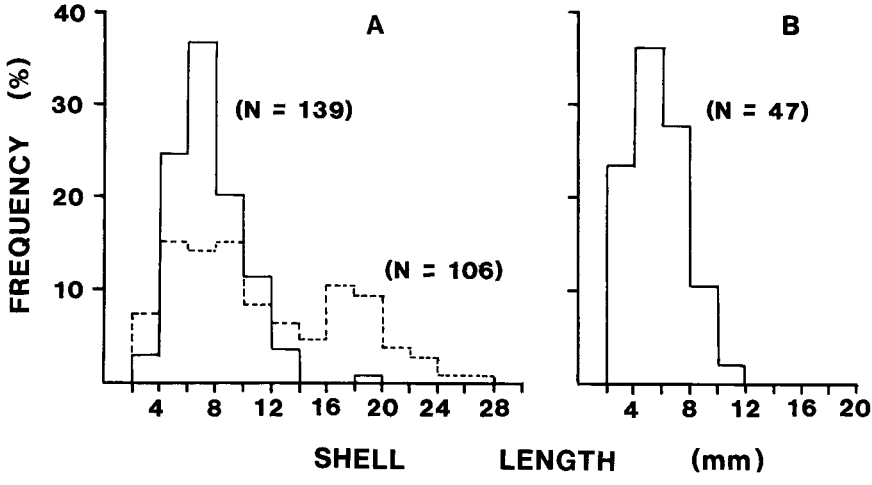

FIG. 1. Size composition of *Semimytilus algosus* (1983) (A) and *Perumytilus purpuratus* (1984) (B) eaten by Surfbirds (solid line) and of the natural populations (broken line). No environmental figures are available for 1984.

Crop and gizzard contents of each bird were analyzed by counting all identifiable items and measuring maximum length of intact mussels to the nearest 0.1 mm. Also, 21 fecal pellets were collected at feeding areas in February 1983. Pellets were broken up in water and fragments placed in a Petri dish with a dot-matrix of 66 evenly spaced points. Dots covered by each item were counted and expressed as percent of the total number of dots covered. At feeding areas, food availability (percent cover of sessile species) was measured in 7 randomly placed quadrats (20 × 20 cm) during February 1983. In an additional quadrat, all mussels were removed and measured. In order to evaluate qualitative differences between the mussel species consumed by Surfbirds, shell strength (force necessary to break the shells) was measured with a Universal Testing Machine (N = 45 *Semimytilus algosus* and N = 48 *Perumytilus purpuratus* of different sizes), by applying pressure perpendicularly over the valve sides. R×C test (Sokal and Rohlf, Biometry, Freeman, 1969) was used to compare absolute frequencies, pooling categories when necessary to avoid zero frequency cells.

Flocks of 20 to 100 birds (mean = 68 ± 27 [SD], N = 12) were observed foraging on mussel beds in the mid- and low-rocky intertidal region. Prey were pulled from the rock and swallowed whole: no attempts to open the mussels were observed. Prey were crushed in the gizzard and hard parts were not regurgitated.

Stomach contents (crop plus gizzard) and feces showed that the mussel *Semimytilus algosus* predominated in the diet of Surfbirds during 1983, but in 1984 the mussel *Perumytilus purpuratus* was as important as *S. algosus* (Table 1). Stomach contents showed significant differences between years ($\chi^2 = 398$, df = 4, $P < 0.001$, pooling gastropods and excluding *Choromytilus chorus*—not present in 1984 stomach samples); thus it was not possible to pool both sets of samples for statistical analysis. Relative proportions of *S. algosus* and *P. purpuratus* in stomach contents varied significantly between 1983 and 1984 ($\chi^2 = 395$, df = 1, $P < 0.001$). Differences between years may be attributed to the tide level at the time of collecting the birds. In 1983, collection was done during low tide, while in 1984 birds were collected at the onset of low tide, when most of the *S. algosus* beds are unavailable to

TABLE 1

PREY SPECIES COMPOSITION OF SURFBIRD AND PREY AVAILABILITY ON ROCKY SHORES OF MEHUÍN, VALDIVIA, CHILE

	Relative frequency of items (%), mean ± SE			
	Stomach contents			
	1983[a]	1984[b]	Feces 1983[a]	Environment 1983
Bivalvia				
Semimytilus algosus	92.9 ± 9.0**	46.4 ± 52.5	79.1 ± 39.5*	16.0 ± 26.7
Perumytilus purpuratus	4.1 ± 5.8*	44.9 ± 42.9	0.7 ± 3.1**	18.1 ± 16.4
Choromytilus chorus	0.1 ± 0.6	—	—	0.2 ± 0.4
Gastropoda				
Littorina araucana	2.3 ± 7.5	5.1 ± 10.7	—	[c]
Nucella crassilabrum	0.3 ± 1.3	—	—	[c]
Scurria variabilis	—	0.4 ± 1.0	0.2 ± 1.1	[c]
Cirripedia[d]	0.2 ± 0.8**	3.2 ± 6.7	1.4 ± 3.5**	52.8 ± 25.5
Decapoda				
Emerita analoga	—	—	18.6 ± 39.3	[e]
Algae				
Iridaea boryana	—	—	—	13.0 + 19.7
Number of samples	19	6	21	7

[a] Significance of comparisons between environmental samples and consumption using Wilcoxon two-sample test: * = $P < 0.05$, ** = $P < 0.01$.
[b] No environmental figures for 1984 are available for comparisons with stomach contents.
[c] Species present but density figure not available.
[d] Includes *Chthamalus scabrosus* and *Jehlius cirratus*.
[e] Inhabits sandy beaches.

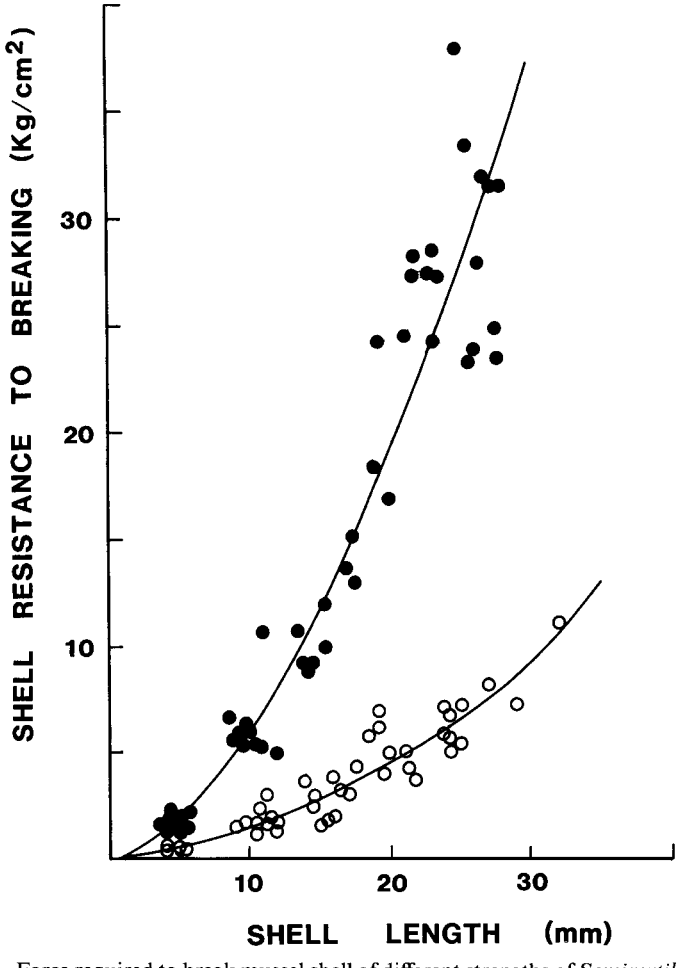

FIG. 2. Force required to break mussel shell of different strengths of *Semimytilus algosus* (open circles) ($r = 0.92$, $P < 0.001$; $\hat{y} = 45.4x^{1.53}$) and *Perumytilus purpuratus* (filled circles) ($r = 0.95$, $P < 0.001$; $\hat{y} = 116.1x^{1.70}$). Force was applied perpendicularly to the valve sides and measured with a Universal Testing Machine.

Surfbirds. Surfbirds, as well as other birds foraging in intertidal zones (e.g., Black Turnstones [*Arenaria melanocephala*] and Black Oystercatchers [*Haematopus bachmani*]), feed in various zones and prey in relation to tide levels (Frank, Ecology 63:1352–1362, 1982). The abundance of prey in the environment was different from that in stomachs and feces in 1983. The mussel *S. algosus* was taken by Surfbirds more frequently than it occured in the environment, while *P. purpuratus* was ignored or taken in the same proportion as it occurred in the mussel beds (Table 1). The remaining prey species appeared at low frequencies. Occasionally when feeding on sandy beaches, Surfbirds preyed on the decapod *Emerita*

analoga. In 1984 the actual prey items were almost the same as those taken during 1983, but *P. purpuratus* and *S. algosus* were equally represented in the stomach contents.

The size distribution of *S. algosus* consumed by Surfbirds (1983 sample) differed significantly from that found in the environment ($\chi^2 = 61.8$, df = 6, $P < 0.005$; test on absolute frequency of size classes, mussels >14 mm were pooled to avoid zero frequency cells). Medium-sized mussels, 6–12 mm in length, were frequent in stomachs, mussels in the length range 12–20 mm were rare, while those >20 mm were not found in stomach contents (Fig. 1A). *P. purpuratus* consumed during 1984 were mainly small-sized, 87.2% below 8 mm in length (Fig. 1B). Whole *S. algosus* and *P. purpuratus* were not found in the stomach contents of the 1984 and 1983 samples, respectively. Surfbirds foraging on mussel beds of *Mytilus californianus* and *M. edulis* on the coast of Oregon consumed mussels in the length range 2–10 mm (Marsh, Ecology 67:771–786, 1986), somewhat below the size range of mussels consumed in Mehuín.

Mussel shell strength increased exponentially with mussel length at the same rate in both species (F between slopes = 1.90; 1,95 df; $P > 0.1$), but *P. purpuratus* had stronger shells than *S. algosus* (F between adjusted means = 653.8; 1,94 df; $P < 0.001$).

The mussels *S. algosus* and *P. purpuratus* are the main prey of the Surfbird on rocky shores in Mehuín, Chile. The low frequency of consumption of other species suggests that they are swallowed incidentally, because most of them live on or among the mussels. The large number of small *P. purpuratus* consumed during 1984 (60% below 6-mm length) may have been swallowed incidentally because juveniles of this species recruit among the byssus of larger mussels (Moreno, Lunecke, and Lepez, Oikos 46:359–364, 1986).

Mussel species consumed by Surfbirds differ in their shell strengths, shells of *S. algosus* being more easily broken than those of *P. purpuratus* (Fig. 2). The same is true of byssuses of both species (pers. obs.). Although energy content of the mussels was not measured, the meat content of *S. algosus* is greater than in *P. purpuratus* of equivalent size (pers. obs.). These characteristics suggest that *S. algosus* is a more profitable prey than *P. purpuratus*.

Acknowledgments.—We acknowledge financial support of the Dirección de Investigación y Desarrollo of the Universidad Austral de Chile (Project RS-83-21 to R.P.S.) and the Fondo Nacional de Ciencias, CONYCIT-Chile (Project 1230/84 to R.P.S.). D. Duffy, J. Castilla and P. Hockey reviewed a previous draft. R. Cardenas, A. Turner and M. Isler helped crushing mussels.—RENÉ A. NAVARRO, CLAUDIO R. VELÁSQUEZ, AND ROBERTO P. SCHLATTER, *Inst. Zoología, Univ. Austral de Chile, Casilla 567, Valdivia, Chile.* (Present address: R.A.N. and C.R.V., *Percy FitzPatrick Institute of African Ornithology, Univ. Cape Town, Rondebosch 7700, South Africa*). *Received 25 March 1988, accepted 15 July 1988.*

Wilson Bull., 101(1), 1989, pp. 141–143

Historical breeding records of the Common Merganser in southeastern United States.—The Common Merganser (*Mergus merganser*) breeds throughout the forested boreal portions of the Holarctic Region (Vaurie 1965), but presently nests only sporadically south of New England in the eastern United States (AOU 1983). In routine curating of the egg collection of the Western Foundation of Vertebrate Zoology (WFVZ) and during visits to other major museum collections, I recently discovered evidence of a formerly more extensive southerly breeding range for this species in the United States.

A clutch (WFVZ 124,806) containing 9 eggs was collected at Bishop's Swamp, Mercer County, West Virginia, by David Willis on 19 May 1897. The set was acquired by the WFVZ from the private collection of Nelson D. Hoy of Media, Pennsylvania, who obtained