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Aerial surveys of shorebirds and other wildlife in South America: some preliminary results

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Abstract

In 1981 and 1982, information on shorebird distribution in South America was gathered during a series of extensive aerial surveys involving collaborative work between the Canadian Wildlife Service and counterpart agencies in Argentina, Brasil, Suriname, Trinidad, Venezuela, French Guiana, and Guyana. In March 1981 an estimated 1 014 690 shorebirds were counted during aerial surveys of the coastlines of Venezuela and Suriname. In January/February 1982, an estimated 2 267 741 shorebirds were counted during aerial surveys of the north coast of South America, from Lake Maracaibo to east of the mouth of the Amazon River, and of the Atlantic coasts of southern Brasil and Argentina.

The surveys clearly identified areas of major international importance used by shorebirds in South America during the northern winter. On the north coast of South America, of the estimated 1.9 million small shorebirds (mainly Semipalmated Sandpipers *Calidris pusilla*), over 70% occurred in Suriname and 20% in French Guiana. These countries also held substantial proportions of the totals counted for a variety of other species of shorebirds. There were other important areas in Venezuela and Brasil. On the southern half of the Atlantic coast of South America, important con-

centrations of small shorebirds (mainly White-rumped Sandpipers *Calidris fuscicollis*) occurred on the coastline of Rio Grande do Sul in southern Brasil. In Argentina, areas of major international importance for Red Knot (*Calidris canutus*) and Hudsonian Godwits (*Limosa haemastica*) were identified on the coastlines of Patagonia and Tierra del Fuego.

The extensive geographical scope of the surveys has provided the information required to identify areas of international importance for shorebirds in South America and has underlined the need for an internationally co-ordinated approach for the effective future conservation of this important group of birds.

Resumen

En 1981 y 1982, el Servicio Canadiense de la Fauna Silvestre en colaboración con Servicios homólogos de Argentina, Brasil, Surinam, Trinidad, Venezuela, Guayana Francesa, y Guyana realizó una serie de extensos reconocimientos aéreos, donde se recopiló información sobre la distribución de aves limícolas en America del Sur. En Marzo de 1981, se contaron aproximadamente 1 014 690 de aves limícolas durante reconocimientos aéreos realizados en los litorales de Venezuela y Surinam. En enero/febrero de 1982, se contaron aproximadamente 2 267 741 aves limícolas durante reconocimientos aéreos realizados en la costa norte de America del Sur, desde el lago de Maracaibo hasta el este de la desembocadura del río Amazonas, así como en el litoral atlántico del Brasil y la Argentina.

Los reconocimientos aéreos identificaron claramente las principales zonas internacionales utilizadas por las aves limícolas en America del Sur durante el invierno septentrional. En la costa norte de America del Sur, de un estimado de 1.9 millones de aves limícolas pequeñas (principalmente *Calidris pusilla*), más del 70% fueron localizadas en Surinam y un 20% en la Guayana Francesa. Estos países registraron asimismo una considerable proporción de los totales contados para otras variedades de aves limícolas. Otras regiones importantes se encontraron en Venezuela y Brasil. En el litoral de Rio Grande do Sul en el sur del Brasil se registraron importantes concentraciones de aves limícolas pequeñas (principalmente *Calidris fuscicollis*). En la Argentina, las principales zonas de importancia internacional para *Calidris canutus* y *Limosa haemastica* se localizaron en los litorales de la Patagonia y Tierra del Fuego.

El extenso ámbito geográfico de los reconocimientos aéreos ha suministrado la información requerida para identificar las zonas de importancia internacional de las aves limícolas en America del Sur y ha subrayado la necesidad de un enfoque coordinado internacionalmente para la conservación futura y eficaz de este importante grupo de aves.

Resumo

Através de uma série de extensos sobrevôos realizados em 1981 e 1982 pelo Serviço Canadense de Fauna em colaboração com os órgãos similares da Argentina, Brasil, Suriname,

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Trinidad, Venezuela, Guiana Francesa e Guiana, colheram-se informações sobre a distribuição de aves limícolas na América do Sul. Em Março de 1981, um total de cerca de 1 014 690 maçaricos foram contados nos sobrevôos do litoral da Venezuela e Suriname. Em janeiro/fevereiro de 1982, foram contados cerca de 2 267 741 maçaricos nos censos aéreos realizados na costa norte da América do Sul, desde o Lago Maracaibo até a leste do estuário do Rio Amazonas, além da costa atlântica do Sul do Brasil e Argentina.

Foram, assim, claramente identificados certas regiões sul-americanas de grande importância internacional onde os maçaricos passam o inverno boreal. Na costa setentrional da América do Sul, verificou-se que mais de 70% e 20% do total estimado de 1,9 milhão de pequenos maçaricos (principalmente *Calidris pusilla*) concentraram-se, respectivamente, no Suriname e na Guiana Francesa, e que esses países também recebiam grande proporção de outras espécies limícolas. Áreas importantes como invernada para estas aves foram observadas no Brasil e na Venezuela. Na costa meridional do Atlântico, encontraram-se grandes concentrações de pequenos maçaricos, no litoral do Rio Grande do Sul, especialmente *Calidris fuscicollis*. Na Argentina, foram identificadas regiões de grande importância internacional para *Calidris canutus* e *Limosa haemastica* no litoral da Patagônia e Terra do Fogo.

A grande extensão geográfica desses sobrevôos tem proporcionado informações necessárias para a identificação dos locais importantes internacionalmente para os maçaricos na América do Sul, salientando, ao mesmo tempo, a necessidade de um esforço cooperativo a nível internacional visando a conservação deste importante grupo de aves.

Introduction

Some 27 species of shorebirds and 3 species of waterfowl that breed in Canada have significant portions of their populations that winter in South America (Godfrey 1966), spending as much as half of their life cycles on that continent. Such species clearly require an international approach for their effective conservation. The most basic requirement for conservational planning is an understanding of the birds' distributions throughout their ranges so as to identify areas that are critical at various stages in their annual cycles. Little detailed information is available on shorebirds in South America, and that which is tends to be from widely scattered local areas and is thus not able to provide the broad geographical perspective required (e.g. Venezuela, McNeil 1970; Suriname, Spaans 1978; Argentina, Myers and Myers 1979, Harrington and Morrison 1980a). Obtaining such information in South America presents considerable logistical problems owing to the enormous size and remoteness of the coastline. Aerial surveys represent the only method of overcoming this logistical barrier and a series of such surveys has been initiated under the Latin American Program of the Canadian Wildlife Service, set up in 1980 to promote conservation of migratory birds shared between Canada and Latin American countries. The major objective of the surveys is the production

of a shorebird atlas documenting the birds' distributions and gross habitat preferences on wintering and migration areas for as much of the South American coast as possible. Although the surveys have been conducted principally for shorebirds, observations of waterfowl have also been made where possible, as well as counts of local wildlife species whose numbers could be effectively estimated from the air without lowering the efficiency of the shorebird survey.

To date, spring surveys have been carried out in Suriname and Venezuela in March 1981, and the first major set of winter surveys was completed in January/February 1982. During the 1982 period a large proportion of the coastline of northern South America was covered, including the coasts of Venezuela, Trinidad, Guyana, Suriname, French Guiana, and Brasil from French Guiana to east of the mouth of the Amazon River; in southern South America, surveys were made of the coasts of the Rio Grande do Sul state of southern Brasil and nearly all of Argentina (see Figure 1a and b). This paper presents preliminary results from both sets of surveys.

Methods

Aerial surveys of the mainland coast were carried out in single- or twin-engine fixed-wing aircraft (Rockwell Aero Commander, Britten-Norman Islander, Cessna 206 and 210), and in an Aérospatiale Gazelle helicopter for the coast of Trinidad. Surveys were flown at an altitude of approximately 40-50 m and an air speed of 160-240 km/h, depending on the densities of birds being encountered. Along coastlines with narrow tidal zones, the flight line ran approximately 25 m offshore and the two principal observers both watched from the same side of the aircraft, splitting species to be counted between them; the other observers received training in aerial survey techniques, prepared habitat descriptions and recorded other species of interest. The two principal observers remained the same throughout all flights to ensure consistency in estimation of numbers of birds. When a broader tidal zone was encountered, the flight line was run approximately 100 m inshore of the water's edge and the observers watched out of opposite sides of the aircraft, each recording all species of interest. An effort was made to survey gently sloping coastline during high tide, thus limiting the area to be covered. Occasionally, lagoons set in from the coast were surveyed and, for each of these, all likely habitats were examined from the aircraft. Lastly, brief reconnaissance flights were made over the prairie-like llanos of Venezuela and took the form of a timed transect over a series of wetlands. In each case, the time and place of bird observations and estimates of numbers were recorded directly onto cassette tape recorders for later transcription. When large flocks were encountered, photographs were usually taken for future analysis. Photographic and descriptive records were made of habitat being covered

at regular intervals and/or when major changes in coastal habitat types occurred.

Shorebird species were divided into three groups for the survey (Table 1). Small species were lumped together as they could not be reliably distinguished from the air. Medium-sized species, except for the two yellowlegs (*Tringa* sp.), could often be separated given good light and slow survey speeds. Large species were separable in almost all cases. Occasionally, the very size and diversity of shorebird flocks precluded identification at anything but the broadest level. Numbers of these species counted are given in Table 2.

Other wildlife species recorded during the surveys are listed in Tables 3, 4, 5, and 6. Only those species were included that concentrated along the coast and for which potentially useful indices of habitat utilization could be produced.

Survey results are presented by country for Trinidad and the Guianas; Venezuela, Brasil, and Argentina have been subdivided into survey sectors, the boundaries of which are presented in Figure 1a and b.

Results and Discussion

Shorebirds

An estimated 1 014 690 and 2 267 741 shorebirds were counted during aerial surveys in spring 1981 and winter 1982, respectively (Table 2, see Figure 1a and b). A number of areas of outstanding international importance for shorebirds were identified. Coastal Suriname and parts of neighbouring French Guiana are of critical importance for a number of shorebird species; several areas on the coast of Argentina hold major portions of the wintering populations of the North American race of the Red Knot (*Calidris canutus rufa*) and of the Hudsonian Godwit (*Limosa haemastica*). Results are summarized for each country, moving from north to south.

Venezuela

For Venezuela, the most important shorebird habitats occurred along the outer shore of the Orinoco River delta and in the coastal lagoons, especially those of the east-central coast between Caracas and Barcelona and on the Araya Peninsula, as well as those on the west-central coast and the Paraguana Peninsula. The Orinoco Delta is the only area with extensive mangrove coasts. Much of the western coastline is sandy with a flat hinterland; extensive beaches provide habitat for species such as Sanderling (*Calidris alba*), and a few lagoon developments, particularly at the entrance to Lake Maracaibo, attract shorebirds. Most of the central coastline north of Caracas, as well as the Paria Peninsula, is mountainous and not suitable for shorebirds, and the area east of Barcelona is also rocky and hilly, with little coastal habitat suitable for shorebirds.

In February 1982, an estimated 132 493 shorebirds were counted in Venezuela; 58% were found in the Orinoco River delta, and 24% and 15% along the east-central and west-central coasts, respectively, particularly in the lagoons. Small shorebirds, probably mostly

Semipalmated Sandpipers (*Calidris pusilla*), comprised 72% (95 676) of the total; these represented 5.0% of the total small shorebirds for the north coast of South America (see Fig. 2). Dowitchers (*Limnodromus* sp.) and Willets (*Catoptrophorus semipalmatus*) (10 213 and 858, respectively) were most common in coastal lagoons with mangrove cover, and virtually all Black-necked Stilts (*Himantopus himantopus*) (2649) occurred in the lagoons and at Lake Maracaibo. Sanderling (654) were recorded along the ocean beaches of western Venezuela (30%) and sandy areas of the Orinoco River delta (70%). Red Knot (520) were identified only in western Venezuela and presumably belong to the population wintering in the Caribbean (see Morrison 1983, 1984).

During spring surveys in late March 1981, an estimated 99 140 shorebirds were recorded in Venezuela. Some differences were observed in shorebird distribution compared with results from the winter surveys, suggesting a westerly shift in the birds; a much higher proportion occurred along the east-central coast, particularly in the coastal lagoons (85%), and fewer were found in the Orinoco River delta (9%). Lower numbers and percentages were found on western coasts and lagoons and around Lake Maracaibo. These differences may be related to a general westerly movement associated with spring migration toward the breeding grounds, and/or changes in availability of habitat and food resources. Apart from the greater use of coastal lagoons and westerly shift in distribution, proportions of the various species were generally similar between the surveys. Small shorebirds (87 147) comprised 88% of the shorebirds recorded, and 89.3% of these occurred along the east-central coast, primarily in lagoons. Willets and medium-sized shorebirds, including yellowlegs, favoured east-central coastal lagoons; over 94% of Black-necked Stilts were in lagoons. Sanderling (469) were once more restricted to sandy beaches in western Venezuela (84%), the east-central coastline (13%), and the Orinoco River delta (3%), a more westerly distribution again being evident.

Trinidad

An estimated 13 675 shorebirds were counted in Trinidad, of which some 90% were small species. The most important shorebird habitats (tidal flats) occurred at a restricted number of locations on the west coast. Oil pollution was evident along many parts of the west and east coasts.

Guyana

Nearly all the estimated 21 766 shorebirds recorded in Guyana occurred on the tidal flats in the eastern section of the country, between Georgetown and the border with Suriname. Although this area is probably heavily used during migration periods, it contained a relatively small proportion of shorebirds on the north coast of South America (1%). The large number of band recoveries in Guyana of Semipalmated Sand-

Figure 1
 Countries and coastal areas in which aerial surveys
 were carried out in South America, (a) north coast, (b)
 south Atlantic coast

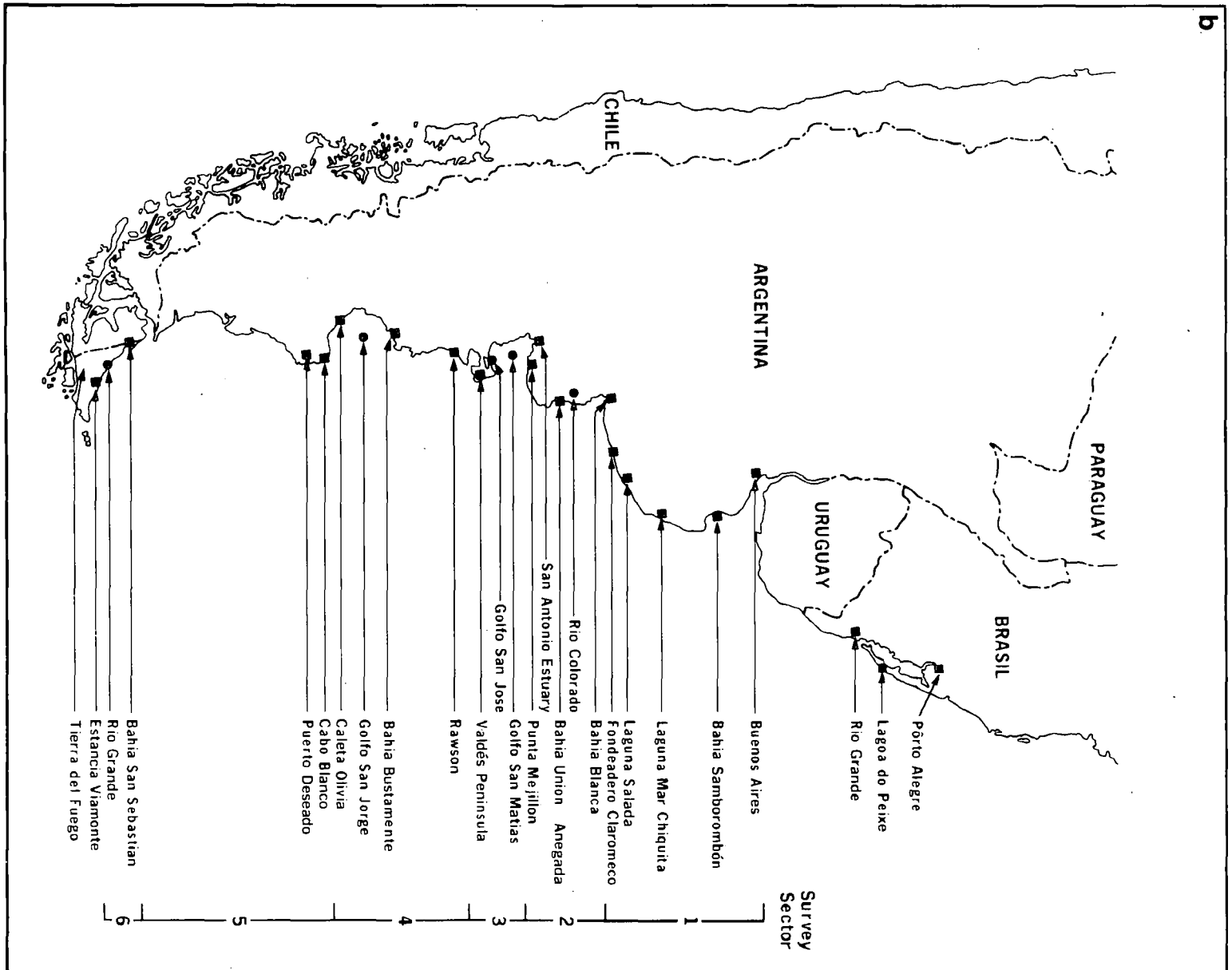
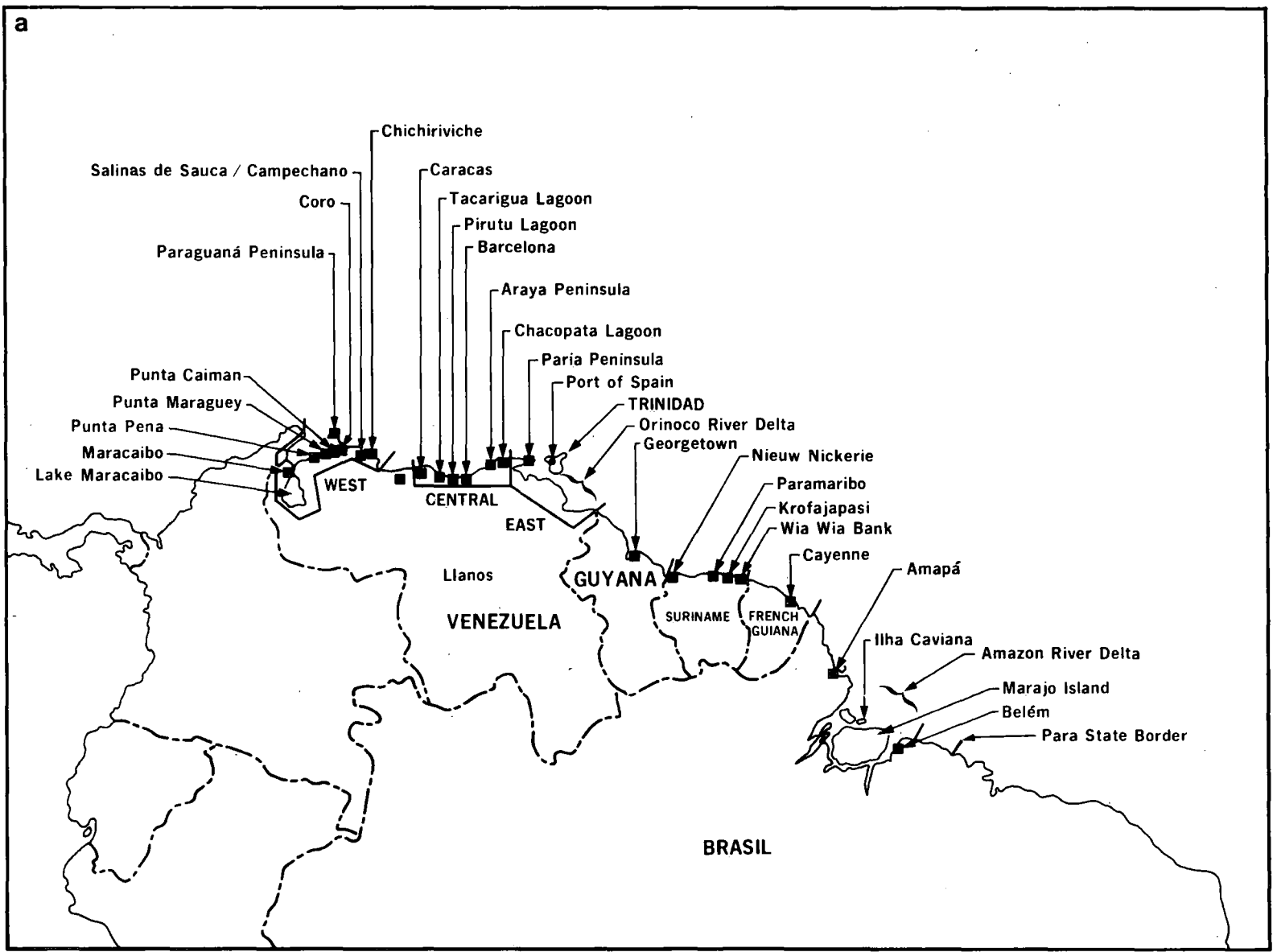
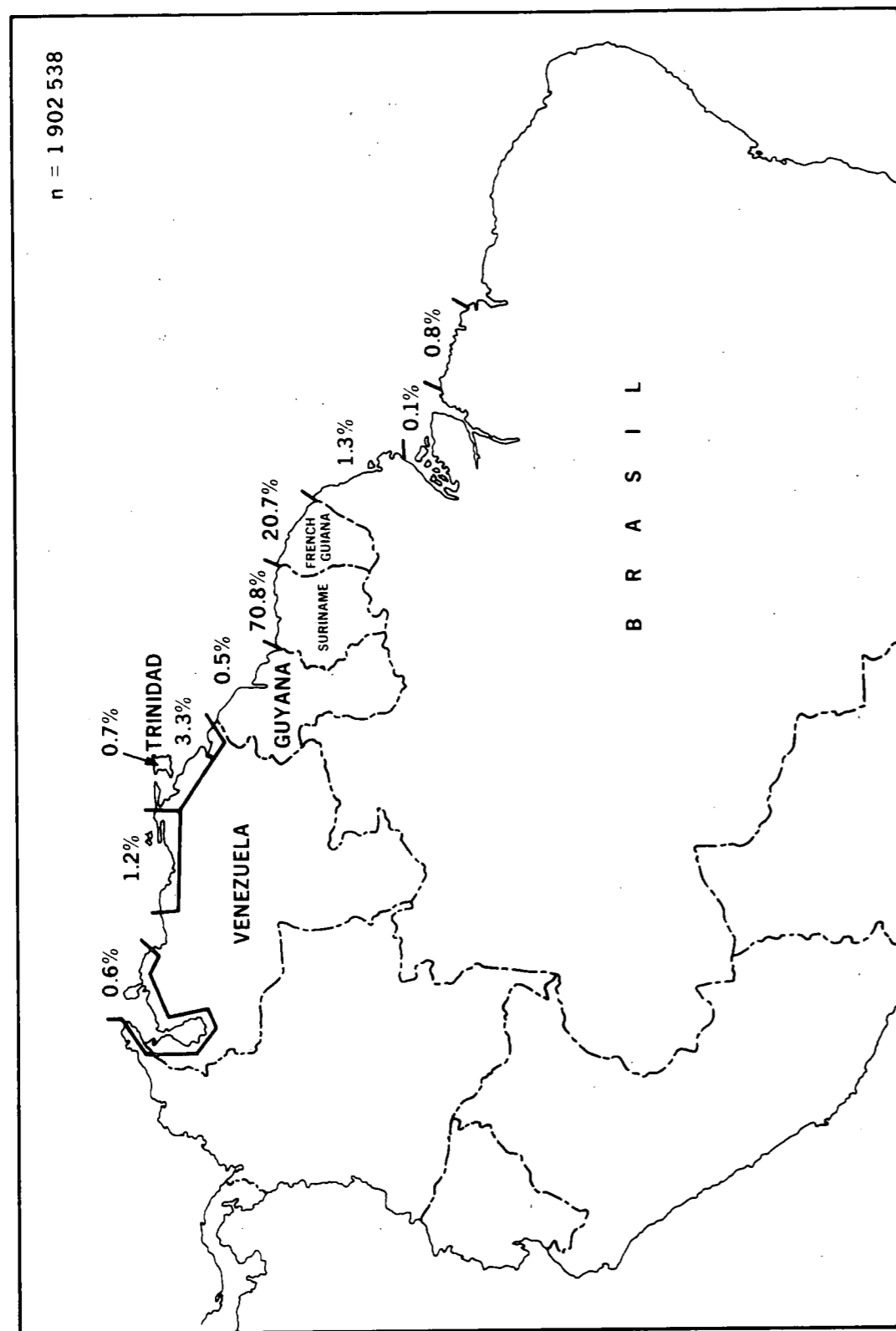


Figure 1 (cont'd)

Figure 2
Distribution of small sandpipers (mostly Semipalmated Sandpipers *Calidris pusilla*) on the north coast of South America during aerial surveys in January/February 1982



pipers marked in James Bay, Canada, suggests heavy hunting pressure on the coast in this area (Morrison 1984). Very few shorebirds indeed were seen west of Georgetown, the coastline consisting principally of steep tropical sand beach.

Suriname

Suriname is clearly the most important area for shorebirds on the north coast of South America. During the winter survey, an estimated 1 526 409 shorebirds were counted in Suriname, comprising 70% of the total for the north coast of South America (2 187 311).

Small species, mostly Semipalmated Sandpipers, comprised 88% of the shorebirds in Suriname; their total (1 346 573) represented 71% of the small shorebirds recorded along the north coast of South America (Fig. 2).

Suriname also contained high percentages of other species on the north coast, including yellowlegs (66 377 or 81%), Willets (15 646 or 85%), Whimbrel (*Numenius phaeopus*) (3310 or 69%), unidentified medium-sized shorebirds (65 392 or 49%), Black-bellied Plover (*Pluvialis squatarola*) (3940 or 56%), and Ruddy Turnstone (*Arenaria interpres*) (619 or 31%).

The most important areas were the large mudflats of the Wia Wia Bank in eastern Suriname and those in the west of the country toward Nieuw Nickerie.

In March 1981, a total of 915 550 shorebirds was counted in Suriname, of which 909 626 (99%) occurred on the coast and 5924 in the adjacent coastal lagoons. Small shorebirds, mostly Semipalmated Sandpipers, were again predominant, comprising 95% of the total. The largest concentrations were again found in the eastern part of the coastline, especially on the Wia Wia Bank. The February 1982 total for the four eastern survey sectors for small sandpipers was 698 342 compared with 720 862 for the March 1981 survey, a difference of 3% of the latter figure.

Whereas small shorebirds were concentrated heavily in the eastern part of Suriname in March 1981, other larger species were more evenly distributed, or occurred more towards the west of the country. For instance, Short-billed Dowitchers (9376) were observed principally in the western half of the country, whereas yellowlegs (27 666), Ruddy Turnstones, Black-bellied Plover, Whimbrel, and Willet were more evenly distributed. The only flock of Sanderling recorded (61 of 66 birds total) occurred in a section containing extensive sandy beaches in eastern Suriname. Red Knot (723) were observed during the March 1981 survey, though none was recorded in early February 1982.

French Guiana

French Guiana is the second most important country for shorebirds on the north coast of South America. Estimated counts totalled 430 854, representing 20% of the shorebirds recorded on the north coast.

Small shorebirds (394 327) comprised 92% of the total for French Guiana and represented 21% of these species recorded on the north coast of South America (Fig. 2). The second largest number of Ruddy Turnstones recorded on the surveys (601) was in French Guiana, representing 31% of the total for the north coast, and there were significant proportions of other species, including yellowlegs (5117 or 6%), Whimbrel (326 or 7%), dowitchers (2400 or 6%), and unidentified medium-sized shorebirds (25 648 or 21%).

The most important habitats were mud- and sandflats in the western section of the country between the border with Suriname and Cayenne.

Brasil — North

The northern section of the Brazilian coast contained lower numbers of shorebirds than the Guianas. An estimated 62 114 shorebirds were observed, representing 3% of the total for the north coast, and of which 69% (43 167) were small species.

Three distinct zones were covered: (a) the northern section, running from the border with French Guiana to the north shore of the Amazon River, consisting principally of a muddy or sandy mangrove coast, (b) the Amazon Delta itself, containing extensive areas of sandflats backed by a mangrove and palm coastline, and (c) the eastern section from the east shore of the Amazon River to the Para State border, consisting of a series of deeply indented shallow bays lined by mangroves and separated by sandy headlands often containing lagoons.

The northern section contained moderate numbers of shorebirds, including 25 594 small shorebirds (1% of the total for the north coast — see Fig. 2), especially in the Amapá area. Small and medium-sized species made up a greater proportion of total shorebirds than in the eastern section.

The mouth of the Amazon River itself was notable for containing very few shorebirds, despite there being large areas of sandflats. Fresh water input and strong, turbulent currents would appear to preclude development of suitable invertebrate food resources. Only 1489 small shorebirds were observed (0.1% total for north coast — see Fig. 2), with smaller numbers of Sanderling (117), Black-bellied Plover (101), yellowlegs (227), and dowitchers (150).

The section east of the mouth of the Amazon River contained good numbers and a moderate diversity of shorebirds. Comparatively more large species were found there than in the northern section. For instance, small shorebirds (16 084) comprised only 52% of the section total, and there were relatively high numbers of Whimbrel (759), Willets (762), unidentified large (4611) and medium-sized shorebirds (7395), and Sanderling (408), making up 85, 97, 90, 86, and 77% of the species totals for northern Brasil, respectively. These figures probably reflect the greater diversity of habitat available east of the mouth of the Amazon River.

Brasil — South

The Rio Grande do Sul coastline of Brasil was surveyed from Porto Alegre to near the border with Uruguay. The outer coast consists entirely of ocean beaches backed by lagoons. Of these lagoons, the Lagoa do Peixe was the most important area for shorebirds and contained higher numbers of small sandpipers, probably mostly White-rumped Sandpipers (*Calidris fuscicollis*), than any other individual area observed further south (as far as Tierra del Fuego). The Lagoa do Peixe, in the section surveyed north of Rio Grande, was connected directly to the sea, whereas those lagoons south of Rio Grande did not appear to be.

Large numbers of Sanderling were found on the outer beach (6618), the total representing some 83% of the Sanderling observed south to Tierra del Fuego. Sanderling, Lesser Golden Plover (*Pluvialis dominica*), and American Oystercatchers (*Haematopus palliatus*) were identified exclusively or principally on the outer beach, whereas Black-necked Stilts and Southern Lapwings (*Vanellus chilensis*) occurred in the lagoons. White-rumped Sandpipers, Sanderling, and Lesser Golden Plover were more numerous on the outer beach north of Rio Grande in the section backed by the Lagoa do Peixe than in the section south of Rio Grande, whereas American Oystercatchers were more numerous in the southern section.

Argentina

An estimated 53 294 shorebirds were recorded in Argentina. Most numerous were small sandpipers (18 719 or 35%), mostly White-rumped Sandpipers, followed by Red Knot (14 512 or 27%), American Oystercatchers (11 154 or 21%), and Hudsonian Godwits (3714 or 7%).

Aerial surveys indicated that important wintering concentrations of Hudsonian Godwits occurred in: 1) Bahia Union/Bahia Anegada in the estuary of the Rio Colorado (1213 or 33%); 2) on the *restinga* from Caleta Olivia to just south of Puerto Deseado (1072 or 29%); and 3) on the extensive mudflats of Bahia San Sebastian in Tierra del Fuego (1000 or 27%) (Fig. 3). Ground surveys confirmed that Bahia San Sebastian, in particular, is of outstanding international importance. An estimated 6000-8000 Hudsonian Godwits were observed in approximately 20% of the bay that could be reached on the ground on 18 January 1982, suggesting that a substantial proportion of the world population of this species may use the area during the northern winter (Morrison 1983, 1984).

Important wintering areas for Red Knot (Fig. 4) identified on the aerial surveys occurred around the Valdés Peninsula (5023 or 35% of the knot total), where knot were found mostly on the outer coasts of and to the north of the Peninsula (Golfo San Jose was not surveyed), and in the Golfo San Jorge, particularly at Bahia Bustamente and on the *restinga* south of Caleta Olivia (8691 or 60%) (Fig. 4). The largest concentrations observed on the surveys occurred around

Bahia Bustamente, where the coastline is rocky with sandy bays, but where there is also a series of low, scrubby swamplands near the shore. To these areas of importance must be added the Atlantic coastline of Tierra del Fuego; during ground surveys, flocks estimated to contain 1000 and 1200 birds were observed in Bahia San Sebastian and on the coast near Estancia Viamonte, respectively, and wintering flocks of 5000 have previously been reported from the Rio Grande area (Devillers and Terschuren 1976, Harrington and Morrison 1980a, b).

Small shorebirds, mostly White-rumped Sandpipers, were most numerous along the sandy bays and rocky headlands from Rawson to Bahia Bustamente and on the *restinga* of southern Golfo San Jorge (7484 or 43%). The large estuaries at Bahia Blanca and of the Rio Colorado in Buenos Aires Province were also important (4727 or 27%), and concentrations were observed in other areas of coast with sandy bays and rocky shores around the Valdés Peninsula, along the coast of Santa Cruz Province, and in Tierra del Fuego.

Sanderling occurred principally on the ocean beaches of Buenos Aires Province and south to the San Antonio estuary and Valdés Peninsula (1270 or 91%). Note that concentrations of White-rumped Sandpipers, Sanderling, and Lesser Golden Plover were considerably larger on the Rio Grande do Sul coastline of southern Brasil, particularly in and around the Lagoa do Peixe, than along the coast of Argentina. Oystercatchers, on the other hand, were more numerous in Argentina than on the Rio Grande do Sul coastline. Yellowlegs were found mostly around the marshes of Bahia Samborombon and coastal lagoons in Buenos Aires Province (642 or 92%), as were Black-necked Stilts (375 or 100%). Flocks of oystercatchers were most numerous between Rawson and Santa Cruz (10 288 or 92%); Black Oystercatchers (*Haematopus ater*) (345) were recorded only on that section of coast.

Waterfowl

The Blue-winged Teal (*Anas discors*) is the most important waterfowl species shared between Latin America and Canada. During both surveys, highest numbers occurred in Venezuela (Table 3), primarily in the coastal lagoons; largest flocks were found within the Morrocoy National Park at Chichiriviche. Smaller numbers were recorded along the mangrove coast of the Orinoco River delta and in the central llanos area. Few were noted in Suriname and only three birds were recorded in Trinidad in February 1982. No teal were seen during the survey along coastal Guyana, French Guiana, or northern Brasil, although the species is considered to occur regularly throughout this region (Bellrose 1978, Haverschmidt 1968). Numbers of teal were much lower in Venezuela during the survey in March 1981, suggesting that migration was underway; the more easterly sections of Venezuela, in particular, showed a marked decline. In contrast, numbers of teal observed in Suriname were higher than in February

Figure 3
Distribution of Red Knot (*Calidris canutus rufa*) during aerial surveys of Argentina and southern Brasil, January 1982

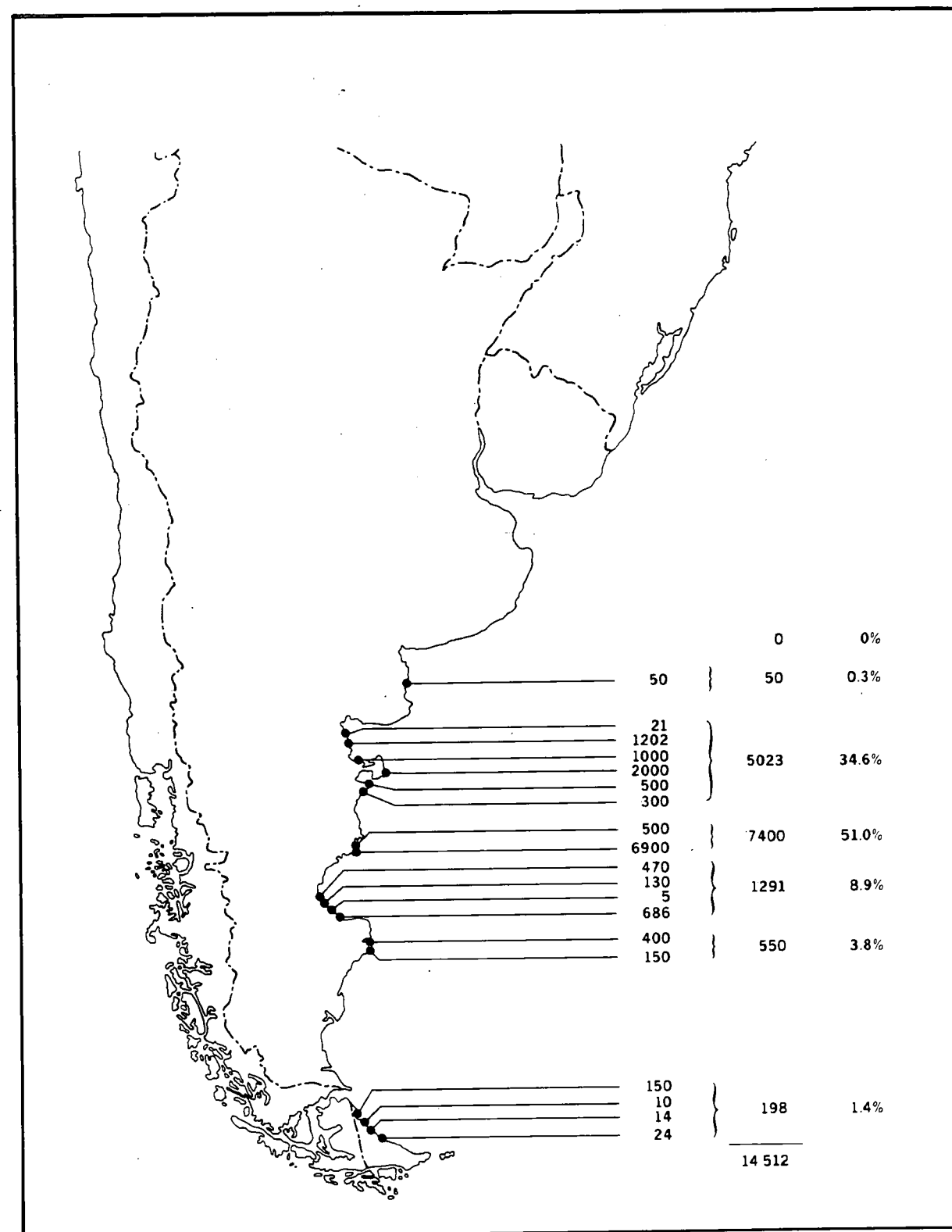
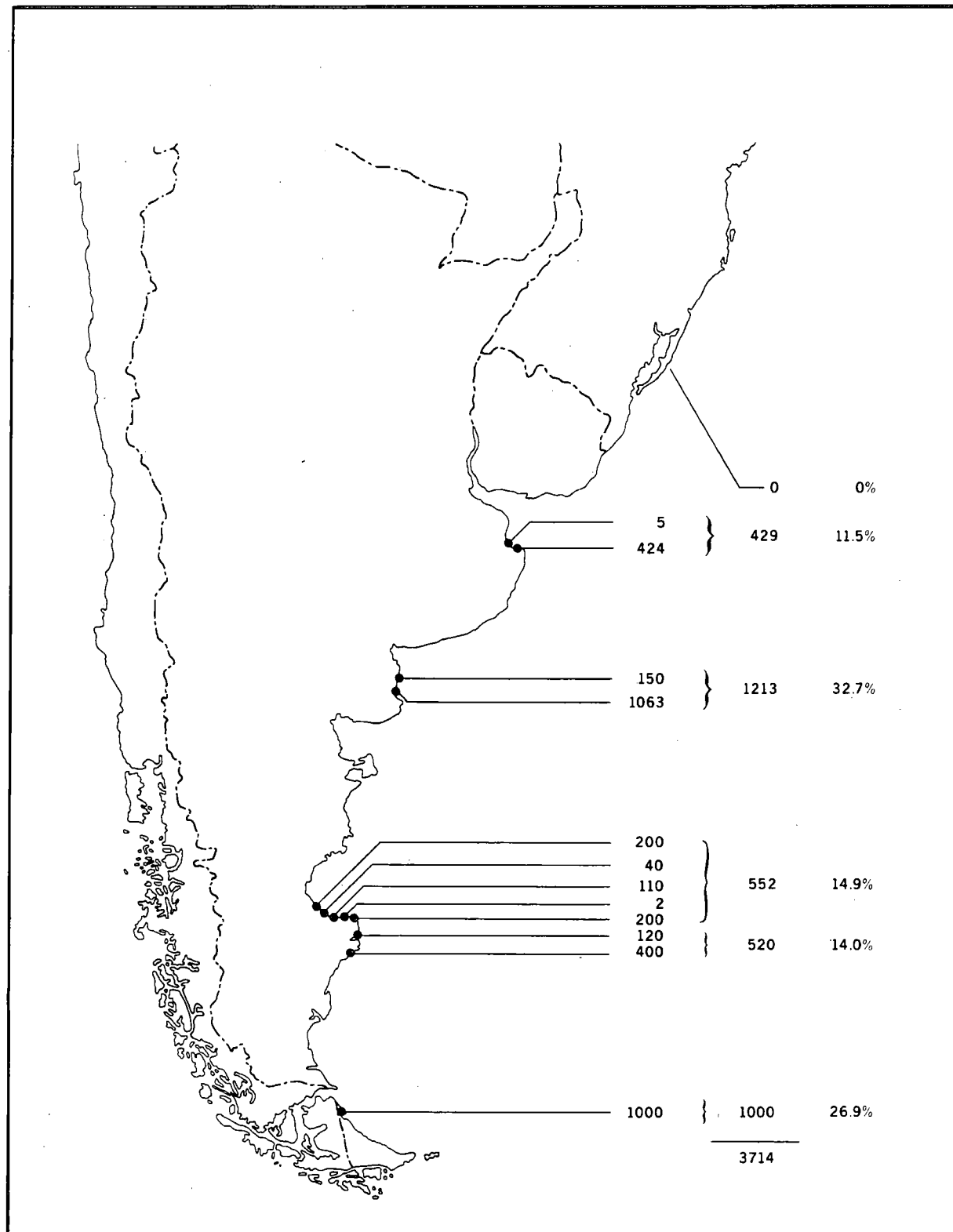


Figure 4
Distribution of Hudsonian Godwits (*Limosa haemastica*) during aerial surveys of Argentina and southern Brasil, January 1982



1982. Moreover, the main hunting season for teal in the Guianas and northern Brasil occurs during March and April. This suggests the existence of a separate subpopulation wintering in an area as yet unknown and migrating on a somewhat different schedule than the Venezuelan birds.

A flock of 3550 American Wigeon (*Anas americana*) was noted at the Campechano lagoon in northwestern Venezuela on 12 February 1982. Meyer de Schauensee and Phelps (1978) list only a single record for this species in Venezuela although it has been recorded more regularly in Panama (Ridgely 1981) and Colombia (Meyer de Schauensee 1964).

In northeastern South America, indigenous waterfowl species noted during the surveys included the whistling-ducks (*Dendrocygna bicolor*, *D. viduata*, *D. autumnalis*), the Muscovy Duck (*Cairina moschata*), the White-cheeked Pintail (*Anas bahamensis*) and the Brazilian Duck (*Amazonetta brasiliensis*). Whistling-ducks were usually not segregated to species, although *D. bicolor* was observed to be much rarer than the other two forms. These species were found occasionally in flocks on coastal lagoons (Table 3), but were much more common on the llanos of Venezuela. Muscovy Ducks showed a similar concentration on the llanos during the February survey; however, they appeared to vacate that area by March, which is the height of the dry season. Brazilian Ducks were noted on the llanos (10, 22 March 1981; 54, 14 February 1982) and on Marajo Island in the Amazon delta (21, 28 January 1982). White-cheeked Pintail occurred in small flocks in coastal lagoons and mangrove swamps in northern Venezuela and Suriname (Table 3).

In southern Brasil and Argentina, species including whistling-ducks, Black-necked Swan (*Cygnus melanocoryphus*), Coscoroba Swan (*Coscoroba coscoroba*), Brazilian Duck, Yellow-billed Pintail (*Anas georgica*), Speckled Teal (*A. flavirostris*) and Rosy-billed Pochard (*Netta peposaca*) were noted sporadically on coastal marshes and lagoons. Apparently flightless flocks of Upland Geese (*Chloephaga picta*) were seen occasionally along the coasts of southern Patagonia and Tierra del Fuego. Only counts of maritime species such as the steamer ducks (*Tachyeres* sp.) and the Crested Duck (*Lophonetta specularioides*) provided a reasonable index of abundance along the coast (Table 5). Both species occurred in small flocks regularly along the coasts of Patagonia and Tierra del Fuego, the Crested Duck reaching as far north as Rio Negro province.

Other species

Results for other species for which useful counts could be made are summarized in Tables 4, 5, and 6.

Flamingo survey data in Table 4 have been based on visual estimates supplemented by photographs. Along the north coast of South America, the American Flamingo (*Phoenicopterus ruber*) was recorded primarily in the saline lagoons of the Caribbean shore of Venezuela; a flock was also noted on the Wia Wia

Bank of Suriname. The breeding grounds on Bonaire Island have been recently disturbed and there is considerable concern for this subpopulation of flamingos (Rooth 1981). In Argentina, the Chilean Flamingo (*P. chilensis*) was noted along the coasts of Buenos Aires and Rio Negro provinces, most being found around the delta of the Rio Colorado. Most notable was the discovery of a new colony (approx. 300-400 pairs) on a low island in Bahia Anegada. Two Chilean Flamingoes were recorded in the Lagoa do Peixe.

Highlights from the surveys for other species (Tables 5 and 6) are as follows:

- (1) Very large numbers (46 630, March 1981; 42 155, February 1982) of Olivaceous Cormorants (*Phalacrocorax olivaceus*) concentrated on Lake Maracaibo. Colonies occurred mostly along the northwestern shore of the lake south of Maracaibo. Considerable oil pollution was evident along the western shore of the lake.
- (2) Large flocks of non-breeding Brown Pelicans (*Pelecanus occidentalis*) were found along the sandy shore between Maracaibo and Coro, Venezuela. Breeding birds were also found on several small mangrove swamps along the Caribbean coast of Venezuela (Punta Pena, Punta Marauey, Punta Caiman, Laguna de Tacarigua, Laguna de Chacopata), although much larger colonies were located along the northern end of the Orinoco delta.
- (3) Magnificent Frigatebirds (*Fregata magnificens*) were observed sporadically along the coasts of Venezuela and Trinidad, often around pelican colonies. An active colony was recorded at Punta Marauey, just west of Coro, Venezuela.
- (4) Scarlet Ibis (*Eudocimus ruber*) were noted wherever possible; however, their ability to hide in the mangroves made counting very difficult, thus producing only a rough index of abundance. Most notable was the general scarcity of juveniles throughout their range. The very large flocks of adults, involving an estimated 7500 birds, on the eastern side of Ilha Caviana in the mouth of the Amazon River have not to our knowledge been noted previously.
- (5) Ospreys (*Pandion haliaetus*) occurred regularly along the northern coast of South America. Highest concentrations were found around Lake Maracaibo.
- (6) Peregrine Falcons (*Falco peregrinus*) were recorded in Venezuela, Suriname, and French Guiana, in all cases near large concentrations of shorebirds.
- (7) Kelp Gulls (*Larus dominicanus*) increased in abundance in the higher latitudes in Argentina as do the larger gull species in the northern hemisphere.
- (8) Brown-hooded Gulls (*Larus maculipennis*) were widespread, although highest counts occurred in southern subtropical Brasil along the coastline of Rio Grande do Sul.

- (9) Distributions of elephant seals (*Mirounga leonina*) and South American sea lions (*Otaria byronia*) were centred on the Valdés Peninsula, Argentina. Small groups of sea lions were also noted along most of the Patagonian coast.

Conclusions

The major result of the surveys along the north coast of South America was the identification of Suriname as by far the most important area for shorebirds in the region. Of the estimated 2 187 311 shorebirds counted on the north coast during the winter survey, a full 70% occurred in Suriname, with a further 21% in French Guiana, these two countries alone accounting for over 90% of the shorebirds observed on the surveys. Of the estimated 1.9 million small shorebirds (mostly Semipalmated Sandpipers) found on the surveys, over 90% of the birds occurred in Suriname and French Guiana, 71% of the total occurring in Suriname (Fig. 2). The estimate of two million Semipalmated Sandpipers along the coast of Suriname in September 1980 by Spaans and Swennen (1982) is of the same order of magnitude as totals observed on the present surveys, and their observation of some 400 000 birds near Krofajapasi during the same period is similar to aerial survey estimates for the Wia Wia Bank area in February 1982 and March 1981. Other species for which Suriname held major proportions included yellowlegs (81%), Willets (85%), Whimbrels (69%), Black-bellied Plovers (56%), and unidentified medium-sized shorebirds (49%). The importance of the coast of Suriname for shorebirds of North American breeding origin has been pointed out by Spaans (1978, 1979), Morrison and Spaans (1979) and Spaans and Swennen (1982), but this is the first time that large-scale survey results have put that fact into continental perspective. Such large concentrations of shorebirds are undoubtedly related to the very extensive and rich mudbanks along the coast, sediments of which are derived from the Amazon River and deposited after being transported westwards by the Guiana Current.

Distribution of other habitats along the north coast of South America is also reflected in the wintering distribution of certain shorebird species. For instance, Sanderling were found principally along sandy coastlines, with 37% being found in the Orinoco River delta, 32% along ocean beaches east of the Amazon River, and a further 15% on the long, sandy coastlines of western Venezuela. Over 95% of the Black-necked Stilts were recorded in coastal lagoons in central Venezuela and at Lake Maracaibo.

Other important results of the surveys were the identification of major wintering areas for Hudsonian Godwits and Red Knot in Argentina (Figs. 3 and 4). The large concentrations (6000–8000) of Hudsonian Godwits found in Bahía San Sebastián corroborate earlier sightings (Harrington and Morrison 1980a) and suggest that this area is probably the major wintering ground of the species. Such large concentrations have

only elsewhere been observed in James Bay, Canada, although the birds are suspected to have a major intermediate stopover, probably somewhere in northern South America (Morrison and Harrington 1979, Morrison 1983, 1984). Other areas of importance for the Hudsonian Godwit in Argentina included the *restinga* around Caleta Olivia in Golfo San Jorge south to past Puerto Deseado, as well as the intertidal flats of Bahía Unión/Bahía Anegada in the estuary of the Rio Colorado.

For Red Knot, the most important areas found on the aerial surveys were around Bahía Bustamante and on the *restinga* from Caleta Olivia to Cabo Blanco in Golfo San Jorge, as well as around the Valdés Peninsula. Ground surveys indicated that the Atlantic coast of Tierra del Fuego was also of major importance (unpublished results). In general, these results agree well with and extend the previous findings of Harrington and Morrison (1980a, b).

Waterfowl species counted during the surveys include whistling-ducks, Muscovy Duck, Blue-winged Teal, American Wigeon, Crested Duck, and steamer ducks. Most interesting was the apparent scarcity during late January and early February 1982 of Blue-winged Teal in the Guianas and northern Brasil, where they are considered to be a common wintering species. As numbers were higher in Suriname during the surveys of March 1981, it would appear that the birds move through that area from an unknown wintering ground during the northward migration. The location of that wintering ground, the schedule of its utilization and the origin of birds using it should all be examined through a thorough study of banding returns.

Other species for which effective counts were made include the Flamingo, Brown Pelican, Olivaceous Cormorant, Magnificent Frigatebird, Scarlet Ibis, Osprey, Peregrine Falcon, Kelp Gull, Brown-hooded Gull, South American sea lion and elephant seal. Of interest were the sightings of four Peregrine Falcons near large shorebird concentrations along the northeastern coast of South America. Ospreys were also seen regularly along the north coast, particularly around Lake Maracaibo. Another piscivore, the Olivaceous Cormorant, was also extremely abundant there, implying a high level of productivity in the lake.

Survey results presented in this report are at the most general level, and yet the advantage of the broad geographic perspective for establishing relative importance remains clear. Further analysis will examine habitat correlates at a much finer level and will hopefully lead to explanations of the birds' distributions.

Conclusiones

El principal resultado de los estudios realizados a lo largo de la costa norte de América del Sur fue la identificación de Suriname como, con mucho, la zona más importante para las aves marinas de esta región. De los 2 187 311 aves marinas estimadas en la costa norte durante el estudio de invierno,

hasta un 70% se registró en Suriname, con otros 21% en la Guayana Francesa, representando estos dos países por sí solos más del 90% de las aves marinas observadas en los estudios. Del 1.9 millón de pequeñas aves marinas calculadas (en su mayoría chorlitos enanos) registrados en los estudios, más del 90% de las aves se localizó en Suriname y la Guayana Francesa, mientras que el 71% del total se localizó en Suriname (figura 2). La estimación de dos millones de chorlitos enanos a lo largo de la costa de Suriname en septiembre de 1980 por Spaans y Swennen (1982) es del mismo orden de magnitud que los totales observados en los estudios presentes, y su observación de aproximadamente 400 000 aves cerca de Krofajapasi durante el mismo período es similar a las cifras del estudio aéreo arrojadas para la zona Wia Wia Bank en febrero de 1982 y marzo de 1981. Otras especies para las que Suriname ha registrado importantes cantidades incluyen los zarapitos o chorlos patas amarillas (81%, agachadizas o *Catoptrophorus semipalmatus* (85%), zarapitos comunes o trinadores — *Numenius minor* — (69%), chorlitos grises o *Pluvialis squatarola* (56%) y aves marinas de tamaño mediano no identificadas (49%). La importancia de la costa de Suriname para las aves marinas de origen norteamericano ha sido señalado por Spaans (1978, 1979), Morrison y Spaans (1979) y Spaans y Swennen (1982), pero ésta es la primera vez que los resultados de estudios en gran escala han colocado el hecho en una perspectiva continental. Estas concentraciones tan grandes de aves marinas indudablemente se relacionan con los muy extensos y ricos bancos de arena ubicados a lo largo de la costa, los sedimentos de los cuales proceden del río Amazonas y se depositan después de ser transportados hacia el oeste por la corriente de la Guayana.

La distribución de los otros habitats a lo largo de la costa norte de América del Sur también está reflejada en la distribución de la invernada de algunas especies de aves marinas. Por ejemplo, se han encontrado chorlitos blancos o *Calidris alba*, principalmente a lo largo de litorales arenosos, encontrándose un 37% en el delta del río Orinoco, un 32% a lo largo de las playas oceánicas al este del río Amazonas y otro 15% en el largo y arenoso litoral del oeste de Venezuela. Más del 95% de las cigoñuelas o teros reales (*Himantopus*) se registraron en las lagunas costeras del centro de Venezuela y en el lago Maracaibo.

Otros importantes resultados de los estudios fueron la identificación de las principales zonas de invernada de las becacas de mar o *Limosa haemastica* y de los canutos rojizos o *Calidris canutus* en la Argentina (figuras 3 y 4). Las grandes concentraciones (6000–8000) de becacas de mar encontrados en la bahía de San Sebastián corroboran avistamientos anteriores (Harrington y Morrison 1980a) y sugieren que esta zona es probablemente el principal lugar de invernada de la especie. Estas concentraciones tan grandes se han observado plenamente en otros lugares, en la bahía James de Canadá, si bien se sospecha que las aves tienen una importante parada intermedia, probablemente en algún lugar situado en la parte septentrional de América del Sur (Morrison y Harrington 1979, Morrison 1982). Otras zonas de importancia para las becacas de mar en la Argentina incluyeron los *restinga* alrededor de la caleta Olivia en el

Golfo de San Jorge, al sur, más allá de puerto Deseado, así como en las llanuras intermareales de la bahía Unión/bahía Anegada en el estuario de río Colorado.

Para los canutos rojizos las zonas más importantes encontradas durante los estudios aéreos fueron alrededor de la bahía Bustamante y sobre el *restinga* de Caleta Olivia a cabo Blanco en el Golfo de San Jorge, así como también alrededor de la Península de Valdez. Los estudios terrestres realizados indicaron que la costa Atlántica de la Tierra del Fuego también era de gran importancia (resultados inéditos). En general, estos resultados concuerdan perfectamente y extienden las conclusiones previas de Harrington y Morrison (1980a,b).

Las especies de aves acuáticas contadas durante los estudios incluyen a los patos o fochas comunes (*Dendrocygna*), el pato criollo o almizclado (*Cairina moschata*), la cerceta común (*Anas discors*), la mareca o ánade silbón americano (*Anas americana*), el ánade crestado (*Anas cre斯塔ta*), y los ánades *Tachyeres*. Es particularmente interesante la aparente escasez durante fines de enero y principios de febrero de 1982 de la cerceta (*Anas discors*) en las Guayanas y al norte de Brasil, donde se consideran como una especie común de invernada. Dado que las cantidades eran más elevadas en Suriname durante los estudios realizados en marzo de 1981, parecería que las aves atraviesan dicha región desde un lugar de invernada desconocido durante la migración hacia el norte. Tanto el lugar de dicho terreno de invernada como el período de su utilización, así como el origen de las aves que utilizan dichos lugares deben ser examinados minuciosamente mediante bandas de regreso.

Otras especies para las cuales se realizaron conteos efectivos incluyen el flamenco, el pelicano castaño oscuro (*Pelecanus occidentalis*), el cormorán o cuervo marino neotrópico (*Phalacrocorax olivaceus*), el rabihorcado (*Fregata magnificens*), la ibis escarlata (*Eudocimus ruber o rubra*), la águila marina o pescadora (*Pandion haliaetus*), el halcón peregrino (*Falco peregrinus*), la gaviota de alga marina (*Larus dominicanus*), la gaviota crestada (*Larus maculipennis*), el lobo marino sudamericano (*Otaria byronia*) y el elefante marino (*Mirounga leonina*). Resultaron interesantes los avistamientos de cuatro halcones peregrinos cerca de grandes concentraciones de aves marinas a lo largo de la costa noreste de América del Sur. También se han avistado regularmente águilas marinas o pescadoras a lo largo de la costa norte, particularmente alrededor del lago Maracaibo. Otro piscívoro, el cormorán o cuervo marino neotrópico, se encontró allí en gran abundancia, implicando un alto nivel de productividad en el lago.

Los resultados del estudio presentados en este informe son de un orden muy general y sin embargo la ventaja de la amplia perspectiva geográfica para establecer la importancia relativa permanece clara. Con nuevos análisis se examinan los correlatos de habitat a un nivel mucho más refinado que se espera conducirán a explicaciones de las distribuciones de las aves.

Conclusões

O principal resultado dos levantamentos realizados na costa norte da América do Sul foi a identificação do Suriname

como o ponto principal de concentração da saracura nessa região. Assim, de cerca de 2 187 311 aves contadas no litoral setentrional durante o levantamento invernal, 70% se encontram no Suriname e uns 21% na Guiana Francesa, representando uma concentração de mais de 90% das saracuras nesses dois países. E do total estimado em 1,9 milhão de pequenas saracuras (principalmente a baturinha semi-palmípede) registrado nos levantamentos, mais de 90% também estavam localizados naqueles dois países, e 71% no Suriname (figura 2). Foi estimada a presença de 2 milhões de baturinhas semi-palmípedes na costa do Suriname, primeiro por Spaans em setembro de 1980, depois por Swennen em 1982, e posteriormente confirmada pelos atuais levantamentos. No mesmo período, os dois cientistas observaram a presença de cerca de 400 mil aves perto de Krofajapasi, concordando com as estimativas obtidas no levantamento aéreo da região das margens do Wia Wia em fevereiro de 1982 e março de 1981. Outras aves gruiformes foram encontradas em grandes números no Suriname, incluindo gêneros de saracuras tais como a *Totanus flavipes* (81%), a *Catoptrophorus semipalmatus* (85%), a tarambola de ventre vermelho (56%) e algumas gruiformes não identificadas de tamanho médio (49%).

A importância das costas do Suriname para as saracuras procedentes da América do Norte já fora salientada por Spaans (1978, 1979), Morrison e Spaans (1979) e Spaans e Swennen (1982), mas esta é a primeira vez que o fato é colocado numa perspectiva continental pelos resultados de um levantamento de grande escala. A sensível concentração de saracuras nessa região deve-se, indiscutivelmente, à presença de extensas margens barrentas ao longo da costa, resultado da intensa sedimentação do Rio Amazonas transportada para o oeste pela corrente da Guiana.

A localização invernal de certas espécies de saracuras também depende da distribuição de outros habitats na costa setentrional da América do Sul. Assim, por exemplo, a *Crocebia alba* foi vista principalmente nas praias arenosas do delta do Rio Orinoco (37%), no litoral oceânico ao leste do Amazonas (32%) e nas grandes praias arenosas do oeste da Venezuela. Mais de 95% das narcejas de colo preto foram vistos nas lagoas costeiras da Venezuela central e no Lago Maracaibo.

Os levantamentos também localizaram os principais centros de invernção da limosa de Hudson e da *Calidris canutus* na Argentina (figuras 3 e 4). A grande concentração das primeiras (de 6 a 8 mil) na Baía São Sebastião veio confirmar dados anteriores (Harrington e Morrison, 1980) e sugerir que essa região provavelmente seja o principal ponto de invernção das limosas. Outras concentrações dessa magnitude só foram observadas até agora na Baía de James, no Canadá, embora se suspeite que as aves façam escala num outro ponto, provavelmente ao norte da América do Sul (Morrison e Harrington 1979, Morrison 1982). Outras áreas importantes para as limosas na Argentina são as restingas perto da Caleta Olivia no Golfo de São Jorge, ao sul do Porto Deseado, e as áreas rasas entre as marés da Baía União e Baía Anegada, no estuário do Rio Colorado.

Os principais pontos de concentração da *Calidris canutus* constatados pelos levantamentos aéreos foram os arredores

da Baía Bustamante, a restinga que se estende desde Caleta Olivia até o Cabo Blanco no Golfo de São Jorge, e em volta da Península de Valdés. Em levantamentos terrestres de resultados ainda não publicados, verificou-se que a costa atlântica da Terra do Fogo também constitui uma área importante. De modo geral, esses resultados concordam e complementam as conclusões anteriores de Harrington e Morrison (1980a,b).

Entre as aves aquáticas observadas durante os levantamentos figuram algumas espécies de patos, tais como o *Cairina moschata*, o pato selvagem americano, o pato cristado e a cerceta de asas azuis. Um fato interessante foi a aparente ausência desta última nas Guianas e no norte do Brasil no fim de Janeiro e inícios de Fevereiro de 1982, época em que deveria estar invernando nessa região. Como aumentou o número de aves contadas no Suriname durante os levantamentos de Março de 1981, pareceria que os pássaros passam por aquela região durante sua migração para o norte procedentes de um ponto de invernção desconhecido. A localização desse ponto, a origem dos pássaros e a época que o visitam devem ser o tema de um abrangente estudo dos padrões migratórios.

Outras espécies examinadas durante os levantamentos foram o flamengo, o pelicano marrom, o cormorão neotrópico, a magnífica fragata, o íbis escarlata, a águia pescadora, o falcão peregrino, a gaiivota marinha, a gaiivota de cresta marrom, o leão-marinho e a foca sulamericana. Em certa ocasião, foram avistados quatro falcões peregrinos nas vizinhanças de grandes concentrações de saracuras no litoral setentrional da América do Sul. As águias pescadoras também saíam regularmente na costa norte, principalmente nas proximidades do Lago Maracaibo. Uma outra ave piscívora, o cormorão neotrópico, também abundava na região, implicando um alto nível de produtividade no lago.

Embora os resultados dos levantamentos sejam aqui apresentados em termos genéricos, é evidente a vantagem de contar-se com uma ampla perspectiva geográfica para estabelecer a importância relativa das situações. Uma análise mais detalhada permitirá examinar as correlações do habitat a um nível muito mais acurado, podendo inclusive fornecer dados esclarecedores sobre a distribuição das aves.

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References

- AOU 1983. Check-list of North American birds. 6th ed. Am. Ornithol. Union. 877 pp.
- Bellrose, F.C. 1978. Ducks, geese and swans of North America. 2nd ed. rev. Stackpole, Harrisburg, Pa. 540 pp.
- Devillers, P.; Terschuren, J.A. 1976. Some distributional records of migrant North American Charadriiformes in coastal South America (Continental Argentina, Falkland, Tierra del Fuego, Chile and Ecuador). *Gerfaut* 66:107-125.
- Godfrey, W.E. 1966. The Birds of Canada. Natl. Mus. Canada Bull. 203, 448 pp.
- Harrington, B.A.; Morrison, R.I.G. 1980a. An investigation of wintering areas of Red Knots (*Calidris canutus*) and Hudsonian Godwits (*Limosa haemastica*) in Argentina. 54 pp. Report to the World Wildlife Fund, Washington, DC, and Toronto, Canada.
- Harrington, B.A.; Morrison, R.I.G. 1980b. Notes on the wintering areas of Red Knot *Calidris canutus rufa* in Argentina, South America. *Wader Study Group Bull.* 28:40-42.
- Haverschmidt, F. 1968. Birds of Surinam. Oliver and Boyd, Edinburgh.
- McNeil, R. 1970. Hivernage et estivage d'oiseaux aquatiques nord-américains dans le nord-est du Venezuela (mue, accumulation de graisse, capacité de

vol et routes de migration). *L'oiseau et la R.F.O.* 40:185-302.

Meyer de Schauensee, R. 1964. The birds of Colombia. Livingston, Wynnewood, Pa.

Meyer de Schauensee, R.; Phelps, W.H., Jr. 1978. Birds of Venezuela. Princeton Univ. Press, Princeton, N.J. 424 pp.

Morrison, R.I.G. 1983. A hemispheric perspective on the distribution and migration of some shorebirds in North and South America. Pages 84 - 94 in H. Boyd, ed. Proc. Int. Waterfowl Res. Bur. Symp., Edmonton, Canada, May 1982. Can. Wildl. Serv. Spec. Publ. Ottawa. 147 pp.

Morrison, R.I.G. 1984. Migration systems of some New World shorebirds. Pages 125 - 202 in Burger, J.; Olla, B.L., ed. Behavior of marine animals. Vol. 6. Shorebirds: migration and foraging behavior. Plenum Press, New York and London. 329 pp.

Morrison, R.I.G.; Harrington, B.A. 1979. Critical shorebird resources in James Bay and eastern North America. Trans. 44th N. Am. Wildl. Nat. Resour. Conf. pp. 498-507. Wildl. Manage. Inst., Washington, D.C.

Morrison, R.I.G.; Spaans, A.L. 1979. National Geographic mini-expedition to Suriname, 1978. *Wader Study Group Bull.* 26:37-41.

Myers, J.P.; Myers, L.P. 1979. Shorebirds of coastal Buenos Aires Province, Argentina. *Ibis* 121:186-200.

Ridgely, R.S. 1981. A guide to the birds of Panama. 3rd ed. rev., Princeton Univ. Press, Princeton, N.J. 404 pp.

Rooth, J. 1981. Netherlands National Report, Debrecen. Research on *Phoenicopterus ruber*. Int. Waterfowl Res. Bur. Bull. 47:48-49.

Spaans, A.L. 1978. Status and numerical fluctuations of some North American waders along the Suriname coast. *Wilson Bull.* 90:60-83.

Spaans, A.L. 1979. Wader studies in Suriname, South America. *Wader Study Group Bull.* 25:32-37.

Spaans, A.L.; Swennen, C. 1982. The 1980 Dutch mini-expedition to Suriname. *Wader Study Group Bull.* 34:32-34.

Table 1
Categories of species of shorebirds used during aerial surveys
in South America. Nomenclature and order based on AOU (1983)

Group	Species	
Small shorebirds	Semipalmated Plover	<i>Charadrius semipalmatus</i>
	Spotted Sandpiper	<i>Actitis macularia</i>
	Sanderling	<i>Calidris alba</i>
	Semipalmated Sandpiper	<i>Calidris pusilla</i>
	Western Sandpiper	<i>Calidris mauri</i>
	Least Sandpiper	<i>Calidris minutilla</i>
	White-rumped Sandpiper	<i>Calidris fuscicollis</i>
	Baird's Sandpiper	<i>Calidris bairdii</i>
	Pectoral Sandpiper	<i>Calidris melanotos</i>
	Medium-sized shorebirds	Black-bellied Plover
Lesser Golden-Plover		<i>Pluvialis dominica</i>
Greater Yellowlegs		<i>Tringa melanoleuca</i>
Lesser Yellowlegs		<i>Tringa flavipes</i>
Solitary Sandpiper		<i>Tringa solitaria</i>
Ruddy Turnstone		<i>Arenaria interpres</i>
Red Knot		<i>Calidris canutus</i>
Stilt Sandpiper		<i>Calidris himantopus</i>
Short-billed Dowitcher	<i>Limnodromus griseus</i>	
Large shorebirds	Willet	<i>Catoptrophorus semipalmatus</i>
	Whimbrel	<i>Numenius phaeopus</i>
	Hudsonian Godwit	<i>Limosa haemastica</i>
Indigenous shorebirds	Southern Lapwing	<i>Vanellus chilensis</i>
	American Oystercatcher	<i>Haematopus palliatus</i>
	South American Black Oystercatcher	<i>Haematopus ater</i>
	Black-necked Stilt	<i>Himantopus himantopus</i>

Table 2a
Counts of shorebirds during aerial surveys of the northeastern
coasts of South America, January/February 1982

Country and sector	Species				TOTAL
	Small shorebirds sp.	Sanderling	Spotted Sandpiper	Medium shorebirds sp.	
Venezuela: west	10 636	194	10	8 175	
central	23 006	0	1	365	
east	61 362	460	7	10 370	
Trinidad	12 367	5	21	80	
Guyana	9 755	30	23	1 248	
Suriname	1 346 573	42	10	65 392	
French Guiana	394 327	2	5	25 648	
Brasil: north	25 594	2	2	1 064	
Amazon	1 489	117	4	139	
northeast	16 084	408	2	7 395	
Country and sector	Lesser Golden Plover	Black-bellied Plover	Ruddy Turnstone	Yellowlegs sp.	TOTAL
Venezuela: west	0	212	219	1 290	
central	0	48	0	795	
east	0	143	42	322	
Trinidad	0	173	6	518	
Guyana	0	598	48	6 824	
Suriname	0	3 940	619	66 377	
French Guiana	0	640	601	5 117	
Brasil: north	47	676	191	205	
Amazon	0	101	4	227	
northeast	1	464	237	544	
Country and sector	Red Knot	Dowitcher sp.	Large shorebirds sp.	Whimbrel	TOTAL
Venezuela: west	520	0	171	114	
central	0	7 113	50	17	
east	0	3 100	0	195	
Trinidad	0	209	0	75	
Guyana	0	2 900	0	57	
Suriname	0	21 840	2 580	3 310	
French Guiana	0	2 400	1 039	326	
Brasil: north	120	20	511	138	
Amazon	0	150	2	0	
northeast	0	0	4 611	759	
Country and sector	Willet	Black-necked Stilt	Lesser Oystercatcher	Southern Lapwing	TOTAL
Venezuela: west	121	2 251	48	0	23 961
central	472	398	1	0	32 266
east	265	0	0	0	76 266
Trinidad	184	37	0	0	13 675
Guyana	283	0	0	0	21 766
Suriname	15 646	80	0	0	1 526 409
French Guiana	729	20	0	0	430 854
Brasil: north	25	2	0	0	28 597
Amazon	0	1	0	5	2 709
northeast	762	0	11	0	30 808
					2 187 311

Table 2b
Counts of shorebirds during aerial surveys of the coasts of
Venezuela and Suriname, March 1981

Country and sector	Species				
	Small shorebirds sp.	Sanderling	Spotted Sandpiper	Medium shorebirds sp.	
Venezuela: west	3 481	395	8	1 286	
central	78 290	60	83	1 771	
east	5 376	14	30	271	
Suriname	872 279	66	41	0	
Country and sector	Species				
	Lesser Golden Plover	Black-bellied Plover	Ruddy Turnstone	Yellowlegs sp.	
Venezuela: west	4	167	0	812	
central	0	251	0	1 278	
east	0	189	0	188	
Suriname	0	1 281	872	27 666	
Country and sector	Species				
	Red Knot	Dowitcher sp.	Large shorebirds sp.	Whimbrel	Willet
Venezuela: west	123	0	8	3	0
central	0	0	0	18	1 446
east	2 400	0	0	82	256
Suriname	723	9 376	0	331	2 914
Country and sector	Species				
	Hudsonian Godwit	Black-necked Stilt	American Oyster-catcher	Southern Lapwing	TOTAL
Venezuela: west	0	0	35	2	6 324
central	0	804	5	0	84 006
east	0	4	0	0	8 810
Suriname	1	0	0	0	915 550
					1 014 690

Table 2c
Counts of shorebirds during aerial surveys of the coasts of
Southern Brasil and Argentina, January 1982

Country and sector	Species				
	Small shorebirds sp.	White-rumped Sandpiper	Sanderling	Medium shorebirds sp.	
Brasil — southern coast	970	2 250	6 618	4	
— southern lagoons	14 149	90	0	707	
Argentina	1	1 475	0	253	1 267
	2	4 727	0	240	1 760
	3	1 038	0	777	4
	4	7 484	0	75	190
	5	1 700	0	0	0
	6	896	0	54	4
Country and sector	Species				
	Lesser Golden Plover	Black-bellied Plover	Ruddy Turnstone	Yellowlegs sp.	
Brasil — southern coast	394	3	0	2	
— southern lagoons	235	0	0	417	
Argentina	1	85	0	642	
	2	30	5	0	1
	3	0	5	0	55
	4	0	0	320	17
	5	0	0	0	0
	6	0	0	0	0
Country and sector	Species				
	Red Knot	Large shorebirds sp.	Whimbrel	Hudsonian Godwit	
Brasil — southern coast	0	4	3	0	
— southern lagoons	0	0	0	0	
Argentina	1	0	47	6	429
	2	50	5	0	1 213
	3	5 023	0	0	0
	4	8 691	5	0	552
	5	550	3	0	520
	6	198	0	0	1 000
Country and sector	Species				
	Black-necked Stilt	American Oyster-catcher	Black Oyster-catcher	Southern Lapwing	TOTAL
Brasil — southern coast	2	848	0	0	11 098
— southern lagoons	100	1	0	338	16 038
Argentina	1	371	0	20	4 924
	2	4	176	0	8 211
	3	0	227	0	7 131
	4	0	7 572	165	25 071
	5	0	2 716	180	5 669
	6	0	134	0	2 288
					80 430

Table 3
Survey results for waterfowl along the northeastern coast of South America

Coastal Sector	Survey date	Species			
		Whistling ducks sp.	Muscovy duck	Blue-winged teal	Bahamian pintail
Venezuela					
—western	11, 12-2-82	1 752	0	29 220	460
	18-3-81	1 265	6	8 030	10
—central	12-2-82	250	3	4 495	90
	20-3-81	0	0	587	6
—eastern	13-2-82	0	9	587	0
	20, 21-3-81	0	8	4	0
—llanos	14-2-82	15 520	1 472	300	0
	22-3-81	13 210	0	15	0
Trinidad	17, 18-2-82	167	0	3	15
		—	—	—	—
Guyana	6-2-82	0	0	0	0
		—	—	—	—
Suriname	3, 4-2-82	0	0	100	200
	27-3-81	0	0	475	70
French Guiana	3-2-82	0	0	0	0
		—	—	—	—
Brasil					
—northern	28-1-82	0	0	0	0
		—	—	—	—
—Amazon	28-1-82	1 190	9	0	0
		—	—	—	—
—northeastern	29-1-82	0	0	0	0
		—	—	—	—

Table 4
Counts of flamingo flocks taken during coastal surveys of South America

Species	Location	Date	Total
<i>P. ruber</i>	Western Falcon State Venezuela	18-3-81	3
" "	Paraguana Pen. Venezuela	12-2-82	2150
" "	Salinas de Sauca Venezuela	18-3-81	400
" "	Salinas de Sauca Venezuela	12-2-82	2930
" "	San Juan de los Cayos Venezuela	12-2-82	1450
" "	Chichiriviche Venezuela	18-3-81	3500
" "	Chichiriviche Venezuela	12-2-82	1800
" "	Laguna de Unare Venezuela	20-3-81	170
" "	Laguna de Piritu Venezuela	20-3-81	5000
" "	Laguna de Piritu Venezuela	12-2-82	1100
" "	Chacopata Venezuela	20-3-81	720
" "	Chacopata Venezuela	12-2-82	430
" "	Wia Wia Bank Suriname	27-3-81	1800
" "	Wia Wia Bank Suriname	3-2-82	850
<i>P. chilensis</i>	Lagoa do Peixe	23-1-82	2
" "	Bahia Samborombon, Argentina	13-1-82	326
" "	Laguna Mar Chiquita Argentina	13-1-82	600
" "	Laguna Salada Argentina	13-1-82	10
" "	near Fondeadero Claromeco Argentina	13-1-82	35
" "	Bahia Anegada Argentina	13-1-82	2275
" "	Punta Mejillon Argentina	14-1-82	90
" "	San Antonio Estuary Argentina	14-1-82	402
" "	North-west Golfo San Matias Argentina	14-1-82	35

Table 5
Survey results for other bird species along the northeastern coast of South America

Coastal sector	Survey route	Species					
		Brown Pelican	Olivaceous Cormorant	Magnificent Frigatebird	Scarlet Ibis	Osprey	Peregrine Falcon
Venezuela							
—western	11, 12-2-82	9 206	39 262	3 608	750	41	0
	18-3-81	467	48 449	177	54	234	0
—central	12-2-82	7 880	4 927	90	201	9	1
	20-3-81	3 534	10 853	439	751	21	0
—eastern	13-2-82	11 327	651	477	699	5	1
	20, 21-3-81	1 801	4 930	37	3 578	9	0
—llanos	14-2-82	0	—	0	—	1	0
	22-3-81	0	1 065	0	270	2	0
Trinidad	17, 18-2-82	1 096	1 015	46	—	17	0
	24-3-81	75*	—	—	50*	*	—
Guyana	6-2-82	0	0	0	885	3	0
		—	—	—	—	—	—
Suriname	3, 4-2-82	0	0	0	4 481	10	1
	27-3-81	0	0	5	350	3	0
French Guiana	3-2-82	0	0	4	1 894	4	1
		—	—	—	—	—	—
Brasil							
—northern	28-1-82	0	13	0	1 276	1	0
		—	—	—	—	—	—
—Amazon	28-1-82	0	590	0	7 555	20	0
		—	—	—	—	—	—
—northeastern	29-1-82	0	2 042	0	291	2	0
		—	—	—	—	—	—

* Observed during ground surveys.

Table 6
Survey results for waterfowl and other wildlife species along the coast of southern Brasil and Argentina

Coastal sector	Survey date	Species							
		Crested Duck	Steamer duck sp.	Kelp Gull	Brown-hooded Gull	Elephant seal	Sea lion	Gull sp.	
Southern Brasil — coast	23-1-82	0	0	9	2 636	0	0	1	
Southern Brasil — lagoons	23-1-82	0	0	2	9 719	0	0	0	
Argentina — 1	13-1-82	0	0	4 452	805	0	0	9 767	
	2	13, 14-1-82	70	1	5 997	2 147	0	14	904
	3	14-1-82	0	0	18 976	4 220	5 862	5 975	4 692
	4	15-1-82	364	552	27 237	1 464	0	2 414	3 881
	5	15-1-82	110	369	44 084	130	0	201	20
	6	16-1-82	*	*	2 125	17	0	0	200

* Observed only during ground surveys.