MONITORING ANATIDAE POPULATIONS IN RIO GRANDE DO SUL STATE, SOUTH BRAZIL

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ABSTRACT

The Rio Grande do Sul state, located in the subtropical part of Brazil, harbours 24 Anatidae species, which is the highest number in the country. The state is unique in Brazil, as it is the only one which has a hunting season since the past ten years. Three duck species are currently on the state’s game list. Two species considered federally endangered depend on state wetlands. Since 1977 the state’s Anatidae, are the highest priority for monitoring by CEMAVE/IBAMA, with up to 15,000 ducks and swans being banded. In 1992 and 1993, aerial surveys were carried out, covering the state’s wetlands, both inland and coastal. The results from the banding studies and surveys lead to changes in the bag limits and a hunting ban of two duck species. These new data also showed new migrations or movements from the lower Paraná river valley in Argentina into Brazil and Uruguay. For the two swan species, protected by law in Brazil, results have shown some long distance movements for Coscoroba swan (Coscoroba coscoroba), whereas the black-necked swan (Cygnus melancoryphus) shows rather short distance movements. The aerial surveys and analysis of the Neotropical Waterfowl Census data has shown that the yellow-billed pintail (Anas georgica) population may be in trouble in terms of conservation. Based on information from the long-term monitoring, a tree duck range expansion was found, following the arrival of the black-billed whistling duck (Dendrocygna autumnalis) in recent years. Overall, some Anatidae species depend year round on the state’s wetlands for their survival. Rose-billed pochard (Netta rosmarinus) migrates every year to the lower Paraná river valley for breeding (although a smaller population breeds in Brazil). A third species group moves to Argentina during the breeding season, although the available data do not show a true seasonal migration after the breeding season. The lower Paraná river valley is a key point for some species using the Rio Grande do Sul wetlands, being the central portion of the state used as pathway. Two different conservation strategies are needed for the Anatidae in Rio Grande do Sul. The first is the urgent need for protection of the state’s interior wetlands, which are severely affected by human activities. The second one is the need for an international approach for the conservation of the lower Paraná river valley wetlands, as its Anatidae populations are shared by Brazil.
Argentina, Uruguay and Paraguay. The recently established organization Mercosur, which is an international economic treaty between these countries, may represent a cooperative cornerstone for this conservation need.

I. INTRODUCTION

Brazil has 24 Anatidae species, of which 21 occur in the Rio Grande do Sul state (Table I). Geographically located in the southernmost tip of the coun-

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<tr>
<th>Species</th>
<th>Status in the state</th>
<th>Remarks</th>
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<td>Movement to Argentina</td>
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<td>Partially migratory (?)</td>
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<tr>
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<td>Unknown movements</td>
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<tr>
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<td>Decreasing</td>
<td>Migratory within the state and other movements</td>
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<td>Anas versicolor</td>
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<td>Resident and unknown movements</td>
</tr>
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<td>Anas discorsa</td>
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<td>Anas platyceala</td>
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<tr>
<td>Netta peposaca</td>
<td>Game species</td>
<td>Migrant to Argentina and resident</td>
</tr>
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<td>Oxyura dominica</td>
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<tr>
<td>Oxyura vittata</td>
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try, it has borders with Uruguay in the South and Argentina in the West and it is situated in the subtropical part of South America. Its Eastern border is the Atlantic Ocean. Roughly, Rio Grande do Sul stretches 1,000 km in both North/South and East/Westly directions, and is almost the same size as Uruguay (Figure 1).

Figure 1: The State of Rio Grande do Sul and the lower Parana river valley. The hatched flight lines represent the aerial Anatidae survey routes for 1992 and 1993. The known migration pathway of some Anatidae links the eastern portion of the state with the lower Parana river valley through the Inland sector.

Figure 1 : L'état de Rio Grande do Sul et la basse vallée du fleuve Parana. Les lignes de vol hachurées sont les voies utilisées pour les comptages aériens des Anatidae en 1992 et 1993. La voie de migration connue de certains Anatidae relie la partie est de l'état à la basse vallée du Paraná en passant par l'« Inland Sector ».

I.1. RIO GRANDE DO SUL’S WETLANDS

The state’s wetlands are located mostly in the seaside lowlands and the central, South and Western regions. The northern region is dominated by mountains and plateaus, where only small temporary marshes are available
for waterfowl. Its wetlands vary from seaside habitats with large freshwater lagoons near the coast to inland riverine habitats. The wetlands have been affected by human activities in all the classical ways, from drainage to industrial pollution. However, human occupation also created wetlands in the southwestern part of the state, in the form of hundreds of small (2 ha maximum) reservoirs for cattle and agricultural uses. Traditionally, wetlands have been drained for cattle and rice cultures, and the highest impact was in the eastern lowlands, where most of the rice fields occur. The state is the first rice producer in Brazil.

Two federal conservation units protect samples of wetlands, Lagoa do Peixe National Park and Taim Ecological Station, which are both considered of international importance (SCOTT and CARBONELL, 1988) and one is a Ramsar site (Lagoa do Peixe National Park). The state government also has state conservation units legally protecting wetlands. As a general rule, the conservation units, both federal or state government managed, still have to resolve basic problems, such as land tenure, personnel, equipment and facilities. For instance, the Taim Ecological Station, near the border with Uruguay, has basic facilities and a strong public awareness. However, due to the lack of land tenure by the federal government in parts of its area, ranchers are legally allowed to keep cattle grazing inside of parts of Taim. The impacts on the natural system, including the wetlands, coming from this use has never been properly evaluated or monitored. In the late 1990s, its wetland also suffered from a drainage project and part of the water regime is still affected by the old channels as well as by the construction of the Pan-American road, linking Brazil to the coast of Uruguay.

Most of the remnant wetlands are in private hands and pressure for drainage remains as important as in the past. Furthermore, the industrial pollution coming from the Porto Alegre area (the state's capital), affects the aquatic ecosystems in a large region. Among many industries, this part of the state has an important petrochemical plant. The industrial output has a direct and indirect effect on the wetlands. Other important sources of water pollution are the slice factories, again in the Porto Alegre area.

Coal mining is important in the state's central region and two large electric plants, burning coal, are located in the state. Only in recent years, efforts are being used and the impact of both coal mining and burning are virtually unknown in terms of effects on the wetland ecosystems.

In terms of water quality and its effects on wildlife, it is poorly known which damage organochlorine products may have caused to waterfowl, either directly or indirectly. The organochlorine pesticides were freely used from the 1950s onwards until the beginning of the 1980s. As the state has a long and important agricultural history in Brazil, most of which was based on intensive use of chemicals, the damage caused to the natural systems can only be guessed due to the lack of comprehensive studies.

The wetlands are directly dependent on the local rainfall. Rain is common year round, although the rainfall is heaviest during the late southern autumn (April-June) and winter (July-September). Temperatures are mild after summertime, resulting in a decrease in evaporation and enabling the water-table to recover from the summer losses. Severe droughts have occurred in recent years, possibly due to the effect of the El Niño atmospheric phenomenon. The last important drought lasted from late 1989 until early 1992.
I.2. THE RIO GRANDE DO SUL WATERFOWL

Besides its richness in Anatidae, the state has another specific characteristic in Brazil, being the only state where sport hunting is legally allowed, with three duck species currently included on the hunting list, all of them with specific bag limits per hunter.

To monitor the game species, as well as other waterfowl in the state, the Centro de Pesquisas para a Conservação de Aves (CEMAVE/IBAMA), the federal government research center linked with birds and their habitats conservation in Brazil, has been working in Rio Grande do Sul almost since its creation in 1977. Activities carried out so far include the development of banding techniques, resulting in up to 15,000 ducks and swans banded by CEMAVE's crews or in cooperation with local organisations, both governmental or non-governmental. Besides the banding, other CEMAVE's activities in the state, linked with waterfowl conservation, include field training and workshops, aerial surveys and the organisation as well as the promotion of the Neotropical Waterfowl Census.

The results of the banding studies have been published or presented in various sources (e.g. ANTAS et al., 1990; NASCIMENTO et al., 1990; ANTAS, 1994). The most important achievements are the confirmation of early studies in Argentina showing movements of Anatidae in the southern part of South America, as well as the finding of migrations and movements from Rio Grande do Sul into Uruguay (especially within the Lagoa Mirim basin) and Argentina (lower part of the Paraná River Valley, namely the Santa Fé Province, and the Córdoba Province wetlands). As a logical follow-up of the banding results, joint training and cooperative banding programmes have been developed with both countries and/or provincial organisations in recent years, namely the correspondent environmental organisations of the Uruguayan government and the Santa Fé Provincial government, in Argentina.

II. MATERIAL AND METHODS

The data used in this paper are based on three main sources: (i) the banding and recovery information, (ii) aerial surveys, and (iii) results of the Neotropical Waterfowl Census.

The Anatidae species in Rio Grande do Sul are captured using three different methods. The whistling duck (Dendrocygna spp), the rosy-billed pochard (Netta pepoeca), the yellow-billed pintail (Anas georgica), some teal (Anas spp.) and the Brazilian teal (Amazonetta brasiliensis) are mostly caught in traps made of wire and covered with nylon fishing nets, baited with a mixture of rice and other seeds not fit for human consumption. The trap itself is the Neutar trap (OLHOG, 1952) modified for Brazilian conditions (SILVA and SCHERER, 1992). Incidentally, few swans are trapped. Mist-nests (mesh 121 mm) are used to band most of the teal and have been used only in specific cases. Both swans (black-necked swan, Cygnus melancoryphus and Coscoroba swan, Coscoroba coscoroba) are generally captured during their wing moult and are chased with a small boat with an outboard
motor and hand nets. Some flightless young are also captured by running after them. Cannon and rocket nets were both tested in Rio Grande do Sul, but their results were not satisfactory, although they are quite effective in other parts of Brazil for duck banding. The wire trap proved to be the first choice for large duck species. Besides being banded with metal bands, roughly 30% of the swans were also neck-banded with individually numbered neck collars. In 1991 and 1992 and part of 1993 the swans received a yellow collar with individual black numbers; the 1994 swans were individually marked with blue, yellow, or yellow and red collars, numbered in black.

The aerial surveys were conducted in early May 1992 (when the 1989-1992 drought finished) and 1993, as well as in September 1992. The aircraft was a Cessna 182 with two observers; one recording their counts and a navigator. The state was divided in two sectors. The “Inland sector” encompassed the central and southern and southwestern wetlands and the “Litoral sector” included the seaside plains with the large lagoons. The “Litoral sector” was covered during every survey; the “Inland sector” was not surveyed in September 1992.

The third data source is the Neotropical Waterbird Census, conducted in Brazil through CEMAVE’s support in collaboration with the International Waterfowl and Wetlands Research Bureau (IWRB), the Wetlands for the Americas (WA) and Ducks Unlimited (DU). Data from this source are collected on a volunteer basis, twice a year, and are published in a specific annual volume (e.g., BLANCO and CANEVARI, 1994). For this paper, data of the yellow-billed pintail were used, modified in an index of birds counted by locality, making comparisons possible among different parts of its range. Data from Brazil included only the Rio Grande do Sul localities (the state is nearly the northern limit of its Atlantic range) and, in any case, just the austral winter (July) was considered.

III. RESULTS AND DISCUSSION

III.1. BANDING STUDIES

One of the main results of the banding studies was the revision and the modification of the migration model of the rosy-billed pochard (ANTAS et al., 1999). The movements of the fulvous whistling-duck (Dendrocygna bicolor) into the Paraná river valley were discovered (NASCIMENTO et al., 1996) and other similar movements for other species have been found (ANTAS, 1994), following an East/West pattern, using the central and South Rio Grande do Sul wetlands as pathway. The yellow-billed pintail, a game species until 1980, was found decreasing during the last decade and had its hunting prohibited. The fulvous whistling-duck bag limit was cut down to half of its past limit in 1985, and is currently ten ducks per hunter per week.

Besides the game species, another major group of interest are the two swan species: the black-necked swan and the Coscoroba swan. The black-necked swan is included in the list of species of special concern under Brazilian legislation. The Coscoroba swan has not been listed, but as the species
faces the same range and conservation problems as the black-necked swan; it has also been studied by CEMAVE. The swan totals are showed in Tables II and III, by species and banding locality.

### TABLE II


**TABLEAU II**

*Sites de baguage et nombre total de cygnes à cou noir, Cygnus melanocoryphus, bagués dans l'état de Río Grande do Sul.*

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<td>4</td>
<td>38</td>
<td>38</td>
<td>71</td>
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<tr>
<td>Rinção</td>
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<tr>
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<td>L. Margueirin</td>
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### TABLE III

Localities and totals of Coscoroba swans, *Coscoroba coscoroba*, banded in Río Grande do Sul.

**TABLEAU III**

*Sites de baguage et nombre total de coscorobas blancs, Coscoroba coscoroba, bagués dans l'état de Río Grande do Sul.*

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<tr>
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<td>4</td>
<td></td>
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</tr>
<tr>
<td>E. Ipiranga</td>
<td></td>
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<tr>
<td>L. da Reserva</td>
<td></td>
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<tr>
<td>L. Margueirin</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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Up to now, 26 swans have been recovered (20 black-necked swans and five Coscoroba swans) from a total of 422 black-necked swans and 360 Coscoroba swans banded. Most of the recoveries came from trapping operations for banding or from observations by banding crews; two were shot by illegal hunters. The band recoveries, sights and re-traps have proved that at least a percentage of the swans show site fidelity from one year to the next. However, part of the population may wander. This was shown by three black-necked swan banded in August 1983 at Taim Ecological Station. They were recaptured together during banding operations in December 1985 at Lagoa da Reserva, Mostardas county, some 200 km north. One Coscoroba swan banded in April 1983 at Taim was shot at São José do Norte, some 150 km north. However, this species has a recovery of a swan shot near Buenos Aires, some 1,500 km from the banding place, indicating a long distance movement. Whether this single record represents an individual movement, a population wandering or a true migration remains to be found.

The available data indicate that the swans may move over distances in order to get a better understanding of the swans, movements which is essential for their proper management and monitoring, a satellite tracking programme is planned to be launched soon, in cooperation with the Japanese government.

III.2. AERIAL SURVEYS

The results of the aerial surveys showed the impacts of the severe drought of 1988-1989 on the waterfowl population and their habitats.

Yellow-billed pintail, Anas georgica, speckled teal, Anas flammea, silver teal, Anas versicolor, and ring teal, Calonetta leucophrys.

The numbers are presented in Figure 2 by species, flight month and sector (Inland or Liitoral). The yellow-billed pintail was unable to seriously increase its numbers after the drought. The Inland totals even decreased on a yearly basis. The other species showed slight increases or a boom, as for speckled teal in the Liitoral sector. The numbers for this species are four times higher than previously in this sector. As the wetlands were recovered by 1993, more habitat was available for the teals and other waterfowl observed. On the other hand, the early 1992 flight covered the wetlands when they were reduced to their smallest area, concentrating the water-dependent birds in few places. With the habitat recovery after one year of normal rains, the waterfowl was scattered over the many naturally recovered wetlands. Such habitat recovery suggests that the increase in numbers for this species was even more astonishing and breeding alone may well not be the only source for the numbers detected. A possible source for extra speckled teals could be either Uruguayan and Argentinian wetlands. Two band recoveries in either country make such linkage possible for this species.

However, the drought also affected most of the inland wetlands from both of these countries, except the coastal areas and the Paraná River valley. Possibly, the Paraná wetlands play an important role as a refuge for waterfowl during the droughts, as their water supply comes from the Paraná river, which is fed by a large area comprising upstream Paraná and the Paraguay rivers.
Figure 2: Distribution of four Anatidae species (yellow-billed pintail, Anas georgica, speckled teal, Anas flavirostris, silver teal, Anas versicolor, and ringed teal, Calonetta leucophrys) in Rio Grande do Sul, based on aerial surveys in May (1992 and 1993) and in September (1993). Data from CEMAVE/IBAMA. Inl. = inland, llt. = littoral.


Including the Pantanal. For the strictly freshwater wetland species this is almost certainly the case. It is also worthwhile to mention the increase in numbers of ringed teal, a species which is considered rare in Rio Grande do Sul (BELTON, 1984). It may have movements to the state wetlands or even an unknown migration. As its numbers are important, it was considered scarce in this paper.

The figures for the silver teal are interesting. This species is considered resident, with some long distance band recoveries (BELTON, 1984; ANTAS, 1994). The Inland sector showed some increase, consistent with local breeding. The Littoral sector, however, is suggesting that some influx came from somewhere else and band recoveries suggest the Paraná river valley wetlands are the most likely source for this surplus, which cannot easily be explained by breeding successes.
The situation of the yellow-billed pintail deserves special consideration. Although some band recoveries occurred elsewhere, as far as coastal Chile (SILVA, 1987), the bulk of the bands were found year round in Rio Grande do Sul, showing a consistent pattern for at least a resident (in the state) population (ANTAS, 1994; NASCIMENTO et al., 1994). The movements so far were restricted to the coastal areas of the state and the wetlands of the northern state mountains. On the other hand, until the late 1980s, the species was on the hunting list. Indications of a decrease came from an analysis of hunting bag numbers from 1988 to 1990, which showed that the hunters' success was consistently decreasing during that period. This decrease is also shown in Figure 3, where data from the Neotropical Waterfowl Census are presented as an index of yellow-billed pintails counted per census locality. In Brazil, only localities in Rio Grande do Sul were considered. In Argentina (where the species occurs in almost every lowland) the numbers are decreasing. In Chile, Uruguay and Brazil (the latter showing numbers which are quite low in comparison with the other countries) the index stays fairly

Figure 3: Index (birds/locality) of yellow-billed pintails, Anas georgica, counted in July (1989-1993) by the Neotropical Waterfowl Census, in Argentina, Uruguay, Chile and Brazil (Rio Grande do Sul).

Figure 3: Indice d’abondance (oiseaux/localité) du canard à queue pointue, Anas georgica, d’après les comptages effectués en juillet (1990-1993) lors des reconnais- sements d’oiseaux d'eau néo-tropicaux (NWC) en Argentine, Uruguay, Chili et Brésil (Rio Grande do Sul).
stable in the time period considered. In all countries, the number of volunteers and localities covered doubled in the same period, although this increased effort had no positive effect on the calculated indexes. Our interpretation is that the species may well be giving signs of problems to maintain its recent population level in Argentina and that the Brazilian population is severely decreased, being currently at its lowest population level. The numbers found in Uruguay are more difficult to understand, as the Uruguayan population has close links with the Brazilian population, as shown by band recoveries (SILVA, 1987; NASCIMENTO et al., 1994). It is clear that, although the evidence is indirect, the yellow-billed pintail is facing problems at the population level in part of its range, at least. The lack of knowledge of many basic biological and ecological aspects of this species prevents a more detailed approach to the possible causes and management measures.


Figure 4 shows the results for the preferred hunting species in Rio Grande do Sul, the rosy-billed pochard and also those for the Brazilian teal. Band recoveries have indicated that the former is a resident species (NASCIMENTO and ANTAS, 1990) and the latter is a migratory pochard with a year-round population in Rio Grande do Sul (ANTAS et al., 1996; ANTAS, 1994). It is clear that the Brazilian teal increased its numbers and, despite the extent of the increase, this is consistent with the population dynamics of this prolific breeder without a clear breeding season in the state (NASCIMENTO and ANTAS, 1990). For the rosy-billed pochard, its numbers

![Diagram](image)

Figure 4: Distribution of two Anatidae species (Brazilian teal, *Amazonetta brasiliensis*, and rosy-billed pochard, *Netta peposaca*) in Rio Grande do Sul, based on aerial surveys in May (1992 and 1993) and in September (1993). Data from CEMAVE/ BAMA.

also increased on a yearly basis in the Littoral sector. As the May flights were scheduled at the onset of migration, when the majority of pochards found are part of the resident population, the increase found at the Littoral sector could be a result of the breeding success of this population or of Rosy-billed pochards coming earlier than expected to the state from Argentina. The September flight, on the other hand, was before or during the migratory movement back to Argentina, as shown by the values found.

White-faced whistling-duck, *Dendrocygna viduata*, and fulvous whistling-duck, *Dendrocygna bicolor*.

The results of aerial surveys for the two hunted whistling ducks, white-faced whistling-duck (*Dendrocygna viduata*) and the fulvous whistling-duck (*Dendrocygna bicolor*), are in Figure 5. Based on band recoveries, it is clear that the lower Paraná river valley in Argentina, is the most important breeding ground for the population of fulvous whistling-ducks using the Rio Grande do Sul during the austral winter (NASCIMENTO et al., 1990). This whistling duck moves back and forth to Argentina following the same flyway as the Rosy-billed pochard, through the wetlands of central and southern Rio Grande do Sul. However, it is not a true migration, according to the available data, as the band recoveries do not show a seasonal pattern.

On the other hand, the band recoveries have shown that the white-faced whistling-duck is primarily a resident species or it moves in the same pattern as the yellow-billed pintail, within the Littoral sector. However, a few recoveries...

![Figure 5: Distribution of two Anatidae species (fulvous whistling-duck, *Dendrocygna bicolor*, and white-faced whistling-duck, *Dendrocygna viduata*) in Rio Grande do Sul, based on aerial surveys in May (1992 and 1993) and in September (1993). Data from CEMAVE/IBAMA.](image-url)

*Figure 5: Distribution (nombre d'oiseaux, en milliers) de deux espèces d'Anatidae (*Dendrocygna bicolor*, et *Dendrocygna viduata*) dans l'état de Rio Grande do Sul, d'après les comptages aériens effectuées en mai (1992 et 1993) et en septembre (1993). Données de CEMAVE/IBAMA. Inland = intérieur des terres, littoral = littoral.*
eries show that this whistling duck also moves into the Paraná river valley wetlands, in Argentina. The species is the most banded duck by the Companhia Energética de São Paulo (CESP) and the Parque Zoológico de São Paulo, in the São Paulo state (some 2,000 km north). In the zoo, only wild ducks have been banded. Both programmes have been banding up to 12,000 white-faced whistling-ducks and, so far, there is no evidence of movements back and forth among both marked populations.

Looking at the results of the aerial surveys (Figure 5), it is clear that the white-faced whistling-duck did increase its numbers in both sectors. The increase in the Inland sector may well reflect the results of the breeding success of the local population. However, the increase found in the coastal areas cannot easily be explained by breeding only. Furthermore, the increase found in September is noticeable, not only regarding the number itself but also because it is known that this whistling duck only breeds during the austral summer. From this point of view, the increase in numbers should reflect the influx of ducks from other parts of the range and again the Paraná river valley could be the most likely source.

The increase in white-faced whistling-duck numbers is completely different from that in tawny whistling-ducks. Although a slight increase is found in the fulvous whistling-duck, this is far less than in the other whistling ducks or other species. This is even more astonishing when we take into account that the important breeding grounds in the Paraná river valley were less affected by the drought, a fact that is reinforced by the results for the rosy-billed pochard, which is the other species known to heavily use the same area for breeding. The lack of data on breeding success or other basic aspects of the biology and ecology of both whistling duck species again prevent us to better understand these results. In any case, it is clear that the explanation is different for this two species.

*Black-bellied whistling-duck, Dendrocygna autumnalis, and white-cheeked pintail, Anas bahamensis.*

Two other ducks were also detected during the flights, but both species are poorly known in the state (see Figure 6). Firstly, the third whistling duck in Rio Grande do Sul, the black-bellied whistling-duck, *Dendrocygna autumnalis*, was tentatively listed for the state in 1984, based on a hunter report (BELTON, 1984). The species occurs in the central part of Brazil and in the Amazon Basin. Only as recently as in 1984, it colonised the major river basins in São Paulo state (P.T.Z. ANTAS, personal observation). The aerial survey in Rio Grande do Sul was able to show its presence in the state in both sectors, although in very low numbers. A black-bellied whistling-duck was previously (1990) banded in the southern part of coastal Rio Grande do Sul.

For the other duck in Figure 6, the white-cheeked pintail, *Anas bahamensis*, even less is known. It has been found in the state for a long time (1899), but always at a few locations only and only a few individuals (BELTON, 1984). The aerial surveys show that it occurred in low numbers in both sectors in 1992. However, in 1993, no white-cheeked pintails were seen in the coastal areas and a high number (at least, relatively spoken, for this species) showed up in the Inland sector.
the black-necked swan population between flights, which could well be linked to breeding success. The Littoral numbers, however, deserve special attention. The breeding season for both species is scheduled from the mid-ustral winter (July) until March (late nesters). On the other hand, it is believed that they move, at least during drought years. They are found concentrated on the remaining waters, especially on the large coastal lagoons. As the first flight took place before the watertable was recovered from the drought, fewer wetlands with open water were available for the swans in May 1992 than in May 1993. However, both species increased their numbers far above a recovery expected, when only based on the local breeding population. In addition, as is the case for other swans, both species may not be very prolific in the short period between the aerial surveys. Therefore, both species must have an input from other populations elsewhere. The Argentinian population is again the likely source for young swans, in this case both the coastal area and the Parana river valley could be the origin. Another possibility is that the adult swans moved to Argentina and Uruguay at the onset of the drought, and came back to Rio Grande do Sul after the end of the drought. However, Uruguayan wetlands were as severely affected by the drought as Rio Grande do Sul's wetlands, making Argentina again the most likely source.

IV. CONCLUSION

The results of the aerial surveys show the importance of the coastal wetlands to maintain the Anatidae population in the Rio Grande do Sul state. However, the lack of protection in the central state wetlands and the current evolution of land use, draw attention to the need of conservation of the known migratory pathways, including the strict protection of some of the remaining wetlands in the inland sector. The aerial surveys were also able to show the recent range increase of the black-bellied whistling-duck. It is also important to note that the wetland situation of the lower rio Parana river in Argentina is of great concern to some of the Anatidae using the Rio Grande do Sul wetlands on a seasonal or nomadic basis.

Basic biological and ecological studies are still needed for the Anatidae species in the southern part of the continent. Banding must take place in different parts of the species' range, preferably in a coordinated way.

Figure 7: Distribution of two Anatidae species (black-necked swan, Cygnus melanocoryphus, and Cossoroba swan, Cossoroba coccoroba) in Rio Grande do Sul, based on aerial surveys in May (1992 and 1993) and in September (1993). Data from CEMAVE/IBAMA.

Figure 7 : Distribution (nombre d'oiseaux, en millions) de deux espèces d'Anatidae (cygne à cou noir, Cygnus melanocoryphus, et cossoroba blanc, Cossoroba coccoroba) dans l'état de Rio Grande do Sul, d'après les comptages aériens effectués en mai (1992 et 1993) et en septembre (1993). Données de CEMAVE/IBAMA. Inland = intérieur des terres, littoral = littoral.
An international cooperative work has been proposed through CEMAVE since 1988, although not yet completely funded. With the implementation of Mercosul, a commercial treaty among the Paraná river valley countries, there is hope that the environmental aspects of the region could be tackled in a cooperative way.

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SUIVI DES POPULATIONS D'ANATIDAE DANS L'ÉTAT
DE RIO GRANDE DO SUL, SUD DU BRÉSIL.

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MOTS-CLÉS : Anatidae, cygne de l'Amérique du Sud, Coscoroba sp., Cygnus
sp., migration, bagage d'anatidés, comptage aérien, zone humide, conservation, basse vallée du Paraná, État de Rio Grande do Sul, Brésil.

RÉSUMÉ

L'État de Rio Grande do Sul, situé dans la partie sub-tropicale du Brésil, accumule le plus grand nombre d'espèces d'Anatidae du pays. 24. À Rio Brésil, cet État est unique, car c'est le seul à avoir une saison de chasse depuis six ans. Trois espèces de canards sont actuellement sur la liste des espèces chassables de l'État. Deux espèces, considérées comme menacées au niveau fédéral, dépendent de la présence de zones humides dans l'État. Depuis 1977, le suivi des Anatidae présents sur ces zones est devenu la priorité absolue du CENAVE/IBAMA, qui a basé 15 000 canards en 1962 et 1963. Des comptages aériens ont été effectués, qui ont permis de couvrir les zones humides de l'État situées à l'intérieur des terres et le long du littoral. Les résultats des études de bagage et de dénombrement ont, dans certains cas, permis de modifier le nombre autorisé de pièces à tirer et de limiter la chasse pour deux espèces de canards. Les données recueillies ont également révélé des migrations nouvelles ou des déplacements depuis la vallée du Paraná. En Argentine et dans le Brésil, vers l'Uruguay. Quatre aux deux espèces de cygnes, protégées par la loi au Brésil, les recensements ont montré que le coscoroba blanc, Coscoroba coscoroba, effectuait quelques déplacements sur de longues distances, alors que le cygne à cou noir, Cygnus melanocoryphus, se déplaçait sur des distances assez courtes. Les comptages aériens et l'analyse des données collectées lors des recensements d'oiseaux d'eau n'étaient pas (NWC) ont montré que la population de canards à queue pointue, Anas gracilis, pourrait être menacée d'extinction. Les données obtenues par un suivi à long terme ont permis de constater une expansion de l'aire de distribution de l'ensemble des espèces de dindons, Anas plancus, à la suite de l'intensification de la chasse à l'Anatidae au cours des dernières années. En général, certaines espèces d'Anatidae dépendent de l'État des zones humides pour leur survie. Les nettes dérives. Nota: pepper, migrent chaque année vers la basse vallée du Paraná pour s'y reproduire (bien qu'une petite population se reproduise au Brésil). Un troisième groupe migre vers l'Uruguay pendant la saison de reproduction, mais les données recueillies n'ont pas permis de démontrer l'existence d'un voyage migratoire saisonnier dans ce pays. La vallée du Paraná est un site de protection, où l'on utilise les zones humides de la partie centrale du Rio Grande do Sul comme voie de passage. Pour conserver les Anatidae dans le Rio Grande do Sul, deux stratégies différentes doivent être appliquées. La première consiste à protéger d'urgence les zones humides situées dans la partie centrale de l'État, qui ont été gravement dégradées par les activités humaines. La seconde est la nécessité d'adapter une approche internationale pour sauvegarder les zones humides du Paraná, étant donné que les populations d'Anatidae sont partagées entre le Brésil, l'Argentine, l'Uruguay et le Paraguay. Le Mercosur, créé récemment, est un accord économique international entre ces pays, qui pourrait devenir la pierre angulaire d'une politique commune de conservation.
MONITORING DER ANATIDAE-Populationen im Bundesstaat Rio Grande do Sul, Südbrasilien

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SCHLÜSSELVÖRTER: Südamerikanische Schwäne, Anatidae, Migration, Wasservogelbekämpfung, Luftzählung, Feuchtzone, Konservierung, Tal des unteren Paraná, Bundesstaat Rio Grande do Sul, Brasilien.

ZUSAMMENFASSUNG