



Imminent extinction of the guanay cormorant on the Atlantic South American coast: a conservation concern?

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Abstract. Guanay cormorants *Phalacrocorax bougainvillii* are distributed mostly on the Pacific coast of Peru and northern Chile. A small population of around 50 pairs was described on the Patagonian Atlantic coast in the late 1960s. Further records have revealed a progressive decrease of this population. During 1999 we looked for guanay cormorants at those Atlantic colonies where the species was recorded in the past. Only four individuals were detected in one colony (Punta Lobería), and all of them were mated with king cormorants *P. albiventer*. In addition, we recorded hybrids between guanay and king cormorants mated with pure king and imperial cormorants *P. atriceps*. Causes of the population decline are unknown. Since guanay cormorants inhabiting the Atlantic coast could be a genetically differentiated population, we emphasize the need for molecular studies. If genetic polymorphism is detected, the capture of remnant individuals in order to constitute a genetic stock should be considered.

The guanay cormorant (*Phalacrocorax bougainvillii*) shows a disjunct distribution in South America (Figure 1). The main nucleus is located on the coast of Central Peru, where this species is one of the most abundant seabirds (Duffy 1983), reaching the northern coast of Chile (Orta 1992). Another breeding population exists on the Atlantic coast of Argentinean Patagonia (Chubut Province). This population is 3000 km away along the shortest coastline from the Pacific populations (Erize 1972). The Atlantic population has always been very small (Yorio et al. 1999; Malacalza and Bertellotti 2001). The first record of the species in Argentina was made during the late 1960s, when around 50 pairs were detected breeding among king cormorants (*P. albiventer*) in Punta Tombo (Navas 1970; Erize 1972). Guanay cormorants were still breeding at this locality throughout the 1970s (Yorio et al. 1999), the last published record being in 1981 (33 pairs; Malacalza 1984). In 1982, seven pairs were located at Punta Lobería (60 km south of Punta Tombo) (Malacalza 1984). In 1992 only eight individuals were detected in this area, and some of them were paired with king cormorants (Malacalza and Bertellotti 2001). At Punta León (150 km

north of Punta Tombo), Malacalza (1984) found three and nine guanay cormorants in 1980 and 1982, respectively, and reported the existence of hybrid individuals between guanay and king cormorants and also mating between hybrids (Malacalza 1991). In the global census of Patagonian seabirds carried out in 1994, only three and six pairs were found at Punta León and Punta Lobería, respectively (Yorio et al. 1998). At Punta Tombo, the remaining known colony, no guanay cormorants were present in 1994. At Punta León, guanay cormorants bred in the middle of the mixed king and imperial (*P. atriceps*) cormorant colony, whereas in Punta Lobería they bred only among king cormorants.

Here, we present information recorded in 1999 about the presence of guanay cormorants on the Atlantic coast of South America. Our investigation documents the imminent extinction of the species and extensive hybridisation with congeneric species.

The Chubut Province has a large and diverse coastline of about 1000 km, offering

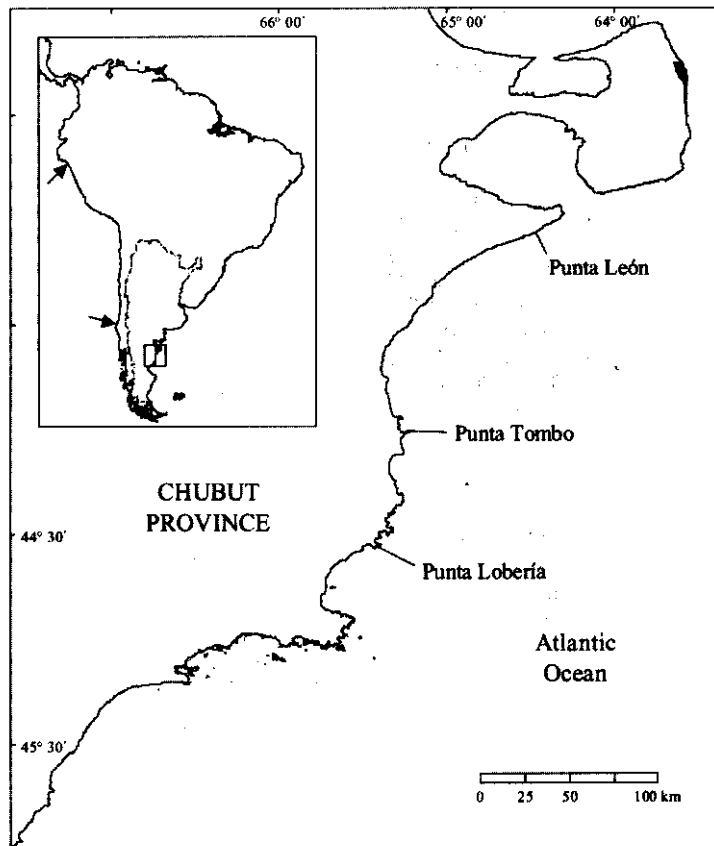


Figure 1. Distribution of guanay cormorants on the Pacific coast (between arrows) and position of the studied colonies on the Atlantic coast of Argentina, where the species has bred during the last 40 years.

many suitable breeding sites for cormorants. A total of 20 000 pairs of imperial and king cormorants, grouped in 26 colonies, breeds along this coast (Yorio et al. 1998). Punta León is the northernmost breeding colony of the species on the Atlantic Patagonian coast. During December 1999, we surveyed cormorants in the three localities where the guanay cormorant has bred during the last 40 years (Figure 1). Additionally, we also visited nearby colonies where dispersal of guanay cormorants could have occurred. We visited these colonies during the egg or chick stage and we determined the specific composition of each breeding pair and recorded nest contents. We paid special attention to looking for birds with intermediate characteristics between guanay and king or imperial cormorants. Following Malacalza (1991), we classified an individual as a hybrid if it presented mixed morphological features between guanay and king or imperial cormorants, especially attending to the patterns of the neck plumage and the presence and colour of bare skin, crest and caruncles.

In 1999 we only detected four guanay cormorants at Punta Lobería. They bred at the centre of a mixed colony of about 600 pairs of king cormorants. These individuals presented the typical plumage pattern of the species. Two of these birds were mated with king cormorants and the other two with hybrids between guanay and king cormorants. Nests from these four individuals were active, with abundant nesting materials and eggs. At Punta León, where about 3000 pairs of king and imperial cormorants bred, no pure guanay cormorant was observed in 1999. We only recorded five individuals showing hybrid characteristics; four of them were paired with king cormorants and another one was mated with an imperial cormorant. Their nests contained chicks in different stages of growth. No pure guanay cormorant or hybrid was detected at Punta Tombo, where about 300 pairs of king cormorant were breeding during our survey.

Our data reveal that the Atlantic population of the guanay cormorant is close to extinction. Only four individuals showing typical pure morphological features were present, whereas hybridisation with congeneric species seems common. The causes of this rarefaction process remain unknown. It cannot be discounted that human-induced alterations have influenced population decreases, since the Punta Tombo and Punta Lobería colonies were the target of guano exploitation during past decades (Malacalza 1984; Punta 1996). The small population of Atlantic guanay cormorants could also have been driven to extinction by environmental (including climate catastrophes), genetic and/or demographic stochasticity, as it is expected to affect populations below a threshold size (Frankham 1995, 1996; Hanski 1999). In this sense, Malacalza (1984) reported the almost total abandonment of the cormorant colony at Punta Tombo, possibly as a consequence of a spring storm. Finally, hybridisation may contribute to the extinction of guanay cormorants. These processes are the common result of an extreme rarefaction of species in areas where closely related taxa are abundant (Grant and Grant 1992). In this sense, it is interesting to note that the hybrids resulting from mating between guanay and king cormorants are fertile (see also Malacalza 1991). Hybridisation could be favoured if few or no conspecific mates are available (Grant and Grant 1997; Nuechterlein and Buitron 1998).

It is unknown how guanay cormorant colonies appeared on the Atlantic coast of Patagonia. It has been postulated that they could have been founded by recently arrived immigrants from the Pacific populations (Navas 1970; Johnsgard 1993). During their southerly migration along the Chilean coast guanay cormorants occasionally reach the Magellanic Province, at the extreme south of South America, when food supply fails due to the occurrence of the El Niño current, as took place in 1950 and 1972 (Orta 1992). Guanay cormorant colonies could then have decreased to the current level, since no older records exist of the species in the Atlantic, including at colonies where the species has been subsequently recorded later (Durnford 1878; Olrog 1959). Another hypothesis is the isolation of Atlantic and Pacific populations during the last glaciation (see Devillers and Terschuren 1978). The first ornithologists visiting the Patagonian coast could have overlooked small colonies of these species, like those of Punta Lobería and Punta León.

From a conservation point of view, if the Atlantic South American population of guanay cormorants has remained isolated for many generations it could constitute an evolutionarily significant unit (Moritz 1994; Sangster 2000), and its conservation may be important due to the founder effect, as expressed in the model of the quantum speciation through processes of genetic divergence (Mayr 1963). Even if this population is the result of a recent colonisation, and if it is not genetically different from pacific population, conservation efforts should be directed to protect and enhance the viability of these isolated individuals. We recommend the urgent study of the genetic identity of the Atlantic guanay cormorants in relation to the Pacific populations and, if genetic differentiation is detected, we recommend also the capture of the few remnant pure individuals in order to constitute a captive stock with possibilities of maintaining genetic diversity.

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