

Status and conservation of Magellanic Penguins *Spheniscus magellanicus* in Patagonia, Argentina

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Summary

There are 36 breeding colonies of Magellanic Penguins *Spheniscus magellanicus* along the coast of mainland Argentina. During the breeding period we counted the number of active nests and estimated the breeding population was approximately 652,000 pairs. Development of coastal areas is diminishing the quality of Magellanic Penguin breeding habitat and reducing penguin reproductive success. Adult mortality rates are increasing because of human activities. Maritime petroleum traffic and petroleum operations are known to cause mortality. Fishing activities cause incidental mortality and may negatively affect penguin foraging and reproductive success. In some areas, offal is increasing gull populations with a corresponding increase in predation on penguin eggs and chicks, thereby lowering reproductive success. These sources of mortality are relatively recent and are human caused. We found three areas where human activities are of particular concern: Península Valdés, Golfo San Jorge and Estrecho de Magallanes. Human impacts on Magellanic Penguin populations could be reduced, benefiting the tourist industry where yearly tens of thousands of people come to the provinces of Chubut and Santa Cruz to visit penguin colonies.

Existen 36 colonias de pingüino de Magallanes *Spheniscus magellanicus* a lo largo de la costa Argentina. La población reproductiva se estimó en 652,000 parejas realizando un conteo de nidos activos durante la estación reproductiva. El desarrollo de las áreas costeras está reduciendo la calidad del hábitat de reproducción y el éxito reproductivo del pingüino de Magallanes. El tráfico de petróleo y las actividades relacionadas son conocidas causas de mortalidad. Las actividades pesqueras están causando mortalidad incidental y pueden estar afectando negativamente el éxito de alimentación y reproductivo. En algunas áreas la basura está contribuyendo al aumento de la población de gaviotas, incrementándose la predación sobre huevos y pichones de pingüino reduciendo su éxito reproductivo. Estas fuentes de mortalidad son relativamente recientes y provocadas por el hombre. Hemos detectado tres áreas donde la mortalidad relacionada con actividades humanas es preocupante: Península Valdés, Golfo San Jorge y Estrecho de Magallanes. El impacto humano sobre la población de pingüino de Magallanes podría reducirse y beneficiar la industria turística de las provincias de Chubut y Santa Cruz, donde anualmente decenas de miles de personas visitan las colonias reproductivas del pingüino.

Introduction

Magellanic Penguins *Spheniscus magellanicus* breed along the Chilean and Argentine coastlines of South America. In Argentina the breeding range extends

from Península Valdés 42°04'S, 63°21'W to Isla Martillo in the Beagle Channel 54°54'S, 67°23'W. Magellanic Penguins also breed on offshore islands, such as Isla de los Estados (Staten Island) 54°50'S 64°30'W and Islas Malvinas (Falkland Islands) (Scolaro *et al.* 1980). Historical data are crude and abundance figures are often nothing more than educated guesses. Estimates of Magellanic Penguin numbers in Argentina vary from 8–10 million birds to 4.3 million birds (Boswall and MacIver 1975, Scolaro 1986). Croxall *et al.* (1984) estimated 200,000 Magellanic Penguins breeding in Islas Malvinas (Falkland Islands).

The development in Argentina of (1) coastal areas in Patagonia, (2) fisheries and (3) petroleum and its transport, represent human-induced sources of mortality to the population. Development of coast areas decreases breeding areas and leads to reduced reproductive success. Increased fishing activities causes direct mortality of birds caught in nets and may reduce their foraging success (Boersma *et al.* 1990). Maritime petroleum traffic and the operations of offshore platforms are known to cause high mortality each year (Gandini *et al.* 1994). These human-induced mortality factors may have negative impacts on penguin numbers that could have economic impacts on tourism, particularly in the province of Chubut where many people come to see large numbers of breeding penguins.

Methods

From 1982 to 1994 we visited colonies during incubation to estimate the numbers of reproductive adults.

At small or very heterogeneous colonies all active nests were counted. At large colonies the breeding area was divided into transects every 30 m and we made a direct count on 100 m² circular plots through the colony (see Boersma 1988). The limit of each transect is taken as a point of zero density and the total perimeter of the colony is obtained by joining the limit points of all transects. Large colonies were mapped to calculate the breeding area. A nest during incubation was considered active when it had an adult with an egg. We used either the literature to estimate the size of the colonies that we were unable to visit or information provided by others.

Magellanic Penguins arrive on the Patagonian coast in late August or early September. They lay two eggs in early October and incubate them until they hatch in November. Both sexes incubate the eggs and feed chicks until they fledge at the end of January or early February (Boersma *et al.* 1990, Frere 1993).

Results: distribution, abundance and status

There are 36 penguin colonies in three provinces of Argentina. Chubut has 13 colonies, Santa Cruz 22 and Tierra del Fuego has one (Figure 1). We surveyed 28 of the 36 colonies. Isla de los Estados, not considered in this study, has at least three colonies (A. Schiavini and E. Frere unpubl. data).

The breeding population of Magellanic Penguins in mainland Argentina is approximately 652,000 (652,484 pairs for the 36 colonies, Table 1). Nearly 60% of the population is found in the north (Chubut province) and 40% is found in the south (Santa Cruz and Tierra del Fuego provinces). Colony size varies from

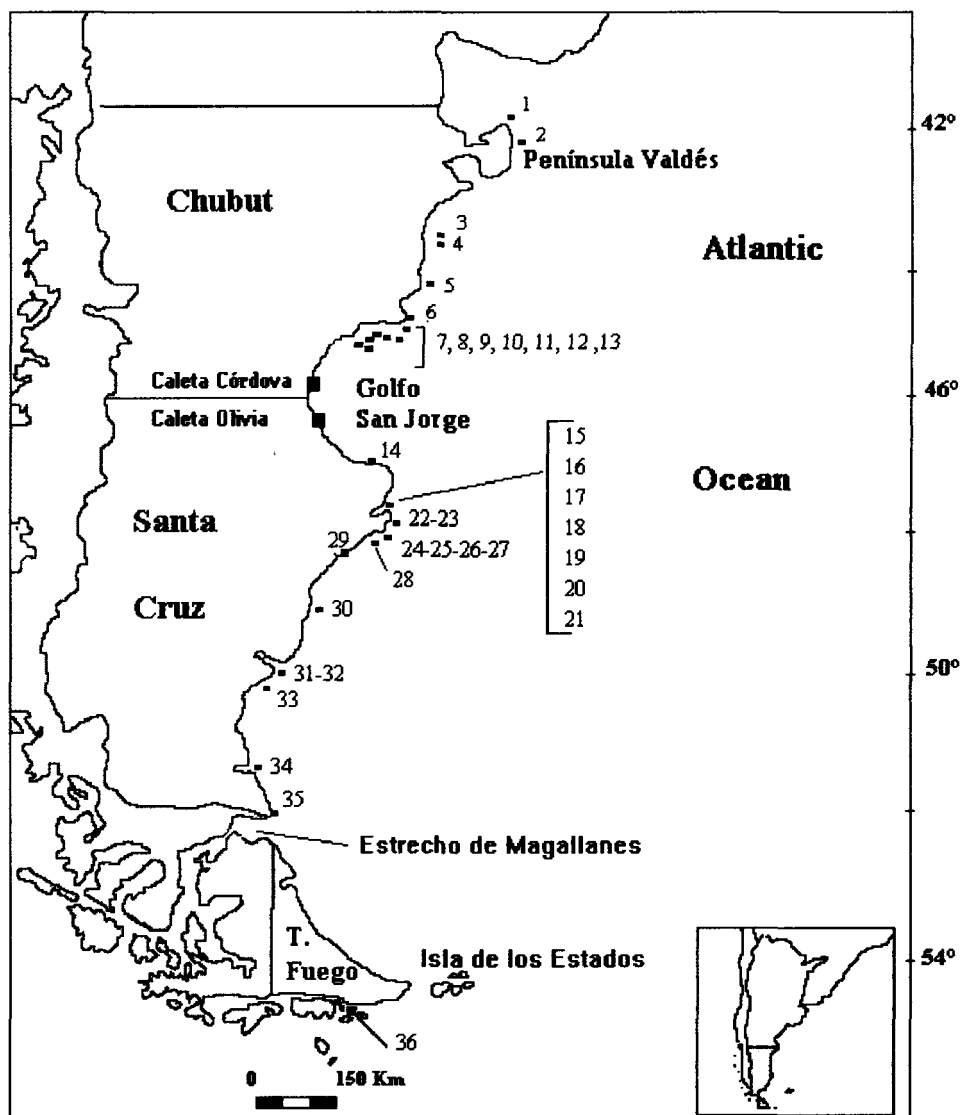


Figure 1. Locality of Magellanic Penguin colonies along the Patagonian Coast of Argentina. 1, Estancia San Lorenzo; 2, Caleta Valdés; 3, Punta Clara; 4, Punta Tombo; 5, Punta Roja; 6, Cabo dos Bahías. *Chubut Islands*: 7, Isla Arce; 8, Isla Leones; 9, Isla Blanca; 10, Isla Tova; 11, Isla Tovita; 12, Isla Viana; 13, Isla Quintano. 14, Punta Pájaros; 15, Isla Quiroga; 16, Isla Chaffers; 17, Isla de los Pájaros; 18, Isla Larga; 19, Islote Burlotti; 20, Cañadón del Puerto; 21, Isla del Rey; 22, Isla Pingüino; 23, Isla Chata; 24, Punta Buque; 25, Isla Liebres; 26, Isla Burgos; 27, Isla Schwarz; 28, Estancia 8 de Julio; 29, Bahía Laura; 30, San Julián; 31, Punta Entrada; 32, Isla Leones; 33, Monte León; 34, Isla Deseada; 35, Cabo Vírgenes; 36, Isla Martillo.

Table 1. Locality, status and number of reproductive pairs of Magellanic Penguins *Spheniscus magellanicus* on the mainland Argentine coast.

| | Locality | Latitude and longitude | Status | Number of pairs (min.; max.) and (sample method) | Breeding area in ha, (max number plots of 100 m ²) | Year of the count or data source |
|----------------------------|----------------------|------------------------|--------|--|--|------------------------------------|
| <i>Chubut Province</i> | | | | | | |
| 1. | Estancia San Lorenzo | 42°04'S 63°21'W | R | 7,000; 17,000(1)(2) | — | 1982, Carribero <i>et al.</i> 1995 |
| 2. | Caleta Valdés | 42°28'S 63°21'W | R | 3,000; 26,300 (1)(2) | — | 1982, Carribero <i>et al.</i> 1995 |
| 3. | Punta Clara | 43°58'S 65°16'W | P | 70,000 (2) | — | Boersma <i>et al.</i> 1990 |
| 4. | Punta Tombo | 44°02'S 65°11'W | R | 225,000 (2) | — | Boersma <i>et al.</i> 1990 |
| 5. | Punta Roja | 44°35'S 65°22'W | P | 15,000 (1) | — | 1987 |
| 6. | Cabo Dos Bahías | 44°54'S 65°32'W | R | 12,000 (2) | 18.27 (78) | Capurro <i>et al.</i> 1988 |
| <i>Chubut Islands</i> | | | | | | |
| 7. | Isla Arce | 45°00'S 65°29'W | G | — | — | — |
| 8. | Isla Leones | 45°03'S 65°37'W | G | — | — | — |
| 9. | Isla Blanca | 45°03'S 65°58'W | G | — | — | — |
| 10. | Isla Tova | 45°06'S 66°00'W | G | — | — | — |
| 11. | Isla Tovita | 45°07'S 65°57'W | G | — | — | — |
| 12. | Isla Viana | 45°07'S 66°12'W | G | — | — | — |
| 13. | Isla Quintano | 45°15'S 66°42'W | G | — | — | — |
| | Sub total 7-13 | | | 20,000 | — | G. L. Punta pers. comm. |
| | Total Chubut | | | 385,300 | — | |
| <i>Santa Cruz Province</i> | | | | | | |
| 14. | Punta Pájaros | 46°57'S 66°50'W | P | 300 (1) | — | 1994 |
| 15. | Isla Quiroga | 47°45'S 65°56'W | R | 665; 760 (1) | — | 1990, 1993 |
| 16. | Isla Chaffers | 47°46'S 65°52'W | R | 8,950; 13,700 (2) | 8.3 (358) | 1987, 1993 |
| 17. | Isla de los Pájaros | 47°45'S 65°58'W | R | 8,525; 8,650 (2) | 2.5 (10) | 1987, 1993 |

| | | | | | |
|----------------------------------|-----------------|---|--------------------|------------|--------------------------|
| 18. Isla Larga | 47°45'S 65°56'W | R | 50 (1) | — | 1994 |
| 19. Isote Burlotti | 47°46'S 65°57'W | R | 225 (1) | — | 1992 |
| 20. Cañadón del Puerto | 47°45'S 66°00'W | R | 580 (1) | — | 1992 |
| 21. Isla del Rey | 47°46'S 66°03'W | R | 1,100 (1) | — | 1993 |
| 22. Isla Pingüino | 47°53'S 65°49'W | R | 15,000 (1) | — | 1988 |
| 23. Isla Chata | 47°53'S 65°50'W | R | 120 (1) | — | 1994 |
| 24. Punta Buque | 48°06'S 65°55'W | P | 14,000; 22,000 (2) | 34.5 (118) | 1987, 1994 |
| 25. Isla Liebres | 48°06'S 65°54'W | G | 170 (1) | — | 1994 |
| 26. Isla Burgos | 48°05'S 65°54'W | G | 800 (1) | — | 1994 |
| 27. Isla Schwarz | 48°04'S 65°54'W | G | 11,000 (2) | — | 1994 |
| 28. Estancia 8 de Julio | 48°07'S 66°08'W | P | 2,150; 4,000 (2) | 8.5 (20) | 1987, 1993 |
| 29. Bahía Laura | 48°21'S 66°21'W | R | 5,150; 7,000 (1) | — | 1987, 1994 |
| 30. San Julián | 49°16'S 67°40'W | R | 37,150 (2) | 98.0 (62) | 1993 |
| 31. Isla Leones | 50°04'S 68°27'W | R | 18,600 (2) | 26 (93) | 1994 |
| 32. Punta Entrada | 50°08'S 68°22'W | P | 10,000 (1) | — | 1987 |
| 33. Monte León | 50°17'S 68°51'W | P | 21,110 (2) | 25.0 (30) | 1988 |
| 34. Isla Deseada | 51°35'S 69°02'W | G | 5150 (2) | 5.5 (10) | 1987 |
| 35. Cabo Vírgenes | 52°20'S 68°21'W | R | 82,600; 89,200 (2) | 47.2 (30) | 1989, 1992 |
| Total Santa Cruz | | | 266,665 | | |
| <i>Tierra del Fuego Province</i> | | | | | |
| 36. Isla Martillo | 54°54'S 67°23'W | P | 519 (1) | — | Schiavini and Yorio 1995 |
| Total Argentine | | | 652,484 | | |

R, Provincial Government Natural Reserve; G, Government land without protection; P, Privately owned. Method used in population estimate: (1) direct count; (2) plots.

less than 200 to more than 200,000 breeding pairs. The biggest colonies at Punta Tombo and Cabo Virgenes are in Provincial Government Natural Reserves (Table 1).

Colony location appears to be reasonably stable. Six of the mainland colonies in Chubut, reported by Scolaro *et al.* (1980) are still present at the same sites (Figure 1). In Chubut province, two colonies are on private property and four are in Provincial Government Natural Reserves (Table 1). Penguins also breed on islands along the Chubut coast (Isla Arce, Isla Leones, Isla Blanca, Isla Tova, Isla Tovita, Isla Viana and Isla Quintano) (Herrero 1970, Scolaro *et al.* 1980, Punta 1989).

In Santa Cruz and Tierra del Fuego provinces, in the southern part of Patagonia, there are 23 penguin colonies. Eight colonies have not previously been reported in the literature (Punta Pájaros, Isla Larga, Islote Burlotti, Cañadón del Puerto, Isla Chata, Isla Liebres, Isla Burgos, Isla Schwarz). These colonies are small and according to local people have been present for more than 20 years.

Approximately 266,000 Magellanic Penguin pairs breed in the provinces of Santa Cruz and Tierra del Fuego. The largest colony is at Cabo Virgenes which has over 89,000 pairs and nearly 35% of the reproductive pairs in the southern part of the breeding range (Table 1). Although at Santa Cruz and Tierra del Fuego Provinces, 13 colonies are protected as Provincial Government Natural Reserves, only one, Cabo Virgenes has a warden, offering protection and six colonies are privately owned.

Discussion

Population trends

Magellanic Penguins are found in colonies scattered along the coast of Patagonia. Little information exists on the size of colonies over time (Capurro *et al.* 1988, Boersma *et al.* 1990, Frere 1993). What little information there is suggests no clear trends for the entire population. The colony at Caleta Valdés was apparently new in the early 1960s when two pairs were found and it continued to grow through the 1970s and 1980s (Perkins 1984, Carribero *et al.* 1995, P. D. Boersma unpubl. data). In contrast, Punta Tombo has declined in numbers since 1987 (P. D. Boersma unpubl. data) and Cabo Virgenes has been stable for at least the last seven years (Frere 1993).

Potential threats to penguins

Oil pollution Oil pollution is increasing mortality of Magellanic Penguins in Argentina and appears to be the most common cause of death of adults (Gandini *et al.* 1994).

There have been no major oil spills reported along the Argentine coast since major oil transport began in the 1930s; however, chronic pollution has been documented since the 1970s (Jehl 1975, Jenkins 1978, Perkins 1983, Boersma 1987, Knaus 1990, Gandini *et al.* 1994). Chronic oil pollution is estimated to kill more than 40,000 penguins each year (Gandini *et al.* 1994). In addition, small

oil spills along the coast are known to kill large numbers of birds. One spill in September 1991 affected the Chubut coast and caused an estimated loss of 17,000 penguins just prior to the breeding season (Anonymous 1991).

Petroleum can also have indirect effects on the population. At Cabo Vírgenes offshore platforms were built which resulted in the destruction of approximately 2% of the breeding area (E. Frere and P. Gandini, unpubl. data).

Commercial fisheries During the last 10 years commercial fisheries in Argentina, especially in Chubut, Santa Cruz and Tierra del Fuego, have increased rapidly (Csirke 1987, Anonymous 1994).

Incidental takes in fishing nets cause about 10% mortality (Boersma *et al.* 1990). Mortality from nets appears to be an important problem since most captains at Puerto Deseado said they had incidentally killed penguins during their fishing (E. Frere and P. Gandini unpubl. data). Fishing also appears to kill birds away from the breeding grounds. Two out of 10 birds reported dead along the Atlantic coast and banded at Cabo Vírgenes were captured in squid nets by Brazilian coastal fisherman (Frere 1993).

Many of the fish that Magellanic Penguins feed upon are commercially valuable species. Magellanic Penguins feed upon sardine *Sprattus fuegensis*, anchovy *Engraulis anchoita*, hake *Merluccius hubbsi*, silverside *Austroatherina* sp. and squid *Illex* sp. and *Loligo* sp. (Gosztonyi 1984, Scolaro and Badano 1986, Frere 1993, Frere *et al.* in press). These commercial fisheries are more important in the northern part of the penguin's breeding range.

Coastal development and human disturbance One of the most important predators on Magellanic Penguins is the Kelp Gull *Larus dominicanus* (Frere *et al.* 1992, Yorio and Boersma 1994). The growth in the gull populations near cities is probably due to the increase in offal associated with fish companies. Frere and Gandini (1991) reported that in the Puerto Deseado area (Figure 1), Kelp Gull numbers have been increasing for the past seven years. Predation rates on penguin eggs is higher at Puerto Deseado than at Cabo Vírgenes (Frere 1993) and at Punta Tombo (Yorio and Boersma 1994). Also Kelp Gulls are increasing in Chubut Province (Pagnoni *et al.* 1993, Yorio *et al.* in press).

Human disturbance can facilitate gull predation. Tourists sometimes disturb incubating penguins, causing them to expose their eggs or young chicks making them more vulnerable to gulls (Yorio and Boersma 1992).

Disturbance by humans and domestic animals also causes mortality of adults and lowered reproductive success. Sheep, horses, cattle, cats and dogs are often seen in penguin colonies. Particularly when animals are being herded or when domestic stock flees from people, nests collapse killing adults and young (pers. obs.). Dogs sometimes kill adults and both dogs and cats eat eggs and small chicks (pers. obs.).

Areas of high penguin mortality

Although Magellanic Penguins are found all along the coast of Patagonia conflicts between human activity and penguins are restricted mainly to three

areas: (1) Península Valdés, (2) Golfo San Jorge, and (3) Estrecho de Magallanes (Figure 1).

Península Valdés in 1993 had more than 60,000 tourist visits to see wildlife. Conflicts between tourism and breeding penguin colonies seem to be minimal and well regulated by the provincial government.

Oil pollution is a problem along the coast of Patagonia. Dumping of oil appears to be a problem along the tanker route but it is worse near the two oil ports of Caleta Cordova and Caleta Olivia (Gandini *et al.* 1994). More vigorous enforcement of existing laws is needed to stop illegal dumping and chronic oil pollution.

The Estrecho de Magallanes is one of the most important navigational routes along the Patagonia coast as it connects the Atlantic and Pacific ocean. The second largest Magellanic Penguin colony is located near the strait on the Argentine side. There are more than 20 oil platforms in Chilean and Argentine waters and chronic oil pollution is characteristic of this area. Each year penguins are found covered in petroleum along the Cabo Virgenes coast.

In the Golfo San Jorge, prawns *Pleoticus muelleri* and hake are fished throughout the year by trawlers. The impact of such fishing activities on penguins is unknown but is not likely to be beneficial. Many species of fish that are important in the diet of penguins are discarded and many penguins are captured incidentally. The impacts of humans on Magellanic Penguins from development activities appears to be increasing mortality.

The population of Magellanic Penguins is around 652,000 breeding pairs in Argentina. The greatest numbers of penguins are found in the province of Chubut where most conflicts with the oil and fishing industry seem to occur. Little is known about how these development activities are affecting penguin populations at the colony level. Tourism can be compatible with penguin reproduction when tourism is well controlled and concentrated (Yorio and Boersma 1992). How development, economic interests and penguin numbers can be balanced is not clear. The impacts of fishing, oil transport, oil development and tourism on individual penguin colonies are not known but could exceed natural forces in regulating penguin populations in the near future.

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