

# Opinion

## Tourism and recreation at seabird breeding sites in Patagonia, Argentina: current concerns and future prospects

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### Summary

Seabird colonies often constitute valuable tourist attractions. Different species differ in their sensitivity to human disturbance and, although birds may habituate to visitors, inappropriate intrusions at poorly managed sites may result in adverse effects on breeding individuals. The rapid growth of wildlife-based tourism and recreation in coastal Patagonia, Argentina, presents opportunities for significant economic benefits but also raises concerns about the potential effects on seabird colonies. Sixteen seabird species breed along the Patagonian coast, with Magellanic Penguin *Spheniscus magellanicus* being one of the main tourist attractions. At least 27 sites where seabirds breed are currently visited by people either through organized tourism or for recreational purposes, 19 of which are included in coastal protected areas. The number of visitors per year varies from 50 to more than 100,000, depending on the site. Negative effects on seabird reproduction in Patagonia are through direct destruction of nests or their contents and desertion of offspring, particularly at locations where seabirds nest in association with or near to colonies of avian predators. Tourism and recreation activities are growing in extent and intensity at most coastal sectors in Patagonia. Current trends in coastal recreation activities may result in negative effects on breeding seabirds unless management guidelines are developed and enforced. Information shows that tourism in coastal Patagonia is compatible with seabird conservation if appropriately managed. Given the rapid increase in the interest in visiting seabird colonies in Patagonia, several management tools such as sanctuaries, the limitation of visitor numbers and both temporal and spatial zoning, need to be implemented in the short term.

### Introduction

Because seabirds breed in large aggregations, show diverse diurnal behaviours, and generally nest in remote and attractive coastal environments, they often constitute valuable tourist attractions. Seabirds have been a significant part of the tourism industry in several parts of the world, including the Galapagos Islands, Antarctica, Australia, and Canada (Evans and Nettleship 1985, Cepeda and Cruz 1994, Enzenbacher 1994, Ross *et al.* 1995). Since the 1980s, seabird colonies in Patagonia, Argentina, have been visited by increasing numbers of national and international tourists (Tagliorette and Losano 1996, Yorio *et al.* 1996).

Ecotourism may stimulate local and national interest in conservation, generate revenues that can support conservation efforts, and be a sustainable alternative to the harvesting of wildlife (De Fontaubert *et al.* 1996). Available information suggests that tourism may be compatible with the breeding of some seabird species if visits are controlled (Hill and Rosier 1989, Yorio and Boersma 1992, Cepeda and Cruz 1994, Tershy *et al.* 1997, Burger and Gochfeld 1999). Many species can become habituated to visitors, and adverse effects on their breeding success may be minimized (Burger and Gochfeld 1983, Dunlop 1996, Burger and Gochfeld 1999, Nisbet 2000). However, this depends on adequate planning and the consideration of associated environmental issues. Different seabird species show different sensitivity to human disturbance and, at some poorly managed sites, inappropriate intrusions may prevent birds becoming habituated, or affect associated non-target species. Thus, visitor behaviour at such colonies may result in negative effects on breeding populations, i.e. a reduction in breeding success or in local populations. In addition, the increasing use of coastal areas for recreational purposes often results in unsupervised visitation of seabird breeding sites by people. In contrast to organized tourism, where people follow specific guidelines during their visit to colonies and seabirds may become habituated, recreation activities at many sites may result in adverse effects on breeding seabirds.

The rapid growth of wildlife-based tourism and recreation in coastal Patagonia presents opportunities for significant economic benefits but also raises concerns about potential effects on the environment, including seabird colonies. In this paper we present information on the characteristics of the seabird resource and the current state of tourism and recreation activities in coastal Patagonia, review the main threats posed by uncontrolled visitation to colonies, and discuss potential problems and concerns related to the development of seabird-based tourism. Understanding the patterns of current use of seabirds by people and the potential negative effects of poorly managed visitation to colonies may help improve the management and conservation of seabird populations in Patagonia and other regions.

### Characteristics of the resource

Sixteen seabird species breed along the Patagonian coast, including penguins Spheniscidae, cormorants Phalacrocoracidae, and gulls and terns Laridae (Table 1). Some Patagonian seabirds are relatively abundant and have a wide distribution, breeding at many sites along the coast, while others have a highly restricted distribution or nest in small colonies at a few sites (Yorio *et al.* 1999). Magellanic Penguin *Spheniscus magellanicus* is widely distributed in Patagonia and is the most abundant species, with a total population of approximately 920,000 breeding pairs. Colony size ranges from a few to 175,000 nests (Gandini *et al.* 1996, Yorio *et al.* 1998a). However, most other seabirds have relatively small total breeding populations, often less than 5,000 pairs (Yorio *et al.* 1999; Table 1). At some sites, up to eight species may be found breeding in close proximity. Most colonies are located on islands or mainland cliffs. Of the *c.* 270 sites where seabirds breed, 40 (15%) are on accessible mainland locations, allowing regular visitation by people. Fifteen of these mainland sites have Magellanic Penguin colonies.

Table 1. Species, number of breeding sites, and estimated breeding population (in breeding pairs) of seabirds in Patagonia.

Species	No. of sites	Estimated total population size
Magellanic Penguin <i>Spheniscus magellanicus</i>	60	920,000
Southern Rockhopper Penguin <i>Eudyptes chrysocome chrysocome</i>	3	174,000
Southern Giant Petrel <i>Macronectes giganteus</i>	4	2,300
Imperial Cormorant <i>Phalacrocorax atriceps</i>	54	48,900
Rock Shag <i>Phalacrocorax magellanicus</i>	143	7,500
Red-legged Cormorant <i>Phalacrocorax gaimardi</i>	13	1,100
Olivaceous Cormorant <i>Phalacrocorax olivaceus</i>	12	1,200
Guanay Cormorant <i>Phalacrocorax bougainvillii</i>	2	10
Southern and Chilean Skuas <i>Catharacta antarctica</i> and <i>C. chilensis</i>	36	500
Kelp Gull <i>Larus dominicanus</i>	104	74,300
Dolphin Gull <i>Larus scoresbii</i>	26	600
Olrog's Gull <i>Larus atlanticus</i>	10	2,300
South American Tern <i>Sterna hirundinacea</i>	23	16,300
Cayenne Tern <i>Sterna eurygnatha</i>	11	2,800
Royal Tern <i>Sterna maxima</i>	5	800

Sources: Yorio *et al.* 1998a, Schiavini *et al.* 1999, Schiavini 2000.

### Current trends at visited sites

At least 27 sites in coastal Patagonia where seabirds breed are currently visited by people, either through organized tourism or for recreational purposes (Figure 1). Numbers of visitors vary among sites, with some colonies receiving high numbers throughout the breeding season (Table 2). By 1996, tourism in coastal Patagonia, of which seabird-based ecotourism is an important component, was generating more than 59 million dollars annually (Fundación Patagonia Natural 1996). Tourism at some sites is oriented exclusively to seabirds (e.g. Isla de los Pájaros, Punta Tombo, Cabo Dos Bahías, Punta Buque and Cabo Vírgenes), while at other sites wildlife attractions also include marine mammals (e.g. Península Valdés, Puerto Deseado and Beagle Channel). Most seabird colonies which are currently visited are included in coastal protected areas (Table 2). Tourism is one of the main human activities taking place in coastal wildlife reserves in Patagonia, and has fostered the creation of several such protected areas (Yorio *et al.* 1998b). Recreation also takes place at some of these tourist reserves, and some sites such as Punta Pozos, Punta Conos, El Pedral and Monte León are visited exclusively for recreational purposes (Table 2). Recreational activities that take place at these coastal sites include walking, general beach use, sailing, use of off-road vehicles, dog-walking, bird-watching, sports fishing, and/or recreational harvest of intertidal invertebrates, all activities which may result in an adverse impact on breeding birds.

The number of sites being visited by organized tours has increased from 13 to 22 in the last decade, and five locations have been recently proposed as viable new sites. These proposals for the tourist development of important wildlife sites, including coastal protected areas such as Punta León, have been presented not only by the provincial governments but are also the result of private initiatives. Economic problems have also led many landowners to supplement sheep farm-

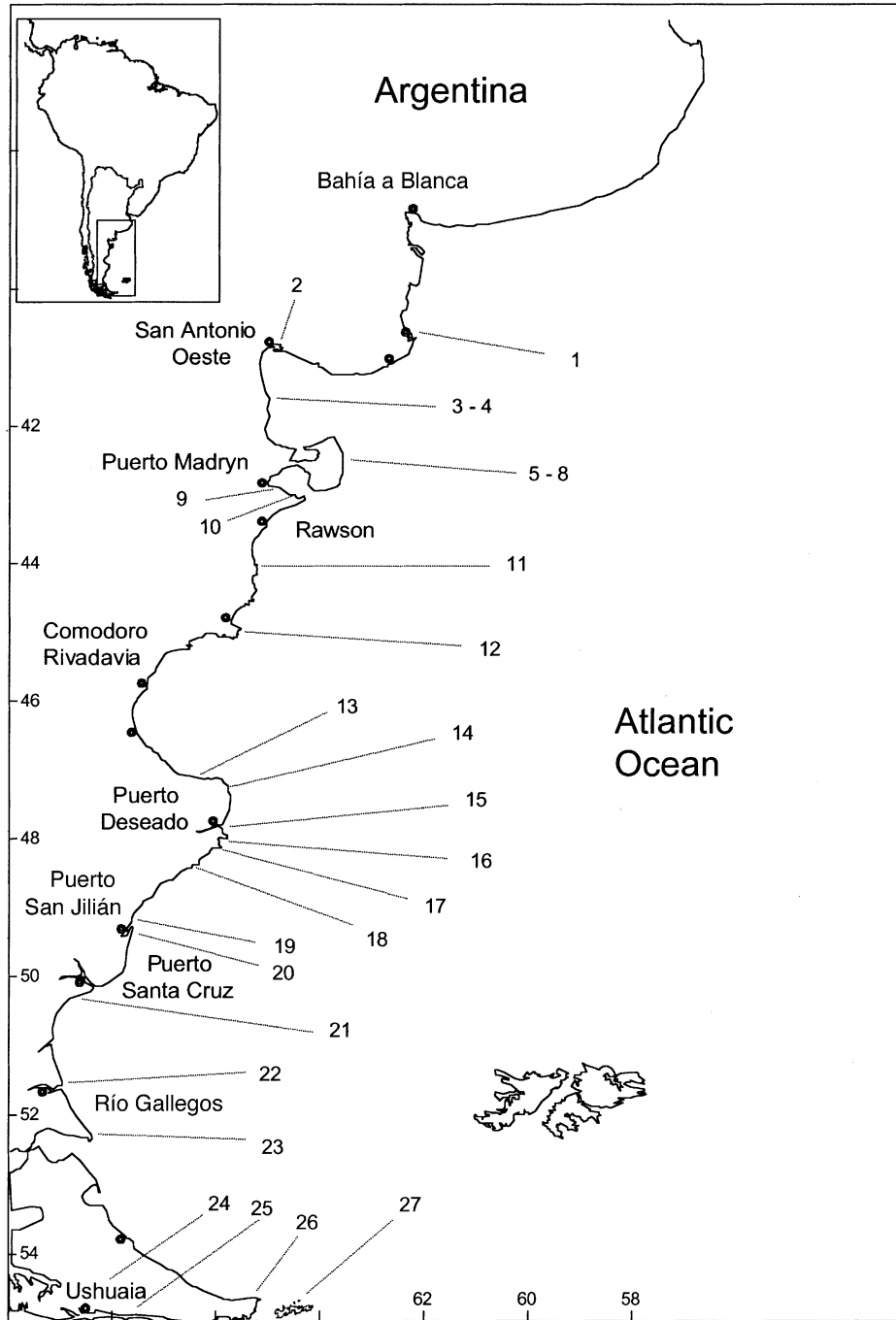


Figure 1. Location of coastal sites with seabird breeding colonies currently visited by people in coastal Patagonia, Argentina. Numbers correspond to sites in Table 2.

Table 2. Locations on the Patagonian coast where seabird colonies are regularly or occasionally visited by people.

Location	Target species	Associated species	Activity	View	Visitation frequency	Visitors per year
1 Bahía San Blas* (BA)		KG,OG,ST	R	F	Occasional	N/1
2 Bahía de San Antonio Oeste* (RN)		KG,ST	T, R	F	Occasional	N/1
3 Complejo Isote Lobos* (RN)		KG,OC	R	F	Occasional	N/1
4 Punta Pozos (RN)		ST	R	F	Occasional	N/1
5 Isla de los Pájaros* (CH)	KG,MP,OC,RS		T, R	F	Regular	>100,000
6 Estancia San Lorenzo* (CH)	MP		T	F	Regular	N/1
7 Caleta Valdés* (CH)	MP		T, R	F	Regular	>100,000
8 Punta Pirámide* (CH)		ST	T, R	F	Regular	30,000
9 Punta Loma* (CH)	RS	ST	T, R	F,B	Regular	35,000
10 Playa El Pedral (CH)		ST	R	F	Regular	N/1
11 Punta Tombo* (CH)	MP		T	F	Regular	68,000
12 Cabo Dos Bahías* (CH)	MP		T	F	Regular	6,700
13 Monte Loayza* (SC)	IC,RC,RS	CT,DG,KG,ST	T	F	Regular	N/1
14 Cabo Blanco* (SC)	IC,RC,RS	DG,KG	T, R	F	Regular	>3,000
15 Ría Deseado* (SC) (several sites)	DG,KG,MP,OC,RC,RS, ST		T, R	B,F	Regular	9,000
16 Isla Pingüino* (SC)	CS,MP,RP,SS	DG,KG,RS,RC,ST	T	B,F	Occasional	<50
17 Punta Buque (SC)	MP		T, R	F	Occasional	<100
18 Bahía Laura* (SC)	MP		T, R	F	Occasional	<100
19 La Mina (SC)	RC		T	F	Occasional	N/1
20 Bahía San Julián* (SC)	IC,MP	KG,OC,RS	T, R	B,F	Regular	5,000
21 Monte León (SC)		IC,MP,RC,RS,ST	R	F	Occasional	1,500
22 Isla Deseada* (SC)	CI,DG,KG,MP		T	F	Occasional	<100
23 Cabo Vírgenes* (SC)	MP	RS	T, R	F	Regular	5,000
24 Islas Bridges and Islotes Les Eclaireurs (TF)	IC,RS,ST	CS,DG, KG	T, R	B	Regular	50,000
25 Isla Martillo and Isla de las Cigüeñas (TF)	MP,RS	CS	T	B,F	Regular	~10,000
26 Península Mitre (TF)	IC		T	F	Occasional	~50
27 Isla de los Estados* (TF)	MP,RP	GP,IC,RS	T	B,F	Occasional	>50

Species: CS, Chilean Skua; CT, Cayenne Tern; DG, Dolphin Gull; GP, Southern Giant Petrel; IC, Imperial Cormorant; KG, Kelp Gull; MP, Magellanic Penguin; OC, Olivaceous Cormorant; OG, Olrog's Gull; RC, Red-legged Cormorant; RP, Southern Rockhopper Penguin; RS, Rock Shag; RT, Royal Tern; SS, Southern Skua; ST, South American Tern.

Province: BA, Buenos Aires; RN, Río Negro; CH, Chubut; SC, Santa Cruz; TF, Tierra del Fuego.

Activity: T, Tourism; R, Recreation.

View: F, foot; B, boat/vessel.

\*Protected area

ing revenues with specialized tourism, which in many cases includes the visitation of seabird and marine mammal aggregations.

The number of visitors to seabird colonies has also greatly increased since the 1980s. The Magellanic Penguin colony at Punta Tombo, for example, currently receives more than 65,000 visitors per season; in 1985 less than 20,000 tourists visited the reserve (Dirección de Conservación of Chubut unpubl. data). At Puerto Deseado, where tourists are mainly attracted by the diversity and abundance of seabirds and other coastal birds, the number of visitors increased from less than 500 in 1976 to almost 9,000 in 1995, of which about 3,000 visited more than one colony (P. Gandini and E. Frere 1996). The colony of Magellanic Penguins at Cabo Vírgenes, which received less than 500 visitors in the early 1980s, has recently become an important tourist destination in southern Santa Cruz, with about 5,000 visitors per season (Frere and Gandini unpubl. data). Visitors to the city of Ushuaia increased from 64,000 in 1994 to 102,100 in 1998, of which about 85,000 visited seabird aggregations by tour boats (Subsecretaría de Turismo, Municipalidad de Ushuaia, unpubl. data 1999).

Seabird colonies at tourist sites are visited in different ways (Table 2). At Magellanic Penguin colonies, for example, tourists walk among nests along fenced trails, therefore experiencing a very close encounter (down to less than a metre) with the birds. With most other species, people approach the colonies walking along defined trails and breeding birds are observed from a distance. In these cases, minimum approach distances may range between 15 and 20 m, depending on the species. The time organized tours remain in these seabird colonies is not regulated, and varies between 45 minutes to one hour. At several tourist locations, visits to breeding colonies are made by boat, and birds are approached to within 10 to 30 m, depending on both site and boat characteristics. Visits typically last between 5 and 15 minutes. At sites with poor visitation control, people may leave tourist areas or trails and wander through or close to seabird colonies which are supposed to be restricted to visitors. This is generally the case at recreational sites, where people visiting the site many times for purposes other than bird-watching, get close to or enter colonies and interfere with seabird breeding activities (see Current concerns below). The variability in the way visitors interact with seabirds along the Patagonian coast indicates that not all sites or species are exposed in the same way to disturbance and, therefore, negative effects will be site and species specific.

### **Potential effects of visitation to seabird colonies in Patagonia**

Human disturbance can have different effects on colonial birds depending on its type and intensity, leading in some cases to a decrease in numbers or productivity (see reviews by Anderson and Keith 1980, Götmark 1992, Burger and Gochfeld 1994, Carney and Sydeman 1999). In general, the negative effects on seabird reproduction are a consequence of the direct destruction of nests or their contents and desertion of eggs and chicks. It has also been shown that in many cases the effects of disturbance may be minimized or even eliminated if birds become habituated to visitors (Nisbet 2000). All these effects have been observed in seabirds breeding in Patagonia (Table 3). Knowledge of the variability of seabird response to both deliberate and casual intrusions, and the ways in which visitor

Table 3. Effects of human disturbance on Patagonian seabirds.

Consequences of disturbance	Species	Sources
Nest or offspring desertion	CT,MP,RP,RT,ST	1,2,3,4
Offspring predation due to nest abandonment	CI,CT,DG,GP,MP,OC,RS, RT, ST	1,2,4,5,6,8,9,10
Destruction of nests or nest contents	MP, ST	11
Reduction of nest densities	MP	5

Species: CS, Chilean Skua; CT, Cayenne Tern; DG, Dolphin Gull; GP, Southern Giant Petrel; IC, Imperial Cormorant; KG, Kelp Gull; MP, Magellanic Penguin; OC, Olivaceous Cormorant; OG, Olrog's Gull; RC, Red-legged Cormorant; RP, Southern Rockhopper Penguin; RS, Rock Shag; RT, Royal Tern; ST, South American Tern.

Sources: 1 Boswall (1973); 2 Yorio and Quintana (1996); 3 Gandini and Frere (1998); 4 pers. obs.; 5 Gandini (1993); 6 Yorio and Boersma (1994); 7 Vila and Pérez (1996); 8 Kury and Gochfeld (1975); 9 Gochfeld (1980); 10 Frere et al. (1992); 11 Yorio et al. (1996).

behaviour may result in adverse effects on seabird reproduction, is important for the development of management guidelines.

The degree of sensitivity to human disturbance differs among seabird species. Among Patagonian seabirds, Magellanic Penguin is a relatively tolerant species and may get used to visits which are appropriately managed, such as those in the Provinces of Chubut and Santa Cruz (Yorio and Boersma 1992, Gandini and Frere 1996, Fowler 1999). This penguin shows different behaviour according to the degree of previous exposure to people. For example, penguins breeding within the area visited at the Punta Tombo colony are used to people, and visitors do not seem to affect breeding success or chick growth (Yorio and Boersma 1992, Fowler 1999, B. Walker and D. Boersma unpubl. data). Similarly, Magellanic Penguins that nest on frequently visited islands of Puerto Deseado do not start to react until intruders are closer to their nests than those breeding at islands which are not visited (Gandini and Frere 1996). Magellanic Penguin tolerance to people is higher than that of other seabirds even at colonies not regularly visited, but at sites with restricted human access, some individuals abandon their nests leaving their eggs and small chicks exposed when approached (E. Frere and P. Gandini pers. obs.). Other Patagonian seabirds are more sensitive to visitors. For example, Royal Terns *Sterna maxima* and Cayenne Terns *S. eurygnatha* desert nests when people enter their colonies resulting in egg losses to avian predators (see below; Yorio and Quintana 1996).

Differences in bird response to intrusion by people are also observed among colonies of the same species, as for example in Rock Shag *Phalacrocorax magellanicus* and Magellanic Penguin (Gandini and Frere 1996, P. Yorio pers. obs.). Whether these differences are due to a different history of exposure to humans is unknown. Seabird responses and the impact of human visitation also depend on the stage of the breeding cycle, the earliest stages being in general the most sensitive (Götmark 1992, Burger and Gochfeld 1994, Carney and Sydeman 1999, Nisbet 2000). These seasonal differences in response have been observed in Magellanic Penguin (both at colonies regularly visited and those which are not), Imperial Cormorant *Phalacrocorax atriceps*, Rock Shag, Olivaceous Cormorant *P. olivaceus* and Kelp Gull *Larus dominicanus* (Kury and Gochfeld 1975, Yorio and Boersma 1992, Yorio and Quintana 1996, Gandini and Frere 1998). In Magellanic Penguin, regional variations are observed in this respect. For example, at Punta

Tombo the distance at which breeding birds start to respond to an approach is greatest during incubation (Yorio and Boersma 1992), in Puerto Deseado and Cabo Vírgenes the distance is greatest during the chick stage (Gandini and Frere 1996). The type and intensity of the disturbance may also affect seabird response. Walking quickly through a Magellanic Penguin colony causes an escape response by the birds more frequently than walking slowly (Yorio and Boersma 1992). A quick approach to breeding Southern Rockhopper Penguins *Eudyptes chrysocome chrysocome*, Imperial Cormorants, Rock Shags, Dolphin Gulls *Larus scoresbii* and Royal and Cayenne Terns causes nest abandonment at a greater distance than if the approach is slow (P. Yorio and A. Schiavini pers. obs.).

At some locations, such as Punta Loma, Ría Deseado, Bahía Ushuaia and Isla Martillo, observations of breeding seabirds are made from boats. Although these sites receive an important number of tourists per season, little is known about the effects of colony approaches using boats. In Bahía Ushuaia, tour boats, sometimes two or three at the same time, can approach Imperial Cormorant, Magellanic Penguin and Rock Shag colonies to within 10 m without apparent negative effect on the birds (Schiavini and Yorio 1995). However, Rock Shags generally abandon their nests when people approach the colony to within 100 m using inflatable boats or sailing vessels, particularly during the settlement period or after chicks fledge (Schiavini and Yorio 1995). At Ría Deseado tour boats regularly approach Magellanic Penguin, Red-legged Cormorant *Phalacrocorax gaimardi* and Rock Shag colonies. Preliminary information suggests that this is done with minimum disturbance to nesting birds, although birds outside the tourist areas flee when approached (Gandini and Frere 1996, 1998). These observations at Bahía Ushuaia and Ría Deseado suggest that breeding birds may also become habituated to boats which regularly get close to their colonies. However, it has been shown that breeding birds may respond negatively to the presence of boats (e.g. Burger 1998). Indirect effects of tourist visitation using boats and vessels should also be explored, as boat traffic may result in disturbance of feeding areas. For example, more than 75% of the local marine avifauna forage in the interior waters of the Ría Deseado (Gandini and Frere 1998), and breeding birds at the Beagle Channel forage almost exclusively within its waters (Raya Rey and Schiavini 2000).

At most locations in Patagonia, seabirds nest in association with or near to colonies of avian predators, such as gulls or skuas. Kelp Gulls prey on eggs and chicks exposed due to human disturbance in colonies of Imperial Cormorant, Olivaceous Cormorant, Rock Shag, Royal Tern, Cayenne Tern, Magellanic Penguin and Southern Giant Petrels *Macronectes giganteus* (Gochfeld 1980, Frere *et al.* 1992, Yorio and Boersma 1994, Yorio and Quintana 1996, P. Yorio pers. obs.). Similarly, Dolphin Gulls are attracted to human disturbance and follow intruders to seabird colonies, taking advantage of nest contents when they are unattended (Kury and Gochfeld 1975, Yorio *et al.* 1996). Most of the adverse effects of human disturbance on colonial waterbirds are the result of the promotion of predation by diurnal avian predators (Nisbet 2000).

Little is known about how effects of disturbance on individual survival, behaviour or reproductive output may translate into negative impacts at the population level. Several authors have suggested that human disturbance may cause seabird population declines (Thomson 1977, Jouventin *et al.* 1984) or prevent



populations from increasing (Woehler *et al.* 1994). However, lack of information on visitor effects, long-term trends in seabird numbers and patterns of recruitment at disturbed colonies in Argentina prevent the adequate assessment of the impact of human disturbance at the population level.

### Current concerns

Increasing interest in visiting wildlife areas, and the relatively high success in terms of revenues in some locations, is resulting in a growing number of sites being developed for ecotourism (see above). This is fostered, at least in part, by the current economic problems in Argentina, which are resulting in more people seeking alternative business opportunities. The Patagonian region has shown one of the largest population increases in Argentina over the last 30 years, from 550,000 people in 1970 to more than 1,100,000 in 2000 (Instituto Nacional de Estadísticas y Censos unpubl. data), mainly a result of policies giving economic advantages to industries settling in this region, thus promoting immigration to Patagonia. Many of these development activities were not originally related to the utilization of natural resources. However, recent socioeconomic changes are leading to an economy based upon the utilization of such resources. Among the alternative economic activities, tourism is perceived as one with the greatest potential for increase in the short term.

The natural resources and tourism government agencies of most of the Patagonian Provinces, which are responsible for seabird management, face serious limitations in their ability to provide appropriate oversight. Many seabird colonies visited by people are located far from urban centres, making control and monitoring difficult and expensive. Only Chubut's protected seabird colonies and some reserves in Santa Cruz have wardens and management guidelines which allow the adequate control of visitors (Yorio *et al.* 1998b). Besides, in view of the economic problems aforementioned, it is unlikely that the allocation of resources to tourist control will increase in the short term in some Patagonian provinces. Although tourism may allow visitation to seabird colonies with few effects on breeding birds, the lack of guarantees that governments will be able to implement management guidelines raises concerns about the potential negative impacts on seabirds in the near future.

Problems may also arise as the number of visitors to current wildlife sites continues to grow, making tourism at some colony sites unsustainable. Tourism capacity at visited seabird colonies in Patagonia is unknown and no sites have guidelines limiting the number of visitors. Disturbance to nesting birds may increase with visitor group size and nature-based tourism may lose quality with overcrowding of trails. At Punta Tombo, for example, several hundred people can congregate on the tourist trail for several hours with no apparent effects on breeding penguins (pers. obs.), although it is unknown whether birds will be unaffected by a further increase in visitor numbers. Often, exceptionally large numbers of visitors arrive simultaneously at the colony, a result of cruise ship tour groups (see below), which arrive at the nearby port of Puerto Madryn. An increase in the number of visitors may lead to requests for the opening of new sectors at Magellanic Penguin colonies. It should be considered that the establishment of new tourist areas, either at Magellanic Penguin colonies not previously

on the tourist circuit or new sectors in colonies already visited, could result in negative impacts on the birds during the early stages of their implementation (Yorio and Boersma 1992).

In Tierra del Fuego, the number of tour boats has increased from five in 1994 to 11 in 2000. There are currently no regulations about the number and characteristics of vessels that may operate around seabird colonies. Small boats can land people at some islands and, although Tierra del Fuego has a specific law banning the entrance to seabird colonies except for scientific studies, control is far from adequate and illegal landings at seabird colonies are common. In addition to the relatively small local tour vessels, there is currently a growing interest in improving facilities at several ports along the Patagonian coast to allow for the arrival of large, mostly foreign, cruise ships. Cruise ships have the potential of simultaneously bringing large numbers of passengers to a seabird colony and facilitating the access to new sites not previously opened for visitation, such as more off-shore islands or sites which lack nearby tourist facilities.

Of particular concern is the lack of organization and control during visits to recreational coastal areas, which often results in people getting too close to or entering colonies, causing in many cases a significant disturbance to breeding birds. For example, visitors entering South American Tern *Sterna hirundinacea* colonies have trampled eggs (e.g. at Punta Pozos and Punta Loma) or induced colony abandonment (e.g. at Punta Conos, Punta Pozos and Bahía Ushuaia). In addition, off-road vehicles have been recorded driving through a South American Tern colony at El Pedral and over Magellanic Penguin nests at Punta Buque, Monte León and Isla Chaffers (Ría Deseado), resulting in offspring mortality and destruction of penguin burrows. Deliberate damage to birds is rare, but shooting of South American Terns and the destruction of their eggs has been recorded at Punta Pozos. On occasions, people enter colonies with dogs, such as in the Magellanic Penguin colonies at Punta Buque and Cabo Vírgenes. At all of these sites, fences or signs informing visitors about the existence of nesting birds and the required approach distances are lacking. In contrast with organized tourism taking place in protected areas, lack of control and guidelines might result in the decline of breeding populations or the desertion of colony sites by some seabirds, particularly terns.

Development of new tourism opportunities requires careful planning as it may have unexpected negative consequences. The opening of new sites favoured by the economic incentives resulting from ecotourism may lead to improved roads and better services. This may promote the development of alternative economic activities in the same site or in adjacent areas. In addition, the development of new areas to satisfy stakeholders or tourist demand may distract funding and attention from existing protected areas where seabird colonies are visited and which are not adequately managed due to lack of government funds.

### Future prospects and needs

Ecotourism in Patagonia has shown great potential and wildlife is currently attracting a growing number of visitors, particularly foreign tourists. The socio-economic changes taking place in Patagonia will very likely result in the transformation of some recreational sites as tourist destinations and will also demand

from planners and managers the opening of new areas. To date, the selection of new tourist sites has not taken into account the distribution and abundance of breeding populations, the vulnerability of different species, the composition of seabird assemblages (including the presence of avian predators), or the genetic relationships among colonies. Some of these issues will shortly have to be included in development decisions by local authorities and stakeholders, particularly considering that there are no guarantees that development of a site will be followed by the implementation of management plans (see above).

One important issue not usually considered in coastal Patagonia is that species respond differently to visitation, some species being more vulnerable to intrusion by people to their colonies than others (see above). Magellanic Penguins at some sites allow a very close approach by large groups of people with no apparent negative effects, and this has led many times to the belief that other more sensitive seabirds can be visited in the same way as penguins. In addition, risks of visitation pressure have to be considered particularly for species with small population sizes or those that breed at only a few locations along the coast (Table 1; see above). Otherwise, the costs of adverse effects if management guidelines are not enforced will be high compared with other species. Another important factor that needs to be considered is the composition of the seabird assemblage. A relatively tolerant species might nest in association with more sensitive species or with opportunistic predator species, such as gulls (see above). Given these factors, it is necessary to identify key sites that, because of their status, characteristics or location, should remain closed to human visitation.

Growing wildlife-based ecotourism in Patagonia requires the rapid generation of environmental awareness and the development of guidelines for the management of visitors to coastal areas to minimize the impact on seabirds. Education programmes aimed at local communities, stakeholders and government officials should be developed in order to increase awareness of potential effects of visitation to colonies. Development of guidelines will require, among other things, the knowledge of the birds' response to visitors and of the distances at which birds start to react to human intrusion (Yorio *et al.* 1996, Giese 1998). The observed variability in seabird responses suggests that information should be obtained at each location of tourist or recreational interest, since it is not always possible to extrapolate information from one colony to another. It is also necessary to obtain data at different stages of the season to determine the most sensitive period of the breeding cycle. Knowledge of the response by seabirds to approaching vessels is also needed, particularly considering that more than 80% of colonies along the Patagonian coast are on islands or on cliffs that can only be reached from the water. In addition, research on the impacts of disturbance on individual species should be increased to improve conservation guidelines. Adequate control of visitors will need an increase in the number of on-site wardens, both at tourist destinations and recreational sites, and visitors at tourist destinations should always be accompanied by licensed tour guides. Limited funds for management in Patagonia will require that more emphasis is given to passive control measures, such as signs, brochures delivered at tour agencies and hotels, fences, and trails. The posting of signs is needed particularly at recreational locations. The implementation of a few specific guidelines may reduce the impact on breeding birds and improve the visitor's natural experience in coastal Patagonia. As in

other parts of the world, ecotourism policies based on scientifically sound thinking need to be developed in order to convince communities, stakeholders and government.

In summary, tourism and recreation activities are growing in importance at most coastal regions of Patagonia. Current trends in coastal recreation activities may result in negative effects on breeding seabirds unless management guidelines are developed and enforced. However, current information also shows that tourism in coastal Patagonia is compatible with seabird conservation if appropriately managed. Several protected areas are currently receiving important numbers of visitors and generating high revenues with little impact on breeding birds, particularly Magellanic Penguins. Given the rapid increase in the interest in visiting seabird colonies in Patagonia, several management tools such as sanctuaries, the limitation of visitor numbers and both temporal and spatial zoning, need to be implemented in the short term. Management and conservation efforts will also have to concentrate on other threats to seabirds to minimize negative effects on the tourist industry. Commercial fisheries and oil extraction and transport are almost certainly in conflict with seabird-based tourism, as they are affecting species that are currently important tourist attractions, such as the Magellanic Penguin (Boersma and Stokes 1995, Gandini *et al.* 1996, 1999). Besides the adequate management of protected areas which currently receive visitors, sustainable seabird-based tourism will need other conservation and management tools, such as integrated coastal management, if long-term viability of the activity and the conservation of seabird colonies are to be achieved.

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