

Laguna Colorada and Eduardo Avaroa National Reserve, Bolivia

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Resumen

Laguna Colorado está ubicada dentro de la Reserva Nacional de Eduardo Avaroa en el altiplano suroccidental de Bolivia, en un área de vastas salinas y praderas de arena, cubierta con lagos no muy profundos. Durante el verano, estos lagos, en particular la Laguna Colorada (el lago le más grande en la reserva) tiene una población de miles de flamencos. Es el único sitio en donde todas las tres especies *Phoenicoparrus jamesi*, *P. andinus* y *Phoenicopterus chilensis* nidifican juntos, y es el único sitio de nidificación para *P. jamesi*, su población llegó a tener 30,000 individuos (incluyendo 9,000 parejas reproduciendo) durante un estudio reciente. Las dos otras especies se encuentran en números más pequeños, prefiriendo los lagos menos salinos de la región. El consumo humano de los huevos de flamencos es un problema grave, y durante la época de reproducción del 1992/1993 ninguna de las parejas de *P. andinus* pudo reproducir con éxito. Muchas especies interesantes de la puna se encuentran en los alrededores de la Laguna Colorada, aunque el conocimiento de las aves de ningún modo completo, y los visitantes que llegan para conocer esta lugar están siendo animados para que hagan disponibles sus observaciones.

Laguna Colorada lies within Eduardo Avaroa National Reserve on the altiplano of south-western Bolivia, in an area of vast saltflats and high altitude sand plains, dotted with shallow lakes. During the austral summer, these salt lakes, in particular Laguna Colorada (the largest lake in the reserve) are home to thousands of flamingos. This is the only place where all three species, *Phoenicoparrus jamesi*, *P. andinus* and *Phoenicopterus chilensis*, are known to breed together, and is the only regular breeding site for *P. jamesi*, the numbers of which reached 30,000 individuals (including 9,000 breeding pairs) during a recent survey. The other two species are present in much smaller numbers, favouring the less saline lakes in the region. Human consumption of flamingo eggs is a serious problem, and during the 1992/1993 season none of the 1,000 pairs of *P. andinus* attempting to breed were successful. Numerous other interesting puna species can be found in the vicinity of Laguna Colorada, although knowledge of the birds is by no means complete, and

visitors to this exciting reserve are encouraged to make their observations available.

The altiplano south of the Salar de Uyuni in south-western Bolivia is a remote and spectacular region. Vast saltflats and high altitude sand plains are surrounded by colourful mountains, and dotted with shallow lakes stained different colours by algae and minerals. At altitudes ranging from 4,000 to 5,700 m, climatic conditions are harsh with blazing hot days followed by cold frosty nights, giving daily temperature ranges of around 30°C in the summer, and temperatures down to -30°C in winter.

The Eduardo Avaroa National Reserve (714,000 ha) covers most of this area. Set up in 1973 to protect the puna wildlife, the park is home to regionally threatened species such as Lesser Rhea *Pterocnemia pennata* and vicuña *Vicugna vicugna*, but is perhaps most famous for its flamingos: Puna Flamingo *Phoenicoparrus jamesi*, Andean Flamingo *Phoenicoparrus andinus* and Chil-



Laguna Colorada, November 1992 (Ruth Maier)



Puna Flamingo *Phoenicoparrus jamesi*, Laguna Colorada, November 1992 (Ruth Maier)

ean Flamingo *Phoenicopterus chilensis* are all present on the salt lakes in their thousands during the austral summer. The park contains a wide variety of puna habitats ranging from barren rocky slopes to lush freshwater river valleys, with bofedales (bogs fed by freshwater springs) surrounding the lake basins. Most of the lakes are strongly saline but there are a few freshwater lakes in the south.

The largest lake is Laguna Colorada with a surface area of c.50,000 ha, and named after the brilliant red colouration caused by particular algae and bacteria in its shallow waters. Laguna Colorada is the only regular breeding site for *Phoenicoparrus jamesi*, and the only lake where all three species of flamingo breed together.

Due to the remoteness of this region, little research had previously been carried out on the flamingos and their salt-lake environment. In order to redress this deficiency, a team of graduates from the University of East Anglia (UEA), U.K. spent four months (from November 1992 to March 1993) at Laguna Colorada, studying the salt-lake ecosystem and finding out more about the breeding success of the three flamingo species.

On arrival at Laguna Colorada in late November the flamingo breeding season was already well under way: through the shimmering heat haze, a wavering bright pink mirage could be made out in the centre of the lake, several miles from the shore - the location of the breeding colonies. The project had been based on extensive use of a four-wheel drive vehicle, which unfortunately was out of action for most of the time spent at Laguna Colorada. Consequently a very foot-sore research team spent much of its time walking to reach study sites in different parts of the lake. A lake circumference of 40 km meant that these could be a considerable distance away from the base camp, which was made even less desirable by the spectacular thunderstorms which, early and late in the rainy season seemed to replace the afternoon gale force winds common at

other times of year.

Despite the thunderstorms, whole lake counts were carried out on a regular basis to monitor the variation in numbers of birds throughout the breeding season. Thus, numbers of *Phoenicoparrus jamesi* peaked in January at c.30,000 individuals including about 9,000 breeding pairs. *P. jamesi* chicks started hatching in late December and numbers in the nurseries increased throughout January to March. In total, about 9,000 fledged or near-fledged chicks were present on the lake in late March - by all accounts a very successful year (judging from the scant literature). The two other flamingo species were present in much smaller numbers with peaks of 2,200 individual *P. andinus*, and about 1,600 *P. chilensis*. These two species are more numerous on the less saline lakes in the region, with many of the "off-duty" *P. chilensis* feeding in the more extensive freshwater habitat of the surrounding lakes. None of the 1,000 pairs of *P. andinus* attempting to breed at Laguna Colorada were successful. *P. chilensis* breeds later than the other two species and by March 1,200 pairs were incubating on the lake.

The human consumption of flamingo eggs is a widespread problem in this area, and the breeding colonies are raided frequently by egg-collectors. Many eggs are sold across the border in Chile where better protection has all but stopped egg-collecting in the wild. Sadly, egg-collecting was observed on five days during the four months and possibly went unrecorded on others. We were asked several times how much longer we intended to stay at the lake to observe the flamingos - had the presence of the watchful UEA research team on the shores of Laguna Colorada averted more intense collecting? After raids in early December *P. jamesi* colonies were apparently left in peace, which no doubt contributed to their spectacular breeding success. Even so, the raids led to an early breeding failure in the westernmost part of the colonies and were almost certainly responsible for the breeding failure of *P. andinus*.

For a few years in the late 1980s funding was provided for locals to guard the breeding colonies at Laguna Colorada. This may well have reduced the overall number of raids to colonies at this lake even after the guarding ceased. Funding for guards in the 1993/94 breeding season has also provided for a team of three Bolivian scientists who were carrying out further research in the reserve during the second half of 1993.

Many other interesting birds are found in the Eduardo Avaroa National Reserve. The threatened Horned Coot *Fulica cornuta* is amongst the numerous waterbirds found on the lakes, and the elusive Diademed Sandpiper-plover *Phegornis mitchellii* can be found in the bofedales. Several other shorebirds breed, such as Andean Avocet *Recurvirostra andina*, Puna Plover *Charadrius alticola* and three species of seedsnipe.

The area is also used by North American migrant shorebirds with thousands of Wilson's Phalaropes *Phalaropus tricolor* wintering on some of the lakes. Baird's Sandpiper *Calidris bairdii* is another common migrant to the region and several other species such as Stilt Sandpiper *Micropalama himantopus* and Lesser Yellowlegs *Tringa flavipes* have been recorded on passage at Laguna Colorada. However, with most of the numerous lakes in the region rarely visited, many passage visitors probably go unnoticed. Winter migrants from the south also frequent the region, with for example Ochre-naped Ground-tyrant *Muscisaxicola flavinucha* and Cinnamon-bellied Ground-tyrant *Muscisaxicola capistrata* recorded during March. At this time the number of species recorded around the lake was the highest with winter migrants present from both north and south, and immature birds turning up presumably following post-breeding dispersal from elsewhere. Several species of furnariids and sierra-finches are found variously in the rocky and bushy hillside, and stream and lakeside habitats. Small patches of *Polylepis* woodland exist in places which may well harbour other previously unrecorded species for the region.

A total of 44 species were recorded within three km of Laguna Colorada during this project (see Table). Breeding was confirmed for 15 of these, and 10 were new or second records for the reserve, clearly showing the lack of work previously carried out in the area. The bird list for the whole reserve, published in 1990 lists 61 species in a compilation of the records from the few ornithologists who have visited the reserve. No other records have been published.

This is a spectacular region with stunning scenery and an interesting range of wildlife. Not surprisingly, the number of tourists visiting these parts has steadily increased in the last few years and there are now no less than five tour operators in the nearest town. However, local people as yet see few cash benefits from the tours, with only a few of the more enterprising ones providing simple overnight facilities for tourists. Conservation organisations in Bolivia are well aware of their country's importance for flamingo conservation, and it is encouraging that funding has been provided for a team of three Bolivian scientists to carry out further research into the reserve's poorly known avifauna. Some of the funding will pay for local people to protect the breeding colonies, thus providing a source of income which will not be detrimental to wildlife. Hopefully, with time, large numbers of flamingos will be valued more as a source of income from ecotourism and conservation rather than for the eggs they produce.

Access to this remote area can be a problem. Many tourists visit Laguna Colorada as part of a four-day tour which takes in the Salar de Uyuni, a number of smaller flamingo lakes, Laguna Colorada, Laguna Verde on the Chilean border, and the geysers at Sol de Manana. This is a spectacular tour but there is very little time to explore the different areas in more detail. Having your own vehicle is definitely worthwhile, although a four-wheel drive is necessary and access can be tricky during the rainy season which lasts (intermittently) from late December to March. During this time the salars are often flooded and dangerous



Rufous-bellied Seedsnipe *Attagis gayi*, Laguna Colorada, November 1992 (Ruth Maier)



Puna Miner *Geositta punensis*, Laguna Colorada, November 1992 (Ruth Maier)

for those not familiar with the route. Good maps (available only in La Paz or other big cities) are necessary for driving in this area and all petrol must be bought in Uyuni as none is available locally. Tinned and dried food can be purchased in some of the small villages en route, such as Chiguana and Alota. There are few people living outside the small villages and you must be prepared to camp - cold weather gear is absolutely

essential. There is no public transport and trying to negotiate transport on one of the infrequent mining trucks takes a lot of time and patience, and therefore it may be easiest to try and negotiate a tailor-made tour in Uyuni with a guide who knows the area. Make sure the itinerary remains flexible and that you carry enough petrol to get to the more remote lakes.

Laguna Colorada: November 1992 - March 1993

Puna Tinamou	<i>Tinamotis pendlandii</i> * ^	Puna Miner	<i>Geositta punensis</i> *
Puna Flamingo	<i>Phoenicoparrus jamesi</i> *	Straight-billed Earthcreeper	<i>Upucerthia ruficauda</i>
Andean Flamingo	<i>Phoenicoparrus andinus</i> *	Cordilleran Canastero	<i>Asthenes modesta</i> *
Chilean Flamingo	<i>Phoenicopterus chilensis</i> *	Plain-mantled Tit-spinetail	<i>Leptasthenura aegythaloides</i>
Mountain Caracara	<i>Phalcooboenus megalopterus</i>	Bar-winged Cinclodes	<i>Cinclodes fuscus</i> *
Aplomado Falcon	<i>Falco femoralis</i>	White-winged Cinclodes	<i>Cinclodes atacensis</i>
Andean Goose	<i>Chloephaga melanoptera</i> *	Spot-billed Ground-tyrant	<i>Muscisaxicola maculirostris</i>
Speckled Teal	<i>Anas flavirostris</i> *	Cinnamon-bellied Ground-tyrant	<i>Muscisaxicola capistrata</i>
Crested Duck	<i>Anas specularioides</i>	Rufous-naped Ground-tyrant	<i>Muscisaxicola rufivertex</i>
Puna Teal	<i>Anas puna</i>	Puna Ground-tyrant	<i>Muscisaxicola juninensis</i> *
Andean Coot	<i>Fulica ardesiaca</i>	Cinereous Ground-tyrant	<i>Muscisaxicola cinerea</i>
Andean Avocet	<i>Recurvirostra andina</i> *	Ochre-naped Ground-tyrant	<i>Muscisaxicola flavinucha</i>
American Golden Plover	<i>Pluvialis dominica</i>	White-winged Negrito	<i>Lessonia oreas</i> *
Puna Plover	<i>Charadrius alticola</i> *	Blue-and-white Swallow	<i>Notiochelidon cyanoleuca</i> *
Baird's Sandpiper	<i>Calidris bairdii</i>	Barn Swallow	<i>Hirunda rustica</i>
Stilt Sandpiper	<i>Micropalama himantopus</i>	Correndera Pipit	<i>Anthus correndera</i>
Wilson's Phalarope	<i>Phalaropus tricolor</i>	Bright-rumped Yellow-finch	<i>Sicalis uropygialis</i>
Lesser Yellowlegs	<i>Tringa flavipes</i>	Black-hooded Sierra-finch	<i>Phrygilus atriceps</i>
Rufous-bellied Seedsnipe	<i>Attagis gayi</i> *	Plumbeous Sierra-finch	<i>Phrygilus unicolor</i>
Gray-breasted Seedsnipe	<i>Thinocorus orbignyia</i> *	Red-backed Sierra-finch	<i>Phrygilus dorsalis</i>
Andean Gull	<i>Larus serranus</i>	Ash-breasted Sierra-finch	<i>Phrygilus plebejus</i> *
Golden-spotted Ground-dove	<i>Metriopela aymara</i>	Black Siskin	<i>Carduelis atrata</i> *

^ = Laguna Hedionda, 70 km north of L. Colorada

* = evidence of breeding

Breeding records based on the presence of juveniles refer to juveniles accompanied by two adults at the lake throughout the study period.

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