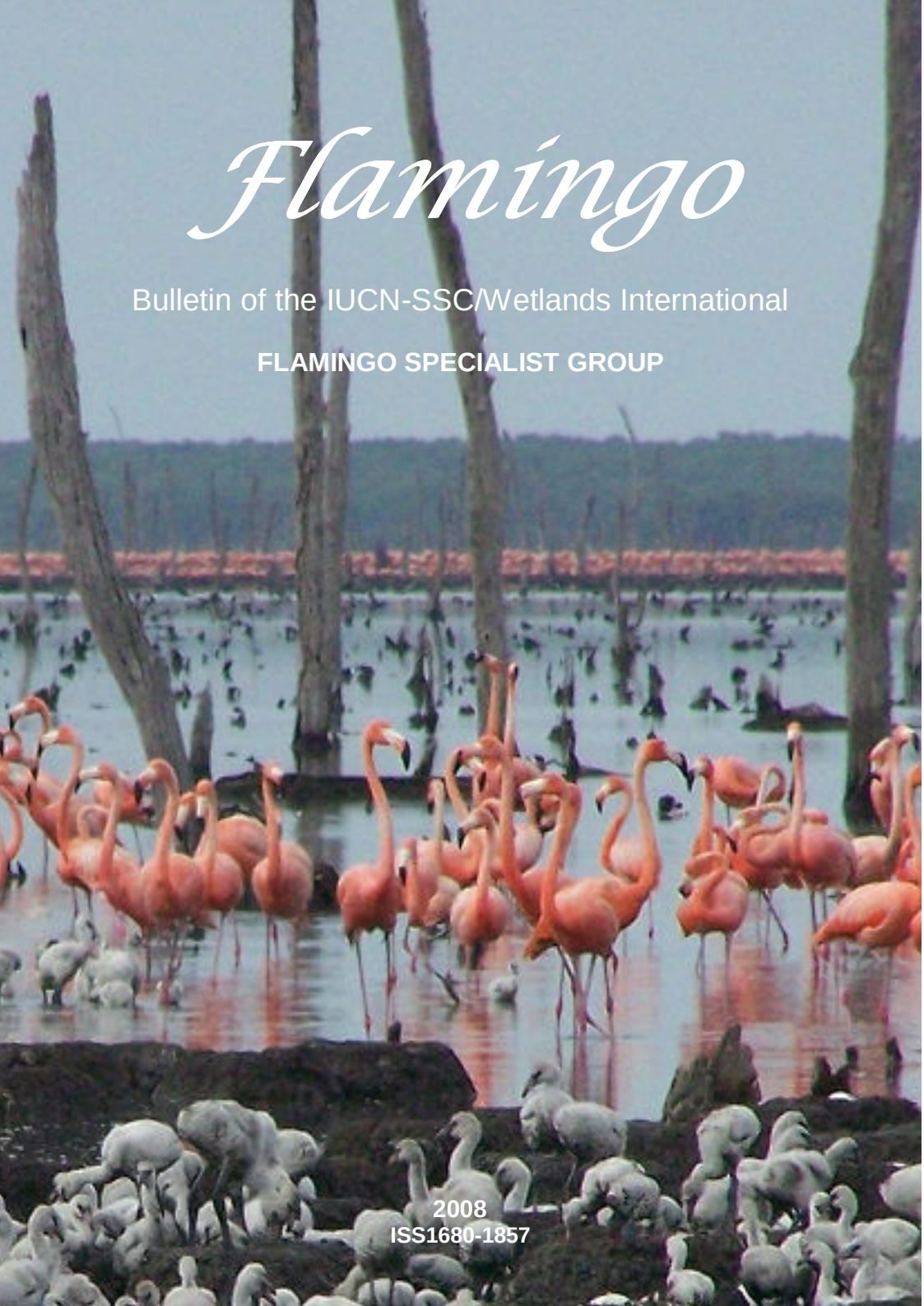


Flamingo

Bulletin of the IUCN-SSC/Wetlands International

FLAMINGO SPECIALIST GROUP

2008
ISS1680-1857

ABOUT THE GROUP

The Flamingo Specialist Group (FSG) is a global network of flamingo specialists (both scientists and non-scientists) concerned with the study, monitoring, management and conservation of the world's six flamingo species populations. Its role is to actively promote flamingo research, conservation and education worldwide by encouraging information exchange and cooperation among these specialists, and with other relevant organisations, particularly the IUCN Species Survival Commission (SSC), the Ramsar Convention on Wetlands, the Convention on Conservation of Migratory Species (CMS), the African-Eurasian Migratory Waterbird Agreement (AEWA), and BirdLife International. The group is coordinated from the Wildfowl & Wetlands Trust, Slimbridge, UK, as part of the IUCN-SSC/Wetlands International Waterbird Network.

FSG members include experts in both *in-situ* (wild) and *ex-situ* (captive) flamingo conservation, as well as in fields ranging from research surveys to breeding biology, infectious diseases, toxicology, movement tracking and data management. There are currently 255 members representing 176 organisations around the world, from India to Chile, and from France to South Africa. Further information about the FSG, its membership, the membership list serve, or this bulletin can be obtained from Brooks Childress at the address below.

Chair
Dr. Brooks Childress
Wildfowl & Wetlands Trust
Slimbridge
Glos. GL2 7BT, UK
Tel: +44 (0)1453 860437
Fax: +44 (0)1453 860437
Brooks.Childress@wwt.org.uk

Eastern Hemisphere Chair
Dr. Arnaud Béchet
Station biologique, Tour du Valat
Le Sambuc
13200 Arles, France
Tel : +33 (0) 4 90 97 20 13
Fax : +33 (0) 4 90 97 20 19
bechet@tourduvalat.org

Western Hemisphere Chair
Dr. Felicity Arengo
American Museum of Natural History
Central Park West at 79th Street
New York, NY 10024 USA
Tel: +1 212 313-7076
Fax: +1 212 769-5292
arengo@amnh.org

Citation: Childress, B., Arengo, F. and Bechet, A. (eds.) 2008. *Flamingo*, Bulletin of the IUCN-SSC/Wetlands International Flamingo Specialist Group, No. 16, December 2008. Wildfowl & Wetlands Trust, Slimbridge, UK.

Cover photograph: 2008 Caribbean Flamingos breeding in El Refugo de Fauna Rio Maximo, Cuba provided by José Morales Leal, Director.

Flamingo

Number 16, December, 2008

CONTENTS

MEMBER ESSAY

Flamingos fly into a fragile future

By Hu Berry

As they lance the sky with crimson wings, flamingos follow ancient routes across Africa. Migration in tune with the rains is cardinal for their existence, but if breeding sites become unsuitable their flight for survival will become futile.

Africa is dehydrating. The second largest of the earth's continents straddles both hemispheres, covering an immense area of 30 million square kilometres. However, 60% of it is classified as desert and semi-desert, and this is increasing as human activities desiccate the surface and drain the subterranean aquifers. Africa is home to two to three million flamingos, which survive on soda lakes, saline pans and salt-water lagoons. It is also home to 800 million humans and their domestic livestock.

The lifespan of humans and flamingos is remarkably similar, both living considerably longer than most wildlife species, but there the similarity ends. Flamingos are highly specialised, filter feeders, with genes originating 50 million years ago and their evolution rooted in the times when reptiles developed feathers instead of scales and Archaeopteryx rose phoenix-like from the morasses of the Triassic era. Humans made a relatively recent appearance on earth – some religions purporting they are as contemporary as 8 000 years, while science dates us as a distinct species that started evolving 600,000 years ago. Whatever our time of origin, we have developed into the most opportunistic species on earth. We are generalist-specialists, enlisting a daunting array of technology to ensure our survival.

Are humans a major threat to the future of flamingos in Africa? Our apparent, albeit unintentional, ability to change even the earth's climate has placed not only flamingos, but also any other species, at risk. Barren wildernesses and desert wastes surround the natural world of flamingos. Whatever climate change may bring, be it conditions that are hotter or colder, wetter or drier, a shift in weather patterns bodes ill for these upside-down beaked feeders of micro-organisms.

As specialists they depend on specific water depths for successful breeding. Higher rainfall will result in raised surface-water levels, flooding traditional nesting areas. Decreased rainfall will expose naturally inaccessible breeding sites to access by predators. Moreover, there is an ominous, immediate threat to the largest concentration of flamingos on earth. East Africa's soda lakes host about two million Lesser Flamingos and tens of thousands Greater Flamingos. One of these sanctuaries, Lake Natron, is threatened by the proposed development of a soda-ash factory and a coal-fired electrical power station. Any factories close to the shore will cause undue disturbance, and increase the number of failed breeding attempts, while a grid of pipelines will disrupt the movement of unfledged chicks fatally. Moreover, the data available suggest a decline in the East African population since the late 1960s from four million to not more than two and a half million.

In combination these threats place an increased responsibility on Namibia, which boasts the second-largest African populations of both flamingo species, to ensure

secure feeding and breeding habitats for them. Fortunately, we have representatives on the Flamingo Specialist Group, an affiliate of the IUCN Species Survival Commission and Wetlands International, giving us direct and immediate contact with the extensive database of the world's flamingos. The Group is co-ordinated from the Wildfowl & Wetlands Trust at Slimbridge, United Kingdom. Namibia and other African countries maintain close contact with these experts because the sharing of local knowledge is essential for the future of flamingos.

This essay has been reprinted with permission from Conservation & the Environment Magazine of Travel News Namibia (www.travelnews.com.na)

As the head of the Etosha Ecological Institute and the Namib Research Institute, Dr. Hu Berry, now retired, has spent 35 years monitoring the flamingos at Etosha Pan. During this time, Namibia experienced periods of copious rain, when an estimated one million flamingos and several thousand pelicans massed to breed on Etosha Pan, and subsequently suffered under the worst drought in recorded history. This rich mixture of experiences in Namibia's environment is reflected in the mood he captures with the essay "Flamingo fly into a fragile future".

2007- 2008 FLAMINGO SPECIALIST GROUP ANNUAL REPORT

Aim of the Group

The aim of the Flamingo Specialist Group (FSG) is to actively promote study, monitoring, management and conservation of the world's six flamingo taxa by:

- Developing and maintaining an active and comprehensive international network of *in situ* and *ex situ* flamingo conservation specialists (both scientists and non-scientists)
- Stimulating and supporting information exchange among flamingo conservation specialists
- Encouraging development and implementation of conservation action plans for the three taxa of greatest conservation concern: *P. andinus*, *P. jamesi* and *P. minor*.
- Promoting innovative conservation approaches, such as coordinated management of wetland networks to secure flamingo population processes (e.g. dispersal and seasonal movements) and reconciliation of water conservation for people and for flamingos in the context of climate change and predicted water shortage
- Providing information and advice in support of the programmes of Wetlands International, IUCN - SSC, BirdLife International, Ramsar and others that promote the conservation of flamingos and their habitats

Significant short and long term programmes

To accomplish its strategic objectives, the FSG organised its 2004-08 quadrennium work plan into four programme areas corresponding to the objectives:

Programme 1: Developing and maintaining an active and comprehensive international network of *in situ* and *ex situ* flamingo conservation specialists

Four-year objective: To develop an international FSG membership that includes the flamingo specialists in each flamingo range state, those working on flamingo conservation at zoological societies and scientific institutions, and others interested in flamingo conservation, wherever located.

We proposed to achieve this objective by:

1. Updating the 37-member FSG membership list extant at the end of 2004, including contacts, focal species and expertise or special interests
2. Conducting an active membership drive early in 2005, with the goal of increasing the geographical coverage and expertise of the membership
3. Encouraging membership growth continuously during the four-year period

Progress during 2007-08: During 2007-08 membership grew 13%. Currently, there are 255 members representing 180 organisations from 56 countries. 180 members are involved primarily with the conservation of flamingos in the wild (*in-situ*), while 75 are involved primarily with *ex-situ* conservation.

255 members representing 176 organisations in 56 countries
180 involved with "in-situ" conservation
75 involved with "ex-situ" conservation

Country	No. Members	Country	No. Members
Algeria	6	Madagascar	2
Argentina	10	Mauritania	1
Bahamas	2	Mexico	11
Belgium	4	Morocco	1
Bolivia	1	Namibia	4
Botswana	3	Netherlands Antilles	2
Canada	1	Paraguay	1
Chile	8	Peru	3
Colombia	2	Poland	1
Cuba	2	Portugal	1
Cyprus	3	Saudi Arabia	1
Czech Republic	2	Senegal	3
Denmark	1	South Africa	8
Djibouti	1	Spain	9
Egypt	1	Suriname	1
Ecuador	2	Switzerland	2
Eritrea	1	Tanzania	5
Ethiopia	4	The Netherlands	9
Finland	1	Tunisia	2
France	8	Turkey	1
Germany	5	Turkmenistan	1
Guinea-Bissau	1	Uganda	1
India	10	United Arab Emirates	7
Iran	2	United Kingdom	34
Italy	8	Uruguay	1
Kazakhstan	1	United States	44
Kenya	6	Venezuela	1
Libya	1	West Indies	1

Programme 2: Stimulating and supporting information exchange among flamingo conservation specialists

Four-year objective: Develop and maintain convenient facilities and opportunities for FSG members to exchange information and ideas

We proposed to achieve this objective by:
1. Developing and promoting an FSG e-mail list-serve for use by members
2. Promoting regional research cooperation among specialists
3. Developing and publishing an up-graded bulletin annually
4. Promoting the development of new information websites

Progress during 2007-08: The list serve continued to provide an active channel of communication for members, with over 100 messages posted during the year concerning varied subjects such as the suitability of "maintenance " vs. "breeder" diets in the captive breeding of flamingos, the effects of hail storms on captive and wild flamingo flocks, recommended standard ring sizes, breeding and ringing reports from around the world and many other subjects of concern to both *in-situ* and *ex-situ* flamingo conservationists. A new format for the annual bulletin/newsletter was introduced in 2005 with Flamingo 13 and Flamingo 16 follows in that tradition. A new flamingo information website (www.flamingoresources.org) was launched during 2008 by an FSG member affiliated with Wildfowl & Wetlands Trust.

Programme 3: Encouraging development and implementation of conservation action plans for the taxa of greatest conservation concern: *P. andinus*, *P. jamesi* and *P. minor*.

Four-year objective*:* Develop a single-species action plan for the Lesser Flamingo (*P. minor*) under the auspices of the Convention on Migratory Species (CMS) and African-Eurasian Migratory Waterbird Agreement (AEWA). Develop a similar action plan for Andean (*P. andinus*) and Puna (*P. jamesi*) Flamingos under the auspices of the Convention on Migratory Species.

We proposed to achieve this objective by:
1. Compiling a biological assessment report for each species containing current data on population size and trends, breeding biology, feeding ecology, habitat requirements, conservation status, threats and priorities for future conservation action from information supplied by FSG members and specialists in each of each of the species' range states
2. Organising and supporting action planning workshops to finalise the conservation priorities for each species
3. Drafting, reviewing and editing the action plans for submission to the CMS/AEWA Technical and Standing Committees and ultimately to the party members for endorsement.

Progress during 2007-08: The International Single-Species Action Plan for the Conservation of the Lesser Flamingo was adopted by AEWA MOP 4 in September, and will be submitted to the CMS Scientific Council in November. The action plan for the Andean (*P. andinus*) and Puna (*P. jamesi*) Flamingos was drafted.

Programme 4: Provide technical information and advice in support of the programmes and publications of Wetlands International, IUCN-SSC and others that promote the conservation of flamingos and their habitats

Four-year objective: Provide information on the plans and activities of the FSG, including a new quadrennial work plan and annual updates, liaise closely with Wetlands International and the IUCN-SSC, as requested, to provide the most recent research information and advice in support of their programmes and publications, as well as the programmes of other organisations (e.g. BirdLife International, AEWA, CMS) concerned with the conservation of flamingos and their habitats.

We proposed to achieve this by:
1. Producing a quadrennial work plan for 2005-2008, with annual updates
2. Liaising closely with relevant staff at Wetlands International and IUCN-SSC
3. Providing input for updates of Wetlands International's *Waterbird Population Estimates*, *No. 4* and the IUCN *Red List of Threatened Species*
4. Participating in conferences, TAG meetings and conservation workshops

Progress during 2007=08: During 2007-08, FSG coordinators participated in the following conferences, meetings and workshops:

Meeting: SSC Specialist Group Chairs' Meeting, 11-14 February, 2008
Venue: Hilton Hotel in Al Ain, Abu Dhabi
Number of participants: 122
Key outputs: The FSG presented the techniques used to build its membership. The delegates discussed four main themes: the future of species conservation; the role of the SSC within IUCN and beyond, including the future plans for the SSC, as represented in the 'Design for the Future"; expanding and sharing knowledge; and challenges for the future, including fund-raising, and establishing and managing an effective network.

Meeting: Ramsar Advisory Mission (No. 59) to Tanzania, 18-21 February 2008
Venue: Protea Hotel Oyster Bay, Dar es Salaam, Tanzania
Number of participants: 12
Key outputs: Mission report provided advice to the Government of the United Republic of Tanzania concerning the wise use and future management of the Lake Natron Basin Ramsar Site, with particular reference to the proposed development of a soda ash facility that would abstract liquid brine from Lake Natron and process it at a nearby site.

Meeting: 12th Pan-African Ornithological Conference, 7-12 September 2008
Venue: ATKV Goudini Spa Conference Centre, Breede River Valley, Western Cape, S. Africa
Number of participants: 251
Key outputs: FSG representatives co-chaired a symposium on flamingo conservation and a round-table discussion on the implementation of the CMS/AEWA International Action Plan for the Lesser Flamingo. Conservationists from all over Africa and other parts of the world issued a resolution strongly urging the Government of Tanzania to ensure the protection of Lake Natron. The site is the world's most important breeding site for Lesser Flamingos *Phoeniconaias minor*.

Meeting: IUCN World Conservation Congress, 05-14 October 2008
Venue: Centre de Convencions Internacional de Barcelona, Barcelona, Spain
Number of participants: >8,000
Key outputs: FSG gave poster and video presentations in Species Pavilion.

Brooks Childress, Chair

IN SITU BREEDING SUMMARY

South America

Argentina

Breeding period: December-February

There are 11 known flamingo breeding sites in Argentine, two for *Phoenicoparrus andinus*, five for *P. jamesi* and five for *Phoenicopterus chilensis*. (E. Derlindati and E. Bucher *in litt.*)

Laguna Pozuelos (*P. chilensis*): No breeding
Laguna Vilama (*P. jamesi*): No breeding
Laguna Honda (*P. jamesi*): No breeding
Laguna Pabellón (*P. jamesi*): No breeding
Laguna Grande (*P. jamesi)*: No breeding
Laguna Aparejos (*P. jamesi*): No survey
Laguna Brava (*P. andinus*): No breeding
Salinas Grandes (*P. chilensis*): No survey
Laguna Mar Chiquita (*P. andinus & P. chilensis*): ~ 4,500 *P. chilensis* chicks, based on aerial survey.
Laguna Melincué (*P. chilensis*): No breeding
Laguna Llancanelo (*P. chilensis*): Not surveyed

Bolivia

Breeding period: December-February

Laguna Colorada (*three species*): 5,937 chicks of mixed species were produced

Chile

Breeding period: December-February

Reserva Nacional Los Flamencos:(P. andinus, P. jamesi, P. chilensis)

- ***Salar de Atacama***
  - ***- Laguna Barros Negros (P. andinus)*** ~114 *P. andinus* chicks fledged
  - ***- Laguna Puilar (P. andinus)****:* 600 chicks fledged
  - ***- Laguna Saladita (P. andinus)*** 62 *P. andinus* chicks fledged
- ***Salar de Pujsa (P. chilensis, P. andinus)****:* No breeding in 2007-08
- ***Salar de Tara* (*P. jamesi & P. chilensis*):** No breeding in 2007-08

Salar de Coposa (P. andinus, P. jamesi, P. chilensis): No report
Laguna Huambune (P. chilensis): No report
Salar de Huasco (P. andinus, P. jamesi, P. chilensis): No report
***Salar de Loyoques (P. chilensis)*:** No report
El Parque Nacional Nevado de Tres Cruces

- ***Salar de Maricunga (P. andinus):*** No report
- ***Laguna Negro Francisco (P. andinus):*** No report

Nevado Tres Cruces (P. andinus, P. jamesi): No report
***Salar de Piedra Parada (P. jamesi)*:** No report
Salar de Punta Negra (P. andinus)*:* No breeding in 2007-08
***Salar de Surire (P. andinus & P. chilensis & P. jamesi*):** No report

Reports by Nelson Amando Pool, *in litt.*

Bahamas & Caribbean

Bahamas (*P. ruber*)

Breeding period: April-June

Lake Rosa, Great Inagua: ~ 8,064 pairs attempted to breed, based on a count of nest mounds; an unknown number of chicks were produced. (Tamica Rahming, *in litt*.)

Bonaire (*P. ruber*)

Breeding period: October-March

Pekelmeer: An unknown number of pairs attempted to breed; ~ 930 chicks were produced (Peter Montanus, *in litt*.)

Cuba (*P. ruber*)

Breeding period: April-June

El Refugo de Fauna Rio Maximo: El Refugo de Fauna Rio Maximo is by far the most important breeding site for the Caribbean Flamingo, having produced between 17,000 and 55,000 chicks annually between 1998 and 2007 (*Flamingo* 13 & 15). In 2008, breeding began normally in April, with an exceptionally large (but unknown) number of breeding pairs and by the end of May there were large crèches of young. The number of breeding pairs was so large, possibly swelled by an influx of breeding birds from the Yucatan (see following report), and access to the colonies was so poor that it was not possible to estimate the total number.

Sadly, in early September, the breeding site suffered a direct hit by Hurricane Ike. Thousands of fledglings and adults still sitting on nests were killed. The field centre was destroyed, along with all of the scientific equipment inside and the reserve workers' houses. The destruction was so severe that it has been impossible to estimate the effects on the breeding colony. (J. Morales Leal and M. Tabasco, *in litt.*)

Mexico (*P. ruber*)

Breeding period: April-September

Ría Lagartos Biosphere Reserve: For the fourth year in succession, breeding at the Ría Lagartos Biosphere Reserve in Yucatan was unsuccessful. In contrast to the heavy flooding of the Punta Mecoh breeding site that destroyed approximately 10,000 chicks in 2006, and destruction of the colony by ferel dogs in 2007, this year the rains that usually trigger breeding here in late April failed. Late April and the entire month of May were so dry that the flamingos did not have the wet mud necessary for nest building. It is hypothesised that the birds that normally breed in Yucatan attempted to breed elsewhere, possibly in Cuba. The early-October arrival at reserves in Yucatan of approxiately 2,200 fledglings and adult minders with Yucatan leg bands tends to support this hypothesis. (R. Migoya, *in litt*.)

Venezuela (*P. ruber*)

Breeding period: (October-March)

Report by F. Espinoza, *in litt*.

Refugio de Fauna Silvestre y Reserva de Pesca **(Los Olivitos Wildlife Refuge and Fishing Reserve)*:*** An unknown number of pairs attempted to breed; ~ 6,450 chicks were produced.

See full report for 2006-2008 in Research Papers and Reports, this volume.

La Restinga National Park, Margarita Island: Based on nest count, 132 pairs attempted to breed but abandoned the attempt after being disturbed by tourist photographers. This was first breeding record for this site.

Mediterranean & West Africa

Breeding by *P. roseus* in Mediterranean and West African countries during 2008 was reported at sixteen sites. Approximately 37,800 pairs attempted to breed and an estimated 11,330 chicks were fledged. While the number of breeding sites has more than doubled during the past two years, the numbers of breeding pairs and chicks fledged are down markedly (see reports in *Flamingo* 13-15) In a major breeding disaster, the breeding attempt by an estimated 6,000 pairs on Grande Kiaone Island in the Banc d'Arguin National Park in Mauritania was completely abandoned after apparent repeated disturbances from suspected illegal fishermen. The following reports were provided by Arnaud Béchet and members of the Mediterranean and West African Greater Flamingo Network.

Mauritania (*P. roseus*)

Breeding period: March-July

Aftout es Saheli: ~ 1,400 pairs attempted to breed; ~ 800 chicks were produced

Banc d'Arguin National Park (Grande Kiaone Island): ~ 6,000 pairs attempted to breed; attempt abandoned following an unknown disturbance, thought to have been illegal fishermen.

Algeria (*P. roseus*)

Breeding period: April-June

Bazer: ~ 750 pairs attempted to breed; attempt abandoned when site dried out

El Golea: ~ 270 pairs attempted to breed; attempt abandoned due to human disturbance

Garaet Ezzemoul: ~ 400 pairs attempted to breed; attempt abandoned when site dried out

See recent history of *P. roseus* breeding in Algeria in Research Papers and Reports, this volume

Tunisia (*P. roseus*)

Breeding period: April-June

Salines de Thyna: ~ 85-90 pairs attempted to breed; abandonded attempt following disturbance

Spain (*P. roseus*)

Breeding period: April-June

Doñana: No breeding at this site in 2008

Ebro Delta: 2,454 pairs attempted to breed; ~ 430 chicks were fledged

Fuente de Piedra: ~ 1,500 pairs attempted to breed; no chicks produced

Marismas del Odiel: ~ 500 pairs attempted to breed; ~ 400 chicks were fledged

France (*P. roseus*)

Breeding period: April-June

Camargue (Etang du Fangassier): 8,807 pairs attempted to breed; 2,880 chicks fledged.

Italy (*P. roseus*)
Breeding period: April-June

Comacchio saltpans: 1,264 pairs attempted to breed and ~ 790 chicks were fledged

Diaccia Botrona: ~ 80 pairs attempted to breed; only two chicks fledged

Dogà, Lagoon of Venice: 173 pairs attempted to breed; 22 chicks fledged

Margherita di Savoia: An unknown number of pairs attempted to breed; 236 chicks fledged

Valles Sagreda & Pozzatini, North Po Delta: No breeding at this site in 2008.

Saline di Macchiareddu (Santa Gilla, Sardinia): ~ 2,340 pairs attempted to breed and ~ 860 chicks were fledged.

S'Ena Arrubia (Oristano, Sardinia): No report

Stagno di Cabras (Sardinia): 10-15 pairs attempted to breed; no chicks produced

Turkey (*P. roseus*)
Breeding period: April-June

Acigöl: No report.

Akşehir Lake: An unknown number of pairs attempted to breed; > 100 chicks produced

Camalti Tuzlasi saltpans (Izmir): ~10,743 pairs attempted to breed; ~3,200 chicks fledged

Tuz Gölü: ~ An unknown number of pairs attempted to breed; ~ 1,610 chicks produced

Southwest Asia & South Asia

Iran (*P. roseus*)
Breeding period: May-June

Uromiyeh Lake: No report

India (*P. minor* & *P. roseus*)
Breeding period: Erratic, depending on the rains, but mainly September-November

No report

East Africa & southern Africa

Tanzania (*P. minor & P. roseus*)
Breeding period: Erratic, depending on the rains, but mainly November-February

Lake Natron: No report

Botswana (*P. minor & P. roseus*)

Breeding period: Erratic, depending on the rains, but mainly November-February

Sua Pan: No numbers, but a good breeding year, with above average rainfall. Many Greater Flamingos bred on small calcrete islands in the middle of the pan. The chicks were protected from predators by flooding around the colonies that lasted until June, making for a high number of fledglings. Fewer Lesser Flamingos took part in breeding compared to previous years with similar conditions. This may have been due to the success of the new Lesser Flamingo breeding site on Kamfers Dam, or as a result of disturbance to the breeding site, as many more Lesser Flamingos were observed in the feeding grounds than were recorded breeding at the colonies, which was a little unusual. (G. McCulloch, *in litt.*)

Namibia (*P. minor & P. roseus*)

Breeding period: Erratic, depending on the rains, but mainly November-February

Etosha Pan: With good rains, flamingo breeding on Etosha was excellent this year, although it did not begin until late May, much later than normal. Approximately 26,000 pairs of mostly Lesser Flamingos attempted to breed and they produced an estimated 10,000 chicks. (W. Versfeld, *in litt*.).

South Africa (*P. minor*)

Breeding period: Erratic, depending on the rains, but mainly November-February

Kamfers Dam: The first breeding event on this new artificial island was extraordinarily successful. Breeding began in December 2007, and by mid-February 2008 the island was completely covered with nesting Lesser Flamingos. They built 8,517 nests and produced an estimated 9,000 chicks. (M. Anderson, *in litt.*)

EX-SITU BREEDING SUMMARY

Three flamingo species (Greater *P. roseus*, Caribbean *P. ruber* and Chilean *P. chilensis*) breed regularly in zoos and other captive facilities. The following table summarises captive flamingo populations and breeding success in ISIS-registered institutions worldwide from October 2007 to September 2008. (Rebecca.Lee@wwt.org.uk)

Species	No. registered institutions	No. registered birds	No. hatched (last 12 months)
Caribbean Flamingo (*Phoenicopterus ruber*)	169	4,428	116
Greater Flamingo (*Phoenicopterus roseus*)	124	3,888	132
Chilean Flamingo (*Phoenicopterus chilensis*)	171	4,580	71
Lesser Flamingo (*Phoeniconaias minor*)	57	1,142	1
Andean Flamingo (*Phoenicoparrus andinus*)	2	29	0
James's Flamingo (*Phoenicoparrus jamesi*)	1	3	0
Unidentified flamingo species and hybrids	38	128	12
	346	14,198	332

Source: International Species Information System (www.isis.org; date accessed: 13 Oct 2008)

IN SITU RINGING SUMMARY

South America

Bolivia (*P. andinus & P. jamesi*)
553 *P. andinus* & *P. jamesi* chicks banded at Laguna Colorada

Chile
For the second year in a row, CONAF authorities cancelled banding activity to avoid human disturbance and associated risks for chick survival due to the low reproductive success for Andean Flamingo colonies in Atacama site.

Bahamas & Caribbean

There were no reports of ringing in the Bahamas or Caribbean

Mediterranean & West Africa

The following reports were provided by Arnaud Béchet and members of the Mediterranean and West African Greater Flamingo Network.

France (*P. roseus*)
545 *P. roseus* chicks were ringed with PVC bands at the Fangassier colony in the Camargue.

Italy (*P. roseus*)
366 *P. roseus* chicks were ringed at the Comacchio salt pans.

Sardinia (*P. roseus*)
571 *P. roseus* chicks were ringed at Saline di Macchiareddu.

Spain (*P. roseus*)
350 *P. roseus* chicks were ringed at Ebro Delta and 393 were ringed at Marismas del Odiel

Southwest & South Asia

No flamingo ringing reported from Southwest or South Asia in 2008.

East Africa & Southern Africa

No flamingo ringing reported from East Africa or southern Africa in 2008.

IN SITU PAPERS AND REPORTS

Nesting of the Greater Flamingo *Phoenicopterus roseus* in Algeria (2003-2008)

Samraoui[1], B., Bouzid[2], A., Boulkhssaïm[4], M., Baaziz,[3] N., Ouldjaoui[4], A. and Samraoui[1], F.
[1]*Laboratoire de Recherche des Zones Humides, Department of Biology, University of Guelma, Algeria. E-mail: bsamraoui@yahoo.fr*
[2]*Department of Agronomic Sciences, University of Ouargla, Algeria*
[3]*Department of Biology, University of Constantine, Algeria*
[4]*Centre Universitaire of Oum El Bouaghi, Algeria*

Abstract
Between 2002 and 2008, we conducted an ornithological survey of Algerian wetlands focused on breeding by the Greater Flamingo (*Phoenicopterus roseus*) in eastern and southern Algeria. During the study period, the Greater Flamingo made at least ten breeding attempts in three different salt lakes: Ezzemoul and Bazer Sakra in the Hauts Plateaux, and El Goléa in the Sahara. Two attempts were successful (Ezzemoul 2005 and 2006). Factors causing breeding failures are analysed and discussed.

Resume
Entre 2002 et 2008, nous avons exploré les zones humides algériennes et suivi la reproduction du Flamant rose (*Phoenicopterus roseus*), principalement dans l'est et le sud du pays. Durant la période d'étude, au moins dix nidifications tentative de Flamants roses ont eu lieu dans trois sites répartis: Ezzemoul et Bazer Sakra à travers les Hauts Plateaux, et El Goléa dans le Sahara. Seules deux tentatives (Ezzemoul 2005 et 2006) ont réussies. Les causes d'échec des autres tentatives sont analysées et discutées.

Introduction
The quest to document breeding of the Greater Flamingo *Phoenicopterus roseus* in North Africa has been long and frustrating (Lavauden 1924). Johnston was the first to observe a Greater Flamingo colony, at lake of Tunis in 1881 (Allen 1956). In the second half of the 20th century, sporadic records were made in Morocco (Johnson 1983) and Tunisia (Johnson 1983, Isenmann *et al.* 2005). The first successful reproduction in Algeria was not recorded until 2005 (Samraoui *et al.* 2006b). For many years, North African sites were thought to support a few thousand wintering Greater Flamingos and to serve as a "crèche" for immature birds. Recent work has overturned these assumptions by revealing that North African wetlands may play an important role in the dynamics of a wide range of species of wetland birds (Boulkhssaïm *et al.* 2006, Samraoui *et al*. 2006b, Samraoui & Samraoui, in press).

Study area
Algeria, being both a Mediterranean and an African country, can be broadly divided into three climatic regions: the Tell which includes the Atlas Mountains and a narrow coastal strip that enjoys mild wet mild winters, and hot dry summers, the semi-arid high plateau (Hauts Plateaux) sandwiched between the Tell and the Saharan Atlas Mountains, and the vast arid Sahara desert (Figure 1). The hyper saline lakes used for breeding and foraging by Greater Flamingos are mostly located in the Hauts Plateaux and northern Sahara. They undergo prolonged periods of drought interrupted by sporadic wet periods following the arrival of rains, characterised by high productivity of fairy shrimp (Samraoui *et al*. 2006a). This abundance of food makes these saline lakes attractive nesting sites, wintering sites and migration stopovers for thousands of waterbirds (Boulkhssaïm *et al.* 2006; Samraoui & Samraoui, In press). Our survey concentrated on the

wetlands in the eastern region of the Hauts Plateaux and the north-central Sahara region. These regions may not include all potential Greater Flamingo breeding sites.

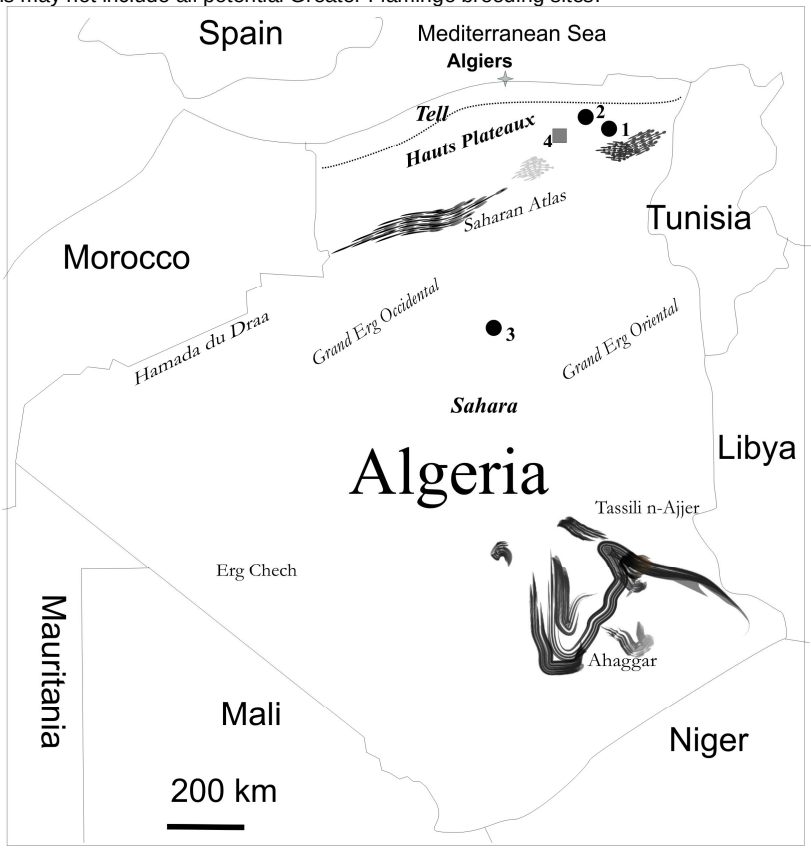


Figure 1. Location of proven nesting sites of the Greater Flamingo in Algeria: 1= Ezzemoul, 2= Bazer Sakra, 3= El Goléa, 4= Chott Hodna.

Methods

All sites in the study area were monitored at least once a month. Nesting attempts could have been missed if the exact location of the colony was not known beforehand, or if the nesting attempt and abandonment occurred between two consecutive visits. Colonies were observed from the shores or approached using hides once hatching is underway. Colour bands were recorded. Observations were made with binoculars and telescopes Optolyth with x20-60 zoom.

Results

During the study period, the Greater Flamingos attempted to breed on at least ten occasions (Table 1) at three sites: Ezzemoul and Bazer Sakra in the Hauts Plateaux and El Goléa in the Sahara (Figure 1). There is also circumstantial evidence that they may have bred in the past at Chott Hodna in the Hauts Plateaux (egg fragments on islets where a local witness reported breeding).

At Ezzemoul, which was monitored during the past six years (2003-2008), the species attempted to breed in all six years, but was successful in only two years (33.3%). In three years, they laid eggs and started incubation but later aborted the breeding attempts. In one year the

species abandoned their attempt before laying any eggs. Breeding failure due to human intrusion or drought each accounted for two failures. Human disturbance occurred before 2005 when steps were taken to actively protect the colony. Following the introduction of preventive measures, cases of locals pilfering eggs virtually disappeared and only one instance of trespassing (by a photographer) was prevented by local guards in 2007.

Table 1: Nesting attempts at Ezzemoul, El Goléa and Bazer Sakra between 2003 and 2008. Causes of nesting failure is given in brackets (H.D. = human disturbance).

	Ezzemoul	El Goléa	Bazer Sakra
2003	60 nests, 7eggs (H.D.)	?	?
2004	276 nests, 226 eggs (H.D.)	?	?
2005	successful, >5000 chicks	?	?
2006	successful, 3500 chicks	?	?
2007	no nesting (drought)	17 nests (unknown)	60 nests (unknown)
2008	400 eggs (drought)	46 nests (H.D.)	55 nests (unknown)

The weather also had an influence on habitat use in the Hauts Plateaux salt lake complex during the two successful years, and it is noteworthy that breeding success at Ezzemoul seemed to hinge on the presence of foraging sites close to the colony. The salt lakes have vast watersheds and which sites will be filled by local rainfall cannot be reliably predicted. Foraging sites differed on each successful breeding occasion. Adults foraged mainly at Garaet Ank Djmel (40 km east of Ezzemoul) in 2005 and at Chott Tinsilt (less than 1 km west of Ezzemoul) in 2006. No quantitative data are available but observations indicated that the breeding site seemed to harbour two abundant species of fairy shrimps *Artemia salina* and the *Branchinella spinosa*. It is not known why, but the Greater Flamingos elected not to feed at Ezzemoul on either occasion.

In both 2005 and 2006, Ezzemoul dried up before the chicks could fledge. Once, the crèche moved to the centre of the salt lake, it appeared safe from potential terrestrial predators. However, in late summer, the crèche broke into smaller groups and the chicks appeared to be greatly attracted to residual pools near the shore, where encounters with stray dogs and locals resulted in some casualties. The recovery of dead banded chicks at Ezzemoul seemed to indicate that late-hatching chicks were at a disadvantage in the race to fledge but the limited sample precluded statistical testing.

At Bazer Sakra, the Greater Flamingos attempted to breed in two consecutive years (2007 and 2008). The colony was built at the edge of the salt lake and was highly vulnerable to human disturbance (egg poachers) and terrestrial predators (feral dogs, foxes, jackals and wild boars). At El Goléa, the Greater Flamingos also attempted to breed in 2007 and 2008. In 2008, egg removal by nomadic herders, probably for their own use, disrupted the breeding attempt in the incubation stage.

Nearly 7,000 Greater Flamingo colour bands were recorded during the six-year study period, with a majority (>90%) of birds originating in the Camargue and Andalusia. Other colonies (Ebro Delta, Sardinia, continental Italy and Turkey) are less represented (Samraoui *et al.*, In press). In 2006, 208 chicks from Ezzemoul were banded (Samraoui *et al.*, In press) and re-sighting of banded individuals by the Greater Flamingo network revealed that they dispersed across the whole of North Africa (Morocco, Algeria, Tunisia and Libya) and southern Europe (Portugal, Spain, France and Italy) (Samraoui *et al.* 2008).

Discussion

Until recently, the Greater Flamingo was believed to breed only sporadically in North Africa (*e.g.* once in every 15 years) (Isenmann and Moali 2000). Past records, mostly from the 20th century supported this belief. Recent surveys in Algeria have cast doubt on this long-held assumption, but the reasons for the apparently more frequent breeding are not clear. The large increase in the Mediterranean population over the last 30 years (Johnson 1983; 2000) may have been the driving force, and almost certainly Algerian colonies have been overlooked in the past. The Ezzemoul

colony is at least a century old (Saheb *et al.* 2006) and more colonies may have existed in the past or may still be undetected in the vast expanses of the Hauts Plateaux and the Sahara.

Our survey spanned only six years, a relatively short period for the long-lived Greater Flamingo, and thus it may not provide us with the full range of the species' behavioural plasticity and habitat use in the region. Although drought prevented breeding in 2007 and 2008, the study period as a whole may also have coincided with a relatively favourable wet period. One feature of the Algerian Hauts Plateaux, with both Ezzemoul and Bazer Sakra located at an altitude of 900 m, is that nesting starts relatively late in the season (May) compared to other colonies around the Mediterranean. This comparatively late breeding may be a penalising factor to the Ezzemoul colony with chicks facing desiccating temperatures and potentially becoming exposed to terrestrial predators. In the race to fledge, late-hatching chicks face greater odds.

Another feature of the Algerian Hauts Plateaux is the patchy nature of foraging sites which may vary from one year to another. Chick provisioning is highly dependent on the degree of connectivity between the breeding and foraging sites (Amat *et al.* 2005). Various studies have shown that chick condition and survival may be dependent on wetland connectivity (Amat *et al.* 2005, 2007) and on the length of the hydro period (Cézilly *et al*. 1995; Béchet & Johnson 2007). In the context of global climate changes, breeding in North Africa may become problematic because predicted large-scale climatic variations may negatively affect the North African semi-arid zones (Béchet & Johnson 2007) and a change in the degree of connectivity of local wetlands may adversely tip the balance by increasing flight distances performed by foraging flamingos during the breeding season.

Climate-caused hydrological changes may be exacerbated by human interventions, and the recent proliferation of dams and reservoirs represents a major concern to conservationists, threatening as they do the majority of salt lakes in the Hauts Plateaux. It is feared that the Algerian colonies may undergo the same fate as Dayet Iriki in Morocco which disappeared following the damming of Oued Draa (Johnson 1979). Already many Algerian wetlands (*e.g.* Garaet Boulehilet, Daiet Tiour, Guelif and Chott Hodna) have been totally or partially drained by dam construction (Samraoui & Samraoui, In press). Because of the extensive interchange between colonies around the Mediterranean, the loss of a number of foraging and breeding sites in North Africa could be disastrous and we can only guess at the repercussions it could have on the dynamics of the Mediterranean metapopulation.

North African wetlands not only serve as important breeding sites for the Greater Flamingo and many other waterbirds (Samraoui & Samraoui, In press), they are important wintering quarters and migration stopovers (Boulkhssaïm *et al.* 2006). Recent banding of chicks from the Ezzemoul colony has shown that dispersal is widespread across the Mediterranean and it is expected that many of these birds will eventually breed in different colonies in southern Europe, shedding new light into the dynamics of the species in the area.

All three nesting sites (Ezzemoul, Bazer Sakra and El Goléa) are recognised as Important Bird Areas (IBAs) and whereas Ezzemoul is in the process of being classified as a Ramsar site, the latter two have been so designated since 2004. It is hoped that local efforts and international cooperation would help ensure the long-term conservation of habitats of an important flagship species.

Acknowledgements

We thank members of the Laboratoire de Recherche des Zones Humides (colleagues and students) who generously provided assistance in the field. We also thank the Algerian Ministère de l'Enseignement Supérieur et de la Recherche Scientifique, l'A.N.D.R.U., l'O.N.E.D.D. for grants and we are most grateful to Luc Hoffmann and the MAVA foundation for material support.

References

Allen, R. P. 1956. The Flamingos: their life history and survival. National Audubon Society, NY.

Amat, J. A., Rendon, M. A., Rendon-Martos, M., Garrido, A. and Ramirez, J. M. 2005. Ranging behaviour of greater flamingos during the breeding and post-breeding periods: linking connectivity to biological processes. Biological Conservation 125: 183-192.

Amat, J. A., Hortas, F., Arroyo, G. M., Rendon, M. A., Ramirez, J. M., Rendon-Martos, M., Pérez-Hurtado, A. and Garrido, A. 2007. Interrannual variations in feeding frequencies and food quality of greater flamingo chicks (*Phoenicopterus roseus*): evidence from plasma chemistry and effects on body conditions. Comparative Biochemistry and Physiology, Part A. 147: 569-576.

Béchet, A. and Johnson, A.R. 2007. Anthropogenic and environmental determinants of Greater Flamingo *Phoenicopterus roseus* breeding numbers and productivity in the Camargue (Rhone delta, southern France). Ibis 150: 69-79.

Boulkhssaïm, M., Houhamdi, M. and Samraoui, B. 2006. Population dynamics and diurnal behaviour of the Shelduck *Tadorna tadorna* in the Hauts Plateaux, northeast Algeria. Wildfowl 56: 65-78.

Cézilly, F., Boy, V., Green, R. E., Hirons, G. J. M. and Johnson, A. R. 1995. Interannual variation in greater flamingo breeding success in relation to water levels. Ecology 76: 20-26.

Isenmann, P. and Moali, A. 2000. Birds of Algeria. Société d'Etudes Ornithologiques de France, Paris.

Isenmann, P., Gaultier, T., El Hili, A., Azafzaf, H., Dlensi, H. & Smart, M. 2005. Birds of Tunisia. Centre national du Livre.

Johnson, A. R. 1979. L'importance des zones humides algériennes pour les flamants roses (*Phoenicopterus ruber roseus*). Rapport de l'Institut National d'Agronomie, Alger.

Johnson, A. R. 1983. Etho-écologie du Flamant rose (*Phoenicopterus ruber roseus* Pallas) en Camargue et dans l'ouest Palearctique. Thèse de doctorat d'Université, Université Paul Sabatier de Toulouse, France.

Johnson, A. R. 2000. Flamingo Specialist Group: past, present, and future activities. In: Baldassare, G. A., Arengo, F. and Bildstein, K. L., editors. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1): 200-205.

Lavauden, L. 1924. Voyage de M. Guy Babault en Tunisie. Résultats scientifiques. Oiseaux. Paris.

Saheb, M., Boulkhssaïm, M., Ouldjaoui, A., Houhamdi, M. and Samraoui, B. 2006. Sur la nidification du Flamant rose *Phoenicopterus roseus* en 2003 et 2004 en Algérie. Alauda 74: 368-371.

Samraoui, B. and Samraoui, F. in press. An ornithological survey of Algerian wetlands: Important Bird Areas, Ramsar sites and threatened species. Wildfowl 58.

Samraoui, B., Chakri, K. and Samraoui, F. 2006. Large branchiopods (Branchiopoda: Anostraca, Notostraca and Spinicaudata) from the salt lakes of the Eastern Hauts Plateaux, Algeria. Journal of Limnology 65: 83-88.

Samraoui, B. Ouldjaoui, A., Boulkhssaïm, M., Houhamdi, M., Saheb, M. and Béchet, A. 2006. Behavioural and ecological aspects of the first successful reproduction of the Greater Flamingo *Phoenicopterus roseus* in Algeria. Ostrich 77: 153-159.

Samraoui, B., Boulkhssaim, M., Bouzid, A., Bensaci E., Germain, C., Bechet, A. and Samraoui, F. in press. Current research and conservation of the Greater Flamingo in Algeria. In: Béchet, A., Rendón-Martos, M., Baccetti, N. and Childress, B. (eds.) 2008. *Flamingo*, Bulletin of the IUCN-SSC/Wetlands International Flamingo Specialist Group, Special Issue 1: Proceedings of the IVth International workshop on the Greater Flamingo in

the Mediterranean region and northwest Africa, Anteguerra, Spain, 5-6 November 2007. Wildfowl & Wetlands Trust, Slimbridge, UK.

La Reproducción del flamenco común (*Phoenicopterus roseus*) en la Reserva Natural la laguna de Fuente de Piedra (España) durante el año 2008

Garrido, A.[1] and Rendón-Martos, M.[1]

[1] Reserva Natural Laguna de Fuente de Piedra, apartado de correos 1 (oficial) 29520 Fuente de Piedra, Málaga-España. E-mail :araceli.garrido.ext@juntadeandalucia.es

Resumen

Durante el año 2008, las precipitaciones registradas antes del inicio de la reproducción en la Laguna de Fuente de Piedra han sido escasas. No obstante, los flamencos han continuado visitando la laguna, hasta que las lluvias de abril han permitido un rápido ascenso en el nivel de agua y el establecimiento de una colonia de reproducción formada por 1500 parejas con un nivel de agua relativamente bajo (28 cm) y en fechas muy tardías, a finales de abril. El incremento de la evaporación determinó un rápido descenso de nivel (17 cm el 7 de mayo). La disminución de la protección natural que ofrece el agua al territorio de cría y el bajo número de ejemplares que acometieron la reproducción, determinaron que las aves abandonasen la puesta a las dos semanas de haber iniciado la reproducción. En los meses de julio y agosto, fue posible observar unos 50 flamencos inmaduros construyendo nidos y con actividad de cortejo, pero sin realizar puestas en la zona de la desembocadura del Arroyo del Charcón, fuera de la zona de colonia.

Summary

During 2008 there was little rainfall at Fuente de Piedra before the beginning of breeding. Nevertheless, flamingos continued visiting the lake until the rains in April, which caused a rapid rise in water level and the establishment of a breeding colony of 1,500 pairs at the relatively late date of 28 April and with relatively low water level (28 cm). Increased evaporation caused a rapid decrease in water level (17 cm on 7 May). The lowering of natural protection of the breeding colony offered by the water and the low numbers of birds committed to breeding meant that the eggs were abandoned just two weeks after starting incubation. In July and August some 50 immature flamingos were observed constructing nests and with courtship activity, but without any laying in the area of the mouth of the Arroyo del Chacón, outside the region of the colony.

Introducción

La Laguna de Fuente de Piedra acoge una de las colonias de reproducción de flamencos más importantes del Mediterráneo, cuando el nivel de agua determina el aislamiento de los territorios de cría (Rendón-Martos y Jonson, 1996). No obstante, su carácter de laguna endorreica y temporal implica que las precipitaciones determinen el nivel de agua y en último término el establecimiento o no de una colonia de reproducción.

Material y methodo

Área de estudio

La Laguna de Fuente de Piedra está situada en una cuenca endorreica en el sur de España (37º 6' N y 4º 46' W). Se trata de una laguna temporal tipo playa, con ciclos hidrológicos irregulares, que se caracterizan por frecuentes sequías estacionales y un alto grado de imprevisibilidad. Su funcionamiento hidrológico es natural, dependiendo sólo y exclusivamente de las precipitaciones que se producen en su cuenca. Esta laguna presenta una extensión de 1350 ha siendo, por lo general, poca profunda (García, et al. 1997). La laguna de Fuente de Piedra tanto por su carácter salino, por su extensión, la más grande de Andalucía, y por el conjunto de sus rasgos físicos y bióticos, es uno de los más importantes y singulares de la Península Ibérica. El territorio en que los flamencos han intentado la reproducción en 2008 está situado en una zona central de la

laguna, siendo restos del antiguo canal central que utilizaba la industria salinera que la explotaba hasta mediados del siglo pasado. Esta zona es conocida como Isla de Senra.

La desembocadura del Arroyo del Charcón es una entrada de agua natural a la laguna en su orilla este. Es estos momentos recoge las aguas procedentes de las depuradoras de un municipio cercano. Esta zona es utilizada por las aves en Fuente de Piedra como refugio de agua dulce, para beber y bañarse, debido a la alta salinidad que presenta el resto del vaso.

Toma de datos

El seguimiento de la colonia de reproducción se ha realizado dentro del Programa de Anillamiento de Flamencos que la Consejería de Medio Ambiente de la Junta de Andalucía desarrolla desde el año 1986 en esta Reserva Natural. Para el control de las aves reproductoras se cuenta con una torre de observación situada a 250 metros de la Isla de Senra. Los censos se han realizado desde puntos previamente fijados y el seguimiento de las aves del Charcón desde un observatorio o desde puntos próximos.

Resultados

Las precipitaciones registradas durante el año hidrológico 2007-08 (octubre de 2007 a septiembre de 2008) en Fuente de Piedra han sido de 361,9 mm, inferior a la media (429,7 mm). Las escasas precipitaciones ocurridas durante el invierno y el inicio de la primavera (185,9 mm) (Figura 1) determinaron que la laguna presentase unos niveles de agua muy bajos (16 cm) (Figura 2) durante el mes de marzo, cuando los flamencos suelen ocupar su territorio de reproducción.

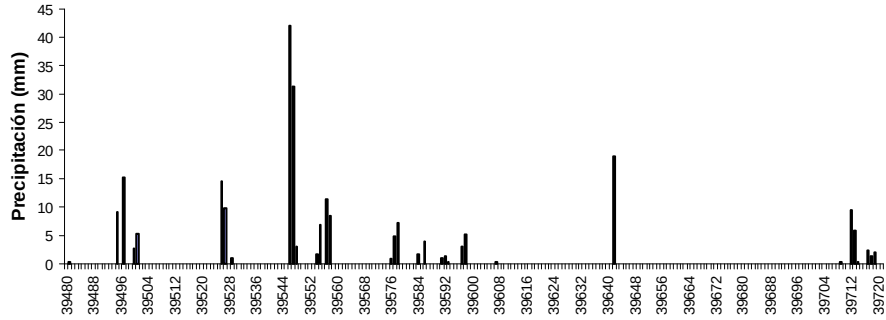


Figura 1: Precipitaciones registradas en la Laguna de Fuente de Piedra durante el periodo febrero-septiembre de 2008.

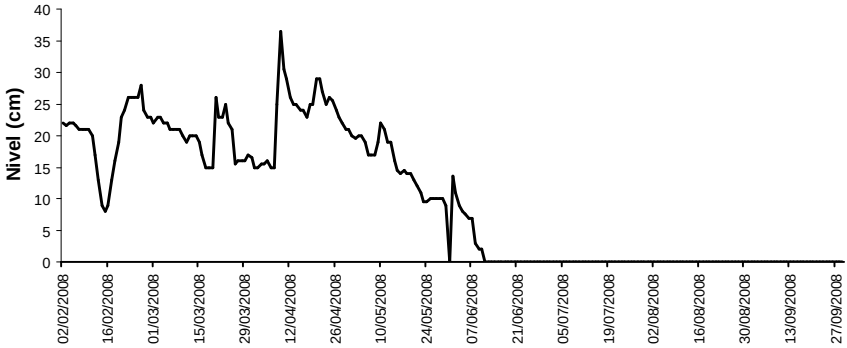


Figura 2: Niveles de agua alcanzados en la Laguna de Fuente de Piedra durante el periodo febrero-septiembre de 2008.

El número de flamencos en la laguna presentó importantes fluctuaciones (Figura 3). Estas variaciones en el número de efectivos coinciden con los cambios en el nivel de agua que la laguna ha venido sufriendo a lo largo del periodo. Ha comienzos del mes de febrero se encontraban en la laguna unos 300 flamencos y terminó el mes con más de 2000 debido al aumento del nivel de agua, este mismo efecto se produjo desde primeros de marzo a mediados de abril. El máximo de efectivos se registró en el periodo de agregación de aves a la colonia, disminuyendo de forma notable a partir del abandono de la reproducción. Durante la época estival se mantuvo un número constante de individuos en la zona de la desembocadura del Arroyo del Charcón.

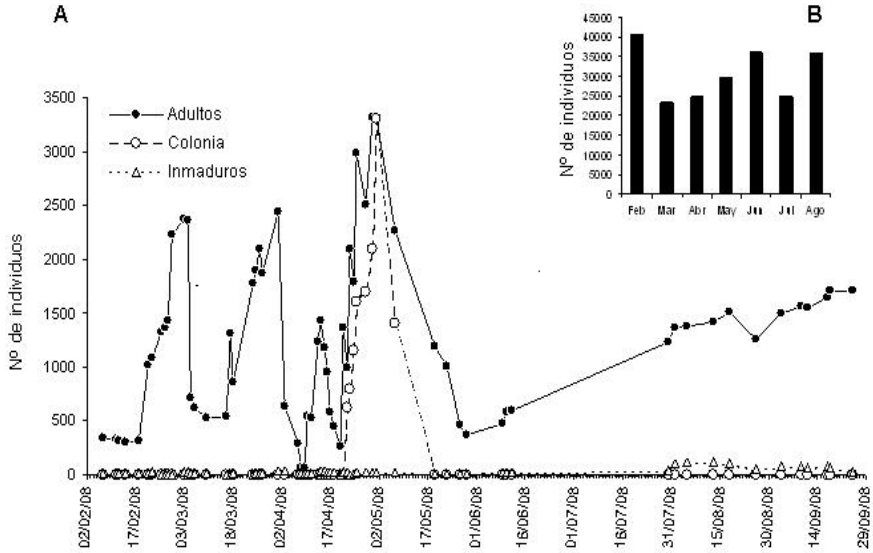


Figura 3: Número de individuos censados en la Laguna de Fuente de Piedra durante el periodo febrero-septiembre de 2008.

El control de aves anilladas y los censos diarios antes del atardecer, durante los meses de mazo y abril coincidiendo con el inicio de la reproducción en las colonias de flamencos del Mediterráneo, permitieron comprobar como las aves que ocupaban la laguna durante el día, la abandonaban a la puesta del sol y durante la noche otras aves llegaban permaneciendo en la laguna uno o dos días. Lo que pone de manifiesto que los flamencos que se encontraban en condiciones para iniciar la reproducción, accedían a Fuente de Piedra para evaluar si este humedal reunía condiciones para acoger una colonia de cría.

Las elevadas lluvias registradas durante las tres primeras semanas del mes de abril (105,1 mm) permitieron un rápido ascenso del nivel de agua hasta los 28 cm, por debajo del límite mínimo para que tenga lugar las condiciones adecuadas para el inicio del proceso de reproducción en esta laguna (Rendón-Martos, 1996). No obstante, el día 22 de abril, en fechas muy tardías, se establecieron las primeras parejas reproductoras en la Isla de Senra, agregándose aves hasta albergar un núcleo reproductor formado por 1500 parejas para los primeros días del mes mayo. Posteriormente, cesaron las precipitaciones, las temperaturas se incrementaron de forma significativa, lo que unido a los fuertes vientos determinaron que el nivel

de la laguna descendiera a 17 cm para el día 7 de mayo. La escasa lámina de agua y los fuertes vientos de sureste y poniente, hicieron que la colonia de reproducción se encontrase desprotegida frente a los depredadores terrestres (*Vulpes vulpes*). La disminución de la protección natural que ofrece el agua al territorio de cría y el bajo número de ejemplares que acometieron la reproducción, determinaron que las aves abandonasen la puesta y a las dos semanas no quedarán flamencos incubando y todos los huevos fueron depredados por *Gaviota Patiamarilla Larus cachinnans*).

A partir de junio, con el estiaje de la laguna, solo se mantuvo inundada la desembocadura del Arroyo del Charcón. En esta zona permanecieron unos 1400 flamencos durante todo el verano. En los meses de julio y agosto, fue posible observar alrededor de 50 flamencos construyendo nidos y con actividad de cortejo, pero sin realizar puestas. Se trataba de individuos mayoritariamente inmaduros que han aprovechado la ausencia de una colonia de cría en Fuente de Piedra, para ir tomando experiencia en las actividades relacionadas con la reproducción.

Discusión

En los humedales temporales, como Fuente de Piedra, las precipitaciones determinan el nivel de agua y en último término el establecimiento o no de una colonia de reproducción y su éxito reproductor. Por el contrario, las salinas industriales presentan cada año un nivel de agua estable y previsible para estas aves, como consecuencia de los procesos salineros (Rendón-Martos y Johnson, 1996; Johnson & Cézilly 2007).

Las escasas precipitaciones durante la primavera de 2008 han sido el factor determinante del bajo nivel de agua en la laguna de Fuente de Piedra y consecuentemente del fracaso de la colonia de reproducción. No obstante, será interesante comprobar si la inundación en fechas tardías del Estanque de Fangassier en La Camarga (Francia) (Béchet A., com. per.) puede haber favorecido la gran afluencia de aves a esta laguna y el inicio de la reproducción en una fecha tardía, cuando los niveles de agua eran insuficientes.

Bibliografía

Johnson, A. & Cézilly, F. 2007. *The Greater Flamingo*. T & AD Poyser, London.

García, C. M., García-Ruiz, R., Rendón, M., Xavier Niell, F., and Lucena, J., 1997. Hydrological cycle and interannual variability of the aquatic community in a temporary saline lake (Fuente de Piedra, Southern Spain). *Hydrobiologia* 345: 131–141, 1997.

Rendón-Martos, M., 1996. La Laguna de Fuente de Piedra en la dinámica de la población de flamencos (*Phoenicopterus ruber roseus*) del Mediterráneo Occidental. PhD thesis, University of Málaga.

Rendón-Martos, M. y Johnson, A.R. 1996. Manegement of nesting sites for Greater Flamingos. Colonial Waterbirds Special Publication 19: 167-183.

Odiel Marshes: A new breeding site for Greater Flamingos (*Phoenicopterus roseus*) in Spain

Rendon-Martos, M. [1], Garrido, A. [1] Chávez, J. [2], Méndez, J.M. [2] and. Sayago. J. M [2]

[1] *Reserva Natural Laguna de Fuente de Piedra, apartado de correos 1 (oficial) 29520 Fuente de Piedra, Málaga-España. E-mail: rendon.martosf@juntadeandalucia.es*
[2] *Paraje Natural Marismas del Odiel, Ctra. Dique Juan Carlos I, km 3, Apdo. correos 720, 21071 Huelva*

Site description
The Odiel Marshes (37º17′ N, 06º 55′ W) are an estuarine complex at the confluence of the Odiel and Tinto rivers in southwest Spain. They comprise 6,000 ha of intertidal mudflats and 1,185 ha of saltpans (Aragonesas Saltpans) and are designated a Biosphere Reserve, Ramsar site, EU-SPA and Paraje Natural.

Flamingo breeding history at Odiel Marshes
Prior to 1989, small colonies of Greater Flamingos regularly attempted to breed in the Aragonesas Saltpans without success. In 1989 and 1990, an artificial breeding island of 211 m^2 was built especially for the flamingos in evaporator salt pan E-11 (Garrido 1996). The years 1989 to 2002 saw a series of small, sporadic, but mostly successful colonies: 1989: 66 nests, 1993: 100 nests, 1995: 85 nests (Garrido 1996). Between 1998 and 2002, small colonies attempted to breed but no eggs were laid (Rendón-Martos 2003).

In 2008, the flamingos bred in large numbers on the artificial island (Figure 1). The colony was first recorded by J. Chávez, J. M. Méndez and J. M. Sayago (Paraje Natural) on 12 April 2008. The first eggs were observed on 25 April and chicks were first recorded on 22 May, when they were estimated to be 2-3 dais old, so egg-laying would have started c.20 April. The last successful hatching was observed on 10 June. The colony consisted of approximately 500 breeding pairs and 399 chicks.

Monitoring the breeding colony
As part of a larger waterbird monitoring program, the staff of the Paraje Natural monitored the new breeding colony. Fourteen visits were made in May-June by A. Garrido to search for ringed individuals, and ringed birds from both the Camargue and Fuente de Piedra were recorded. It is estimated that approximately 20% of the ringed birds recorded were from the Camargue, while 80% were from Fuente de Piedra.

The Ringing Scheme
As part of the programme: "Long-term Studies and Conservation of Greater Flamingos in Fuente de Piedra (Consejería de Medio Ambiente, Junta de Andalucía)" a chick ringing operation was organised on 19 July 2008 in cooperation with the staff of the Paraje Natural and Aragonesas Saltpans. All 393 remaining chicks were captured and ringed with Darvic rings marked with a specific code for Odiel Marshes (J|XX where X represents an alphanumeric character) and metal rings. The ringing methodology was identical to that conducted at Fuente de Piedra. At dawn, two hundred beaters divided into teams of four, set out to surround the crèche and helped drive the flock into the corral. The ringing operation was also used to record several biometric measurements (weight, length of the tarsus, wing and bill) and an estimation of the crop volume, as well as extracting blood samples for other studies (*e.g.* Avian Influenza, sex determination, and genetic research).

The breeding of the Greater Flamingo in the Aragonesas Saltpans this year is probably related to the absence of suitable breeding conditions in the Fuente de Piedra Lagoon, one of the principal breeding sites in Spain and the Mediterranean (Rendon-Martos and Johnson 1996).

Figure 1. Breeding colony of the Greater Flamingo at Odiel Marshes, July 2008 (A. Garrido)

References

Garrido, H., 1996. *Aves de las Marismas del Odiel y su entorno*. Ed. Rueda. Alcorcón.

Rendón-Martos, M. y Johnson, A. R. 1996. Management of nesting sites for Greater Flamingos. Colonial Waterbirds Special Publication 19: 167-183.

Rendón Martos, M. 2003. Flamenco Común. En R. Martí y J. C. del Moral (Eds.). *Atlas de las Aves Reproductoras de España*. Dirección General de Conservación de la Naturaleza-Sociedad Española de Ornitología. Madrid (128-129).

Two new Greater Flamingo (*Phoenicopterus roseus*) breeding sites in Italy

Baccetti, N.[1], Panzarin, L.[2], Cianchi, F.[3], Puglisi, L.[3], Basso, M.[4] and Arcamone, E.[3]

[1]*ISPRA (formerly INFS), I-40064 Ozzano Emilia BO. E-mail: nicola.baccetti@infs.it*
[2]*via Leopardi 5, I-30020 Torre di Mosto VE*
[3]*Centro Ornitologico Toscano, CP470, I-57100 Livorno LI*
[4]*via Ivrea 20A, I- 35142 Padova PD*

The steady increase and expansion of the Mediterranean Greater Flamingo population over the last two decades has implied the regular establishment of new colonies (Johnson and Cézilly 2007). However, the number of sites that have hosted successful breeding events is still relatively low in comparison to other colonial waterbirds (24 sites, not all regularly occupied: Johnson and Cézilly 2007, Boulkhssaïm *et al*. 2006, Azafzaf *et al.* 2007). Breeding attempts, or 'false-breeding' (Johnson and Cézilly 2007), has occurred at a much larger number of sites.

The first Italian Greater Flamingo chicks were hatched in Sardinia in 1993, and very shortly thereafter the birds established new colonies in central and southern Italy (Orbetello, Tuscany in 1994 and Margherita di Savoia, Apulia in 1996: Johnson and Cézilly 2007, and references therein). In 2000 a new colony at Comacchio saltpans, on the edge of the present-day Po Delta in northern Italy, began producing young. Some of the initial breeding birds were individually marked birds that apparently relocated from the colonies at Orbetello and the Diaccia Botrona marshes 44 km to the north of Orbetello, following several years of breeding failures. Following an eight-year hiatus, two new colonies were established in 2008.

Lagoon of Venice, in north-eastern Italy, is one of the largest coastal lagoons of the Mediterranean (>50,000 ha), and one of the very few in the region to be affected by remarkable tidal movements (Smart and Vinals 2004). In the past, approximately 9,000 ha were dammed and traditionally have been managed as large fishponds and/or private hunting areas ('valli'). In the northernmost of them (Valle Dragojesolo, 1,200 ha), Greater Flamingos attempted breeding and laid eggs in spring 2007, but they abandoned the site following shooting and disturbance allegedly aimed at cormorant scaring.

A colony was again reported in May 2008, on an islet within a remote part of Valle Dogà (1,980 ha, the largest of all the Venetian valli). The new site (45.34° N, 12.33' E) was about five kilometres from the 2007 colony. The local property owners and managers allowed some mild form of monitoring and eventually even ringing. Two newly-hatched chicks and at least three eggs were observed from a distance on 30 April, among 50-60 apparently breeding adults. The estimated onset of egg-laying, 31 March, would therefore precisely match observations at the nearest large colony (Comacchio, G. Arveda pers. comm.).

On 27 May, about 45 nest mounds were counted on an islet of about 80 m^2 (area actually covered by nests: 50 m^2), while a small crèche of 22 young chicks was present nearby. On 7 July, a new count of the empty nest mounds showed they had increased to 173 (Figure 1). On 17 July a team attempted to ring the chicks, but were successful in ringing only seven, as the remainder were already capable of flying. All 22 chicks fledged, but it is not known how many survived after a strong hailstorm that hit this area on the night of 24-25 August. This caused at least 100 casualties, within a flock that by then had increased to about 2,000 individuals and included several marked juveniles coming from other colonies. Among adults observed on the Venice colony site during April, May and June we recorded nine individuals ringed as chicks at Comacchio, three from the Camargue and just one from Sardinia, all aged two to five years (mean 3.4).

Figure 1. Nest mounds of Valle Dogà colony on 7 July 2008 (Photo D. Cester).

Diaccia Botrona, in central Italy (42.46° N, 10.55' E) is a natural coastal wetland of c. 800 ha. It has been a Ramsar site since 1991. A steady lowering of the groundwater level and continuous release of saline water from nearby fish farm pumps has turned this site from a reed bed into an open salt marsh. Here Greater Flamingos have repeatedly attempted to breed, especially in the years 1997-1999, but always failed due to regular drying up of the marshes in May or June. The colonies were never closely monitored and it is not known whether laying ever occurred.

Extraordinary rains between 13 May and 17 June 2008 (more than twice the average of the last decade for both May and June) prompted us to visit the area on 23 May, after 80 mm of rain had fallen in five days. A total of 800 Greater Flamingos were counted, of which about 200 were densely packed on two distinct breeding spots 60 m apart. A closer approach was only possible on 1 August, when two groups of 70 and 10 empty nests were counted. Only two chicks, about 40 days old, were present. Their apparent age suggested a laying date around 20 May, *i.e.* 6 weeks after laying had started at the nearest colony (Comacchio, see above) and just one week after heavy rains had begun. Quite remarkably, not all nests were placed on islets or emergent soil, although these were available. Many had been built directly on the lagoon bottom in the shallows (Figure 2), on a deep and sticky layer of mud which had probably prevented wild boars from raiding the colony. No monitoring of marked breeders was possible, despite additional visits on 4, 9 and 12 August. Both chicks were observed again on these dates.

Acknowledgements. In Venice we are most grateful to Eng. Giancarlo Zacchello and Roberto Sperandio from Blue Valley s.r.l.; Angelo Brugnerotto, Luisella Penzo, Giuseppe Cherubini, Francesca Borgo and Renato Anoè from the Venice Province administration; to the Mestre Canoe Centre and all participants to the Valle Dogà ringing operation. For Diaccia Botrona, access authorizations were provided by Paolo Stefanini and Pietro Giovacchini (Grosseto Province Administration).

Figure 2. One of the two groups of nests at Diaccia Botrona, with nest mounds directly emerging from the lagoon bottom as a possible anti-predatory adaptation (Photo L. Puglisi).

References

Azafzaf, H., Feltrup-Azafzaf, C. & Dlensi, H. 2007. Breeding of Greater Flamingo *Phenicopterus roseus* in Salines de Thyna, Tunisia. Pp 13-14. In: Childress, B., Arengo, F., Bechet, A. & Jarrett, N. (eds.) 2007. *Flamingo*, Bulletin of the IUCN-SSC/Wetlands International Flamingo Specialist Group, No. 15, December 2007. Wildfowl & Wetlands Trust, Slimbridge, UK.

Boulkhssaïm, M., Houhamdi, M., Saheb, M., Samraoui, F and Samraoui, B. 2006. Breeding and banding Greater Flamingo *Phoenicopterus roseus* in Algeria, August 2006. Pp 21-23. In: Childress, B., Arengo, F., Bechet, A. & Jarrett, N. (eds.) 2006. *Flamingo*, Bulletin of the IUCN-SSC/Wetlands International Flamingo Specialist Group, No. 14, December 2006. Wildfowl & Wetlands Trust, Slimbridge, UK.

Johnson, J. and Cézilly, F. C. 2007. The Greater Flamingo. T. & A. D. Poyser, London

Smart, M. and Vinals, M. J. 2004. The Lagoon of Venice as a Ramsar site. Provincia di Venezia, 63 pp.

Découverte de deux colonies de Flamants roses dans l'Aftout es Saheli, Mauritanie le 29 février 2008

Diawara, Y.[1], Siddaty, Z.[2] and Béchet, A.[3]

[1]Parc National du Banc d'Arguin, BP 5355 Nouakchott, République Islamique de Mauritanie. E-mail: yelli-pnba@mauritania.mr
[2]Direction des Aires Protégées et du Littoral, Nouakchott, République Islamique de Mauritanie
[3]Tour du Valat, Le Sambuc, 13200 Arles, France.

Summary
A joint mission of Banc d'Arguin National Park, Diawling National Park, and the Department of Protected Areas and Littoral confirmed the nesting of Greater flamingos (*Phoenicopterus roseus*) in the Aftout es Saheli, near Diawling National Park in southern Mauritania. On 29 February, two colonies of flamingos were discovered in Aftout es Saheli (16° 41' 53" N and 16° 20' 03" W). The largest (~ 1,200 pairs) had reached an advanced stage of reproduction with chicks aged ~ 2 weeks. The second (~ 200 pairs) was still at the incubation stage. Several flamingo breeding attempts have been reported in this sector, but the last report of successful reproduction (fledglings) was in 1988, *i.e.* 20 years ago (Johnson 1989).

A second mission took place from 14 to 16 March 2008. The small colony of 200 pairs was totally abandoned, but there were nearly 800 chicks in the main colony. Although more than 70% of the crèche appeared to be less than three weeks old, the colony surroundings were dry. Nevertheless, a substantial number of fledglings were observed between June and August 2008 (58 chicks at Banc d'Arguin and 136 in the Senegal River delta) suggesting that this breeding attempt was successful. Two groups of displaying Lesser Flamingos (150 and 300 individuals) were also observed, but with no sign of a breeding attempt.

Résumé
Une mission conjointe du Parc National du Banc d'Arguin, du Parc National du Diawling et de la Direction des Aires Protégées et du Littoral a confirmé la nidification des Flamants roses (*Phoenicopterus roseus*) dans l'Aftout es Saheli, zone périphérique du Parc National du Diawling en 2008. Le 29 février 2008, deux colonies de Flamants roses ont été découvertes à l'extrême Est de l'Aftout es Saheli (16°41 53N et 16°20 03W). A cette date, la plus grande avait atteint un stade avancé avec des poussins âgés de deux semaines, ce qui suggère que les premières pontes ont eu lieu à la mi-janvier. La seconde colonie était encore au stade d'incubation. La grande colonie comptait 1200 couples et la seconde 200 couples. Cela fait plusieurs années que des tentatives de reproduction de Flamants roses sont reportées dans ce secteur mais la dernière preuve d'une reproduction réussie (envol des jeunes) date de 1988 soit près de 20 ans (Johnson 1989). Une seconde mission a été menée du 14 au 16 mars 2008. La petite colonie de 200 couples était abandonnée. Par contre, près de 800 poussins étaient présents à l'emplacement de la grande colonie. A cette date, il n'y avait plus d'eau aux abords de l'îlot alors que plus de 70% de la crèche était âgée de moins de trois semaines. Les poussins restaient donc exposés à toutes sortes de prédateurs, y compris les collecteurs d'œufs et de poussins, dont la présence était probable étant donné le grand nombre de traces de pas observées autour du site. Cependant un nombre significatif de juvéniles volants a été observé entre juin et août 2008 dont 58 poussins au Banc d'Arguin et 136 au delta du fleuve Sénégal. A cette période, vu l'âge des oiseaux observés et l'échec de la reproduction au Parc national du Banc d'Arguin (voir *Old world news* dans ce numéro), il ne fait pas de doute que ces juvéniles provenaient de l'Aftout es Saheli. Nous avons également observé deux groupes de flamants nains (*Phoeniconaias minor*) de 150 et 300 individus en parade. Mais, il ne restait plus suffisamment d'eau dans la lagune de l'Aftout pour accueillir de nouvelles colonies.

Johnson, A. R. 1989. Notes from the regions (Old World). IWRB – ICBP. *Flamingo Research Group Newsletter* 5: 3-6.

First confirmed breeding record of the Lesser Flamingo (*Phoeniconaias minor*) in Ethiopia

Bozic, L.[1] and Ewnetu, M.[2]

[1]*DOPPS-BirdLife Slovenia, Kamenskova 18, SI-2000 Maribor, Slovenia.*
E-mail: luka.bozic@dopps-drustvo.si
[2]*Ethiopian Wildlife Conservation Authority , PO Box 10-17-50,*
E-mail: mihretewnetu@yahoo.com

Thousands of adult Lesser Flamingos and a crèche of 2,500 - 3,500 chicks of different ages were observed on the northern shore of Lake Abiata in Abiata-Shala National Park on 9 October 2005 (Figure 1). Some nests still contained incubating birds, but most chicks appeared to have hatched by the time of our visit. The colony was situated on muddy and unstable ground formed by the receding lake water level. Access to the area was difficult, probably making the colony safe from disturbance by predators and humans. This is the first confirmed breeding of the Near-threatened (IUCN 2008) Lesser Flamingo in Ethiopia.

Figure 1: Lesser Flamingos *(Phoeniconaias minor)* breeding at Lake Abijata in Abijata - Shalla Lakes National Park, Ethiopia, October 2005 (Photo Luka Bozic).

Previously, there were observations of the species building nests at lakes Abiata and Basaaka, but not breeding successfully (Urban & Brown 1971). The last recorded breeding attempt was in March 1991 (Ekube Mickael Ahferom, *pers. comm.*). Following our observations in 2005, Lesser Flamingo breeding at Lake Abiata was observed again in 2006 (Borrow 2006). Regular Lesser Flamingo breeding in Ethiopia would be of international importantance, due to this Near-threatened species' current dependance on only five regular breeding sites throughout a vast range that spans much of Africa, southwest Asia and India (Childress *et al.* in press). The only known regular breeding site in East Africa, where >75% of the species' global population occurs is on Lake Natron in Tanzania (BirdLife International 2008). Zimmerman *et al.* (1996) mention breeding of the Lesser Flamingo on lakes Natron, and Magadi and Logipi in Kenya. However, in the last 45 years breeding was successful only at Lake Natron. (Childress *et al.* in

press). According to Childress *et al.* (2007) the key site network for the Lesser Flamingo in East Africa consists of eight permanent alkaline lakes and one ephemeral wetland in Kenya and Tanzania. Confirmed breeding of the Lesser Flamingo at Lake Abiata in 2005 and 2006, together with evidence of movements between Ethiopia and other parts of the East African range (Urban & Brown 1971, Brown *et al.* 1982), suggests that Lake Abiata be considered as a part of this key site network.

In 2008, a visit to Lake Abiata was made on 19 July, approximately the same date when Lesser Flamingos were observed nesting in the previous years. There were many flamingos gathered along the shore, but no nests were found. The lake water level was very low, having receded a long way as the result of a prolonged dry period in the country and the efficts of water extraction by the soda ash factory which has been pumping water from the lake since 1987. The swampy habitat which had protected the breeding flamingos from interference was totally dry only flooded by rain water which can get dry in a few days. People and predators can easily reach the breeding site. There were many cattle near the lake and we recorded three Common Jackals (*Canis aureus*), a common Lesser Flamingo predator, very near the birds. Even though the lake is an Important Bird Area and is within a national park, it is not legally protected and human disturbance of the birds' breeding site is high.

References

BirdLife International 2008. Species factsheet: *Phoeniconaias minor*. Downloaded from http://www.birdlife.org on 2/11/2008

Borrow, N. 2006. Ethiopia. Birdquest trip report. Downloaded from http://www.birdquest.co.uk/reportFiles/ETHIOPIA%20REP%2006.pdf on 6/9/2007.

Brown, L. H., Urban, E. K. and Newman, K. 1982. The Birds of Africa, Vol. 1. Academic Press, London.

Childress, B., Hughes, B., Harper, D., Van den Bossche, W., Berthold, P. & Querner, U. 2007. East African flyway and key site network of the Lesser Flamingo (*Phoenicopterus minor*) documented through satellite tracking. Proceedings of Pan African Ornithological Congress XI, Djerba, Tunisia, 20-25 November 2004. Ostrich 78 (2): 463-468.

Childress, B., Nagy, S. and Hughes, B. (Compilers). in press. International Single Species Action Plan for the Conservation of the Lesser Flamingo (*Phoeniconaias minor*). AEWA Technical Series No. --. Bonn, Germany

IUCN 2008. 2008 IUCN Red List of Threatened Species. www.iucnredlist.org. Downloaded on 02 November 2008.

Urban, E. K. & Brown, L. E. 1971. *A checklist of the birds of Ethiopia*. Addis Ababa, Ethiopia: Addis Ababa University Press.

Zimmerman, D. A., Turner, D. A. & Pearson, D. J. 1996. *Birds of Kenya and Northern Tanzania*. Christopher Helm, London.

Caribbean Flamingo breeding at Olivitos Wildlife Refuge and Fishing Reserve, western Venezuela

Espinoza, F.[1] and Perozo, H.[2]

[1]Ministerio de Ambiente, Oficina Nacional Diversidad Biológica, Dirección de Fauna, Museo Estación Biológica Rancho Grande, Maracay, Venezuela. E-mail: fkspinoza@Gmail.com
[2]Ministerio de Ambiente. Dirección Estadal Zulia. Maracaibo, Venezuela.

Abstract
From October 2006 to September 2008, we surveyed Caribbean Flamingo (*Phoenicopterus ruber*) numbers and breeding activity at Los Olivitos Wildlife Refuge and Fishing Reserve in western Venezuela. The highest numbers of flamingos occurred in October 2006 (30,000), October 2007 (24,000) and September 2008 (28,000). We also censused flamingos six times in a four-month visit to an adjoining solar saltworks, where an estimated total of 20,552 adults and 822 juveniles were counted. In 2007, the flamingo colony produced 5,200 chicks, while in 2008 they produced the highest number of chicks ever recorded at the refuge (6,450). We report two main breeding disturbances, one from an American crocodile (*Cocodrilus acutus*) that entered the breeding site in November 2007, while groups of flamingo were engaged in nest construction, and military artillery practice near the refuge in July 2008.

Resumen
Entre octubre 2006 y septiembre 2008, se realizaron censos y seguimientos de la actividad reproductiva de la población de Flamencos del Caribe (*Phoenicopterus ruber*). El mayor número de flamencos fueron observados en octubre de 2006 (30.000), octubre 2007 (24.000) y septiembre 2008 (28.000). Adicionalmente se visito durante 4 meses la compañía salinera Produsal ubicada en los límites con el refugio, donde se realizaron 6 censos que arrojaron un total aproximado de 20. 552 flamencos y 822 juveniles. El éxito reproductivo de la colonia de flamencos, produjo en 2007 un total aproximado de 5.200 pollos. Mientras que en 2008, el número de pollos supero todas las cifras jamás vista en el refugio, con un total de 6.450 pollos. Se reportan 2 perturbaciones importantes: un Caiman de la costa (*Cocodrilus acutus*) que entro en la isla de anidamiento (noviembre 2007) durante el período de cortejo y construcción de nidos y la realización de Ejercicios Militares de Artillería, en una zona cercana al refugio.

Introduction
The Los Olivitos Wildlife Refuge and Fishing Reserve in western Venezuela is an important feeding and breeding site for the southern population of the Caribbean Flamingo (Casler *et al* 1994, Casler and Esté 2000, Espinoza *et al* 2000, Espinoza and Perozo 2006). In the past 10 years, since the disastrous flooding of the breeding site in 1988, breeding success at Olivitos has steadily improved (Espinoza and Perozo 2006, Casler *et al* 1994). Flamingo censuses in this decade have recorded higher counts (Espinoza 2003, Espinoza and Perozo 2006) than those recorded during the 1990s (Lentino 1986, Espinoza 1994, Casler *et al* 1994, Espinoza *et al* 2000, Pirela 2000). In spite of unfavorable weather conditions and food shortages during the dry season months (December - March), the majority of the Los Olivitos flamingos do not need to migrate to other wetlands (Pirela 2000), since an alternative and protected feeding site is available at a solar saltworks located near the refuge. Flamingo feeding numbers have been increasing at the nearby solar saltworks (Casler and Esté 2000, Espinoza y Perozo 2006), now that salinities have stabilized and populations of food organisms seem to have become established. In the present report, we present data concerning Los Olivitos flamingo numbers and reproduction success from October 2006 to September 2008.

Study Area
The Olivitos Wildlife Refuge and Fishing Reserve (the refuge), is located in the eastern shore of El Tablazo Bay (10°50' N 71°23' W) in the state of Z ulia, western Venezuela (Figure 1). The refuge is an estuarine wetland comprised of 24,000 ha. mixed habitat types (mangroves, sandy beaches,

shallow open water, inlets). Mean annual rainfall is 500 mm. and is highly seasonal with the main rains falling between August and October, and very little between December and March (Figure 2; Espinoza and Perozo 2006)

Methods

In Venezuela, flamingo censuses are conducted only in the Los Corianos sector of the refuge, including the breeding site (Espinoza and Perozo 2006). They are not conducted in the northern sector of the refuge, where an estimated 55% of the Venezuelan flamingo population may concentrate (Pirela 2000). Counts of flamingos at Los Corianos sector were made monthly from October 2006 to September 2008 (except for April and June in both 2007 and 2008). While at the solar saltworks that borders the southern and southeastern boundaries of the refuge, flamingo counts were made in March, May, June of 2007, and in August 2007 and 2008. Estimates of flamingo numbers were made by one or two persons. For large flocks (>than 1,500 individuals), the means of counts obtained by two observers at different observation points were compared and if the difference between the counts was considered too wide, the counts were added to get a mean value. Otherwise, if both counts were close, then the larger value was selected. Flocks of <1,500 birds were counted by one observer only.

At the breeding site we counted adult flamingos that were close, around and on the nesting island as breeding birds, recording their behavior: display, nest building or incubation. We also recorded the presence of eggs on nests or on the ground, presence of chicks on the nest (0-6 days old) or at the base of the nest (>6 days), the number of chicks in crèches and plumage color (Shannon 2000) in order to calculate hatching dates. We used 15-60x spotting scopes and 8x40 binoculars. Photos of the breeding colony were regularly taken (250-600 mm zoom). All observations during breeding activity were made at a distance of approximately 250m-300m.

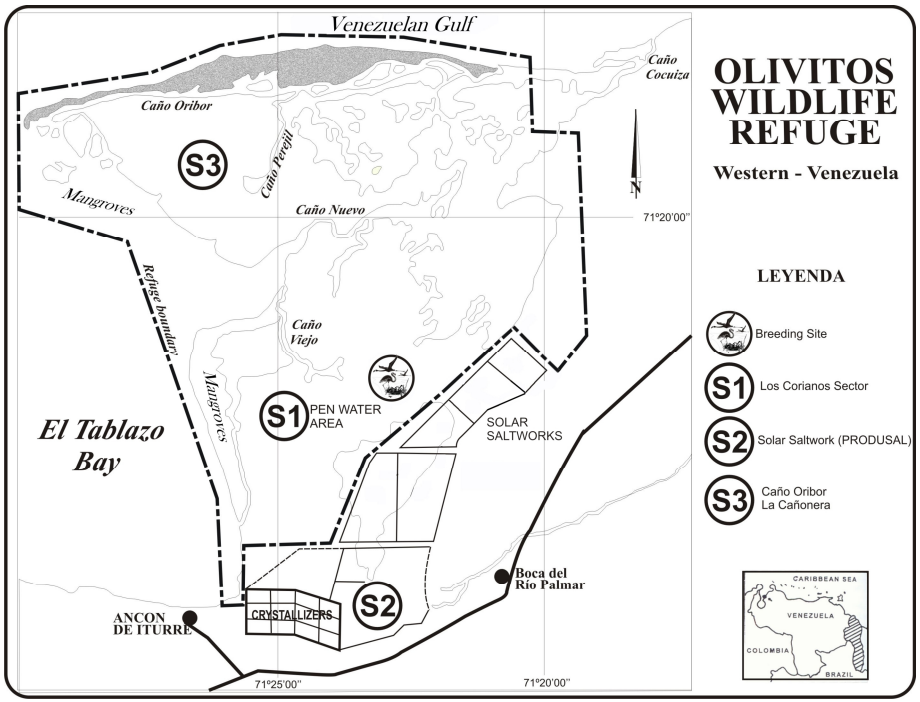


Figure 1. Map of Olivitos Wildlife Refuge and Fishing Reserve, Zulia, Venezuela

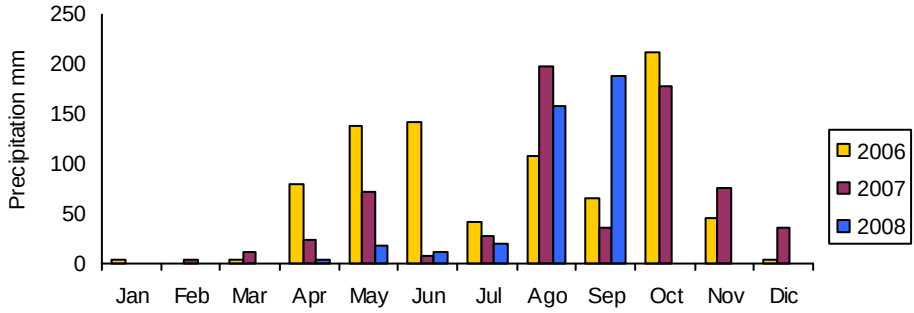


Figure 2. Rainfall distribution at Olivitos Wildlife Refuge and Fishing Reserve, Zulia, Venezuela, 2006-2008

Results

2006-07

Breeding activity at Los Olivitos Wildlife Refuge was first recorded in the third week of October 2006, when several groups of 170-370 individuals were observed in courtship display about 2 km away from the breeding site. During October and November, flamingo numbers in Los Corianos sector were estimated between 29,000 and 30,000 (Table 1). While the number of flamingos displaying increased to almost 3,200 during this period, no eggs were laid during these two months, although a few birds did go through a period of nest building. On 6 December about 11,350 flamingos were seen on and around the breeding island. But, it was not until 13 December that approximately 8,100 flamingos were observed on nest mounds incubating eggs. At the end of 2006, weather conditions were becoming very dry (Figure 2).

Chicks were first observed in the first week of January 2007 (Table 1). At that time, we estimated that the oldest chicks were almost two weeks old, meaning that the first hatching date was during the last week of December 2006. During January, February and March, chick production increased rapidly, reaching a peak of 5,200 chicks of different age classes by 24 March (approximately 90 days after first eggs hatched). We did not visit the nesting colony again until 24 May, counting about 3,800 chicks of different ages, approximately 45% of which were still around the nests, while the rest were in crèches some 300-400 m away from the nesting island. Most adult flamingos observed at this time were performing different activities: repairing nest (12%), incubating (20%) and accompanying chicks. The last groups of chicks from the 2006-2007 breeding season were seen near the nesting island on 15 July and 6 August. At the same time, total flamingo numbers at the refuge started to increase rapidly as wet conditions started to improve as well.

2007- 2008

In 2007, flamingo numbers at los Olivitos Wildlife Refuge started to increase markedly during September (Table 1), perhaps stimulated by unusually heavy rainfall in August (figure 1). On 5 November, almost 10,000 flamingos were congregated near and on the nesting island. However, on 10 November we discovered that most of the breeding groups seen five days earlier had left the nesting island, and the rest of the flock was standing some 600-700 m from nesting site acting nervous.

As we approached within 200 m of the nesting island, we discovered the tracks of an American Crocodile (*Crocodylus acutus*) leading to the east side of the nesting island, and eggs spread among the nests. On our next visit (27 November), breeding conditions were favorable as more groups of flamingos were either displaying or re-building old nests. However, it was not until 18 December when about 550 chicks were seen for the first time. By 31 December, there were approximately 5,900 chicks at Los Olivitos Wildlife Refuge and more than 4,000 adult flamingos

still sitting on nests. In the first week of January 2008, approximately 6,450 chicks were counted, representing the highest number of chicks ever estimated at the refuge.

Table 1. Estimated Caribbean Flamingo numbers and breeding activity at Olivitos Wildlife Refuge and Fishing Reserve, Zulia, Venezuela, 2006-2008

Year	Month	Est. no. non-breeding adults in refuge	Est. no. breeding adults in refuge	Est. no. chicks in refuge	Est. total adults and chicks in refuge
2006	Oct	27,500	0	0	27,500
	Nov	29,000	0	0	29,000
	Dec	25,500	8,266	0	33,766
2007	Jan	14,500	9,180	765	24,445
	Feb	10,533	7,292	2,767	20,592
	Mar	9,967	7,763	4,467	22,197
	May	10,800	2,872	3,900	17,572
	Jul	9,300	125	125	9,550
	Aug	11,450	0	0	11,450
	Sep	23,000	0	0	23,000
	Oct	24,000	0	0	24,000
	Nov	20,550	6,565	0	27,115
	Dec	18,386	5,585	1,871	25,842
2008	Jan	15,450	1,975	4,275	21,700
	Feb	15,400	6,630	1,900	23,930
	Mar	14,000	0	5,350	19,350
	May	4,000	0	0	4,000
	Jul	9,600	0	0	9,600
	Aug	14,400	0	0	14,400
	Sep	28,000	0	0	28,000

The following month, chick numbers started to drop as climate conditions at the nesting site became very dry. Then, on 8 March a total of approximately 5,350 chicks were seen forming several crèches, but there were few adult flamingos on the nesting island. At the end of June and first days of July, we could not get access to the breeding area, since Military Artillery Practice was underway just a few kilometers from Los Olivitos refuges border. Finally, on 12 July we visited the breeding site, but it was empty. Flamingo numbers were low and no chicks or juveniles were seen at Los Corianos sector.

Discussion

In 2006-07, estimated chick production at Los Olivitos Wildlife Refuge was lower (5,200 chicks) than in 2005-06 (5,600 chicks) (Espinoza & Perozo 2006). However, in 2007-08 the flamingos produced an estimated 6,450 chicks, the highest number ever recorded. When the 2007-08 results are added to the breeding data gathered since 1999 (Espinoza 2003, Espinoza y Perozo 2006), the flamingos have fledged approximately 40,000 chicks at Olivitos during the past 10 years.

During October-December 2006, estimated numbers of breeding and non-breeding flamingos in the Los Corianos sector, including the nesting site, were higher than during the same period of 2007. From January to September 2007, the mean number of flamingos estimated to be in the Los Corianos sector, including the nesting site, was substantially higher (25,670 birds) than the mean number estimated in the same period of 2008 (15,600).

Perhaps one of the reasons for such differences between years could be related to rainfall conditions that in the period January-July 2008 were extremely meager (52mm). When we visited the breeding colony on 8 March 2008, approximately 5,350 flamingos were either nesting, building nests, displaying or feeding chicks, but climate conditions were very dry. We returned on 5 May

and found that the flamingos were no longer breeding, and the island was empty, while the groups of flamingos that remained were those associated with the chick crèche.

Besides weather conditions, another reason why we did not see chicks or juveniles in visits from June to September 2008, like in previous years, was related to military artillery practice near the refuge. Because, by the time the Ministry of Environment officially ordered the practice to stop, it had already had gone on for 5 days.

Regarding annual flamingo migration or absence from the refuge due to a shortage of feeding resources from February to April (Pirela 2000), our census results demonstrated that, in spite of the population fluctuations, flamingos continue to be present at the Olivitos refuge all year around. And one particular argument for that is: the "feeding alternative" available next door. Since both food and water quality seems to have improved significantly at Produsal (Productora de Sal, C.A., a subsidiary of Cargill de Venezuela), flamingos are using the site more often. For instance in 2007 we visited concentrator pond number 1 in five different months, estimating a total of approximately 14,252 flamingos and 679 juveniles. While in a single visit in 2008, we counted 6,300 flamingos and 143 juveniles. All these results were significantly higher than the previous census reports at this site (Espinoza& Perozo 2006, Casler y Este 2000).

The importance of solar saltworks for the flamingos was anticipated by Casler and Este (2000), who stated that "once salinities stabilised, the concentrator system will support more frequent visits by flamingos, and the solar saltworks will be important for flamingo conservation because they offer alternative and protected feeding sites". We strongly believe that one of the key factors contributing to the improvement in flamingo chick production during the past few years, has been the availability of this alternative feeding site nearby, which has substantially reduced the energy required for the adults to provide food for their chicks, and has provided a sheltered environment for the juveniles to achieve adult size and fully-developed bill filter apparatus.

Although initiation of breeding (courtship displays and occupation of the nesting island) was synchronised in the flamingo colonies of 2006-07 and 2007-08, the disturbance caused by the American Crocodile in November 2007 resulted in abandonment of the traditional breeding site on the island and the establishment of a new breeding site by the mouth of Caño Viejo, about 3 km away from the traditional nesting island. However, this new site was unsuccessful, as we recorded only about 65 flamingos laying on the bare soil (no nest built) and several eggs spread on the ground.

We believe our census results are conservative, but we strongly recommend an annual surveillance of the breeding population: counting the maximum numbers of incubating birds and the number of young using aerial photography of the crèche when the chicks are at least half-grown.

Acknowledgements

We would like to express particular thanks to General Manager Produsal Luis Castro, Raoul Taylhardat and Ronald Nava for allowing access to the concentrator area and unpublished climate data. Also thank R. Rivero for participation in several censuses and for his valuable comments. The Venezuelan Flamingo Project was carried out under the Ministerio de Ambiente, Oficina Nacional de Diversidad Biológica, Dirección de Fauna, ANAPRO, Museo Estación Biológica Rancho Grande and DEA Zulia. We also would like to thank the people of El Ancon de Iturre, for caring so much about the conservation of La Ciénaga de los Olivitos Wildlife Refuge

References

Casler, C. L., Este, E. E. and Pardo, H. M. 1994. Breeding of the Greater Flamingo in Western Venezuela. Colonial Waterbirds 17 (1): 28-34.

Casler, C. L. and Este, E. E. 2000. Caribbean flamingo feeding at a New Solar Saltworks in Western Venezuela. In: Baldassarre, G. A., Arengo, F. and Bildstein, K. L. (editors). 2000. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1): 95-102.

Espinoza, F. 1994. Censos aéreos y terrestres de flamencos en las costas de Venezuela. Informe Técnico. MARN-Proafuna, 15pp. Caracas.

Espinoza, F., Parra, L., Aranguren, J., Martino, A., Quijada, M., Pirela, D., Rivero, R., Gutierrez, T., Jiménez, N., Leal, S., and León,E. 2000. Numbers and distribution of the Caribbean Flamingo in Venezuela. In: Baldassarre, G. A., Arengo, F. and Bildstein, K. L. (editors). 2000. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1): 80-86.

Espinoza, F. 2003. El Flamenco del sur del Caribe (Phoenicopterus ruber) en los humedales costeros del estado Zulia, Venezuela. Pages 42-43, in: 27th. Annual Meeting of the Waterbird Society. Pantanal-Cuiba. Universidad Federal do Mato Groso. Brazil.

Espinoza, F. and Perozo, H. 2006. Caribbean Flamingo breeding at Cienaga de Los Olivitos Wildlife Refuge and Fishing Reserve, western Venezuela. In: Childress, B., Arengo, F., Bechet, A.& Jarret, N.(eds) 2006. *Flamingo*, Bulletin of the IUCN-SSC/Wetlands International Flamingo Specialist Group, No. 14, December 2006. Wildfowl & Wetlands Trust, Slimbridge, UK.

Lentino, M., and M. L. Goodwin. 1992. Situación del flamenco (*Phoenicopterus ruber*) en Venezuela. Pages 27-41 in actas del I Taller Internacional de especialists de flamencos Sudamericanos. San Pedro de Atacama, Chile.

Pirela, D. E. 2000. Monitoring Caribbean Flamingos at Los Olivitos Wildlife Refuge, Western Venezuela. In: Baldassarre, G. A., Arengo, F. and Bildstein, K. L. (editors). 2000. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1): 103-108.

Shannon, P. W. 2000. Plumages and Molt Patterns in Captive Caribbean Flamingos. In: Baldassarre, G. A., Arengo, F. and Bildstein, K. L. (editors). 2000. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1): 160-172.

High Andean Flamingo Wetland Network: Evaluation of degree of implementation of priority sites-preliminary results

[1]**Marconi, P. M. and** [2]**Sureda A. L.**

[1] *Fundación YUCHAN, Caseros 121. 4400, Salta, Argentina. E-mail: huaico1709@gmail.com*
[2] *Administración de Parques Nacionales, Delegación Regional Noroeste, Santa Fe 23, 4400, Salta, Argentina.*

Background and Methods

Grupo de Conservación Flamencos Altoandinos (GCFA) is developing a regional project to achieve sustainable and integrated conservation of wetlands of importance for Andean and James' Flamingos through the establishment of a regional network of priority sites, focusing on the high Andean wetlands, but also including key lowland sites (Marconi 2007). Based on explicit criteria and careful analysis of available information, 14 sites were selected for the initial phase of the project (Figure 1).

In order to establish a common baseline for integrated network management, we applied an adapted version of RAPPAM methodology for rapid assessment of protected areas (Ervin 2003) to the 14 network sites. Two sites in Argentina with particular legal and land tenure conditions were each split into two separate areas for this analysis: Pozuelos was split into: National Monument and Biosphere Reserve, and Mar Chiquita was split into: Mar Chiquita (Córdoba Province) and Bañados del Río Dulce (Santiago del Estero Province).

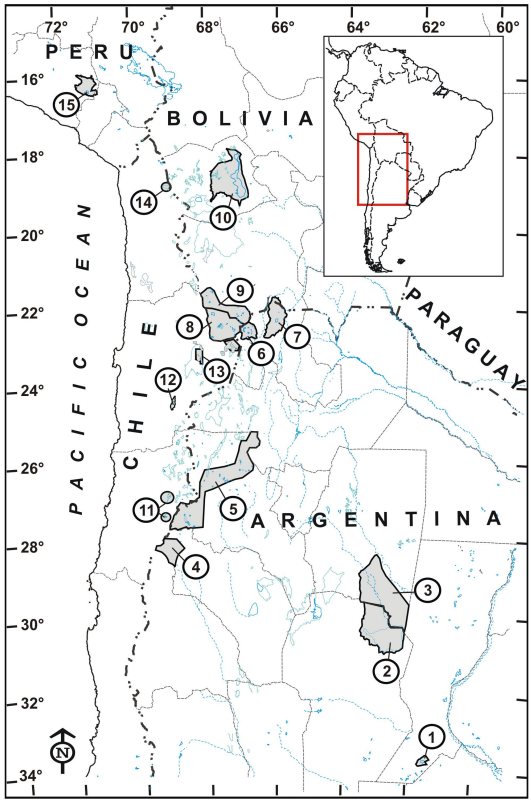


Figure 1. Map of 14 priority sites in the wetland network for conservation of High-Andes flamingos. Argentina: 1- Melincué, 2-Mar Chiquita, 3- Dulce, 4- Brava, 5-Parinas, 6-Vilama, 7-Pozuelos; Bolivia: 8- Avaroa, 9-López, 10-Poopó-Uru Uru; Chile: 11-Negro Francisco, 12-Punta Negra, 13-Atacama, 14-Surire; Peru: 15-Salinas y Aguada Blanca.

Managers from the 14 priority sites were asked to complete a RAPPAM questionnaire and submit to the authors, who summarized biological, social and economic data prior to the first Wetland Network workshop. Additional information was gathered during the workshop, where participants discussed the questions and their interpretations, agreed upon the answers, conducted the analyses and recommend priorities and possible following steps.

Results

We defined pressures (primarily existing, current impacts) and threats (imminent, potential impacts) at each of the Network sites (Table 1): 1. Mining, 2. Power generation and transmission, 3. Roads, 4. Water management, 5. Agriculture, 6. Livestock raising, 7. Use of Fauna (hunting and harvesting), 8. Flora Use (firewood collection and non-timber forest products), 9. Fishing, 10. Exotics, 11. Tourism and recreation, 12. Urbanization, 13. Deforestation, 14. Burning, and 15. Land-use/land tenure conflicts.

Table 1. Activities that represent a Pressure (current) or Threat (potential) at the 14 priority wetland sites

PRESSURES/ THREATS	Melincué	Mar Chiquita	Brava	parinas	Vilama	Pozuelos	N Francisco	Punta Negra	Atacama	Surire	Avaroa	Lípez	Poopó	Salinas
Mining		T	T	P/T	T	P/T	P/T	P/T	P/T	P/T	P/T	P/T	P/T	P/T
Power generation/ transmission						P			P		P/T			
Roads	T		P	P/T	T		P	P	P/T	P/T	P/T	P/T	P	P/T
Water management	P/T	P/T	T					P/T	P/T				P/T	T
Agriculture	P/T	P/T				T						T	P/T	T
Livestock raising	P/T			P/T	P/T	P/T					P/T	P/T	P/T	P/T
Use of Fauna	P/T	P/T	P/T	P/T	P/T	P/T			P/T	P/T	P/T	P/T	P/T	P/T
Use of Flora			P/T	P/T	P/T	P/T			T	T	P/T	P/T	P/T	P/T
Fishing		T											P/T	
Exotics	P/T		T	P/T	T	P/T							P/T	
Tourism and recreation	P/T	T	P/T	P/T	T	P/T	P/T	T	P/T	P/T	P/T	P/T	T	T
Urbanization	P/T	T				T					T	P/T	P/T	P/T
Deforestation		P/T												
Burning		P/T			T								P/T	P/T
Land-use/ land tenure conflicts		P/T	P/T	P/T	P/T	P/T	T	T	P/T	P/T	T	T	P/T	T

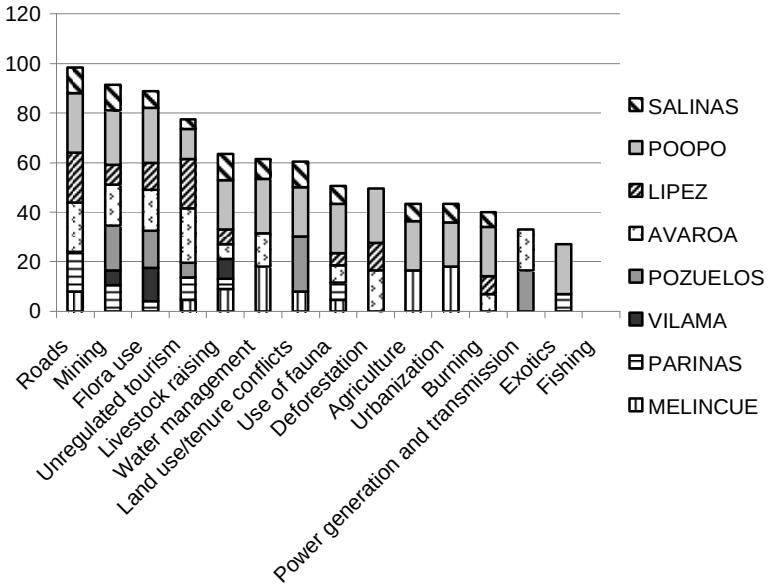


Figure 2. Main pressures in the network (8 sites)

During the second Wetland Network workshop, site administrators further evaluated pressures in terms of extent, impact, permanence and trends over time, for 8 network priority sites (administrators from Chile could not attend the workshop). Roads, mining, use of flora, unregulated tourism and livestock raising were the most important pressures identified at these sites (Fig. 2), and Poopó in Bolivia scored highest as threatened (Fig. 3), likely because of the extent of threats, accessibility and human population density in the wetland area of influence.

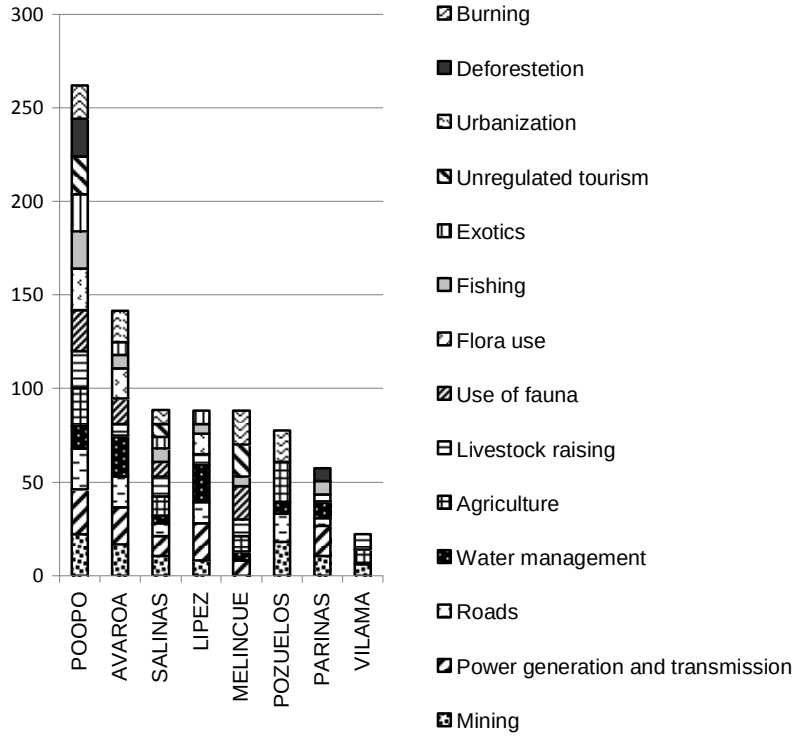


Figure 3. Pressures by site (8 network sites)

The evaluation of the degree of implementation and conservation effectiveness of the sites has contributed to identify systemic strengths and weaknesses within the network. Each priority site received a score between 0 and 180 for planning, inputs, management processes and management outputs, which enabled a broad comparison of management effectiveness or degree of implementation at the network level (Figure 4)

We recognized the following implementation categories: 1) not implemented (0-50): Lípez, Bañados del Dulce, Melincué, Parinas, Reserva de la Biosfera de Pozuelos and Vilama; poorly implemented (50-90): Mar Chiquita, Poopó, Brava and Monumento Nacional Pozuelos; implemented (90-110): Avaroa, Atacama, Negro Francisco and Surire, highly implemented (<110): Punta Negra and Salinas.

Site administrators and policy makers attending both workshops agreed to use this analysis to adjust protected area policies, allocate funds and develop technical support programs. We identified conservation alternatives for priority sites in the first category (not implemented) that lack legal protection (*i.e.* Parinas as a new Ramsar site).

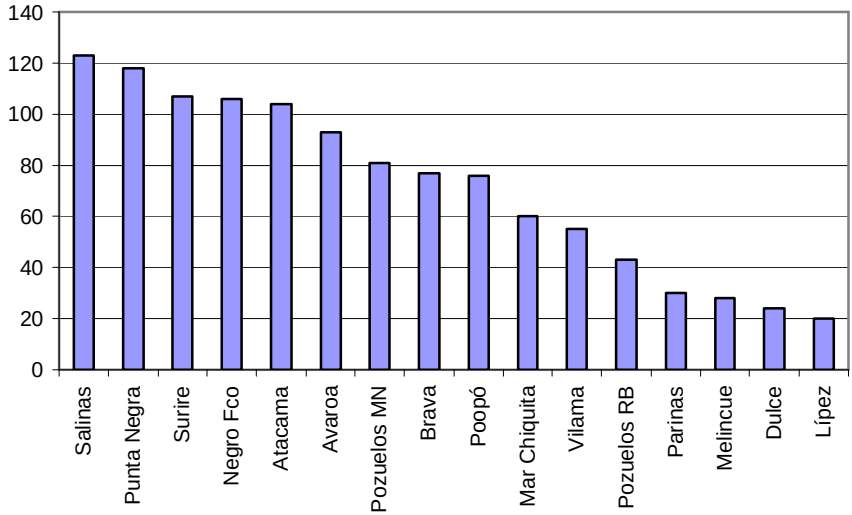


Figure 4. Degree of implementation of the Wetland Network priority sites.

Acknowledgements
We would like to thank site administrators and researchers for providing the information necessary to conduct this evaluation. This activity was funded or supported in part by the Rio Tinto-BirdLife International Partnership Action Fund, Ramsar, The Wildlife Conservation Society, and Fundación Yuchán.

References

Ervin, J. 2003. WWF: Rapid Assessment and Prioritization of Protected Area Management (RAPPAM) Methodology. WWF Gland, Switzerland. 52 pp.

Marconi, P. 2007. Proyecto Red de Humedales Altoandinos y Ecosistemas Asociados, basada en la distribución de las dos especies de Flamencos Altoandinos. Grupo de Conservación Flamencos Altoandinos. Libro de Gestión Sostenible de Humedales, Castro Lucic, M. & L. Fernández Reyes (editores) pp. 211-226.

Status and Distribution in Paraguay of the Chilean Flamingo (*Phoenicopterus chilensis*)

Lesterhuis, A. J.[1], Clay, R. P.[2] and del Castillo, H.[3]

[1]Guyra Paraguay, Gaetano Martino 215, Asunción, Paraguay
E-mail: arne_j_lesterhuis@yahoo.co.uk
[2]Birdlife International, Gaetano Martino 215, Asunción, Paraguay
[3]Guyra Paraguay, Gaetano Martino 215, Asunción, Paraguay

INTRODUCTION

The Chilean Flamingo (*Phoenicopterus chilensis*) is the most widely distributed member of the family Phoenicopteridae in South America. Globally, the species is considered Near-threatened (IUCN 2008), with a population estimated at 200,000 individuals and believed to be in decline (Birdlife International 2008, Wetlands International 2006). *Phoenicopterus chilensis* is the only flamingo species known from Paraguay, where it is essentially restricted to the Chaco (an arid lowland plain in western Paraguay) with most records from the saline lagoons of the central Chaco. The species was first documented in the country through a series of nine specimens collected by A. Schulze at Punta Riel, Boquerón department, between March and May 1937 (specimens in UMMZ, nos. 93076-93079, 93516-93517 and 131159-131161). Away from the central Chaco, the one site with regular records is Laguna Sanidad/Estero Patiño, in the floodplain of the río Pilcomayo in southern Presidente Hayes department. Small numbers (tens of birds) have been recorded there since at least 1994 (A. Madroño pers. comm.). Other records outside of the central Chaco lagoons include three birds flying over Estancia Co'e Pyahú, Boquerón department in September 1989 (Contreras 1989), three birds south of Pozo Colorado, Presidente Hayes department in March 1989, and three birds at Fortín Teniente Martinez, in Alto Paraguay department in August 1989 (A Madroño pers. comm.).

The only records from eastern Paraguay are of a few birds along the Paraguay River to the north of Asunción in June 1939 and June 1940 (Podtiaguín 1944), six birds observed at Yabebyry (Misiones Department) in March/April 1993 by López de Kochalka *et al.* (1999), and a flock of 42 flying high, to the south, over Asunción on 7 September 2008 (RPC).

Hayes *et al*. (1994) considered the species to be a rare irruptive austral migrant to Paraguay, visiting in small numbers, with most records during the austral winter (and extreme dates of February to November). Hayes (1995) added that the wintering population appears to be increasing, as evidenced by an increase in the highest counts over time. High counts in the early 1990s include 62 birds along the río Paraguay at km 105 (P. A. Scharf, pers. comm.), up to 250 birds at Estancia Amalia, Presidente Hayes department (Brooks 1991, D. Brooks in litt.) and 420 birds at Laguna Capitán and Laguna Campo María, Presidente Hayes department in July 1992 (López 1993). In August 1995, Hayes recorded over 1,000 flamingos at Laguna Campo María (F. E. Hayes pers. comm.).

Since 2000 Guyra Paraguay, a national bird conservation NGO, has conducted periodic waterbird surveys throughout the central Paraguayan Chaco. Here we present an overview of survey results for *P. chilensis* from the period 2000 to 2005.

Study Areas

Waterbird surveys were carried out in two different areas, the central Chaco lagoons and Laguna Sanidad/Estero Patiño.

Central Chaco lagoons

The area is typified by xerophytic thorn-scrub forests, interspersed by bare saline depressions and rivers beds, forming numerous shallow saline lagoons after heavy rains (Clay *et al*. 2004a, b). The two principal watersheds are the Riacho Yacaré Sur and the Riacho Yacaré Norte, with most lagoons located in the Riacho Yacaré Sur. The largest lagoon, Laguna Salada, has been declared a Ramsar site based on high concentration of waterbirds, specifically shorebirds and flamingos (Lesterhuis & Clay 2001, Clay *et al.* 2004a). The principal lagoon in the Riacho Yacaré Norte

watershed is the Laguna Ganzo (22º19'S, 59º03'W), situated approximately 30 km northeast of the Riacho Yacaré Sur watershed. Both the Yacaré Sur lagoons and Laguna Ganzo have been declared as IBAs, due to their importance for colonial waterbirds (Guyra Paraguay 2008).

Laguna Sanidad/Estero Patiño

Laguna Sanidad (24º08'S, 59º50'W) is a freshwater lagoon within Estero Patiño, a seasonally inundated wetland within the lower watershed of the Plicomayo river, close to the border with Argentina. As a result of the construction of canals and water extraction higher-up in the watershed, the Pilcomayo floodwaters rarely reach Estero Patiño, and the area was completely dry during 2000-2003. In 2004 and 2005 waters reached the marsh and lagoon, attracting high numbers of waterbirds. Part of Estero Patiño is included within the Ramsar site "Tinfunque National Park", and the combined area has been declared an IBA (Guyra Paraguay 2008).

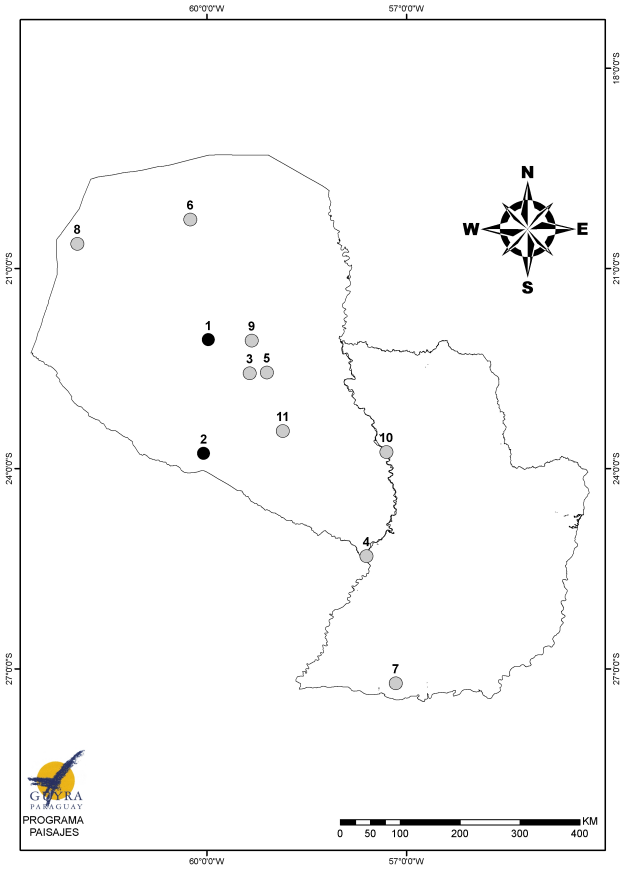


Figure 1. Sites with Chilean Flamingo records in Paraguay. 1. Central Chaco lagoons, 2. Laguna Sanidad/Estero Patiño, 3. Laguna Teniente Rojas Silva, 4. Asunción, 5. Estancia Amalia, 6. Fortín Teniente Martínez, 7. Yabebyry, 8. Estancia Co'e Pyahú, 9. Punta Riel, 10. km 105 río Paraguay, 11. South of Pozo Colorado.

Materials and Methods

A total of 21 surveys were conducted in the central Chaco lagoons (though with only two visits to Laguna Ganzo). Visits were carried out throughout the year, ranging from one to four per season (Table 1). Surveys were primarily focused on the Campo María-Laguna Salada lagoon complex, as the one area that consistently held water. Highly variable water levels at other lagoons (Clay *et al*. 2004b) prohibited the use of a systematic survey methodology, and surveys were conducted at those that held water at the time of a visit. Four surveys were conducted at Laguna Sanidad/Estero Patiño during 2004-2005. In 2004, two aerial surveys were carried out, one covering the Riacho Yacaré Sur watershed and the other Laguna Sanidad/Estero Patiño.

Table 1: Surveys conducted per season in the central Chaco lagoons. All seasons are austral seasons: Summer (21 Dec- 20 Mar), Autumn (21 Mar- 20 Jun), Winter (21 Jun- 20 Sep), Spring (21Sep- 20 Dec).

	Summer	Autumn	Winter	Spring
2000	-	-	-	2
2001	3	2	3	1
2002	-	1	-	1
2003	1	-	2	-
2004	1	-	2	2
2005	1	-	2	-

Results

Central Chaco lagoons

In the Riacho Yacaré Sur watershed, the Chilean Flamingo was most abundant in the years 2000, 2004 and 2005 (counts exceeding 2,000 birds or 1% of the estimated global population), see Table 2. The highest counts recorded were during the austral winter (2003-2005) and austral spring (2000), though as surveys were only undertaken in each season during one year (2001) it is impossible to determine whether numbers peaked during the austral winter in each year (in 2001 the highest count was during the austral autumn).

Table 2: Maximum counts of Chilean Flamingos in the central Chaco lagoons per season. All seasons are austral seasons: Summer (21 Dec- 20 Mar), Autumn (21 Mar- 20 Jun), Winter (21 Jun- 20 Sep), Spring (21Sep- 20 Dec).

	Summer	Autumn	Winter	Spring
2000	-	-	-	2,378
2001	276	997	475	48
2002	-	77	-	2
2003	43	-	1,557	-
2004	33	-	2,871	741
2005	632	-	5,209	-

Particularly high counts of flamingos were as follows: October and November 2000, 1,923 and 2,212 individuals respectively; June 2001, 997 birds; July 2003 and July 2004, 1,451 and 2,871 birds respectively. The highest count was obtained during July 2005, when 3,609 birds were present in the Riacho Yacaré Sur and 1,600 birds at Laguna Ganzo. The highest count during the austral summer was that of 632 birds observed in February 2005.

Within the central Chaco lagoons, the highest counts were from Laguna Salada, with flocks of 1,636 individuals in October 2000, 1,888 individuals in November 2000, 1,489 individuals in July 2004 and 2,005 individuals in July 2005.

Laguna Sanidad

At Laguna Sanidad the highest count was obtained during the aerial survey in October 2004 when approximately 500 birds were counted. Counts during the terrestrial surveys in 2004 and 2005 resulted in a maximum of 265 individuals.

Discussion

Periodic surveys carried out between 2000 and 2005 showed the Chilean Flamingo to be more abundant in the Paraguayan Chaco than previously documented, and to be present throughout the year. High counts surpassed 1% of the species' estimated global population in three of the five years, with over 2.5% of the estimated global population recorded in 2005.

The species has typically been considered an austral winter migrant to Paraguay (*e.g.* Hayes *et al*. 1994, Hayes 1995, del Castillo and Clay 2004). While the highest counts are from the austral winter, high counts have also been recorded in other seasons, and flamingos are present year-round in the central Chaco lagoons. In fact, there are indications of at least occasional breeding attempts (BirdLife International 2008). del Castillo *et al*. (2005) considered the species to be an "intratropical migrant" to Paraguay, but it is probably best considered to be an irruptive winter migrant and partial resident.

One possible explanation for the apparent increase in flamingo numbers in Paraguay is the intensification of agriculture and conversion of natural habitat within the Mennonite colonies of the central Paraguayan Chaco. This has led to a marked increase in salinity (Clay *et al*. 2004b), potentially favouring the flamingos. There is clearly still much to be learned regarding the Chilean Flamingo in Paraguay. Future research should focus on better understanding the fluctuations in numbers at the main sites in the central Chaco, and the movements of birds between Paraguay and populations in neighbouring countries.

Acknowledgements

Fieldwork and aerial surveys were conducted as part of projects supported by the National Fish and Wildlife Foundation and the USFWS (Neotropical Migratory Bird Conservation Act) and with support from Wetlands International for the Neotropical Waterbird Census. The distribution map was prepared by Hugo Cabral.

References

BirdLife International. 2008. Species factsheet: *Phoenicopterus chilensis* Downloaded from http://www.birdlife.org on 20 June 2008

Brooks, D. M. 1991. Algunos antecedentes sobre las poblaciones del norte de Flamenco Chileno *(Phoenicopterus chilensis)*. Bol. Grupo Phoenicop. Sur Andina. 2: 2-3.

Clay, R. P., Lesterhuis, A. J. and López, L. 2004a. Aves de los humedales del Paraguay. Pp. 175-190 in: D.A. Salas-Dueñas, F. Mereles and A. Yanosky (eds.). *Los humedales del Paraguay*. Asunción, Paraguay: Comité Nacional de Humedales.

Clay, R. P., Rodas, O., Cabral, H., Lesterhuis, A. and Zárate, R. 2004b. Use of remote sensing to plan waterbird conservation in the Central Paraguayan Chaco. Pp. 112-121 in: Cardozo, M., Browne, D. & Carbonell, M. (Eds.) 2004. *Upper Paraguay River Basin GIS Database, Expanding the Pilot Project.* Ducks Unlimited, Inc., Memphis, TN, USA.

Contreras, J. R. 1989. La avifauna de la Estancia Co'e Pyahú u sus cercanias, Nueva Asunción, República del Paraguay. Nótul. Fauníst. 17:1-6.

del Castillo, H. and Clay, R. P. 2004. Lista comentada de las Aves de Paraguay. *Annotated checklist of the Birds of Paraguay*. Guyra Paraguay: Asunción, Paraguay

del Castillo, H., Clay, R. P., De Egea, J.., Rodas, O., Cabral, H., Morales, V. and Centrón, S. 2005. Atlas de las aves de Paraguay. Guyra Paraguay: Asunción, Paraguay.

Guyra Paraguay 2008. Áreas de Importancia para la Conservación de las Aves en Paraguay. 1ª edición. Guyra Paraguay/ Birdlife Internartional. Asunción, Paraguay.

Hayes, F. E. 1995. Status, distribution and biogeography of the birds of Paraguay. American Birding Association (Monographs in Field Ornithology No.1).

Hayes, F. E., Scharf, P. A. and Ridgely, R. S. 1994. Austral Migrants in Paraguay. The Condor Pp 83-97.

IUCN 2008. 2008 IUCN Red List of Threatened Species. www.iucnredlist.org. Downloaded on 24 October 2008.

Lesterhuis, A. J. and Clay, R. P. 2001. Laguna Salada: A 'new' site of regional importance for migrant shorebirds in Paraguay. Wader Study Group Bull. 95. August 2001.

López, N. E. 1993. Paraguay. Pp. 38-48 en D. Blanco y P. Canevari (eds). *Censo Neotropical de aves acuáticas 1992*. Humedales para las Américas. Buenos Aires

López de Kochalka, N., Morales, C. and Esquivel, E. 1999. Avifauna, en: Proyecto Conservación de la vida silvestre en el área de la influencia de represa Yacyreta. Informe final.

Podtiaguín, B. 1944. Catálogo sistemático de las aves del Paraguay. Aumentado por las contribuciones al conocimiento de la ornitología paraguaya. *Rev. Soc. Cient. Parag.* 5(5): 1-109.

Wetlands International. 2006. Waterbird Population Estimates - Fourth Edition. Wetlands International, Wageningen, The Netherlands.

Winter monitoring of Andean and Chilean Flamingos in lowland wetlands of central Argentina

Monitoreo invernal de flamencos andino y austral en humedales de tierras bajas de Argentina

Romano, M.[1,2], Barberis, I.M.[1,2,3,4], Pagano, F.[2,5] , Marconi, P.[1,6] and Arengo, F.[1,7]

[1] *Grupo Conservación Flamencos Altoandinos (GCFA). E-mail: mcromano@arnet.com.ar*
[2] *Centro de Investigaciones en Biodiversidad y Ambiente –ECOSUR-, Rosario, Argentina.*
[3] *Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET).*
[4] *Facultad de Ciencias Agrarias, Universidad Nacional de Rosario. Zavalla, Argentina.*
[5] *Facultad de Ciencias Veterinarias, Universidad Nacional de Rosario. Casilda, Argentina.*
[6] *Fundación Yuchán, Salta, Argentina.*
[7] *American Museum of Natural History (AMNH), New York, USA.*

High Andean wetlands are of key importance for flamingos during most of their life cycle. However, our research has shown that lowland lakes in Argentina are key habitats for flamingos, especially during winter when some of the high-Andes lakes freeze over (Caziani *et al.* 2007). Summer and winter censuses targeting flamingos carried out simultaneously in Argentina, Bolivia, Chile and Peru have shown much higher total Andean Flamingo abundances in summer than in winter (Caziani *et al.* 2007). It has been suggested that these seasonal differences in Andean Flamingo abundance could be a result of Andean Flamingos over-wintering in sites that we did not survey or in sites not known as flamingo habitats (Caziani *et al.* 2007). In order to track flamingo movements and to detect known and unknown key sites, we used satellite telemetry on Andean Flamingos.

In August 2008, based on data from four years of Andean Flamingo satellite tracking records (F. Arengo, unpublished data), we conducted a field survey of shallow brackish alkaline lakes in lowland Argentina where we had prior location information from tagged birds. We surveyed 20 lakes (18 in Santa Fe Province and two in Córdoba Province, Figure 1), identifying

flamingo species and performing total counts. At nine of these lakes, we also took water samples to characterize physical and chemical properties, and to identify and determine abundance of phytoplankton and zooplankton.

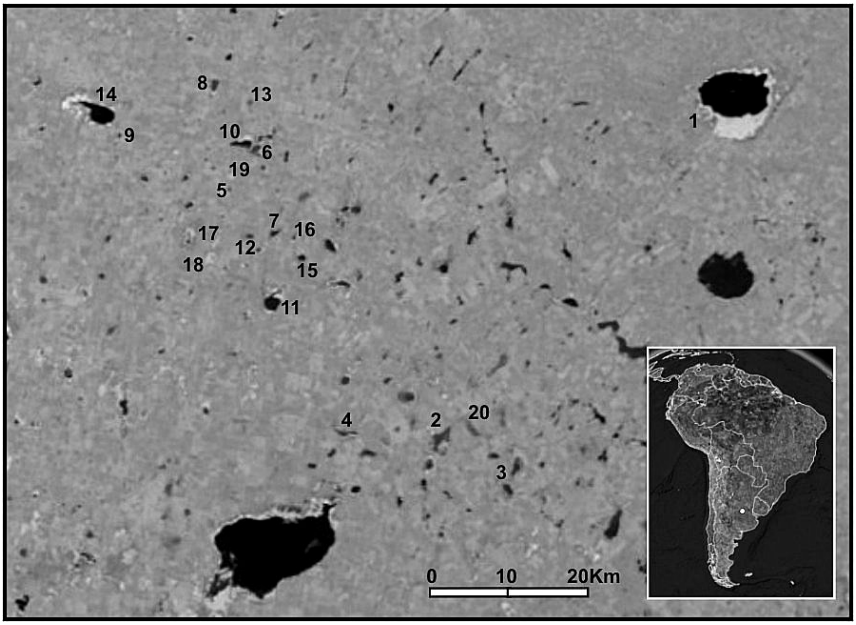


Figure 1. Satellite image of area in Santa Fe Province where wetlands were censused in August 2008. 1: Laguna Melincue, 2: Laguna Martin Garcia, 3: Laguna Morgan, 4: Laguna Carmen, 5-7: Unnamed, 8: Laguna La Badenia: 9-10: Unnamed, 11: Laguna Sancti Spiritu, 12-13: Unnamed, 14: Laguna Las Tunas, 15-19: Unnamed, 20: Laguna Los Patos.

We counted 20,864 Andean Flamingos (*Phoenicoparrus andinus*), 29,539 Chilean Flamingos (*Phoenicopterus chilensis*) and 286 unidentified flamingos (Table 1). Andean flamingos were recorded in seven wetlands. Laguna Melincué contained almost half of the total individuals recorded (9,904), whereas the rest were mainly counted in three other wetlands (Carmen, Martín García and Morgan complex). Chilean flamingos were recorded on 15 lakes. Almost 80% of the individuals were counted at five lakes (La Badenia and four other lakes unnamed on maps).

Lowland lakes showed a wide range of differences in surface area (800-10,000 ha) and appearance. However, except for pH, the nine sampled wetlands appeared to exhibit substantial differences in water quality characteristics: O2 (range: 8.30-15.2 mg/L), conductivity (range: 8.69-18.33 mS), pH (range: 9.5-10.5) and temperature (11.0-15.8ºC). However, these results represent only one water sample taken from each lake, and they do not take into account spatial or temporal variations within each lake, which should be considered in subsequent surveys. As there are not replicated samples for each lake, we are not able to run a statistical test to compare water quality among lakes. We presume that differences in flamingo species composition also could be related to variations in food resources (quality and availability), rather than water quality. Analysis of phytoplankton and zooplankton abundance is pending and may help answer this question.

This comprehensive winter monitoring of southern Santa Fe province has dramatically increased the numbers of Andean Flamingos previously recorded in Argentinean lowland wetlands, reaching 61% of the global population. This may be explained by the increase in abundance of Andean Flamingos in Melincué in addition to the results from new wetlands surveyed during this census. Conservation of these key lowland sites is of high priority. Melincué, one of the largest lakes in the area, is included in the “Network of Wetlands of Importance for

Flamingo Conservation" (Marconi *et al.* 2007) and it was recently designated as a Ramsar site. However, the new discovered sites are not included within any conservation category and are mostly on private lands. Thus, we recommend including southern Santa Fe wetland complex (SSF) in the winter monitoring scheme and eventually to incorporate the complex in the "Network of Wetlands of Importance for Flamingo Conservation".

Table 1. Numbers of flamingos and habitat variables for wetlands censused during August 2008 in Santa Fe Province, Argentina.

	Site	*P. andinus*	*P. chilensis*	*Ph.* spp.	Total *Ph.*	pH	Temp (ºC)	Salinity mg/l	O2 mg/l
1	Lag. Melincué	9,904	1,282	286	11,472	9.5	12.5	5.97	9.5
2	Lag. Martín García	5,632	1,207	0	6,839	9.5	15.5	9.69	8.9
3	Lag. Morgan	4,342	946	0	5,288	9.5	13.0	12.44	9.1
4	Carmen	959	1,538	0	2,497	10.0	14.3	10.44	12.2
5	unnamed	15	3,177	0	3,192	10.5	15.8	11.53	15.2
6	unnamed	8	322	0	330	10.0	15.0	5.87	13.0
7	unnamed	4	6,775	0	6,779	10.0	14.9	11.53	9.35
8	Lag. La Badenia	0	8,602	0	8,602	10.0	13.0	9.08	8.3
9	unnamed	0	2,500	0	2,500				
10	unnamed	0	2,332	0	2,332				
11	Lag. Sancti Spiritu	0	366	0	366				
12	unnamed	0	175	0	175				
13	unnamed	0	174	0	174				
14	Lag. Las Tunas	0	120	0	120	10.0	11.0	73.44	8.95
15	unnamed	0	23	0	23				
16	unnamed	0	0	0	0				
17	unnamed	0	0	0	0				
18	unnamed	0	0	0	0				
19	unnamed	0	0	0	0				
20	Lag. Los Patos	0	0	0	0				
	Totals	20,864	29,539	286	50,689				

Acknowledgements
We thank Jorge Postma, Nicolás Acosta and Florencia Ruíz for their help in the field work.

References

Caziani, S. M., Rocha, O., Rodríguez, E., Romano, M., Derlindati, E.J., Tálamo, A., Ricalde, D., Quiroga, C., Contreras, J. P., Valqui, M. and Sosa, H. 2007. Seasonal Distribution, Abundance, and Nesting of Puna, Andean, and Chilean Flamingos. The Condor 109:276-287.

GCFA 2001. Convention on Migratory Species (CMS) Final Report. 'Priority actions for the conservation of High Andes flamingos'. 37 pp.

Marconi, P. M., Sureda A. L., Rocha Olivio, O., Rodríguez Ramírez, E., Derlindati, E., Romano, M., Sosa, H., Amado, N., and Arengo, F. 2007. Network of important wetlands for flamingo conservation: Preliminary results from 2007 monitoring at priority sites. Flamingo 15:17-20.

Monitoring high-Andes flamingos at Laguna de los Pozuelos National Monument, Argentina: preliminary results

Moschione, F. N. and Sureda A. L

Administración de Parques Nacionales, Delegación Regional Noroeste (APN-DRNOA), Santa Fe 23, 4400, Salta, Argentina, and Grupo de Conservación Flamencos Altoandinos (GCFA). E-mail: alsureda@apn.gov.ar

Laguna de los Pozuelos (22º 20' S, 66º 01' W) is a saline lake at 3,500 m a.s.l. with a variable surface area of between approximately 10 and 80 km^2 in the arid puna of Jujuy Province, northwestern Argentina. This site, which is an important wintering area for both species of high-Andes flamingos (*Phoenicoparrus jamesi* and *P. andinus*) (Valqui *et al.* 2000, Caziani *et al.* 2006, 2007, Marconi *et al.* 2007) is a National Monument and Ramsar Site, and has been identified (Marconi 2007) as one of 14 key sites in a wetland network for the conservation of the two species.

As part of a waterbird monitoring program launched in 2006, we conducted three summer and three winter waterbird surveys at Laguna de los Pozuelos. Twenty five waterbird species in eight families were recorded, including the three species of South American flamingo (*P. andinus*, *P. jamesi* and *Phoenicopterus chilensis*). Total flamingo counts were 3,850, 14,886 and 2,001 in summer, and 5,046, 21,467 and 3,743 in winter (Table 1). We recorded six ringed Andean Flamingos from the ringing programs in Bolivia and Chile: two from Atacama, two from Punta Negra in Chile (winter 2006), and two from Laguna Colorada in Bolivia (winter 2008). In all counts except February 2008, we recorded numbers above 1% of the global population of *P. andinus,* the most vulnerable species of flamingo in the world (IUCN 2008).

Table 1. Austral summer and winter flamingo abundance by species recorded at Laguna de los Pozuelos, 2006-2008

	Summer counts			Winter counts		
Species	Feb-06	Feb-07	Feb-08	Jul-06	Jul-07	Jul-08
P. andinus	1,033	1,071		1,513	681	1,143
P. jamesi	156	136		554	2,326	872
P. chilensis	2,114	13,679	2,001	2,971	595	1,728
Phoenicopteridae	547			8	17,865	
Totals	3,850	14,886	2,001	5,046	21,467	3,793

We calculated the water surface area with ESRI ArcGIS 9.0 on Modis satellite images taken at the census dates (February and July 2006, 2007 and 2008). During the February 2008 census, the lake level was unusually high as a consequence of strong La Niña conditions that increased the lake area to 90.23 km^2. There was a highly significant negative correlation between the lake surface area and our estimates of the total number of flamingos on the lake (Spearman coefficient = -0.943). The drop in observed flamingo abundance with higher water levels (and larger surface areas) could be the result of reduced salinity affecting food abundance, or of the increased difficulty in counting the flamingos due to their dispersion over the larger available habitat. These preliminary results appear to show the special importance of Laguna de los Pozuelos as a wintering area for the vulnerable and Near-threatened high-Andean species under dry regional conditions. However, we must take into account that these surveys cover only a three-year period in a highly fluctuating environment.

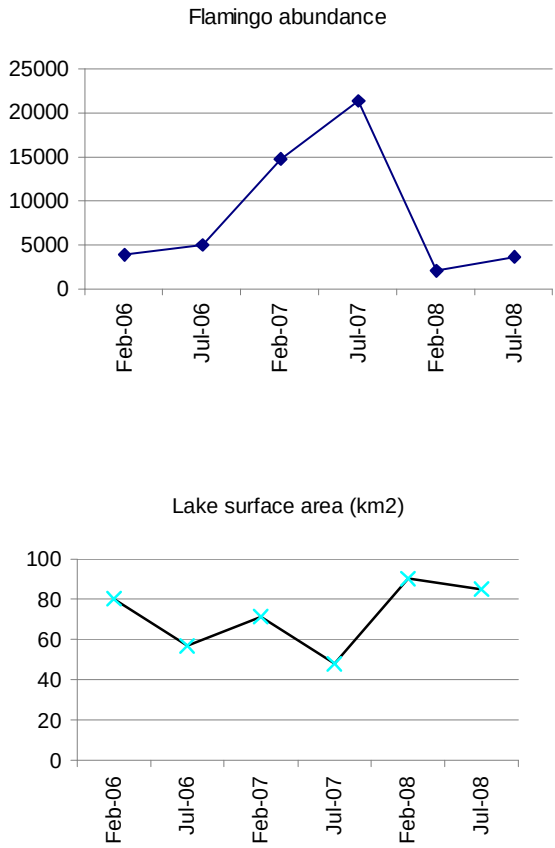


Figure 1. Relationship between observed flamingo abundance and lake surface level, Laguna de los Pozuelos, 2006-2008

Acknowledgements
We thank the park rangers, volunteers and technicians who accompanied the fieldwork, especially Guillermo Nicolossi, Marcos Bernuchi, Patricia Piccardo, Roberto Canelo, Rafael Terán, María Saravia, Pancho Gallardo, Baltasar Ramos, Marcelo Valverde and Angeles Gerónimo, and Patricia Marconi, Felicity Arengo and Leonidas Lizarraga for their valuable comments on the ms. We thank constant support of Administración de Parques Nacionales (APN) and Grupo de Conservación Flamencos Altoandinos (GCFA).

References

Caziani, S. M., Rocha Olivio, O., Romano, M., Tálamo A., Derlindati, E. J., Ricalde, D., Rodríguez Ramírez, E., Sosa, H. and Sureda, A. L. 2006. Abundancia poblacional de flamencos altoandinos: resultados preliminares del último censo simultáneo internacional. In: Childress, B., Arengo, F., Béchet, A. and Jarrett, N (eds.) 2006. Flamingo, Bulletin of the IUCN-SSC/Wetlands International Flamingo Specialist Group, Nº 14, December 2006. Wildlfowl & Wetlands Trust, Slimbridge, UK.

Caziani, S. M., Rocha Olivio, O., Rodríguez Ramírez, E., Romano, M., Derlindati, E. J., Tálamo A., Ricalde, D., Quiroga, C., Contreras, J. P., Valqui, M. & Sosa, H. 2007. Seasonal distribution, abundance, and nesting of Puna, Andean, and Chilean Flamingos. The Condor 109:276-287.

IUCN 2008. 2008 IUCN Red List of Threatened Species. www.iucnredlist.org. Downloaded on 05 November 2008.

Marconi, P. 2007. Proyecto Red de Humedales Altoandinos y Ecosistemas Asociados, basada en la distribución de las dos especies de Flamencos Altoandinos. Grupo de Conservación Flamencos Altoandinos. Libro de Gestión Sostenible de Humedales, Castro Lucic, M. & L. Fernández Reyes (editores) pp. 211-226.

Marconi, P., Sureda A. L., Rocha Olivio, O., Rodríguez Ramírez, E., Derlindati, E., Romano, M., Sosa, H., Amado, N., Arengo, F. 2007. Network of Wetlands of Importance for Flamingo Conservation: Preliminary results from 2007 summer monitoring at priority sites. In: Childress, B., Arengo, F., Béchet, A. and Jarrett, N (eds.) Flamingo, Bulletin of the IUCN-SSC/Wetlands International Flamingo Specialist Group, Nº 15, December 2007. Wildlfowl & Wetlands Trust, Slimbridge, UK.

Valqui, M., Caziani, S.M., Rocha, O., Rodríguez, E. 2000. Abundance and distribution of the South American altiplano flamingos. In: Baldassarre, G. A., Arengo, F. and Bildstein, K. L. (editors). 2000. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1): 110-113.

Chilean Flamingos (*Phoenicopterus chilensis*) in estuaries of central Chile

Estades, C. F.[1], Aguirre, J.[2] and Camaño, A.[3]

[1] *School of Forest Sciences, Universidad de Chile. E-mail: cestades@uchile.cl*
[2] *Aves Chile, Mosqueto 459 Of. 103, Metro Bellas Artes, Santiago, Chile*
[3] *Environment Arauco, El Golf 150 Piso 11, Las Condes, Santiago, Chile*

Abstract
We present information on the population dynamics of the Chilean Flamingo (*Phoenicopterus chilensis* Molina) in some coastal estuaries in central Chile, during the southern winters of 2006 and 2008. Our data confirm the status of this species as a winter visitor in the region. Between-year differences for the studied estuaries suggest that there might be some level redistribution of birds between sites in different years, following changes in regional rainfall patterns that affect the quality and abundance of suitable flamingo habitat in these environments. Our results are part of a long-term waterbird monitoring program that is aimed at understanding the dynamics of populations that use coastal wetlands in central Chile.

Introduction
The Chilean Flamingo is the most widespread of the three species of South American flamingos (Johnson *et al.* 1959, Del Hoyo 1992). Among the most important breeding areas for the species are the saline Mar Chiquita, in Cordoba, Argentina (Bucher *et al.* 2000) and the salt flats in the highlands of the two northernmost regions of Chile (Parada 1990). In central and southern Chile, the species is only a winter visitor (Markham 1971, Gibbons *et al.* 1997, Von Meyer and Espinosa 1998). A previous nesting colony was reported at the Maule lagoon in the Andes of central Chile, but this site has been inactive for decades. Although the presence of *P. chilensis* in the coastal

wetlands of central Chile during the non-breeding season is well known, there are no quantitative accounts of its use of these ecosystems. Here we present some information on the population dynamics of *P. chilensis* in some estuaries in central Chile.

Study Area

During the past three years (2006-2008), we conducted frequent censuses at several coastal estuaries in central Chile. Among these, three are part of a monitoring program that is aimed at understanding the long term dynamics of the waterbird communities in these systems. Figure 1 shows the location of the Mataquito (34°58'S 72°10'W), Reloca (35°43'S 72°15'W) and Itata (36°23'S 72°'51W) estuaries. These sites have been censused an average of ten times each year since June 2006. In addition, we visited the mouth of the Maipo river (33°36'S 71°37'W), the estuary of Estero Topocalma (33°59'S 71°53'W), Estero Pichilemu (34°22'S 71°59'W) and Maule river (39°19'S 72°24'W) with varying frequency.

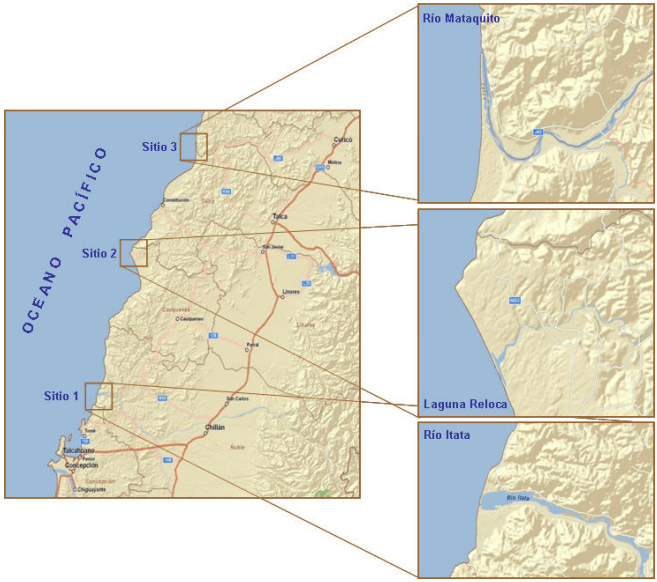


Figure 1. Central Chile, and location of the estuaries of the rivers Mataquito, Reloca and Itata.

Methods

We used the complete census method (Bibby *et al.* 1992), in which a complete count of all birds present in the estuary is recorded. Because of accessibility and visibility differences between sites, we have focused on getting comparable data through time for a given site, rather than comparing absolute numbers in different estuaries.

All observations were conducted during the morning with the exception of Itata where each survey was comprised of six censuses (three days, one census in the morning and one in the afternoon). All observations were made by two people, with the help of a spotting scope. Censuses were conducted over the shortest time possible in order to reduce the chance of double counting birds.

Results and Discussion

Figure 2 shows the seasonal population dynamics of *P. chilensis* at Mataquito, Reloca and Itata between the southern winters of 2006 and 2008 (Estades & Vukasovic 2008). Although the data show a great deal of variation between sites and years, they do confirm the status of the species as a winter visitor in the region. With the exception of a few summer records of solitary individuals in Maipo, this seems to be the case for the entire region.

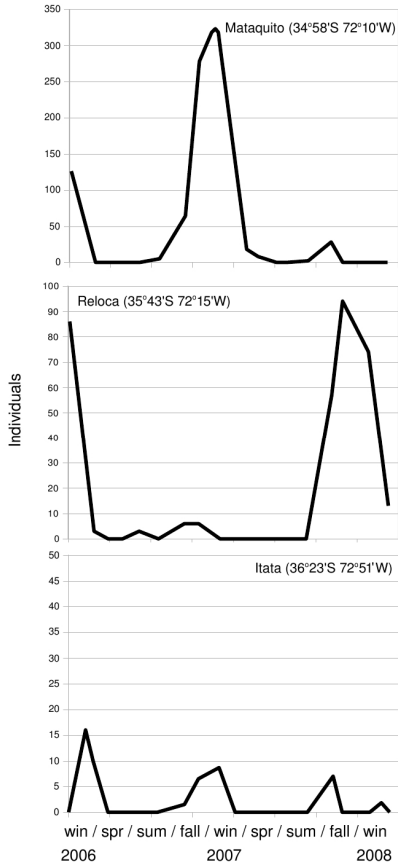


Figure 2. Population trajectories of *P. chilensis* at Mataquito, Reloca and Itata between the southern winters of 2006 and 2008. Each data point corresponds to a census in Mataquito and Reloca and to the average of six censuses in Itata.

The data also suggest that there might be some level redistribution of birds between sites in different years. The high concentration of birds in Mataquito during the winter of 2007 coincides

with the lowest records for the species in Reloca, whereas the opposite is true for the winters of 2006 and 2008. Although we do not have enough data to establish a formal relationship, its seems that during years with above-average rainfall, the level of water in the rivers of the central regions of Chile increases significantly, reducing the amount of habitat for flamingos in the estuaries of most rivers. For example, for Curicó (34°57'S 71°14, 50 km east from Mataquito), the rainfall for the winters of 2006, 2007 and 2008 were +10%, -47%, and +13%, respectively, in relation to a normal year (Geophysics Department, University of Chile). On the other hand, Reloca is a small river whose water level does not change significantly even during rainy seasons. Additionally, the fact that the river mouth is long and narrow, running parallel to the shore, reduces the speed of the water which very likely has positive effects on the quality of the sediments.

Itata does not seem to be an important site for the species and most recorded birds were apparently resting during their journey to or from their wintering grounds. This is probably due to the scarcity of areas of shallow waters and mudflats in this estuary. Similar restrictions may exist in the estuaries of the Maipo and Maule rivers, where regular assessments have failed to record regular visits by the species.

In addition to this apparent redistribution at a regional level, our observations suggest that there are substantial differences between years in the total number of flamingos that winter in the central part of the country. For example, compared to June 2006 the numbers of flamingos in June 2008 were lower at all sites (Topocalma 70 to 1, Pichilemu 5 to 0, Mataquito 126 to 0, Reloca 86 to 74, Itata 16 to 2), even though the rainfall was similar in both years.

Vilina *et al.* (2006) suggested that a possible origin for the flamingos that winter in central and southern Chile might be populations in Argentina. While this may be true for the southernmost populations (*e.g.* Magallanes), the birds wintering in the central part of the country may come from the populations in northern Chile. During the winter most salt flats in northern Chile freeze and some birds are known to move down to the coast. The fact that during the winter of 2007, along with the Chilean Flamingos in Mataquito, we observed an Andean Flamingo (*Phoenicoparrus andinus*) that likely came from the highland salt flats of northern Chile (Parada 1990), tends to support this hypothesis.

Our data are the first quantitative description of the dynamics of the *P. chilensis* populations in central Chile. However, there is still a high level of uncertainty as to the driving forces for population changes over time and space. With our long term monitoring program we hope to contribute to answer some of the remaining questions. However, the importance of the species and the fragility of its wintering grounds (Vilina *et al.* 2006) demands a more intense and direct approach to studying flamingo habitat use and migration movements.

Rererences

Bibby, C. J., Burgess, N. D. and Hill, D. A. 1992. Bird census techniques. Academic Press, London.

Bucher, E. H., Echevarría, A. L., Juri, M. J., Chani, M. and Chani, V. M. 2000. Long-term survey of Chilean Flamingo breeding colonies on Mar Chiquita Lake, Córdoba, Argentina. In: Baldassare, G. A., Arengo, F. and Bildstein, K. L., editors. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1)::114-118.

Del Hoyo, J., 1992. Order Phoenicopteriformes, Family Phoenicopteridae (flamingos). pp. 507-526, In: Del Hoyo, J., Elliot, A. and Sargatal, V. (eds.), Handbook of the Birds of the World, Vol. 1. Lynx Edicions, Barcelona.

Estades, C. and Vukasovic, M. A. 2008. Estudios de las aves en el sistema Vegas del Itata, periodo invierno de 2006 a verano de 2008. Subprograma Estudios de Avifauna. In: M. Salamanca (Ed) Programa de Monitoreo del Medio Ambiente Marino, CFI Nueva Aldea (PROMNA) Arauco. Octava Campaña Febrero de 2008.

Gibbons, J., Vilina, Y. A. and Cárcamo, J. 2007. Distribución y abundancia de Cisne Coscoroba (Coscoroba coscoroba), Cisne de Cuello Negro (*Cygnus melancoryphus*) y del

Flamenco Chileno (Phonicopterus chilensis) en la región de Magallanes. Anales Instituto Patagonia (Chile) 35:53-58

Johnson, A. W., Behn, F. and Millie, W. R. 1958. The South American Flamingos. Condor 60:289-299

Markham, B. 1971. Censo invernal de cisnes y flamencos en Magallanes. Anales Instituto Patagonia (Chile) 2:146-157.

Parada, M. 1990. Flamencos en el norte de Chile, distribución, abundancia y fluctuaciones estacionales del número. Actas I Taller Internacional de Especialistas en Flamencos Sudamericanos. Corporación Nacional Forestal-New York Zoological Society. Antofagasta (Chile) 1: 52-66.

Vilina, Y.A., Cofré, H. and Pizarro, C. 2006. Reporte Final. Aves Acuáticas en Chile. Waterbird Conservation for the Americas.

Von Meyer, A. and Espinosa, L. 1998. Situación del flamenco chileno (*Phoenicopterus chilensis*) en Chiloé y sur de la Provincia de Llanquihue. Boletín Chileno de Ornitología. 5:16-20.

EX-SITU PAPERS AND REPORTS

Size and trend of the Tanzanian export trade in wild Lesser Flamingos (*Phoeniconaias minor*)

Clamsen, T. E. M.[1], Mlingwa, C. O. F.[1] and Childress, B.[2]

[1]Tanzania Wildlife Research Institute (TAWIRI), P. O. Box 661, Arusha, Tanzania. E-mail: tclamsen@yahoo.com
[2] Wildfowl & Wetlands Trust, Slimbridge GL2 7BT, UK

Abstract
Tanzania is the only major Lesser Flamingo range state that permits the trade in live Lesser Flamingos (*Phoeniconaias minor*). The size and trend of this trade, and thus its potential effect on the conservation of this Near-threatened species, are not well known. This paper reports data on the annual harvest, exports and quota utilization between 1997 and 2003. The report is based on data from Wildlife Division annual reports (Tanzania Ministry of Natural Resources and Tourism), TRAFFIC International, CITES and other published sources. During this seven-year period, the mean annual harvest and export were 612 ± 140.1 and 388 ± 65.2 birds respectively, while the annual CITES quota was 1,600 birds. Annual harvests and exports generally declined during the period, but the levels of captures and exports varied widely from year-to-year, and this declining trend was not significant. The level of trade appears to be sustainable when compared with the estimated East African Lesser Flamingo population of 1.5 - 2.5 million and the tens of thousands of new Lesser Flamingos hatched in Tanzania each year although a population viability analysis has not been conducted. A disturbing finding is the apparent high level of mortality involved in this trade, as indicated by the sometimes large difference between the number of birds captured and the number exported. Recommendations to reduce this mortality are presented.

Introduction

The Lesser Flamingo is a gregarious and nomadic species that occurs regularly in 30 countries from West Africa, across sub-Saharan Africa and along the SW Asian coast to South Asia, and occurs as a vagrant in 26 additional countries (Childress *et al.* in press). The species is classified as Near- threatened in the IUCN Red List of Threatened Species (IUCN 2008), indicating that it is considered likely to qualify for a threatened category in the near future. The species is also listed in Columns A and B of the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) Action Plan, Appendix II of the Bonn Convention (CMS) and Appendix II of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES).

More than 75% of the Lesser Flamingos in the world are found on the saline-alkaline lakes in the eastern Rift Valley of East Africa (Childress *et al.* in press). The species is considered "Near-threatened" because of the lack of suitable breeding sites and the susceptibility of breeding to both natural and anthropogenic disturbance (BirdLife International 2008, Anderson 2000, Simons 2000). The Lesser Flamingo is an obligate filter feeder that normally feeds on microscopic blue green algae (cyanobacteria, primarily *Arthrospira fusiformes* in East Africa) that occurs in soda lakes.

Tanzania is the only primary range state for the Lesser Flamingo that allows the capture and export of live animals, including Lesser Flamingos (UNEP-WCMC 2008). However, data on the extent of this business, and its implications for the conservation of this species have not been well-known. This review provides information that will enable better management of the trade in Lesser Flamingos by the relevant authorities in Tanzania.

Methods

Data for the bird trade in Tanzania were mainly secondary and were collected from various sources. Trade data, including harvests and exports from 1997 to 2003 were sourced from the annual reports of the Wildlife Division (Tanzania Ministry of Natural Resources and Tourism), TRAFFIC International, Dar es Salaam and the CITES website. Other sources of information were the CITES office in Arusha and various literature surveys and extracts from published sources such as the TRAFFIC bulletin.

Data were analyzed using Microsoft Excel. A regression analysis was used to test whether there had been significant trends in annual harvests and exports from 1997-2003.

Results

Between 1997 and 2003, the mean annual harvest of Lesser Flamingos from the wild was 612 ± 140.1 SD, while the mean annual number exported was 388 ± 65.2 SD, but the sizes of both harvests and exports varied widely from year-to-year (Figure 1). The annual CITES quota throughout this period was 1,600 birds.

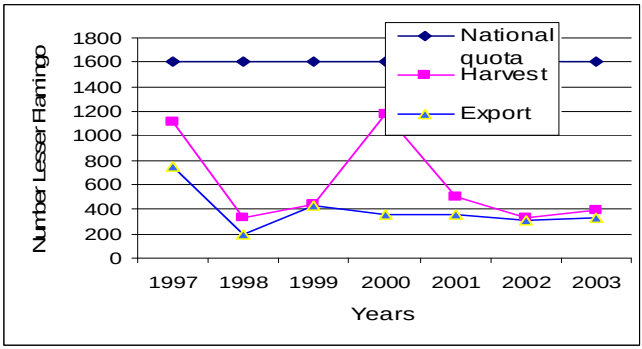


Figure 1: Annual Lesser Flamingo quota, harvests and exports from Tanzania, 1997- 2003.

The trends in the number of birds captured and exported generally declined during this period but and the declines were not significant (R^2 = 0.19 and 0.24 for captures and exports respectively).

Discussion

Tanzania is the only country where the capture and export of wild Lesser Flamingos is allowed. Thus, the CITES annual quota of 1,600 Lesser Flamingos and the mean annual harvest (612 ± 140.1 SD) seems unlikely to have a significant negative effect on the East African population of this species (1.5 - 2.5 million), although we have not conducted a population viability analysis to validate this conclusion.

The number of birds harvested and exported annually showed a statistical decline during the seven-year study period. However, the numbers varied widely from year-to-year, and the decline was not statistically significant. The wide variability in the numbers of captures and exports probably reflected orders received by the traders, rather than any other factor. It is understood that most traders capture the birds to order, usually during the period May to November, rather than holding an inventory.

The difference between the number of birds harvested and the number exported (33% to 67% of birds captured; approximately 850 birds in 2000) is understood to represent mortalities, either during transport between the capture sites and the traders' holding pens, or while being held in the pens for export. The main capture sites are believed to be lakes Manyara and Eyasi, both unprotected, while the traders are located in either Arusha or Dar es Salaam. Captured flamingos are kept in cages near the capture site and then transported to the trader's holding pen, which is reinforced by wire mesh.

Based on interviews with traders and veterinarians, the primary cause of the mortality between capture and export is starvation. Being an obligate filter feeder on microscopic blue-green algae in the wild, traders find it very difficult to feed them while in captivity awaiting transport to their final destination. Currently, they are fed on a ground mixture of maize husks, dagaa (small fish) and soda. Malnutrition may also be an important factor in mortalities sustained during shipment to the customer, but there are also other factors. In one recent importation into the USA, the birds were slung in crates. The slings twisted and resulted in the mortality of five individuals (L. Conrad *in litt*.)

Article IV of the CITES convention text, which relates to the regulation of trade in specimens of species included in Appendix II of the Convention, trade in Lesser Flamingo specimens (including live birds) "requires the prior grant and presentation of an export permit. An export permit shall only be granted when the following conditions have been met: (a) a scientific authority of the state of export has advised that such export will not be detrimental to the survival of that species; (b) the management authority of the state of export is satisfied that the specimen was not obtained in contravention of the laws of that State for the protection of fauna and flora; and (c) a management authority of the state of export is satisfied that any living specimen will be so prepared and shipped as to minimize the risk of injury, damage to health or cruel treatment."

Unfortunately, it appears that in the export of Lesser Flamingos from Tanzania the live birds are not being captured, held, or transported in ways that "minimize the risk of injury, damage to health or cruel treatment". However, it would also appear that this is a situation that can be easily rectified. There are 57 zoos and other captive facilities registered with the International Species Information System that keep Lesser Flamingos in their collections. Many of these institutions have maintained flocks of Lesser Flamingos for decades, and the best feeding methods and diets are well known. Moreover, there are several manufacturers of specialized Lesser Flamingo food mixtures (L. Conrad, *in litt.*), for both breeding and non-breeding Lesser Flamingos.

In order to help insure that the trade in Lesser Flamingos is conducted in a way that minimizes the risk of injury, damage to health or cruel treatment of the birds, we propose that the management authority in Tanzania, as part of the permit process, requires the use of best practices in the care, feeding and transportation of birds that have been captured for trade. We also propose that the purchasers of Lesser Flamingos make the use of best practices in the care, feeding and transportation of the birds a condition of their purchase orders, and that they ensure this condition is met by making unannounced visits to the supplier's place of business. A description of the best practices that need to be followed should be attached to the purchase order.

Acknowledgement
We thank the management of TAWIRI for logistic support for this study.

References

Anderson, M. D. 2000. Lesser flamingos, In: Barnes, K. N. (ed.). *The Eskom Red Data Book of Birds of South Africa, Lesotho and Swaziland.* Birdlife South Africa. Johannesburg, South Africa.

BirdLife International. 2008. Species factsheet: *Phoeniconaias minor*. Downloaded from http://www.birdlife.org on 4/11/2008

Childress, B., Nagy, S. and Hughes, B. (Compilers). In press. International Single Species Action Plan for the Conservation of the Lesser Flamingo (*Phoeniconaias minor*). AEWA Technical Series No. --. Bonn, Germany.

IUCN 2008. 2008 IUCN Red List of Threatened Species. www.iucnredlist.org. Downloaded on 04 November 2008.

Simons, R. E. 2000. Declines and movements of lesser flamingos in Africa, In: Baldassarre, G. A., Arengo, F., and Bildstein, K. L. (Eds). *Conservation Biology of flamingos*. Waterbirds 23 (Special publication 1): 83- 84.

UNEP-WCMC. 2008. *UNEP-WCMC Species Database: CITES-Listed Species* http://www.unep-wcmc.org. Downloaded 3 November, 2008.

A hypothetical husbandry point system for breeding flamingos in captivity

King, C. E.[1,2]

[1] *EAZA Ciconiiformes and Phoenicopteriformes Taxon Advisory Group*
[2] *Zoo de Fuengirola, Avda. Camilo José Cela, 8-10, 29640 Fuengirola, Spain.*
E-mail: king.koen@telefonica.net

Abstract
The concept of a point system as a tool to enable managers of captive flamingos to evaluate their enclosures and colonies regarding important elements in flamingo breeding is explained here. It is clear that no single factor is absolutely essential to breeding; rather it seems the affect of individual factors is cumulative, and once a certain level of requirements is met breeding will occur, while values above that level increase breeding success.

General colony management
Appropriate flamingo husbandry should always be paired with knowledge of individual birds and good record keeping. Any zoo or private person wanting to work seriously with flamingos should be able to identify individual flamingos at a distance, as this essential to understanding what is happening within the colony and being able to troubleshoot or otherwise alter the situation to improve success. Many managers assume that a group of flamingos will have a sex ratio of roughly 50:50. This is often not the case, particularly regarding Lesser Flamingos (*Phoeniconaias minor*), where the European population currently consists of 198 males, 76 females and 170 birds of unknown gender, and the North American population consists of 260 males, 132 females and 51 birds of unknown gender (ISIS 2008).

Zoos are often reluctant to invest time in observing a breeding colony, however 15 to 30 minutes of daily observation by a practiced observer is all that is needed to monitor most colonies. This will not be sufficient time to identify each bird on the nests each day, but if done every day gives a fairly accurate impression of which birds are paired to each other, which nests they are using, when eggs are laid and fate of the nest/eggs. The pattern of egg-laying within a colony is a measure of colony synchrony, which is usually important in breeding success. Knowing when eggs were laid is helpful if interventions are made (*e.g.* if eggs are abandoned or if egg management will be practiced) (Perry 2005). Productive pairs and problem birds can be identified, which is helpful in making a selection if flamingos are removed from the group. Regular observation also helps in identifying enclosure and nest area obstructions to breeding, potential predators and other risks.

There are a number of factors that are important for breeding flamingos, but there is no essential factor. The important factors can be viewed in terms of a hypothetical point system, with points awarded based on how well the enclosure satisfies the criterion for each factor. The affect of the factors is cumulative, and breeding occurs once a certain required level is reached. For example, it may be necessary to have 35 of 50 points to breed flamingos, and points accumulated above the minimum increases breeding success rate. Factors could be assigned a maximum point value indicating their importance (Table 1). While precise values (maximums and the score given to a particular situation) may be debatable, this should not detract from the evaluation process. This system is meant to provide a tool for examining the different factors separately, so that managers can arrive at a clearer idea of how and where they can invest in improvements, with the goal of optimizing the cumulative score.

The factors and their maximum values

Colony size

Colony size might have a value of 8 points, as it is indisputably the most important factor for optimizing breeding, based on a number of studies (*e.g.* King and van Weeren 2005). The EAZA Ciconiiformes and Phoenicopteriformes TAG recommends a single species group of more than 40 flamingos for breeding. If this is not possible, there are some tactics to try to achieve the same effect. Reducing the amount of accessible area increases density, although a compromise needs to be made between reducing area to increase density, and having sufficient area to display. Additionally, flamingos should have ample room to move around as reduced movement reduces blood circulation, which can increase chance of foot lesions. Some zoos have reported success using mirrors to increase perceived colony size. However, as zoos tend to make multiple changes at the same it is difficult to establish whether it is the mirrors, or any single factor, that made a difference. Again it may be the summation of all the factors that made the difference.

Security

Flamingos need to feel secure to breed. The most secure place may be a few meters from people, as long as the flamingos know that the people cannot reach them. More serious threats are larger animals held in their enclosure and predators, most commonly foxes in Europe. Flamingo enclosures should be covered or hot-wired if there is a chance of ground predators; bringing flamingos indoors every night for their protection negatively affects breeding. Flamingos may still feel unsafe if they can see potential predators, even if they cannot access the enclosure. Providing islands surrounded by water that the flamingos perceive as safe, and blocking their view past the enclosure barriers may help. Flamingos that do not feel safe tend to bunch together rather than spreading out when they are loafing. Security deserves a point value of at least 6.

Colony sex ratio

Colony sex ratio does not seem important in whether a colony breeds or not, but it certainly affects the degree of breeding success. More atypical partnerships (not male-female pairs) occur with uneven sex ratios (King 2006), which may result in reduced fertility and/or more unrest in the colony, leading to lower reproductive success. Sex ratio may be assigned a value of 4 points.

Table 1. Important factors identified for breeding flamingos in captivity and their awarded maximum point values

Factor	Points
Colony size (single species)	8
Security	6
Colony sex ratio	4
Male wing condition	4
Water areas characteristics	4
Hours of sun	4
Weather	4
Nest area characteristics	4
Display area characteristics	4
Strategically-placed barriers	4
Photoperiod	2
Substrate	2
Total	50

Male wing condition
Like sex ratio, the wing condition of the males (full-flighted, pinioned, wing-clipped etc.) probably does not have much affect on whether a breeding attempt occurs or not, although there are not enough full-flighted groups to analyze this. Wing-condition clearly has a strong influence on fertility. Copulation behaviour of males seems to be most influenced by pinioning. The response to flight restraint on males is individual. Fertility is not a 100% reliable measure of effect, as eggs can be fertilized by extra-pair copulations. Based on observations in several zoos, three-fourths to one-half of traditionally pinioned males in a colony are not able to copulate. Full-flighted males have a value of 4, long-pinioned males, wing-clipped or tenectomized males have a value of 3, traditionally pinioned males have a value of 2, and males with wing removals above the Carpometacarpus bone have a value of 1.

Water area characteristics
Easily accessible water area with gradual, smooth banks and primarily shallow bottoms (*e.g.* < 30 cm deep) are features in flamingo exhibits that are lacking surprisingly often. Flamingos are clearly water birds, and deserve to be in their element. Foraging behaviour is essential to flamingos, and if there is no water around flamingos will continue to make trampling movements with the feet (movements that function to stir up food in water) and bill-foraging movements in dry substrates. Flamingos usually roost in water, as this presumably confers a feeling of safety. Much displaying is also performed in water. Water, especially if the basin bottom is smooth or covered with a layer of organic material, is good for the soles of the feet, as flamingos often have foot lesion problems in captivity. Appropriate water would certainly be worth 4 points. Ideally, appropriate water areas should constitute at least half of the enclosure.

Hours of sun
Preference for sun (versus shade) clearly affects use of enclosures in northern Europe and at least in that part of the world might have a value of 4 points. Studies of colonies in warm climates should indicate if this is an important exhibit feature universally. A study of four flamingo enclosures in western Europe (Greene 2005) showed that the flamingos in the one with much sun and easily accessible water areas had the best breeding, used the largest proportion of their enclosure (including spending half the time in the water) and were more active than the flamingos in the other enclosures. Another group that did not have access to much water but did have good access to mud in which flamingos also forage, was the second most active group.

Weather
Other aspects of weather are also important. It has been frequently noticed that a prolonged period of rain, cold and clouds early in the breeding cycle depresses reproductive activities, at

least temporarily. This appears to affect the synchrony of the colony (Studer-Thiersch 2000) and can effect breeding success. Warmth may be particularly important for Lesser Flamingos. The influence of weather on reproductive activities decreases once nesting has advanced to the incubation stage. Weather might have a point value of 4.

Nest area characteristics
Having a good nesting area (damp, pliable) available at the right time (when the birds are increasing display rates), can definitely be stimulating. In some cases presence of artificial nest mounds or even placing an egg on one or more artificial or flamingo-built nests can even be more stimulating. A suitable nesting area may deserve a value of 4 points.

Display area characteristics
Flamingos prefer long stretches of mostly unobstructed area for performing the "marching" display. This can be land, water or both. Too many obstructions can cause them to break off the displays prematurely, which can lead to reduced stimulation and synchronization, thereby reducing breeding success. Too hilly a terrain also impedes displays. Proper terrain is awarded a point value of 4.

Strategically-placed barriers
On the other hand, presence of an occasional soft visual barrier (*e.g.* a shrub, or large clump of grass or small stand of bamboo) and spreading of important resources (bathing, feeding, nesting and loafing areas) requires that flamingos occasionally need to seek each other out, which can increase synchrony (Studer-Thiersch 2000). Spreading of resources and strategically-placed barriers might also count as 4 points.

Photoperiod
While photoperiod is not usually seen as an issue in breeding flamingos, it can be a factor. Prolonged photoperiod (*e.g.* 24 hours a day) has stimulated reproduction in Caribbean (*Phoenicopterus ruber*) and Greater Flamingos (*P. roseus*) housed indoors (J. Lammers, B. Hiddinga, pers. comms.) and may influence moult. Photoperiod may also be particularly important in breeding Lesser Flamingos in captivity. Photoperiod may deserve a point value of 2.

Substrate characteristics
A soft substrate enhances condition of the feet and should always be available. As mentioned above, water is recommended as a substrate. Short vegetation is also good, and matting or another type of flooring that has resilience should be used indoors. Substrate might count as 2 points for breeding, but from a well-being standpoint it would count as more.

Acknowledgements
This point system is based on results of various research projects, many viewings of enclosures and discussions with flamingo managers. All the people that have been willing to share their experiences and ideas over the years are thanked. Members of the EAZA Ciconiiformes and Phoenicopteriformes TAG who commented on the point system are also thanked.

References

Greene, T. 2005. Flamingo's in de ruimte. Onderzoek naar het verblijfgebruik van flamingo's in vier Nederlandse dierentuinen. Rotterdam Zoo, Rotterdam (In Dutch).

ISIS 2008. International Species Information System. http://www.isis.org/ downloaded 03 November 2008.

King, C. E. 2006. Pink flamingos: atypical partnerships and sexual activity in colonial breeding birds. Pp. 77-106. In: Sommer, V. and Vasey, P. L. (eds). Homosexual behaviour in animals: an evolutionary perspective. Cambridge University Press, Cambridge

King, C. E. and van Weeren, L. 2005. Captive flamingo management on a European level. Rotterdam Zoo, Rotterdam.

Perry, J. 2005. Reproduction. Pp. 68-93. In: Brown, C. and King, C. (eds). Flamingo husbandry guidelines. A Joint Effort of the AZA and EAZA in cooperation with Wildfowl & Wetlands Trust. Dallas Zoo, Dallas.

S**tuder-Thiersch, A. 2000.** Behavioural demand on a new exhibit for greater flamingos at the Basle Zoo, Switzerland. In: Baldassarre, G. A., Arengo, F. and Bildstein, K. L. (editors). 2000. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1): 185-192.

The potential contribution of captive flamingos to research

King, C. E.[1,2]

[1] *EAZA Ciconiiformes and Phoenicopteriformes Taxon Advisory Group*
[2] *Zoo de Fuengirola, Avda. Camilo José Cela, 8-10, 29640 Fuengirola, Spain.*
E-mail: king.koen@telefonica.net

Abstract
Investigations on topics such as flamingo behavior, physiology and reproduction are often more easily carried out in zoological settings than in the field, as illustrated in this article. Field and zoo researchers would benefit from closer collaboration in identifying potential research contributions of captive flamingos and in conducting relevant studies.

Introduction
Flamingos are extremely popular zoo animals: for example, approximately 70% of European Association of Zoos and Aquaria (EAZA) zoos have flamingos (King and van Weeren, 2005). The total number of captive flamingos registered world-wide with the International Species Information System (ISIS) is 14,324 (ISIS 2008). Although this number is probably less than half of the true number of flamingos in captivity, as many flamingos are held by non-ISIS-registered zoos and by private breeders, it is likely to reflect the impressive number of flamingos potentially available for research projects.

Field research in many areas of flamingo biology is beset with potential problems. Flamingo movements are unpredictable, thus field studies may end prematurely because of disappearance of the study subjects. Even when flamingos remain at a given location, they are often so difficult to approach that detailed observation of behaviours and experimental manipulation is impossible. While there are some ongoing field programs to band flamingos with coloured plastic rings that allow identification at a distance, only a small portion of the birds is banded. The advantages of using captive birds in studies are that many zoos use such bands to identify all their flamingos, flamingos can be observed at short distances, and there are possibilities to capture and handle animals as well as to experimentally alter the environment with relative ease.

Although captive flamingos are not suitable for studies in topics such as migratory behaviour, there are a number of areas in which captive flamingos have contributed to our understanding of basic flamingo biology and to managing wild populations and/or their habitats, and in which they can continue to do so in the future (King 2000).

Life History Statistics
To date, the oldest living wild flamingos known have been a male Greater Flamingo (*Phoenicopterus roseus*) that was 40 years and 23 days of age (Johnson 1998) and a Lesser Flamingo that was 40 years and approximately nine months of age (Childress 2004). We know from flamingos in captivity that the potential to live, and to breed, is even longer. A male Greater Flamingo at Basle Zoo bred successfully at minimally 57 years of age (Studer-Thiersch 1998) and a female that lived minimally 71 years laid an egg when she was at least 60 years old (see "The

last veteran flamingo at Basel Zoo's has died", this issue). A Greater Flamingo currently alive at the Adelaide Zoo is minimally 72 years of age (Bogle and Watson 2008).

Communication and Reproductive Research

Analysis of ring information on Greater Flamingos nesting in the Camargue indicates that these birds, which nest in the thousands in the Camargue, do not usually re-pair with the partner from the previous year, or even from the same year if a bird makes two breeding attempts in the same season (Cezilly and Johnson 1995). Contrarily, flamingos in captivity tend to maintain partnerships for several years. At Rotterdam Zoo, the mean number of partners that Greater Flamingos had over a ten year period was 3.1 ± 1.4 S.D. (n = 26; range: 1-7) (King 2006). Similar to the situation with captive birds (Pickering 1992), it may be that in the wild the rate of partner change increases as colony size increases, and that smaller colonies are more monogamous than larger ones. This could simply be because the flamingos that were paired the year before have a more similar physiological cycle (Studer-Thiersch 2000). It has also been observed that flamingos that arrive together at a zoo tend to pair with other birds from that same shipment (King 2000), which could be for the same reason. Understanding the dynamics of mate choice and the effect of size of colonies could be important in maintaining sound genetic bases in small wild flamingo populations in the future.

Studies indicate that individual aggression and dominance interactions could have a negative effect on feeding time, and thereby fitness, of free-ranging flamingos (Bildstein *et al*. 1991; Schmitz and Baldasarre 1992). Studies on dominance and agonistic behaviours in captivity can help elucidate the relative importance of factors that can influence the outcome of agonistic encounters (*e.g.* size, age, reproductive status, sex, familiarity with the surroundings).

Voice recognition is very important in flamingos, as parents must be able to find each other and to find their young in the crèche. Studies involving transfer of eggs and chicks at various stages of hatching to unfamiliar nests in captivity could help to discern when recognition starts. An investigation of vocalization development of parent- and foster-reared chicks could provide insight into genetic and behavioural components of vocalisation acquisition.

Cézilly *et al*. (1997) concluded that Greater Flamingos nesting in the Camargue have an age-assortative mating system, with directional preference towards older and more experienced birds. They suggested that differences between individuals in the performance of displays could provide proximate cues for assessing age. Testing this hypothesis by measuring qualitative and quantitative variation in display performance could be much more easily achieved in captive populations.

Morphology, Physiology, Endocrinology and Feeding Studies

Any study that involves measuring a physical or behavioural value can be more easily undertaken with captive flamingos. Investigations on sexual and taxonomic differences in several morphological parameters have been conducted with captive flamingos (Studer-Thiersch1986, Richter and Bourne 1990, Richter *et al.* 1991). Captive flamingos have been used as a material for studies of filter-feeding structures and mechanisms (Beckman 2006, Jenkins 1957, Zweers *et al*. 1995), metabolism of carotenoids (Fox 1975), moult (Shannon 2000), vocalizations (Boylan 2000), vision (Martin *et al.* 2005), crop milk (e.g. Lang 1963, Studer-Thiersch1966) and normal blood chemistry values and values for comparative taxonomic cytochemistry (Hagey *et al*.1990, Péindo *et al.* 1992). It has been proposed that flamingos can manipulate the gender of their young, with males hatching earlier in the season and females later, but finding a morphological indicator of age of juveniles that is independent of sex would be helpful in studying this topic (Bertault *et al*. 2000), a goal that could be more easily accomplished using captive flamingos. Bildstein (1990) cites flamingos as an example in a paper he wrote advocating the use of zoo collections in studies of feeding ecology and conservation biology in wading birds.

Development of Management Techniques

Management techniques for free-ranging flamingo populations can often be tested and adapted using captive populations. Marking methods, and harnesses and transmitters for radio or satellite tracking can be tested easily. Use of artificial nests to encourage free-ranging flamingos to colonize a particular breeding area was adopted from zoos, and has been successful (*e.g.*

Rendon and Johnson 1996). Studies related to disease such as avian influenza and response to medications and vaccinations can be studied much more easily in captive birds.

Other advantages of collaboration with zoos

Cooperation with zoos can have other advantages in addition to provision of study subjects and sites. Captive flamingos can be very useful tools for illustrating problems and potential solutions in the ecosystems of their wild counterparts. The collaboration can be helpful in gaining financial, logistical and political support for field research and conservation projects. For example in addition to carrying out in-house research, Dallas Zoo has been working since 1999 on a project in the Yucatan, Mexico to better understand the natural history of Caribbean Flamingos. Hundreds of young flamingos are banded, sexed and crop samples taken each year to gather data needed to create sound action plans. The Dallas Zoo's role is primarily supportive: channelling money, providing the leg bands, equipment (scales, band applicators), veterinary services, staff expertise with flamingo husbandry, means for DNA sexing and nutritional analysis of the crop samples. The zoo also provides education support and materials to the NGO, Ninos Y Crias, for this organization to educate children of the region about the flamingos and wetlands habitat preservation (C. Brown, pers. comm.).

References

Beckman, M. 2006. Science Now daily news: 31 October 2006. http://sciencenow.sciencemag.org/cgi/content/full/2006/1031/2?etoc

Bertault, G., Raymond, M., Cézilly, F. and Johnson, A. R. 2000. Evidence of seasonal sex ratio manipulation in the Greater Flamingo. In: Baldassarre, G. A., Arengo, F. and Bildstein, K. L. (editors). 2000. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1): 20-25.

Bildstein, K. L. 1990. The use of zoo collections in studies of feeding ecology and conservation biology of wading birds (Aves: Ciconiiformes). AAZPA 1990 Regional Proceedings: 353-360.

Bildstein, K. L., Frederick, P. C., and Spalding, M. G. 1991. Feeding patterns and aggressive behaviour in juvenile and adult American flamingos. Condor 93: 916-925.

Bogle, D. and Watson, C. 2008. Shock over Adelaide Zoo bashing of rarest flamingo. http://www.news.com.au/adelaidanow/story/0,27574,24574238-2682,00.htm

Cézilly, F. and Johnson, A. R. 1995. Re-mating between and within breeding seasons in the Greater Flamingo. *Phoenicopterus ruber roseus*. Ibis 137: 543-546.

Cézilly, F., Boy, V., Tourenq, C. J. and Johnson, A. R. 1997. Age-assortive pairing in the Greater Flamingo. *Phoenicopterus ruber roseus*. Ibis 139: 331-336.

Childress, B. 2004. Remarkable Lesser Flamingo recovery. Lanioturdus 37: 3-4.

Fox, D. L. 1975. Caretenoids in pigmentation. Pp.162-182 In: J. Kear and N. Duplaix-Hall, eds. Flamingos. Poyser, Berkhamsted.

Hagey, L. R., Schteingart, H. T., Ton-nu, H. T., Rossi, S. S., Odell, D. and Hofman, A. F. 1990. Beta-phocalacholic acid in the bile: biochemical evidence that the flamingo is related to an ancient goose. Condor 92:593-597.

ISIS 2008. International Species Information System (ISIS). 2008. http://www.isis.org/CmsHome/content/MyHome (November 4 2008)

Jenkin, P. M. 1957. The filter-feeding and food of flamingos (*Phoenicopteri*). Philosophical Transactions of the Royal Society of London Series B 240: 401-493.

Johnson, A. R. 1998. A noteworthy recovery. Flamingo Specialist Newsletter 9:12.

King, C. E. 2000. Captive flamingo populations and opportunities for research in zoos. In: Baldassarre, G. A., Arengo, F. and Bildstein, K. L. (editors). 2000. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1): 142-149.

King, C. E. 2006. Pink flamingos: atypical partnerships and sexual activity in colonial breeding birds. Pp. 77-106. In: V. Sommer and P.L. Vasey. Homosexual behaviour in animals: an evolutionary perspective. Cambridge University Press, Cambridge.

King, C. E. and van Weeren, L. 2005. Captive flamingo management on a European level. Rotterdam Zoo, Rotterdam.

Lang, E. M. 1963. Flamingos raise their young on a liquid containing blood. Experentia 15: 532-533.

Martin, G. R., Jarrett, N., Tovey, P. and White, C. R. 2005. Field vision in flamingos: chick-feeding versus filter-feeding. Naturwissenschaften 92: 351-354.

Péindo, V. I., Polo, F. J., Viscor, G. and Palomeque, J. 1992. Hematology and blood chemistry values for several flamingo species. Avian Pathology 21: 55-64.

Pickering, S. P. C. 1992. The comparative breeding biology of flamingos Phoenicopteridae at the Wildlife and Wetlands Trust Centre, Slimbridge. International Zoo Yearbook 31: 139-146.

Rendon, M. M. and Johnson, A. R. 1996. Management of nesting sites for Greater Flamingos. In: Baldassarre, G. A., Arengo, F. and Bildstein, K. L. (editors). 2000. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1):167-183.

Richter, N. A. & Bourne, G. R. 1990. Sexing Greater Flamingos by weight and linear measurements. Zoo Biology 9: 317-323.

Richter, N. A., Bourne, G. R. & Diebold, E. N. 1991. Gender determination by body weight and linear measurements in American and Chilean flamingos, previously surgically sexed: within-sex comparison to Greater Flamingo measurements. Zoo Biology 10: 425-431.

Schmitz, R. A. & Baldassarre, G. A. 1992. Contest asymmetry and multiple bird conflicts during foraging among non-breeding American flamingos in Yucatan, Mexico. Condor 94: 254-259.

Shannon, P. W. 2000. Plumages and molt patterns in captive Caribbean flamingos. In: Baldassarre, G. A., Arengo, F. and Bildstein, K. L. (editors). 2000. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1): 160-172.

Studer-Thiersch, A. 1966. Altes en neues über das Futterungssekret der Flamingos *Phoenicopterus ruber*. Ornithologische Beobachter 63 : 85-89 (in German).

Studer-Thiersch, A. 1986. Tarsus length as an indicator of sex in the flamingo genus *Phoenicopterus*. International ZooYearbook 24/25: 240-243.

Studer-Thiersch, A. 1998. Basle Zoo's veteran flamingos. Flamingo Specialist Newsletter 8: 33.

Studer-Thiersch, A. 2000. Behavioural demand on a new exhibit for Greater Flamingos a the Basle Zoo, Switzerland. In: Baldassarre, G. A., Arengo, F. and Bildstein, K. L. (editors). 2000. Conservation biology of flamingos. Waterbirds 23 (Special Publication 1): 185-192.

Zweers, G., de Jong, F., Berkhoudt, H. and Van Den Berge, J. C. 1995. Filter feeding in flamingos. Condor 97: 297-324.

Translocation and hand rearing of Greater Flamingos *Phoenicopterus roseus*

Simpson, N.

Bristol Zoo Gardens, Clifton, Bristol BS8 3HA, UK. E-mail: nsimpson@bristolzoo.org.uk

Survey results have shown that flock size is a determining factor in the extent of breeding participation in captive Greater Flamingo flocks (King & Weeren 2005), with a higher percentage of birds breeding in larger flocks than in smaller ones, and with no birds breeding in flocks of fewer than 20 birds (Table 1).

Table 1. Relationship between Greater Flamingo flock size and percentage of birds breeding (King & Weeren 2005)

Colony size	0-10	11-20	21-30	31-40	41-50	51-100	>100
Number of colonues	7	9	9	9	3	8	2
Percentage breeding	0	0	33.3	55.6	66.7	78.5	109

Forty birds is the recommended ideal flock size for breeding Greater Flamingos. Prior to 2005, the flock size at Bristol Zoo was between 25-30 birds and the birds were breeding. In 2005, a number of birds were killed by a fox, reducing the flock to only 20 birds. To increase the chances of Bristol Zoo's colony breeding, an increase in bird numbers was needed. Discussions with Wildfowl and Wetlands Trust (WWT) staff at their Slimbridge centre led to the opportunity to transfer eggs from Slimbridge to Bristol to hatch and hand rear.

Fourteen eggs were transferred in two batches, one in May and one in June 2008. The eggs had all been incubated to the third trimester of incubation and were all fertile and viable at the time of transfer. Twelve of the 14 eggs hatched successfully with the remaining two being dead in shell.

The chicks were hand fed from day one, following the methods and diets used by Batty *et al.* (2006), and were weighed daily to plot their growth (Figure 1). The volume fed to the first chicks that hatched was recorded and used as a guide for the volume to be fed to chicks that hatched at later dates (Table 2). All rearing was video taped. The tapes were edited to create a DVD of the rearing methods that will be available for others to view.

Chicks were seen to self-feed from a very young age and at 24 hours old were seen picking up small pieces of broken egg shell that was provided for them to eat. After five days a small bowl of adult flamingo pellets was provided and chicks would readily take these pellets.

Problems encountered included refusal to feed by two of the chicks, and due to time constraints, these two birds were tube fed the formula, a relatively easy method of quickly filling the crop. Splayed legs occurred in two chicks, but this was easily corrected through the use of ties and a suitable substrate that allowed the chicks' feet to grip the surface and not slip out from underneath them. Aggression was also a problem, especially at feeding times, and chicks had to be separated at these times and put back together after the feed.

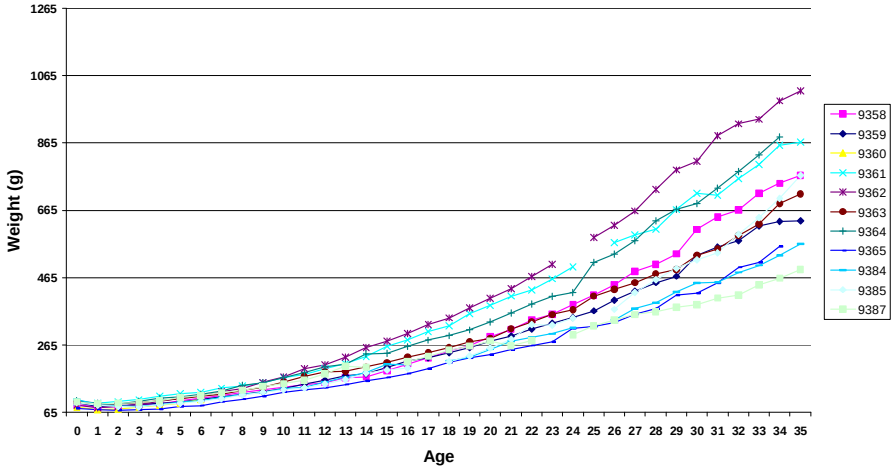


Figure 1: Daily Growth rate in grams for Greater Flamingos hand reared at Bristol Zoo, June-July 2008

Table 2. Daily food intake for Greater Flamingos hand reared at Bristol Zoo, June-July 2008

Age in days	No feeds per day	Average food intake per day (ml)	Average food intake per feed ml)	Age in days	No feeds per day	Average food intake per day (ml)	Average food intake per feed (ml)
1	6	39.5	6.6	24	4	225.9	56.5
2	6	54.0	9.0	25	4	229.3	57.3
3	6	57.5	9.6	26	4	266.5	66.6
4	6	63.9	10.6	27	4	276.0	69.0
5	6	66.7	11.1	28	4	291.0	72.8
6	6	77.8	13.0	29	4	286.5	71.6
7	6	77.7	13.0	30	3	262.0	87.3
8	6	84.5	14.1	31	3	275.0	91.7
9	6	96.9	16.1	32	3	280.5	93.5
10	5	93.5	18.7	33	3	318.0	106.0
11	5	109.5	21.9	34	2	300.0	150.0
12	5	107.3	21.5	35	2	280.0	140.0
13	5	109.3	21.9	36	2	286.5	143.3
14	5	110.4	22.1	37	2	259.0	129.5
15	5	124.1	24.8	38	2	270.0	135.0
16	5	140.3	28.1	39	2	305.0	152.5
17	5	146.0	29.2	40	2	293.0	146.5
18	5	147.4	29.5	41	2	291.0	145.5
19	4	155.0	38.8	42	2	298.9	149.4
20	4	153.9	38.5	43	2	295.0	147.5
21	4	182.7	45.7	44	2	271.3	135.6
22	4	191.5	47.9	45	2	234.3	117.1
23	4	206.5	51.6				

From five weeks the chicks were introduced to the main flock in a small separate pen and then fully introduced to the adult birds with no negative interactions. All the chicks were left full-winged and will fly small distances in the enclosure, no serious imprinting was seen, although the hand-reared birds are still steadily around the keeping staff.

Later in the year, some of these young birds began to show nesting behaviour with attempts to build nests in the enclosure. The Bristol Zoo flock is now 28 birds and we hope for breeding in the near future. The DVD of this hand rearing is available from the author.

Acknowledgements
All the avicultural staff at Bristol Zoo for their hard work and commitment to the rearing process. Nigel Jarrett and WWT Slimbridge staff.

References

Batty, M., Jarrett. N. S, Forbes. N, Brown, M. J., Stadley, S., Richardson, T., Oliver, S., Ireland, B., Chalmers, K. P. and Fraser, I. 2006. Hand rearing Greater Flamingos *Phoenicopterus ruber roseus* for translocation from WWT Slimbridge to Auckland Zoo. International Zoo Yearbook 40: 261-270.

King, C. and Weeren, L. 2005. Captive flamingo management on an European level, EAZA Ciconiiformes and Phoenicopteriformes Taxon Advisory Group, European Association of Zoos and Aquaria.

Longevity and value of veteran flamingos in zoological collections

Over the past two decades, there have been several reports on the status of Basel Zoo's veteran Greater Flamingos in Flamingo Specialist Group newsletters (No. 6, 1992; No 7, 1995; No 8, 1998; No 10, 2001; No 12, 2004). At the end of 2001, a male and a female acquired either in 1932 or 1938 were still alive. As the birds were not leg-banded until 1944, it is impossible to tell if they originated from the importation of 1932 or 1938. Also their ages at their arrival in Basel is unknown, although they were not reported as being young birds.

Both birds were regular breeders well into their 60s, particularly the male. Although the female had lost interest in breeding by 2000, the male incubated and raised a chick that year, and was a particularly attentive parent, spending more time feeding his young than his mate did. After the death of the male in 2003, the female was the only survivor of these early imported birds. Though her colouration was still normal and bright, she had difficulty walking, probably due to the not always perfect conditions in the enclosure, especially in the early years of her long zoo career. In her final years her eyesight had decreased. However, because of these handicaps, she became a very valuable bird for the colony, as she no longer participated in all the nervous reactions of the younger colony members, and her (perhaps only seemingly) imperturbable tranquillity quickly calmed the other birds. For several years she and her mate were the favoured birds to accompany each year's crèche of young after they had separated from their parents. The older birds gave a feeling of safety to the youngsters and helped them find food quickly in the new surroundings.

In summer 2007, after at least nearly 70 years of safety in the Basel zoo, she was killed by a fox invading the exhibit. However, the last veteran Greater Flamingo of the Basel Zoo was not the oldest bird of this species living in a zoological garden. Another very old Greater Flamingo in the Adelaide Zoological Gardens, Australia, reported to be at least 75, was attacked and seriously injured by four teenagers at the end of October 2008 (www.flamingoresources.org). This old flamingo, which is recovering from the senseless attack, had become almost blind and lived together with a Chilean flamingo. It was imported in 1933, only one year later than the arrival of a group of flamingos at Basel Zoo. A. Studer-Thiersch (adelheid.studer@vtxmail.ch)

NEWS ITEMS

Forestry officials in Chile appeal to the courts to protect a key flamingo breeding site from mining

In early October, Chile's National Forestry Corporation (CONAF), the government agency that administers the country's national parks, asked a court to halt mining company Quiborax's operations in northern Chile's Salar de Surire, a protected saline lake classified as a natural monument.

CONAF claimed the company was breaking the law by working too close to the flamingo breeding areas. They also requested that the court require the National Environmental Commission (CONAMA) to demand an environmental impact study from the company. Quiborax mines ulexite, a mineral which is converted into boric acid and agrochemical products. A 1978 presidential decree granted the company permission to work in the protected salt flat. While the decree requires the company to take measures to protect local flora and fauna, it does not establish specific guidelines. A 1989 decree, however, is more precise, prohibiting mining activities within 3,000 meters of nesting sites. CONAF said the company currently is in violation of the second decree, the only one the agency considers to be valid.

"The end of October marks the beginning of courtship, one of the stages in the flamingos' reproductive process," said Jorge Torres, CONAF director for far northern Chile's Region XV. The (mining) operations continue to take place 1,000 meters from the nesting sites, which we think is an imprudent distance."

Earlier this year CONAF alleged that Quiborax extended its Surire operations without proper authorization, putting the flamingos in danger. Flavia Liberona, head of Chilean environmental NGO Fundación Terram, said that although the Surire salt flat is a protected area, there are not enough park guards to ensure that companies and individuals respect regulations. Taken from an article by Leigh Shadko in the Santiago Times. (editor@santiagotimes.cl).

Tata Chemicals withdraws its soda extraction plans for Lake Natron, Tanzania

The Indian company Tata Chemicals announced in May 2008 that it was withdrawing its much-flawed initial plans for a soda extraction facility at Lake Natron in Tanzania. This welcome announcement was the result of over 30 months of sustained effort by the Flamingo Specialist Group and many international, regional and local conservation NGOs, including IUCN, BirdLife International, Wetlands International, the Ramsar Convention, Wildfowl & Wetlands Trust and the Lake Natron Consultative Group (a consortium of 40 mainly East African national NGOs).

Lake Natron is the only regular breeding site for the East African population of the Near-threatened Lesser Flamingo, a regional population representing over 75% of the total species. Tanzania's Minister for Environment, Dr Batilda Burhani, said the investors were free to redraw their plans and conduct a new Environmental and Social Impact Assessment, but they should be aware that unless their report satisfied environmental and social concerns, no approval would be granted. Furthermore, Dr Burhani told Tata that a new ESIA must be preceded by the development of an Integrated Management Plan for the Lake Natron Ramsar Site which would spell out the future conservation and development agenda for the area. B. Childress

Hurricane Ike hits Bahamas and Cuba flamingo breeding sites

In early September, Hurricane Ike smashed directly into the large Caribbean Flamingo colonies on Great Inagua in the Bahamas and El Refugo de Fauna Rio Maximo in Cuba (cover image before storm), the two most important breeding sites for this species. The immense storm hit the Great Inagua National Park first on Sunday, 7 September, with 135 mph (217 kph) winds that apparently caused no human deaths or injuries, but tore the roofs off homes, and toppled trees and utility poles, and caused so much damage to the Morton Salt Company facilities that they may not reopen.

Luckily, the young from this year's breeding at Great Inagua had fledged and the entire colony survived the storm by flying off the island. Tamica Rawling of the Bahamas National Trust who manage the national park reports "On September 7th, 2008, Hurricane Ike, made landfall on Inagua as a Category 3 storm. Over 80% of the homes on Inagua were damaged but there was no loss of life. Residents reported that prior to the storm, the majority of the flamingos disappeared from the visible portions of Lake Rosa, returning to the lake after the storm had passed. A small group of about 30 birds retreated into the mangroves near town. After the storm these birds were found alive but with broken legs and had to be euthanized."

The huge colony at El Refugo de Fauna Rio Maximo was not so fortunate. The same storm hit that colony on 8 September and inflicted terrible damage. Breeding at Rio Maximo had been unusually active this year and although breeding began in April, as in the Bahamas, there were hundreds of adult birds still incubating when the storm hit. Based on telephone reports after the storm from refuge Director José Morales Leal, the storm caused the death of thousands of chicks that had just fledged and juveniles that still remained in the area, as well as the adult flamingos what were still incubating. In addition, the storm severely damaged the refuge field stations and their equipment. The Flamingo Specialist Group and the International Flamingo Foundation are leading an effort to raise the necessary funding to repair these facilities. Tamica Rahming (TRahming@bnt.bs), José Morales Leal (flamenco@caonao.cu), Melgar Tabasco (mtabasco@ninosycrias.org.mx)

Eagerly-awaited monograph on Greater Flamingos by Alan Johnson and Frank Cézilly published

The eagerly-awaited and brilliantly written new monograph *The Greater Flamingo* by Alan Johnson and Frank Cézilly of Tour du Valat is now available! *The Greater Flamingo,* published by T. & A. D. Poyser (London) summarises our current understanding of flamingo biology, with detailed discussions of population dynamics, evolution and systematics, migration and movements, feeding, reproductive biology and conservation, with emphasis placed on the authors' work on the famous flamingo population in the Camargue region of southern France. There is also a detailed inventory of Greater Flamingo breeding areas throughout its range, and an outline of future challenges for research. The book is available from Amazon (www.amazon.com) or Natural History Book Service in the UK (www.nhbs.com).

Disney to release spectacular new feature-length film on the Lesser Flamingo

The Crimson Wing: Mystery of the Flamingos, a spectacular new feature-length nature documentary by Disney Nature, chronicling the precarious life cycle of the Near-threatened Lesser Flamingo, will be premiered in Paris and Geneva on 18 December 2008. It was filmed over a two-year period at Lake Natron in Northern Tanzania, the only regular breeding site for over 75% of

the species' population by FSG member Matthew Aeberhard and is expected to become the most successful full-length nature documentary ever produced. Release in the USA is anticipated in 2009. Disney Nature plans to donate a substantial portion of the proceeds to support flamingo conservation at Lake Natron. B. Childress

Matt Aeberhard

Pioneering flamingo documentary nominated for award

In The Pink, a 24-minute pioneering documentary by FSG member Ashima Narain exploring the phenomena of 20,000 flamingos visiting the polluted Sewri Bay in Mumbai, India, was nominated for a Panda Award for Promoting Film Makers from Developing Countries at Wildscreen. Wildscreen is the premier wildlife film festival, held every 2 years at Bristol, UK. *In The Pink* had earlier won the Asia Oceania Award at the Japan Wildlife Film Festival and a Special Jury Award at Vatavaran in New Delhi.

In The Pink was Ashima's first attempt at directing a wildlife documentary, her second film *The Last Dance,* on the crimes committed against the Indian Sloth Bear was also nominated for a Panda Award, in the same category, at Wildscreen. (ashima.narain@gmail.com)

Flamingo Resource Centre and website launched

A new website (www.flamingoresources.org) called the Flamingo Resource Centre has been launched, which aims to assist the research and conservation of flamingos worldwide by gathering together flamingo-related information and resources and making them easily accessible to conservationists, researchers, collection managers, educators, policy makers and all interested parties.

The Flamingo Resource Centre was created to provide one place where information and resources relating to all flamingo species both in the wild and in captivity in all parts of the world could be found.

As well as information pages on flamingo basics, the species, conservation and special topics, the site has the following resource sections:

- Literature
- Flamingos and zoos: husbandry guidelines and related resources
- Flamingo Specialist Group: publications, meeting documents and contact details
- Photo gallery: images of flamingos and flamingo related conservation activities to act as a reference and guidance to others
- Links: links to already existing flamingo related websites

In addition, the site has a latest news section, a forum and a page on how to help flamingos. The site is only as useful as the resources that are contributed. Please help make this initiative worthwhile by submitting:

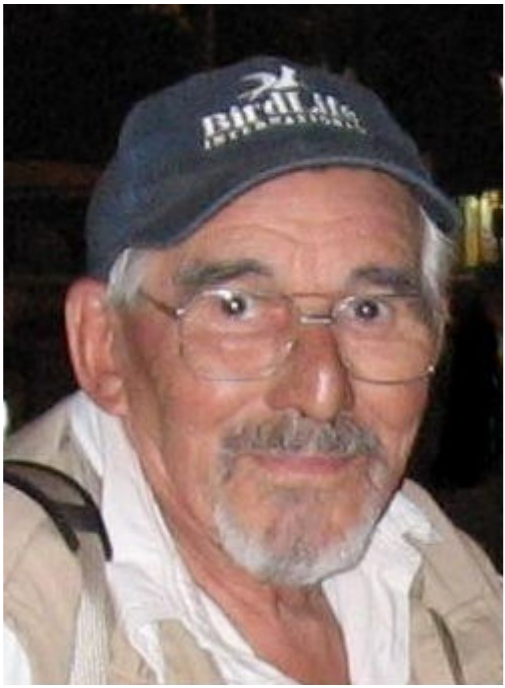
- Scientific publications for which you are the copyright holder or can obtain copyright permissions
- Guidelines relating to the husbandry of captive flamingos
- Reports on captive breeding activities
- Information on conservation projects, initiatives, groups and networks
- Information on research activities
- Field reports
- Policy and legislation information relating to flamingo conservation
- Reports on relevant meetings, workshops, and conferences
- Original articles
- Photos and video of wild or captive flamingos, or related activities

Rebecca Lee (rebecca.lee@wwt.org.uk)

RECENT SCIENTIFIC PUBLICATIONS

Normally, we include a list of recent scientific publications here. However, due to the large number of papers and reports received, we have distributed this list via the member list serve.

IN MEMORY



Keith Wearne, best known for his work on flamingos, shorebirds and particularly the Walvis Bay wetland, died of a heart attack in mid-July. He became synonymous with fire-brand conservation of Namibia's spectacular desert wetlands and was affectionately known as the "Curmudgeon". Keith took no prisoners, was always up for a fight, and saw off many would-be developers trying to impinge on the Walvis Bay sanctuary. He was the brains behind the Coastal Environmental Trust of Namibia whose influence spread beyond just the Walvis Bay wetland. It is thanks to him that Walvis Bay is recognised as one of Africa's premiere sites for coastal shorebirds, particularly Lesser Flamingos. His work spanned three decades and in that time he made sure that Walvis Bay was recognised as an internationally acclaimed Ramsar wetland, and an Important Bird Area. He was awarded the Namibia Nature Foundation's Conservator of the Year for this work. He was approached by many birders and specialists alike for his expertise and wisdom - which he always gave freely and with a twinkle in his eye. Realizing his input, the local saltworks built and named in his honour the only bird hide in the Walvis Bay complex. His drive, enthusiasm, salty wit and sheer will to succeed will be sorely missed not just by his friends and family but by all conservationists who have benefitted from his time at the coal face.

Rob Simmons

NOTES