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THE SOUTH AMERICAN FLAMINGOS

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In 1953, Dr. Robert Porter Allen asked one of the authors of this article, A. W. Johnson, to supply him with information on the distribution, numbers, habits, and life-cycles of the three endemic species of South American flamingos. Johnson gave him such information as he had been able to obtain many years ago in the course of three trips to the isolated plateau country of northern Chile which these birds inhabit, and this information was duly reproduced in Allen's masterly monograph entitled "The Flamingos: Their Life History and Survival" published by the Audubon Society in 1956. On reading this book, with its ample documentation of the life-cycles and habits of the other three species of flamingos, we noted that the information regarding the South American species was scanty and unsatisfactory. Then we noted the following remarks (pp. 30–31) with reference to James' Flamingo (*Phoenicoparrus jamesi*) which the senior author, in company with J. D. Goodall and R. A. Philippi B., had looked for in vain on all three of their expeditions.

"Thus the mystery that surrounds this strange, three-toed, little highland flamingo today is matched by an equally obscure history that goes back more than a century . . . The most astonishing fact concerning *Phoenicoparrus jamesi* is that its habits and nidification have never been described. No actual breeding sites, past or present, are known . . . Although the fact that *jamesi* has not been observed for many years may be a result of its isolated range . . . we cannot but wonder if James' flamingo still survives. At the moment this would seem to be one of the outstanding mysteries of the avian world."

This statement was too much of a challenge for us to resist, so in spite of the rigors and inclemency of the terrain to be visited, there was nothing for it but to organize another expedition to the remote Andean region of northern Chile where James' Flamingo had been found originally. Accordingly, Dr. and Mrs. Behn, A. W. Johnson, Bryan Johnson, and W. R. Millie left Santiago for the north by pick-up truck on January 14, 1957.

In the course of our five-week expedition, we traversed a distance of 5000 kilometres (3125 miles) by pick-up, 4-wheel drive vehicle, and mule back (fig. 1), and we visited almost every possible flamingo habitat in the mountains of northern Chile from the extreme south of the Province of Antofagasta (southern tip of Salar de Atacama, lat. 23° 45′S) to the Department of Arica close to the Peruvian border (Salar de Surire, lat. 18° 50′S). In addition we made an excursion across the border into an uninhabited section of southwestern Bolivia to Laguna Colorada (Red Lake), located at lat. 22° 15′S, long. 67° 95′W, which is at an altitude of 14,800 feet. It was there that we found the main object of our quest—the long lost and elusive James' Flamingo.

On arriving at this lake on January 22, 1957 (fig. 2), we found flamingos feeding in great abundance in stretches of shallow water all over the lake, and on examining them with our glasses we came to the conclusion that Chilean and Andean flamingos (*Phoenicopterus chilensis* and *Phoenicoparrus andinus*) were present in approximately equal numbers. After some time, we noticed that in a small group of about 30 flamingos, one bird seemed to be somewhat smaller and whiter on the back than the others. Because of the strong light and multiple reflections on the water it was impossible to be sure, so

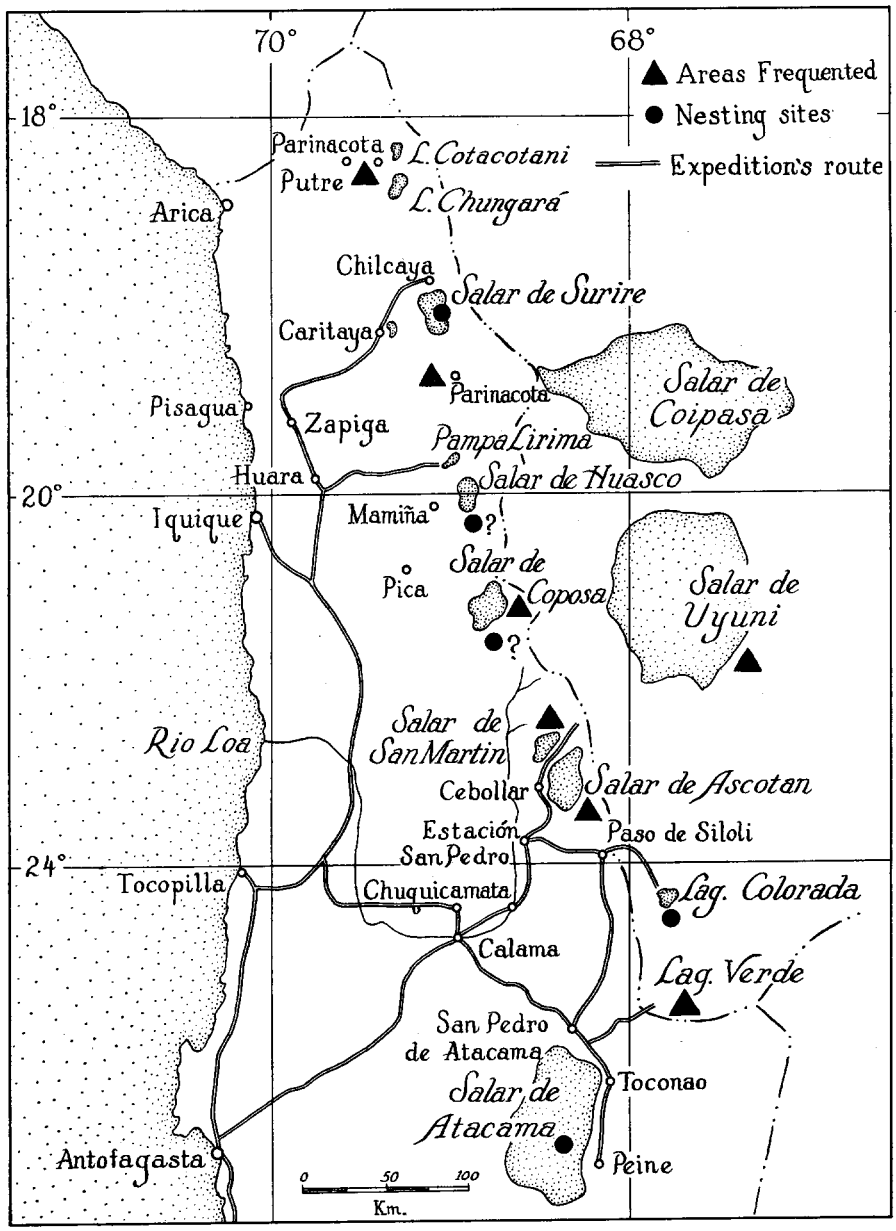

Fig. 1. Map of northern Chile and adjacent Bolivia where flamingoes were studied. See key above.

we approached cautiously and chanced a shot at about 200 yards. The bird took flight with the rest but it soon dropped, and by the time we could launch our rubber boat and reach the spot it was dead. The dark brick-colored legs and yellow area on the bill (see frontispiece) showed us immediately that we had found *Phoenicoparrus jamesi*. This specimen proved to be an adult female in full breeding plumage.

Later while walking around the lake we met a Quechua Indian who told us that he had just arrived from the interior and that it was his custom to come once a year with his family and settle on the shores of the lake to gather flamingo eggs for sale in the

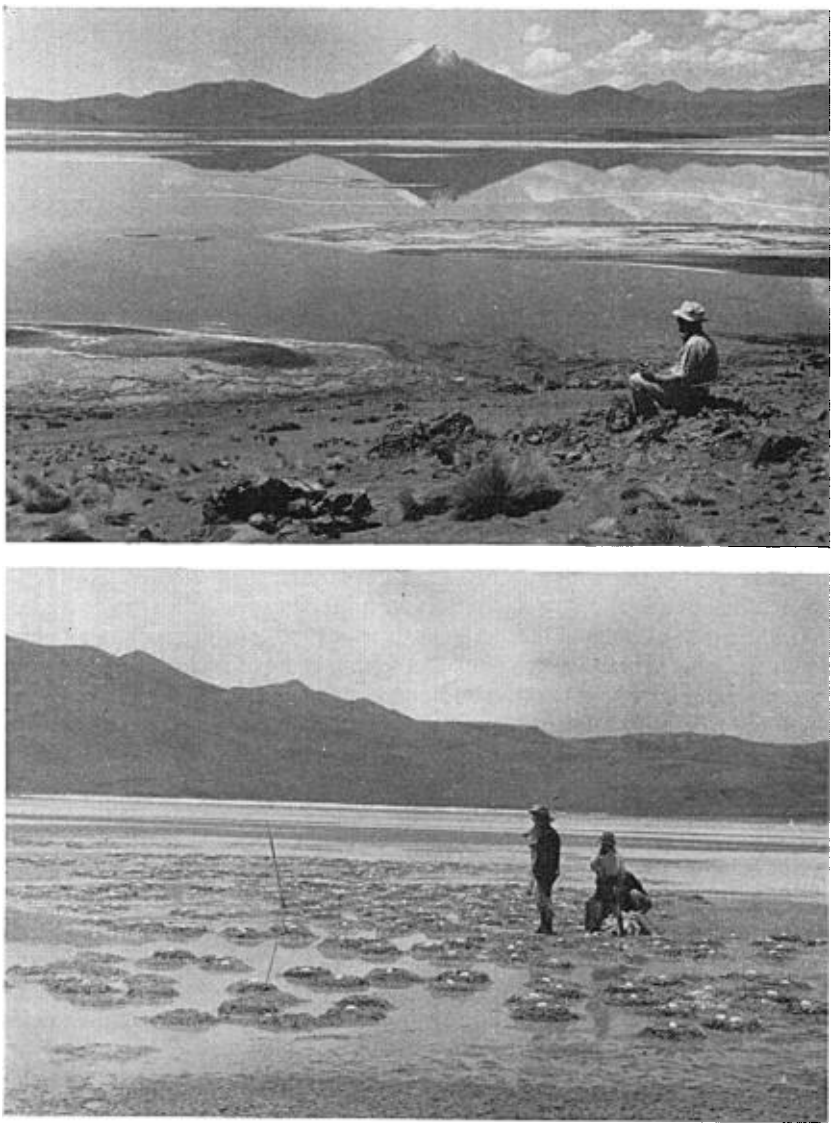

Fig. 2. Upper: panorama of Laguna Colorada, in western Bolivia.
Lower: partial view of flamingo nesting colony.

villages of the hinterland, where they were very much prized for food. We asked him to show us the nesting colonies, but he replied that they were out in the middle of the lake and very difficult to reach, and that "tenderfeet" like ourselves would never be able to get there. Finally, on our assuring him that we would not interfere with his taking the eggs or scare the birds away by shooting at them, he agreed to take us at our own risk.

Fig. 3. Egg of *Phoenicoparrus jamesi,* in nest, with egg of *P. andinus,* held, for comparison.

Early next morning we set out across the lake through shallow water, towing the boat with our equipment and tapping the bottom in front of us with the oars as we advanced to avoid falling into occasional bottomless pits where subterranean geysers poured their waters into the lake. It was heavy going, as the thin crust of salt which formed a sort of false bottom to the lake gave way under our weight at every step and cut gashes in our ankles and legs. Finally, after wading nearly two kilometers, we reached a large island of salt with "cliffs" facing the open water and a large expanse of low-lying, level ground (crystallized sulphate of soda) beyond. Traversing this, we soon found ourselves in difficulties as the hard surface proved to be interspersed with long strips or belts of salty slime of uncertain depth through which we had to stumble and flounder with great physical effort.

Finally we reached firmer ground, topped a salt-bluff and there before us, less than 50 yards away, was a veritable paradise of flamingos, a nesting colony of at least 4000 birds. The birds were standing in all directions and postures, sitting on their nests, or walking and feeding with stately dignified gait along the adjacent stretches of open water! On seeing us appear thus suddenly from behind the bluff, they all rose into the air, filling the sky with their beautiful roseate hues, their dark wings and long necks extended and legs stretched out behind them. However, after a while, on our remaining quiet, the majority decided to return and we were able to admire them at close quarters. As before, the Chilean and Andean species were present in approximately equal numbers, but we were also able to identify a very small minority of *Phoenicoparrus jamesi.* A

narrow strip of deep slime still separated us from the colony, and this we were unable to cross. We accordingly decided to go back for the boat, but by the time we reached it the imminence of the regular afternoon thunderstorm, coupled with the effects of the altitude on our physical endurance, caused us to change our minds and set out for the shore.

Early the following morning we were on our way again, but on picking up the Indian guide we learned from him that some of his relatives were already at the colony gathering eggs, and so we decided to change our plans and visit a second colony of which he also knew. Conditions in this second colony, which consisted of about 3000 birds, were similar to those at the colony we had visited the day before. The numbers of Chilean and Andean flamingos were approximately equal and there were in addition not more than 20 to 25 pairs of James' Flamingo. As we had noted previously all three species were nesting together without separation or segregation of any kind. This habit of communal nesting posed a further problem: how to distinguish the eggs of one species from those of another. There was no alternative but to wait for the individual owners of the nests to return, identify them at reasonably close range with our glasses, and then wait until another member of our party could reach the spot and point to the particular nest we were watching. By this means, we eventually identified 18 nests of *Phoenicoparrus jamesi,* 14 of *P. andinus,* and 13 of *Phoenicopterus chilensis.* Later we learned to distinguish the eggs with relative ease because we found that those of each species were characteristic in shape (fig. 3).

As can be seen from table 1, the eggs of *Phoenicoparrus jamesi* are significantly smaller in both dimensions, while those of *Phoenicopterus chilensis* are appreciably longer and tend to be narrower than those of *Phoenicoparrus andinus.*

Table 1

Measurements of Eggs of *Phoenicoparrus jamesi, P. andinus,* and *Phoenicopterus chilensis*

Species	Number	Range	Mean with standard error	Standard deviation	Coefficient of variability
Length:					
Phoenicoparrus jamesi	18	78.1–87.8	82.8±0.58	2.47±0.41	2.6±0.44
Phoenicoparrus andinus	13	80.9–90.9	84.7±0.74	2.68±0.53	3.2±0.62
Phoenicopterus chilensis	14	87.6–100.0	94.9±0.98	3.64±0.69	3.8±0.92
Breadth:					
Phoenicoparrus jamesi	18	48.4–55.2	51.1±0.45	1.92±0.32	3.7±0.62
Phoenicoparrus andinus	13	52.8–57.2	54.3±0.34	1.21±0.24	2.2±0.44
Phoenicopterus chilensis	14	50.0–56.5	53.5±0.46	1.70±0.12	3.2±0.60

The nests were roughly formed, conical mounds of mud averaging 45 to 50 cms. at the base and 28 to 30 cms. at the rim, but they were only 10 cms. high. The average distance between nests was about 6 to 8 cms. It was absolutely impossible to distinguish the nests of one species from those of another either by size, shape, or material used. As already stated, there was no segregation of any sort and individuals of *Phoenicoparrus jamesi* were observed sitting on their nests with both *Phoenicopterus chilensis* and *Phoenicoparrus andinus* as next door neighbors. Of the 1500 to 2000 nests comprising the two colonies (there was also a third colony farther around the lake which we did not visit) not one contained more than a single egg or chick and our guide insisted that in all his years of collecting the eggs for sale he had never seen a nest with more than one egg.

While at the colony it was interesting to observe the curious manner in which the flamingos settled on their eggs. Approaching on foot, they would straddle the nest, spread

their legs wider and wider and suddenly let themselves drop onto the nest, shifting themselves until they had arranged the egg to their satisfaction. The legs remained doubled under the body, with the shins projecting backward nearly up to the pelvis.

By the time we had collected the eggs, taken photographs and measurements, and obtained samples of water, slime, mud, and other materials, it was well past three o'clock and the usual afternoon thunderstorm had begun. Long before we reached the shore the rain had turned into sleet and then to hail, and on our way back to camp it started to snow. Such is the habitat of the South American highland flamingos!

IDENTIFICATION

Once one has become familiar with the birds in the field, it is easy to distinguish *Phoenicoparrus andinus* from *Phoenicopterus chilensis,* even when the color of the legs cannot be determined with certainty, by the much greater amount of black visible on the primaries of *Phoenicoparrus andinus* when the wings are folded and by the vinaceous areas on its neck. *Phoenicopterus chilensis* looks pinker, especially on the back, but there is no apparent difference in the size of these two species. To positively identify *Phoenicoparrus jamesi* from a distance is decidedly difficult, as the smaller size of that species cannot be determined with certainty in the strong light which usually prevails in their habitat and, although in general the bird looks much less roseate than *Phoenicopterus chilensis,* it is easy to confuse it with immature *Phoenicoparrus andinus* which are similar in size and lack the vinaceous areas on the neck which characterize the adults. However, at close range *Phoenicoparrus jamesi* can be distinguished immediately by its dark, brick-red legs and the smaller bill with large areas of yellow (see frontispiece). Incidentally, it should be mentioned that all sketches of the bill thus far published are inaccurate. This may be due to fading of the colors in the bills of the museum specimens which are 60 or more years old.

Our guide, Juan Villca, was able to distinguish the three species at a glance and called them respectively "Guaichete" (*Phoenicopterus chilensis*), "Tococo" (*Phoenicoparrus andinus*), and "Chururo" (*P. jamesi*). He stated that sometimes a few "parinas" (flamingos) of another kind known as "Jetete" were also to be seen, and that these could be distinguished from the others by their whiter wing-coverts and by the absence of the wine-color on the neck. Although the remote possibility that a fourth species of flamingo does in fact exist in these desolate wastelands should not be discarded altogether, and in spite of our guide's assurance that a few might be seen at the nesting colonies, it is our impression that the "Jetete" corresponds to immature specimens of *Phoenicoparrus andinus* which, as we learned from experience when we later shot one, mistaking it for an adult *P. jamesi,* cannot be identified at sight with any degree of certainty.

A further point of interest is that the possibility of sexual dimorphism in James' Flamingo should not be too readily discarded. While watching small groups of *Phoenicoparrus jamesi* feeding in the shallow waters of the lake we noticed on more than one occasion that they were accompanied by a few larger birds which, on account of the vinaceous color on parts of the head and neck, we took to be *P. andinus*. However, these larger birds seemed to be especially interested in the smaller ones and on one occasion we saw an attempt at copulation between birds of different sizes. As the specimen we shot proved to be an adult female, it is possible that these larger birds are in reality males of the same species. Further investigation along these lines and the capture of an adult male *Phoenicoparrus jamesi* is much to be desired.

FOOD AND FEEDING

On several occasions we saw flamingos of all three species feeding at sufficiently close range to enable us to determine the details of their movements. The head and neck are submerged until the bill rests on the bottom; the bill is then drawn toward the feet with a slight swinging motion, followed, in some cases, by the bird stepping backward and continuing the motion without raising the head. On examination, the mud where the birds had been feeding was found to be covered with irregular, wavy lines, usually in the form of an "S" or double "S," about 3 cms. wide and 1 cm. deep. These were blotted out at intervals by the impressions left by the toes and webs of the feet. These same wavy lines were also observed on the muddy bottom in the immediate vicinity of the nesting colonies and our guide assured us that he had often seen the birds sitting on their nests and feeding in the usual way with the head and part of the neck completely submerged!

Analyses of samples of this mud and of the formalin-preserved stomach contents of the three flamingos which we shot show the presence of the silicaceous skeletons of more than 20 different species of diatoms mixed with large quantities of sand, but there is no trace of larger organisms of any kind. Nevertheless, it appears to us that the possibility of the birds' eating larger organisms should not be summarily dismissed, as our samples were necessarily limited in number and in addition it is difficult to explain the purpose of the row of small hooks on the sides of the flamingo's tongue unless larger, macroscopic organisms such as small crustaceans or molluscs also form part of the normal diet. However, even if this surmise is correct, it is evident that no food larger than a pea can be consumed as the bill, despite its large size and complex shape, can be opened only about half a centimeter at the tip.

Samples of the lake water taken between 8 and 9 a.m. were found to have a temperature of 12°C. and a pH of between 8 and 9. When analyzed in the laboratories of the University of Concepción by Professor Anibal Pinto Alvarez, these samples gave the following results:

	Grams per liter
Sodium chloride	59.32
Sodium sulphate	21.41
Magnesium sulphate	2.85
Calcium bicarbonate Sodium and aluminum silicate Iron Sodium borate	9.48

These same salts form a kind of false bottom over the greater part of the lake and also crystalize in quantity around its edges. Analyses made in the same laboratory gave the following chemical composition of these salts:

	Per cent
Sodium sulphate	66.62
Sodium chloride	3.50
Water	29.08
Insolubles	0.30
Other substances	0.50

ORIGIN OF THE RED TINT OF THE LAKE WATERS

The name "Laguna Colorada" (Red Lake) has been attributed to the pink plumage of the flamingos which inhabit it. This, in our opinion, is incorrect. There is no doubt, however, that the water does have a distinct reddish tint which is accentuated by reflec-

tions from the surrounding brownish hills until it appears brick-red. The chemical analyses of the water and salts point to the presence of iron in the form of oxides and chlorides, but samples of slimy water selected because of the intensity of their reddish color, when studied under the microscope, betray the presence of innumerable, spherical, orange-colored microorganisms which have been identified by the Botanical Institute of the University of Concepción as "unicellular cyanophyceous algae of the genus *Aphanocapsa,* rich in phycoerythrin pigments."

It would seem quite possible that these organisms, which undoubtedly give the water of this lake its characteristic reddish tint, also entered into the composition of the equally characteristic reddish lipopigments of the adipose tissue of the flamingos which we shot. These algae are likewise probably responsible for the deep orange-red yolks, not only of the flamingos' eggs which we blew, but also of the chickens' eggs which we bought from the guide's family. It may be possible that the delicate pink hues of the flamingos' plumage are in some way derived from this same phycoerythrin and that the fading of these tints when the birds are kept in captivity may be due to a lack of this coloring element in their food.

DISTRIBUTION

After visiting on this trip the salt lakes of Atacama, Ascotán, and San Martín in the province of Antofagasta, Laguna Colorada and Laguna Verde in western Bolivia, and Pampa Lirima, Tranque Caritaya, and Surire salt lake in the Province of Tarapacá (fig. 1), and taking into account Johnson's observations made years ago at Salar de Huasco, Collacagua, and Isluga in the Province of Tarapacá and lakes Parinacota ("Lake of the Flamingos") and Cota-Cotani in the highlands of the Department of Arica, we are of the opinion that the distribution within Chilean territory of the three species of South American flamingos may be summarized as follows:

The birds are to be found on the salt lakes and on certain lakes of relatively fresh water from the extreme south of Salar de Atacama (lat. 23° 45′S, long. 68° 15′W) to Lago Parinacota (lat. 18° 15′S, long. 69° 15′W) in the cordilleras of Arica. Their nesting sites, however, would appear to be confined to two points on Salar de Atacama, certain small lakes in the mountains directly to the east, possibly Salar de Ascotán (although we were not able to establish this and it is likely that the renewal of operations for the extraction of borax has caused the birds to abandon this site), and in the province of Tarapacá at Salar de Coposa, Salar de Huasco, Lago Parinacota (where *Phoenicoparrus jamesi* was originally found in 1850; not to be confused with the lake of the same name in the Department of Arica already mentioned), and Salar de Surire.

It should be borne in mind, however, that these data on nesting distribution refer to flamingos in general and that very few people are capable of distinguishing *Phoenicoparrus jamesi* from the other two species. Apart from Laguna Colorada, we only saw *P. jamesi* at Salar de Ascotán and Salar de Surire (in both instances in very small numbers), and up to the present its only known nesting site must be listed as Laguna Colorada, western Bolivia.

At none of the locations visited did the total population exceed 3000 flamingos, and of these only a very small minority of not more than 6 or 8 per cent at most was *Phoenicoparrus jamesi.* Of the two larger species, *Phoenicopterus chilensis* predominated in the southern section of the range, gradually becoming fewer in numbers than *Phoenicoparrus andinus* as we advanced northward. Although flamingos were seen by us and are known to breed on Salar de Atacama at an altitude of only 8500 feet, and a few were observed at Caritaya at an elevation of 12,000 feet, the bulk of the population lives at altitudes between 14,000 and 16,500 feet.

Flamingos have occasionally been reported from Salar de Maricunga and "El Negro Francisco" in the Andes in the Province of Atacama which is immediately to the south of the southernmost point reached by us. In all probability, however, these observations refer to the migratory *Phoenicopterus chilensis* and there is as yet no evidence of any species of flamingo nesting in this region. On the other hand, there is no doubt whatever that the flamingo population of the plateau country of western Bolivia, centering around the immense salares of Uyuni and Coipasa (fig. 1), is considerably larger than that found in Chilean territory, and it is equally certain that the main point of concentration of these birds in the more southerly sector of their range (between latitudes 22° and 24°S) is in Laguna Colorada.

What is now required to improve our knowledge of the distribution, habits, and life-cycles of the South American flamingos is a systematic survey of all possible habitats in the high plateau country comprising the more northerly reaches of western Bolivia, the extreme south of Peru, including in particular the Lake Titicaca region, and certain mountain fastnesses of northwestern Argentina. It is to be hoped that some of our colleagues in these three bordering countries will undertake such a survey in the very near future.

MIGRATION AND SEASONAL MOVEMENTS

Reverting to our findings at Laguna Colorada, there is another point which is of interest. At the northeast corner of the lake a series of hot springs of volcanic origin pour their waters into those of the lake. Day and night water temperatures taken during our four-day stay showed an unvarying temperature of 22°C., and the pH also remained stable between 5 and 6. This was in contrast to the water in other parts of the lake which had a temperature of 12°C. and a pH of 8 to 9. A chemical analysis of these waters gave the following results:

Chlorides	0.175 grams per liter
Nitrites	Trace
Ammonia	Trace
Nitrates	none
Sulphates	none
Heavy cations	none

It would seem to us that the presence of these warm, sweet waters gives the clue to the apparent ability of the Andean flamingos to withstand the rigors of the plateau winters, where temperatures may drop during the nights to —20°C., or even —30°C. Our guide assured us that as soon as the rest of the lake freezes over the entire flamingo population moves to the northeast corner, where the water never freezes. The birds remain there all through the winter, a fact which was afterwards confirmed from other sources of information. At Ascotán and Surire salt lakes, we found similar in-flows of warm water and such conditions no doubt exist at other points of the essentially volcanic regions which these flamingos inhabit. It is reasonable to assume, therefore, that it is these ultra-specialized ecological conditions, together with the possibility of the birds withdrawing temporarily during periods of extreme cold to similar conditions at a lower altitude, such as the Salar de Atacama, which have given rise to and permit their sedentary way of life and account for the fact that neither *Phoenicoparrus andinus* nor *P. jamesi,* notwithstanding their strong powers of flight, has ever been reported from points outside the restricted triangle of frigid and forbidding plateau country which constitutes their known geographic range.

What these conditions do not account for, however, is that whereas these two species apparently remain in this one specialized area throughout the year, the closely allied

Phoenicopterus chilensis, which, as has been seen, lives and nests in intimate association with them, nevertheless ranges over half the continent and is found all along the crest of the Andes from Lake Junín in Perú to Magallanes in southern Chile. This species also appears at times, although never as a resident, on the Pacific coast of central Chile (and possibly also of central Perú), the Atlantic coast of Argentina, the Falkland Islands and the island of Tierra del Fuego. *Phoenicopterus chilensis* recently has been reported as nesting in an estuary at the extreme northern tip of the island of Chiloe in southern Chile but a visit will have to be made to this site before so unexpected a nesting record can be regarded as definite.

Whether or not this last report is correct, how can we explain so strikingly contradictory a response to the same ecological conditions? Might it not be that *Phoenicopterus chilensis* has been more successful in building up a larger total population, that it has consequently spread over a wider area, and that the part of the population which lives and nests in intimate association with *Phoenicoparrus andinus* and *P. jamesi* does in fact remain in the plateau territory throughout the year, but that the remainder, living and nesting in areas where the tempering influence of hot springs is not available, has found itself obliged to migrate in winter to regions where climatic conditions are less severe?

In any case, the climatic range which flamingos are able to withstand is truly remarkable. Imagine the contrast between the torrid heat of Lake Natron or Lake Elmenteita in the rift valley of Africa almost on the Equator, where Leslie Brown has recently found flamingos nesting in great numbers, and the night temperatures in winter of —20°C. or even —30°C. which are usual in the 14,000 to 16,000-foot habitat of the two Andean species!

CONSERVATION OF THE SPECIES

We have mentioned that at Laguna Colorada we witnessed the collecting of hundreds of flamingo eggs by local people of Quechua origin. This is done by wading out to the colonies, placing the eggs on llama or sheep hides, and half floating and half dragging them through the slime to the shore of the lake. The eggs are then packed in boxes lined with dry grass and taken on the backs of donkeys or llamas to the villages of the interior, the nearest of which is a full two days walk by Indian measure. Here, due to the near-starvation conditions under which the inhabitants live, the eggs are highly prized for food and find a ready sale.

Our guide admitted that he belonged to a Quechua family that came every year and established itself from December to February on the otherwise uninhabited shores of the lake for the express purpose of collecting flamingo eggs. He said that the colonies were visited and the eggs removed every 12 to 15 days and that the birds went on replacing their eggs until February, after which they were left alone, as at that time, which is at the end of the rainy season, the villagers were all very busy harvesting their meager crops.

According to reliable information received from Mr. Jeldres of Concepción and confirmed by an old resident of the village of Peine, the eggs of the flamingos are also taken at the Salar de Atacama, Chile. However, in this place the eggs are taken only once a year; the visit to the colonies is made the occasion for a sort of annual pilgrimage on the part of the local inhabitants. Because of the higher standard of living in Chile, as compared with Bolivia, it is quite likely that this is so.

Notwithstanding these depredations, which doubtless have been practiced by these indigenous peoples for generations, there is no tangible evidence of any marked diminution in the flamingo population and certainly no immediate danger of its extinction.

No doubt the birds have been favored by the remoteness of their habitat, by the sparse human population, and also by the great difficulty of access to their nesting colonies, which must deter all but the most resolute human visitors and which certainly deters all other predatory animals.

Further, except for the nesting hazard, the birds are virtually free from danger, as the local inhabitants are too poor to possess firearms in any quantity and too few to represent a menace. The open nature of the country, together with the great height of the birds and their natural wariness, also operates in their favor. In addition, at present there is little or no likelihood that the terrifying whine of jet planes, which so seriously disturbed the life cycle of the American Flamingo (*Phoenicopterus ruber*) in the islands of the Caribbean, will ever invade the vast frigid silences of the remote Andean domain of its South American cousins, *Phoenicoparrus andinus, Phoenicopterus chilensis,* and *Phoenicoparrus jamesi.*

SUMMARY

Information concerning the habits and life cycles of the three endemic species of South American flamingos is notoriously scanty and unsatisfactory. In particular, practically nothing is known of the little three-toed highland flamingo, *Phoenicoparrus jamesi.* This paper tells of a successful attempt to locate this bird and describes the finding of a nesting colony of this species for the first time. Eighteen nests of James' Flamingo were positively identified in a mixed colony of approximately 3000 flamingos in Laguna Colorada in the high plateau country of western Bolivia.

Measurements of the eggs of all three species are given and also the results of the chemical analyses of the samples of water, slime, mud, and salts which were obtained at the colony. Observations showed that all three species are bottom feeders, and the samples indicate that their food consists of diatoms of at least 20 different species.

In the course of five weeks in the field, almost every possible flamingo habitat in the Andes of northern Chile was visited, and much new information as to distribution, habits, and seasonal movements was obtained.

The suggestion is made that the lack of any record of the occurrence of the Andean and James' flamingos outside a restricted area of frigid and forbidding plateau country may be accounted for by the in-flow of warm waters of volcanic orgin at one point or another of almost all the salt lakes visited. It is admitted, however, that this does not explain the contrast presented by the wide-ranging movements of the Chilean Flamingo, which is found nesting in intimate association with the other two species.

We conclude that, notwithstanding the practice of the indigenous Aymará and Quechua peoples of the plateau country of systematically removing flamingos' eggs for food, there is no evidence of a pronounced diminution in the numbers of these birds and certainly no imminent danger of their extinction.

Santiago, Chile, December 12, 1957.