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## Cranes of the World: Black-necked Crane (*Grus nigricollis*)

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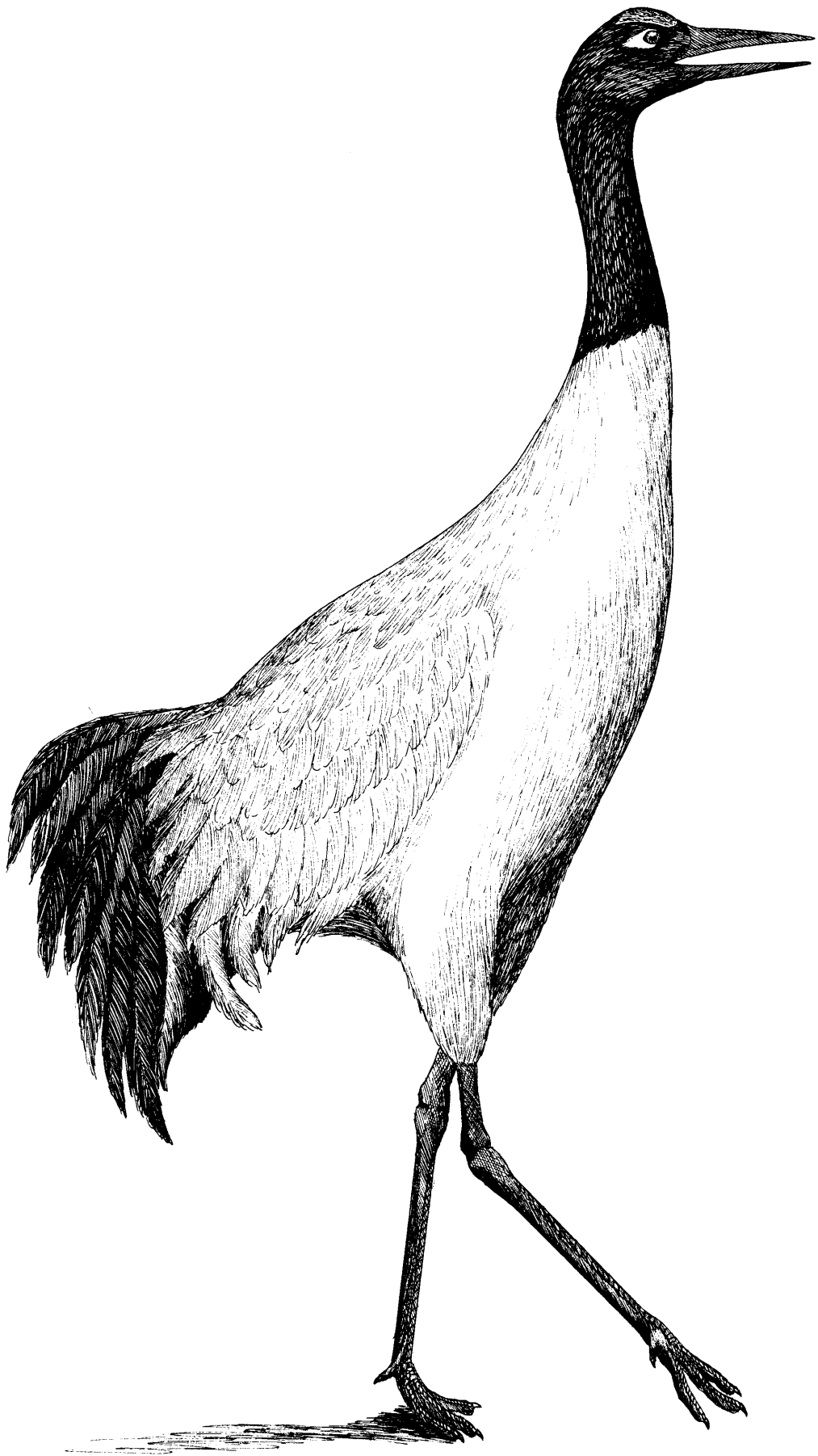


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# Black-necked Crane

## *Grus nigricollis* Prezhwalsky 1876

**Other Vernacular Names.** None in general English use; Grue à cour noir (French); Schwarzhals Kranich (German); Cheniozheuleu zhuravl (Russian); Grulla de cuello negro (Spanish).

**Range.** Breeds from Ladakh east through Tibet (Xizang Zizhiqu) to the Koko Nor Region in eastern Tsinghai (Qinghai), probably mostly between 4,300 and 4,600 meters elevation. Migratory, and reported on migration or during winter from central and eastern Sikang, Yunnan, and Tonkin (Vaurie, 1965). Also winters in small numbers in the southern Himalayas (Bhutan and Frontier Division of Subansiri Pradesh) at elevations of 1,500-3,000 meters (Ali, 1976).

**Subspecies.** None recognized.

**Measurements.** Wing, males 569-677 mm (average of 8, 623 mm); females 585-628 mm (average of 7, 606.5 mm). Exposed culmen, males 110-129 mm (average of 8, 120.5 mm); females 111-124 mm (average of 7, 116.4 mm). Tarsus, males 226-262 mm (average of 8, 247.4 mm); females 214-252 mm (average of 7, 231.7 mm). Eggs, average 102.6 × 62.8 mm (96.4-105.3 × 59.6-69.1 mm) (Walkinshaw, 1973).

**Weights.** Cheng (pers. comm.) reported a female weighing 6,000 grams. The estimated egg weight is 222 grams. Lu, Yao, and Liao (1980) reported that 17 eggs averaged 217.7 grams, and ranged from 200 to 245 grams.

extending as a narrow line above the eye. Otherwise the body is ashy gray, becoming almost whitish on the underparts. The tail is black, and the upper tail coverts are grayish. The primaries and innermost elongated secondaries are black, and the outer secondaries are black on the inner webs, as are many of the secondary coverts and the tips of some scapulars. The smaller wing coverts are pale gray. The iris is yellow. The bill is greenish horn to grayish horn, with a yellowish tip. The legs and toes are black.

*Juveniles* at 70 to 90 days have yellow brown feathers on the crown, and a gray abdomen. The primaries and secondaries are black, the feathers of the back are grayish yellow, and black and white feathers alternate on the neck. By eight months the iris color is yellow brown, and one-third of the neck is grayish black, with some yellowish brown feathers remaining on the back. By one year of age the bird resembles the adult (Lu, Yao, and Liao, 1980).

*Downy chicks* are covered by a brownish down, and have a bill that is flesh red, becoming whitish at the tip. The feet are reddish, with a touch of gray. When the chick is 20 days old the color of the head and tail becomes darker, and at 4 weeks the toes become grayish brown, the primary quills begin to emerge, and the top of the head becomes pale yellow (Lu, Yao, and Liao, 1980).

### Description

*Adults of both sexes* are alike, with a nearly bare red crown and lores, sparsely covered by black hairlike feathers, primarily on the lores. The rest of the head and the upper part of the neck are black, except for a small white or light gray spot extending backward from the rear and lower edges of each eye and sometimes

### Identification

*In the field*, the limited Himalayan range of this species makes it unlikely that any other crane would be confused with it. It is the only grayish crane with black flight feathers and a black neck that extends forward to include the nape. Its calls are loud and high-pitched trumpeting notes, similar to those of the sarus.



Breeding (hatched) and wintering (shaded) ranges of the black-necked crane. Inked circles indicate breeding records, and insets show breeding-season occurrences in Tsinghai (Qinghai) Province, China (above), and location of known breeding pairs in Ladakh (below). The small arrow indicates the location of the Sea of Grass, Kweichow (Guizhou) Province, China.

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*In the hand*, this species may be readily recognized by the entirely black head and neck, except for the bare red crown and face patch and a small white area behind the eyes. The trachea is coiled inside the sternum.

### DISTRIBUTION AND HABITATS

#### *Historical and Current Breeding Ranges*

Of all the cranes, this species is the least known in every respect. Indeed, it was the last of the cranes to be discovered and described (in 1876). Walkinshaw (1973) described its summer range as consisting of the higher mountain valleys of the Himalayas and their neighboring ranges, and occurring between longitudes 78° and 101° east and between latitudes 28° and 37° north, with the northern limits around Lake Koko Nor, Chinghai (Qinghai) Province, China.

In an excellent review, Archibald and Oesting (1981) summarized the information on the historical distribution of this species, and the present account is a brief summary of their findings. They suggested that the species breeds in Ladakh, in the vicinity of the upper reaches of the Indus River in southwestern Tibet, in areas bordering the Brahmaputra River in southern Tibet, and in Szechwan (Sichuan) and Chinghai provinces of China. There are no specific breeding records for the Tibetan Plateau area between Ladakh and Koko Nor, but inasmuch as large migrating flocks have been at Jalung in south-central Tibet and near Seshu (northwestern Szechwan) there are almost certainly some still-unknown breeding areas in the Central Plateau of Tibet. Archibald and Oesting found only 9 definite nesting localities, 8 areas where pairs have been presumed to be breeding, 6 areas where migration has been reported, and 9 wintering sites. The accompanying range map is largely based on the one produced by these authors, with some additional information as provided by Lu, Yao, and Liao (1980).

The western part of the species' range is a somewhat crescent-shaped series of breeding and wintering grounds from Ladakh on the west to eastern Tibet, skirting the northern parts of the Himalayas. Some of these populations may be almost sedentary, since Walton (1946) reported that both breeding and wintering occur near Lhasa, Tibet.

The eastern part of the species' range extends from Lake Koko Nor of Chinghai Province in the north, south through western Szechwan, and southward into wintering areas of Yunnan and the Vietnam lowlands near Hanoi. The breeding range in Chinghai (Qinghai) Province has recently been more fully described by Lu, Yao, and Liao (1980). They reported that the species is widely distributed across this province, in marshes, along lakeshores, and on rivers. The areas of breeding

season concentration include Zeku (Tse-k'u), in Huangnanzhou (Huan-nan-chou Tibetan District), an area about 100 miles south of Xining (Hsi-ning), the Honan Mongolian Autonomous County (an area about 30 miles south of Zeku), Gongo (Kung-ho), Guide (Kueite), and Qinghai Lake (Koko Nor) in Hainanzhou (Hainan-chou) (a large region stretching to the south from Lake Koko Nor). Birds also occur at Gangcha (Kangch'a), Qilian (Ch'ilien), and Menyuan (Men-yüan) in Haibeizhou (Hai-pei-chou) (a large region extending to the north of Koko Nor).

Concentrations also occur at Dulan (Tu-lan), Niaolan (Niao-lan), Goermu (Ko-erh-mu), and Tianjun (T'ien-chun) in Haixizhou (Hai-hsi-chou Mongol-Tibetan Autonomous District) (a large region stretching to the west from Koko Nor). Other areas include Yushu (Yü-shu), Qumalai (Chu-ma-lai), Zhiduo (Chih-to), and Chengduo (Ch'eng-to) in Yushuzhou (Yu-shu-chou Tibetan Autonomous District) (a large region in central Chinghai Province). Birds also occur at Maduo (Ma-to), Jiuzhi (Chiu-chih), and Magin (Ma-ch'in) in Guoluozhou (Kuo-lo-chou) (a large region in southeastern Chinghai Province). The major areas of breeding are Longbaotan in Yushu (Chich-ku) County, at Lake Shalin (Cha-ling) near Maduo (Mato), Nuomuhong near Dulan (Tulan), Muli near Gangcha (Kangcha), Shule (Shu-le) near Qilian (Ch'i-lie), and the Zha (Cha) River and Kouquian (K'ou-ch'ien) River near Zhiduo (Chito), all in northern Chinghai Province.

#### *Breeding Habitat Requirements and Densities*

Archibald and Oesting (1981) reported that the nesting areas of the species are from 3,962 to 4,571 meters above sea level (13,000 to 15,000 feet), and consist of tundralike marshes and bogs around the margins and on islands of lakes in the Tibetan steppes. Lu, Yao, and Liao (1980) reported that the breeding areas of Chinghai Province in China have a moist climate, fertile soil, plentiful vegetation, and abundant aquatic life. Among the plants present are *Phragmites*, *Carex*, and *Eleocharis*. The primary nesting areas seem to be marshy areas, such as reed marshes of Nuomuhon and the grassy marshes of Longbaotan. The latter area lies 4,200 meters above sea level, with an average temperature of about 5° C, and temperatures ranging from -12° to 19° during May and June. The ponds of the area contain grass mounds that are formed into small islands, some of which are relatively soft and are seemingly floating on the water surface. The water depth varies, to a maximum of 2 meters, and the bottom of the lake is covered by a deep layer of silt.

In a breeding area in Ladakh, near Chusul, the elevation is 4,328 meters, and a freshwater lake is surrounded by a broad stretch of marshland in a vast, sandy plain through which occur scattered streams,

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brackish pools, extensive belts of caragana, and salt beds. The lake itself has some tiny islands, on which a nest was discovered (Gole, 1981).

The only information on breeding densities is that of Lu, Yao, and Liao (1980), who reported that during the first ten days of May, when the birds are establishing their nesting territories, the density was as high as 1.45 birds per square kilometer. In June, after the carrying capacity has been established, the density was 0.76 birds per square kilometer, or 0.38 pairs.

### *Nonbreeding Range and Habitats*

Large winter flocks have been reported in south-central Tibet (Walton, 1946), and in southwestern Szechwan and northwestern Yunnan (Schäfer, 1938; Dolan, 1939; Archibald and Oesting, 1981). Small numbers also traditionally wintered in Bhutan and the Frontier Division of Subansiri Pradesh (Ali, 1976). In earlier years there were records of a few birds wintering on the Plain of Hanoi and in the province of Hadong, Vietnam.

Reports by Schäfer (1938) and Dolan (1939) indicate a major historic wintering area in western Szechwan, on the Plain of Litang. To what extent this area may still be used by the birds is unknown. However, in 1979 a major wintering habitat was discovered by Zhou, Ding, and Wang (1980) in the Sea of Grass in Weining County, in the eastern part of the Yun Kwei Plateau. This area in Guizhou (Kweichow) Province, is at an elevation of 2,200 meters above sea level, and is located at 104°14' east longitude, 26° 51' north latitude. The lake, which was once 45 square kilometers in area, is now only 1.2 square kilometers of open water, and some 20 to 50 centimeters deep. Surrounding the lake are vast marshes, and stretching out from these to the original limits of the lake is an area that has been put under cultivation. Both the Eurasian and black-necked cranes winter here, with the latter's population much the smaller. On 11 December 1979, 46 cranes in a flock of 600 were black-necked, while on the next day 52 were counted in what was apparently the same group of 600 birds in a separate part of the marshes. About 20 to 30 or more were in scattered flocks of both species that numbered about 200 to 300 in all. Altogether, perhaps 70 to 80 black-necked cranes and some 800 to 900 Eurasian cranes were wintering in the area that year.

## FOODS AND FORAGING BEHAVIOR

### *Foods and Foraging Behavior of Adults*

While on their breeding grounds in Chinghai Province, the birds apparently feed from dawn until dusk. They forage both from the ground and in water, and when flock-feeding the individuals tend to remain within a set area. Mated birds tend to feed side by side.

One female dissected in June was found to have consumed green plant materials, while a male that was examined during May was found to have eaten *Potentilla anseriana*, as well as stones and pebbles.

In Ladakh, a pair of territorial cranes was observed feeding in a muddy area that contained a species of coarse grass, but no tubers. The birds also fed in freshwater streams that contained a species of carp, some mollusks, algae (*Nostoc*), moss, and submerged aquatic plants (mainly *Hydrilla*) (Gole, 1981). Gole believed that the birds were mainly feeding on grass.

In their wintering area of Bhutan, the cranes feed in stubblefields, gleaning waste grain. They are also attracted to boggy areas bordering grainfields, and seem to prefer them for feeding. There they dig up small round bulbs. The soil of these areas also contained large numbers of earthworms and hibernating frogs, which perhaps also are eaten (Khacher, 1981). In general, the species appears to be less aquatic in its winter foraging behavior than is the sarus crane or the highly aquatic Siberian crane, and Khacher suggested that the black-necked crane is perhaps thus less susceptible to habitat changes than at least the latter species. However, on the Sea of Grass area, the black-necked crane was observed in six of eight observations of Eurasian and/or black-necked cranes feeding in marshes, but on none of the four occasions where cranes were observed feeding on cultivated lands, suggesting a preference for marshes and wetlands (Zhou, Ding, and Wang, 1980).

Gole reported that when a pair was feeding, one member of the pair normally would be alert. At times, when there was no apparent danger, both birds would forage simultaneously. When feeding in water, the birds would often splash water with sideways sweeps of their beaks, as if they were removing mud from their bodies. At times they would immerse their entire head in the water and splash it on their bodies, as if bathing.

### *Foods and Foraging Behavior of Young*

No specific information is available on foods or foraging for wild birds of this species. Young hand-reared cranes a month old are able to catch flies (*Musca*), *Lucilia*, and small insects. By the time they are two months old they like to eat cooked rice, green vegetables, and egg yolks. Later, they were fed a diet consisting of about 80 to 90 percent animal materials, and thereafter the birds did not like to eat vegetable matter (Lu, Yao, and Liao, 1980).

## MIGRATIONS AND MOVEMENTS

### *Seasonal Movements*

Archibald and Oesting (1981) have summarized what little is known of the migrations of this species. They suggested that observations by Schäfer (1938) of migra-

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ting cranes at Jalung in south-central Tibet and near Seshu in northwestern Szechwan were probably of birds moving between southern wintering grounds and unknown breeding areas on the central plateau of Tibet. They also suggested that there may be both migratory and relatively sedentary populations in western Szechwan, with the birds of the Koko Nor region and northern Szechwan migrating through this area and continuing on to wintering grounds of Yunnan and North Vietnam, while others remain in Szechwan. They also suggested that some of the birds breeding near Lhasa, in Tibet, may be migratory, and that perhaps the birds breeding in the eastern part of the species' range may be either sedentary or longitudinal and altitudinal migrants, while those from the western areas may be either sedentary or latitudinally migratory. They also proposed that the many hot springs that occur on the Tibetan Plateau serve as wintering areas for some cranes.

The cranes return to their breeding areas in Chinghai Province in March, and large flocks are seen well into April. One "relatively large" flock of 36 birds was seen on April 16 (Lu, Yao, and Liao, 1980). Likewise, large spring flocks have been observed in mid- to late April in northwestern Kansu Province (Meise, Schönwetter, and Stresemann, 1938). The fall migration out of the Chinghai region occurs in October (Lu, Yao, and Liao, 1980).

Wintering arrival times in Bhutan and Assam do not seem to be well established, but the birds leave these areas at the end of February or in early March (Gole, 1981; Khacher, 1981). In the Sea of Grass area of Kweichow Province, China, the birds typically arrive in October and leave in March (Zhou, Ding, and Wang, 1980).

### Daily Movements

On their wintering areas of the Sea of Grass, these birds fly daily from roosting areas to other areas of the marsh for foraging. However, actual distances involved were not indicated.

## GENERAL BIOLOGY

### Sociality

Little information is available on flock sizes. Of the wintering birds observed at the Sea of Grass, a group of about 50 birds comprised one flock that in turn associated with about 550 Eurasian cranes. However, each species tended to remain separated within this larger flock. Several smaller mixed flocks of the two species also occurred, ranging in size from about a dozen to a hundred or so birds. Within these smaller flocks the black-necked cranes maintained a similar proportion (Zhou, Ding, and Wang, 1980).

On their breeding grounds during spring arrival in

March, the birds are in groups of 5 or 6 to as many as 20, and occasionally to as many as 36. Flock behavior persisted through April and until mid-May, especially during periods of bad weather. After the start of the reproductive period there was no longer any flocking except for a group of about 10 cranes that moved through the area from mid-April until the end of May. It was believed from the appearance of one of these birds that probably the entire group was composed of immatures (Lu, Yao, and Liao, 1980).

### Daily Activities

On the Sea of Grass wintering area, the daily behavior pattern of the black-necked crane is similar to that of the Eurasian crane. When dawn is breaking, about 7:00, the first birds begin to call. This gradually builds up to a mass chorus that can be heard for miles. At 7:20 the birds would take to flight, and by 7:40 the sky would be full of cranes. The birds then alight and begin foraging. At this time they may be spread out over an area of a thousand meters or more, or clustered into a smaller group. The major morning foraging is between 8:00 and 10:00, and is marked by much aggressive behavior. From about noon to 2:00 p.m. the birds rest. From 3:00 to 4:00 the birds again begin feeding, reaching a climax at 5:00 p.m. Sunset is shortly after 6:00 and by 7:00 the flock quiets down and it is completely dark (Zhou, Ding, and Wang, 1980).

### Interspecific Interactions

Foraging interactions with the Eurasian crane have already been mentioned, and in general it would appear that these two species are quite tolerant of one another, with the Eurasian crane perhaps slightly more adapted to terrestrial grazing in cultivated fields (Zhou, Ding, and Wang, 1980).

On its breeding grounds in Ladakh, Gole (1981) observed no predators and perhaps as a result the eggs were sometimes left unattended for as long as a half an hour. Three pairs of ruddy shelducks (*Tadorna ferruginea*) nesting in the area were extremely alert, and raised a warning cry at the first sign of disturbance. The cranes evidently used the ducks as a kind of lookout, and would return to their foraging field to feed whenever they saw the ducks doing the same.

This same species of duck is an associate of black-necked cranes in the Chinghai area of China, as are also the bar-headed goose (*Anser indicus*), the common tern (*Sterna hirundo*), the redshank (*Tringa totanus*), and the coot (*Fulica atra*). Possible enemies of the black-necked crane in that area are the common buzzard (*Buteo buteo*) and the tawny eagle (*Aquila rapax*). The latter was observed to circle low over a nest, and a common buzzard was attacked and chased away by a nesting crane when it landed within 30 meters of the nest.

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### BREEDING BIOLOGY

#### *Age of Maturity and Time of Breeding*

The small number of egg records (see table 10) suggest that laying begins in May, peaks in June, and a few egg records continue on into July. Gole (1981) found a nest on May 26 in the Chusul area of Ladakh. In the Longbaotan area of Chinghai Province, China, the egg-laying period in 1979 extended from May 1 to June 8 (Lu, Yao, and Liao, 1980). Schäfer (1938) believed that in western China the eggs were first laid in late May, with the chief breeding season occurring between June and August.

There is no information on the age of maturity in this species, which has never been bred in captivity.

#### *Pair Formation and Courtship*

Archibald (1975, 1976) was unable to include this species in his comparative behavior study, and thus detailed information on the unison display and associated behavior is still lacking. Dancing behavior was observed by Gole (1981), who stated that as he approached a pair they engaged in dancing behavior, with the male moving around the female with outstretched wings, and trying to lead her. He also observed an apparent courtship dance once. After the pair had alighted, the male began waving his neck up and down, tiptoed several paces ahead, turned, and while spreading his wings came dancing back toward the female. As the male came nearer, the female responded with a similar movement of her neck. The male uttered a short call as he had begun his display, and he responded to the female's neck-waving by standing beside her, still waving his neck. The female did not respond any further. Dancing behavior has also been reported by Ali (1946), Schäfer (1938), and Ludlow (1928), and Schäfer reported a threat display in which the male flapped its wings, bent its neck so that its head nearly touched the ground, and ran around in a circle with its toes pointed inward.

One account of mating is available for the species. Lu, Yao, and Liao (1980) reported that on April 20 they observed a female uttering a low *gu—gu—* mating call. At the same time, both members of the pair pointed their bills and necks upward and began a mating dance with their wings outstretched. The male then quickly mounted the female, and copulation occurred. The male flapped his wings during treading, which lasted up to 20 seconds. After mating, the male jumped off, and both birds uttered a loud clear *guoguo—guoguo* call. The last day that they observed soliciting behavior by a female was on May 16, or about two weeks before the first nest containing eggs was found.

#### *Territoriality and Early Nesting Behavior*

In the Chinghai area of China, breeding birds moved into their nesting territories in mid-April and early May, when competition for suitable areas evidently occurs and the population temporarily exceeds its carrying capacity. By the final attainment of breeding density in June, the number of birds on the area was approximately half of the original number, perhaps owing to the exclusion of immature nonbreeders. In their 1978 studies, Lu, Yao, and Liao (1980) found only three nests, but in 1979 they found seven more, plus an abandoned nest having a single old egg. The nests were constructed in marshy areas out of reach of man and domesticated animals, and were usually on grass mounds or dirt "islands." Such mounds may rise only a little above water, be on somewhat higher ground, or have relatively thick grass and some dead grass present. The nests were round to elliptical, and were produced by piling up *Carex*, *Eleocharis*, and grasses found in the immediate vicinity. Some of the nests were simple and crude, others were "tightly" constructed. The external diameter of 11 nests averaged about 80 centimeters, ranging from 46 to 124, and the average height was 10.6 centimeters, ranging from 4.5 to 16. The depth of the depression averaged 4.5 centimeters, and its diameter about 40 centimeters. Nest-building continued beyond the egg-laying period right up to the middle of the incubation period.

The nest that Gole (1981) found in Ladakh was in a shallow, marshy pool, about 30 meters from the shore and in water about 0.3 meters deep. The nest was built of aquatic vegetation, entirely composed of *Hydrilla*, and was about 25 centimeters high and about 60 to 150 centimeters in length and width. Other nests from Tibet and elsewhere seem either to consist of this rather large and typical crane type, with a pile of vegetation pulled from the vicinity and piled up on a marsh border in a shallow marsh, or to be very small and on an island having little or no vegetation. In this latter situation, mud may be piled up, or short, dead grass as is available may be used (Schäfer, 1938; Ludlow, 1926; Ali, 1946). Evidently the size and construction of the nest vary greatly under these different environmental conditions (Walkinshaw, 1973).

#### *Egg-laying and Incubation*

Nests in the Chinghai study area varied from about 500 to 2,000 meters apart, and each of the nests had one or two eggs. A total of 17 eggs was reported for ten active nests, suggesting an average clutch of 1.7 eggs. The egg-laying interval was found to range from one to three days (Lu, Yao, and Liao, 1980).

Incubation begins with the first egg, with one bird of the pair feeding while the other incubates. The nonin-



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cubating bird forages in an area extending out some 200 to 300 meters from the nest. In a nest studied in 1978, the female bird was on the nest 61.8 percent of the time, and the male for 38.2 percent. In 1979, the daytime incubating activity of the female also exceeded that of the male in one nest studied. The number of nest exchanges per day ranged from as few as two or three to as many as seven or eight (Lu, Yao, and Liao, 1980).

In the nest studied by Gole (1981), both sexes incubated about an equal amount of time. In one 24-hour period, the male incubated for nearly 10 hours, the female for somewhat over 10 hours, and the nest was left unattended for nearly 4 hours. Normally, each bird would incubate for 1 to 1.5 hours between changeovers, which would be done silently. During nighttime hours, the bird sat on the nest for longer periods, with the nonincubating bird resting within 3 meters of the nest. Evidently the male did most if not all of the nighttime incubation. During the day, the incubating bird would normally sit facing the sun, with the bill resting on its chest and the nape touching the back.

According to Lu, Yao, and Liao (1980) the incubation period lasts from 31 to 33 days. In two years of study, no cases of unhatched eggs were found.

### *Hatching and Postbreeding Biology*

Based on two years of observations, Lu, Yao, and Liao (1980) reported that it requires about one day from the time that pipping begins until the young chick hatches. On the day before hatching, a small hole is made in the egg, and a vocalization can be heard. The newly hatched chick has a flesh-red bill, becoming almost white at the tip, and the reddish feet have a touch of gray. By the second day, the chick is able to stand, and moves about close to the nest. By the third day, it begins to eat. As the chick begins to eat, the parents lead it around the grassy and sandy areas near the nest. The chick imitates the food-searching behavior of the parents, and they sometimes place food in front of its head so that it can peck at it. About a week later, the young cranes were taken to an area where there was plentiful food. If the birds are frightened during the hatching period, the adults will lead their young away the second day after hatching, and not return again to the nest. At least among the chicks raised by hand, considerable fighting among the chicks occurs from the first or second day after hatching, and they must be kept separated thereafter.

In the case of hand-raised chicks, body weight increased for the first 180 days after hatching, reaching a maximum of about 6,750 grams. Thereafter, it declined some, and stabilized at about 5,500 grams. The flight feathers are fully grown at 90 days after hatching, so fledging must occur somewhat before this age.

Apparently the young birds remain with their parents

during the first winter, with parents and young all feeding in a single group (Ludlow, cited in Walkinshaw, 1973).

### RECRUITMENT RATES, POPULATION STATUS, AND CONSERVATION

There is no good information on recruitment rates for this species, nor is there any convincing information on its population status. Cheng (1981) reported that in September of 1973 a flock of 300 to 400 birds was seen at the Tangra Range Pass in Chinghai (Qinghai) Province, and also that in the fall of 1979 a flock of at least 600 was observed in Muomubong, in the Tsaidam Basin of Chaimadu Pendi. These observations would suggest that northern Tibet might support a substantial population of black-necked cranes, the exact breeding distribution of which remains completely unknown.

Archibald and Oesting (1981) summarized available information on the black-necked crane's distribution and population size, and suggested that at least in fairly recent decades as many as thousands of birds might winter in the Kyi-tschu Valley around Lhasa, and in the Brahmaputra Valley between Samyea and Yalong Podrang. At least until the Chinese influence became strong in the 1950s, the Tibetans considered all living things sacred, and thus the birds were fully protected and relatively tame.

Information gathered by Archibald and Oesting, as well as that of Khacher (1981), suggests that the birds no longer winter in the Apa Tani Valley of Aranuchal Pradesh, India. However, perhaps as many as 200 winter in eastern Bhutan, in the narrow river valleys from Punakha east to Bumthong and Tashigan. They probably still also winter in north Burma, in the western area and the Triangle area of Kachin Hills, between the Mali Hka and the Nam Tamai valleys, as well as in the Tarun Hka Basin, the major headwaters of the Chindwin River of northwestern Burma. Although the birds did not winter in North Vietnam during the period of bombing, they have since returned to the vicinity of Hanoi and elsewhere in the Babco Delta (Archibald and Oesting, 1981).

The number of black-necked cranes in China is not possible to guess, but one crane sanctuary has already been established at Longbaotan in Qinghai (Chinghai) Province (Cheng, 1981). The species is now receiving the highest level of protection in China, and is the subject of detailed biological study there (Lu, Yao, and Liao, 1980). The director of the Peking Zoological Gardens (letter of June 12, 1981) informed me that black-necked cranes have been kept there since 1965, and are now being exhibited or have been exhibited at five Chinese zoos. They have not yet bred at any zoo, but

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such captive birds might provide a means of learning more of the basic biological requirements of this little-studied species.

### EVOLUTIONARY RELATIONSHIPS

Wood (1979) was unable to include the black-necked crane in his phenetic study of the Gruidae, nor was Archibald (1975, 1976) able to study the species' vocalizations. In the Peters (1934) taxonomy the black-necked

crane is placed sequentially between *grus* and *monachus*, and Archibald evidently accepted this general idea (cf. Wood, 1979). In the absence of any new data on its anatomy or behavior, it is necessary to accept these ideas for the present time. Recently Archibald was able to observe several captive specimens of this species, and on that basis was able to judge that the black-necked crane is in the same evolutionary group as the whooping, Japanese, and Eurasian cranes (*Brolga Bugle*, 6(1):3-4, 1980).