

As already mentioned, the Relict Gull dominates in nest-site selection and the arrangement of colonies of the two species on islets (Figures 3 and 4). The terns allow gulls to nest within their established colonies and benefit both species by their rapid and concerted reaction to predators.

Gull-billed Terns are also found at other breeding, or potential breeding, localities of the Relict Gull: Wuliangsu Hai and Suoguo Nur (Zhang Yin-sun); Lake Alakul, Russia (Knystautas 1987); Tatsain Tsagaan Nuur, Mongolia (Fisher 1985); Orok Nor, Mongolia (Kitson 1980, Vaurie 1964).

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REFERENCES

- Aužov, E. M. (1975) [*Larus relictus* at Lake Alakul'.] Pp. 58-59 in [*Colonies of waterbirds and their protection.*] Moscow. (In Russian.)
- Fisher, D. J. (1985) Observations on Relict Gulls in Mongolia. *Dutch Birding* 7: 117-120.
- Golovushkin, M. I. (1977) [On the colony of Relict Gulls in the Chita district.] Pp. 207-209 in [*Proceedings of the 7th all-Union ornithological conference, Kiev.*] (In Russian.)
- He Fen-qi, Zhang Yin-sun, Wu Yong and Gao Tie-jun (1992) The distribution of the Relict Gull *Larus relictus* in Maowusu Desert, Inner Mongolia, China. *Forktail* 7: 151-154.
- Il'ichyev, V. D. and Zubakin, V. A. (1988) [*Birds of the U.S.S.R.: seabirds.*] Moscow: Izdatelstvo Nauk [Publishers of Science]. (In Russian.)
- Kitson, A.R. (1980) *Larus relictus* - a review. *Bull. Brit. Orn. Club* 100: 178-185.
- Knystautas, A. (1987) *The natural history of the U.S.S.R.* London: Century.
- Potapov, R. L. (1971) [A find at the Torey lakes.] *Privoda* 5: 77-81. (In Russian.)
- Zhang Yin-sun *et al.* (1991a) [A new finding of a breeding population of the Relict Gull in Ordos.] *Chinese J. Zool.* 26(3): 32-33.
- Zhang Yin-sun, Liu Chang-jiang, Tian Lu and Bu He (1991) Recent records of the Relict Gull *Larus relictus* in western Nei Mongol autonomous region, China. *Forktail* 6: 66-67.
- Zhang Yin-sun, Ding Wen-ning, Bu He and Tian Lu (1992) Breeding ecology of the Relict Gull *Larus relictus* in Ordos, Inner Mongolia, China. *Forktail* 7: 131-137.

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Birds of Sariska Tiger Reserve, Rajasthan, India

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Sariska Tiger Reserve (76°17'-76°34'N and 27°5'-27°33'E), situated in the Aravali hill range, is located in the district of Alwar, Rajasthan. Sariska is in the semi-arid part of Rajasthan (Rodgers and Panwar 1988). The tract is mainly hilly and undulating and has numerous narrow valleys, two large plateaus: Kiraska and Kankwari, and two lakes: Manasarovar and Somasagar. Silisad Lake is situated along the north-eastern boundary of the reserve. The total area of the reserve is 800 km², of which 302.2 km² is a buffer zone and 497.8 km² is the core zone.

According to Champion and Seth (1968) the vegetation of Sariska comes under (1) Tropical Dry Deciduous Forest and (2) Tropical Thorn Forest. The dominant vegetation types include *Anogeissus* forest, *Boswellia* forest, *Acacia*-mixed forest, *Butea*-mixed forest, *Ziziphus* woodland, scrub land and riverine forest. The climate of this tract is subtropical, characterised by distinct winter (November to February), summer (March to June), monsoon (July to August) and autumn (September to October). In winter the temperature drops to 0° and in summer it rises as high as 47°. The average annual rainfall is around 600 mm.

Little previous work has been carried out on the avifauna of the reserve. Rodgers (1991) recorded 24 species of birds from Algal spring. KS stayed in Sariska from July 1988 to December 1990 studying the ecology of large herbivores. Birds were identified during this period and also during November 1986, November 1987, May 1988, November 1991 and February 1992. The most interesting finds were Painted Spurfowl *Galloperdix lunulata*, which had not been recorded previously from the arid and semi-arid tracts of Rajasthan, and Indian Cuckoo *Cuculus micropterus*, a rare straggler to the semi-arid tracts. The Aravali race of Red Spurfowl *Galloperdix spadicea caurina*, endemic to the Aravali hill range, is only found in a few localities.

SYSTEMATIC LIST

A total of 211 species was recorded, of which 120 were resident, 73 were migrant visitors and 18 were considered to be vagrants. In the list the following codes are used:

- R = resident
 W = winter visitor
 S = summer visitor
 M = monsoon visitor
 V = presumed vagrant
 ? = uncertain status
 B = confirmed breeding
 PB = probably breeding

GREY FRANCOLIN *Francolinus pondicerianus* R, B. Abundant.
 BLACK FRANCOLIN *Francolinus francolinus* R, B. Rare - Karnakawas scrubland only.
 RAIN QUAIL *Coturnix coromandelica* R, B. Common.
 BLUE-BREASTED QUAIL *Coturnix chinensis* R, B. Rare.
 JUNGLE BUSH-QUAIL *Perdica asiatica* R, B. Abundant.
 RED SPURFOWL *Galloperdix spadicea* R, B. Rare - rocky areas near Pandupole, Siliberi and Slopka.
 PAINTED SPURFOWL *Galloperdix lunulata* R, B. Rare - rocky areas close to water, near Pandupole, Slopka, Udainath, Siliberi, Algal and Naldeshwar.
 INDIAN PEA FOWL *Pavo cristatus* R, B. Abundant.
 COMB DUCK *Sarkidiornis melanotos* R, PB. Rare.
 COTTON PYGMY-GOOSE *Nettapus coromandelianus* R, PB. Common.
 GADWALL *Anas strepera* W. Rare.
 COMMON TEAL *Anas crecca* W. Fairly common.
 MALLARD *Anas platyrhynchos* W. Rare.
 SPOT-BILLED DUCK *Anas poecilorhyncha* R, PB. Common.
 NORTHERN PINTAIL *Anas acuta* W. Fairly common in Silisad.
 NORTHERN SHOVELER *Anas clypeata* W. Common in Silisad.
 RED-CRESTED POCHARD *Netta rufina* W. Common.
 COMMON POCHARD *Aythya ferina* W. Rare.
 TUFTED DUCK *Aythya fuligula* W. Rare.
 SMALL BUTTONQUAIL *Turnix sylvatica* R, B. Common.
 BROWN-CAPPED WOODPECKER *Dendrocopos nanus* V. One near Sariska, November 1986.
 YELLOW-CROWNED WOODPECKER *Dendrocopos maharattensis* R, PB. Rare.
 BLACK-RUMPED FLAMEBACK *Dinopium benghalense* R, B. Fairly common.
 COPPERSMITH BARBET *Megalaima haemacephala* W. Common.

INDIAN GREY-HORNBILL *Ocyrocus birostris* R, B. Rare - only along the park boundary near Thanagazi and Malakera.
 EURASIAN HOOPOE *Upupa epops* R, B. Common.
 INDIAN ROLLER *Coracias benghalensis* R, B. Common.
 COMMON KINGFISHER *Alcedo atthis* R, PB. Rare.
 WHITE-THROATED KINGFISHER *Halcyon smyrnensis* R, PB. Common.
 PIED KINGFISHER *Ceryle rudis* R, PB. Rare.
 LITTLE GREEN BEE-EATER *Merops orientalis* R, PB. Rare.
 BLUE-TAILED BEE-EATER *Merops philippinus* R, PB. Rare.
 PIED CUCKOO *Oxylophus jacobinus* M. Common.
 COMMON HAWK-CUCKOO *Cuculus varius* R, B. Common.
 INDIAN CUCKOO *Cuculus micropterus* V. One seen near Kundli road, 23 June 1989; one heard, 3 July 1989.
 ASIAN KOEL *Eudynamis scolopacea* R, B. Rare.
 SIRKEER MALKOHA *Phaenicophaeus leschenaultii* R. Rare.
 GREATER COUCAL *Centropus sinensis* R, B. Rare.
 ALEXANDRINE PARAKEET *Psittacula eupatria* V. Seen only in November 1987, in three places between Sariska and Kalighati.
 ROSE-RINGED PARAKEET *Psittacula krameri* R, B. Fairly common.
 PLUM-HEADED PARAKEET *Psittacula cyanocephala* W, B. Fairly common.
 LITTLE SWIFT *Apus affinis* R, B. Common.
 BARN OWL *Tyto alba* R, B. Rare.
 INDIAN SCOPS-OWL *Otus bakkamoena* R, B. Rare - one heard, 12 November 1991.
 BROWN FISH-OWL *Ketupa zeylonensis* R, B. Bandipul stream.
 MOTTLED WOOD-OWL *Strix ocellata* R, PB. One at Slopka waterhole, 8 June 1988.
 SPOTTED OWLET *Athene brama* R, B. Common.
 SHORT-EARED OWL *Asio flammeus* W. Seen around Karnakawas, January to February 1989.
 GREY NIGHTJAR *Caprimulgus indicus* R, B. Common.
 ROCK PIGEON *Columba livia* R, B. Common.
 ORIENTAL TURTLE-DOVE *Streptopelia orientalis* V. One at Sariska, 15 June 1989.
 LAUGHING DOVE *Streptopelia senegalensis* R, B. Fairly common.
 SPOTTED DOVE *Streptopelia chinensis* R, B. Fairly common.
 RED COLLARED-DOVE *Streptopelia tranquebarica* R, B. Fairly common.
 EURASIAN COLLARED-DOVE *Streptopelia decaocto* R, B. Fairly common.

- YELLOW-FOOTED GREEN-PIGEON *Treron phoenicoptera* W. Fairly common - flocks of 30-50 birds seen feeding on *Ziziphus* fruits.
- SARUS CRANE *Grus antigone* W. Rare - one near Manasarovar, 12 January 1990.
- WHITE-BREASTED WATERHEN *Amauormis phoenicurus* R, B. Not very common.
- PURPLE SWAMPHEN *Porphyrio porphyrio* R, PB. Rare.
- COMMON MOORHEN *Gallinula chloropus* R, PB. Rare - Silisad and Manasarovar.
- COMMON COOT *Fulica atra* W. Common - 60 on Manasarovar, 12 December 1990.
- CHESTNUT-BELLIED SANDGROUSE *Pterocles exustus* R. Common.
- BLACK-BELLIED SANDGROUSE *Pterocles orientalis* R. Rare.
- PAINTED SANDGROUSE *Pterocles indicus* R. Common in winter.
- BLACK-TAILED GODWIT *Limosa limosa* V. One at Somasagar, 10 March 1990.
- COMMON REDSHANK *Tringa totanus* W. Fairly common.
- COMMON GREENSHANK *Tringa nebularia* W. Common.
- GREEN SANDPIPER *Tringa ochropus* W. Common.
- WOOD SANDPIPER *Tringa glareola* W. Common.
- COMMON SANDPIPER *Tringa hypoleucos* W. Common.
- LITTLE STINT *Calidris minuta* W. Rare.
- TEMMINCK'S STINT *Calidris temminckii* W. Rare - one at Silisad, November 1986.
- EURASIAN THICK-KNEE *Burhinus oedicnemus* R, PB. Rare.
- BLACK-WINGED STILT *Himantopus himantopus* R, PB. Not very common.
- PIED AVOCET *Recurvirostra avosetta* W. Not very common - 20 on Manasarovar, 11 January 1990.
- LITTLE RINGED PLOVER *Charadrius dubius* W. Rare.
- KENTISH PLOVER *Charadrius alexandrinus* W. Rare.
- NORTHERN LAPWING *Vanellus vanellus* W. Rare - Silisad, 1988, 1989 and 1990.
- YELLOW-WATTLED LAPWING *Vanellus malabaricus* V. Two records from Udainath, July 1989.
- RIVER LAPWING *Vanellus duvaucelii* V. Silisad, November 1986.
- RED-WATTLED LAPWING *Vanellus indicus* R, B. Fairly common.
- BROWN-HEADED GULL *Larus brunnicephalus* V. One on Manasarovar, 14 January 1989.
- RIVER TERN *Sterna aurantia* R. Rare.

- BLACK-BELLIED TERN *Sterna acuticauda* V. One at Kankwari, 10 April 1989.
- WHISKERED TERN *Chlidonias hybridus* W. Rare - two near Kankwari, January 1989.
- ORIENTAL HONEY-BUZZARD *Pernis ptilorhynchus* W. Rare - one in Bandipul, 12 December 1989.
- BLACK-WINGED KITE *Elanus caeruleus* R, PB. Rare.
- BLACK KITE *Milvus migrans* R. Rare - only two records near Udainath during monsoon and summer 1989.
- EGYPTIAN VULTURE *Neophron percnopterus* R, B. Rare.
- WHITE-RUMPED VULTURE *Gyps bengalensis* R, B. Fairly common.
- LONG-BILLED VULTURE *Gyps indicus* R, B. Fairly common.
- EURASIAN GRIFFON *Gyps fulvus* V. One near Sariska, November 1986.
- RED-HEADED VULTURE *Sarcogyps calvus* R, B. Rare.
- CRESTED SERPENT-EAGLE *Spilormis cheela* R, PB. Rare.
- WESTERN MARSH-HARRIER *Circus aeruginosus* W. Rare - one near Silisad, November 1986.
- SHIKRA *Accipiter badius* R, PB. Common.
- EURASIAN SPARROWHAWK *Accipiter nisus* W. Seen very occasionally near Sariska, 1988 and 1990.
- WHITE-EYED BUZZARD *Butastur teesa* W. More than 100 were seen around Karnakawas in 1989 when rodents were abundant; however, in 1990 very few were seen.
- GREATER SPOTTED EAGLE *Aquila clanga* W. Rare - one near Kankwari, 20 November 1989 and one near Kalighati, 17 November 1991.
- IMPERIAL EAGLE *Aquila heliaca* W. Rare - one near Karnakawas, 17 January 1990.
- COMMON KESTREL *Falco tinnunculus* W. Rare.
- ORIENTAL HOBBY *Falco severus* ? Rare - only in November 1986, in Sariska, Silisad and Kankwari.
- LITTLE GREBE *Tachybaptus ruficollis* R. Common in winter.
- GREAT CRESTED GREBE *Podiceps cristatus* V. Four seen on Manasarovar, 12 January 1990.
- ORIENTAL DARTER *Anhinga melanogaster* W. Rare - 2-3 on Manasarovar and Silisad.
- LITTLE CORMORANT *Phalacrocorax niger* R.
- INDIAN CORMORANT *Phalacrocorax fuscicollis* R.
- GREAT CORMORANT *Phalacrocorax carbo* R. Numbers of all three cormorants are augmented by migrants in winter.
- LITTLE EGRET *Egretta garzetta* R. An influx of migrants in winter.

- GREY HERON *Ardea cinerea* R. Rare.
 PURPLE HERON *Ardea purpurea* R. Rare.
 GREAT EGRET *Casmerodius albus* ? Rare - 2-4 seen in winter on Somasagar, Silisad and Monasarovar.
 INTERMEDIATE EGRET *Mesophoyx intermedia* R. Numbers augmented by migrants in winter.
 CATTLE EGRET *Bubulcus ibis* R. Most frequent during summer and the early monsoon period.
 INDIAN POND-HERON *Ardeola grayii* R, B. A colony found in summer 1989.
 GREATER FLAMINGO *Phoenicopterus ruber* W. Rare - four on Manasarovar on 15 January 1990.
 BLACK-HEADED IBIS *Threskiornis melanocephalus* W. Rare - 11 on Manasarovar, 11 January 1989.
 RED-NAPED IBIS *Pseudibis papillosa* W. Rare - one on Manasarovar, 11 January 1990.
 EURASIAN SPOONBILL *Platalea leucorodia* W. Common, maximum of 50 on Manasarovar, 11 January 1990.
 GREAT WHITE PELICAN *Pelecanus onocrotalus* W. 45 at Silisad, 11 January 1990; six on Manasarovar, 13 January 1990.
 DALMATIAN PELICAN *Pelecanus crispus* W. Two on Manasarovar, 12 January 1990.
 PAINTED STORK *Mycteria leucocephala* W. 30 on 11 and 15 on 13 January 1990 on Silisad.
 ASIAN OPENBILL *Anastomus oscitans* W. 10 on Manasarovar, 13 January 1990; 4 on Somasagar, 16 March 1990.
 BLACK STORK *Ciconia nigra* W. Six at Kankwari, 12 January 1989.
 WOOLLY-NECKED STORK *Ciconia episcopus* R, B. Rare - breeds near Bharthari.
 INDIAN PITTA *Pitta brachyura* S, B. Fairly common and widespread during May and June.
 GREY-HEADED CANARY-FLYCATCHER *Culicicapa ceylonensis* W. Common.
 BAY-BACKED SHRIKE *Lanius vittatus* R, PB. Common.
 LONG-TAILED SHRIKE *Lanius schach* R, PB. Common.
 NORTHERN SHRIKE *Lanius excubitor* R, PB. Rare.
 RUFOUS TREEPIE *Dendrocitta vagabunda* R, B. Common.
 HOUSE CROW *Corvus splendens* R, PB. Rare.
 LARGE-BILLED CROW *Corvus macrorhynchos* R, B. Fairly common.
 EURASIAN GOLDEN-ORIOLE *Oriolus oriolus* S, B. Common.

- LARGE CUCKOO-SHRIKE *Coracina macei* R. Rare.
 BLACK-HEADED CUCKOO-SHRIKE *Coracina melanoptera* S. Rare - one at Kalighati, 23 June 1989.
 SMALL MINIVET *Pericrocotus cinnamomeus* W. Rare.
 SCARLET MINIVET *Pericrocotus flammeus* V. One near Sariska, November 1987.
 WHITE-BROWED FANTAIL *Rhipidura aureola* R, B. Common.
 BLACK DRONGO *Dicrurus macrocercus* R, B. Fairly common.
 WHITE-BELLIED DRONGO *Dicrurus caerulescens* W. Rare.
 ASIAN PARADISE-FLYCATCHER *Terpsiphone paradisi* R. Rare.
 COMMON IORA *Aegithina tiphia* W. Rare.
 COMMON WOODSHRIKE *Tephrodornis pondicerianus* R, PB. Common.
 RED-BREASTED FLYCATCHER *Ficedula parva* W. Common.
 TICKELL'S BLUE-FLYCATCHER *Cyornis tickelliae* R, PB. Rare.
 BLUETHROAT *Luscinia svecica* W. Rare.
 ORIENTAL MAGPIE-ROBIN *Copsychus saularis* R, B. Common.
 INDIAN ROBIN *Saxicoloides fulicata* R, B. Common.
 BLACK REDSTART *Phoenicurus ochruros* W. Common.
 SIBERIAN STONECHAT *Saxicola maura* R, PB. Rare.
 PIED BUSHCHAT *Saxicola caprata* R, B. Common.
 GREY BUSHCHAT *Saxicola ferrea* V.
 DESERT WHEATEAR *Oenanthe deserti* V. One near Tehla, 12 February 1989.
 INDIAN CHAT *Cercomela fusca* R, PB. Rare.
 CHESTNUT-TAILED STARLING *Sturnus malabaricus* R. Abundant, July to October; otherwise rare.
 BRAHMINY STARLING *Sturnus pagodarum* R, PB. Common.
 ROSY STARLING *Sturnus roseus* W. Rare.
 COMMON STARLING *Sturnus vulgaris* W. Only in November 1986 around Sariska.
 ASIAN PIED STARLING *Sturnus contra* R, PB. Common.
 COMMON MYNA *Acridotheres tristis* R, B. Common.
 BANK MYNA *Acridotheres ginginianus* R, PB. Common.
 SPOTTED CREEPER *Salpornis ptilonotus* W. Seen near Sariska, 3 January and 12 November 1989, 13 November 1991.
 GREAT TIT *Parus major* R, B. Numbers augmented in winter.
 PLAIN MARTIN *Riparia paludicola* R, PB. Common.
 DUSKY CRAG-MARTIN *Hirundo concolor* R, PB. Common.
 BARN SWALLOW *Hirundo rustica* W. Rare.

WIRE-TAILED SWALLOW *Hirundo smithii* R, PB. Rare.
 RED-RUMPED SWALLOW *Hirundo daurica* R, PB. Rare.
 WHITE-EARED BULBUL *Pycnonotus leucotis* R. Rare.
 RED-VENTED BULBUL *Pycnonotus cafer* R, B. Abundant.
 GREY-BREASTED PRINIA *Prinia hodgsonii* R, PB. Common.
 JUNGLE PRINIA *Prinia sylvatica* R. Rare.
 ASHY PRINIA *Prinia socialis* R, PB. Rare.
 PLAIN PRINIA *Prinia inornata* R, PB. Common.
 ORIENTAL WHITE-EYE *Zosterops palpebrosus* R, PB. Common.
 COMMON TAILORBIRD *Orthotomus sutorius* R, B. Common.
 EURASIAN CHIFFCHAFF *Phylloscopus collybita* W. Common.
 INORNATE WARBLER *Phylloscopus inornatus* W. Rare.
 GREENISH WARBLER *Phylloscopus trochiloides* W. Rare.
 TAWNY-BELLIED BABBLER *Dumetia hyperythra* V. One near Raika village, 12 November 1988.
 YELLOW-EYED BABBLER *Chrysomma sinense* R, B. Fairly common.
 COMMON BABBLER *Turdoides caudatus* R, B. Fairly common.
 LARGE GREY BABBLER *Turdoides malcolmi* R, B. Common.
 JUNGLE BABBLER *Turdoides striatus* R, B. Fairly Common.
 LESSER WHITETHROAT *Sylvia curruca* W. Rare.
 SINGING LARK *Mirafra cantillans* R, PB. Rare.
 INDIAN LARK *Mirafra erythroptera* R, PB. Common.
 PURPLE SUNBIRD *Nectarinia asiatica* R, B. Common.
 HOUSE SPARROW *Passer domesticus* R, B. Fairly common.
 SPANISH SPARROW *Passer hispaniolensis* W. Abundant - flocks of over 1000 around Karnakawas and Sariska, December to February.
 EURASIAN TREE SPARROW *Passer montanus* W. Rare.
 CHESTNUT-SHOULDERED PETRONIA *Petronia xanthocollis* R, B. Common.
 WHITE WAGTAIL *Motacilla alba* W. Rare.
 WHITE-BROWED WAGTAIL *Motacilla maderaspatensis* R, PB. Common.
 YELLOW WAGTAIL *Motacilla flava* W. Rare.
 GREY WAGTAIL *Motacilla cinerea* W. Rare.
 PADDYFIELD PIPIT *Anthus rufulus* R, PB. Rare.
 TREE PIPIT *Anthus trivialis* W. Rare.
 BAYA WEAVER *Ploceus philippinus* R, B. Fairly common.
 RED AVADAVAT *Amandava amandava* V. One near Umri village, February 1988.

WHITE-THROATED SILVERBILL *Lonchura malabarica* R, B. Fairly common.
 COMMON ROSEFINCH *Carpodacus erythrinus* W. Rare.
 CRESTED BUNTING *Melophus lathami* R, B. Fairly common during summer.
 GREY-NECKED BUNTING *Emberiza buchanani* W. Rare - November 1986 near Sariska.
 CHESTNUT-BREASTED BUNTING *Emberiza stewarti* W. Fairly common. Large flocks in 1988 and 1989.

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REFERENCES

- Champion, H. G. and Seth, S. K. (1968) *A revised survey of forest types of India*. Govt. of India.
 Rodgers, W. A. (1991) A preliminary ecological survey of Algal spring, Sariska Tiger Reserve, Rajasthan. *J. Bombay Nat. Hist. Soc.* 7: 201-209.
 Rodgers, W. A. and Panwar, H. S. (1988) *Planning of wildlife protected area network in India*, 2. Wildlife Institute of India.
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