## BIRD NOTES FROM BALUCHISTAN PROVINCE, PAKISTAN<sup>1</sup>

## T. J. ROBERTS<sup>2</sup>

### INTRODUCTION

Practically nothing has been recorded about the avifauna of this fascinating area since the second world war, when Brigadier A. F. P. Christison gave an account of the birds seen in the south-western part of the Province (1941) and subsequently described some new records for the northern part of Baluchistan (1942). In fact most of our knowledge about the breeding birds in Baluchistan is based upon earlier writers (Meinertzhagen 1914, Ticehurst 1926-27, and Williams & Williams 1929). Since the area is in the south-eastern fringe of the great Palaearctic region and is characterised by mountain steppe or cold desert, it tends to have faunal affinities with Afghanistan, and Soviet Asia rather than the rest of the Indian sub-continent. The purpose of this note is to give detailed descriptions of two places of considerable ornithological interest in order to reflect the present day status of one and to draw attention to the other which seems to have been missed by earlier ornithologists working in the region.

#### Sirandah lake

In Dr. Sálim Ali's HANDBOOK series (The Birds of India and Pakistan) this lake is mentioned as the only locality within the territorial limits covered by these ten volumes, where the Slenderbilled Gull (*Larus genei*) and the

Caspian tern (*Hydroprogne caspia*, synonym *Sterna caspia*) (de Voous 1973) are known to breed. Sirandah is also recorded in the HANDBOOK as a regular breeding site for Gull-billed terns (*Gelochelidon nilotica*) and the Marbled Teal (*Anas angustirostris*).

When I moved to Karachi in the autumn of 1973 I was naturally keen to visit this lake and studied all available literature. I had difficulty in locating the lake until 1974, and because I could learn so little about the place I feel that my limited observations are worth recording. Perhaps some twentyfirst century ornithologist, writing about the extinct or vanishing birds of the Middle East region will find my notes of value!

General Bentham and Mr. Ludlow, two British Government officials visited Sirandah lake around the turn of the century and submitted manuscript notes to Stuart Baker, who edited the Ornithological Journal for the region in those times, "Stray Feathers". Dr. Claude B. Ticehurst, a Captain Surgeon in the Army was stationed in Karachi from 1917 to 1918 and mentions Sirandah in his comprehensive account of the Birds of Sind (Ibis 1922-1924) but he did not apparently go there personally. Kenneth Eates of the Indian Police, a great oologist and authority on the birds of Sind, visited Sirandah in the early 1930s. I know of no other written records about this lake and imagine that it has been very seldom visited by any competent ornithologists within the past 50 years.

Despite the huge growth of Karachi City,

<sup>&</sup>lt;sup>1</sup> Accepted July 1979.

<sup>&</sup>lt;sup>2</sup> P. O. Box 3311, Malir City Post Office, Karachi-23 Pakistan.

now a sprawling metropolis of 4.5 million people, the adjacent hinterland is still very sparsely populated being not only desert, but rocky and unsuitable for cultivation. Sirandah Lake lies 90 Km. west north west of Karachi in Las Bela District in the extreme south eastern corner of Baluchistan Province. approximate location is 66° 40' East and 25° 30' North. It is a good three Kilometres from the only road in the region which runs to the towns of Uthal and Bela. There are no villages anywhere nearby and even today the lake is seldom disturbed by human visitors. It lies in a shallow basin near Sonmeani Lagoon connected to the open sea  $6\frac{1}{2}$  km. to the west, and is surrounded to the north and west by sedimentary sandstone hills. It is cut off from the sea by a spectacular series of 50 metre high barren sand hills. The area receives absolutely no rainfall from end September till early July and the monsoon influence is erratic, hardly bringing any rain in some years. The few dry nullahs which drain to the coast are blocked off by the above mentioned high sand dunes and hence after monsoon rains a lake tends to form in the bottom of the basin. It is always highly brackish and due to fluctuating water levels there are no sedges or reeds established along its barren margins. The only vegetation consists of scattered trees of Prosopis spicigera, much lopped for goat browse, and in the low lying areas stunted Tamarix troupii bushes. The ground consists of undulating sand hills upto 2 to 3 metres in height and dotted with salt-wort bushes, both Sueda fruticosa and Salsola foetida. The area is severely hot in summer with temperatures exceeding 44°C in June.

When first visited by me in 1974, guided by some local fisherman, the lake was much shrunk in size and no one could recall any

terns or gulls nesting there within recent years. Because of its remoteness, the lake always has 100 or 200 Greater flamingos (Phoenicopterus ruber) and a few Pelicans (both species). In winter small numbers of coot and dabbling ducks use it as a resting ground and perhaps the most interesting bird in the Common Sheld duck (Tadorna tadorna) which spends the winter in fair numbers on the lake. In 1977 I counted a flock of 80. In wildfowl censuses of Pakistan conducted over 5 years by Mr. F. Koning for the I.W.R.B. during the early 1970s, at the most 3 to 5 Sheld ducks were recorded per annum between all the major wetlands of Pakistan and apart from the Marbled Teal, this is Pakistan's rarest duck. In one year on June 9th I saw many Rednecked Phalaropes (Phalaropus lobatus). Though so close to the open sea on which they spend the winter, it seemed late for migrating waders to be tarrying on this lake at the start of their migration. During other summer visits I have got the impression that a few Curlew Sandpipers (Calidris ferruginea), Little Stints (Calidris minuta) and Dunlin (Calidris alpina) spend the entire summer around the lake shores. In February 1978 the lake was very shallow and had shrunk to a mere 30 hectares and I did not bother to visit it again. Indeed I believed that no terns or gulls could have nested there for many decades. I have never seen any Marbled Teal there. Stuart Baker, who lived and worked in North East India, referred to Caspian Terns nesting in bushes on an island in the lake. (FAUNA OF BRITISH INDIA Vol. VI). There are no permanent vegetated islands in the lake and his observations about nests on bushes were so untypical of Sterna species as to imply that this was some second-hand account emanating rather from the reports of uneducated egg collectors. Great was my excitement,

therefore when in May, 1979 a fisherman friend from nearby Sonmeani came to report that 'hundreds of Terns', were nesting at Sirandah. The Mekrani language for Tern is "Khora" and for Gull is "Kinari". May 24th was the first Friday when an opportunity allowed the lake to be visited. The 3 Km walk over soft sand dunes, coupled with the terrific heat made prolonged observations difficult. Added to this we discovered a temporary settlement of fishermen on the extreme southern corner of the lake. These men, occupying two palm thatched huts, insisted on accompanying us and this added to the disturbance of the nesting birds. The monsoon rains of 1978 were unprecedently heavy in Las Bela district. Road bridges were swept away and many heads of livestock as well as people were drowned by flash floods pouring down normally dry sandy nullahs. The lake was transformed from my memories of February 1978. It now stretched for perhaps 6 kilometres in a north south axis with numerous inlets and lagoons between the sand hills and several islands. The nearest of these, located 1½ kilometres from the fishing camp, revealed great activity with wheeling flocks of Slenderbilled Gulls. By wading thigh deep, we could reach the island which was a long narrow sand bar, some 200 metres in length and practically devoid of vegetation. In the middle and highest part of the island was a colony of some 60 pairs of Slenderbilled Gulls.

Most nests contained two downy young, and only about ten still contained eggs, all with clutches of two. No nests had three eggs, or appeared to have 3 young. I thought this was due to heavy egg predation by the fishermen as there was a basket full of gulls eggs in one of their huts collected the week before. However Meinertzhagen records that 2 is the normal clutch size in Sind (BIRDS OF

ARABIA 1954). The nests, about 11 cm in diameter and as close as 0.75 metres apart, were quite substantial saucers of blackened bits of saltwort with stalks and stems and a surprising number of both gull and flamingo feathers in the cup lining. The eggs are pale greenish to almost white in ground colour and much paler than any other gulls eggs I know of. I believe that the parent birds must have to wet their eggs regularly and incubate them also throughout the day, simply to prevent the developing chicks from overheating and being killed by the intense heat. The chicks had black feet and bills (unlike their parents), their body covered with almost white down with small black spots forming bars along the crown and wings. They were most attractive and when picked up did not regurgitate their food as Herring gull chicks (Larus argentatus) in Britain commonly do. Possibly this was because they had not been fed by their parents since early morning, these gulls confining their foraging to morning and evening.

On the far side of the island, nearer to the waters edge were six Caspian terns nests. These were hollows in the sand, devoid of any lining or decoration, and located 10 to 15 metres from each other. Unlike the wheeling flock of Slenderbills, the Caspian terns repeatedly dived over our head and uttered harsh alarm cries. All contained two eggs of a pale grevish stone colour with comparatively small spots of olive brown and violet grey under markings. In body size the Caspian tern is not much bigger than L. genei but its eggs are quite remarkably bigger and more pointed at the narrow end. Between the Caspian Terns and the Slenderbill gulls nests, were two disjunct colonies of Gullbilled Terns (Gelochelidon) comprising about 17 nests in all—each with two eggs only and no chicks hatched. These nests were noticeably decorated with

bits of leaves and stems and shells and the eggs were much smaller than those of the Caspian terns or Slenderbilled Gulls. I estimated in the gull colony, that nest building must have commenced from early April and egg laying from mid April. Ticehurst (Birds of Sind, op. cit.), records their nesting in June and this is repeated in other books. The terns had obviously started nesting three or four weeks after the gulls and towards the middle of May.

Conversation with the fisherman was disturbing. Not only did they regularly collect gulls and terns eggs to eat, but also one of their number was skilled at snaring flamingoes. Equipped with a long shaft propellor, out board motor and a rickety boat, they had been at the lake since October 1978 and during the winter had killed two adult flamingoes, bearing rings on their legs. I have not seen nor been able to recover these, but my fisherman friend said he saw them and they were Iranian rings. Rather surprising as I would otherwise have assumed them to be Bombay Natural History Society rings from the Rann of Kutch.

I arranged with another intelligent and reliable fisherman who had accompanied me on May 24th that he should visit Sirandah Lake a second time. This was possible on June 12th and he brought back the following report. Due to evaporation the lake had become increasingly brackish and many fish were dying off. The fishermen had abandoned their temporary camp at Sirandah. Worse still, the nearby island was also deserted and hardly any Slenderbilled Gulls could even be observed. On this island addled eggs remained in a few nests but no chicks. All the terns nests were also deserted. The colony had deserted either as a result of excessive human egg predation or more probably because of difficulty in feeding the chicks. Gulls must dip for surface swimming fry and monsoon conditions would make it difficult for them to catch fish from the open sea  $6\frac{1}{2}$  kilometres distant. The chicks in hunger may have attempted to swim from the island. They were active and running around on May 24th. There are lots of foxes (*Vulpes vulpes pusilla*) and Jackals in the area and only island nesting birds would be safe from their predation.

Some 2 kilometres further north were two more islands now inhabited by terns which were not in evidence on May 24th. The largest of these islands had an unmixed colony of Caspian terns numbering atleast 150 pairs. No other species were present and Natha my fisherman friend made several interesting observations. At least two nests contained 3 eggs, all the rest only 2 and most nests now had some decoration around the rim of bits of blackened Salsola leaves and stems. these nest were within two metres of each other. About ten per cent of the eggs were olive buff in ground colour and a few also beautifully marked with curly black lines. On the second island were about 30 Caspian terns nests and also 4 Gullbilled terns nests, two containing chicks. These were more grey than the gull chicks, with brownish red legs and fleshy pink at the base of their mandibles. A bluish darker area of naked skin through the eye and almost pure white throat and breast (a specimen preserved in formaldehyde was brought back). The downy wings were predominantly black.

Regarding other birds, there were many Whiskered terns (*Chlidonias hybrida*) hunting over the lake but no sign of breeding. Also we encountered on the May 24th visit, a colony of some 15 pairs of Blackwinged Stilts (*Himantopus himantopus*) on the first island. They build quite a thick pad of dried

stems and leaves for a nest and some had a full clutch of four eggs. On the lake shore itself in the recently dried out part were pairs of Snowy or Kentish Plovers (*Charadrius alexandrinus*), and we stumbled across one nest on May 24th. This was under the shelter of a *Sueda* bush and its rim was decorated with tiny shells. Hopefully the Caspian terns can hunt for fish in Sonmeani Lagoon and they will rear their chicks, as these powerful terns dive deeply and can catch fish upto 20 cms in length.

Nearby Sonmeani is a very extensive lagoon averaging not more than 5 to 10 metres in depth. It is extremely rich in marine life with mangrove fringed shores, but a description of its ornithology is outside the scope of this note. Only one record seems appropriate to include. In early winter, shrimp fishing with throw nets is the most profitable occupation for the fishermen. The state of the tide is apparently critical for success and they commonly encamp overnight with their boats along the shores of the lagoon. Large Cormorants (Phalacrocorax carbo) are a favoured food at this time, the birds being skinned and roasted over open fires. In December 1977 a cormorant with a ring was shot, and though I failed to recover this ring, it apparently bore "foreign letters" on it and could have been Russian. During March I have often seen these cormorants in the distinctive breeding plumage of Phalacrocorax carbo sinensis which sub-species has a Russian breeding population. Later in the summer I have only seen birds in non-breeding or immature plumage and I cannot find evidence of local breeding. The Indian Shag (P. fuscicollis) does breed during the monsoon in the Sonmeani mangroves.

## Surkhab Valley—Pishin District

Located at approximately 30° 35' N and

67° 20' E, the Valley is situated in Pishin District, approximately 45 kilometres due north of Quetta City and 65 km by road.

I first discovered the place in March 1974 and have been able to visit it in April, May or June each year subsequently. It is almost unique in the region as being one of the few places with a perennially flowing stream and some relatively well grown surviving tree cover which stretches for a distance of about 2½ km where the valley is so restricted by surrounding hills that it does not afford opportunity for cultivation. Two species regularly nest here which I have not been able to locate anywhere else in Pakistan, namely the Rufoustailed Chat (Cercotrichas galactotes) and Ménètries's Warbler (Sylvia mystacea) and the area seems worthy of recording in this note about the birds of Baluchistan. I have searched in vain for the Rufoustailed Chat in the Chaghai District, where Christison (1941) thought it probably bred.

The Valley itself is relatively flat and level with low surrounding hills of conglomerate and gravel. The Surkhab Lora, as it is called, is a shallow but fast stream flowing over gravel beds. The elevation is 1500 metres and average annual rainfall in Pishin town, 17 km distance, is 22 centimetres including light snowfall which falls every winter. It is severely cold and dry from October often until late March and has a relatively restricted resident bird population, but in summer it attracts a number of breeding migrants. On the gravel and shale hills abutting the valley are scattered bushes of Artemesia scoparia, Prunus jacquemontii (the wild almond) and spiny clumps of Convolvulus spinosus with showy white flowers in late April. In the valley floor itself are groves of Populus species and Salix viminalis, forming trees upto 10 metres height. in the open drier areas are a number of

shrubs and thorny bushes; Tamarix species, Berberis gambleana and Caragana ambigua have been identified. There are also scattered brakes of the reed Arundo donax. In spring the ground is also carpeted with the hoary leaved vetchlike plant Sophora alopecuroides, which in April has creamy yellow flowers in a cluster at the tips of its stems. Clumps of the tall grass Chrysopogon aucheri also survive in the shelter of bushes, and though the area is heavily grazed by goats and cattle, there is good cover for nesting warblers.

My accumulated notes from five annual visits between 1974 and 1979 are summarised below, with more details covering the less well known species.

- 1. Little ringed plover Charadrius dubius.

  Breeding confirmed.
- 2. Kestrel Falco tinnunculus.

No nearby suitable breeding cliffs, but a pair haunts the area each year.

3. See-See Ammoperdix griseogularis.

Seen drinking from Surkhab in late evening and breeds in surrounding hills.

4. European or Common Kingfisher Alcedo atthis.

Breeding confirmed.

5. Golden or European Bee-eater Merops apiaster.

Nests in the earth cliffs. Excavation of the nest hole is a prolonged business and observed in one year, as late as June 29th.

6. Little Brown Dove Streptopelia senegalensis.

Very common throughout Baluchistan.

7. Common Cuckoo Cuculus canorus.

Seen every year and on May 2nd a proable egg found in a Brown Shrikes nest. See below.

8. Hoopoe Upupa epops.

This species seems to nest in holes in

earth cliffs as there are no suitable tree holes for nesting sites.

9. Red-rumped swallow Hirudo daurica rufula.

This sub-species has a practically white rump but the breast is quite fulvous. They shun human habitation and nest upto 2700 metres elevation in the higher hills. At Surkhab they hawk insects along the valley and must nest nearby.

10. Magpie Pica pica.

The most conspicuous bird in the valley and a family party of eight on June 29th seemed to confirm breeding. I have also seen its old unoccupied nests in the valley. It is an early breeder.

11. Brown Shrike Lanius cristatus.

In the latest Palaearctic Checklist this species is Lanius isabellinus. The Russians call it Lanius cristatus, whereas in Sálim Ali's HANDBOOK it is listed as Lanius collurio (de Voous 1977, Ali 1972 and Dementiev et al. 1954). However, in all three instances the subspecies is the same L. l. phoenicuroides and this very distinctive bird is certainly the same species in all referred cases. It is Pakistan's rarest breeding Shrike and normally prefers higher elevations than Surkhab at least in Baluchistan. In fact I only saw it in one year out of five. Its nest, about 2 metres from the ground on a horizontal fork of a Willow tree, was not very neatly made but the cup was snugly lined with rootlets and shredded grasses. On May 2nd there were three pale pinkish buff eggs thickly speckled with grey and red brown forming a zone at the blunt end. A fourth egg was more green than turquoise with quite sparse red brown speckling. I presumed this was a Cuckoo's egg but it was the same shape and size as the other three eggs. Dementiev (op. cit.) records that in Turkestan this Shrike frequently becomes host to the Cuckoo (Page 19 Vol. vi). I note that in the HANDBOOK the ground colour of their eggs are described as greenish white. In Dementiev's account a reddish buff or pink ground colour is usual.

The Brown Shrike has many similar calls to other Shrikes, particularly the loud harsh rasping near the nest. The female was larger than her mate with a less darkly contrasting eye stripe. The male with shining white throat and upper breast, warm buff flanks and vent, has pinkish chestnut crown and tail; grey buff back and shoulders and his dark brown flight feathers were conspicuously bordered with paler buff. The eye streak seemed quite jet black and extends from the fore crown to well behind the eye.

12. Long tailed or Rufousbacked Shrike Lanus schach.

In every other year conspicuous breeding pairs in the valley.

13. Spotted Flycatcher Muscicapa striata.

This species normally breeds in the Juniper forest zone at higher elevations. I could not find its nest but at least one bird was haunting the tree groves every year and in March a pair were seen.

14. Menetries's Warbler Sylvia mystacea.

I first encountered this species in March 1974, a new record for the subcontinent (Roberts 1975). At the time I presumed it to be a spring passage migrant since such avid egg collectors as Williams & Christison (op. cit.) had failed to record it. I have searched in vain for a nest but the *Donax* thickets are impenetrable. It seems to arrive earlier and start nest-

ing sooner than the Rufoustailed Chat. (They were plentiful on March 25th when no Rufous Chats were in evidence). I have seen a nest building male bird with a beak full of vegetable floss on May 2nd and on June 29th a family of at least three fully fledged young (with stubby tails and wisps of head down) were being fed by their parents who attracted me to the spot by their agitated alarm calls. In the whole valley I estimate there may be ten to fifteen pairs and in foraging, at least, their territories seem to overlap considerably. The male has a noticeable dark grey tail which is bordered with white outer tips as he dives into a bush. They feed well inside bushes and thickets rarely affording a clear view but are tame enough to allow approach to within 2 metres. Their contact call is the typically sylvine 'tak-tak-tak.' It is more diminutive than the lesser white throat and if it pauses long enough for a good view the brick red flush to its upper breast, prominent white malar streaks and red eye ring make it a striking and beautiful little warbler. I have recordings of its song which can continue uninterrupted for upto half-a-minute. I have only once seen it flutter into the air during the display song which is mostly given from well inside a thicket. It is quite melodious in short phases and to my ear superior to the song of the Sykes' Tree Warbler.

15. Rufoustailed Chat or Greybacked Warbler Erythropygia galactotes.

In habits this bird is very like the Indian Robin and the Himalayan Ruby Throat and therefore the name Chat much appropriate than seems more warbler. It feeds mostly on the ground running in little spurts

the end of which it raises its tail and often fans it. It only passes through Pakistan for a period of a few days in September on its return to its wintering grounds in North West Africa, and I was unfamiliar with the species until I learned where to find it in the hills around Karachi. The males probably arrive in the extreme border regions of Baluchistan in mid April and do not start vigorous territorial singing until early May. The sweet little song is always given from the top of a bush with the bird conspicuous and lasts two to three seconds, and may be repeated for upto a minute. It soon resumes feeding and then flies upto another bush to sing, travelling round its territory fairly systematically. Again I have failed to find a nest but Donax thickets with last year's dried stems encompassed by new green growth seem to be favoured and I never went to Surkhab armed with a suitable machete or billhook to cut open these thickets. However, on June 29th a pair were watched both carrying insect larvae and ants into a reed thicket and my annual observations leave no doubt that they are regular breeders. From territorial singing I estimated that there were 6 to 8 pairs in 1979.

## 16. Sykes Tree Warbler Hippolais caligata rama.

This bird is fairly wide-spread as a summer breeder in the lower valley of Baluchistan and they abound in the Surkhab valley. Their song is given almost continuously throughout the day in the breeding season. It is louder and coarser than that of Ménètries's warbler but like the latter invariably given from well inside a bush and during pauses between foraging for insects.

## 17. Pied Wheatear Oenanthe picata picata.

This bird forages in the valley bottom but nests in the surrounding low milk—a hole under a rock being favoured.

## 18. Pied Bush Chat Saxicola caprata.

No different from its habits in the plains.

## 19. Rock Pipit Anthus similis.

A nest with downy young was in a grass clump, perhaps fortituously well roofed over and concealed. This was right on the valley floor in sandy substrate.

## 20. Grey Wagtail Motacilla caspica.

Single birds seen and possibly breeding.

# 21. House Sparrow Passer domesticus parkinii(?)

Besides a small resident population in the towns, huge migrant flocks, shunning villages, sweep through in late March to early May presumably breeding further North in Afghanistan or Turkestan. But small colonies stay to breed in isolated valleys or higher hill-slopes where there is some tree-cover. The birds look bigger and more richly coloured than P. domesticus indicus and the subspecies P. domesticus bactrianus, which I would have expected, is supposed to be smaller and paler than the resident Indian race.

# 22. Trumpeter Bullfinch Bucanetes githagineus syn. Rhodopechys githaginea.

This thirsty little finch is rare in Central and Northern Baluchistan, commoner in the warmer more southern latitudes. I have seen it drinking from the Surkhab stream and it may well breed locally.

## 23. Striolated Bunting Emberiza striolata.

Also seen drinking from the stream and may well breed locally.

Birds like the Rock Nuthatch (Sitta teph-ronota), Orphean Warbler (Sylvia hor-

tense) and Desert Lark (Ammomones deserti) are typical of this elevation in Baluchistan but I have never encountered

them in that particular patch of valley. I did not visit the valley late enough in the evening to identify any owls or nightjars.

#### REFERENCES

ALI, SALIM AND RIPLEY, S. D. (1968-72): Handbook of the Birds of India and Pakistan. Vol. I, Vol. III (Laridae) and Vol. V (Lanidae). Oxford University Press, Bombay.

BAKER, STUART (1929): Fauna of British India. Birds Vol. VI. Francis and Taylor, London.

CHRISTISON, A. F. P. (1941): Notes on the Birds of Chagai. *Ibis* 1941: 531-556.

DEMENTIEV, G. P. AND GLADKOV, N. A. et al. (1954): Birds of the Soviet Union. Vol. VI. Moscow.

HUE, FRANCOIS AND ETCHECOPAR, R. D., (1970): Les Oiseaux du Proche et du Moyen Orient. Boubee & cie, Pare.

MEINERTZHAGEN, R. (1914): Birds nesting at

ROBERTS, T. J. (1975): Ornithological Records for Pakistan. J. Bombay nat. Hist. Soc. 72(1): 201-204.

TICEHURST, CLAUDE, B. (1922-1924): The Birds of Sind. *Ibis*. Parts I to VIII.

VOOUS, DE K. H. (1973): List of Recent Holarctic Bird species. *Ibis*, Vol. 115.

———— (1977): ibid. Ibis, Vol. 119.

WILLIAMS, C. H. AND WILLIAMS, C. E. (1929): Some notes on the Birds breeding round Quetta. J. Bombay nat. Hist. Soc. 33: 598-613.



Roberts, T J. 1980. "Bird Notes from Baluchistan Province Pakistan." *The journal of the Bombay Natural History Society* 77, 12–20.

View This Item Online: <a href="https://www.biodiversitylibrary.org/item/156167">https://www.biodiversitylibrary.org/item/156167</a>

Permalink: <a href="https://www.biodiversitylibrary.org/partpdf/151602">https://www.biodiversitylibrary.org/partpdf/151602</a>

#### **Holding Institution**

Smithsonian Libraries and Archives

#### Sponsored by

**Biodiversity Heritage Library** 

#### **Copyright & Reuse**

Copyright Status: In Copyright. Digitized with the permission of the rights holder.

License: <a href="http://creativecommons.org/licenses/by-nc-sa/4.0/">http://creativecommons.org/licenses/by-nc-sa/4.0/</a></a> Rights: <a href="https://www.biodiversitylibrary.org/permissions/">https://www.biodiversitylibrary.org/permissions/</a>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at https://www.biodiversitylibrary.org.