

# The Birds and Other Vertebrates of Soldado Rock, Trinidad

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## Introduction

Of all Trinidad's offshore islands the most remote and inaccessible is Soldado Rock, situated about 10 km west of Icacos Point. It has always been of interest to naturalists, especially ornithologists and geologists, but problems of access have meant that very few people have been able to make more than superficial studies.

The egg-collectors Belcher and Smooker (1935) visited Soldado on 17 May 1931 and they refer to a visit made by T. Spencer on 12 May 1928. On both occasions seabirds were nesting on the island and eggs were collected, but no other data are forthcoming. However, Leslie Brown (1947) twice visited the island in 1940\*, mostly to take photographs, and he mentions a visit by "Trinidad's other ornithologists" Ernest Chenery and Ray Johnson, who unfortunately seem not to have recorded their findings. The next published account was from John Saunders (1957), a geologist who wrote a graphic article giving a clear picture of bird-life on the island during the main breeding season. Herklots (1961) refers to trips he made there on 4 July 1954 and 27 April 1958; on the latter occasion the seabirds were breeding in quantity. I also know that David Snow visited the island at least once during 1956-1959 when he was resident in Trinidad, for he advised me that it might be worth spending a night there. In addition, the ornithologist A.W. Diamond made a brief visit in October 1983 but found little of significance except for two unidentified eggs.

The longest and most intriguing account of a visit to Soldado Rock comes from Brooke Worth (1967), whose amusing style combined with a highly imaginative and philosophical spirit of reflection has produced an unforgettable cameo of a field expedition as many of us have experienced it; an account well worth re-reading.

However, none of the previous writers has attempted to give a comprehensive account of the island's natural history, so in this article I shall try to fill in some details. Although circumstances in Trinidad have changed radically since the time when I made most of my visits, the following account may serve as a basis for further studies.

## Description of the Island

Soldado Rock lies about 12 km off the Venezuelan coast (Lat. 10° 4' 25" N, Long. 62° 0' 56" W) (Fig. 1). Indeed from the island's summit an observer with binoculars can clearly make out the trees lining the shores of the western Orinoco delta. A little further to the west the river Manamo, the western arm of the great Orinoco, flows out past the small settlement of Pedernales into the Gulf of Paria. During the rainy season quantities of floating vegetation and other debris are carried out to sea, and some of this is washed up on to Soldado Rock itself.

Until comparatively recent times the Rock was of no interest to politicians, but once marine oilfields came into the reckoning, the necessary demarcation of borders between Trinidad and Venezuela resulted in Soldado Rock falling within Trinidad's jurisdiction. During the Second World War the island was occasionally used for bombing and target practice and one can still find pieces of shrapnel and spent bullets scattered about amidst the rocks.

The island mainly comprises a large limestone boulder

from the Eocene and Paleocene periods lying in younger beds probably from the Miocene. Rather less than one hectare in area, the rock rises steeply up from the sea to a height of about 35 metres. There are two main rock masses connected by a ridge, with the silts being heavily added to by the guano from many generations of seabird colonies. It is possible to clamber around the base of the cliffs on a raised platform of rocks, just above sea level, for about three quarters of the island's circumference; but the cliffs themselves are not only fairly precipitous but liable to crumble away under pressure, so that climbing is hazardous and generally ill-advised. In certain places the rocks contain conspicuous amounts of macro-fossils, and geologists have designated Soldado Rock as the type-locality for certain formations - another good reason for preservation of the site.

The environment, exposed to the elements on all sides, is fairly harsh, especially when the dry season is prolonged, and few plants can survive. Those recorded there include the shrubby *Plumbago scandens*, two grasses *Paspalum vaginatum* and *Eleusine indica*, a large sedge *Mariscus ligularis*, and the ground-hugging succulent *Portulaca oleracea*. But in many places the terrain is devoid of plant life and the general impression during the late dry season is of a dusty desert. However, soon after the rains have come, the *Plumbago* thrives and the island can look quite green for a while. But it is doubtful whether rainfall exceeds 130 cm per annum.

## My Visits

During the period 1960-1982 I made 29 visits to Soldado Rock. These fall broadly into three categories. From 1960 to 1962 I made six trips primarily to band terns at their nesting colonies. During 1963-1964 I made seven trips in collaboration with the Trinidad Regional Virus Laboratory (TRVL) staff, during which I banded and examined birds that were being tested in the course of virus research. Between May 1965 and October 1967 I visited 14 times in order to conduct research into interesting moult systems in the Brown Noddy tern *Anous stolidus*. On most of these occasions I stayed for approximately 24 hours in order to be there overnight. Two more trips followed in May 1974 and March 1982 "for old time's sake."

On many of the trips I was accompanied by my wife Margaret, and often by other companions, especially research scientists from TRVL or UWI, or visiting researchers from overseas. On one occasion the Forestry Division conducted a party to the island from the Wildlife Conservation Committee, on which I served as ornithologist, and in March 1982 the TTFNC had a field meeting on Soldado, with a boat provided by Peter Percharde. I have attempted to list at the end as many of my co-workers on the island as I can recall and I hope that I've not omitted anyone.

One of the major problems of working on Soldado was the logistical one of access. One must have a reliable boat. At least once a serious breakdown occurred en route and our powerless boat drifted away towards the far west of the gulf and probable incarceration in an inhospitable Venezuelan jail! Eventually all breakdowns were corrected but, with the long drive down to Icacos Point and back, not much time was left

\* See addendum to Darling's paper immediately following.





Fig. 1: Location of Soldado Rock

for meaningful research on the island if the boat journey too became prolonged. Normally it would take from one to one and a half hours to reach Soldado from Trinidad, but occasionally weather conditions were hazardous, and in a pirogue we had to expect an uncomfortable ride from time to time. The main difficulty was in ensuring that transportation was available.

Although there were many fishing boats at Cedros and Icacos, their owners used them regularly for fishing in the productive waters of the area and were unwilling merely to ferry visitors to and from Soldado Rock, except at an exorbitant price. In fact much fishing takes place quite close to the island by both Trinidadian and Venezuelan fishermen, and clearly these men not infrequently land on Soldado for rest or recreation, as we later discovered.

The real trouble came from the fact that communication with a boatman was very difficult, especially as the telephone line to Cedros was often down. After one or two experiences when I arranged a boat for a day, only to arrive and find its owner had decided to go fishing instead after all, I discovered the answer. A "retired" fisherman, named Ogir Boodoo, was found at Cedros, who used to "borrow" a boat for the occasion. Although the boat was not too clean, the engine often unreliable and the journey a bit slow, I was never let down by Ogir during the long period from 1960 to 1967. The only trouble was that if I could not contact him by telephone, I had to drive to Cedros a week ahead and arrange things for the following weekend. However, on the many occasions when I spent two days and a night on the island, Ogir never once failed to show up and collect the party for the return journey. Sadly Ogir suffered a stroke some years ago, but I shall not forget his loyal help. His broad grin, disclosing a mouth full of gold teeth, and familiar battered hat were always a welcome sight on Cedros beach.

## The Birds

### 1. Breeding Seabirds

Not surprisingly, seabirds predominate on the island, which is the most important breeding site for the group on any of Trinidad's offshore islets. Five species are known to have bred on Soldado, but principally two are involved. Since conditions for breeding are best during the months March to August, I concentrated my visits during that period; however, five visits during the months of January, September and October disclosed little sign of breeding activity.

**Magnificent Frigatebird** *Fregata magnificens*. Present on every visit, this huge seabird was usually found gliding on the updraughts created by the steep cliffs, occasionally in numbers up to 500. Birds sometimes roosted on rocky promontories but often spent the night in the air, probably sleeping on the wing. Undoubtedly they preyed on the smaller seabirds and would certainly take eggs or small young if available.

I found two males in full breeding display on 19 January 1963, and John Saunders (pers.comm.) found a few nests with eggs during February 1973, the only breeding record of the species from Trinidad coastal waters. Two other eggs found by A.W. Diamond in October 1983 may well have been of this species.

Usually the species nests in trees, as on St. Giles Island, Tobago, but Soldado with its convenient cliffs provides the necessary opportunity for wind-assisted take-off. But with the breeding period lasting over 6 months from egg-laying to the fledging of young, it is not likely that any individuals of this species would survive inevitable human disturbance on the island.

**Sooty Tern** *Sterna fuscata*. This species was always present on the island in considerable numbers whenever I visited between March and July. Peak numbers rose to about 5000 on some April to June visits, but fell away sharply from early July. On most visits between September and February none were seen in the area. During the off-season Sooty Terns appear to migrate eastward into the tropical Atlantic (French 1980) as far as the Gulf of Guinea.

Between 1960 and 1982 I banded with U.S. Fish & Wildlife Service bands 801 Sooty Terns on Soldado, the great majority as nestlings (Table I). One of the latter was recovered on Martinique three years later. Seven other birds banded as nestlings off southern Florida have been recovered in the area of Trinidad during the months of September - December, showing that at least some birds are found in the area outside the breeding season.

The breeding cycle appeared to be annual, but in some years it clearly started earlier than in others. On the Club's field trip to Soldado on 28 March 1982 we found Sooty Tern chicks that seemed to be about four weeks old. That would indicate a laying date as early as the last week of January. Yet I found no Sooties present on 19 January 1963 and only a few adults about on 25 January 1964. But birds were incubating on all visits from 4 March to 27 May, with 7 August the latest date for non-flying young. It appears that, contrary to previous statements (Herklots 1961), there is no second period of egg-laying in June and July. Replacement eggs are probably laid only if the first egg is destroyed or removed very early in the season. In 1966 very large numbers of eggs and young were found on 2 April and 16 April, but heavy rain fell during the last week of April, and on 30 April practically all the young and eggs were found to have been destroyed. Subsequent visits on 14 May, 11 June, 25 June and in July disclosed no evidence of re-laying; so the 1966 season appears to have been very poor for the Sooty Tern on Soldado.

This tern tends to nest on the bare earth, building no nest but occasionally creating a small area of flattened vegetation where the single egg is laid.

On Soldado many nests are situated under the Plumbago clumps that are found on the cliffsides, especially on the western face. Here the nesting birds and their offspring gain some shade from the baking sun, which otherwise takes toll of exposed eggs and small chicks. On the ridge and open rocky slopes many other nests are made without shelter, and these nests are particularly at risk from human disturbance. Indeed it



can be difficult to avoid stepping on the well camouflaged eggs, so close packed are the nesting birds.

Of all the seabirds of Soldado, the Sooty Tern is probably the most spectacular. With its beautifully contrasted black and white plumage, its graceful and wonderfully buoyant flight, and its excitable temperament, it creates a scene of constant activity. From time to time, when breeding is at its height, practically the whole population of Sooties will suddenly leave their nests in apparent response to an alarm cry and sweep out over the waves in a huge, dynamic swirl of birds. Gradually regrouping, they return to their eggs or young, over which they can be fiercely protective in the face of a potential predator, human or otherwise.

**Royal Tern** *Sterna maxima*. This species, the largest resident tern in the south Caribbean, is found in the area of Soldado Rock in small numbers. It has attempted to breed on several occasions; 14 eggs were found in June 1962 and another 14 in June 1966, but none succeeded in hatching, partly because of human interference and partly from destruction by torrential rain. A small chick was found and banded, along with one parent bird, on 15 June 1963. But the adult was found dead on Icacos beach a few days later, and the chick undoubtedly succumbed. Royal Terns prefer an open location for nesting, which makes them very susceptible to human disturbance. On Soldado Rock the only likely site is on the narrow ridge where visiting fishermen invariably go, so the chances of survival of eggs and young there are extremely small.

Almost all records of Royal Terns on Soldado were between May and July, spanning the nesting period. Occasionally birds were seen flying nearby in other months.

**Sandwich Tern** *Sterna sandvicensis*. Smaller than the previous species, but fairly similar in appearance, it is less common in the Soldado area. Four eggs were found on 10 June 1962 and a pair was seen feeding a young bird on 15 June 1963; these are the only breeding records. Since it too prefers an open breeding site, it probably suffers from the same restrictions as the Royal Tern. Birds were seen only in the immediate area of the Rock between May and July, but were found along the Trinidad coast at other times also.

**Brown Noddy** *Anous stolidus*. Along with the Sooty Tern, this species is the main breeding seabird on Soldado Rock. Its numbers may be slightly fewer, but estimates of 3000 were common, and it may be that 5000 is no exaggeration. I found Noddies present on every visit to the island, although numbers were limited to between 250 and 1000 during the off-season from September to February. However, at this time they are sometimes not seen on the island during the daylight hours for they arrive only after dark to roost overnight.

Unlike Sooty Terns, Noddies spend their off-season at sea not too far from their breeding sites, some of them remaining to roost at the same site throughout the year. During the years 1960-1982 I banded 1013 Brown Noddies, of which 624 were adults (Table 1). Of these one was recovered on Aruba and another on St. Lucia. Many others were recaptured on Soldado after intervals of up to seven years, indicating a high degree of site-fidelity.

The breeding cycle is also annual, but appears to be a few weeks later than the Sooty Tern's. Eggs have been found as early as 18 March and as late as 9 July, with large numbers of non-flying young still about on 7 August. There is also evidence that Noddies re-lay after some major destruction of early nests. Although their eggs and young were largely wiped out in late April 1966, as were those of the Sooty Tern (see above), many birds were again on eggs on 14 May, 11 and 25

June, and some eggs were still hatching on 9 July. However, in other years when no early disaster occurred, most eggs had hatched by mid-June so I doubt if there is normally a second breeding period during June-July, as suspected by earlier writers. I have wondered whether the theory of a second breeding period may not have stemmed from confusion between the rather similar eggs of Sooty Terns and Brown Noddies, so that the earlier eggs of the Sooty and the later eggs of the Noddy have been ascribed to both species, which are in fact present together on the island from February to July.

As a rule the Noddy seems to nest on rocky ledges or in shallow depressions situated on rock-strewn hillsides. Some nests are found perilously close to high tide level on rocks beside the sea. The "nests" vary from a mere depression with no nesting material to fairly elaborate heaps of *Plumbago* twigs. Feathers and seaweed are sometimes added as decoration, even when no other material is used, and these items figure in courtship rituals on occasions. The habit of some Noddies of nesting in crevices of steep cliffs ensures their protection from most predators, so human disturbance is less damaging to this species.

Unlike Sooty Terns, Noddies are more phlegmatic at the nest, often being reluctant to leave in case of danger, especially if an egg is just about to hatch or has recently hatched. Both Noddies and Sooty Terns show the well-known propensity of terns to attack human and other intruders at a nesting colony, striking and pecking at the head.

In another article (in prep.) I will discuss the interesting moult regime in this species which I studied between 1965 and 1967.

Table I: Numbers of Brown Noddy terns and Sooty Terns banded on Soldado Rock, Trinidad between May 1960 and March 1982.

Date	Brown Noddy <i>Anous stolidus</i>			Sooty Tern <i>Sterna fuscata</i>		
	Adult	Nestling	Total	Adult	Nestling	Total
22 May 1960	1	9	10		89	89
7 Aug 1960	9	5	14		3	3
18 Jun 1961	2	26	28		81	81
27 May 1962	1	30	31		22	22
10 Jun 1962	1	37	38		74	74
8 Jul 1962		35	35			
20 Jan 1963					82	82
21 Apr 1963		29	29		61	61
16 Jun 1963	34	85	119	32	253	285
27 Oct 1963	39	1	40			
26 Jan 1964		21	21			
3 May 1964	75	22	97	4	2	6
5 Jul 1964	56	77	133	1	12	13
9 May 1965	8	29	37	5	31	36
2 Apr 1966		37	37		12	12
16 Apr 1966	44	1	45	1	27	28
30 Apr 1966	7	2	9			
14 May 1966	21	3	24		11	11
11 Jun 1966	24	1	25			
25 Jun 1966	7	15	22			
9 Jul 1966					14	14
24 Jul 1966	17	9	26			
6 Aug 1966	12	25	37			
4 Mar 1967	13	13				
18 Mar 1967	33	33				
30 Sep 1967	21	1	22			
14 Oct 1967					15	15
5 May 1974		11	11		20	20
28 Mar 1982		1	1		25	25
Totals	624	389	1013	116	685	801



## 2. Other Seabirds

**Brown Booby** *Sula leucogaster*. Small numbers between 5 and 30 were present at Soldado on practically every visit, but the fluctuation in numbers followed no set pattern. Some birds frequently roosted on one particular promontory, allowing easy landing and take-off. Although there has been speculation (Herklots 1961) that the species might breed on the island, no evidence is yet to hand. Numbers of birds feeding in the area exceeded 100 during January; most of those seen appeared to be in immature plumage.

**Brown Pelican** *Pelecanus occidentalis*. This species roosts on the rocky shores of Soldado in considerable numbers. I usually found between 150 and 300 birds, but once in April I counted more than 700. Evidence from dead birds indicated that both the West Indian race *occidentalis* and the North American *carolinensis* frequent the area.

Clearly pelicans find the rich fishing-grounds around Soldado much to their liking. Many can be seen feeding in the rocky shallows just south of the island. The birds are also exploited by fishermen for food, being caught on baited lines.

**Bulwer's Petrel** *Bulweria bulwerii*. Represented only by a single mummified bird found by John Saunders on the island on 23 January 1961. This species breeds on islands of the eastern Atlantic, and is rarely found in the Caribbean.

**Leach's Storm-Petrel** *Oceanodroma leucorhoa*. Dead birds of this species, which breeds in the north Atlantic, were found on 9 May 1965 and 18 March 1967. Birds were also seen flying nearby on 4 and 28 March and 30 April, probably in the course of a northward migration.

**Parasitic Jaeger** *Stercorarius parasiticus*. This large predatory seabird winters in our area, and up to 4 individuals were seen in the vicinity of Soldado on 5 occasions between 28 March and 8 July, usually in immature plumage.

**Laughing Gull** *Larus atricilla*. This gull was occasionally found near the island; individuals were recorded on 25 January, 27 May, 4 July and 7 August. However, I have no evidence to support Belcher and Smooker's supposition (1935) that it breeds on Soldado. It is much more commonly found along the Trinidad coast, and breeds in considerable numbers off Tobago.

**Common Tern** *Sterna hirundo*. I had been led to believe from reports that this migrant species roosted in large numbers on Soldado, but I never found any sign of this. One or two birds occasionally settled and a dead banded bird was found there on 23 January 1961. The species was certainly present in large numbers in the area, but more particularly along the Trinidad coast. Many thousands were found there on 25 January and 27 October, and birds were seen in considerable numbers on other occasions in January, April, May, July and August. A Canadian survey team found them commonly exploited for food by fishermen at Icacos (Blokpoel et al. 1982).

**Roseate Tern** *Sterna dougallii*. The only definite records are of several on 5 May 1974 and one bird on the island on 28 March 1982. However, similarity with the previous species may have caused some birds to be overlooked.

**Bridled Tern** *Sterna anaethetus*. Resembling the Sooty Tern to some extent, this species was rarely found on the island, and never in circumstances suggesting that it was nesting. In all, six individuals were recorded on 28 March, 30 April, 9 July and 6 August.

**Least Tern** *Sterna albifrons*. Only recorded once, when several birds were seen flying off the island on 30 September 1967, probably in the course of migration.

**Black Tern** *Chilodactylus niger*. Encountered only in September, presumably on migration. On 30 September 1967

many birds of this species were found near the island, several perched on floating rafts of the water hyacinth *Eichhornia* which had come down the flooding Orinoco to the sea.

**Large-billed Tern** *Phaetusa simplex*. This South American tern was recorded only once, on 9 July 1966. It commonly frequents Trinidad's coastal waters.

## 3. Other Species.

**Ruddy Turnstone** *Arenaria interpres*. Recorded on practically every visit to the island in numbers ranging from a few individuals to more than twenty-five. Presumably those regularly found during the mid-year months were non-breeding immatures. Although they were often found feeding on shore-side invertebrates among the rocks, they were also frequently encountered up on the ridge amongst the breeding terns. The species has been known to break and eat tern eggs, but I was unable to confirm this.

**Gray-breasted Martin** *Progne chalybea*. A sizeable population of this large swallow is resident on Soldado Rock, with numbers estimated as high as 1000 on occasion. Nests are situated in rock crevices, the eggs being laid between April and July. Most feeding - for aerial insects - is over Trinidad or Venezuela, so they have to travel considerable distances in order to collect enough food for their young. After the breeding season is completed, the martins still roost on the island but spend all day away from the island except for one hour after dawn and another before nightfall.

A number of other species were seen from time to time in small numbers. Most of these were migrants from the north, but some were South American species or Trinidadian landbirds, presumably dispersing to or from breeding grounds. Very little is known about bird movements within the South American mainland, owing to the lack of field stations and the vast size of the continent.

The northern migrants recorded on Soldado include the Spotted Sandpiper *Actitis macularia*, with one or two individuals seen each time (24 July to 9 May), Semipalmated Sandpiper *Calidris pusilla* (January and April), Willet *Catoptrophorus semipalmatus* (seen once on 27 October), Peregrine Falcon *Falco peregrinus* (seen in April and October, preying on the seabirds), and Yellow-billed Cuckoo *Coccyzus americanus* (27 October).

Of the other category, 40 Scarlet Ibis *Eudocimus ruber* were seen flying from Trinidad to Venezuela on 30 September 1967 - this was when the ibis still bred in Caroni Swamp and dispersed to the mainland after the breeding season ended. Another wanderer, the Cattle Egret *Bubulcus ibis* was seen on 27 October 1983. A few Fork-tailed Flycatchers *Tyrannus savana*, which migrate north from Argentina as far as Venezuela and Trinidad during the austral winter, were recorded in July and September.

Finally, there are records of individual landbirds that are not known to have a regular migration but which occurred on Soldado presumably in the course of some dispersal movement. These are Violet-eared Dove *Zenaida auriculata*, found dead on 6 August, Ruddy Quail-Dove *Geotrygon montana*, trapped on 1 October, Pied Water-Tyrant *Fluvicola pica* on 7 August, and an unidentified hummingbird on 1 October. An *Elaenia* flycatcher was also seen on one occasion.

## Other fauna

A small nocturnal rodent, the Cane Rat *Zygodontomys brevicauda*, maintains a small population on the island, no doubt profiting from the abundant eggs available in the nesting season. It is also known to feed on seeds and grasses (Alkins 1979).



The rat population on Soldado has been separated as a distinct subspecies *soldadoensis* (Goodwin 1965). The first specimen was collected by my wife Margaret in 1963. While camping overnight on the ridge of the island, she became aware of the rat foraging near her camp-bed and trapped it under an empty can. Although it managed to escape, it soon returned and was again "canned"!

Apart from the birdlife, the most conspicuous animal on the island is undoubtedly the large lizard *Iguana iguana*, of which a sizeable population maintains itself. I encountered iguanas on every visit to Soldado. I always assumed that they fed at least partly on bird eggs, since they are known to accept such food in captivity. My supposition was questioned by Brooke Worth (in litt.), and I must admit that I never actually saw iguanas eating eggs, though I had found them "in suspicious circumstances" amidst the tern colonies with broken eggs nearby. The lizard's normally vegetarian diet may well be supplemented during the flood season by the rafts of *Eichhornia* and other water-plants drifting past and near the island. It is of course likely that iguanas may have arrived on Soldado as passengers on such rafts.

Boos (1983) reported on an incidence of the gecko *Sphaerodactylus molei* on the island, when the Club made its visit on 28 March 1982. I recall having seen small lizards - not iguanas - on earlier trips, but had not identified them.

During the 1963-1964 visits all these animals were of interest to the TRVL team as possible hosts of viruses, so we attempted to catch and bleed every species that we encountered. One such animal rarely found was the Marine Toad *Bufo marinus*, which was seen near the boat landing-place on the western shore. Possibly these amphibians arrived on fishermen's boats.

## Conservation

Soldado Rock was proclaimed a Wildlife Sanctuary in 1934, clearly with the seabird colonies in mind, and the Trinidad and Tobago Government has paid lip-service to the protection of wildlife on the island (Bacon & French 1972). However, the location of the island must make enforcement of the law virtually impossible without a considerably improved wardening system, and the island is bound to attract attention from the many fishermen - of both Trinidad and Venezuela - who ply their trade in the area.

Evidence of poaching, shooting, catching the large seabirds with lines, etc. has frequently been found on Soldado. But the most blatant instance of poaching we encountered was not without significance. In June 1962 our party had been on the island for some hours when a small boat landed from which came a group of men who had evidently been fishing. They walked about amongst the breeding terns, carelessly treading on several eggs and young, and then began to return to their boat, after first capturing a few adult terns. When our party accosted them, one of the men revealed that he was a Cabinet Minister! However, when it was pointed out that Soldado Rock was a Wildlife Sanctuary - which he did not know - the birds were released and the fishing party departed.

It has recently been suggested by a visiting consultant A.W. Diamond that Soldado Rock be designated a Prohibited Area, requiring a permit to land; but even this would be

difficult to enforce. In my opinion, until such time as public education may have brought about the necessary transformation of popular attitudes towards wildlife, it is unlikely that Soldado could function effectively as a sanctuary, unless the authorities were to decide on the use of National Security forces to assist in the enforcement of the wildlife laws, as is the practice in various Third World countries.

Soldado Rock has all the charm and challenge of the wild and inaccessible places of the earth, even though it is not all that difficult to reach nowadays. In his book Brooke Worth has related with great humour the occasion when our party camped overnight in torrential rain with no shelter. But I also remember lying and watching the meteorites in an incredibly clear starry sky, with no evidence of human activity within earshot; and one magical occasion, when the calm and peace of an early morning were enhanced by our friend Mitsuo Takahashi singing a hauntingly beautiful Japanese song. That was Heaven on earth indeed.

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