THE VANUA LEVU SILKTAIL (Lamprolia victoriae kleinschmidti): A PRELIMINARY LOOK AT ITS STATUS AND HABITS

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ABSTRACT

This paper aims to bring together what is known of the Silktail *(Lamprolia)* of Fiji, in order to provide a base line for future study and particularly in order to consider the status of the little-known *L. v. kleinschmidti* of Vanua Levu.

The contribution of previous workers, especially Theodor Kleinschmidt, is examined which, together with recent work, strongly suggests that *L. v. kleinschmidti* is confined to the Natewa Peninsula of eastern Vanua Levu.

What little is known of *L. v. kleinschmidti* in the field is presented, largely by comparison with the better-known *L. v. victoriae* of Taveuni. Based largely on field observations by 1973 and 1975 parties of OSNZ members and other available material, particular attention is given to population strength, feeding, display, breeding and voice.

Discussion, largely speculative, considers the possible relationship of *Lamprolia* to the Paradisaeidae, and considers the implications of the distribution of the two forms. *L. v. kleinschmidti* seems more likely to be the relict population, from which *L. v. victoriae* has been recently derived.

INTRODUCTION

Lamprolia, the Silktail of Fiji, is as much a subject of taxonomic interest today as it was when first discovered in 1873. It has been lumped in with various groups from time to time, often more from convenience than conviction, but seems likely to remain of " uncertain family " and " one of the most puzzling birds of the world " (Mayr 1945). It may best be regarded as an isolated relict of a previous south-west Pacific avifauna, in a category similar to the wrens (Xenicidae), wattle-birds (Callaeatidae) and thrushes (Turnagridae) of New Zealand and to the even older Kagu *(Rhynochetos jubatus)* of New Caledonia. In the field one cannot fail to be impressed by its distinctiveness of manner and appearance and to be sceptical of its supposed relationship to warblers, chats, fairy wrens, babblers and so on.

The history of taxonomic argument over *Lamprolia* — a " record of scant information and voluminous conjecture " — has been admirably reviewed by Cottrell (1966). He also recounts his own brief experience

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FIGURE 1 — Adult *L. v. victoriae,* Vunivasa, Taveuni, from colour slide by M. D. Dennison. Spangled head and wing coverts are partly visible. Note small size, shape of wing and tail, tail-rump pattern.

with *Lamprolia* on Taveuni and with Birds of Paradise and Riflebirds (Paradisaeidae) in New Guinea and Queensland and his positive feeling that there is some link between them. This feeling, which has been echoed from time to time in the literature, is easily shared when one sees *Lamprolia* in the field and alive in the hand.

Lamprolia has been described formally by Finsch (1873, 1876), Ramsay (1876), Sharpe (1883: 31-32) and less formally by Cottrell. It is a small (c. 13cm), insectivorous bird with long rounded wings and short rounded tail. The sexes are alike and the breeding is apparently monogamous. In the dim light of the forest it appears jet black with conspicuous white rump and tail, the tail bordered and tipped black. Its build, stance and feeding mannerisms are reminiscent of the Riflebirds *(Ptiloris)* of Queensland (Wood & Wetmore 1926, Cottrell 1966, Blackburn 1971). Its plumage is distinctly paradiseine. In sunlight or in the hand, the plumage is a shining velvety black glossed with purple in many areas. The rump and tail are a gleaming white, with the sheen and feel of silk, the tail feathers having a singularly loose structure. The black feathers of head, neck, throat, breast and wing coverts are scale-like, with tips of shining metallic blue, shifting to green or purple in some lights. As Finsch (1873: 734) first pointed out, similar feathers occur on the Birds of Paradise *Ptiloris* and *Manucodia,* to which Cottrell adds *Phonygammus* and *Paradigalla.* It is tempting to speculate that *Lamprolia* could be a relict of a primitive, unspecialised paradiseine avifauna.

Despite its antiquity *Lamprolia* has only two forms which, when one considers that insular divergence is a striking feature of Fijian birds, are remarkably alike and have therefore only recently diverged. *L. victoriae victoriae* Finsch occurs on Taveuni and *L. v. kleinschmidti* Ramsay occurs on the much larger neighbouring Vanua Levu (see Fig. 2). For a general map of the Fiji Islands, see Blackburn (1971). Taveuni has been more accessible than Vanua Levu from the old capital Levuka, on Ovalau and, since 1883, the present capital Suva, on Viti Levu and, although successive ornithologists have seen *L. v. victoriae,* little of value has been recorded about it. It still flourishes, however, in the extensive though steadily diminishing forest of Taveuni. *L. v. kleinschmidti* is almost one third smaller and has a narrower black tip to the tail. Nothing has been known about it beyond a few museum skins, a vague reputation for being hard to find and a tacit assumption that it occurs throughout Vanua Levu.

In early September 1973 a New Zealand ornithological party, after a week on Taveuni, spent a week near the extreme tip of the Natewa or Cakaudrove Peninsula on Vanua Levu. The choice of site was fortuitous, because of the generous offer of Dr Doug and Jean Corey to stay on their Kubulau estate (see Fig. 3). In the forest that is part of their estate *kleinschmidti* was quite readily found and some evident behavioural differences from *victoriae* were noted. No special study was made since it was assumed that its presence was typical of the whole island.

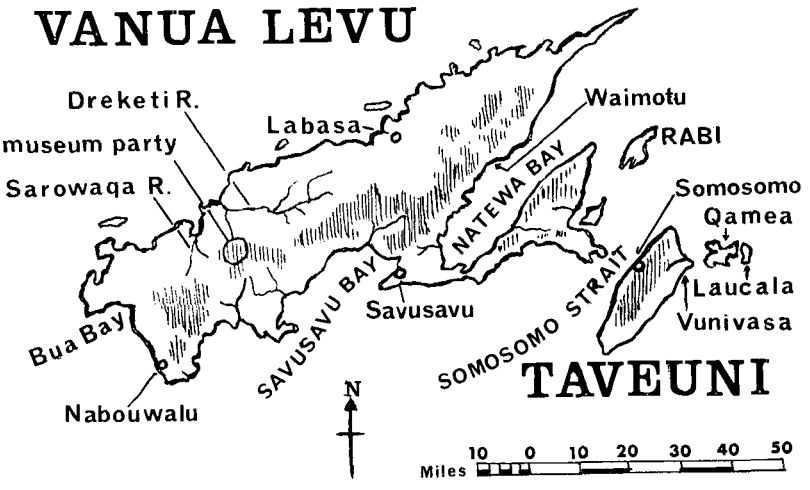

FIGURE 2

However in June/July 1974 a combined Fiji Museum-National Museum of NZ party collecting in the west-central high country of Vanua Levu found no Silktails, even though the habitat would have suited Taveuni birds (F. C. Kinsky & F. Clunie, pers. comm.). A party from New Zealand being organised for August/September 1975 therefore chose an intermediate site on the west coast of Natewa Bay directly opposite the Natewa Peninsula. Here a week was spent based on the Vunigarani estate of Mr David Browne and the adjoining Waimotu estate of Mrs Martha Smith (see Fig. 2). It was planned to study the Silktail closely before proceeding to Taveuni to begin a comparative study. There were no Silktails. Moreover, according to Mr Robin Mercer (pers. comm.) they are not known from the remaining forest at the base of the Natewa Peninsula, nor has he seen them from the track to Labasa from the Natewa Bay coast north of Tabia River. It seems likely, therefore, that the distribution of *kleinschmidti* is very restricted and may well be confined to the Natewa Peninsula.

A brief three days were spent back at Kubulau, which allowed some of the party to accumulate enough notes on *kleinschmidti* to make a first comparison with *victoriae* the following week on the Vunivasa estate of Colonel and Mrs Kolb, on the wet north-east side of Taveuni.

A general report on the 1973 and 1975 parties is in preparation.

Not wishing to neglect earlier work, I have looked into the history of collecting on Vanua Levu, hoping to discover exact localities where collectors have found *kleinschmidti* and where they have not, and to bring together what is known of *Lamprolia* in general. The results, despite considerable research, are meagre but interesting. Some indirect

information may remain to be gleaned from labels and archives in museums but, short of finding the lost field notes of Kleinschmidt for 1875, little of substance can be expected.

As the forests of Fiji are being extensively modified or removed and as there has been little local interest since the first flush of collecting a century ago, *Lamprolia* deserves urgent study, with as a first priority the distribution and habitat tolerances of *kleinschmidti*. This paper aims to bring together what little is known of *Lamprolia* up to the present, and to suggest hypotheses, in order to provide a starting point for further studies.

PAST COLLECTORS ON VANUA LEVU

TITIAN R. PEALE

Peale, the first naturalist in Vanua Levu, was artist and zoologist with the U.S. Exploring Expedition of 1832-42. Although the expedition surveyed the coastline of Vanua Levu in 1840, the reputation of the Fijians was such that the explorers rarely ventured ashore, certainly not far inland except in the north-west where the Fijians were more tolerant because of the sandalwood and beche-de-mer trade. It appears that Peale scarcely stepped off the ship for, in the narrative, only once is Peale mentioned (Wilkes 1845: 215) as returning from a "jaunt" inland from Sandalwood Bay (Bua Bay on modern maps). His field notes (Cassin 1858) suggest that he collected in safe, open country, collecting such open-country species as the Grey-backed White-eye *(Zosterops lateralis)* and the Red-headed Parrot Finch *(Erythrura cyanovirens)*.

Dr EDUARD GRAFFE

The first in Fiji of the explorers and scientific collectors appointed to the south-west Pacific by the Hamburg trading firm of Johann Cesar Godeffroy. Graffe collected in Ovalau and Viti Levu but the nine species listed by Finsch & Hartlaub (1867) from Vanua Levu refer to Peale's skins. Graffe worked also in Samoa, Tonga, the Wallis and Phoenix Islands.

THE *"CHALLENGER"* EXPEDITION

H.M.S. *Challenger,* during its 1873-76 voyage of deep-sea exploration, visited Fiji briefly in 1875 but before *kleinschmidti* had been discovered. It was at Matuko, east of Kadavu on 24 July, Kadavu on 25 July and Levuka from 28 July to 1 August: 82 birds were collected and are described in the Report (Finsch 1881). Finsch was travelling himself in the Pacific between 1879 and 1882 but I have found nothing to suggest he visited Fiji.

EDGAR LAYARD

Layard brought to Fiji an enthusiasm for birds beyond that of a mere collector and he provided the only published field notes of merit from the period. During 1874 and 1875 he was British Consul and,

after Fiji was ceded to the Crown, administrator of the government, resident in Levuka, tied to a routine of administration and official visits round the islands, with little opportunity or physical strength to explore or collect himself. He had to rely mainly on the collecting and observations of others, including his butler on Ovalau, Storck and Abbott on the Rewa River, Viti Levu, Liardet on Taveuni, Holmes, Swayne and Tempest on Vanua Levu and his son Leopold on the Rewa River, on Taveuni and Vanua Levu. He did manage some collecting time on Wakaya and also on Kadavu at the time the *Challenger* was there and, when the first resident Governor took over from him late in 1875, six weeks at Gila in northern Taveuni where he collected many specimens of *victoriae* now in museums around the world.

He did not visit Vanua Levu or see *kleinschmidti* alive himself but received several skins in exchange from Kleinschmidt. In Levuka his relationship with Kleinschmidt developed from " Mr Kleinsmidt [sic], a gentleman in Levuka much addicted to natural history " (1875a) to " my friend Kleinschmidt " (1878), with whom he exchanged skins and ornithological gossip.

The first hint of the existence of *kleinschmidti* came from Layard on Taveuni (1876a: 148) — " a gentleman, on whose observations I do not place much confidence, has assured my son that he has seen it [= *Lamprolia*] on the neighbouring islands [sic] of Vanua Levu." Its discovery was announced as a hasty insertion in his next paper (1876b: 154-5) that " Mr Klinesmith has just discovered a new *Lamprolia* near Savu-Savu Bay, on Vanua Levu, which resembles *L. victoriae* but is about a third smaller, and the head is entirely covered with the brilliant blue feathers. He has named it *L. minor*." " Near Savu-Savu Bay " (see Fig. 2), therefore, has become the type locality but it is so vague that we learn little of where Kleinschmidt had been, except that it was somewhere on the long southern side of the island. Layard was not familiar with the southern side and may have thought this prominent bay sufficient to indicate the area of collection. The two Layard skins in the British Museum, the only ones I know of, have on their labels merely ' Savu Savu. Kleinsmith Co.' [= collector]. When Kleinschmidt visited the hot springs on the site of the present township of Savu Savu in May 1876 (Kleinschmidt 1879), it was clearly his first visit there and six months later than his only collection of *kleinschmidti* in November 1875, and in the meantime he had been elsewhere — certainly on Leluvia, near Ovalau on 12 March (Anon, 1876: 165) and on Viti Levu on 21-27 March (Anon. 1876:166; Nehrkorn 1879: 399). Therefore Savu Savu on Layard's labels cannot be considered a precise locality.

In his last paper from Fiji (1876c), Layard gave a summary table of all species collected in Fiji and an explanatory note on where collecting had been done. On Vanua Levu his knowledge was limited to the western end around Bua Bay where Holmes, Swayne and Tempest

as well as Leopold Layard had collected for him. The species concerned show that true forest had been included. Leopold had " spent a month at the eastern end of the island," which may vaguely mean somewhere between Labasa and Natewa Bay but I can find no further reference. Kleinschmidt had " worked the southern side," and if this was as thorough as it sounds (and Kleinschmidt was a thorough explorer), it is interesting that the Silktail had been found once only. It is implied (p. 387) that the interior of Vanua Levu had not been worked, which could suggest that Kleinschmidt had not been into the high country behind Savu Savu Bay.

THEODOR KLEINSCHMIDT

Kleinschmidt, whose name gave Layard so much spelling trouble, would be the dominant figure of Fijian ornithology and prominent in ethnology were his notes, reports and letters not lost to us. From 1873 to 1878 he travelled widely in Fiji, avidly collecting, sketching and painting, noting, sending his collections of birds, insects and ethnological material mainly to the Godeffroy Museum in Hamburg. His tragic death in 1881 before he could bring together his material for publication, the financial collapse of J. C. Godeffroy & Son in 1881, followed by the auctioning of the contents of the Godeffroy Museum in 1885 meant that much of his collections was dispersed and his writings lost. Consequently his work has remained almost completely forgotten, although it seems that interest is reviving (Tischner 1961). There is no direct material left in the Kleinschmidt family archives (Dr A. Kleinschmidt, pers. comm.).

Kleinschmidt was a naturalist of the old style, largely self-taught, combining a sound wide knowledge of natural history, artistic talent and an understanding of correct collecting techniques. His life and qualities have been reviewed by Schmeltz (1881) and Tischner (1961). After boyhood in Kassel, Germany, and a period at sea, he spent twelve years in St. Louis, USA, where his fortunes fluctuated in a series of business ventures. He came to Fiji via Melbourne in 1873 at the age of 39 but his fortunes in Levuka did not prosper in the economic conditions there. To his delight he was in 1875 offered a post as explorer-collector (Reisende, Naturforscher und Sammler) for the Godeffroy Museum. He worked enthusiastically in Fiji until late 1878 when he moved to islands off the Rabaul coast of New Britain. Here he was murdered by islanders two years later in reprisal for the bad manners of an Englishman in a land claim. This was reported with strong pro-European bias in *The Fiji Times* of 27 August 1881.

Kleinschmidt must have started exploring very soon after his arrival, for in his first year he discovered *Lamprolia* on Taveuni and sent two skins to Finsch, who described, named and published the genus and the species *victoriae* the same year (Finsch 1873). J. G. Keuleman's beautiful woodcut does not show the true body shape

and stance of the bird. Finsch's type specimen still exists in the Hamburg Zoological Museum (W. Meise, pers. comm.), although a little damaged — the museum was badly bombed in 1943.

We do not know how often or exactly where Kleinschmidt went to southern Vanua Levu, except for his visit to the Savu Savu hot springs. It seems that he collected *kleinschmidti* only once, on the occasion when he discovered it. The first mention of his discovery was by Layard who gave the vague locality of " near Savu-Savu Bay " and whose two exchange skins add nothing. A skin must have been sent to or at least seen by E. Pierson Ramsay in Sydney for he gave the first formal description of it, with the locality " Vanua Levu," and named it *L. klinesmithi* (Ramsay 1876). This skin seems to have been part of the Macleay collection but is not in the Macleay Museum, Sydney, today even though two of Layard's *victoriae* skins are (G. Phipps, pers. comm.).

Ramsay's publication preceded Layard's by several months, even though Layard had written his first, so that Kleinschmidt's appropriate choice of name, *minor,* although used by taxonomists until 1930, has been superseded by *klinesmithi.* I prefer to follow Mayr (1945) by using the more desirable spelling *kleinschmidti.* Ramsay's habitat summary, " confined to the mountains, in scrubs," is absurd but he does quote remarks by Kleinschmidt that they " live in the interior part of the country, and only in certain spots in the high but damp ranges; in dry and rocky parts they are not seen at all," and that " they are scarce and extremely hard to find." This could refer to high country behind Savu Savu Bay or on the Natewa Peninsula.

This habitat description is echoed by Kleinschmidt in his note that accompanied his first three skins to the Godeffroy Museum (Finsch 1876). " The bird is not quite as brilliant as the large one but is nevertheless a most elegant creature which lives in the deepest bush, in damper places, seems in general to keep to its chosen area (sein Revier) for in the same forest it does not occur at all in other equally high but dry places only two or three miles from its area." He then gives the only behaviour note we have until 1973: " It hovers, like a *Myzomela* honeyeater or a humming-bird around the numerous lianas that creep up the tall trunks, seems to snap up certain insects there, then settles for an instant on a thin twig in the undergrowth." The bird so delights him that he can scarcely bear to shoot it. " The natives call it ' sassa.' Although I offered every reward, I could not get an egg from them since the bird and thus its nest are rare."

Finsch, commenting on these three specimens, will not accept that they deserve specific rank and thus foreshadows the modern view that, based on morphology, the two Silktails are subspecies. His comment begins: " The last consignment includes three further specimens from Somosomo on Taveuni," which, were Vanua Levu not mentioned in his table, could suggest that Finsch thought they had been collected on Taveuni. That others may have believed this is shown by Richmond,

former Associate Curator of Birds, U.S. National Museum (undated): " Finsch says it occurs on the coast of Somo Somo Strait, on Vanua Levu; not from Somo Somo on Taveuni." The source of this remark is probably the *Kleine Mittheilungen* (Anon. 1876), which appears not to be written by Finsch, in his absence in Siberia, and includes comments from Hartlaub and extracts from Kleinschmidt's letters. The text says: " Up to now found by Mr Kleinschmidt only on the coast of Somo Somo Strait on Vanua Levu, not at Somo Somo on Taveuni, as wrongly printed on p. 6 above."

It is therefore clear that Kleinschmidt found the Silktail somewhere on the east side of Natewa Peninsula, a locality that accords with recent findings.

Existing Kleinschmidt skins provide no help on where he collected them although they tell us when. Apart from Layard's two, I know of four skins from the Godeffroy Museum and there are probably others in other European museums. Two in the Hamburg Zoological Museum have no information on their labels; one in the British Museum has " Van. Lev. Mitt. Nov. 75 " [= mid November 1875]; one in the Merseyside County Museums, Liverpool and one in the American Museum of Natural History have Vanua Levu and Nov. 1875. One in the Museum Heineanum, Halberstadt, is wrongly labelled " Kadavu " and is of obscure origin since it has a Finsch label and has been through the hands of a dealer, Dr Eugen Rey, who was in business in Leipzig between 1874 and 1890 (K. Handtke, pers. comm.).

The type status of the various skins has still to be decided.

A further lead to Kleinschmidt's locality comes from Tischner (1961: 671, Plate I). In one of three folders of Kleinschmidt drawings and handscript dating from late 1876 onwards, found in the Hamburg Ethnological Museum, is a drawing of the tatooing on a Fijian woman. On the drawing Kleinschmidt has written the locality " Cakaudrove, Vanua Levu " and the date " October 1875." This is just before he collected *kleinschmidti* in mid November. Cakaudrove was the tribal area encompassing the shores of Natewa Bay, Savu Savu Bay, Natewa Peninsula, Rabi, Kioa and Taveuni. The headquarters was and still is Somosomo on Taveuni.

Kleinschmidt seems to have travelled to and from from Somosomo during and after November for, after his collection of *kleinschmidti* in mid November, we know he found a pair of *Petroica* on Taveuni on 21 November and his first Orange Dove nest on 28 November on Kioa Island (Anon. 1876: 166-7; 172). There was an egg of Peale's Pigeon in the Godeffroy Museum with the note " Somo-Somo Straits, part of Vanua Levu, end November 1875 (Nehrkorn 1879) and there is mention, without date, of a Pacific Swallow nest found " on the cliff coast of Vanua Levu . . . near Kioa I " (Anon. 1876: 166). Finally, there were December skins of Fiji Shrikebill from Taveuni (Anon. 1876: 170).

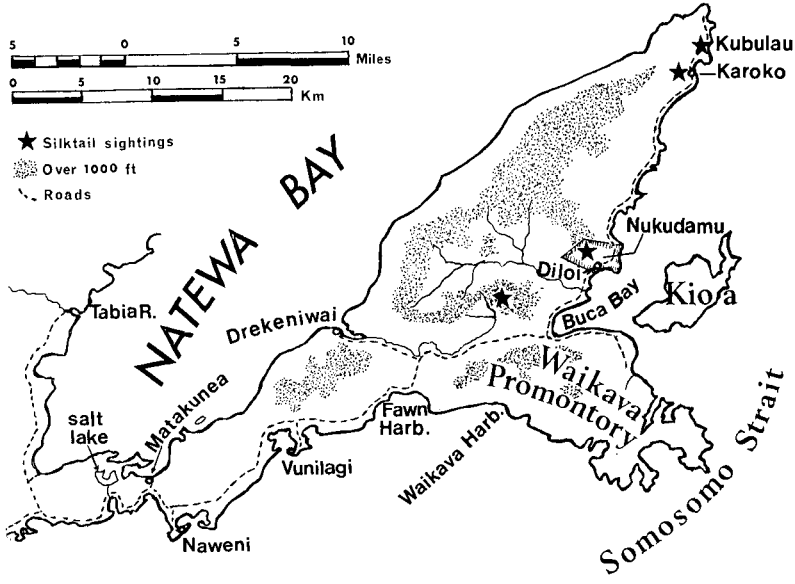

FIGURE 3 — Natewa Peninsula.

There is little doubt that *kleinschmidti* was found in mid November 1875 in the high country of Natewa Peninsula, within range of Taveuni and Kioa, that is in the Buca Bay area. This locality falls within the area of recent sightings.

CASEY A. WOOD

Wood was in Fiji during 1923 and 1924 (Wood & Wetmore 1925, 1926) and made an extensive collection of 259 skins which were commented on by Dr Alexander Wetmore and are still housed in the National Museum of Natural History, Smithsonian Institution (George E. Watson, pers. comm.). He did not visit Vanua Levu himself but was helped by the artist W. J. Belcher and by the government architect in Suva, A. H. Martin and his son Gordon, who made collections and sketches on the north side around Labasa (30 Sept), around the Dreketi and Sarawoga Rivers (2-3 Oct) and Nabouwalu in the south-west corner (4 Oct). Some forest species were collected which could, however, have been taken from forest margins. Four *victoriae* skins were collected on Taveuni by the Martins on 19-23 November 1923; two males (one immature) and two females, according to Wood. Dr George E. Watson (pers. comm.) describes them as one male and one female immature, one female sub-adult and one male adult.

ROLLO BECK and JOSE CORREIA

The Whitney South Sea Expedition of the American Museum of Natural History was working the islands and islets around Vanua

Levu in December 1924. Beck and Correia were the collectors and chanced to land on Vanua Levu once. Their unpublished journals are held by the museum in typescript.

After sailing up the eastern side of Taveuni in November, landing briefly opposite Qamea with little collecting success, they went to Qamea and then in a sweep to the islets north and north-west of Taveuni and back down to Rabi and Kioa. On 7 December, a Sunday, the ship " crossed the channel " from Kioa to " the small harbour of the mainland, Vanua Levu " (Correia: 194), " three miles to Vanua Levu side of the strait " (Beck: 108) where they rested for the day. On 8 December 1924, according to Correia who stayed aboard with a swollen foot, Beck went ashore with one of the crew from 6.30 a.m. to 4.30 p.m. " One new species of flycatcher was found on this island " (Correia). " Went ashore at the place of Mr Fisher who owns Kioa Island and a large plantation here on Vanua Levu. Found the little black flycatchers scarce " (Beck). There are no field notes. Five *L. v. kleinschmidti,* including an immature, were collected by Beck and are in the American Museum of Natural History (LeCroy pers. comm.).

The following day they left Vanua Levu for the Yanuca group and from 11-18 December were on Taveuni where Correia noted the contrast: " The small black bird which we first saw on Vanua Levu was very common on Taviuni " (Correia: 196).

The office of the Registrar of Titles, Suva, has informed me that the property of William Fisher was the Nukudamu Estate of 2078 acres (831 ha.). Nukudamu extends from the coast, where it encloses the settlement of Diloi, inland to include a major spur from the main range of Natewa Peninsula, with Koroitakala (1504'; 458.5m) its highest point (see Fig. 3). If forest is still on the property the Silktail is probably there also, as Nukudamu is between the two localities where the Silktail was found in 1973.

FIELD OBSERVATIONS

No apology is made for the rather casual nature of these observations. In both 1973 and 1975 the parties were on ornithological holiday, at their own expense, and there was plenty to do without an intensive study programme. Nevertheless, enough material has accumulated for a start to be made, although it is conceded that it is risky to generalise or draw conclusions about Fijian birds from brief encounters.

Notes on the Silktail have been contributed by: (a) 1973 party: Mrs B. Brown, P. Child, B. D. Heather, Mrs S. M. Reed, R. B. Sibson, C. Smuts-Kennedy; (b) 1975 party: Mrs B. Brown, W. F. Cash, P. Child, M. D. Dennison, B. D. Heather, Miss C. M. Heather, P. Latham, G. A. Woodward.

POPULATION STRENGTH

Taveuni: It is generally agreed that *L. v. victoriae* has a strong population wherever forest remains.

On the western slopes the forest has been cleared up to about 1500′ (457m) and one must camp at this height to be among a natural balance of forest birds. Coconut plantations extend about half way up from the coast, with grassed clearings above, relieved only by isolated trees or cattle-trampled remnants of forest in the gullies. The 1973 party was camped at about 1500′ (457m) above the Waitevala Estate of Burns Philp at Waiyevo, 4km south of Somosomo (see Fig. 2). This was several ridges north of the two sites used by the 1970 parties (Blackburn 1971).

In the forest about the camp the Silktail was readily found wherever one went, in groups of from two to five. They were seen at times even in patches of scrub on partially cleared land, but only in patches continuous with the forest. During two trips to the summit ridge, PC and CS-K saw Silktail throughout, right to the crater lake at 3000′ (915m). F. Clunie (pers. comm.) has also found them high on the upper ridges. Moreover he found the Silktail common in forest, since cleared, some 200m a.s.l. above Tutu, near Waiyevo, so that there is no doubt that the Silktail formerly existed as low down on the western side as rainforest extended.

On the eastern slopes, which are very steep, wet and difficult of access, the forest extends unmodified to the shore, except for the gentler slopes of the northern and southern ends of the island which have been cleared. The 1975 party was camped near the coast on Vunivasa Estate (see Fig. 2), which extends from the shore at Vurevure Bay and its northern headland, back to the steep gorge of the Waibula River. This estate has been cleared completely except for one ridge of partly modified forest, with vine-covered scrub in the gullies. This ridge held a thriving Silktail population. Groups of from two to five were frequent and were seen at times even in low scrub where the vegetation ended at 100m a.s.l. It can be expected that the Silktail occurs in wet eastern forest where it still extends to sea level but this difficult area has yet to be studied.

Vanua Levu: By contrast, both the 1973 and 1975 parties found *L. v. kleinschmidti* at Kubulau (see Fig. 3) thinly distributed, and only in the unmodified forest. The remnant of forest on the Kubulau property, dominated by Fiji kauri *(Agathis vitiensis)* and casuarina *(Casuarina nodiflora)*, held two, perhaps three pairs of Silktails which ranged widely in the area. This forest extends almost to sea level but the final 100m, which is cut off by the road, is too dry for most forest species.

Two other ridges a little south of Kubulau, behind and south of the village of Karoko (see Fig. 3), were visited briefly by PC in 1975. *Agathis* was not present but he saw three pairs of Silktails, one with a juvenile, on one ridge and one pair on the other.

A one-day visit was made in 1973 by PC, BDH and J. Brown to a cut-over but regenerating forest at about 1000′ (305m) about 9km inland from the road junction in Buca Bay (see Fig. 3). Much time was taken getting there and an extensive search was impossible but, although much of the forest was dry, one Silktail was seen in a damp gully near the top of the ridge. Mr Robin Mercer (pers. comm.) saw one bird in the same general area, known as Navonu, in 1972. This is the only *kleinschmidti* he has seen. He has not seen it in the Drekeniwai area.

Study is needed to show whether *kleinschmidti* tolerates selective milling enough to survive until damp forest has regenerated. Study is also needed over a much wider area of Natewa Peninsula to show if the density of *kleinschmidti* is always as low as it is reputed to be and why. Habitat use and habitat tolerances different from those of *L. v. victoriae* may be involved.

FEEDING

Both parties were impressed by the difference between the two Silktails in their levels of feeding in the forest.

Leopold Layard reported that *victoriae* was a bird mainly of the lower understorey. " It creeps about in the low growth of the thick saplings and among the pendant thin lianas and vines in the very thick forest. . . Occasionally they descend to the ground and peck among the fallen leaves. . . He only saw one upon a tall tree " (Layard 1875b). His father added later (1876a) that " it rarely, if ever, ascends trees of any altitude, always keeping to the undergrowth." Kleinschmidt (Anon, 1876) wrote that " the bird lives in the undergrowth of the tall, wet luxuriant forests of Taviuni, seldom higher than 20 to 30 feet from the ground. It even seems to go often to the ground. . ."

Our own impression of *victoriae,* particularly its use of the ground, was neatly expressed by Blackburn (1971): " It is a bird of the fairly open understorey, and not seen higher than about 20 feet, but more often on the ground, or within a few feet of it."

On Vanua Levu, by contrast, *kleinschmidti* consistently fed higher, coming to ground rarely and briefly, despite ample litter. As our comparison was made with only the few birds available at Kubulau, the difference may only be a local one, because of habitat differences. However, until a wider study of *kleinschmidti* can be made, the difference is given tentatively.

To help sort out the habitat niches of the two Silktails, a modified version of Atkinson's feeding levels and stations was tried out (Atkinson 1966). The method is appropriate as by temperament the birds are disturbed by only the most clumsy of observers, and as the birds remain below the top canopy and thus can be followed without bias toward lower stations. It is recommended that the method be con-

tinued in future studies. The results are given tentatively until a wider range of individuals in a wider range of habitats can be recorded.

FEEDING LEVELS

A comparison of the levels of forest being used by the two Silktails at the time of our visit is shown in Table 1. Despite the small sample, the difference we were aware of is clearly shown. Whereas 77.2% of observations of *victoriae* were at lower understorey or ground level, 87.2% of observations of *kleinschmidti* were at upper understorey level. The table is compiled from notes kept by WFC, MDD, BDH, PL and GAW.

TABLE 1 COMPARISON OF SILKTAIL FEEDING LEVELS SEPTEMBER 1975

FEEDING LEVELS	No. of observations		% of total no.	
	TAVEUNI	VANUA LEVU	TAVEUNI	VANUA LEVU
Canopy	0	5	0	3.6
Upper understorey	29	123	22.8	87.2
Lower understorey	41	12	32.3	8.5
Ground storey	57	1	44.9	0.7
Total	127	141	100	100

That *victoriae* also can use the upper understorey is shown by an individual seen on a part of the Vunivasa ridge where sub-storeys had been cleared and the bird moved frequently between the ground and the upper understorey. F. Clunie (pers. comm.) has seen *victoriae* in an area where the ground was barren, covered with scoriaceous rock, feeding in the upper understorey on vines and dead leaves; on normal ground nearby, more typical feeding methods were in progress. High level feeding of *victoriae*, however, seems to be unusual, whereas at Kubulau *kleinschmidti* fed high even though the ground was far from barren.

FEEDING STATIONS

The feeding stations grouped from all levels are compared in Table 2. Both Silktails gave a high proportion of attention to gleaning through dead leaves, whether attached to vines or shrubs, or accumulated

in forks from above. Whereas *victoriae* also moved frequently to the ground, *kleinschmidti* gave much more attention to live parts of plants.

TABLE 2 COMPARISON OF SILKTAIL FEEDING STATIONS -- CONDENSED

FEEDING STATIONS	No. of observations		% of total no.	
	TAVEUNI	VANUA LEVU	TAVEUNI	VANUA LEVU
Dead plant parts	69	66	54.3	46.8
Live plant parts	23	59	18.1	41.9
Bark epiphytes	0	3	0	2.1
Aerial	2	12	1.6	8.5
Ground surface	33	1	26.0	0.7
Total	127	141	100	100

We were unable to keep accurately the *time* spent at stations as, when off the ground, birds shifted station too rapidly. A table of timed observations (cf. Atkinson 1966) would have shown more clearly the high proportion of time *victoriae* spent on or close to the ground.

The same figures broken down to the specific stations are shown in Table 3. It is not intended that too much should be read into the detailed percentages, in such a limited sample, but merely to show the range of stations used by both birds. Stations on the list but not used by the birds were: tufted epiphytes, soil probing, stones on ground, buds, flowers, fruits. Cottrell (1966) and Clunie (pers. comm.) have seen some feeding on stones and logs on the ground.

FOOD AND FEEDING METHODS

The restless gleaning of *Lamprolia*, with continuous and rapid shifts of station, has been described by Layard (1876a), Kleinschmidt (Anon. 1876) and Cottrell (1966). All parts of a plant may be thoroughly searched, with particular attention to vines and clusters of dead leaves. L. Layard recorded small beetles only from stomach contents and Kleinschmidt found "almost entirely remains of various black beetles with dark green and brownish gloss."

TABLE 3 COMPARISON OF SILKTAIL FEEDING STATIONS -- IN DETAIL

FEEDING STATIONS	No. of observations TAVEUNI	No. of observations VANUA LEVU	% of total no. TAVEUNI	% of total no. VANUA LEVU
Dead Plant Parts				
Foliage	60	34	47.1	24.1
Twigs	1	2	0.8	1.4
Branches	1	1	0.8	0.7
Trunks	2	1	1.6	0.7
Vine foliage	5	27	3.9	17.0
Vine stems	0.	4	0	2.8
Live Plant Parts				
Foliage	14	12	11.0	8.5
Twigs				
Branches	0	5	0	3.6
Limbs	0	4	0	2.8
Trunks	3	7	2.4	5.0
Holes & crevices	2	2	1.6	1.4
Vine foliage	3	6	2.4	4.3
Vine stems	1	23	0.8	16.3
Ground Stations				
Litter	28	1	22.0	0.7
Bare soil - picking	3	0	2.4	0
Logs	1	0	0.8	0
Surface roots	1	0	0.8	0
Sundry				
Aerial feeding	2	12	1.6	8.5
Bark epiphytes	0	3	0	2.2
Total	127	141	100	100

L. Layard's observation of a bird digging into an ants' (probably termites') nest has not been repeated although this source could be used for feeding nestlings. Clunie has seen a bird peck open a termite tunnel on a tree trunk, and capture several termites before dashing on to catch up with the other four birds of its group.

A characteristic of *kleinschmidti* noted by WFC, PC, BDH and RBS was its feeding on lianas that clambered up tall trunks. Searching industriously, a bird would steadily work its way in a spiral up a liana to about 20m above ground, would then float back down like a gliding butterfly or a falling black leaf, to three metres and then start again. F. Clunie and F. C. Kinsky (pers. comm.) have seen similar behaviour from *victoriae,* though not to such height, particularly when working through trunk epiphytes. Clunie has noted that individuals from a party of five he was following would rip and drop lichens and leafy liverworts from branches in their search.

Aerial feeding was seen on several occasions, done in opportunist manner during normal gleaning. At Kubulau one bird made a swift three-swirl spiral in mid-air in the lower understorey. On other occasions the birds would hover briefly at a dead leaf or at bark lichens. Twice at Vunivasa a bird was seen hovering at a spider web, once spending two minutes leaping from the ground to hover snapping at a low web.

A bird was seen boulder-hopping in a Taveuni stream bed in 1973 by W. Ringer and RBS saw one drying its feathers and preening after bathing in the same stream. At Vunivasa WFC saw a bird drink from the water in a large dead leaf on the ground, dipping and tipping back the head three times; then later stepping in, shaking its wings and wetting its under parts.

Ground feeding on Taveuni was very common. From one to five birds might be found working over the ground, tossing aside leaf litter with abrupt flicks of the bill, then picking at the ground beneath. Clunie (pers. comm.) saw a bird take a small pale worm and then found only small pale nematodes in the litter. During ground feeding, the partly fanned tail would flick prominently like signal flashes, a habit noted also by Cottrell (1966: 261). This tail-flicking was not used to disturb food from the ground in the manner of fantails and other aerial feeders, and was not used while feeding at other levels.

In all its feeding activity, in our experience, *Lamprolia* is silent, except that when two or more birds are together a quiet twittering may be heard. In Clunie's experience, this twittering among a group is typical.

Loose associations of Slaty Flycatcher *(Mayrornis lessoni),* Spotted Fantail *(Rhipidura spilodera)* and Fiji Shrikebill *(Clytorhynchus vitiensis)* are often encountered below the top canopy, sometimes accompanied by a Fan-tailed Cuckoo *(Cacomantis pyrrhophanus).* Juvenile and female Golden Whistler *(Pachycephala pectoralis)* often

feed at or near ground level and on Taveuni the Blue-crested Broadbill *(Myiagra azureocapilla)* is often present. Often the Silktail will be in the same area but, apart from a general presence, they cannot be said to feed together. Once a ground-feeding Silktail ignored a noisy encounter between a Shrikebill and Slaty Flycatchers, but another was disturbed, as were Slaty Flycatchers, by the loud trumpeting of a Musk Parrot *(Prosopeia tabuensis)* in the canopy overhead.

COMPETITION

There is no evidence available to suggest that either competition from other species or predation markedly affects the Silktail. If the higher feeding levels of *kleinschmidti* at Kubulau are typical, it is more likely to be sharing habitat resources with other sub-canopy specialists than is *victoriae* with its low-level feeding tendency. The Fiji Warbler *(Vitia ruficapilla)* and the Shrikebill are possible competitors to be considered. The Mongoose on Vanua Levu is not known to have an important effect on other than ground-nesting rails, in the present state of knowledge.

DISPLAY

Despite the richness of plumage, particularly about the head, no special display of this plumage has been seen. No courtship has been seen, however, and, although A. Habraken saw copulation on the ground once at Vunivasa, which was preceded by no formality, there was much disturbance at the time by people and Blue-crested Broadbills and copulation may have been a displacement reaction.

We have seen two types of aggressive display. In the first, the wings and tail are fanned in unison slowly out and in, horizontally. This is reminiscent of flight take-off movements and may be derived from them. This display was seen by BDH and MDD at Kubulau when a Silktail joined some noisy Slaty Flycatchers in the upper understorey to display at a Barn Owl *(Tyto alba)* which we had disturbed. At Vunivasa WFC saw a Silktail display about a metre up a tree-fern trunk, facing away from him at something he could not see. No sound was made. Also at Vunivasa, during some three hours of watching a pair of Blue-crested Broadbills which were feeding a newly-fledged chick in the same area as Silktails were feeding a juvenile, I saw this display twice only. Once the female Broadbill dived at a Silktail, which dropped to the ground and displayed briefly. Once the male Broadbill briefly pursued a Silktail which afterwards displayed from a safe distance. Also in the area was the usual understorey mixture of female Golden Whistler, Fiji Shrikebill and Slaty Flycatcher, and occupied nests of Spotted Fantail, Ground Dove *(Gallicolumba stairii)* and Orange Dove *(Ptilinopus victor)* but little attention was paid by one species to the others. That the Silktail can be aggressive is shown by Clunie (pers. comm.) who has twice seen a single *victoriae* dash at a male Blue-crested Broadbill perched on a vine, almost colliding with it and pursuing it in silence for several metres;

and two birds, feeding on the ground, chase a Kingfisher *(Halcyon chloris)* in silence for thirty metres.

In the second type of display, the nape feathers are raised and the whole body is agitated; the tail is flipped up and down and the wings are held out in a drooped position and flapped vigorously up and down; this is accompanied by a harsh scolding cry. I have caused this display three times out of many attempts by making a harsh noise with the lips: twice at Waitevala in 1973 when one bird only from parties of three and five reacted instantly and at length while the rest showed no interest; and at Kubulau in 1975 when unknowing we were within two metres of a nest. Layard (1876a: 149) noted on Taveuni that " it chattered defiance at us if near its nest," and at Waitevala in 1973 CS-K first suspected he was near the nest he later found when one and then two birds became very agitated and displayed all round him. Generally, however, birds leave and approach the nest silently, flying low. Although we spent much time at two nests, and also at nest-building and the feeding of a juvenile, no further displays were seen.

BREEDING

BREEDING SEASON

Published material is meagre and our observations add little.

Taveuni: Layard (1876a) in late July/early August 1875 found the forest above Gila " full of young birds. The nests had chiefly fully fledged young ones; and only one had a single fresh egg." How many birds were involved is not clear but Layard must have struck a good patch of localised breeding for, were July a regular breeding season, one would expect at least an abundance of juveniles in August. From 25 August to 10 September 1970 the New Zealand parties above Somosomo saw no sign of breeding (Blackburn 1971); from 22 to 26 August 1973 above Somosomo one nest with egg was found but birds were otherwise in parties of from three to five, in adult plumage; from 9 to 13 September 1975 at Vunivasa one juvenile was seen and one nest being built but all other birds seemed not breeding.

On the other hand, Clunie (pers. comm.) in early June 1973 above Tutu, south of Somosomo, found three nests with egg or young, one being built and one apparently destroyed by a predator. Yet groups of five and six birds were also common.

Of the three birds collected by Martin for Casey Wood on 19 and 23 November 1923 two were immature and one sub-adult (George E. Watson, pers. comm.). A nest with egg collected by Kleinschmidt on 11 December on Taveuni is described by Nehrkorn (1879), and three nests with one egg each and one nest with no egg were found by Correia on 11-17 December 1924 at about 2000′ (610m) above Somosomo (LeCroy, pers. comm.).

Vanua Levu: At Kubulau from 28 August to 5 September 1973 no breeding was seen, and yet from 4 to 7 September 1975 one nest with egg and one juvenile were seen. In November 1875 Kleinschmidt could get no nests but on 24 December 1924 Beck collected a juvenile going into adult plumage. The four adults Beck collected had small gonads (LeCroy, pers. comm.).

As with many Fijian birds, there seems to be no precise breeding season. Nesting may well be found at any time of year but there is a possibility that pockets of particularly intensive breeding by various species may occur through some form of interspecific stimulation, or some other localised habitat factor. Whether individual *Lamprolia* breed more than once a year has been suspected but not yet shown.

TERRITORY

Whether *Lamprolia* is territorial is not clear. Neither boundary disputes nor signs of aggression between individuals have been recorded. Whether the Silktail's " song " has a territorial function is not known. On Vanua Levu, at Kubulau, birds seemed to be paired and keep well apart, except on one occasion when three birds were together on a vine. However the population pressure seems low.

On Taveuni, although more than one bird has seldom been seen near a nest, numbers close by vary between two and six. Even where the juvenile at Vunivasa was being fed actively, one or two extra birds were often present without apparent friction. Colour marking (dye on the white tail) was begun at Vunivasa but too late to show whether birds were in pairs or in loose groups. The nature of groups and pairs is puzzling and needs study.

NEST AND EGG

The nest of *Lamprolia* is a deep cup slung between the members of a horizontal forked twig at their point of junction (see Fig. 4). The site selected has an umbrella of one or more large leaves immediately above. The nest is placed in a broad-leafed plant of the lower understorey, so that it may be at a height of from one to three metres from the ground. The nesting habitat seems to be places where beneath the top canopy there is a glade of understorey broad-leafed plants between two and three metres high. On the steep slopes of Taveuni this is often on or near ridge tops, but the Kubulau nest was in such a glade in a broad flat gully, close to a sharp drop to a stream.

While the nest is roughly circular (see Fig. 4), it can *look* triangular or almost rectangular from side view because the binding to the twig members gives a shelfed appearance reminiscent of a stretcher. The lip of the nest however is at the level of the twig.

The most remarkable feature of *Lamprolia* nests is the varied form of their lining and external decoration. The nests we have seen agree with the description of Nehrkorn (1879) in being built of

FIGURE 4 — Nest of *L. v. kleinschmidti,* Kubulau, Vanua Levu, from colour slide by M. D. Dennison. Main stem of twig concealed by shadow at left. Note loose external structure, blotched egg, large loose feathers just beside egg.

thin dry fibres and shredded dead leaves, without external decoration and with a few feathers placed loosely at the bottom of the cup. The three Vunivasa nests and the Kubulau nest, because of their dead-matter construction, had a distinctive straw-coloured appearance which seemed conspicuous, but they were easily overlooked because bundles of straw-coloured dead leaves fallen from above were commonplace in the forks of the understorey plants. The Waitevala nest of 1973 on the other hand was black in appearance, as was the Kleinschmidt nest described by Nehrkorn. In this area the bundles of dead leaves caught in forks were black and the nest, presumably made from the materials at hand, was not easily noticed. Although the nest structure was not examined closely I do not recall that it was built externally of black fibres, as Nehrkorn describes, but rather of black shredded leaves.

TABLE 4 — DIMENSIONS OF LAMPROLIA NESTS

External		*Internal*		
Width	*Depth*	*Width*	*Depth*	*Measurer*
		L. v. kleinschmidti		
80	60	40	40	Heather
		L. v. victoriae		
100	62	52	35	Nehrkorn
85-70	50	50-45	35	Heather
80	60-55	45	35	Heather
(c. 80)	(50)	(c. 50)	(30)	Heather
76		52		LeCroy
80		46		LeCroy
85		45		LeCroy
87		48		LeCroy

( ) = uncompleted nest

A nest lining of feathers is unusual in Fiji birds, for obvious climatic reasons. It is known only for the Pacific Swallow *(Hirundo tahitica)* and from a record by Blackburn (pers. comm.) of a Blue-crested Broadbill nest with in the cup a few scarlet feathers of the Collared Lory *(Phigys solitarius)*. A token use of feathers in this undecorated type of Silktail nest is interesting. Nehrkorn notes " a few " feathers; my notes from a glance into the Waitevala nest merely say " a few black and white feathers," perhaps of the Island Thrush *(Turdus poliocephalus)* which was present in the area; and from the Kubulau nest " about eight feathers, two or three large ones in the bottom and smaller ones scattered round the wall." PL noted them to be pigeon feathers. In the two abandoned nests at Vunivasa the feathers were a small indistinguishable mess in the bottom.

The second type of nest is strikingly different in appearance, although the same in basic structure. The inside is completely lined with feathers and the outside so decorated with moss-like liverwort as to look totally green. Layard seems to have seen this type: " composed of fibres and the macerated strands of a species of flag, and lined with feathers," among which he detected the yellow breast feathers of the male Golden Whistler in particular and feathers of Peale's Pigeon *(Ducula latrans)*. Of the four nests collected by Correia on 11-17 December 1924, all at about 2000′ (610m), three are built of " green moss and fine grass, lined with feathers," with a second lining of fine grass (perhaps shredded vine leaves) under the feather lining; and the fourth " bulky, of dry grass," lined with fine grass but no feathers (LeCroy, pers. comm.). Clunie has recent examples of both types, yet to be described. The two types of nest seem unrelated to season, altitude or available materials. They and the use of a feather lining raise interesting questions.

By contrast with the neat, tight cups of broadbills, flycatchers and fantails, the Silktail nest seems large, thick-walled and loosely built. External dimensions (see Table 4) probably vary with the angle of the fork and in any case cannot be measured accurately. The walls of the two Vunivasa nests measured made up roughly 44% of the diameter in one case and between 36% and 41% in the other, and in the Kubulau nest roughly 50%. By Nehrkorn's measurement, Kleinschmidt's nest had walls 48% of the diameter.

Despite the bulk of the nest, and it will be noted that the *kleinschmidti* nest was no smaller externally than the *victoriae* nests, the cup seems too deep and narrow for the bird which adopts a characteristically scissored sitting posture (see Fig. 5) in which the back is out of sight below the rim and the tail, wings and head project upwards, the backward tilt of the head forcing the nape feathers out to give a thick-necked appearance.

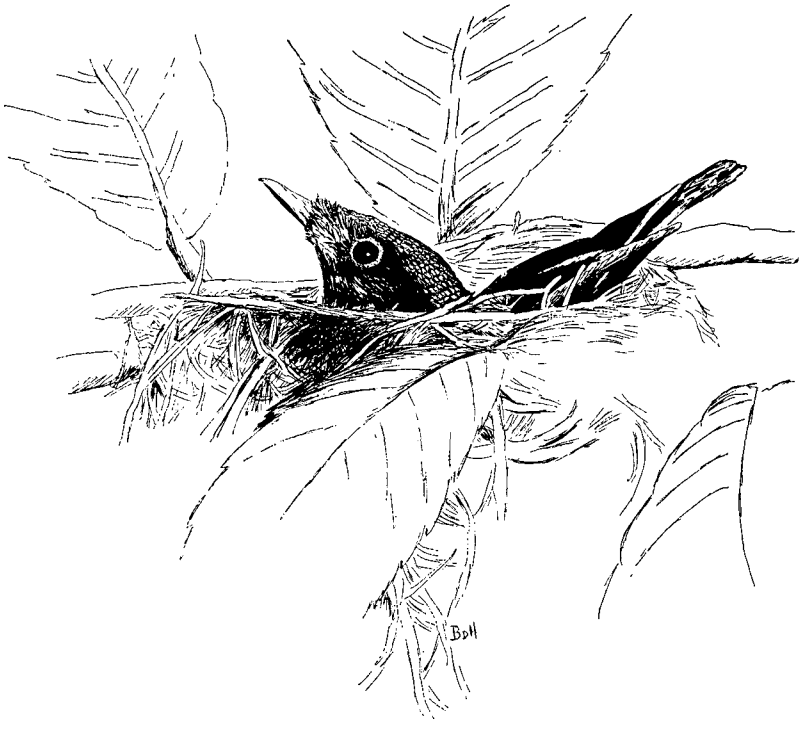

FIGURE 5 — Characteristic incubating posture of *Lamprolia,* based on colour slide of *L. v. kleinschmidti* by J. Brown. Twig apex at left.

Three *victoriae* eggs described after Layard, Nehrkorn and Cat. Brit. Mus. by M. Schonwetter (in MS, *Handbuch der Oologie,* Band II: 651. Berlin) give a range of 24.0-25.1 x 16.5-18.9 (W. Meise, pers. comm.). Two *victoriae* eggs measured by Clunie were 21.5 x 16.5 and 23.2 x 17.0, and the three Correia eggs measured by Mrs LeCroy were 24.1 x 16.2; 23.0 x 16.2; 23.3 x 17.4. Thus the range for all eight eggs is 21.5-25.1 x 16.2-18.9.

The *kleinschmidti* egg measured 16.6 x 14.8, proportionately shorter and broader than the *victoriae* eggs.

The eggs of the two subspecies are alike, an attractive " pinkish white ground, unglossed, covered evenly with larger and smaller blurred lilac-red and pale purple spots " (Cottrell 1966). Clunie (pers. comm.) has seen them more varied, with the pink ground so delicate as to be almost white, and with fewer, smaller spots mainly round the wide end. Two of Correia's eggs are described as " quite pink " and slightly pinkish," both with fine splotches all over (LeCroy, pers. comm.).

All observers agree that the clutch is invariably one. Clutches of one or two are quite frequent with Fiji birds and may, as Lack (1971) has suggested for tropical island birds in general, be related to the absence of a seasonal flush of food supply with which large families may be raised. A year-round moderate food supply in a uniform climate should reduce the rate of mortality, which would also favour a small clutch. The high population level of *victoriae* supports this view.

NEST-BUILDING

In one glade of understorey broadleaves on the Vunivasa ridge was a group of three *L. v. victoriae* nests and a fourth that was begun, two-thirds built and abandoned while we were there. One nest was old, judging by its texture and the litter inside. One was very recent, with feathers and broken, unfaded eggshell sufficient for a complete egg in a sticky mass in the bottom. One was very recent but clean and empty except for a small wet patch of feathers in the bottom. PL saw a single bird begin the fourth nest, which it continued to build with bursts of activity followed by long spells of absence. Only one bird was seen in this area. It was not seen near the empty nests and when the final nest was abandoned it was not seen there again. Perhaps only one bird builds, or these were practice nests but, in view of the broken egg, there may have been a tragedy.

The nest was begun by gathering a small bundle shredded from dead vine leaves lodged in the crown of a shrub. This bundle was laid across the apex of the horizontal fork. The bird then collected spider web, hovering to do so, and the shredded leaf was securely bound to the twig by the web. This was continued for short periods of from five to fifteen minutes, interrupted by absences of thirty minutes or more.

The following day, the bird was watched by CMH for 80 minutes, during which 32 visits were made to the nest, about 23 minutes being spent working at the nest and about 57 collecting material. Times were kept to the nearest half-minute. Time building: ½ to 2½ mins; average 0.8. Time collecting: ½ to 8½ mins; average 1.9. Shredded vine leaf was brought 15 times, spider web 7, rootlet 2, unidentified from the ground 1, nothing 9. Twice, leaf and web were brought together.

As far as was seen, leaf was shredded by tugging and tearing at clumps of dead vine leaves lodged in forks or attached to fine vines. Web was collected by hovering at it or through it and gathering it in the beak and on the face.

The nest was built as a hammock slung from the members of the fork and from the apex, with the sides nearest the fork and apex therefore developing first and the side facing away from the apex remaining open. The bird worked either by standing on the rim or by sitting in the nest, facing the apex, from where it could still reach

round the outside as well as working the inside. Its main activities at this stage were to tuck shredded leaf into the outside, apparently at random, on any part of the sides, less often on the top, occasionally over one or both twigs. Web seemed also to be laid randomly. One spell of 13 minutes was spent gathering big bundles of finely shredded leaf and a rootlet and packing it inside. The inside was worked partly by tucking, partly by trampling with the feet and pushing with the breast.

Surprisingly little rootlet and fibrous material was brought but this may be used more at a later stage, chiefly for the inner lining.

BEHAVIOUR AT THE NEST

With the two nests concerned, the state of incubation of the egg in each was unknown.

In 1973 the Waitevala nest was largely left alone but during a late-morning watch of 134 minutes by SMR the bird left the nest seven times, for periods of between 2 and 10 mins, average 8.5 mins. The bird remained silent, always approached the nest from below and, while sitting, frequently turned the head from side to side.

At the *kleinschmidti* nest various observers spent much of one day using a hide, or watching from four or five metres away. In the morning when MDD and BDH were there from 6.53 a.m. to 10.11 a.m., the bird was on the nest for five spells of from 6 to 13 mins, average 10.0, and off the nest for six spells of from 9 to 15 mins, average 11.7. When we first arrived it was raining and the bird was sitting. It stayed sitting for 18 mins until the rain had stopped and the bush had stopped dripping heavily. Twice more during the time there were heavy showers and the bird returned promptly, curtailing its absence once to 4 mins. Times of disturbance are omitted.

When MDD and GAW continued from 10.27 a.m. to 1.38 p.m., the bird was on the nest for six spells of from 5 to 22 mins, average 11.0 and off the nest for seven spells of from 10 to 18 mins, average 13.4.

Fig. 6 shows the fairly regular rhythm of times off and on the nest. The average time off corresponds closely to the median of 8.5 mins given by Nice (1962: 221) for ten passerine species in which only one sex incubates. However, the average time on the nest is much lower than the median of 30 mins for the eight temperate-zone passerines, and much closer to the 12 and 17 mins averages of the two tropical American species quoted.

In the first period of observation, MDD noted that there was no movement by the bird on the nest. It did not preen, garden, turn the egg or even fuss round the nest as many species do. GAW later noted that the bird often moved its head from side to side, seeming particularly nervous when other species were nearby. During two hours in the afternoon, WFC noted that, during an unusually long 30 minute spell, the egg was turned twice, with a 16 min. interval. He

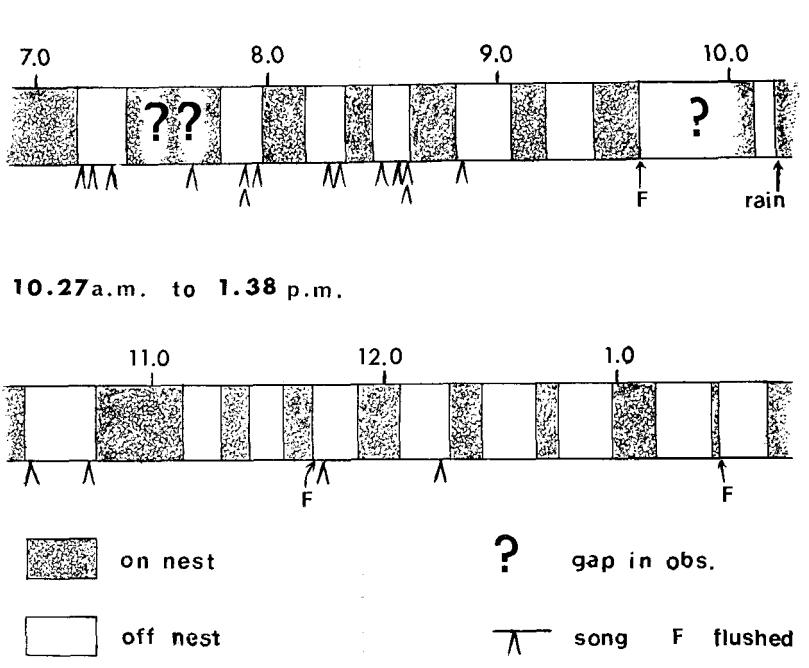

FIGURE 6 — Nest-attentiveness of Vanua Levu Silktail, 7/9/75.

estimated that the bird was on and off the nest for about ten minutes on the average.

The peculiar sitting posture of *Lamprolia* (Fig. 5) has already been described. It always sat facing the apex of the fork, regardless of its direction of approach to the nest.

Its arrival at and departure from the nest were silent and, except when rain suddenly began, unhurried and almost always at the level of or from below the nest. During the morning the bird went from the nest directly up the valley, an area where the morning sun would first strike the canopy, and returned from that direction. In the afternoon it moved to and from the opposite direction, up the side of a ridge where two birds had been seen together the afternoon before the nest was found and where the afternoon sun was on the canopy. Silktail song was heard from the same directions and nowhere else while the bird was away. Song was not heard whenever the bird was sitting.

Change-over at the nest did not take place. The only time two birds were seen near the nest was just before its discovery by P. and R. Latham, when the sitting bird was made by my lip noises to give the

scolding display. A second bird, which remained silent, appeared promptly, watched for a while and then left, moving straight up to and away through the upper understorey.

The function of song was puzzling. During the morning sessions up to 1.40 pm, 18 calls were heard, 14 during the first two hours and the last at 12.15 (see Fig. 6). The impression was that the sitting bird sang, for calls were heard only during its absence, and most often just before or just after being on the nest. Three examples, in which minutes refer to time of calls and 20m is a guessed distance, will show this:

(1) Left nest. 1 min later, 20m up valley. 3 min later, closer. 6 min later, very close. 3 min later, on nest.
(2) Left nest. 8 min later, 20m up valley. 1 min later very close, preceded by scolding cry. 2 min later, on nest.
(3) Left nest. 2 min later, 20m up valley. 5 min later, same. 1 min later, same. ½ min later, close. ½ min later, on nest.

The bird seemed to fly straight up the valley to feed and later to move gradually back to the nest. Which bird really sang and why, and why song virtually ceased later in the morning cannot be discussed profitably.

As a comparison, a bird followed by MDD and BDH for 1½ hours in another part of the Kubulau forest called six times, without apparent purpose and barely interrupting its feeding in the upper understorey. A second bird did appear briefly twice but the calls seemed to be unrelated to its presence.

Whether both birds incubate remains an open question until a pair can be colour-marked. One would expect both to incubate in a monomorphic species but the fact that change-over was not seen at or near the nest suggests that only one bird was sitting, as also do the regular absences of the sitting bird. The climate enables eggs to be left for short spells but other sub-canopy species whose nests we have watched have not been seen to desert the eggs in this way. The eager gleaning of the Silktail for food implies a need for constant food intake and short spells on and off the nest may be a compromise between feeding and incubating needs.

JUVENILES

The appearance of the juvenile *L. v. victoriae* has been described by Finsch (1876) and Sharpe (1883) from skins of unknown age. Grey-black, without much gloss (Finsch); far less spangled, especially underneath (Sharpe). Bill, especially below, light grey or brownish (Finsch). Wood describes his immature male merely as " somewhat duller " and having restricted white on the tail. Watson (pers. comm.) describes Wood's sub-adult female and two immatures as less velvety on the back and with the blue on head and nape not pronounced. The immature male has the widest black tail-tip of all skins (13mm).

Kleinschmidt, in a letter to the Godeffroy Museum (Anon. 1876), says: " The young bird shows the metallic sheen on the head when in the nest; only its velvety plumage is not quite as intensively black or as glossy in others parts as in the adult. When fledged and caring for itself, a juvenile can be recognised by its yellow gape, its lighter beak (chiefly the lower mandible is spotted with yellowish or light brownish areas) and its plumage which is duller, less glossy and dark slate-grey rather than black. The white satin feathers of tail and rump appear in first plumage with full sheen. Legs and bill are shining black in the adult. Because of the many dark grey specimens I have killed, I think that adult plumage is first developed at first breeding when the birds are a year old." The last statement is unproven.

The immature female of *L. v. kleinschmidti* collected by Beck has " less iridescence and the overall colour is more greyish black; the tail feathers are more pointed " (LeCroy, pers. comm.).

In the field where the light is often poor, details are hard to see. The juvenile *kleinschmidti* seen from six metres by PC on the hillside behind Karoko village was full-sized but with tail very short and white with thick-looking black tip. It looked dull black, without sheen, charcoal below and slightly grey under the throat, and with faint teal-blue on the crown. He saw it fed twice at a three-minute interval by one parent and then a half-minute later by the other parent. Twice it flitted a metre to another branch, once pecked vaguely at a leaf but did not try to feed itself. Although the parents twittered considerably, the chick was silent.

The juvenile *victoriae* seen for several days at Vunivasa was full-sized, including tail with fully developed white and black areas. Iridescence, gloss, blue or grey were not visible; in the understorey light it looked just dull black.

This juvenile for the most part was silent but at times uttered a modest ' cheep-cheep ' call. It made a brief tail-wing fanning display at me once but otherwise it and the adults ignored my presence. Once it chanced to land beside the small Blue-crested Broadbill fledgling in the area and was quietly driven off by the male Broadbill. Four Silktails were in the area, at least two of which were feeding the juvenile. The adults collected food in no special way for it, mainly from clumps of dead leaves, sometimes on the ground or hovering at spider webs. The juvenile made no attempt to feed itself, apart from moving vaguely from place to place and occasionally pecking casually at a leaf. It merely passively and silently accepted food, showing its yellow gape, sometimes preening briefly or sitting hunched up whenever the adults were absent, as on one occasion when the adults disappeared to where Slaty Flycatchers were making alarm calls. Once the juvenile moved to the ground and was fed there three times. Food was given as soon as collected, so that intervals of about a half-minute were frequent.

It is interesting that the white of the tail develops clearly in the first juvenile plumage, whereas more decorative plumage appears only gradually. The white of the tail flickers prominently when *victoriae* feeds on the ground and when both subspecies take off for sustained flight. Presumably therefore the main role of the white is for species recognition or for escape movements, that is, for social rather then sexual display.

VOICE

The Silktail is for the most part silent, although groups frequently twitter quietly while feeding. There is no alarm call when birds are suddenly disturbed. The scolding cry described seems to be used at times of extreme stress but too inconsistently to be understood. Clunie (pers. comm.) has heard one of a feeding pair give a loud, very clear whistle and one of another feeding pair give frequently a different whistling call, and also a type of trilling whistle.

The standard call or song of *Lamprolia*, probably the " stridulous cry " of Layard (1876a), can easily be missed among the various louder voices of the Fiji forest. It is unimpressive, hesitant, seldom uttered more than once at a time and does not carry far in the forest. It seems to be spontaneous, uttered during the course of other activities and from no special perch. *L. v. kleinschmidti* called much more readily and often at Kubulau than did *victoriae* at Waitevala and Vunivasa, a difference which, if real, may reflect the difference in feeding levels and ease of social contact at these levels.

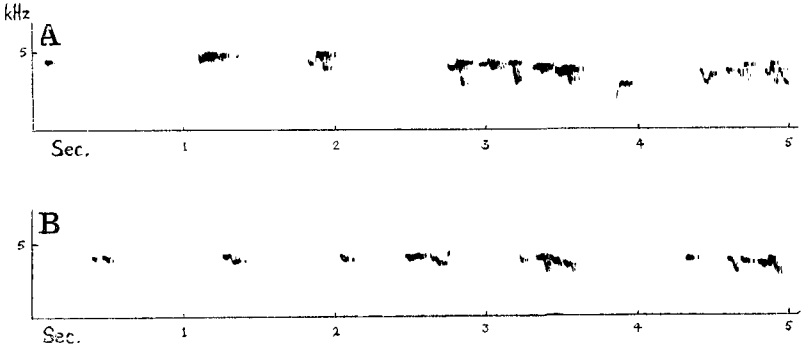

FIGURE 7 — Sound spectrograms of (A) *L. v. kleinschmidti*, (B) *L. v. victoriae*. From tapes of Mrs Beth Brown, prepared by courtesy of Dr P. F. Jenkins and University of Auckland.

Sound spectrograms made from tapes of both subspecies recorded with great patience by Mrs Beth Brown are shown in Fig. 7. Both are given consistently and are sufficiently stereotyped to be probably innate. While they are basically very alike, there are differences which may be no more than dialectal but which may equally be sufficient to deter interbreeding if the two forms were sympatric.

The song can be divided into two sections, an initial three notes, widely spaced and slightly descending in pitch; and a final section of two elaborations of the same note in *kleinschmidti* and three less detailed elaborations in *victoriae,* descending in pitch rather more sharply. The two songs are alike in duration (c. 5 seconds), tonal quality (lack of harmonics) and frequency range. Differences are clear also. In *kleinschmidti* the first note is very faint but the second and third are of greater volume and richness than those of *victoriae;* the first elaboration is much richer in frequencies and loudness than in *victoriae* and the final elaboration is a very weak version of the preceding one.

SOME POINTS OF MORPHOLOGY

I do not wish to attempt a full discussion of *Lamprolia's* morphology, a task for taxonomists with a range of skins at hand. However, several aspects may be worth looking for in the field.

It is well known that *L. v. kleinschmidti* is about one third smaller than *L. v. victoriae,* for which reason Kleinschmidt chose unsuccessfully to call it *minor* (Layard 1876b, Finsch 1876, Anon. 1876). This is apparent in the field when one moves from one island to the other.

The following dimensions, which omit feathers obviously damaged or in moult, are the best available to me for *kleinschmidti,* by different hands and not strictly comparable: bill from base, average of nine birds 14.8mm, range 13 to 16; wing, average of twelve birds 68.8, range 64.5 to 72; tail, average of eleven birds 42.2, range 40 to 44; tarsus, average of nine birds 19.0, range 18 to 20.

The series of nine skins of *victoriae* collected on Taveuni by Kinsky and Clunie, housed in the National Museum of New Zealand, Wellington (NMNZ 17966-17977), give the following fresh measurements: bill from base, average 13.9, range 12.8 to 15.3; wing, average 83.2, range 79.0 to 84.5; tail, average 47.2, range 45.0 to 49.0; tarsus, average 24.2, range 23.4 to 25.3 (F. C. Kinsky, pers. comm.).

The black terminal tail tip is often given as a field character. The following widths, taken parallel to and beside the rachis of the central feather, show a degree of overlap. *L. v. kleinschmidti,* from twelve birds in Halberstadt, Hamburg, London and New York: average 4.6mm, range 1 to 9. *L. v. victoriae,* from thirteen birds in Halberstadt, Hamburg, Sydney and Washington: average 9.5, range 7 to 13. The band width does not correlate with sex or age. The New York (ex-Godeffroy) skin with a width of 1.0mm is exceptional, but the black tapers from 3mm on the vanes to 1mm in the centre.

First brought up by a discussion between Salvadori (1877) and Layard (1878) was the matter of an inverted V on the nape of *Lamprolia* when viewed from behind which at first was thought to distinguish the subspecies, or male from female. This V of dull-coloured feathers, with little or no iridescence, is clearly visible on

some skins of both subspecies, of either sex, both adult and juvenile. On other skins the whole nape is iridescent. There may be a difference in feather micro-structure between nape and crown, emphasised by the quality of skin preparation in some cases. The matter may have no meaning but could be looked for in the field.

DISCUSSION

DISTRIBUTION

It is interesting and not entirely futile to speculate on the strange distribution of *Lamprolia* which is confined to Taveuni and, it seems, to that part of Vanua Levu closest to Taveuni, although there is no apparent reason why it should not flourish in the rainforests of Viti Levu, Kadavu and the whole of Vanua Levu.

Strange distribution patterns are a feature of other Fijian birds. From purely geographical logic one might expect *Lamprolia* to be distributed similarly to the quite unrelated Orange Dove *(Ptilinopus victor)* which occurs throughout Taveuni and Vanua Levu and the adjacent islands of Qamea and Laucala, Rabi and Kioa (see Fig. 2). The forest of these adjacent islands is dry, however, which adds weight to the view that dry conditions are a barrier to the survival and spread of *Lamprolia.* Similarly, the isthmus at the base of Natewa Peninsula, nowadays without forest, may never have held truly damp rainforest so that *kleinschmidti* may long have been isolated within the peninsula, on an ecological island. The isthmus is narrow — barely 1 km at its narrowest point — low-lying and largely cut across by a salt-water lake.

Mayr (1932: 16-17) distinguishes a subspecies *ambigua* of the Golden Whistler *(Pachycephala pectoralis)* which is confined to Rabi, Kioa and eastern Cakaudrove (= Natewa) Peninsula. *P. pectoralis* is much more dispersive and habitat tolerant than *Lamprolia;* the existence of *P. p. ambigua* supports the view that forest birds on the peninsula and its neighbouring islands may be ecologically isolated.

The general trend in Fijian birds is to divergence among the islands, often in seemingly minor ways, such as in details of plumage, body size, song and habitat preference, but more distinctively in older genera. Despite the undoubtedly great antiquity and obscure origin of *Lamprolia,* the two forms show a degree of divergence not much greater than many other Fijian birds and thus their divergence is recent. Present indications are that the two forms are strong subspecies and it is possible that, when *kleinschmidti* is better known, the subspecific status may need to be reconsidered.

Fleming (1962), by a kind of " educated guessing," has ranked the endemic families of New Zealand passerines as survivors of immigrant stocks that colonised New Zealand early in the Tertiary. If evolution on different archipelagos has occurred at the same rate, *Lamprolia,* an endemic family of one species, survives from an earlier array of birds which may have colonised Fiji in the early Tertiary.

Presumably once part of a range of related forms whose diversity was well beyond that of modern Fijian birds, *Lamprolia* may have survived because its small size and relatively unspecialised habits have enabled it to adjust to changing conditions and competition from new immigrant stocks.

On analogy with subspeciation in New Zealand (Fleming 1962), there has been ample time since the late Pleistocene or later for the two Silktails to have diverged to the limited extent they have. Which of the two is the relict form and which the recently derived form is a further matter for speculation.

If one assumes that the much stronger population on Taveuni is the relict population, then dispersal to Vanua Levu probably occurred in the late Pleistocene or soon thereafter. Somosomo Strait, which separates Taveuni and the nearest point of the Waikava Promontory on Vanua Levu by some 8 km (5 miles), is a dispersal barrier partly overcome by the prevailing south-easterly winds but which has been crossed at some time by most other Fijian birds. If one must seek an easier route, the strait could have been as narrow as 1 km ($\frac{5}{8}$ mile) with the lower sea levels at the time of the last major glaciation, some 15000 years ago, but there would have been no direct land bridge (P. Rodda, pers. comm.).

However, since an immigrant form is not likely to establish permanently unless it can occupy a vacant ecological niche or dominate competitors for an occupied niche and therefore flourish, it seems unlikely that *kleinschmidti*, which does not seem to meet these criteria, should be the derived form. Whereas Natewa Peninsula, consisting largely of sedimentary deposits and submarine volcanics, apparently has a long history of uplift, Taveuni is mostly very young, with, except in the extreme east, its original volcanic topography little eroded (P. Rodda, pers. comm.). It seems more plausible that *victoriae* should be the derived form, finding on Taveuni an abundance of the wet forest conditions it seems to favour and in these conditions exploiting a largely vacant niche by developing strong terrestrial and low-level components in its feeding habits. This habitat shift may explain *victoriae's* increase in body size associated with terrestrial life, as has occurred, for example, with *Petroica australis* in New Zealand (Fleming 1950) and with *P. rodinogaster* in Tasmania (Keast 1971).

Should pockets of *kleinschmidti* be found elsewhere on Vanua Levu, this could support the view that *kleinschmidti* is the relict form, dying out from the west, surviving in isolation on Natewa Peninsula, and flourishing as the better adapted *victoriae* in the favourably wet conditions of Taveuni.

Whatever the background, the full distribution and habitat tolerances of *kleinschmidti* should be an early priority for study while stands of unmodified forest remain. One wonders whether higher densities will be found, whether in damper, higher country the birds are litter feeders and whether the feeding behaviour seen at Kubulau in September differs at other times of year.

RELATIONSHIPS

As there is no clear evidence of relationship of *Lamprolia* to other bird groups, it is surprising that relationship to the Paradisaeidae seems to have been dismissed rather hastily, apparently on the grounds that *Lamprolia* does not show some of the primary characteristics of modern Birds of Paradise (for example, see Bock 1963). The Paradisaeidae are a rapidly evolving group whose origins also are obscure. In the presence of congeneric species, recognition plumage-patterns are of high selective value, especially in sexual selection, and this has led to extremes of extravagance and specialisation among the Paradisaeidae (Gilliard 1969). However, one would not expect an ancient isolate like *Lamprolia* to exhibit the specialisations of plumage or of skull structure (Bock 1963) of modern Birds of Paradise.

If one starts by assuming relationship, it can be argued that *Lamprolia* may be closer to the early progenitors of the Paradisaeidae, showing a generalised skull structure, monogamy, monomorphism and unspecialised insectivorous diet, all of which have been suggested for the paradiseine precursor (Gilliard 1969). There is precedent among Birds of Paradise for most of the features of *Lamprolia,* quite apart from the obvious similarity of feather structure, including general build and stance of body, feeding mannerisms, litter feeding, type of nest, egg colouring, flicking white tail, monogamy, sexual monomorphism, even small size (Gilliard 1969). Indeed one is struck while reading works such as Gilliard's that differences between *Lamprolia* and a hypothetical primitive paradiseine are often less than differences among the Birds of Paradise themselves. The problem is hampered by lack of knowledge of the Paradisaeidae in the field, particularly the behaviour of females and juveniles; and by lack of knowledge of *Lamprolia* itself.

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