



Pox-like Lesions on Endangered Puaiohi (*Myadestes palmeri*) and Occurrence of Mosquito (*Culex quinquefasciatus*) Populations Near Koaie Stream

by Christina M. Herrmann¹ and Thomas J. Snetsinger¹

In August 1995 we began a cooperative project on the island of Kaua'i to study the life history of the puaiohi (*Myadestes palmeri*), a critically endangered solitaire, and to recommend management strategies to assist in its recovery. One facet of this research involves the mist netting and banding of puaiohi. On 29 January 1996, we captured an adult puaiohi with multiple lesions typical of those produced by the avian pox virus. This is the first report of pox-like lesions for this species. In our work to date, we have captured and examined eleven puaiohi and have seen evidence of pox in only one individual. Mountspring examined six of thirteen museum specimens of this species and found no evidence of pox (S. Mountspring pers. comm.). Four of these specimens are located at B. P. Bishop Museum. Of these four, two were collected in April and May of 1895 and the remaining two were collected in July 1960.

Avian disease has long been implicated as a major factor contributing to the decline of Hawaii's avifauna (Warner 1968, C. Van Riper et al. 1986, Atkinson et al. 1995). Avian pox was brought to Hawaii soon after the Europeans arrived in the Hawaiian Islands in 1778 (Warner 1968). There are no reliable records of when the virus was first introduced to Kaua'i, but descriptions of tumor-like growths on native birds from O'ahu and the Big Island at the turn of the century suggest that pox may have been affecting native birds as early as the late 1800s (Perkins 1893, Henshaw 1902). It is likely that the spread of pox into native bird populations closely followed the movement of *Culex* mosquitoes from lowland areas into cooler high-elevation forests.

Avian pox can be transmitted mechanically from bird to bird or from fomite to bird through breaks in the skin. It can also be transmitted from insect vector to bird through contamination of vector mouthparts with virus particles. Mosquitoes and other biting arthropods are potential insect vectors. A mosquito can probably infect several different birds after a single feeding on an infected animal and may remain infective for extended periods (Akey et al. 1981). Avian pox manifests itself in two ways. The cutaneous form is seen as wart-like growths around the eyes, beak, or other unfeathered areas. Complications resulting from the cutaneous forms can include difficulty in seeing (in cases where the lesions occur around the eye), eating or breathing (in cases where the lesions are around the bill), perching (if the legs and feet are involved), and loss of digits due either to avascular necrosis or secondary bacterial infections. The diphtheritic form, also known as wet pox, is characterized by yellowish patches of necrosis that can be found on mucous membranes of the mouth, esophagus, and trachea (Tripathy 1993).

The puaiohi we caught displayed lesions typical of those found in cutaneous pox. The lesions were on the middle right toe, the right leg at the top of the tarsometatarsus (ankle joint), the left side of the bill near the feathering at the base of the upper mandible, above and below the left eye, and on the left inside digit. The lesions ranged from 2 - 4 mm in diameter. The largest lesion was at the top of the tarsometatarsus. The lesions were firm, raised, wart-like protuberances covered by crusty brown scabs. Morphological measurements collected included weight, unflattened wing

chord, tail length, and length of exposed culmen. The tarsus length measurement was not taken to avoid rupturing the lesions on the legs. The bird was banded with a uniquely numbered United States Fish and Wildlife Service band and three colored plastic bands, photographed, and released. The puaiohi was not underweight and did not appear to be disadvantaged by any of the lesions at the time of its capture. To prevent the spread of the virus to other birds, all of our instruments were disinfected by washing them in alcohol, the mist net was thoroughly sprayed with Novalsan, and the hands of anyone who handled the bird were washed first in Novalsan and then in alcohol.

We captured a Kaua'i amakihi (*Hemignathus stejnegeri*) that also displayed pox-like lesions during the same week. The amakihi had only one lesion similar in appearance to those of the puaiohi. The lesion was on its tarsus, and it was missing one toe. In May 1996 a single Kaua'i elepaio (*Chasiempis sandwichensis sclateri*) was observed in our study area with a large lesion near its right eye. According to the observer the lesion covered its entire right cheek and was large enough that it may have been interfering with the bird's sight (D. Holmes pers. comm.).

A definitive diagnosis of avian pox can only be made by removing the lesions, submitting them for histopathology, and confirming the presence of viral inclusion bodies. Given the isolation and primitive setting of our field site, and the extended amount of time spent there, collecting the lesions was not possible. With no method available to make a field diagnosis, we cannot conclusively say these birds were infected with pox virus, only that they displayed lesions compatible with avian pox.

Since it was banded in January, the puaiohi has been resighted twice, first on 11 February 1996, and then on 23 March 1996. On both occasions the largest lesion on the right leg was still visible. The first time the bird was sighted, one of its color bands had slid up over the tarsometatarsal joint. It appeared that the size of the lesion was preventing the band from returning to its proper location. At the second sighting the bird was with a partially-scalloped plumage puaiohi, possibly its mate or offspring.

At this time the right leg lesion appeared much as it did in February.

Other Hawaiian solitaires are susceptible to avian pox. Pox-like lesions have been observed in kamao (*Myadestes myadestinus*), olomao (*Myadestes lanaiensis*), and omao (*Myadestes obscurus*) (C. Atkinson pers. comm., S. Mountainspring pers. comm.). There are no records of pox-like lesions in the amau (*Myadestes oahuensis*), which has not been observed since the 1820s and is represented

by only two scientific specimens of undocumented origin (Olson and James 1994).

Pox infections do not always result in the death of infected individuals. Survivors probably acquire active immunity against homologous strains of the virus (Tripathy 1993). Birds that survive the infection may lose one or more digits to secondary infections or avascular necrosis. However, absence of a toe does not provide a definitive indication of exposure to and survival of pox.

While avian pox virus can be transmitted mechanically without the presence of a vector, the presence of a vector may increase the risk of exposure. To track vector abundance we have been monitoring populations of *Culex quinquefasciatus* around Koai'e camp since December 1995. We use ovi-position traps that are attractive to female *Culex* mosquitoes that have had a blood meal and are ready to lay their eggs (Reiter 1987). While in the field, we run two traps placed 100 meters apart. Daily, mosquitoes are collected and weather information is recorded.

Our trap results (Table 1) show substantial daily fluctuation in mosquito captures with peaks in December 1995 and April 1996, shortly before pox lesions were observed in wild birds. Increased vector populations before outbreaks of the virus commonly occur during pox epizootics, indicating that non-vector mediated transmission probably plays a minor role in the spread of the infection (Forrester 1991). Despite periodic high mosquito densities, we have not found any breeding sites near Koaie Stream. A pool with *Culex* mosquito larvae was found at 1130 meters elevation on the Kawaikoi Stream seven kilometers from our field site in April 1996 (D. Jamieson pers. comm.).

Surveys for avian pox and malaria are being conducted over a wider geographic area in the Alaka'i Wilderness Area by the USGS/Biological Resources Division (C. Atkinson pers. comm.). With no reliable methods available for making conclusive diagnoses in the field, our knowledge of the prevalence and impact of the virus is limited. The presence of avian pox in this area is of great concern. This region is the last stronghold for several critically endangered bird species on the island of Kaua'i. Additional research will be required to learn more about the current epizootiology and pathogenicity of avian pox and to determine its role in the decline of puaiohi.

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Table 1

Abundance of Culex quinquesfasciatus near Koaie Stream Gaging Station

Dates		Trap-nights	Average <i>Culex</i> / Trap-night	Standard Deviation
December	1995	14	7.71	13.82
January	1996	12	1.30	0.95
February	1996	20	1.18	1.59
March	1996	22	0.14	0.47
April	1996	26	2.55	4.14
May	1996	4	0.08	0.29
June	1996	16	1.56	2.25

1996 Research Grants Awarded

by Phil Bruner

Hawaii Audubon Society is happy to report the awarding of research grants for 1996. Catherine E. Swift of the Department of Zoology, University of Hawaii at Manoa will be studying the difficult problem of rat control in native forests. The title of her project is: *A proposal to develop an effective technique for broad-scale application of rodenticides to control the impacts of rats in native Hawaiian ecosystems*. Rats pose one of the many serious threats for the native flora and fauna. We feel confident that our financial help will be put to good use and look forward to Catherine's report summarizing her findings. These reports are submitted as part of the requirements for receiving a grant from Hawaii Audubon Society and are published in the '*Elepaio*' in order that we can gain not only insights into the current research occurring in Hawaii but as a method of informing our members

of how their funds are being spent.

Trae Paul Menard of the Department of Geography at the University of Hawaii at Manoa also was awarded funds to study: *Dry season water status of Metrosideros polymorpha at an elevational treeline and the influence of drought on treeline plant communities*. One of those who wrote in support of Trae's proposal stated; "the project will be a significant contribution to our understanding of the adaptive ecology of ohia in a portion of its range where environmental stresses begin to limit its occurrence." We likewise eagerly await the findings of this research and will publish Trae's report at the conclusion of his study. It should be noted that the reports published in '*Elepaio*' are only brief summaries of the research and many later publish their research in a larger format in other journals.

The Society Has a New Nest

by Susan Elliott Miller

We have been in the new quarters at 850 Richards Street, Suite 505 (ewa-makai corner of Richards and Merchant Streets) since December 18th. Our telephone number (528-1432) has not changed; please call to get our new FAX number which is not known at this writing.

E, komo mai between 10 a.m. and 5 p.m. Monday, Wednesday, and Friday to enjoy our larger space, browse the Society's reference library, buy books (1996 edition of *Hawaii's Birds* has landed) tapes, and T-shirts, and take in our pleasant view of the Iolani Palace grounds. Metered parking is available at the downtown post office lot.

You May Submit Photos and Sketches of Hawaii's Birds for Publication

Original photographs and illustrations of Hawaiian birds are welcomed. They may be color or black and white prints, 3.5 by 5 inches or larger. They should be labelled as to subject and photographer/artist. Please include permission to publish along with your address and telephone number.

A Naturalist's Visit to Moloka'i in 1896

by Hugo H. Schauinsland (1857-1937)

translated by Alvin Y. Yoshinaga,
Center for Conservation Research and
Training, University of Hawaii

Extracted and translated from: Ein Besuch auf Molokai, der Insel der Aussätzigen. Abhandlungen naturwissenschaftlicher Vereine zu Bremen 16: 513–543 (1906)

Translator's notes: Schauinsland, director of the Bremen Overseas Museum (Überseemuseum), visited Hawaii for several months in 1896 during the course of a round-the-world collecting trip between April 1896 and May 1897. Exact dates of his Hawaii visit are currently not available. According to Dr. Dieter Heintze of the Bremen Overseas Museum, Schauinsland's field notes are presently being edited and will be published shortly. Udvardy (1996) included a short biography of Schauinsland in his translation of Schauinsland's account of his Laysan trip.

[] indicates summaries of sections not translated. The untranslated sections, of limited natural history interest, give a colorful picture of Meyer's estate at Kala'e and of life in the leper colony at Kalaupapa. They would be of great value to anyone interested in local history, and deserve full translation.

Species names are those given by Schauinsland, without updating. Currently accepted species names are in the appendix.

[Description of a trip from Lahaina to Kaunakakai over rough waters on a small steamship.]

Moloka'i is the Hawaiian island which is least visited and known, but perhaps the one which is home to greatest riches in sublime natural beauty. Of long form (65 km long by 12 km wide), it is divided by a wide cleft into a smaller relatively low western part and a larger eastern part which rises to a considerable height (around 1600 m). (To my knowledge exact measurements have only been made in a few places, so it is not always possible to give completely reliable figures.) While the south side of the island is mostly completely accessible in spite of its often quite steep and abrupt

risers, much of the north coast drops 600 m, in places even 700–800 m literally vertically down to the sea.

Around noon we found ourselves at Kaunakakai, a landing place on the south side. Once this was a favorite place for King Kamehameha IV to stay, but now it is rather empty and deserted, and not at all comfortable due to the fearsome heat. We were therefore quite happy to mount our horses soon. They were hospitably sent us from Kala'e, our next goal, while our baggage would be sent later by 6-span ox carts. At first we went through the algaroba and coconut groves along the coast at the gallop which is customary in the Hawaiian Islands, then the path turned away from the ocean rather steeply uphill.

A true stone desert surrounded us! Not a tree, not a bush was to be seen, not even a stalk of grass sprouted from the sun-parched ground; far and wide there was nothing but intensely brown-red lava rock. The wind raised clouds of dust up from the ground so that we soon looked like authentic redskins.

We had ridden uphill like that for perhaps two hours, when we suddenly found ourselves across from a prominent, wonderfully green oasis. It was Kala'e, our destination. Industrious hands had built a delightful place to live here. We found ourselves almost 500 m over sea level, on an elevated plain with free access to trade winds. The heat of the tropical sun was thereby comfortably moderated, but still enough to allow splendid vegetation to grow with the help of a considerable irrigation system. In the extended gardens oranges and limes ripened, refreshing fruit drooped down from shady mango (*Mangifera indica*) and bizarre papaya (*Carica papaya*) trees, and nowhere else did I find the magnificent "alligator pears" (avocados; *Persea gratissima*) as delicious as here. The slit leaves of gigantic bananas swayed in the wind, and even the beautiful passion flower displayed its juicy fruit. Tall pomegranate trees showed off the beauty of their burning red blossoms, brognatia fully opened their great white trumpet flowers, while wonderful bougainvilleas climbed around the houses and fences and decorated them with their colorful splendor. Thickets of amaryllis perfumed the air; on the heights nearby bizarre araucarias mixed with casuarinas spread out their sprawling branches, and whole forests of giant agaves sent their enormous flowering shafts upward. We were astonished to see that roses were in

bloom next to these tropical plants, and cabbages and cucumbers grew in the vegetable garden like at home; only noble wine did not reward the planter's efforts – his grapevines withered.

The view from here to the ocean far below, to the lower southern part of the island, and the magnificent deep-green gulches in the mountains which rise up nearby, is wonderfully beautiful. These gulches are very characteristic of Moloka'i. While its overall configuration is rather uniform and lacks angular mountain peaks, the dome of the island is furrowed by great valleys which probably owe their origin to volcanic as well as erosive forces. As a result of this gulch formation the system of mountains is quite complicated. Often, from a distance one can believe there is a compact mountain mass facing him; in reality, it is divided up by countless incisions into a large number of secondary ridges. Above Kala'e, i.e. around 500–600 m elevation, most valleys and gulches are wooded, while the surface of the mountains themselves are predominantly bald and covered with at most only grass; at lower elevations almost everywhere around here there is a total lack of vegetation.

[A visit with R. W. Meyer; observations on the character of the Hawaiian people and their state shortly after the overthrow of the monarchy.]

Daily excursions made us familiar with nature on Moloka'i in the wider neighborhood of Kala'e. The rock, like in all the Hawaiian Islands, is of exclusively volcanic origin. Next to heaps of more or less strongly weathered lava, slag, and ash, one not infrequently sees thin, apparently younger basalt dikes going through the rock mass, for example on the vertical wall of the northern slope above Kalawao. In places where the deposits come to light in profile, I also often found those distinctive round masses of stone with broken surfaces like onion peels which are such a characteristic weathering phenomenon of the basalt there. A phonolith-like grey stone with almost slate-like fractures was also common in the gulches above Kala'e. Especially interesting to me were the conglomerates of basalt chunks and coral rubble which I encountered several hundred feet above sea level and which I already presented in another place¹ as evidence for a considerable rise in the level of the island. Small fresh water calcareous deposits with fossil land snails occur also. Characteristic of many places in

Moloka'i is the previously mentioned intense red-brown color of the whole ground, no doubt originating from a high content of iron oxide.²

The favorite goal of our excursions was a small lake lying alone in a peaceful spot in the mountains at about two thousand feet elevation. To its left rose a beautifully formed mountain dome and down to the right stretched a gulch filled with luxuriant vegetation. Some years before, this body of water had been stocked with imported carp. They multiplied fruitfully, but like so many other inhabitants of colder regions in the tropics, they had degenerated and became emaciated and tasteless. Otherwise, the waters hardly sheltered any other sizeable living creatures; no snails, no mussels were to be found, and only a few insect larvae swam around. Later investigation of samples taken showed that even microscopic life was small in number and in many ways corresponded remarkably closely with European forms. Here, too, I found it shown that in the tropics the number of organisms, species as well as individuals, is often smaller than one is accustomed to assume; any puddle in Germany would have yielded a richer yield to a zoologist.³

I was happier to see the beautiful and rare butterfly of the Hawaiian Islands (*Pyrameis tameamea* Eschh.), which fluttered around here in the sunshine on the edge of the pond quite often. Mainly, however, this romantic lake attracted me because I found opportunities here to collect members of the increasingly rare bird life of Moloka'i.

The first I encountered there were a moorhen (*Gallinula galeata* ssp. *sandwicensis* Streets.) and a coot (*Fulica alai* Peal) which are interesting because both still show the greatest similarity to American forms, although they are poor fliers which could hardly cross the wide stretch that separates the American continent from Hawaii in the present geological era. One must conclude from this that, in contrast to the otherwise so thoroughly divergent avifauna of Hawaii, which has strongly differentiated and now shows only minimal relationship to the birds of the nearest continents and island groups, they have remained almost unchanged over a very long period of time. The same is the case for the Hawaiian owl (*Asio accipitrinus* Gurney.) and the night heron (*Nycticorax nycticorax* Linn.), even if one accepts a perhaps more recent immigration by these

strong flying animals; in any case, they resemble their American or European relatives respectively in such a manner that one is not in a position to find distinguishing features which justify citing them as distinct species. I have seen the owl, (which the natives consider to be the corporeal form of a spirit) rather frequently, and have even seen it in daylight, patrolling its range and "fluttering" in one spot attending to the hunt. The night heron, however, which I shot while it was carp fishing, may be the last of its species in this area.

Near the pond is a richly vegetated forest gulch, which is probably the lowest place to which the interesting birds, which otherwise inhabit only the highest montane forests of Moloka'i, come down. From year to year they are becoming rarer and are retreating further into the deeper regions, in any case because, with the disappearance of the forest, the trees which give them their nourishment are beginning to be in short supply. In the tall 'ohi'a lehua trees (*Metrosideros*) of the gulch small honeycreepers (*Himatione Steyneri* and *H. sanguinea*) flit agilely around clinging with their feet as their small bodies hang underneath while they seek their nourishment from the beautiful pomegranate-red blossoms. So closely does the red plumage of *H. sanguinea* Caban. resemble the color of the flowers that a careful look is often necessary to distinguish the little bird between them. In thicker vegetation are found, if less often, the handsome scarlet kakawahie (*Oreomyza flammea* Wils.) and the Moloka'i thrush (*Phaeornis lanaiensis* Wils.) More frequently one sees the splendid glowing red of that beautiful small bird with a long hook-curved beak (*Vestiaria coccinea* Reich.), from whose plumage the Hawaiian kings had their precious feather cloaks made.

Visitors to the Bremen Exposition of 1890 will still remember the beautiful garments which the Hawaiian government had lent. The tasteful arrangement of yellow feathers next to red gave them a fine decorative effect. The bird from which these were mainly taken, the mamo (*Drepanis pacifica* Temminck), is now probably completely extinct. While its feathers glow like gold on the cloaks, those of the 'o'o (*Acrulocercus nobilis* Wils.), which were also used, appeared in brighter shading. These birds were so uncommon even in ancient times that kings and chiefs had to keep a number of men constantly busy with

the time-consuming task of catching birds in the montane forests in order to obtain a sufficient number of them. Taking into consideration that they were almost completely black and had these yellow feathers only in small numbers, it is not surprising that the cloaks, which required many thousands of feathers, were as precious to the Hawaiians as the royal jewels of a European monarch are to us.

I have not seen the greatest ornithological rarities (above all *Drepanis funera* Newt, followed by *Acrulocercus Bishopi* Rothsch. and *Palmeria Dolei* Rothsch.) alive, since they occur only in the highest and most inaccessible parts of the island. However, Meyer's sons have caught them.⁴

While the old Hawaiian avifauna is disappearing more and more, new introduced species have multiplied extraordinarily. This, too, is an example of how the whole nature of a land can have its appearance changed by man within a short period of time (here fifty years at most). For example, the Chinese pheasant has multiplied so much from a few introduced pairs that in heath-like parts of the island with tall grass one encounters them from one step to the next and is repeatedly startled by their unexpected noisy flight. All over in the mountains the introduced California quail sounds its call, and in the guava thickets alien doves (*Turtur chinensis* and others) coo. From the leaves of the kukui tree the voice of the small introduced finch (*Corpodacus frontalis*) rings out; it left its home on the Pacific coast of America and seems fully settled down here. Master Sparrow, who by the way crossed the twenty-five nautical mile channel between O'ahu and Moloka'i without human help, chirps all around human habitations here and is just as fresh as at home. In any case he is surpassed by the mynah bird (*Acridotheres tristis*?), which was introduced from India a few decades earlier by Dr. Hillebrand, the noted botanist. It has multiplied in such a way (on O'ahu; on Moloka'i I only saw it rarely), and acts so rudely that in spite of its handsome appearance it is detested.

The usual traveller will see practically only these aliens, and I am convinced that the majority of inhabitants of Honolulu have seen a living example of the native bird life very seldom, if at all.

While mammals were wholly absent earlier, now feral goats climb in the mountains; wild pigs are at home there too, and beautifully spotted Indian axis deer run

through valleys and rises in large herds.

Even large butterflies, an insect order which one would consider *a priori* not well suited for such an immigration, follow human commerce. The beautiful monarch butterfly (*Danaus erippus* Kram.), originally native to America and now spread over many of the islands of the Pacific, flies in numbers in the grass plains of Moloka'i, too, while *Pirameis virginianensis* Drur., originally from the same area, is found there singly, and the cosmopolitan hawkmoth (*Deilephila lineata*, Fabr.) buzzes in large numbers above the flowers in the gardens of Kala'e.

We spent whole days in the above-mentioned hunting grounds, and we still remember with pleasure with what enthusiasm we sprang uphill and downhill stalking the colorful birds, and how painful it was to us when we downed them in impenetrable thickets where we could not find them. Often we ourselves sank completely inside, while in other places garlands of soft mosses and climbing pteridophytes on branches of mighty trees reached down to our feet.⁵

We usually did not begin to go back until sunset; then the evening wind blew refreshingly on the heights, and the gulches sounded with the song of the Hawaiian thrush, whose flutelike song was as full and as moving as back home, while in between the foreign-sounding melodic sounds of the other birds gradually faded away. The heights were bathed in violet light. Far below, the friendly fields of Kala'e beckoned, and in the distance the sea glowed with the last rays of the sinking sun.

I used one day for a further excursion high up on the mountain. Accompanied by a kanaka boy, we first rode downhill to the almost vegetation-less part of the island described earlier. Bare rock stared at us from all around; its brown-red color was brought out even more intensely when here and there an isolated poppy-like plant unfolded its big, white petals in spite of the dryness. Here, too, old settlements could be recognized everywhere, even if the only remains were half-fallen stone walls and gigantic old cactus (*Opuntia tuna* Mill.) Large and small gullies ran through this landscape and emphasized its unique desert-like beauty. Clearly visible signs showed that during the winter rains, swollen torrents ran through them.

Gradually climbing, we reached a terrrain which was covered with tall, almost dry grass. Everywhere, bare stumps of dead

trees arose, a sign that a forest was here not long ago. Grazing cattle and sheep, as well as the constant damage caused by abundant wild animals, destroyed it in time, with the result that the springs, which once provided the lower-lying settlements with sufficient water, ceased to run.

After several hours of leisurely riding we suddenly stood atop a rounded mountain top from which a stunning view of a magnificent valley, full of vegetation – Waikolo Valley –, opened up. We were probably more than 1200 m high and could look into every crease of the great valley which opened to the sea in its north end. Two enormous rocks, at whose vertical feet the waves crashed high, stood down there like giant guardians of this sublime beauty.

Ascending further we finally came into thick woody vegetation, but this was only a shadow of the old Hawaiian forest, which can still be seen in its original beauty for example on the way from Hilo to Kilauea on the island of Hawai'i. The trees here look weak with age, and white and yellow lichens hang from their branches. Even tree ferns and 'ie'ie (*Freycinetia Arnotti* Gaud.), a climbing Pandanaceae, which usually so decorates the forest as it winds upwards among the trunks and spreads its branches like giant chandeliers on whose bright-red bracts the flowering parts sit like burning candles, no longer flourish here. Yet there was thick luxuriant forest in this spot a few years ago. What could be the cause of its decline? It can hardly be a matter of destruction by livestock and wild animals. I believe that the moisture of the entire region, necessary for vigorous growth, was reduced because of the retreat of the lower-lying parts of the forest caused by the earlier mentioned damage. As a result, first the rain-requiring mosses, so necessary for the other vegetation because of their water-holding capacity, disappeared. Then the fern thickets died, and finally trees fell victim too. Here we see again how the vegetation of an entire landscape is influenced by the direct and indirect actions of man, just as I mentioned above for the animal world. If one adds in the deliberate introduction of new plant species, it is not surprising that the appearance of the entire landscape can undergo a considerable change. The algaroba from Mexico (*Prosopis juliflora* DC) forms extensive thickets in the Hawaiian Islands today. Lantana (*Lantana camara* L.), a shrub originally imported by Hillebrand as an orna-

mental in 1858 grows rampant, displacing all other plants in such a way so that, particularly on O'ahu nowadays, it is hated by planters as a troublesome, almost ineradicable weed. Guava (*Psidium guajava* L.) forms such thickets over wide stretches that no trees or shrubs can come up through it.

The mountains and valleys up here are incidentally a rich locality for achatinellids, land snails which occur only on the Hawaiian Islands, which are distinguished by the infinite number of species and races into which they have split. Almost every valley, every gulch has a distinctive variety which occurs only there. The achatinellids thereby present an excellent subject for the study of the problem of constancy (or mutability) of species. Moloka'i with its richly developed valleys is home to a correspondingly rich number of different forms, and Meyer's sons possessed a collection numbering several thousand individuals.⁶

To get to know Moloka'i's most magnificent side, one must seek out its north coast, the pali. From Kala'e, it was only half an hour away. The path to it went over a rolling landscape on the high plain, which looked almost like a steppe; foot-tall grass covered the ground, forming a welcome hiding place for abundant quail and pheasants whose features match the reddish-yellow sun-dried grass so well that even from close the eye cannot distinguish them. Guavas as tall as a man, loaded full of juicy fruit, formed dense thickets in places, and here and there a hoary dracena of such circumference that I had not seen before rose up over the rather monotonous surroundings. Though the height of this strange lily relative is not great (it seldom reaches more than 6-7 m at most), in its whole habit it resembles that old dragon tree of which visitors to Teneriffe speak with such admiration.

Quite abruptly one steps out of this landscape suddenly on to the edge of a fearsome precipice which falls, in places almost vertically, a good 600 m to the sea. It gives the impression as if here the entire north side of the island was torn off by an enormous natural force and devoured by the waves; one could believe oneself standing on the remains of the walls of a gigantic crater of which only a portion was preserved, while the greater part sank into the deep where the sea now surges.

What a magnificent view presents itself to the eye there! To the right and left, more or less high mountains rise up, to the south

stretches the high plain full of gullies, and in front of us the shining surface of the mighty ocean is spread out, its color reflecting the skies so faithfully that one is hardly able to tell the boundary between water and sky on the horizon, so that a ship in the distance, its sails gleaming in the sun, seems almost like an illusion, as though it were gliding not through waves but in a sea of air

[A description of the view of Kalaupapa Peninsula from above, followed by a digression on the history of leprosy. Schauinsland and his companions descend to visit the leper settlement.]

A small path switchbacked down the vertical rock wall and soon wound through virtual cataracts of luxuriant greenery that seemed to cascade down the rocks like a waterfall. It soon led over a bare, nearly overhanging, rock mass on which one feels like a bird in the air, whose soaring one envies when one sees how such a little feathered songster, who first appears in the abyss far below as a point barely recognizable to the eye, flies straight up with a few flaps of its wings, now sings its song while flying around our heads looking at us curiously, in the next moment to continue flying high over us, hovering over the spot from which it took us so long to climb down with such effort.⁷

[Arrival on the Kalaupapa Peninsula; visit to the leper settlements; discussions with Father Damien's successor; return to Kaunakakai and departure for Honolulu.]

Notes

¹ Schauinsland: Drei Monate auf einer Koralleninsel, p. 93, Bremen 1899. M. Nössler.

² I consider the discovery of two rocks quite noteworthy, since to my knowledge nothing like them was known previously from the Hawaiian Islands. According to the determination of A. Dieseldorff, who is working on my rock collections under Prof. M. Bauer at the Königliches Mineralogisches Institut (Royal Mineralogical Institute) in Marburg, one of them is an olivine-gabbro (found on Moloka'i), the other a red-colored true mud slate which I collected on Maui. The significance of these discoveries for the question of the substrate etc. of the Hawaiian Islands will be discussed elsewhere.

³ The algae of this pond as well as other fresh-water collections from the Hawaiian Islands have already been worked on. See E. Lemmermann - Planktonalgen (Ergebnisse einer Reise nach dem Pacific, Schauinsland 1896/97). Abh. Nat. Ver. Brem., Bd. XVI. 1899.

⁴ I was later able to obtain them for the Bremen Museum, whose valuable bird collection thereby received a noteworthy enrichment.

⁵ The mosses which I collected, including some 20

new species, have already been worked on. See: K. Müller-Halle and V. F. Brotherus, Musci Schauinslandiani. Ein Beitrag zur Kenntnis der Moosflora der Pacificischen Inseln. Abh. Nat. Ver. Brem. Bd. XVI. 1900.

⁶ The Naturw. Verein (Scientific Society) in Bremen provided the means to obtain this collection; through its addition to the older already large holdings, the Bremen Museum now has perhaps the largest existing achatinellid collection.

⁷ Only on this spot on the island did I encounter its best singer, the o'u (*Psittacirostra psittacea* Temm.), in large numbers; I often saw how a pair would fly almost vertically upward from the foot of the pali, with the male singing loudly.

Acknowledgments

I would like to thank the following persons who helped with this translation: Patrick Conant and Dr. Sheila Conant, for assistance with details of entomology and zoology; Dr. Niklaus Schweizer for assistance with translation style; Drs. Lars Achenbach and Dieter Heintze of the Bremen Überseemuseum for providing me with biographical and bibliographical information.

Annotated Bibliography

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Udvardy, Miklos D.F. 1996. Three months on a coral island (Laysan). Atoll Research Bulletin 32: 1-53. Translation of Schauinsland's Drei Monate auf einer Koralleninsel (Laysan). Includes a biography and a partial bibliography of publications resulting from Schauinsland's Pacific trip.

_____. 1969. Bremische Biographie 1912-1962. Historische Gesellschaft zu Bremen & der Staatsarchiv Bremen. Bremen.

Schauinsland - Lebenslauf im Abriss. Privately published. Includes a full bibliography of Schauinsland's lifetime publications, and a full bibliography of publications by others resulting from his Pacific trip.

Appendix: Currently Recognized Species Names

Many of the species names which Schauinsland used are different than currently recognized names, whether because of changes in nomenclature, changes in identification, or identification errors. This appendix cross references the names in the main text with the most current forms and adds common names where Schauinsland does not cite them. Spp. are listed in alphabetical order using Schauinsland's names.

BIRDS

Acridotheres tristis?: *A. tristis*, common myna.

Acrulocercus Bishopi: *Moho bishopi*, Bishop's o'o.

Acrulocercus nobilis: *Moho nobilis*.

Asio accipitrinus: *A. flammeus sandwichensis*, Hawaiian owl, pueo.

California quail: *Callipepla californica*.

Copodacus frontalis: *Carpodacus mexicanus*, house finch.

Drepanis funera: *D. funerea*, black mamo.

Fulica alai: *F. alae*, Hawaiian Coot, 'alae ke'o ke'o.

Gallinula galeata ssp. *sandwicensis*: *G. chloropus sandwicensis* Hawaiian gallinule, 'alae 'ula.

Himatione sanguinea: 'apapane.

Himatione Steynegeri: *Hemignathus virens wilsoni*, 'amakihi.

Nycticorax nycticorax: *N. nycticorax hoactli*, black-crowned night heron.

Oreomyza flammea: *Paroreomyza flammeus*.

Palmerei Dolei: *P. dolei*, crested honey-creeper, akohekohe.

Phaeornis lanaiensis: *Myadestes lanaiensis rutha*, oloma'o.

Psittacirostra psittacea: *Psittirostra psittacea*.

Turtur chinensis: *Streptopelia chinensis*, spotted dove.

Vestiaria coccinea: 'i'iwi

INSECTS

Danaus erippus: Probably a misspelling of *Danaus archippus* Fabricius, now *Danaus plexippus* (Linnaeus).

Deilephila lineata: *Hyles lineata* (Fabr.), whitelined sphinx.

Pirameis virginienensis: *Vanessa virginienensis* Drur., painted beauty.

Pyrameis tameamea: *Vanessa tameamea* Eschholtz, Kamehameha butterfly.

PLANTS

Brognantia: Schauinsland probably means *Brugmansia candida* Pers., angel's trumpet.

Dracena: Hawaiian dracenas, or hale pepe, are now place in the related genus *Pleomele*.

Freycinetia Arnottii: *F. arborea* Gaud, *Opuntia tuna*: *O. ficus-indica*, (L.) Mill., panini.

Prosopis juliflora: More likely *P. pallida* (Humb. & Bonpl. ex Willd.) Kunth, kiawe.

Psidium guajava: *P. guajava* L., common guava.

Persea gratissima: *P. americana* Mill.

Red-billed Leiothrix Observed at Haleakala Observatories

“At this location on the mountain, we see practically no bird life at all...”

by Tony Distasio, Superintendent

Our observatories are located at about the 10,000 foot level, very near the summit of Haleakala, on Mau'i. At this location on the mountain, we see practically no bird life at all, with one exception. That exception is a “family” of chukar partridges, which evidently live here, and which we have seen running around our buildings and feeding, for years. The nene geese, which live in the crater and also around the National Park headquarters at 7,000 ft. are virtually never seen around our site. The dark-rumped petrels which we know nest in rock burrows, just below our C.E.K. Mees Solar Observatory Building, fly in only at night. We hear their barking calls, but do not normally see them. With that background information, I'll proceed.

Approximately two months ago, and then again this past week, and also during the latter part of the previous week, we have observed a small flock of red-billed leiothrix feeding around our buildings. There are abundant Kupa'oa plants which grow at this altitude. They and the Silversword seem to thrive at this site. During the past two weeks, the more mature Kupa'oa have gone to seed, in large numbers. The red-billed leiothrix seemed to be feeding on the seeds of this plant, although I observed an abundance of flies (of several species) on these plants, so it was not clear to me whether the birds were feeding on the seeds, the flies, or both. They were clearly flying close to the ground, from one plant to the next, dwelling at each plant for a few minutes at a time, while feeding there. Their vocalizations included two or perhaps three different songs, which were all very melodious. All of these sightings occurred during the day time, between 0800 and 1700 hours.

I quietly followed them around, and after about twenty minutes they appeared to become accustomed to my presence. A few individuals allowed me to approach them, to within about 5 feet while they were feeding. One individual flew into our Zo-

diacal Light Building, through an open door and became a bit disoriented. Our technician had to gently capture it and release it outside. A number of other individuals seemed to be curiously inspecting our buildings at close range, from two feet or less. We were unable to accurately count their number, as much of the time they were easier to hear than to see. I would estimate that there were approximately sixteen individuals in the flock, although possibly their number was larger. The “flock” at times dispersed into several groups.

It was my understanding that this introduced species dwells in forested areas from sea level up to about the tree line. What seemed peculiar to me about these incidents were the facts that bird sightings are normally so rare up here, and there is a considerable stretch of ground which is mainly barren lava and rocks between the nearest tree line and the summit area where our observatories are located. It thus appears that these birds made a specific effort to fly up to the summit area to feed, and that perhaps they were aware that there was an abundance of seeds here at these times. The fact that these birds were also observed feeding here approximately two months ago, at a time when there was also a flurry of seed production, is somewhat persuasive to me that their arrival (in a flock) at the summit of Haleakala was not merely an accident or a result of poor navigation.

The other conditions which accompanied their arrival were unusually warm air temperature, very low winds for the summit area, and recent lack of rainfall at the summit and elsewhere on Mau'i. There were also a large number of small flies observed and occasionally swarms of dragonflies were present during the week, but not at the same time or on the same days of these sightings.

We found these sightings rather unusual and shall be alert for any future sightings.

Tristram's Storm Petrel (*Oceanodroma tristrami*) on Midway

A Probable Breeding Record

by Paul Baker, Helen Baker and Nanette Seto

At the start of February 1996 while banding Bonin petrels (*Pterodroma hypoleuca hypoleuca*) on Sand Island, Midway Atoll, Paul Baker found and caught a small, dark-rumped, fork tailed storm petrel which came to the entrance of a burrow in a Bonin petrel colony. The burrow was marked so the bird could be returned to it after identification and banding. The bird was identified as a Tristram's (sooty) storm petrel and had an incubation patch. The bird was measured and returned to the burrow after being photographed.

The burrow was monitored for the next week with one or more birds passing in/out of it. In 1980-1981, Grant found adult Tristram's with enlarged testes indicating breeding condition, and some small burrows on Sand Island, Midway, but incubation patches were not mentioned (Harrison 1990). Harrison suggests they probably bred on the atoll prior to the introduction of black rats (*Rattus rattus*) in 1943, but may have been extirpated by rats, and now are attempting recolonization.

Our record is the first recent one to indicate egg laying and incubation on Sand Island.

Reference

Harrison, C. S. 1990. Seabirds of Hawaii. Cornell University Press.

Moving?

Please allow four weeks for processing address changes. Because our records are kept in order by zip code, we need both old and new addresses.

The Egg of the 'Akohekohe Seen and Described

by Paul Baker, National Biological Service

A complete egg of the akohekohe (*Palmeria dolei*) had never been seen or described until this year, although egg fragments have been found. In April 1996, I found the nest of a pair of 'akohekohe in the Hanawi Natural Area Reserve on east Maui. After the single chick fledged, I collected the nest.

The nest was positioned in a terminal leaf cluster of an 'ohi'a (*Metrosideros polymorpha*) tree, but only 7 m above the ground. One egg was in the nest, but it was broken during collection.

Egg description: approximate length 23 mm, width 16 mm, eggshell thickness 0.08-0.07 mm.

Appearance: oval shape, ground color off-white with a beige tone, many irregular shaped and distributed pale brown spots and blotches from 0.1-1 mm diameter over the whole surface of the egg. At the wider-blunt end of the egg, spotting so dense that the cap of the egg almost entirely dark brown (5-10mm across).

Whole egg general appearance much like that of other Hawaiian honeycreepers, especially palila (*Loxioides bailleui*, Berger 1981: 122), but spotting denser over the whole egg than for eggs of any other drepanid I have seen.

Reference

Berger, A. J. 1981. Hawaiian Birdlife, 2nd Ed. University Press of Hawaii.

Scientific Articles Sought

We encourage readers to submit their own articles or encourage others to submit articles about research results in fields related to Hawaiian natural science. Reports of observations of Hawaiian birds or bird life are also welcomed. One of the purposes of the 'Elepaio is to include original scientific articles which are peer reviewed on matters of interest to its members.

Mahalo, Volunteers!

by Sylvianne Yee

Where would **Paradise Pursuits** be without its legions of volunteers who devote countless hours to staffing the games, obtaining prizes, and spreading the word about the Hawaii Audubon Society's environmental quiz program. These wonderful individuals offer their time, expertise and infinite good humor. They come from all walks of life to help educate our young people about the environment and assist them in making environmentally responsible choices and decisions.

Three in particular have taken on the big task of outer island coordinators. They cheerfully and competently go about their tasks of setting up the neighbor island games.

Short-tailed Albatross Ingests Coral Rubble

by Paul and Helen Baker

On Midway atoll in February 1996 we were lucky enough to see a subadult short-tailed albatross (*Diomedea albatrus*) which we observed for about twenty-five minutes at a distance of 20 m. The bird was obviously looking for something along the grass/*Scaevola* bush interface and would occasionally peck at something in the sand. It then picked up a piece of coral rubble about 3 cm long and swallowed it. We observed this behavior another four times as the bird walked around. At one point it tried to swallow a very large piece, which got stuck for several seconds then was ejected. This behavior has been described for Laysan albatross (*Diomedea immutabilis*), and black-footed albatross (*Diomedea nigripes*) stomachs have contained pumice and kuikui nuts (*Aleurites moluccana*) (Harrison 1990) but has never been seen on Midway for short-tails.

Reference

Harrison, C. S. 1990. Seabirds of Hawaii. Cornell University Press.

From the Big Island we have **Julie Williams**, our coordinator for the second year in a row. She is a resource teacher for the Department of Education in charge of the Keakealani Outdoor Education Center in Volcano Village. She is also our very knowledgeable host who keeps everything running smoothly and reads the questions for the Big Island preliminary games. Co-coordinating with Julie is **Cathy Lowder**, a long time Sierra Club member and a social worker for the state. Cathy has been active in environmental circles for many years and we welcome her on board as a Paradise Pursuits volunteer coordinator.

Dr. Renate Gassmann-Duvall gets the nod as our old timer — not in age but in years of service to the Paradise Pursuits program. Renate, a biologist, has helped out since the beginning of the program in 1991, and it is due to her efforts that the Mau'i games go smoothly. A huge round of applause to these three who give so much of themselves to our youth and the community.

Schedule of Paradise Pursuits Games

by Sylvianne Yee

You are cordially invited to see our high school students in action as they go buzzer to buzzer in the Paradise Pursuits preliminary games. The schedule is as follows:

O'ahu - February 1 and 8 at 'Olelo, The Corporation for Community Television, 8:00 a.m. to 4:00 p.m.

Mau'i - February 22 at Hawaii Nature Center at Iao, 8:00 a.m. to 3:00 p.m.

Hawai'i - March 1 at Department of Education Annex in Hilo, 9:00 a.m. to 12:00

Kaua'i - March 8 at National Tropical Botanical Garden in Lawai, 9:00 a.m.-11:00

Come out and cheer the students on and increase your knowledge of Hawaii's environment.

Calendar of Events

Monday, February 3

Regular first Monday of the month meeting of the **Conservation Committee**, 6 p.m., at the U.H. Environmental Center (Crawford Hall, Room 317, 2550 Campus Road). All are welcome. For more information call chairperson Dan Sailer, 455-2311.

Thursday, February 6

Monthly meeting of the **Education Committee**, 7 p.m. at BaLe Sandwich Shop in Manoa Marketplace (near Safeway). All are welcome. For more information, call chairperson Wendy Johnson, 261-5957.

Monday, February 10

HAS Board meeting, (always open to all members) 6:30 p.m. at the **new** office (see page 75)

Monday, February 17

HAS Program and Members' Meeting will feature Dr. Al Lieberman, Program Director for the Peregrine Fund in Hawaii, who will give a slide-illustrated talk on captive propagation as a tool for restoration of endangered Hawaiian birds. The

Fund operates facilities at Keauhou on Hawai'i Island and Olinda on Mau'i. Its work on captive propagation of endangered Hawaiian birds started in 1993 as a direct result of the Society's lawsuit to save the critically endangered 'alala and the subsequent settlement agreement. Bring your friends and join fellow HAS members at Paki Hall Conference Room, Bishop Museum, 7:30 p.m. Refreshments provided; HAS books, tapes, and T-shirts available for purchase.

Sunday, February 23

Join HAS President Linda Paul on a **field trip** to Kaena Point Natural Area Reserve (NAR), starting on the Mokuleia side. You can expect to see monk seals, frigate birds and albatross, whales, and tide pools. Honolulu-side participants can carpool from the Punchbowl side of the State Library (just mauka of King) at 8 a.m. They and others should be at the parking space near the Mokuleia barricade at end of road to the NAR at 9 a.m. Reserve with Mary Gaber at 247-0104 by February 17th. Requested donation, \$2.00/person.

Table of Contents

Pox-like Lesions on Endangered Puaiohi (*Myadestes palmeri*) and Occurrence of Mosquito (*Culex quinquefasciatus*) Populations Near Koaie Stream

by Christina M. Herrmann and Thomas J. Snetsinger 73

The Society Has a New Nest

by Susan Elliott Miller 75

Research Grants for 1996 Awarded

by Phil Bruner 75

A Naturalist's Visit to Moloka'i in 1896

by Hugo H. Schauinsland, Alvin Y. Yoshinaga, translator 76

Red-billed Leiothrix Observed at Haleakala Observatories

by Tony Distasio 80

Tristram's Storm Petrel (*Oceanodroma tristrami*) on Midway

by Paul Baker, Helen Baker and Nanette Seto 80

The Egg of the 'Akohekohe Seen and Described

by Paul Baker 81

Mahalo, Volunteers!

by Sylvianne Yee 81

Short-tailed Albatross Ingests Coral Rubble

by Paul and Helen Baker 81

Schedule of Paradise Pursuits Games

by Sylvianne Yee 81

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