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Notes on the Behavior of Released Nene: Interactions With 'Io and a Lava Tube Accident

by Nora Rojek[1]

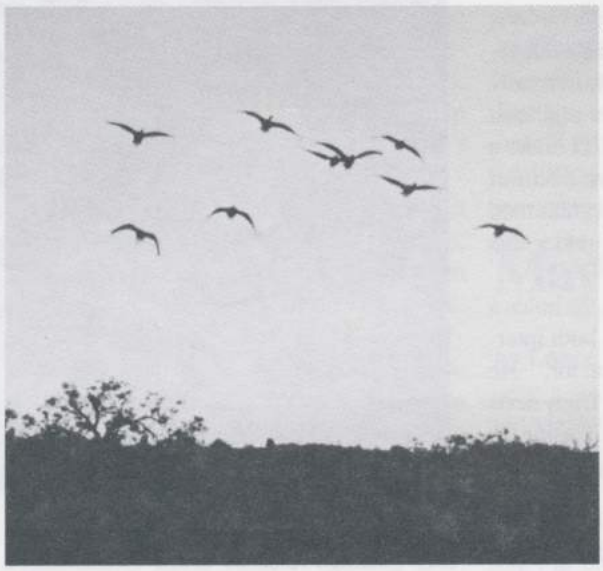

Fig. 1. Nene fledglings in flight. Photo © Nora Rojek.

As part of a study of Nene (*Branta sandvicensis*) gosling feeding behavior, I monitored newly released birds at the Keauhou Nene Sanctuary on Hawai'i for two months in the spring of 1992 and four months in the spring of 1993. The vegetation within the sanctuary consisted of several trees and shrubs typical of subalpine dry shrubland—koa (*Acacia koa*), ohia (*Metrosideros polymorpha*), mamane (*Sophora chrysophylla*), naio (*Myoporum sandwicense*), pukiawe (*Styphelia tameiameiae*), a'ali'i (*Dodonaea viscosa*), ohelo (*Vaccinium reticulatum*), and kukaenene (*Coprosma ernodeoides*)— native (*Deschampsia nubigena*) and non-native grasses—rattail grass (*Sporobolus africanus*) and kikuyu grass (*Pennisetum clandestinum*)— and herbs— gosmore (*Hypochoeris radicata*). The goslings were hatched and raised in captivity at the Olinda Endangered Species Propagation Facility and were released in an open-top pen at 8-10 weeks of age before becoming fully flighted at about 12 weeks of age. In order to relocate and observe the birds after their departure from the open-top release pen, four goslings in 1992 and 14 goslings in 1993 were fitted with radio transmitters. While I was primarily interested in the birds' diets, the use of radio transmitters also provided the opportunity to obtain valuable information on the behavior, survival, and movement patterns of captive-reared released Nene.

The first year survival of both wild and released Nene in high elevation sanctuaries is generally low; less than 50% may survive their second year (Banko 1988, Marshall & Black 1991). At present, the wild population is not considered to be self-sustaining and is likely to decline without the continual release of birds propagated in captivity (Stone et al. 1983, Banko 1988, Black 1990). Whereas predation by introduced mammals is considered a major cause of mortality, other causes may be equally important, e.g., an inadequate diet, road kills, and disease (Black et al 1991, Hoshide et al 1990, Stone et al 1983, Pratt 1991).

Large avian predators were almost certainly a cause of mortality for Nene in the past. Fossil evidence indicates the past presence of several species of large raptors that likely preyed on Nene and the other goose-like species formerly present in the Hawaiian islands (Olson & James 1982). As these predators are now extinct, Nene are considered "relatively safe from aerial, sight-oriented predators" (Banko 1988). Today, the 'Io (*Buteo solitarius*), Pueo (*Asio flammeus sandwichensis*), and the Barn Owl (*Tyto alba*) inhabit sanctuaries where Nene goslings may be released. Banko (1988) notes that "all of these species pose potential threats to Nene, particularly to goslings, although there is no documentation of predation actually occurring."

On a few occasions, I witnessed Nene being followed in flight by 'Io. On 21 April 1992, I was tracking a bird just before sunset. The ten-week-old fledgling took flight as I approached it. As it made a large loop, a hawk flew up behind it and glided along until both landed behind several large dead koa trees. The hawk did not appear to be aggressive in any way, and I observed the Nene unharmed the following day. I also observed a hawk harassing a Nene in flight. On 5 May 1993, I tracked a four-month-old fledgling and found it on the edge of a kipuka within the Keamoku lava flow. After about an hour, the bird took flight and flew across the flow towards another kipuka. As the Nene approached this kipuka, a hawk flew out and chased it back toward the kipuka the Nene had originally flown from. Both birds landed out of my view within this kipuka. Other biologists have observed 'Io in flight with Nene, at times harassing them in flight, but at no time have hawks been observed to physically harm a Nene (Hawaii Dept. of Land and Natural Resources (DLNR) 1972; P. Banko, J. Mello, & N. Santos pers. comm.).

I observed several 'Io within the area of the Nene release pen during two weeks in late spring of 1993. On 15 April 1993, I witnessed an interesting interaction between several Nene and an 'Io which was definitely acting in an aggressive manner. At 1300 hrs, I was tracking a young fledgling (State band identification code TI) whose signal indicated it was close to the release pen. There also were seven other fledglings (all capable of flight) feeding within the release pen. These seven

birds took flight and made a large loop around the area. TI joined the seven but flew lower and behind them. As the eight flew over a grass enclosure adjacent to the release pen, a hawk suddenly flew out from a nearby kipuka and headed straight for TI, knocking it 20 to 30 feet to the ground. The hawk continued to fly behind the seven other birds, which were calling loudly. After a few passes, the seven landed in the pen and the hawk landed a short distance away.

I approached the grass enclosure to check on TI and initially did not observe the bird. As I approached a patch of tall grass, TI suddenly ran out and flew off. The bird flew normally and landed about a half mile to the southeast (SE). The following day, I found TI under a pukiawe bush about a quarter of a mile SE of the release pen. The bird appeared unharmed but was very still and remained under this bush all day.

Griffin (1985) found that the 'Io holds a year-round territory and displays both inter- and intra-specific agonistic behavior. He observed intruders being chased from nests and territories. Instances of 'Io chasing or striking Nene in flight probably represent territorial aggression rather than predatorial attacks.

All my observations occurred in April and May, the peak period for 'Io egg laying. The day before the attack on TI, I saw a pair of hawks chasing each other and calling very close to the release pen in a typical courtship display (Griffin 1985). Because the 'Io neither returned to TI after it fell to the ground nor attacked any of the other seven Nene, predation by the hawk was probably not the prime motive for the attack. But it cannot be ruled out completely. While their diet consists of a large number of small mammals and passerines, 'Io have been observed to prey on birds as large or larger than Nene, such as Kalij Pheasant (*Lophura leucomelana*) and Wild Turkey (*Meleagris gallopavo*) (Shallenberger 1977, Griffin 1985). In addition, Griffin (1985) observed what he called a "predator avoidance response" by three Nene as an 'Io soared above them, and Banko (1988) observed Nene intently watching hawks. These observations indicate that 'Io do, in fact, affect the behavior of Nene.

Besides the sources of mortality previously mentioned, Nene fledgling inexperience and lack of familiarity with their environment may also result in their injury or death. My observation of one such incident would not have been possible without the use of radio telemetry. In March 1992, the last four goslings released at the Keauhou site were fitted with transmitters as a test run for my study. For six days after they left the release pen, the three females (state bands: XB, XF, and ZU) were either visually observed together or their radio signals placed them in the same location. On the seventh day, XB and XF were observed feeding together, whereas ZU's signal indicated it was elsewhere.

Fig. 2. ZU rescued from lava tube with assistance of Joey Mello. Photo © Nora Rojek.

The following day, 20 April, I went in search of ZU with the assistance of S. Conant and T. Martinelli. The signal came from the same direction as the previous day, and we found ourselves on top of a lava tube with a very strong signal. While I wondered if my receiver was malfunctioning, Conant observed ZU at the bottom of a hole in the lava tube. The hole through which the bird fell was approximately four feet in diameter and the floor of the lava tube was seven feet below. The hole was partially surrounded by pukiawe shrubs. There were no exits within the tube itself, other than the hole in the roof, and the sides of the hole were smooth, making it impossible for the bird to climb out. With the help of Joey Mello, of the DLNR, Division of Forestry and Wildlife (DOFAW), and a rope, we were able to rescue ZU (Fig. 2). Although the bird appeared healthy and uninjured, it was obvious that it would not have been able to escape by itself. Fledglings I have observed require a high point to take flight and would not be capable of flying out of the small roof opening.

Lava tubes are a major source of specimens of the Hawaiian avifauna, including fossil, recently extinct, and extant species (Olson & James 1982). Olson and James (1991) note that the "bones of *B. sandvicensis* are found regularly in lava tubes in various parts of the island of Hawaii . . ." As a source of mortality, such accidents in the rugged environment inhabited by the Nene could occur often and remain undetected. Radio telemetry is an important technique for investigating mortality factors.

Acknowledgments

Funding for this project was provided by grants from the State of Hawaii, DLNR, DOFAW, and the U.S. Fish and Wildlife Service, Ecological Services Office. Special thanks for additional support and logistics provided by Carol Terry, Nelson Santos, and Joey Mello of DLNR, DOFAW and the staff of the Olinda Endangered Species Propagation Facility. For help in the field I would like to thank Charlotte Forbes and the Department of Resource Management of Hawai'i Volcanoes National Park, and numerous volunteers. Assistance in housing from Carter Atkinson, Darcy Hu,

David Kuwahara, and the Department of Resource Management of Hawai'i Volcanoes National Park was greatly appreciated. For helpful comments on the manuscript I would like to thank Paul Banko, Sheila Conant, Chuck Stone, and Carol Terry.

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[1]Department of Zoology
University of Hawaii at Manoa
Honolulu, Hawaii 96822

Jodi Kohagura and Dennis Young. Photo © Sheila Laffey.

Paradise Pursuits: The High Schoolers Behind the Scenes

by Andy Cowell

In addition to the many high school students who competed in Hawaii Audubon's Paradise Pursuits and appeared on television in the semi-finals and finals, two high school students volunteered their time in the HAS office to help put on the program that their fellow students participated in.

The two, Dennis Young and Jodi Kohagura, just completed their junior year at McKinley High School. Ironically, their school is one of the few without a team. McKinley does have a student volunteer program, however, and after Paradise Pursuits coordinator Sheila Laffey spoke to students in the program about Paradise Pursuits, the two decided to give it a try.

Kohagura says Laffey "made it sound interesting" to work with the program. And was it? Definitely. Kohagura wanted the experience of working in an office, and spent her time running errands, doing mailings and photocopying, and taking care of all the little details that keep things running smoothly. Young wanted to gain experience working with computers. He said that he learned a lot about various software programs as he helped organize and update files and mailing lists and do word processing.

The two came in every Tuesday morning for three hours, from October through May. Laffey said, "I really couldn't have done this without them. The mailings alone involved hours and hours of work." Both students agreed that the experience has been valuable. Young noted, "it's helped me communicate more openly." Kohagura commented, "it's helped make me more responsible."

Young, who arrived here from China eight years ago, wants to be a dentist. Kohagura, who was born in Hawaii, is interested in animals and medicine and hopes to combine those two interests in a career. For both, the work was not only valuable office and computer experience but also an introduction to environmental issues. Neither had heard about Hawaii Audubon before hearing Laffey's presentation at their school, but Young said, "I would like to participate in the competition next year if possible." Kohagura noted, "It seems like the government here doesn't care about the environment, so people think they don't need to either and it's not important." Paradise Pursuits is Hawaii Audubon's way of showing that kids do care.

Birding on O'ahu

A two-page guide listing areas on O'ahu where interesting birds may be found and where access is not a problem is available. Written by Peter Donaldson, it offers important information for birders unfamiliar with O'ahu. It does not give detailed directions or information on bird identification. For a free copy, send a self-addressed stamped envelope to O'ahu Birding Guide, HAS, 1088 Bishop St., Suite 808, Honolulu, HI 96813.

Book Review by Andy Cowell

The Beak of the Finch: A Story of Evolution in Our Time

by Jonathan Weiner, Cloth, $25.00, 1994, Alfred A. Knopf, New York, NY

Most nature enthusiasts in Hawaii are familiar with at least some of the famous Hawaiian examples of "adaptive radiation," whereby one original colonizing species has evolved into many different species occupying many different ecological niches: the silverswords, the honeycreepers such as the 'I'iwi, 'Amakhi, and 'Apapane, the *Drosophila* fruit flies, of which Hawaii has one third of the world's total, or the unique insect fauna of the lava tubes. Yet most of us probably consider the process of evolution and the origin of new species to be a very slow process, invisible within the span of a single lifetime: it all seems to have happened "in the past."

The Beak of the Finch is the story of evolution happening right now, at an incredibly rapid rate, and actually being measured and observed by a pair of evolutionary biologists. The two scientists are studying another famous example of adaptive radiation, the native finches of the Galapagos Islands. These birds, seen by Darwin in 1856, all derived from a single ancestor, and all so perfectly adapted to their habitat, have traditionally been sighted as the single greatest influence on his theory of evolution (though the book actually reveals that this is a scientific "myth" to some extent).

The biologists, working on a single small island, have been able to weigh, measure, and closely observe every bird on the island over a period of 20 years. They have shown that in times of stress, a difference in bill size of only one millimeter can be the difference between life and death for the finches: natural selection at its harshest is played out from year to year. They have been able to document adaptive shifts in the finches in the space of only a few seasons as the island's environment changes. All of this work is lucidly chronicled by the author, and the book is certainly accessible to non-scientists. The result is an absolutely fascinating account of the processes of nature, and of the work of modern biology.

Interspersed with the account of the finches are reports on other studies from around the world on the processes of evolution and natural selection, including some from Hawaii. The continual message is the rapidity with which evolution can occur, and the way in which small changes can have huge results in the life of an organism.

The book then expands its focus in the last third to consider the implications of rapid, on-going evolution for humans, covering topics such as pesticide use and the increasing ineffectiveness of modern antibiotics to fight disease. The final message is one of both awe and humility in the face of nature, and a plea for more understanding of natural processes and more caution in trying to control and manipulate those processes. This is a lesson which many of us in Hawaii have learned all too well—and which some of us still haven't learned well enough.

Although this book becomes slightly disjointed at times because of the number of examples it uses and the ground it seeks to cover towards the end, it is absolutely fundamental for anyone in the general public who wants familiarity with the latest scientific understanding of evolution and natural selection. More importantly, it is an extremely well-written, entertaining, and evocative piece of literature which has the potential to change the very way in which we look at nature.

Albatross Update

More than 30 Hawaii Audubon Society volunteers participated in monitoring Laysan Albatross behavior on Kaohikaipu Island off the windward coast of O'ahu this past winter and spring. According to biologist Steve Kress of the National Audubon Society, "we now have the first detailed glimpse of colony formation in this species."

At Kaohikaipu, a "fake colony" of albatross was established. It featured two groups of decoys and sound equipment—one with adults only, and one with chicks, ceramic eggs, chick calls, and adults.

Kress and fellow biologist Richard Podolsky had theorized that the latter group would be more attractive to the birds. Kress reports that at times as many as four Laysan Albatross were prospecting on the island, some of whom stayed for a week or more, favoring the decoy group which contained chick models.

Kilauea Point NWR Reopens

Kilauea Point National Wildlife Refuge has reopened after 20 months of repairs due to damage from Hurricane 'Iniki. During the summer it will be open Monday through Thursday, from 10:00 a.m. to 4:00 p.m. However, periodic closings may occur subject to construction schedules, so visitors are encouraged to call the refuge on Kaua'i at 828-1413.

'Iniki destroyed the visitor center, three garages, a vehicle storage/plant nursery building, and the maintenance shop. In addition, the historic lighthouse, storage bunker, environmental education center, residence, administrative building, public restrooms, and fee booth were extensively damaged, and roads, trails, gates, and fences all needed repair. Two miles of predator fence were damaged, leading to the destruction of more than 200 Wedge-tailed Shearwaters by dogs.

According to Richard Voss, Kaua'i National Wildlife Refuge Complex Manager, almost all of the forested hillside, including many native plants, was damaged or destroyed. All of the native plantings that were less than two years old were heavily damaged.

Even though closed to people, the refuge has been an active site for seabird and Nene nesting. Two broods of Nene were successfully raised on the Crater Hill section this spring and five more from the Olinda Endangered Species Propagation Facility will be released there. A record number of Wedge-tailed Shearwaters and Red-footed Boobies were observed on the refuge this year and 23 Laysan Albatrosses hatched on Albatross Hill.

Source: U. S. Fish and Wildlife Service

Seven 'Alala Hatch in Captivity

As we went to press we learned that two 'Alala hatched at the Olinda Endangered Species Propagation Facility on Maui and five hatched at an incubation facility on the Big Island. There is hope that more chicks will hatch this breeding season. See the August *'Elepaio* for more details.

Hawaii Audubon Society

1088 Bishop Street, Suite 808
Honolulu, Hawaii 96813
Telephone and FAX (808) 528-1432

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Managing Editor:
Lynne Matusow 531-4260
Editorial Assistants:
Jean Campbell, Lila Gardner, Donna de Haan, Robert L. Pyle
Reporters:
Andy Cowell
Distribution:
George Campbell, 941-1356 (H), Christi Moore, Robert Pyle, Alice Zacherle, Alan Ziegler

The *'Elepaio* is printed on recycled paper.

T-shirts for Sale

The Hawaii Audubon Society has a stock of T-shirts designed to spread the Audubon message. Not only are they attractive personal apparel, but they make excellent presents as well.

T-shirts bearing the Society's 'Elepaio logo are available in blue spruce and mountain rose with a black design. We also have a few in ash (gray). In addition, the "hot" Kolea (Pacific Golden Plover) T-shirts are also available. This T-shirt is white with a three-color design of the Kolea and native hibiscus. Proceeds from the Kolea T-shirt go to help HAS fund research on shorebirds in Hawai'i and elsewhere in the Pacific region.

T-shirts are $12 each, plus $2.00 per shirt for postage. They are available in medium, large, and extra large adult sizes only. When ordering T-shirts, be sure to list size and first, second, and third choice of color. To order T-shirts send your check, payable to the Hawaii Audubon Society, to Yvonne Izu, 1957 Alai Place, Wahiawa, HI 96786. Don't forget to add $2.00 per shirt for postage. Insufficient postage will delay your order until the proper amount is remitted. T-shirts are not available at the HAS office.

HAS Dues for 1994

All amounts are in U.S. dollars.
Includes delivery of *'Elepaio*.

Regular Member	
Delivery to U.S. zip code addresses	
Via bulk mail	**$ 10.00**
(Not forwardable to new address)	
Via first class mail	**16.00**
(Hawaii residents: there is no significant time difference between bulk and first class mail to addresses within the state of Hawaii.)	
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Delivery to non-U.S. addresses:	
Mexico (airmail only)	**16.00**
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All other countries (surface mail)	**18.00**
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Introductory dues for National and Hawaii Societies:	**20.00**
(Includes delivery of *'Elepaio* and *Audubon Magazine* as bulk or 2nd class mail to U.S. zip codes. Renewal, $30 annually.)	

Research Grants

The Hawaii Audubon Society makes grants for research in Hawaiian or Pacific natural history. Awards generally do not exceed $500 and are oriented toward small-scale projects within Hawaii. Special consideration will be given to those applicants studying dryland forests and aeolian systems on Hawai'i.

The deadlines for receipt of grant applications are 1 April and 1 October. For an application form send a self-addressed stamped envelope to Grants, Hawaii Audubon Society, 1088 Bishop Street, Suite 808, Honolulu, HI 96813. For more information, call Phil Bruner, (808) 293-3820 (W).

May Field Trip

by Lance Tanino

On a beautiful Saturday morning under clear skies and light tradewinds, 22 participants toured the Red-footed Booby colony on the Marine Corps Base Hawaii (MCBH). The tour was led by biologist Mark Rauzon and escorted by M. J. Jadick from the MCBH Public Affairs Office. Rauzon gave a very informative talk about the boobies and the history of Ulupau Crater. Everyone was able to see the boobies in all stages of nesting (nest building, incubating eggs, downy chicks, and fledglings). The group also saw Great Frigatebirds, Sooty Terns, Brown Noddies, and Brown Boobies.

After leaving Ulupau Crater we visited the Nuupia Ponds Wildlife Management Area. Rauzon described his job studying the population, nests, and behavioral censuses of the Hawaiian Stilt at Nuupia Ponds. Currently the area has 130 Hawaiian Stilts and 46 Black-crowned Night-Herons. Thirty five Hawaiian Stilt nests and six Black-crowned Night-Heron nests have been found. Eleven stilt chicks have been seen walking in the ponds.

Other birds seen were Hawaiian Stilts, Black-crowned Night-Herons, Ruddy Turnstones, and Wandering Tattlers.

Calendar of Events

Tuesday, July 5
Monthly meeting of the Conservation Committee, 6:30 p.m., at the Coffee Line, 1820 University Avenue (in the YWCA). To join or for more information call David Hill, 988-7460 (H).

Thursday, July 7
Monthly meeting of the Education Committee, 7:00 p.m., at the Coffee Line, 1820 University Avenue (in the YWCA). To join or for more information call Emily Gardner, 734-3921 (H). The Committee is actively seeking new members. All are welcome.

Monday, July 11
Board meeting, 7:00 p. m., HAS office. Call Reggie David on Hawai'i, 329-9141 (W), for details.

Sunday, July 17
Ewa Plains limestone sinkholes. Dr. Alan Ziegler will lead a field trip to the sinkholes at Barbers' Point where we will see the geology of the area and hunt for fossil bird bones. Bring water, hiking shoes, hat, and sunscreen. Meet at the State Library on Punchbowl Street at 8:15 a.m. or the entrance to Campbell Industrial Park at 9:00 a.m. For more information call Lance Tanino, weekday evenings, 247-5965 (H). Suggested donation: $2.00.

Monday, August 15
General Membership Meeting, Paki Conference Room, Bishop Museum, 7:30 p.m. See the August *'Elepaio* for more details. Refreshments will be served.

Publications Available

The Hawaii Audubon Society publishes books, checklists, and field cards relating to birds of Hawaii and the Pacific. For a complete price list send a self-addressed stamped envelope to Publications List, Hawaii Audubon Society, 1088 Bishop Street, Suite 808, Honolulu, HI 96813.

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