



The Role of Food Supply in Determining Nesting Time for the Nene

John H. Michael, Jr.

Published accounts of the breeding biology of the Nene (*Nesochen sandvicensis*) noted the unusual habit of nesting during the fall and early winter (Soothill and Whitehead 1978), a time of decreasing daylength in the Hawaiian Islands. Kear and Berger (1980), in a review of wild Nene life history, noted that active nests were reported from late August through early April. They ascribed the reports of the April nests to birds living in the lowlands—an area not presently inhabited by wild reproducing populations. Berger (1972) noted fall nesting was maintained in some captive situations. At the same time, Greenway (1967) reported captive stocks in Europe which initiated nesting in February. He also noted that grasses appeared to be a critical component in the diet and important to nesting success—at least in captive flocks. Kear (1974) suggested the nesting season evolved to be timed to the production of the best available food for the goslings. This paper provides some information on the timing of nesting for captive Nene and supports the idea that some factor involving the production of fresh food may be the actual environmental cue that triggers egg laying.

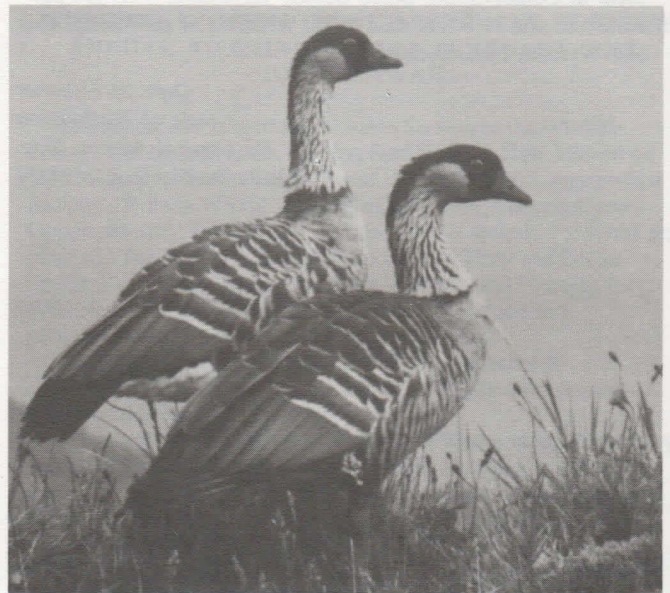
Observations of up to four pairs of captive Nene have been made for the 1984, 1985, 1986, and 1987 nesting seasons. Observations were not made in a systematic fashion, but the birds were cared for and observed daily. All birds are kept year-round in fenced enclosures located in western Washington State. The birds had free run of pens which were about 2000 m sq. The dominant vegetation was a combination of pasture grasses with some broadleafed forbs and small trees also present. The birds have commercial food available at all times in a free access feeder but appear to concentrate feeding on whatever natural foods are present. They particularly concentrate on biting the tips of low-growing grasses. None of the birds are confined to areas with artificial light regimes, and they had constant access to free water.

Nesting time has varied during the four years, with egg-laying occurring from February to May during a period of rapidly increasing daylength. Also occurring at this time, and actually beginning in January, is the active growth of grasses and other herbaceous plants. Nene avidly grazed at this time and generally ignored the commercial feeds. Nene did not appear to change the amount of food they ate, except during incubation, but no quantitative measurements were made.

Observations of the behavior of the males indicate they become very territorial in the fall and attempt to chase away any intruder. Some of the males attempted to defend an area larger than their enclosure—in some cases climbing over the fence to chase away dogs. This aggressiveness intensified through the incubation period.

Soothill and Whitehead (1978) reported several species of Australian waterfowl that respond to rainfall and/or flooding prior to nest initiation, including Black Swan (*Cygnus atratus*), Australian Shoveler (*Anas rhynchos rhynchos*), and Australian Pink-eared Duck (*Malaeorhynchus membranaceus*). Some populations inhabit interior Australia and depend on rainfall or flooding to create the necessary habitat and food supply for successful reproduction. Some of the species mentioned maintain a regular nesting period in areas with a regular pattern of rainfall. Kear and Berger (1980:87-88) outlined their observations of captive Nene populations in England and explained the late January to April egg-laying season:

...long summer days inhibit breeding and are followed by only a short period in September before daylengths decline below the threshold of stimulation. So, although hormones start being secreted, and lead to the appropriate displays, the neuroendocrine mechanism soon becomes inhibited with the onset of shorter days in October. Breeding behavior is not again stimulated until late January, when the 'right' daylength comes around once more.



A pair of Nene, Haleakala Crater, Maui.

Photo by Sheila Conant

Observations of Nene in Washington indicate that at least the males are stimulated to begin courtship in late summer/early fall and that they appear to increase the vigor of their territorial defense through the winter and subsequent egg laying and incubation the following spring. The females do not seem to show any obvious behavioral response until they construct the nest and lay eggs. These observations suggest two explanations for the initiation of actual nesting: 1) the females are responsive to photoperiod in a much more precise manner than males, such that a minimum amount of light may trigger egg laying, or, 2) the female responds to some other environmental cue such as diet quality and produces eggs when some dietary quality threshold is reached. Since the daylength in Hawaii is always above the perceived threshold for hormonal stimulation (Kear and Berger 1980), and since the nesting period of wild birds in Hawaii has been observed to occur both on decreasing and increasing daylengths, it would seem that light is not the critical stimulus in the nesting cycle. The plasticity which Nene have shown in their reproductive biology seems to indicate that the cue which triggers the laying of eggs is somehow tied to the production of fresh forage—probably grass. Rigorous study would probably pinpoint the answer and may demonstrate a key element in nesting and brood success useful to restoration and rehabilitation programs.

Paul Banko and Charles Stone reviewed the manuscript, and their comments and suggestions added substantially to the final product. Their input is much appreciated.

LITERATURE CITED

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COMMENTARY

BIRDS OF NEW GUINEA, by Bruce Beehler *et al.*

The recent review of *Birds of New Guinea* by Andrew Engilis, Jr. ('Elepaio 47:75) prompts some comments and explanations concerning that work's color plates. The reviewer's conclusion "that most color errors can be attributed to the color separation process" is entirely correct. The printer made certain modifications which affected color values in some cases. Further, there was no opportunity for the artists to see color proofs of their plates. Luckily, very few if any of these slight color changes are serious enough to pose problems, although they are aesthetically aggravating, especially to the artists.

I appreciate Mr. Engilis' kind words about certain of my plates, but his statement that my plates "depict incorrect colors of soft body parts including iris and leg color in many species" is in error. The remark seems unrelated to his suspicion of faulty color separation, the implication being one of carelessness on the part of the artist. Unfortunately, he cites no examples.

It is possible that his misinterpretation of "errors" stems in part from a lack of awareness of the considerable variation -- individual, subspecific, age, sexual, and seasonal -- in bare (or "soft") part colors of numerous species. Obviously, only a fraction of this variation can be reflected in the plates. In a book of this sort an artist is allowed space to illustrate one or a very few examples of a species. The number of plates is determined by neither artists nor authors, but by the publisher. Nearly always it is suboptimal, dictating depiction of many fewer figures than desired and, when large avifaunas are involved, requiring much crowding of those which are shown. The alternative, of course, is fewer figures and more "artistic" plates, but at the expense of much useful information. For New Guinea, we chose to provide the maximum amount of information possible in the limited space at our disposal.

Mr. Engilis found those of my plates which were limited to 10-12 species "outstanding." However, crowded and uncrowded plates were painted with the same diligence. On all of my plates extreme care was taken with all bare part colors, and with plumage coloration as well. Except for a handful of species for which few or no data exist, all colors of bare parts -- irides, tarsi, naked skin, etc. -- were taken from (1) carefully prepared specimens with detailed color notes (many collected by the late E. T. Gilliard), largely from the American Museum of Natural History; (2) well exposed, close, color transparencies of living birds, taken by the authors and others; and (3) field notes on colors by the authors themselves. Where discrepancies appeared, additional specimen labels were consulted, photographs tracked down, and correspondence with New Guinea bird experts undertaken, sometimes involving weeks of delay before the eyes or feet of a particular figure could be painted. In not one of the species portrayed was the matter of bare part coloration dealt with casually -- (one of the reasons the painting of these plates covered a five-year period).

All plates were painted under similar (natural) lighting conditions as well, with constant plumage-color comparisons between museum skins and the paintings during and after the latter's preparation. The plates were, in addition, checked for accuracy by the senior author prior to their journey to the printer.

In terms of both unfeathered parts and plumage coloration, therefore, these illustrations are as error-free as possible, given the limitations imposed by the printer's activities and the two-thirds reduction in size from the originals. I might point out, in addition, that virtually every bird figure shown represents a specific individual specimen (or photograph), not merely a "generalized" figure of a particular species as in many field guides. To avoid atypical specimens, selection of bird skins to serve as my models was done

by acknowledged authorities in Papuan ornithology.

Birds of New Guinea now has been used by hundreds of people, and although many letters and a dozen or so published reviews of the book have reached my desk, I have not yet been informed of any specific errors in coloration on any of the plates. However, no bird artist is infallible; we all slip occasionally. Obvious mistakes would warrant correction attempts before a subsequent printing of the volume. I eagerly solicit corrective or supplementary information on bare part colors from field students, bird photographers, and anyone handling living or fresh specimens of New Guinea birds.

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RESPONSE TO DALE A. ZIMMERMAN

The response by Dale A. Zimmerman concerning my criticism about his artwork in *Birds of New Guinea* is well taken. However, his response cannot change my opinion concerning errors in the depiction of soft body color of "many" species. I base my comments, not on casual observation, but on extensive field work I have conducted in Papua New Guinea since 1984.

Most, if any, reviewers did not have the opportunity to field test this book in the same manner as I. On a 1986 Bishop Museum expedition to Northern PNG (where I was chief Ornithologist), I was able to make direct comparisons of Zimmerman's illustrations to hand-held birds. I objectively compared nearly 150 species, and when discrepancies were noted I made an attempt to determine whether: (a) discrepancies were sexual, age or seasonal in nature; (b) discrepancies were attributed to subspecies differences. I also observed over 300 species during that expedition which added greatly to my comparisons. When errors were apparent, as revealed by several individuals of a given species, I consulted other members of the expedition as to their interpretation of those questionable colors.

Also, nowhere in my review did I imply "carelessness" in the depiction of soft body colors by the artist. Errors of this kind are frequently encountered in field guides, despite scrutiny by the artists and authors, especially when concerning rarely encountered species. My comment concerning overcrowded plates, also, was not a criticism of the quality of the illustrations, but was directed towards organization and ease of use (which Dr. Zimmerman points out "is determined by the publishers"). I might add that the last statement of my review where I "strongly recommend *Birds of New Guinea*" was accidentally omitted (*'Elepaio* 47:75). A correction was made in *'Elepaio* 47:84; however, I am unaware that Dr. Zimmerman received this information. Space was a major consideration for why I did not cite examples in my original review.

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INDEX: VOLUME 46

Many thanks to Joel Simasko for preparing the index for volume 46 of the *'Elepaio*! Apart from the usual effort of sorting out authors, titles, and subjects, Joel devised a database program to format this information, making the job of preparing future indices much easier. The index for volume 46 is inserted in the present issue.

OCTOBER FIELD TRIP REPORT JAMES CAMPBELL NATIONAL WILDLIFE REFUGE

A large group (20+) turned out for the 18 October field trip to the National Wildlife refuge in Kahuku. It was warm and overcast, and visibility for birding was good. When the group entered the refuge at 9 AM, everyone observed the endangered native waterbirds, which included Hawaiian Stilts, Hawaiian Ducks (Koloa), Hawaiian Gallinules, and Hawaiian Coots. Indigenous Black-crowned Night-Herons were also seen by all. Migratory waterfowl and shorebirds encountered by the group included Northern Pintails, American Wigeons, Northern Shovelers, Lesser Golden-Plovers, Wandering Tattlers, Ruddy Turnstones, Sanderlings, a Pectoral Sandpiper, and two Long-billed Dowitchers. A Red-footed Booby and Great Frigatebird were the only seabirds seen during the outing. Introduced bird species included Cattle Egrets, Red-vented Bulbuls, Common Mynas, Northern Cardinals, Spotted Doves, Barred Doves, Japanese White-eyes, Nutmeg Mannikins, Chestnut Mannikins, Common Waxbills, House Finches, and a Ring-necked Pheasant. Several members of the resident Fulvous Whistling-Duck population were observed at the Amoriant Prawn Farm along with the "vacationing" Canada Goose who has been a resident for several years. The outing ended around noon. A total of thirty bird species had been observed and enjoyed by all.

Bruce Eilerts

WESTERN SECTION OF THE WILDLIFE SOCIETY ANNUAL MEETING -- 10-13 FEBRUARY 1988 HILO, HAWAII

The annual meeting of the Western Section of the Wildlife Society will be held at the Naniloa Surf Hotel in Hilo, Hawaii on 10-13 February 1988. The theme of the meeting is "Conservation Biology's Role in Wildlife Management: Issues, Concerns, and Opportunities." Two general sessions and six technical sessions are planned. Topics for general sessions include: Feral and Exotic Species; Vegetation Management for Wildlife; and Planning for Wildlife and Energy Development. A poster session and photography contest and exhibit are also planned.

The Conference will highlight emerging concerns of conservation biologists as well as unique wildlife management issues on the Hawaiian Islands.

Two full day field trips are planned for Wednesday, 10 February and Saturday, 13 February. One will be to Volcanoes National Park. On this trip we will see an active volcano, habitat for the Nene, and programs to restore native forest vegetation and control feral animals and exotic plants.

The second trip is planned along an elevational gradient to the saddle between Mauna Loa and Mauna Kea, to examine native rainforest and dryland forest, and interactions and management conflicts between wildlife and introduced game species.

If you need more information on this conference, contact John Henderson during the day at 943-1221. All are invited and welcome to attend.

EXECUTIVE DIRECTOR

The Hawaii Audubon Society (HAS) may hire its first executive director during the first half of 1988, subject to funding and final approval by its board of directors. HAS seeks qualified applicants capable of establishing programs for fund raising, oversight of federal and state natural resource agencies and public education on conservation issues in Hawaii. Candidates must be highly motivated entrepreneurs with proven experience in fund raising, program administration and business. Experience in interacting with elected officials and government natural resource agencies would be helpful. Send resume or inquiry, including salary requirements, to: Search Committee (Executive Director), Hawaii Audubon Society, P.O. Box 22832, Honolulu, HI 96822.



"HIDDEN VALLEY"

Hidden Valley, the oil painting by Patrick Ching, is available now in the form of posters and notecards printed on fine quality quintessence paper.

To order signed posters at the discount rate of \$10.00 each, or 5x7 note cards at \$6.00 per dozen, call Patrick Ching at 839-2866. Twenty-five percent of the proceeds go to support the Hawaii Audubon Society.

The artist will also be available to personally autograph cards and posters at the HAS December general meeting.

PHOTOS NEEDED FOR POSTCARDS

Do you have a great photograph or slide of a native Hawaiian animal or plant? Would you like to share that picture with others and help the Hawaii Audubon Society at the same time? We are expanding the selection of postcards sold by the Society to include one each of a Hawaiian plant, forest bird, water bird, and invertebrate.

If you are interested in submitting a photo for consideration, please contact Marjorie Ziegler at 247-5318, 948-8467, or send your photo to the Hawaii Audubon Society, P. O. Box 22832, Honolulu, HI 96822 along with your name, phone number, and information about the photo (name of subject, location, date, photographer, etc.). Selected photographs become the property of the Hawaii Audubon Society. *Mahalo nui loa!*

DECEMBER PROGRAM: NATURAL HISTORY OF LAYSAN ISLAND

At the general meeting of HAS on Monday, 21 December, Marie Morin will be presenting a slide program showing many of the wildlife species inhabiting Laysan Island. Laysan, which is located 790 miles northwest of Honolulu, is a coral atoll that is less than 2 miles long and 1 mile wide. This island is an important breeding area for 17 species of pelagic seabirds as well as for the Laysan Duck, Laysan Finch, Hawaiian Monk Seal, and the Green Sea Turtle.

Marie Morin is presently a Ph.D. candidate in the University of Hawaii's Zoology Department. She is studying the breeding ecology of the Laysan Finch on Laysan.

DECEMBER FIELD TRIP WAIALAE NUI RIDGE

The 13 December field trip will be a healthy hike along Waialae Nui Ridge in the eastern Koolau mountains where participants stand a good chance of sighting native 'Amakihi, 'Apapane, 'Elepaio, White-tailed Tropicbirds, and possibly a Hawaiian Short-eared Owl (Pueo). A wide variety of introduced forestbirds will also be encountered. The ridge trail ascends to the top of the Koolaus and overlooks Olomana. Most of the vegetation will be native, and since Uluhe fern is abundant in this area, long pants are recommended. Pack a lunch and be sure to bring along your binoculars and bird and plant guides. This hike will be steep at times, but it will certainly be worth a little huffin' and puffin'. Steve Perlman and Bruce and Robin Eilerts will be leading the trip and will be available to answer questions regarding the area's plant and animal life. Those wishing to go should meet in front of the State Library on Punchbowl Street at 7:30 AM. For more information, call Steve Perlman at 734-0519 or the Eilerts at 941-5974.

1987 CHRISTMAS COUNT

There will be seven H.A.S. Christmas Counts this year. These counts are always exciting, with records to be broken and new birds to be seen. We especially need people to attend the counts on the outer islands. The counts have been scheduled to facilitate a weekend visit to Kauai, Maui, or Hawaii. For information on the Kauai counts, contact Winona Sears at 822-3045 (res.), for Oahu count contact Bob Pyle at 262-4046 (res.), for the Maui count contact Fern Duvall at 572-0690 (wk.), and for the Volcano count contact Paul Higashino at 967-7262 (res.). Workshops on bird identification will be conducted on Oahu: lecture at 7:30 PM on 10 Dec. at Atherton Halau, B. P. Bishop Museum and field trip on 12 Dec., yet to be announced. A workshop for the Volcano count was announced in the last issue of *'Elepaio* (47:104); it will be held on 18 Dec. The counts, with dates and leader, are as follows.

OAHU:

Honolulu -- Sunday, 27 December, Bob Pyle
Waipio -- Saturday, 2 January, David Bremer

KAUAI:

Lihue -- Saturday, 19 December, Winona Sears
Waimea -- Sunday, 20 December, Marsha Erickson
Kapaa -- Sunday, 27 December, Barbara Stewart

MAUI:

Puu O Kali -- Sunday, 3 January, Fern Duvall

BIG ISLAND:

Volcano -- Saturday, 19 December, Paul Higashino

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NOTICE TO AUTHORS

The 'ELEPAIO, Journal of the Hawaii Audubon Society, invites authors to submit scientific articles on natural history of Hawaii and the Pacific. Scientific articles are subject to peer review. The 'ELEPAIO also serves as a newsletter to inform members of conservation issues, Society events, and other subjects of interest to members. Manuscripts of articles and newsletter items may be sent to Thane Pratt at 1022 Prospect St., Apt. 1103, Honolulu, HI 96822. Articles not subject to peer review MUST BE RECEIVED BY THE 15TH OF THE MONTH to be considered for publication in the next month's issue.

SCIENTIFIC ARTICLES should be typewritten and double-spaced scientific, and three copies should be submitted. Any photographs should be submitted as photographic prints, in color or black and white (they will appear in black and white). The prints should be 3.5 X 5 inches, or larger, and should be adequately cropped if cropping is required. Original copies of figures (e.g., maps, graphs) should be clear and clean, with lettering large enough to remain legible upon reduction to fit the newsletter format. Authors are advised to design their illustrations with the 'Elepaio's columnar format and size in mind (please look at a copy of the journal).

FREE ICE CREAM!

Requests for flavors are now being received for the Saturday, 12 December paste up of the 'Elepaio at Thane Pratt's house. Note that this month's paste up will be a week earlier than usual. Paste up will begin at 1:00 PM. We thank Sheila Conant, Joel Simasko, Cappy Summers, and Leann Syrotuck for their help on the November paste up. For more information call Thane Pratt at 524-8464.

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All local memberships and subscriptions are for the calendar year.

CALENDAR OF EVENTS

- Dec. 12 (Sat.) 'Elepaio paste up at Thane Pratt's house, 1:00 PM. Call 524-8464.
- Dec. 13 (Sun.) Field trip to Waialae Nui Ridge. Meet at the State Library on Punchbowl St. at 7:30 PM. Announcement on page 120.
- Dec. 14 (Mon.) Board Meeting at Bishop Museum at 7:00 PM. Call Allen Allison, 848-8145.
- Dec. 21 (Mon.) General Meeting at Atherton Halau, Bishop Museum at 7:30 PM. Program: Natural History of Laysan Island, by Marie Morin. Announcement on page 120.

JOIN THE CHRISTMAS COUNTS! See page 120

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