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ECOLOGY OF THE FERAL PIG ON HAWAI'I ISLAND*

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The Hawai'i Division of Fish and Game has been actively involved in a feral pig study for approximately six years. Previous work was centered in the mountain-pasture habitat in conjunction with extensive work on the study of captive, known-age feral pigs. At the present time, emphasis is being placed in the fern or rain forest habitat since it is the most extensive feral pig habitat found in the State.

The objective of this study has been to accumulate data regarding general behaviour, food habits, reproductive patterns, movement patterns and diseases of feral pigs. This data will be used to manage feral pigs on State land so as to ensure a continual yield of this resource.

History: The Hawaiian wild pig was originally introduced to the islands by the early Polynesians who first settled here. They brought with them domestic pigs which were probably descended from the Asiatic form of Sus scrofa. Over the years, these animals populated the forests of all the major Hawaiian Islands. Later, settlers from other lands also brought their domestic swine and these have mixed with the original wild pigs in most areas where they are presently found.

Description: Hawai'i's feral pigs closely resemble domestic pigs. Coloration is usually black, but brown, white and mixed colors are occasionally seen. The average weight of a mature boar is probably 125-150 pounds, but some do exceed 200 pounds. Wild pigs have been reported in excess of 500 pounds, but pigs of this size are very unusual.

In some of the more remote and isolated sections of Hawai'i Island, particularly on the slopes of Mauna Kea, the wild pigs have long been isolated from the influence of escaped or released domestic swine. They appear to have reverted to form to where they now almost resemble their probable ancestors, the European or Asiatic wild boar. The young of these Mauna Kea pigs are occasionally born with striped coats, consisting of a light brown base color, with longitudinal stripes of dark brown or black. This is also a characteristic of the European Boar.

There are several anatomical and phenotypic differences between the European wild boar and the domestic pig, but these differences are not easy to detect when European and domestic stock are subjected to the same environmental conditions.

Presently, one of the most reliable methods for distinguishing between the two is by cytogenetic determination. Recent studies have shown that cells of European wild boars have 36 (2N) chromosomes while domestic pigs normally contain 38. Crosses between the two produce fertile offspring with 37 chromosomes. It is suggested that the differences in chromosome numbers are due to rearrangement of chromatin and not to actual differences in total content of chromosomal material (McFee, Banner, and Rory, 1966).

An attempt was made to detect any European stock that may be present in our feral pig population. Cells from several pigs captured in the Pu'u Lā'au-Kemole area of Mauna Kea were tested for chromosome number. All pigs tested were phenotypically similar to European wild pigs. They exhibited long snouts, short erect ears, guard hairs with split ends,

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* Excerpts from the conference papers of the second Hawai'i Wildlife Symposium held in Hilo, Hawai'i, 12 May 1971, by special permission from State Division of Fish & Game.

and an undercoat of fine bronze wool. The number of chromosomes found in every instance was 38, the same number found in domestic pigs. It appears that our pigs have reverted to the European or wild phenotype, but are genetically comparable to domestic stock. More animals will be tested from other areas of the island to confirm these results.

General Behaviour: Wild pigs generally carry out most of their activities during the late afternoon, night, and early morning hours.

Ranchland and forest pigs commonly travel along well defined trails. These may converge on water holes or feeding areas. Along the edges of the open grasslands, they often wander far out into the pastures and away from cover while feeding, returning to the brush or forest in the early morning. As they head back to cover, they again may follow game trails leading into the thicket; not all pigs stick to these trails.

Wild pigs do not exhibit a strong herding instinct except when very young. Most groups seen are probably family groups or random animals grouped temporarily for companionship. When disturbed, the groups readily break up, with individuals running off alone. Older boars appear to prefer solitude, except when sows are in heat. The typical group observed is composed of one or two old sows and several younger boars and gilts, probably the offspring of the old sows. The sows may also have a nursing litter with them. It is common to see two generations together.

The aggressive nature of wild boars is well known throughout the world and Hawai'i's wild pigs are no exception. Though they will normally run at the first sign of danger (if they are able), they will not hesitate to attack if they are cornered, wounded, or have been unduly excited. Man runs little risk of danger with wild pigs unless he stumbles onto a sow with little ones. In this instance, she may attack.

Food Habits: Data on food habits and preferences were collected from field observations and examinations of stomach contents at necropsy.

In the mountain-pasture habitat of Mauna Kea, grasses (unidentified spp.), gosmore (Hypochaeris radicata), and bracken fern roots (Pteridium aquilinum) were the most important species eaten by volume. When available, gosmore blossoms and leaves were eaten almost exclusively. Bracken fern roots are dug up and eaten in quantity where they occur; the search for these roots is responsible for much pasture damage in this area.

In the dense rain forest habitat, hāpu'u (Cibotium spp.) or tree fern is the most important food species throughout the year. Pigs break open the trunk of this fern for its starchy interior. This plant is an excellent food species, and pigs in these areas are invariably fat. Hāpu'u may be given up entirely when fruits such as Banana Poka (Passiflora sp.) are in season. Other items eaten when encountered are carrion, fronds from several species of ferns, sedges, most fruits, snails, slugs and insects. Earthworms are avidly sought and rooted for, but they make up a minor item of the diet.

Reproduction: When a sow is ready to farrow, she usually builds a nest composed of grasses, fern fronds, and branches. The nest is hollowed out so that it forms a dry, sheltered windbreak which offers some protection to the newborn piglets. Piglets probably leave the nest a week or two after birth and remain with the sow until they are weaned at about 2-3 months of age.

Sows may be bred before the piglets are weaned and therefore, can produce two litters a year. The average litter size is approximately five young.

There is a definite winter-spring farrowing season in the mountain-pasture regions. This farrowing season may be related to the usual winter-spring rainy season which is the best time of the year for lactating sows because of the lush feed.

In the warmer and wetter forest habitat, the winter-spring farrowing season is also pronounced. Sixty to seventy percent of all mature sows may farrow at this time. Water does not seem to be a limiting factor here as feed and water are abundant all year. There is probably a secondary farrowing season in late summer. A few small pigs may be seen during any month so breeding and farrowing occur to some extent all year long.

Movement: In order to study movement and home range of feral pigs, a tagging program was initiated. Over 800 pigs have been ear tagged to date. Many of these have been recaptured. Tag recoveries indicate that pigs in the mountain pasture habitat travel greater distances than rain forest pigs, but both are relatively sedentary under normal conditions. Forest pigs probably move less than pasture pigs because food, water and cover are more abundant in this habitat. Also, forest terrain is much more difficult to traverse.

To date, the longest time elapsed between tagging and recovery was one year, 11 months. The greatest distance traveled was by a sow recaptured at Parker Ranch. This animal was

free for 10 months and was killed 3.8 miles from the tagging site.

Hunting pressure or disturbance definitely induces pigs to temporarily move from an area. This was illustrated in several forests where I continued tagging activities for extended periods. If a pig was tagged and not hunted for a period of time, it was usually recaptured within a few hundred yards of the tagging site and occasionally at almost the same spot.

On two separate occasions, it was possible to observe what appears to be a homing instinct in feral pigs. An adult boar and a young gilt were trapped and tagged at the Pōhaku-loa Nēnē Project area. Each was transported to Ahu-moa Hill, 7.5 miles away on a straight line course and released. The boar returned to the project area and was retrapped again 7 days later. The gilt returned in 8 days and was caught in the same trap.

Parasites: Ectoparasites and endoparasites are very common in feral pigs. They cause unthriftiness and probably contributed to the mortality of piglets by lowering their resistance to disease. Feral pigs are plagued by at least 3 different ectoparasites and 10 different endoparasites. Some pigs were found infested with 5 different parasites.

Diseases: Pigs are probably susceptible to a greater number of diseases than any other domestic or wild animal. Many of their diseases are transmissible to man.

Tests indicate that trichinosis is present in our feral pig population, but the incidence does not appear to be great.

Serological evidence indicates leptospirosis may occur in feral pigs, but attempts to culture the organism have failed.

Brucellosis does occur in feral pigs, but this disease is restricted to the Kona area. Serological evidence indicates at least 50 percent of the pigs are infected animals proved conclusively that Brucella suis is the causative organism.

Pigs are infected by eating infected material or drinking infected water. This disease may spread when infected boars breed sows.

Symptoms in pigs are usually unapparent; however, abortion, infertility, posterior paralysis and lameness may be present. Boars may exhibit swollen testicles. Abortion is usually the first indication of Brucellosis, but not all infected pigs abort. Some infected animals may only abort once and then continue to farrow normally. The offspring of an infected sow may be born with this disease, but it will not usually develop until the piglet reaches sexual maturity.

Brucellosis does occur in man and is known as Bang's disease or Undulant Fever.

Man is infected by eating improperly cooked meat or getting blood on abrasions or cuts of the skin because the organism is active in the blood. It is dangerous to handle the reproductive organs of infected animals becaus they are usually teeming with Brucella organisms.

Symptoms in man are fever, loss of weight, and swollen joints. Recovery is usually prolonged. Death may occur in acute cases.

Prevention consists of completely cooking all wild pork, avoiding contact with infected blood, and avoiding contact with infected reproductive organ.

References

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Letter to Director Lynn A. Greenwalt, U.S. Fish and Wildlife Service; Regional Director; and Eugene Kridler, Office of Endangered Species; from President Sheila Conant, 14 July 1976:

Endangered Plants

Since the enactment of the Endangered Species Act of 1973 the Hawaii Audubon Society has followed with great interest the process of incorporating protective measures for plants into the Act. Because we are so deeply concerned with the protection of our 29 endangered birds, we are naturally anxious for the ecosystems upon which they are dependent for survival to be adequately protected. Many of these ecosystems constitute habitat for the over 700 Hawaiian pla nts that have been proposed for inclusion in the official U.S. List of Endangered and Threatened Species in the federal register on June 16, 1976.

The scientists who contributed to the preparation of a list of threatened and endangered plants represent the best possible experts that could have been chosen to do so. These scientists and the interested laymen who participated in list preparation have all contributed to the tremendous task of a ssembling a list with meticulous care and attention to all available information. Work to compile such a list was first initiated in 1953 by Dr. Raymond Fosberg, so that the present list represents the culmination of over 2 decades of effort by qualified experts. In view of the foregoing, the Hawaii Audubon Society strongly urges the adoption of the list as published in the federal register on June 16,1976.

We are aware that Hawai'i State government officials, among others, are urging that the list be drastically shortened because they fear it will cause serious delays or cancellation of some state government activities. We take strong exception to this viewpoint. In the first place whether or not a plant is placed on the list should be a decision based on biological fact and not political opinion. How the plant is to be protected, i.e., whether or not protection could or should affect economic concerns, is a decision that can and probably will be affected by political as well as legal considerations. Some of the economic activities which state government officials refer to include the destruction of native Hawaiian forests for commercial, often experimental, timber plantations, for land leasing to ranchers who clear native forests and graze cattle, and so on.

Conservationists in Hawai'i look to the inclusion of plants in the Endangered Species Act of 1973 as the most important major advance in assuring the protection of what remains of Hawai'i's truly unique flora. At present the only measures that afford protection for native Hawaiian plants are those invoked in our national parks and the few areas that have been set aside by the state, and, indeed, these are not entirely satisfactory. The protective insurance for vanishing plants provided by the Act is desperately needed to prevent further extinctions of Hawaiian plants.

We cannot agree that removing any Hawaiian plants from the proposed list is in the best interests of the people of Hawai'i, or, indeed, mankind, who stand to lose even more than the over 250 plants that have vanished from Hawai'i. Virtually all of the Hawaiian plants on this list are found nowhere else in the world and certainly should be preserved for their scientific, educational, and aesthetic value.

We endorse acceptance of the list as published in the federal register on June 16,1976, and approve of the appropriate amendments, as published on June 7, 1976, in the federal register,to include endangered and threatened plants in the Endangered Species Act of 1973.

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Letter to Director Lynn A. Greenwalt, U.S. Fish and Wildlife Service from Mae E. Mull, 14 August 1976: U.S. List of Endangered Plants

Substantial acreages of the remnant native forests on the Island of Hawai'i are threatened with destruction by commercial tree farming and by feral mammal populations maintained for sport hunting. What remains of Hawai'i's forest ecosystem, which have the highest ratio in the world for endemicity in plants, birds and invertebrates, cannot survive without official protection and restoration assistance. We urge that the proposed list of some 900 endangered plant species in Hawai'i be adopted promptly.

The windward rain forests on the Island of Hawai'i between Hilo and Honoka'a, commonly called mauka Hāmākua, are the habitat of a number of endangered plants. Some of the forests in this area are threatened with bulldozing for conversion to foreign timber plantations. The enclosed correspondence with Governor Ariyoshi indicates the perilous future these ecosystems face. /see 'ELEPAIO, Vol.37, No.3, Sep.1976, pp.32-33/

In addition, local newspapers have been carrying reports since July 30, 1976 on the sale of 32,000 acres of forest lands above Hilo to a Hong Kong company, World Union Industrial Corporation, Ltd. Although development plans have not been announced, it is widely feared that this diversified 'ōhi'a-tree fern forest will be converted to eucalyptus plantations for wood pulp. Such conversion to an exotic monoculture would be consistent with a joint U.S. Forest Service and State Administration proposal, "Forestry Potentials for Hawai'i" (1976), one alternative of which calls for committing 40% (410,000 acres) of the native forests to intensive timber production.

About a dozen endangered plants are component parts of the māmane forest ecosystem on Mauna Kea, along with the endangered Palila and other endangered bird species. There is no question among biologists that the forest decline is attributable primarily to the depredations of feral sheep and goats. Yet sustained yields of these mammals continue to be maintained for hunting. The official listing of the endangered plants of Mauna Kea will give strong impetus to a program for the elimination of these non-native mammals from that endangered species habitat.

Such discouraging events as these illustrate the urgent need for federal recognition and protection of Hawai'i's endangered plants and their essential habitats.

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Since the Hawaii Audubon Society wanted to keep Senator John T. Ushijima informed of our positions on the Big Island conservation issues, Mae E. Mull on 26 June 1976 sent him copies of the Society's comments on the draft Mauna Kea plan, the Wai-manu Valley Estuarine Sanctuary and on the protection of Hāmākua native forests.

His reply, 27 August 1976: Your thoughtful recommendations of June 26th shall be seriously considered in regards to Big Island conservation. I can assure you that all efforts will be made to pursue reasonable solutions for the future of Mauna Kea and the preservation of our native forests. On the proposed Wai-manu Valley Estuarine Sanctuary, your active concern and effort to keep me informed is also greatly appreciated.

More scientifically based solutions are necessary, particularly in our fragile island ecosystem where piecemeal development can produce significant harm. I fully support the citizen advisory group's stance that Mauna Kea should remain a wilderness resource with limits on the construction of new telescopes and facilities. Nevertheless, a five-year moratorium may not be necessary as long as proper procedures of public hearings are followed and a comprehensive plan for Mauna Kea is adopted.

As to the effective management of the māmane/naio forest and its endangered species, I am in complete agreement that management of a fragile environment is impossible with the continued presence of predator animals. Alternative hunting areas would be necessary for any final solution. Your suggested alternative hunting areas will be studied, hopefully, in conjunction with a goat and sheep eradication program.

Finally, I share your concern for native forests facing potential replacement by exotic timber crop raising. I believe that Hawai'i has a future potential industry as

well as a conservationist and cultural responsibility in protecting our native forests. It makes more economic sense to develop our rare hardwood potential which would create more jobs in furniture and woodcarving industries, than to grow softwoods for pulp and chip export. This would mean much more vigorous State participation in disease and pest control as well as hybridization of tropical hardwoods, both with significant implications for all Pacific Islands. This also means selective harvesting and regeneration of existing native stands as well as reforestation of unused pasture and ranch land, cane fields, and marginal agricultural lands.

In this regard, I will seek a study in the coming session of current timber industry policies, research, and operations in other tropical environments, in particular, the Pacific Islands. I am aware of several active timber operations in the South Pacific that have faced the same problems we currently face in trying to balance the need for viable industry and good conservation of land and water. I will also pursue greater capability and expertise development at the University so that we may realize our leadership position in tropical agriculture and forestry.

I encourage you to continue your vigorous efforts to bring more grassroot concern and scientific reason into the sphere of government. Through such citizen participation, I am sure we shall steer a correct course.

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Comments on the tentative RECOMMENDATIONS of the STATE GOVERNMENT ORGANIZATION COMMISSION. Spoken comments presented at the Public Hearing held in Hilo, Hawai'i on 14 July 1976 by Mae E. Mull: The Hawaii Audubon Society makes these recommendations on PLANNING AND DEVELOPMENT IN THE CONSERVATION DISTRICT:

(1) Strong support is given to the proposal that: "Counties should be given shared jurisdiction over conservation lands as they now exercise in agricultural lands." The Society endorsed this same recommendation over three years ago when public hearings were held on the Overview Corporation's draft revision of Regulation 4 governing land use in the Conservation District.

Veto power over Conservation District Use Applications by the County Planning Department and the Planning Commission will open those land use decisions to more democratic procedures at the grassroots level. Under the existing procedure it is frustrating for the counties to have no voice, no control at all over Conservation land uses. Such lands make up a substantial portion of each county. In Hawai'i County over 50% of the land area is in the Conservation District.

A strong county voice in such land uses can contribute valuable dimensions in knowledge of local conditions, professional planning capabilities, objectivity, and the opportunity for public participation in decision-making on conservation lands.

(2) It has been recognized for at least five years that there is an urgent need to revise Regulation 4, which is much too permissive in allowing commercial and destructive uses in the Conservation District. Under the existing regulation, non-conservation uses are permitted which deplete the resource, such as resorts, hotels, excavation and quarrying, grazing and tree farming. The urbanization of Mauna Kea by technological development is another example of an undesirable use now permitted in the Conservation District.

Often the Society sees the political and economic pressures for development so strong as to drown out conservation values and practices. One way to stem that tide is to make Regulation 4 so tight and restrictive that pressures for commercial development of conservation lands are cut short by the Regulation itself. If the permissiveness of the Regulation is eliminated and if the discretionary power of theBoard of Land and Natural Resources and staff is drastically reduced, these personnel will be relieved of the inordinate pressures that are a present burden.

Development that is urban, industrial or agricultural should be assigned to the land use districts established for those purposes. We ask this Commission to recommend a tight revision of Regulation 4 which will reserve the Conservation District for conservation purposes--moderate uses that replenish the resources--not for economic growth that uses them up!

(3) The Department of Land and Natural Resources does not have any effective procedures for enforcement of Regulation 4. There is no one with overall responsibility to monitor the conditions attached to conservation land use permits or to systematically report violations. Enforcement of the regulations of the DLNR Divisions of Parks, Forestry, and Fish and Game are in dire need of strengthening in order to halt the needless degradation of public lands in the Conservation District. An Enforcement Division with specific police powers within DLNR could effectively protect the integrity of conservation lands.

(4) Almost half of the total land area of the State is assigned to the Conservation District--about 2 million acres. Yet, <u>there is no comprehensive inventory of these conservation lands</u>. Data on the ownership, leases, value, uses and resource capabilities of both public and privately-owned conservation parcels are not available. It is essential that this organized body of information be compiled and be made available to officials and the public for informed decision-making.

(5) State law requires that a public hearing be held on a proposed commercial use within the Conservation District. Several years ago the utility companies were successful in their massive lobbying efforts to exempt utilities by law from the public hearing requirement. This exemption for one kind of commercial activity is not in the public interest. Utilities already have preferential treatment in being removed from the competition of a free market.

There is great public interest in the placement and design of utilities, power plants, substations, power lines and poles in the Conservation District. Yet the public has no opportunity to learn of utility plans and designs, to propose alternatives, or to make its voice heard. Without the stimulation of public input, the utilities can give scant attention to environmental protection. The aesthetic and environmental pollution aspects of utilities in the Conservation District call for the safeguards of public hearings.

The Hawaii Audubon Society respectfully requests the Government Organization Commission to include these recommendations in its report to the State Legislature and to the Governor.

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Letter to Director Lynn Greenwalt, U.S. Fish and Wildlife Service from President Sheila Conant, 3 September 1976: Green Sea Turtle

The Hawaii Audubon Society would like to offer a comment on the proposal to list the Green Sea Turtle (Chelonia mydas) as "Threatened" or "Threatened under the Similarity of Appearance Clause" of the Endangered Species Act of 1973.

We would like to see this species afforded protection in view of continuing pressure to exploit its diminishing populations. We are particularly concerned that taking of the animals for commercial purposes be prevented, as stipulated in the Hawai'i State Fish and Game Regulation 36. However, we would like to request that a special exception be made for the taking of turtles at least 36 inches in (shell) length for home consumption by people in Hawai'i.

Fish and Game Division records reveal that only nine Green Sea Turtles were taken in 1974 and six in 1975 for home consumption. In view of the importance of taking turtles as both a cultural tradition and an additional source of food to some families, we feel such use should be allowed by the new Federal regulation.

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Letter to Superintendent Robert D. Barbee, Hawai'i Volcanoes National Park from Mae E. Mull, 16 December 1976: Thank you for your letter of November 10 and for the opportunity to comment on recent changes in the section on Birds in the Park's Natural Resources Management Plan.

The Society continues in its strong support of the plan to protect remnant Hawaiian ecosystems from the destructive effects of post-Cook introductions of aggressive plant and animal species. The goal of reestablishment of endemic Hawaiian species into former park range can be accomplished naturally in some measure as the stress and competition from exotic species are eliminated from park habitats. The Society's lengthy comments on these goals are contained in the February 18, 1974 letter to former Superintendent Bryan Harry. Your attention is particularly directed to the Society's recommendations on a limited and carefully controlled planting program.

We agree that the endangered Nēnē and 'Alalā, former park residents, are not likely to be reestablished naturally as habitat is restored without the direct intervention of man. Captive propagation may be the only feasible technique now which has a chance of leading to the eventual reestablishment of breeding populations in park habitats for these two species. We are quick to say, though, that direct manipulation of native birds is no more than a last-resort tool, and that success in captive breeding is no substitute for a long-term hospitable habitat in the wild. Since the primary goal is restoration of self-sustaining, viable populations in natural habitats, captive breeding must be accompanied by the removal or reduction of the limiting factors in the range of the species.

The "Nēnē park" method of reintroducing the Nēnē into former breeding range in the National Park certainly deserves a fair trial over many years, as contrasted with the State's "gentle release" program where self-sustaining reproduction in the wild is uncertain.

The proposal to salvage individual 'Alalā in the wild for rearing and possible breeding in park enclosures may be the only hope for restoring this species to the park. Since biologists at the park have had the successful experience of rearing to healthy maturity three salvaged 'Alalā fledglings over a three-year period--before the ill-advised transfer by the State to Pōhaku-loa in March 1976--the expertise and park aviary are available for a prompt renewal of this project. The Hawaiian Raven has been called a "basket case," and the survival of the species may hinge on the Park's capability to propagate and restore offspring into supportive park habitat.

For a minor up-date in the plan, the Hawai'i Creeper has been officially added to the list of endangered species by the Department of the Interior, and Newell's Manx Shearwater is now officially "threatened." ...

Lava flows could obliterate 'Ua'u breeding areas on Mauna Loa, but that would not necessarily mean the loss of all breeding habitat on the island of Hawai'i (p.7). Historic and recent breeding range of the 'Ua'u on the slopes of Mauna Kea was discussed by Richardson and Woodside, "Rediscovery of the Nesting of the Dark-rumped Petrel in the Hawaiian Islands," CONDOR, Nov. 1954. We would agree that 'Ua'u nesting sites are more likely to prosper in the park with effective protection from exotic mammals than on Mauna Kea.

Efforts to make park habitats more hospitable for the small endangered forest birds ('Ō'u, Hawai'i 'Ākepa, 'Akiapōlā'au and Hawai'i Creeper) through removal of introduced predators, disease and competitors are applauded. But the potential for success in rearing, propagation and release of Hawaiian honeycreepers has not been explored. It is possible that useful manipulative techniques could be developed from experimental rearing of the more common honeycreepers, such as 'Apapane and 'Amakihi. These are better "guinea pig" subjects to start with than the rare birds. ...

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Letter to Governor George R. Ariyoshi from Mae E. Mull, 4 February 1977: Your emphatic statement to the Legislature on the need to control population growth is heartily welcomed. We recognize your longstanding commitment to population control and applaud your determination that we in Hawai'i be masters of our future instead of victims of overpopulation.

Organizations that are devoted to conservation of natural resources and protection of the natural environment also have strong population stabilization goals. We understand well that overpopulation is the underlying cause of pollution, smog, loss of agricultural lands, diminishing natural areas, native wildlife and open spaces--which means an inferior quality of life for today's residents and tomorrow's children.

Along with public interest groups in other fields, we see inescapable truth in the

slogan, "Whatever your cause, it's a lost cause unless we control population!"

The Neighbor Islands are wary of urbanization, with the consequences of the population overload on O'ahu so readily apparent. We see that lowland and shore ecosystems have been virtually wiped out by urban development. Only remnants of O'ahu's distinctive native forests remain in the Ko'olau and Wai-'anae ranges, and even these have been drastically altered by the plant and animal introductions of modern man. Population pressure, along with an increasing rate of consumption per capita of goods and services, are instrumental in bringing to depletion and extinction Hawai'i's incomparable array of unique biological resources.

In 1971 you saw that limitations on growth are essential for our island state, and you called for population control back then. Your vision and courage today in giving population control the highest priority in State goals and programs renews hope that Hawai'i's people will retain a viable part of their special natural heritage.

Those of us with a stake in nature's priceless bounty in these islands join your call for Hawai'i to control its own future.

His reply, 22 February 1977: Thank you very much for your letter of February 4, 1977, as a representative of the Hawaii Audubon Society in support of my proposals toward control of our population growth.

As you may imagine, I am delighted that you see this matter so clearly from the viewpoint of meaningful conservation. But I think I am even more pleased that you should remember my remarks from 1971.

This job must be done, and I am vastly encouraged that so many people have expressed a willingness to support such an effort. ...

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Testimony: S.B. 138, Relating to the Conservation, Management and Protection of Endangered or Threatened Species of Wildlife or Plants; to Senator Jean S. King, Chairman, Ecology, Environment and Recreation Committee; from Francis G. Howarth; 16 February 1977: ...The expressed purpose of the Hawaii Audubon Society is to promote the protection of Hawai'i's native wildlife. Thus, we have been very much concerned with the plight of our Hawaiian endangered species and have followed closely the history of Act 65 of 1975 and its proposed amendments.

We concur fully w ith the intent of S.B. 138, which is to bring the Hawaiian endangered species law into conformity with the federal law and, with the inclusion of the following amendments, strongly recommend its passage.

S.B. 138 is very similar to the unamended S.B. 1823 of 1976. We are surprised that most of the amendments added by your excellent committee report of lastyear, Standing Committee Report 512-76, have not been incorporated. We recommend that this report be resurrected and those amendments be reintroduced on this bill. The Hawaii Audubon Society is in full agreement with those changes, specifically the clearer definitions of endangered and threatened species and the new definition of critical habitats. These further bring the act into conformity with the Federal act.

Section 195D-5 (b) to the end after "endangered or threatened species" should be added the phrase "or result in the destruction or modification of habitat."

Further, section 195D-5 (d) sets the priorities of this act with which we are in full agreement. However, we believe the intent is to favor indigenous threatened or endangered species and feel that the word "indigenous" was inadvertently left out. We strongly urge you to reinsert the word "indigenous" to read, "for the protection of those indigenous endangered and threatened wildlife a nd plant /.../ species..." Adding indigenous to this subsection in no way changes the intent of the rest of the act, as both endangered exotic and indigenous species are protected. Adding it only sets priorities and, considering Hawai'i may, in the final analysis, have more than one quarter of the endangered species in the U.S. indigenous to Hawai'i, we feel that the truly Hawaiian species deserve priority.

We call your attention to the fact that the U.S. Fish and Wildlife Service informed your committee last year that these further amendments were acceptable under the Federal act. Hawaii Audubon Society believes that these changes further enhance the intent of Act 65 and S.B. 138. ...

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World Wildlife Conference, San Francisco, California, November 28-December 1, 1976, by Betty L. Johnson

First of all, it was the only one which has ever been held in the United States.... Secondly, there were over 600 delegates in attendance from all over the world....The kings of Sweden and Norway were there....In addition, His Excellency of Nepal was also present, so it was truly international. ...There were two luncheons which everyone attended, each with an excellent speaker. Outstanding in this regard was the second lunch, November 30, when Dr. Sylvia Earle, aquanaut, spoke. She was one of a team of women who went undersea to live for a couple of weeks in a "habitat" off the Virgin Islands a couple of years ago. Not only was she an excellent, inspiring speaker, but, following, was a beautiful film on underwater life (perfect photography by Al Giddings) off Palau in Micronesia. There has been considerable outcry against the proposed Port Pacific, to be built there, for mooring those great super oil tankers and storing oil. In that pristine setting of crystal clear water, abundant with fish, invertebrates, shells, coral, etc., you can imagine what an oil spill would do. ...

Sir Peter Scott of England spoke, first at the opening plenary session, and at the final meeting, so I had the opportunity briefly to rush up, introduce myself as from Hawai'i, and thank him for his part in saving Hawai'i's nēnē. All the slideand film shows were excellent, including "The Year of the Wildebeest" narrated by actor Richard Widmark; one on the whales off Patagonia, narrated by Orson Welles; the one on Palau just mentioned; a slide show on the Operation Tiger in India; one on horned rhinocerous; another one from the Field Museum in Chicago; and an interview with Prince Philip of England, who was unable to attend

the conference. Maurice Strong, of Canada, for five years with the U.N. Environmental Programme, was one of the speakers, as well as Michael McCloskey of the Sierra Club, Amory Lovins the British representative for Friends of Earth, and Jack Mundey, a labor union leader from Australia.... Mundey and Lovins unloaded real blockbusters. Mundey disproved the notion that labor and environmentalists are at odds in the matter of jobs, as he stressed work which was "socially useful". Between them, they blocked Dillingham Corporation from mining (I think for sand) off the islands of the Great Barrier Reef, and his union (building & construction) with citizen support has gone in for "Green Bans" and not high rises. Lovins on "soft energy", as opposed to nuclear energy, shared honors with Mundey on the same panel, and both were received with thunderous applause.

What was heartening was that Operation Tiger, which World Wildlife sponsored to raise $1 million to save the endangered tigers in India--India was to raise $4 million over several years--has succeeded: not only has the slice of the tiger toward extinction been halted, but it has been reversed. Little Costa Rica has come through with wildlife refuges and national parks to preserve its native animals, habitat, and rain forests; and some potentate from Oman (Arabian peninsula, from the Organization of Petroleum Exporting Countries) produced a check for $100,000. Among sponsors and contributors to the conference were Exxon and Atlantic Richfield. Some 25 resolutions were offered the final morning of the conference, and most of these dealt with animals and endangered species, included were the California condor and peregrine falcons....

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Field Notes from Jean-Marie Spoelman, 2 February 1977: September 1976 Observations

* ...On the Nā Lā'au trail I had a face to face encounter with a Fairy Tern. A pair (possibly the same pair seen at Ka-pi'o-lani Park) came fluttering through some Kiawe trees and one hovered an arm length away from my face--gave me the once over and then flew off. I've heard that the Fairy Terns were friendly, but that was an incredible experience for me. Mrs. Conway and I also observed through my scope what she identified as a pair of Rose-ringed Parakeets. We also saw the Orange-cheeked Waxbill and Red-whiskered Bulbul, and at Ka-pi'o-lani Park observed 15+ Java Sparrows, several male and female Pintailed Whydah and a Yellow-fronted Canary.

* ...These sightings were made in company with my husband who is not interested in the study of birds, so I'm technically the only observer. On O'ahu, Mrs. Peg Conway, a native of O'ahu, was with me for the other sightings.

At Ka-wai Nui Marsh near the dump, we saw the Shama and another one in the woods near Mt. Olo-mana; Hawaiian Stilt at Kāne-'ohe MCAS and Paiko Lagoon and Sanderling too. At Kāne-'ohe there were the numerous Red-footed Boobies, Golden Plover, Black-crowned Night Heron, White-capped Noddy (I think), Wanderling Tattler and Ruddy Turnstones plus the Great Frigatebirds. I find it fascinating to see the Cattle Egrets fly in a "V" formation of five frequently, as our Common and Snowy Egrets fly solo or on rare occasions maybe two. A Cattle Egret is still a rare sighting here /California/, but we did have a group of five on our 1976 Christmas Count. Anyway, some of my field notes are also enclosed. ...

Species seen on O'ahu, September 1976: 1.Brown Booby, 2.Red-footed Booby, 3.Red-vented Bulbul, 4.Red-whiskered Bulbul, 5.Yellow-fronted Canary, 6.Northern Cardinal (male, female, immature), 7.Red-crested Cardinal, 8.Barred Dove, 9.Rock Dove, 10.Spotted Dove, 11.Cattle Egret, 12.House Finch, 13.Great Frigatebird, 14.Black-crowned Night Heron, 15.Mallard, 16.Mockingbird, 17.Spotted Munia, 18.Common Myna, 19.White-capped Noddy, 20.Rose-ringed Parakeet (1 pair), 21.Golden Plover, 22.Sanderling, 23.Shama, 24.shearwater (sp?), 25.Shoveler (female), 26.House Sparrow, 27.Java Sparrow, 28.Hawaiian Stilt, 29.Wandering Tattler, 30.Fairy Tern, 31.Sooty Tern, 32.Ruddy Turnstone, 33.Orange-cheeked Waxbill, 34.Japanese White-eye, 35.Pintailed Whydah.

Kaua'i, 16 September 1976, partly cloudy, humid and windy, 75-80°F, 9:00 a.m. to 5:00 p.m.

Back road to 'Opae-ka'a Falls: 1 Melodious Laughing-thrush (?); 1 Spotted Munia; 1 Cattle Egret; Barred, Spotted, and Rock Doves; Common Myna; 3 Northern Cardinal (male, female, and possible immature); Golden Plover.

'Opae-ka'a Falls and Bell Stone Overlooks (small pond below): Spotted Munia; several White-tailed Tropicbird; Hawaiian Gallinule (red-frontal shield); possible Pectoral Sandpiper (smaller than Golden Plover next to it); 2 Hawaiian Duck; 3 Hawaiian Stilt.

Grassy meadow near beach by tracking station on way to Barking Sands beach. Water in meadow and cattle grazing: 50+ Hawaiian Stilt; 1 Yellowlegs (sp.?)(larger than Golden Plover, very yellow legs, barred under breast, white rump, slim looking, hic-cupping or teeter motion, failed to note bill size. Call sounds like our Greater Yellowlegs.); Pectoral Sandpiper (?)(next to Golden Plover, a smaller shorebird, yellow legs, slight white stripe over eye, fine straking coming to an even end on breast. Back seems to be a dark brown scale pattern. Bill was black and at least an inch long with a possible faint downward curve.); 3 Western Meadowlarks.

Enroute to Barking Sands: 1 Ring-necked Pheasant (male)(Strange behavior--ran like a roadrunner and did not fly. On Mainland, erupts when flushed.); Black-crowned Night Heron (Possible immature in cutover cane field. Water in small canals. Resembled an American Bittern. Flew up for a few moments and settled in grasses by small canal. Heron-like flight.); 5 Erckel's Francolin on dirt road to Barking Sands beach.

Other sightings at Wai-mea Canyon, Kuhulua and Kōke'e overlooks: White-tailed Tropicbird (many); Japanese White-eye; 'Apapane; Jungle Fowl; Golden Plover; 'Anianiau.

At Kī-lau-ea Lighthouse Area: Fairy Tern; Red-footed Booby; Brown Booby; White-tailed Tropicbird; Great Frigatebird; Hawaiian Owl in field nearby. (Slow wing beats and glides); House Finch.

Near Wai-lua River during evening: One of the hotels shines spotlights on the water. I observed several bird species flying and dipping over the waves and then soaring above the ironwood trees. I'm not too familiar with shearwaters, but could they have been Newell's Shearwaters? From what little I could see, the bird appeared to be white underneath and gray above. Could not see bill.

Hanalei National Wildlife Refuge: Hawaiian Stilt and Coot.

Maui, 17-19 September 1976, clear to partly cloudy.
Two Wandering Tattlers on rocks in Ka-hului Harbor.
Ka-nahā Pond (was allowed only 45 minutes to check out area): Ruddy Turnstone; Sanderling; Hawaiian Stilt; Shoveler (5 female); Golden Plover; Hawaiian Coot; 3 Black-crowned Night Heron; 3 Phalarope (sp?). I feel one was a Wilson's Phalarope in winter plumage. Was preening close to Observation Post. Pale yellow greenish legs. Black needle-like bill. Appeared larger than other two phalaropes who were spinning around. Their bills were black also. Hard to say if bills were stout enough to be Red Phalaropes in winter plumage. They seem to have a pale black eye strip. Was unable to make further observations, but my feelings were that they were probable Red Phalaropes.
Sacred Falls--Cliffs facing ocean: Noddy species. Possible Common Noddy; White-tailed Tropicbird; Great Frigatebird.
Hawaiian Owl over field enroute to Hāna.
Enroute Hale-a-ka-lā Crater: Chukar; Skylark; Golden Plover; Nēnē; 'Amakihi; House Finch; Japanese White-eye; Barred, Rock, and Spotted Doves.

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Field Notes from Edward Arrigoni, 25 February 1977: Red-vented Bulbul
A pair of red-vented bulbuls (Pycnonotus cafer) has appeared early each morning in a tall paper bark eucalyptus tree outside my apartment near the corner of Date Street and Ka-pahulu Avenue. Identification is positive because it is easy to approach within 8-10 feet of the birds from my fourth-floor lānai. Also during observation the rising sun is at my back so that the birds' totally dark crested heads and other features are easily discernible.
While the male makes a call, the female (apparently) remains obscure on the lower branches and seems reluctant to display itself. (At the same time mejiros usually are flittering about the tree.) The birds do not stay more than 15-20 minutes. Afterward the male flies to another tree at the end of the apartment building, and then about a minute later the female follows. The birds have appeared every morning since the first week in February. During the nine years I have lived in this building, I have not noticed this species in our area, despite the presence of other large trees then.
The voice of the bird is like "chi-chur." Sometimes the call sounds more like variations of "pri-chi burrr," and with a little imagination, "pretty birrrd." The first sound of the call is nearly always at a much higher pitch. Bob Shallenberger informs me the voice can be quite variable. When a barred dove starts a call simultaneously, the red-vented bulbul will stop or trail off its call until the dove is finished.

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Field Notes from Robert J. Shallenberger: Peregrine Falcon
On March 21, 1977 four of us (Robert Shallenberger, Greg Vaughn, Robert Whittam, Judy Whittam) took a short trip into Ka-wai Nui Marsh. We walked to the large observation rock from the Quarry Road, overlooking the main pond. As we approached, we all heard the loud croaking of a Black-crowned Night Heron. Looking over the closest end of the pond, we saw a Peregrine Falcon chasing an adult Heron in flight. The Falcon made at least three passes at the Heron, each time forcing it into the California grass bordering the pond. After this, the Falcon climbed to 50-60' and then crossed the pond (10' off the water)at high speed. It passed directly over 3-4 Hawaiian Coots and 2 Shovelers in open water. All the birds dived underwater as the Falcon passed over. The Falcon chased at least two more Herons over the next 3-4 minutes, reminding the observers of a typical frigatebird-booby harassment chase. Soon after, the Falcon climbed to 100' or more and left the area, heading towards Kāne-'ohe Marine Corps Air Station.

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Field Notes from Andrew J. Berger: Nesting of the Japanese Bush Warbler
The Japanese Bush Warbler or Uguisu (Cettia diphone cantans) is native to Japan and Formosa. It was first released on O'ahu in 1929 by the Territorial Board of Agriculture and Forestry, presumably because this old-world warbler is "a voracious feeder on insects of many kinds" (Caum 1933). Bush Warblers also were released by the Honolulu Mejiro Club and by the Hui Manu several times between January 6, 1931, and December 26, 1941. Some of these birds were released in Nu'u-anu Valley and "in the gardens of the F.J. Lowrey residence, Old Pali Road." The distribution of the Bush Warbler on O'ahu as of 1975 was summarized by Berger (1975).
Berger (1972:218) wrote that "no study has been made of this species /in Hawai'i/, and the nest apparently has not been found on O'ahu." During a field trip of the Hawaii Audubon Society in the Pali-kea area on April 13, 1947, the reporter said that two Bush Warblers were seen and that they "were quite concerned over their babies in a nearby nest" ('ELEPAIO, June 1947:72). The article does not say that a nest was actually found, and one concludes that the statement was based on the behavior and alarm notes of the adult birds. I have been unable to find any other references to the nesting of the Japanese Bush Warbler on O'ahu.
On April 12, 1977, I took my ornithology class on a field trip to Moana-lua Valley, where we found three fledgling Bush Warblers that I estimated had left their nest earlier that morning. Cindy Foursha found the empty nest in a dense stand of false staghorn fern directly under the clump of trees where the fledglings were perched.
Mrs. Foursha and I returned to Moana-lua Valley on April 17. On this trip I found a nest with three eggs. The eggs of this warbler are remarkable in comparison with those of most passerine birds in that they are uniformly a bright and shiny reddish brown in color.

Literature Cited

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Caum, E.L. 1933. The exotic birds of Hawai'i. B.P. Bishop Museum Occ. Papers, Vol.10,#9.

Field Notes from Andrew J. Berger: Rothschild's Starling in Wai-kīkī

Rothschild's Starling (Leucospar rothschildi), endemic to the north coast of Bali, is a striking white bird with a prominent crest, blue facial skin, and black tips to the wing and tail feathers (see J. Delacour, 1947, Birds of Malaysia, p.328). Little seems to be known about the present status of this starling in its native habitat (J. Fisher, N. Simon, and J. Vincent, 1969, Wildlife in Danger, pp.272-273), but the capture of birds for sale in the cage-bird trade is considered to be a serious threat to the native population.

Richard Feldman showed me one of these birds at the Hale Koa Hotel at Ft. DeRussy on April 27, 1977, and told me that he had seen the bird there for the past eight months. One would assume that the bird escaped from, or was released by, a tourist.

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THE CONDOR, April 1969, Vol.71, No.2, pp.102-112, Eggs and Egg-Laying in the Laysan Albatross, Diomedea immutabilis, by Harvey I. Fisher

The purpose of this study was to determine the chronology of the cyclic deposition of eggs by Laysan Albatrosses as a colony and as individuals. A prime concern was the frequency and regularity with which individuals of this species laid eggs during a span of years. Further, an attempt was made to determine the effects of the age of the female and of the age of her mate on the time of egg-laying....

This investigation was based upon data gathered from 1960 to 1966, inclusive, in a study plot on Eastern Island, Midway Atoll....

The expected laying period of the colony is 21 November to 15 December. Ninety-seven per cent of the eggs are laid by 10 December....

The age of the female has a marked effect on the date of egg-laying. Aged females (known to have bred for at least six years) have a median date of 27 November and 82 per cent have laid by 1 December. Females laying for the first time have a median date of 4 December and make their major contribution to the total number of eggs in the colony after 1 December.

Age and experience of the male influence the egg-date of the female. Aged females paired with the same male for at least six years lay four to five days earlier than females paired with younger males or females who have remated because of the death of a mate. Young females, laying for the first time and paired with a younger or older male, lay earlier than when mated to a male of their own age class; especially is this evident when the female is older than the male. Females mated to males of a dissimilar age, as a group, have a more lengthy egg-laying period, with the onset of egg-laying far less abrupt than when members of the pair belong to the same age class.

Laysan Albatrosses are capable of laying an egg and rearing a chick each year...but there is great annual variation in the percentages returning to breed.

Eggs are usually laid during daylight hours, 66% before 10:00 and only 25% between noon and the following dawn....The egg loses 15% of its weight during incubation....

THE CONDOR, Vol.78, No.1, Spring 1976, pp.1-9; The Age of Laysan Albatrosses, Diomedea immutabilis, at First Breeding by Margaret T. Van Ryzin and Harvey I. Fisher

p.1 ...The paper...explores the age at which these albatrosses begin to breed and some of the factors that may influence this age. p.8...Males tended to initiate breeding one year earlier than females. ...Sixty per cent of the males, but only 44% of the females, began to breed by their eighth year.

THE WILSON BULLETIN, Vol.88, No.1, March 1976, pp.121-142, Some Dynimics of a Breeding Colony of Laysan Albatrosses by Harvey I. Fisher

The purpose of this paper is to present data gathered over a 13-year period (1960-73) on Eastern Island of Midway Atoll...on certain aspects of the biology of breeding Laysan Albatrosses....

Some of his summaries are as follows: Attachment to site--Chicks hatched in an area frequent that site for territory acquisition and pair formation in the 3 or 4 years immediately preceding first breeding. They attempt to establish themselves and to nest near the natal nest.... Age composition of the breeding colony--It is not certain that...its age composition has yet completely stabilized.... However,...it is suggested that the following, stabilized population may be present: 1:15% young breeders of no great current reproductive significance; 2:54% prime, reproductive birds, 10 to 19 years old; and 3:31% breeders 20 or more years of age.... Ingress of first-time breeders--In the rapidly growing population on Midway Atoll there is an approximate, mean 14% annual recruitment of new breeders.... Of particular note is the belief that all new breeders are recruited from the Midway colony itself, rather than from any other colonies. Frequency and patterns of breeding--The frequency...is influenced by: 1:the available food; 2:the strictly monogamous nature of the pair bond; 3:the number and length of the successive pair bonds formed over a period of time; 4:the time required to form each bond; 5:the age of the pair bond; 6:the mate's previous experience in breeding; 7:its success in fledging a chick; and 8:perhaps its sex. Nothwithstanding all these potential influences on the frequency of reproduction, the Laysan Albatross is physiologically and behaviorally capable of breeding each year after the second season of its reproductive life, and many do.

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Hawai'i Science Fair, 1976, by Sheila Conant: With former corresponding secretary Lani Stemmermann acting as judge, the Hawaii Audubon Society praticipated, for the first time, in the 1976 Hawai'i Science and Engineering Fair sponsored by the Hawaiian Academy of Science. Awards, a copy of HAWAII'S BIRDS, were given to the following participants:

1. Best Intermediate Division Display Project: Holly Hollinger, Wahi-a-wā Intermediate School. Project Title: Birds of Kaua'i.

2. Best Intermediate Division Research Project: Clyde Iwamoto, Ka-wānana-koa Intermediate School. Project Title: What is the most favorable pH level for the growth of the Iliau /Wilkesia gymnoxiphium/ plant?

3. Best Senior Division Research Project: Steve Finton, Hawai'i Baptist Academy. Project Title: Behavioral Studies of the Black-crowned Night Heron and the Red-footed Booby.

Awards were granted for the best projects dealing with native biota or ecosystems, especially if the project might contribute to the better protection of Hawai'i's native wildlife. If no appropriate projects were entered in a particular division, no awards were granted in that division.

1977, by Carol F. Ralph

As an encouragement to young people interested in Hawaiian natural history, each year Hawaii Audubon makes awards at the Hawaiian Science and Engineering Fair. This year the fair was held 22-26 March in Blaisdell Center. Each student's presentation represented either a research project he had performed or a display he created to inform on a particular topic. Research and display divisions each were subdivided into Senior (grades 10-12) and Intermediate (grades 7-9). Hawaii Audubon makes an award in each division for the best project dealing with native Hawaiian wildlife (including plants), especially conservation or natural history. This year I had the pleasure of representing Hawaii Audubon in selecting the recipients of our awards and presenting them to them.

One of our winners was John Y. Hong, of Moana-lua High School, who had censused reef fish behind the Wai-kīkī Aquarium both in the day and at night. He presented a comparison of the populations. John obviously enjoyed his research and really knew his fish. He is continuing his diving and plans to present a bigger and better project next year. Our other winner was Bryan Booth, of St. Anthony's School, who had taken photographs for his display, "Life of the Nu'u-pia Pond." Along with his pictures of Hawaiian Stilts, Koloa, and other animals, he presented good information about the lives of these species, pointing out the endangered status of some of them. He also explained how the Marine Corps, in their amphibious vehicle maneuvers, help the birds by creating islands where the birds can rest unmolested by mongooses.

Our award for each of these fine projects was a handsome plaque engraved with "FOR THE PROTECTION OF HAWAI'I'S NATIVE WILDLIFE, HAWAII AUDUBON SOCIETY AWARDS (name) WINNER IN (display or research), 1977 HAWAI'I SCIENCE FAIR." Our winners were obviously pleased with these well-deserved plaques when I presented them at the awards ceremony. As a part of the award relating to and reinforcing the interests of the students, we also gave each a year's membership in Hawaii Audubon and National Audubon.

Hawaii Audubon's participation in the Science Fair is probably one of our most worthwhile activities. We are almost alone in encouraging young Hawaiians to study our wildlife. Of the 60 or so organizations that gave awards at this Fair, ours was the only one rewarding projects dealing with Hawaiian natural history. The scarcity of projects on this subject suggests it is important for us to continue to reward students already interested in it and encourage others to look into it.

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Some questions on the PRELIMINARY LIST OF THE BIRDS OF HAWAI'I by Robert L. Pyle, 'ELEPAIO, Vol.37, No.10, April 1977, pp.110-121. Answers are by Robert L. Pyle, 11 April 1977:

Q Page 114: Brant--What happened to the Black Brant? 'ELEPAIO records only Black Brant (Branta nigricans).

A The 33rd Supplement to the AOU CHECKLIST OF NORTH AMERICAN BIRDS in the October 1976 AUK merged the Black Brant and the Eastern Brant in the same species. The species is now Branta bernicla, with the vernacular name Brant. The Black Brant is the subspecies Branta bernicla nigricans, but since the Preliminary List gives names only to species level for visitors, I used Brant.

Q Page 117: Hawaiian Stilt--Why change Himantopus h. knudseni to Himantopus mexicanus knudseni?

A The 33rd Supplement says that the Mainland Black-necked Stilt is called Himantopus mexicanus mexicanus. The Hawaiian Stilt is a subspecies of it and is now called Himantopus mexicanus knudseni.

Q Why change the following from Berger ('ELEPAIO, Vol.36, No.12, June 1976, p.144)? Page 115--1.Gray Francolin from North Indian Gray Francolin, 2.Black Francolin from Indian Black Francolin, 3.Kalij Pheasant from White-crested Kalij Pheasant, 4.Green Pheasant from Japanese Green Pheasant; page 116--5.Turkey from Rio Grande Turkey; page 118--6.Skylark from European Skylark; page 120--7.Black-headed Munia from Eastern Black-headed Munia.

A The Preliminary List omits the subspecies vernacular name. Berger uses subspecies names, but some are uncertain as to just which subspecies is here, so in the Preliminary List I have used only the full species name for all introduced species, although we do know the subspecies for a number of them. The Green Pheasant is sometimes called Blue Pheasant. "Japanese" is either a subspecies or an extra name. Berger lists only the genus and the species, which suggests there are no subspecies of Green Pheasant. For introduced species in general, I feel we should have specimens collected and examined at the U.S. National Museum.

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Summary of the Waterbird Habitat Poster Project by Steven L. Montgomery

In February 1975 members of the Hawaii Audubon Society joined with the Conservation Council for Hawai'i (CCH) and the Ad Hoc Committee for Ka-wai Nui Marsh to design and print a full color poster on Hawai'i's waterbirds and wetland habitat. During this time, Robert J. Shallenberger was collecting photos for use in the new field guide edition and had quality slides of most species. The key was to present these in a manner that would emphasize the primacy of habitat to their livelihood. After a few meetings concentrating on this problem, Alan D. Hart, a professional scientific illustrator, contributed a splendid solution to the dilemma: portraits of 5 waterfowl were set in a monochromatic blue background consisting of a photo of a large flock over a marsh. This setting conveyed the theme, "We Care About Hawaiian Waterbird Habitat." The inset of each species is framed by the outline of an island on which they are found. The poster was printed through Quality Graphic Services at a cost of $1,360 for 5,000 copies. As of May 1977, the Society has

received $560 from donations and a few sales, but over 3,500 copies were given to public and private school classrooms for National Wildlife Week.

Free copies were mailed to all junior members and a policy was set by the Board to provide free copies to additional junior members or educators who wrote requesting them. The Outdoor Circle has donated $200 to the project and was provided 300 copies through Muriel Seto. For the contributions of CCH and its members, they received 300 copies.

Copies were also distributed to legislators, congressmen, and many Interior Department officials, and were prominently displayed by Wayne Gagne and myself at the North American Natural Resources Conference in Pittsburgh.

An attempt has been made to sell copies commercially through Hopaco and the U.H. Bookstore at $1 wholesale, but only $12 has been realized. On February 14, the Board approved a new price of 50¢. About 800 copies remain. ...

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Have you seen the wonderful news in HONOLULU STAR-BULLETIN, 22 April 1977, page A-1 and 23 April pages A-6 and A-8?

John T. Waterhouse, Hawaii Audubon life member, has agreed to deed approximately 1,100 acres of his Kīpū Kai, Kaua'i, estate to the State, to become available after his death and those of his six adult nieces and nephews, for preservation as a nature and marine life sanctuary. Kīpū Kai is an isolated area between Līhu'e and Kō-loa and adjacent to Nā-wiliwili, hard-to-reach but very beautiful property. MAHALO NUI LOA!

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Hawai'i Natural History Scholarship: To lend financial assistance through the Hawaii Audubon Society to deserving undergraduate students majoring in a field relating to Hawaiian natural history, an endowment of a two-semester full tuition scholarship for an undergraduate at the University of Hawai'i at Manoa starting from 1977-1978 has been established by Professor Yao Shen of the Department of English, University of Hawai'i at Manoa, through the Hawaii Audubon Society. The scholarship has been endowed and named the Rose Schuster Taylor Scholarship in honor of Rose Schuster Taylor, a friend of Yao Shen and author of THE LAST SURVIVOR (1932) and YOSEMITE INDIANS (1936). Interested persons may apply to Dr. Sheila Conant, Chairman, Scholarship Committee, Hawaii Audubon Society and Assistant Professor of General Science, 2450 Campus Road, Honolulu, HI 96822. Deadline for application is June 30, 1977.

Dr. Yao Shen has been teaching at the University of Hawai'i since 1962. She is listed in international dictionaries in England, France, Japan, and the United States, including the WORLD WHO'S WHO OF WOMEN. She has 120 publications in 13 countries. MAHALO NUI LOA!

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Excerpts from the minutes of the general meeting, Hawaii Audubon Society, 21 March 1977:

...Sheila Conant reported on the Wai-'anae Kai field trip with one highlight being the discovery of an 'Elepaio's nest with young. There was a report on the Kaua'i trip, which was considered very enjoyable and productive. Ruth Whitten reported a Pueo in Kahana Valley. Rob Shallenberger reported a Peregrine Falcon over Ka-wai Nui Marsh.

The President announced that the Board will vote on Chapterization, April 11, 1977. He also made a request for a membership chairman, and Linda Murakami volunteered her services.

Sheila Conant, newly appointed chairman of a scholarship committee for our Society, announced an endowment for undergraduate scholarships made by Dr. Yao Shen called the Rose Schuster Taylor Fund, in the amount of $450 to begin next year.

Frank Howarth announced the mailing of National Wildlife Federation posters on clean water and a Conservation Council for Hawai'i (CCH) poster on Hawaiian stream life with a letter of explanation and also a letter from CCH regarding the Eel Bill in the Senate. Frank announced that the Eel Bill was killed. He also told us the Endangered Species Act House Bill 220 in the Senate was "tolerable" and that the Senate Bill 1202 in the House is "one we can't live with".

Program Chairman (for 1976) Charles van Riper introduced the speaker for the evening, Dr. J. Michael Scott, with U.S. Fish and Wildlife Service, Rare and Endangered Species Program, Volcano, Hawai'i. He told us of the extensive field studies done by himself and his staff in the rugged Ka'ū-Ka-pāpala Forest Area (110 square miles, 80,000 acres) in the summer of 1976, sampling primarily the birds and the vegetation types. Some highlights: 23 bird species--11 exotic and 12 endemic; the first nest of the Hawai'i 'Ākepa and a number of rare plants.

In the summer of 1977, he will conduct a similar study in the forests above Hilo and Lau-pāhoehoe. His talk was illustrated with slides and a number of colored maps.

After the program, he showed us a few slides of very unusual bird sightings--a white egret, which could be a "little egret" or a "snowy egret"; a Tufted Duck in with a group of Ring-necked Ducks at Waialoa-Wai-ākea Pond on the Big Island; and a slide of a small Canada Goose, probably of the subspecies Taverner. Rob Shallenberger showed a slide of a sea bird sitting on the ocean 5 miles off Lā-na'i, probably an immature species of Jaeger. ...

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NOTES: THE CONDOR, Vol.78, No.2, Summer 1976, pp.264-265: Red-footed Booby Helper at Great Frigatebird Nests by Paul W. Woodward

p.264: On the night of 1 October 1965, while banding Red-footed Boobies in a stand of Tournefortia on the western side of Enderbury Island, I captured an adult male booby... brooding a nestling Great Frigatebird. During the next two days this male was seen standing next to the nestling and threatening intruders.... The following year on 25 September and 9 October I found the same booby guarding another nestling Great Frigatebird, which was too large to be brooded.... A frigatebird egg could have accidentally fallen into a booby nest. However, because the same booby was guarding a frigatebird nestling in two successive years and because these records are unique, this interpretation seems unlikely. For the same reasons, it is unlikely that a Great Frigatebird parasitized a Red-footed Booby nest.... A reasonable explanation is that this booby was raised by frigatebirds, perhaps as a result of an accidental introduction of a booby egg into a frigatebird nest, and was imprinted on Great Frigatebirds rather than on Red-footed Boobies.

p.265: It is significant that this booby was about 3 years old in 1965 (based on the original banding data) and probably had never bred. Therefore, it is unlikely that a frigatebird imprinted on boobies laid its egg in the booby nest. Both species feed mainly on flying fish and squid, and both feed their young in a similar manner..., so it seems possible that either species might raise or help raise a nestling of the other. ...

IBID, pp.267-269: Superimposition of an 'Amakihi Nest on One of an 'Elepaio by Charles van Riper III

p.267: On 3 June 1973, while working on the northwestern slope of Mauna Kea, Hawai'i, at approximately 2,286 m elevation, I found an 'Amakihi building on top of an 'Elepaio nest. ...The nests were placed in a lateral fork of a 7.9-m māmane tree, 6.25 m above the ground. I know of only one reference to superimposition of nests in Hawaiian birds...--'Apapane nests built on top of one another in a lava cave. ...I watched the nest for 10 days, and although it appeared completed, the 'Amakihi never laid any eggs. ...

p.268: Upon closer inspection I was surprised to find egg shell in the 'Elepaio nest. ...I do not know whether the 'Elepaio nest had been active when the 'Amakihi started building, or the egg had not hatched and fragments remained after the 'Elepaio had finished nesting. The behavior of the 'Amakihi appears puzzling until nest placement in the 'Amakihi and 'Elepaio is studied more closely. ...Both species nest at approximately the same height from the ground, but appear to differ in the distance chosen from the central axis of the tree. The 'Elepaio prefers the more upright branches in the central portion of a tree to weave its nest around; most nests of this species are found fairly close to the main trunk of the tree. ...

p.269: The 'Amakihi, on the other hand, builds statant cupped nests usually placed on top of a forked branch and seems to prefer the area eight feet and outward from the main axis of the central trunk. The 'Amakihi that superimposed its nest on the one of the 'Elepaio, placed the structure 12 feet from the central axis, well within the zone of typical 'Amakihi nest placement and well outside the zone preferred by the 'Elepaio. As these two species nest in nearly identical habitat space, it is possible that this may be an overlap in habitat preference for nest-site selection. ...

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ALOHA to New Members:

Junior: Bryan Booth, 2136 Bancroft Drive, Kaneohe Marine Corps Air Station, HI 96615
Eddie Gronemann, 516 Kyles Lane, Ft. Wright, KY 41011
John Y. Hong, 3475 Ala Hapuu St., Honolulu, HI 96818
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Donations: MAHALO! Following members have generously included donations with their dues and purchases: Founder of Hawaii Audubon Society, Charles M. Dunn-$10.00; Walter McKinney-$2.00; Linda Murakami-$2.00; J. Michael Scott-$2.00; Dick Hoy Wong-$2.88.

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Please report all bird sightings to field observation recorder, Dr. Robert L. Pyle, 741 N. Kalaheo Avenue, Kailua, Oahu 96734, telephone 262-4046.

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When you find a bird's nest, please call Dr. Andrew J. Berger at the Department of Zoology, University of Hawai'i, telephone 948-8655 or 948-8617.

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Field Checklist of Birds of Hawai'i is now available either on heavier card stock or on lighter paper. Mail order--25¢ each or 10¢ each for 10 or more, postpaid; direct purchase--10¢ each or 5¢ each for 20 or more.

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JUNE ACTIVITIES:

12 June - Field trip to Poamoho to study forest birds. Meet at the State Library on Punchbowl Street at 7:00 a.m. Bring lunch, water and if possible, your car. Transportation cost ($1.00) to be paid to the drivers. For information call evenings, Dr. Francis Howarth, 841-4953.

13 June - Board meeting at Waikiki Aquarium Auditorium, 7:00 p.m. Members welcome.

20 June - General meeting at Waikiki Aquarium Auditorium at 7:30 p.m.
Program: Role of Law Enforcement in Wildlife Conservation by Ms. Kim Wright, U.S. Fish & Wildlife Service, Law Enforcement Branch.

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