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'ELEPAIO

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The Impact and Spread of *Rubus ellipticus* in Ola'a Tract Hawai'i Volcanoes National Park

by Lisa Stratton[1]

Fig. 1. Rubus ellipticus.

The Office of Technology Assessment recently produced a 390 page document entitled *Harmful Non-Indigenous Species in the United States* (1993). Hawaii received special attention because of the vulnerability of the islands' unique flora and fauna. Habitat destruction has had the most impact on indigenous biota but non-native species invasions have recently taken over that role. While the lowland areas have already been completely altered by man, higher elevations still contain significant stands of native vegetation. Currently, several invasive weeds threaten the integrity of upper elevation forest ecosystems: banana poka (*Passiflora mollisima*), Koster's curse (*Clidemia hirta*), strawberry guava (*Psidium cattleianum*), blackberry (*Rubus argutus*), and Himalayan yellow raspberry (*Rubus ellipticus*), to name a few. Given that these areas contain some of the last remaining habitat for rare plant and bird species, data on the rate and nature of spread of invasive weeds can help land managers make decisions about where to direct their resources. In the case of Hawaii this is particularly important because so little of the state's budget is allocated for forest protection. Although the state ranks eighth out of the 50 states in terms of protected land area, it only ranks 38th in permanent staff and 45th in funding (M.G. Buck, 1992).

Rubus ellipticus, native to the Himalayas (2-7000 ft elev.), is the subject of this article (Hooker, 1879). It is a thorny shrub capable of forming dense thickets which can reach the canopy level in tree-fern dominated rainforests (Fig. 1). Its range is currently limited to the island of Hawai'i, where it was introduced as an experimental crop plant. Although Hawai'i Volcanoes National Park devotes significant resources to alien plant control, the major *R. ellipticus* infestation is in the park's Ola'a Forest Tract. Ola'a Tract is adjacent to the Volcano Agricultural Research Station where *R. ellipticus* was introduced in 1961. As early as 1968 Otto Degener recognized the potential impacts of this pest (Degener, 1968). Recent sitings include Laupahoehoe Forest Reserve (G. Markin) and the Tree Planting Road (M. Kjargaard). The goals of this study were to quantify and analyze the spread of *R. ellipticus* and to determine the impacts on native forest

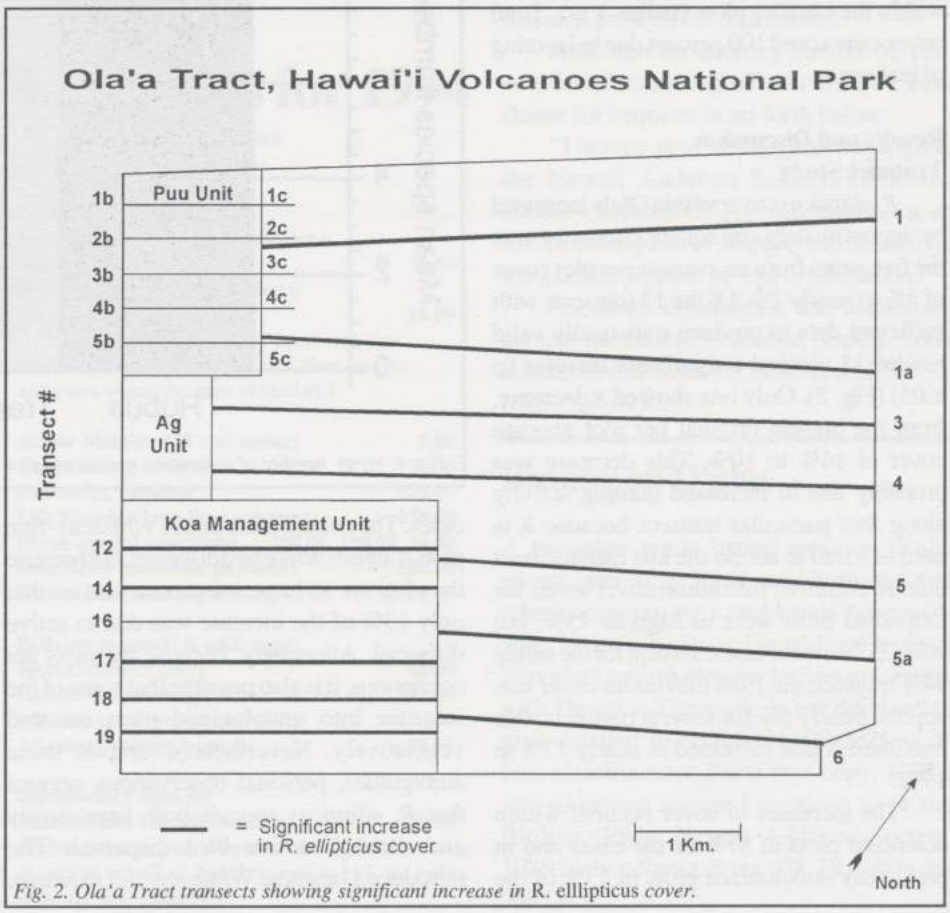

Fig. 2. Ola'a Tract transects showing significant increase in R. elllipticus *cover.*

composition in Ola'a.

Field Methods

The rate of cover increase and range expansion within Ola'a were examined by comparing data on *R. ellipticus* cover collected in 1988 with that collected in 1993 (Linda Pratt). Data were collected along 18 transects ranging in length from 1200 to 5600 meters. Cover was estimated in contiguous 5 x 50 m plots in five cover classes: 0, < 1%, 1-0%, 10-25%, 25-50%, >50%. Exact transects were remonitored in 11 of the 18 cases (within Koa and Puu Management units) and approximate replicas of 7 transects were monitored in the unfenced portion of Ola'a tract (Fig. 2).

The potential impact of *R. ellipticus* on forest composition was assessed through a randomized block design of 25 sets of plots representing three canopy types: *R. ellipticus*, tree ferns, and random forest sites. A block design was selected to control for possible area differences in composition. Tree fern plots were included in order to try to control for the shading effects of *R. ellipticus*. Ultimately there were no significant differences between the tree fern and random forest plots because the forest is dominated by tree ferns and because the shade under *R. ellipticus* is much deeper than under tree ferns. Cover was estimated for each species within the circular plots (radius 1 m). Total cover can exceed 100 percent due to layering of leaf cover.

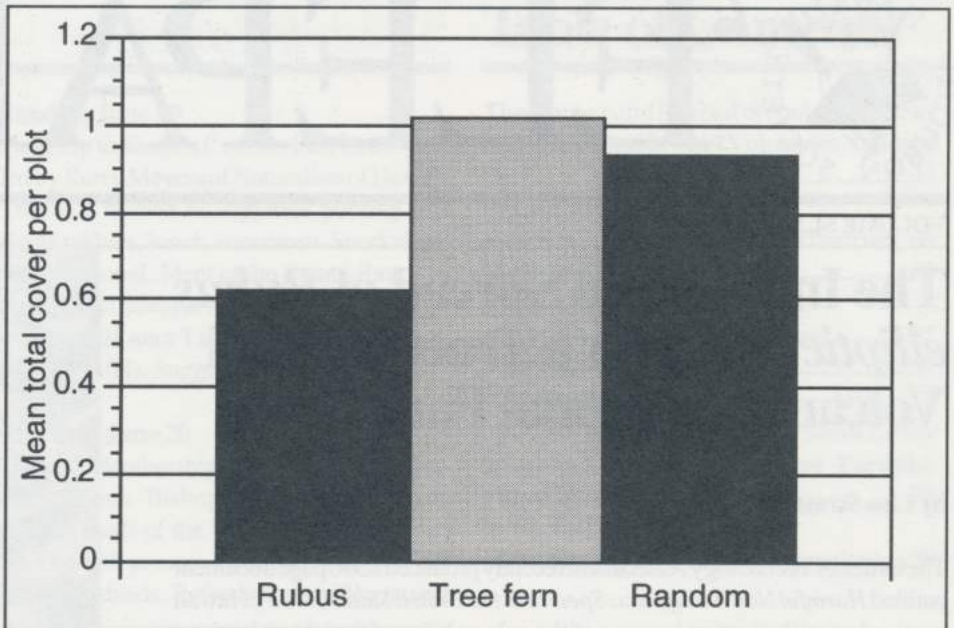

Fig. 3. Mean total percent cover of all understory species growing in the three plot types: under R. ellipticus, *under tree ferns, and at random points in the forest.*

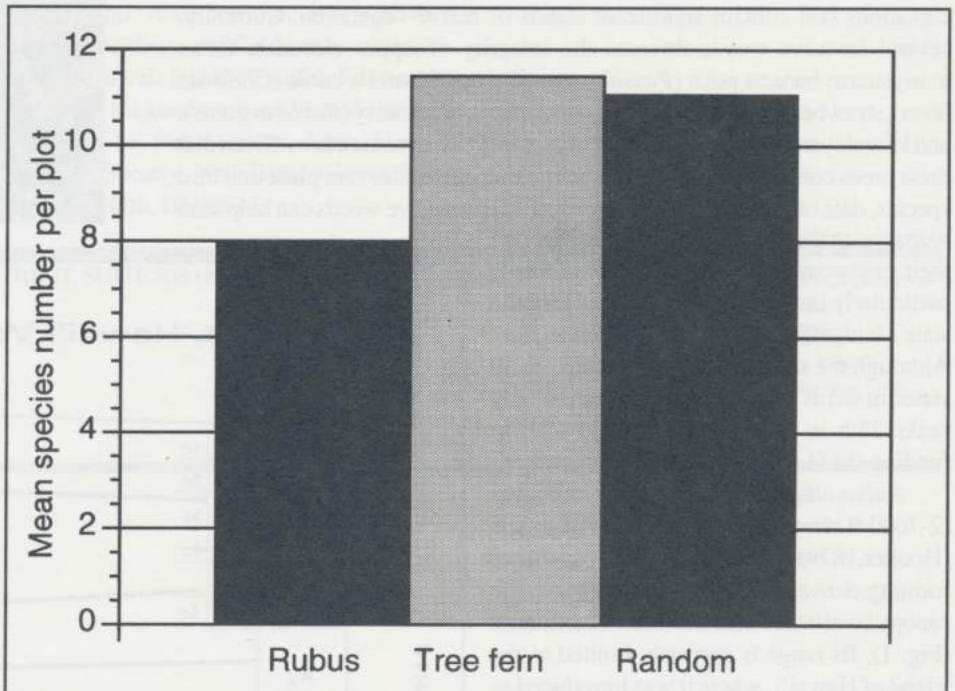

Fig. 4. Mean number of understory species per plot type.

Results and Discussion

Transect Study

R. ellipticus cover within Ola'a increased by approximately one square kilometer over the five years from an average per plot cover of 4% to nearly 7%. Of the 13 transects with sufficient data to produce statistically valid results, 11 showed a significant increase ($p < .05$) (Fig. 2). Only one showed a decrease, from the highest original per plot average cover of 14% to 10%. This decrease was probably due to increased hunting activity along that particular transect because it is used as a trail to access the koa management unit. *R. ellipticus* maximum cover levels for individual plots were as high as 75%, but were 25% in most cases. Except for the single 14% transect, the 1988 maximum cover was approximately 6% for several transects; this maximum value increased to nearly 13% in 1993.

The increases in cover occured within colonized plots in 87% of the cases and in previously uncolonized plots in 13% of the cases. The colonization into *R. ellipticus*-free plots suggests active bird dispersal, but because the plots are so large one cannot assume that only 13% of the increase was due to active dispersal. Alternately, because the plots are contiguous, it is also possible that some of the increase into uncolonized plots occured vegetatively. Nevertheless, despite these ambiguities, personal observations suggest that *R. ellipticus* spreads both vegetatively and through active bird dispersal. The introduced Japanese White-eye, for example, is common in Ola'a and known to eat and disperse the seeds (LaRosa, 1985).

Impact Study

Since *R. ellipticus* grows in large, dense thickets and creates wide patches of deep shade one might expect that it would have an impact on understory vegetation. The results of this study support that hypothesis, although they do not isolate shade as the primary cause of the difference.

Total plant cover under *R. ellipticus* was

significantly lower ($p < .001$) than in either of the other types of plots (Fig. 3). Likewise, species richness, based on the average number of different species found per plot type, was significantly lower in the *R. ellipticus* plots (Fig. 4). The tree fern and random forest plots were not significantly different from each other in either category.

When the species data were separated into groups by life form and native/non-native status there were few significant differences. This was most likely due to insufficient data for individual species comparisons. Overall there were significantly more native trees, native tree ferns, native shrubs, and native ferns in the random plots. There were not, however, significantly more alien shrubs or herbs in the *R. ellipticus* plots. The impact on forest composition was largely defined by the absence of many species under *R. ellipticus*.

Conclusion

Are natural areas managers willing to lose native vegetation under 5m high thickets of thorny *R. ellipticus*? Citizens, land managers, and Department of Agriculture officials all have a role to play in limiting the spread of this weed on the island of Hawai'i and throughout the island chain. Sitings of satellite populations can be mailed to the author. Currently no money is specifically allocated for biocontrol of *R. ellipticus* although research on the congener *R. argutus* may contribute to solutions. Biocontrol issues are made more difficult when native congeners (*R. hawaiensis* and *R. macraei*) are present. This plant deserves immediate attention before it spreads too far or becomes established elsewhere in the Hawaiian rainforest. This project includes ongoing research on light requirements for germination and growth of *R. ellipticus* in forest conditions.

Acknowledgements

Hawaii Audubon Society, State of Hawaii Division of Forestry and Wildlife, the Ecology, Evolution and Conservation Biology Program, and Cooperative Parks Study Unit all provided financial assistance for this project. Valuable advice was kindly provided by Tim Tunison, Linda Pratt, Cliff Smith, and Peter Schuyler.

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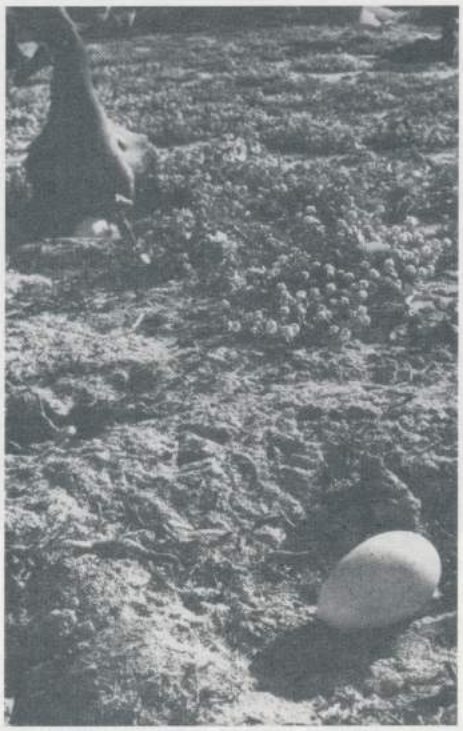
Status of the Short-tailed Albatross on Midway Atoll



Short-tailed Albatross nest and egg after abandonment in December 1993. Incubating Black-footed Albatross in background. Photo © Scott A. Richardson.

by Scott A. Richardson[1]

During each year of the past two decades, Midway Atoll has hosted one or two Short-tailed Albatrosses (*Diomedea albatrus*). In November 1993, the most recent of these visitors, an 11-year-old *ahodori* bearing vestiges of juvenal plumage, was found incubating an egg. This marks the first nesting of a Short-tailed Albatross at Midway in 32 years and is a rare nesting record away from historic and current Japanese breeding islands.

The egg was discovered on 9 November by Brian and Janice Kain, consultants residing temporarily at the atoll. Biologist Dr. James Ludwig also viewed the egg on the day of its discovery.

The nest was placed in an area the albatross has frequented for years—a grassy space beside the southwest edge of the active runway on Sand Island. A stand of naupaka (*Scaevola sericea*) above the shoreline blocked its sea view. Black-footed Albatrosses were nearby neighbors; several nests were within a few meters of the Short-tail site. The nest consisted of a shallow scrape in the sandy substrate with a partially-formed mound of sand around its perimeter. Pieces of dry grass and bits of dried woody stem may have been placed there by the incubating bird, but may also have fallen into the scrape. In general, the nest appeared minimally maintained.

The albatross had arrived during the last week of October and was present until at least 3 November. It was away from its eventual nest site on 5 November, but had returned by the 8th. Frequent sightings were made during an incubation stint that lasted at least 31 days. The bird was last seen on the egg on 9 December at 09:30 and had abandoned it before 13 December at 16:10.

Albatross eggs may remain viable for several days without incubation (Hadden 1941), so this one was left in its nest until 17 December, when it was collected by the U.S. Fish and Wildlife Service (USFWS). An abandoned Black-footed Albatross egg was left as a replacement. Shortly after collection, the egg was placed on an embryo viability detector, a device designed to convert embryonically-generated vibrations to audio signals that can be heard through headphones (Mineau and Pedrosa 1986). No heartbeat was detected. The contents of the inviable egg were discarded and the shell was placed on display at the Midway Atoll National Wildlife Ref-

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Incubating Short-tailed and Black-footed Albatrosses at Midway Atoll, November 1993. Photo © Scott A. Richardson.

uge office.

The egg was dull white with heavy brownish-red blotching and spotting at its blunt end. Using calipers, it was measured as 120.0 by 71.5 mm before it was blown, but 121.0 mm in length after being emptied. These measurements, coupled with the persistence of the incubating bird, suggest authenticity of the Short-tail egg. Average measurements of 43 Short-tailed Albatross eggs reported by Bent (1964) were 116.1 by 74.2 mm, with an extreme length of 125.0 mm. Eggs measured by H. Hasegawa (unpubl. data) averaged slightly longer and narrower (118.7 by 73.0 mm, $n = 5$).

Short-tailed Albatrosses at Midway have been known to adopt eggs of other albatross species (Hadden 1941; S. Barclay, USFWS, unpubl. notes). However, Laysan Albatrosses do not begin to lay until the third week in November and Black-foot eggs are a bit smaller than those of Short-tails, although there is slight overlap. For example, Bent (1964) reported 45 Black-footed Albatross eggs averaged 108.8 mm in length, with a 120.7 mm extreme. Fisher (1969) found 172 Black-foot eggs averaged 108 mm (S.D. ± 0.3) in length, with the longest being 120 mm. Among his measurements of diameter (70.0 ± 0.2 mm; range 64.2 to 74.0 mm), only extremely wide eggs encompass the measurement of the presumed Short-tail egg.

Historic Records

The world Short-tailed Albatross population is estimated to comprise 700 to 750 individuals, with 146 eggs at the larger of the two Japanese nesting colonies during the 1993-'94 season (H. Hasegawa, pers. comm.). In proposing that Short-tailed Albatrosses spending time at Midway might form "the nucleus of a future population," McDermond and Morgan (1993) promulgated the collective wishful thinking of many biologists and conservationists. As the Short-tailed Albatross world population rebounds, Midway's nucleus may expand to include pairs that nest successfully. However, only a few individuals have been seen at the atoll through 1994.

The first Short-tailed Albatross recorded at Midway was one that spent two winters between 1936 and 1941, but somehow was injured and died. It had been observed incubating a Black-foot egg (Hadden 1941:39).

In 1961 and 1962, single Short-tailed Albatross chicks successfully fledged from Midway (Fisher 1983). These were not reported at the time in order to prevent disturbance to the breeding birds.

A juvenile was seen in 1965 (Fisher 1983) and an adult was banded at Eastern Island on 18 March 1966 (Sanger 1972).

Beginning in November 1972 and continuing through at least 10 February 1983, an individual banded as a chick on Torishima in March 1964 (558-30754) returned to Midway during most or all breeding seasons. It was seen as early as 25 October (1978) and as late as 30 March (1974), and was regularly found on the west side of Sand Island.

An unbanded immature was photographed on the south side of the harbor on about 10 February 1981, but it was not seen during later searches (Grant 1982).

An individual banded as a chick at Torishima on 20 March 1979 (130-00501, white 000) was first seen on 15 December 1984 and returned annually through 1993-'94. It has been observed from November through March at its station above the south shore of Sand Island, southwest of the runway crossing.

The individual that incubated an egg in 1993 was banded as a chick at Torishima on 24 March 1982 (130-01320, yellow 015). It has been at Sand Island each year since 1989-'90. Its earliest arrival was 26 October (1993) and its latest departure was 30 April (1991).

The beauty and special status of this species have attracted the attention of Midway residents for many years, so it is unlikely that additional individuals have visited for any length of time without being detected.

In March 1994, white 000 and yellow 015 were seen together consistently for the first time in the 5 years they have shared the island. A courtship dance was observed by Dr. Lee Eberhardt (M. Nishimoto, pers. comm.).

Acknowledgments

I am grateful to the U.S. Fish and Wildlife Service for supporting my visit to Midway, to Dr. Hiroshi Hasegawa for sharing unpublished information and a heretofore unrevealed correspondence from Dr. Harvey Fisher, and to Cheryl Summer for her description of the embryo viability detector.

Several observers not cited above have reported sightings in the form of publications (Sekora 1977, Grant and Pettit 1981), USFWS reports (D. K. McDermond, M. Nishimoto, C. Rowland, W. B. Tyler, D. Williamson), and reports to *American Birds* and the B. P. Bishop Museum (N. Butowksi-Casey, S. Fefer, M. Naughton). This review cannot include all sightings made by hundreds of other residents and visitors to Midway.

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ATOC Boombox Vote Clarified

In the May *'Elepaio* we reported that the HAS Board of Directors unanimously voted to oppose ATOC. The eight board members present at the meeting voted to oppose the project, which involves placing sound generating devices in the Pacific Ocean—one in a marine sanctuary off Point Sur, California, and the other eight miles out from Hanalei Bay, Kaua'i. The devices would generate 195 decibels of noise for 20 minutes at a time at four hour intervals for two years. Six board members were absent from the meeting and did not vote.

Mahalo Donors!

The Hawaii Audubon Society thanks the following members and friends for their generous donations:

Julie Balbach, S. F. Cushman, Dorothy Doleman, Keith Evans, Sherilyn Garrett, John T. Harrison III, Doris Jasinski, Andrea Lippa, John J. Mahoney, Helen L. Morris, Mike Morton, Karen Ratliff, William Swicegood, and Yoshiharu Wada.

Paradise Pursuits Champions—1994

by Candace Lutzow-Felling and Sheila Laffey

The Hui Lama team from Kamehameha High School emerged victorious as the Paradise Pursuits champions for the second year in a row. Kamehameha beat out the 'Oma'om'o team from the Big Island's Parker School following two rounds of stiff competition. The championship game aired on KHON-TV2 on Saturday, 23 April and was hosted by news anchor Howard Dashefsky.

What is Kamehameha's formula for success? The students give credit to their science teachers, Chuck Burrows and Dick Mills, and to their coaches, Keali'i Pang and Karen Victor, for providing them with a wide variety of environmental materials to read and study. Most important, they said, were the many hikes taken by the team and their coaches where they were able to observe first hand the geology, flora, and fauna of Hawaii and could discuss environmental issues in the field. The Kamehameha teachers and coaches attribute the team's success to their many hours of dedicated studying and reviewing of a wide variety of natural history material. The team is enthusiastic about future participation in Paradise Pursuits and the fun they have had preparing for the games.

The spirit of congeniality prevailed among all the Paradise Pursuits teams during the semi-final and final games, even during the most tense moments of the competitions. Kamehameha advanced to the finals after edging out Lahainaluna High School's Kohola team by a narrow 5-point lead in the final round of questioning. Parker High School entered the final game after being challenged in the semi-finals by Kaua'i High School's 'Opihi team. The semi-final competitions aired on KHON-TV2 on 16 and 17 April. This year marked the first year of competition for Parker High School, Lahainaluna High School, and Kaua'i High School. Each team had to beat out several other teams in their respective districts to advance to the semi-final and final rounds.

The Kaua'i High School team was encouraged by the good showing they made for their first year in the competitions. "We had fun," they exclaimed. "We'll be back next year and we'll be awesome." The Lahainaluna High School team echoed this enthusiasm about their participation in Paradise Pursuits. "Science is important," they explained, "because you learn something about the environment you live in and what is happening in the

Left to right: The winners, Mark Silva, Daniel Kauwe, and Rosanna Alegado from Kamehameha Schools, host Howard Dashefsky, and the runners up, Elli Heritage, Starr Peterson, and Sean McIlvenna from Parker School. Photo © Sheila Laffey.

world around you."

For their efforts, Kamehameha Schools team won The Nature Conservancy's overnight trip to Waikamoi Preserve on Maui, with transportation for the trip courtesy of Crazy Shirts. Lahainaluna's team will experience an overnight adventure to Pu'u Kukui on Maui, courtesy of Maui Land and Pineapple. Parker School's team will explore the wonders of a native forest at 6000 feet elevation during an overnight camping trip at Keauhou Ranch, courtesy of The Bishop Estate/ Kamehameha Schools. Kayak Kaua'i donated the top prize to Kaua'i High School's team. Members of the second place O'ahu team from Kahuku High School will keep their eyes open during a whale watching cruise on the Navatek and the runner up Big Island School from Hilo High School will cruise the waters down under on a trip on the semi-submersible Nautilus. Forty organizations, businesses, and individuals donated other prizes

The 25 teams have prepared for the competitions since last fall. They have come to realize that Earth Day needs to be Every Day. Students have learned that flushing the average toilet uses 5 to 7 gallons of water and that average faucet flow is 3 to 5 gallons of water per minute. They have learned that if the entire population of Hawaii were to stop delivery of junk mail, 1.5 million trees could be saved each year. The students have also learned that their conservation actions can make a difference.

Also, they have learned to appreciate the natural world around them, especially in Hawaii which has the highest number of endemic species in the world. They have learned that insects have 6 legs and that the mineral which forms Hawaii's green sand on the Big Island and at Diamond Head and Hanauma Bay is olivine.

The goal of Paradise Pursuits is to motivate students to actively care for Hawaii's resources, recognizing that it is not what you know but what you do with what you know that makes a difference. How are these games faring in meeting this objective?

Parker's 'Oma'om'o team says that participation in the games has given them more of a purpose to try and remember their science lessons than just taking a test does—and that learning science is a lot more fun! Their coach and biology teacher, Pat Wagner, says that participation in Paradise Pursuits has stimulated all the students at Parker School, not just the team participants, to learn about local and global environmental issues and that this experience "makes science more real and practical since (learning) becomes something that you experience for yourself rather than something you just read."

Science teachers who wish their classes would become self-motivated to study science should get their students involved in Paradise Pursuits. The science teachers of the four winning teams were encouraged by the affect participation in the games had on their students. Kamehameha science teacher Dick Mills explained that through participation in the games his students "found that it was fun to get involved and to learn more about the environment and that this process had increased the sense of pride that they had in themselves and their abilities." Clearly, Paradise Pursuits is accomplishing its goal to stimulate environmental education in Hawaii and a greater awareness of environmental issues.

Bob Pritchard, the KHON-TV2 director of Paradise Pursuits, knows first-hand how a positive natural science learning experience when young can influence one's attitude toward the environment as an adult. He recalls that as a boy he constructed several hundred Bluebird houses from discarded grape shipping crates and installed them with his dad on posts along the edges of farm fields in rural Michigan. His contributions were part of an Audubon effort in the 1970s and '80s to reestablish the rapidly dwindling populations of Bluebirds throughout the Midwest. How fortuitous it is for Paradise Pursuits to have him as the director of the television broadcasts.

More Grants for Paradise Pursuits

The expansion of the Paradise Pursuits program received another boost this spring with the awarding of two new grants. The George P. and Ida Tenney Castle Trust awarded HAS a $2,000 for dollar matching grant which required that the matching $2,000 be raised from corporations or private businesses. Acknowledging the importance of this program, Castle and Cooke Homes Hawaii, Inc., quickly came through with the required $2,000. Mahalo to both!

Hawaiian Electric Continues Paradise Pursuits Funding

by Sheila Laffey

Hawaii Audubon Society is very grateful to Hawaiian Electric Company for its continued support as the major funder of Paradise Pursuits. HECO recently awarded HAS $15,000 for Paradise Pursuits' 1994-'95 season. We are pleased that the partnership between HAS and HECO allows us to continue to offer this upbeat environmental education program to high school students state-wide. With the broadcasts of the semi-finals and finals on KHON-TV2, the reach of this program extended to an estimated 130,000 viewers this past April.

As Scott Shirai, director of community relations at Hawaiian Electric Industries observed, "partnerships such as this have opened up and maintained honest communications with organizations whom we might otherwise be facing in court or responding to publicly in the news media. And while we may not always agree with each other on everything, the partnerships have helped keep the doors open for healthy and open dialogue instead of litigation and controversy."

We look forward to working again with Scott Shirai on exploring new ways to extend the reach of Paradise Pursuits.

Paradise Pursuits T-Shirts Available

A limited quantity of Paradise Pursuits T-shirts, in small and large sizes, is available at the office. The white shirts carry the Paradise Pursuits logo, a monk seal relaxing on a surf board, and HAS' 'Elepaio logo. To order, send $12.00 plus $2.00 for postage and handling to Hawaii Audubon Society, 1088 Bishop Street, Suite 808, Honolulu, HI 96813.

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

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T-shirts for Sale

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

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

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

HAS Dues for 1994

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Regular Member	
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Research Grants

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

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

Your Bequest Can Help

A bequest to the Hawaii Audubon Society is an excellent way to help in our conservation efforts. George C. Munro, enthusiastic and tireless field ornithologist and naturalist, provided for a fund to be used exclusively for the protection of native dry forests. Today, the George C. Munro Fund provides money for research projects on such forests.

Although an attorney should be consulted in the drafting of your will, a model clause for bequests is set forth below.

"I hereby give, devise, and bequeath to the Hawaii Audubon Society, Honolulu, Hawai'i, the sum of _____ dollars (or set forth a description of property), to be used for the general purpose of said organization."

For more information and assistance, contact the Hawaii Audubon Society, 1088 Bishop Street, Suite 808, Honolulu, HI 96813, (808) 528-1432.

Birding on O'ahu

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

Calendar of Events

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

Sunday, June 12
Field trip along Manoa Cliffs trail. Leaders John and Donna de Haan. This trail features native plants and birds. Bring water, snacks, rain gear, and binoculars. Meet at the State Library on Punchbowl Street at 7:30 a.m. or the entrance to Pu'u Ualaka'a State Park on Round Top Drive (just past the Manoa lookout) at 8:30 a.m. For more information call Donna de Haan, 941-9817 (H), or Lance Tanino, weekday evenings, 247-5965 (H). Suggested donation: $2.00.

Monday, June 13
Board meeting, 7:00 p. m., HAS office. Call Reggie David on Hawai'i, 329-9141 (W), for details.

Sunday, June 19
Field trip to Shark's Cove on the North Shore led by Kerry Meyers of Naturalists of Hawaii. This is a marine biology/tide pooling trip. Bring tabbies, lunch, sunscreen. Snorkel and mask optional. Meet at the State Library on Punchbowl Street at 9:30 a.m. For more information call Lance Tanino, weekday evenings, 247-5965 (H). Suggested donation: $2.00.

Monday, June 20
General Membership Meeting, Paki Conference Room, Bishop Museum, 7:30 p.m. Johnny Beall of the U. S. Fish and Wildlife Service will present a talk and video on Hawaiian wetlands. Refreshments will be served.

Publications Available

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

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