This series of CPSU/UH Annual Reports replaces the Biannual Reports that were issued by this Unit. The last Biannual Report issued was Number 19.
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HALEAKALA AND HAWAII VOLCANOES NATIONAL PARKS

ADAPTIVE RADIATION OF THE HAWAIIAN SILVERSWORD ALLIANCE

Project Leader: Dr. Gerald D. Carr
Department of Botany
University of Hawaii
3190 Maile Way
Honolulu, HI 96822

Not under contract
Date project started: August, 1975.
Anticipated termination date: Indefinite

Research Objectives:

To characterize the adaptive radiation of the Hawaiian silversword alliance.

Progress to Date:

Information related to the goal has been amassed by several collaborators over the last few years. Data from biosystematic, cytogenetic, ecophysiological, electrophoretic, phytochemical, chloroplast DNA, and reproductive biology studies have been accumulated and provide a basis for a synthetic perspective on the evolutionary divergence of this group. Present arrangements for the investigations into the phytochemical and chloroplast DNA aspects of this work were initiated during the past year. Also, a number of papers, including a monograph of the alliance, was completed during 1983.

Plans for next year:

In addition to continuation of field and laboratory research on the adaptive radiation of the silversword alliance, production of a report on the occurrence and management of representatives of this group in Hawaii's national parks is anticipated.

Reports and publications produced:


HALEKULA AND HAWAII VOLCANOES NATIONAL PARKS

BIOLOGICAL CONTROL OF ALIEN PLANTS

Project Leader: Donald E. Gardner
CPSU/UH, Department of Botany
University of Hawaii at Manoa
3190 Maiea Way, Honolulu, HI 96823

NPS Contract Number (if applicable): NA
Date project started: 1977; current phase, 1983
Anticipated termination date: Indefinite

Research Objectives: To discover organisms which are effective in limiting any of various alien plants in Hawaiian NPS areas, and to implement these biocontrol agents in the most effective manner, while avoiding damage to desirable plants or otherwise causing unacceptable side effects such as undue biological pollution.

Progress to Date: The current phase of the biocontrol project involves testing of the pathogenic fungus Fusarium oxysporum f. sp. passiflorae, under restricted quarantine conditions, as a potential biocontrol agent for banana poké (Passiflora mollissima). Since the fungus was obtained by permit from Australia, it has been grown in pure culture in the laboratory, and root dip inoculation tests have been conducted on several plant species. These represent other weedy Passiflora species which occur in Hawaiian forests and noncultivated areas, as well as the two edible forms of P. edulis in Hawaii, one of which (P. edulis forma flavicarpa) is of limited commercial value. Seedlings of numerous other plants unrelated to the Passifloraceae have also been tested by this method in the quarantine chambers specifically designed and constructed for this work. Testing thus far has yielded promising results.

A rust disease of Rubus spp. from the southeastern U. S. has been tested on native and nonnative Rubus species from Hawaii at North Carolina State University. Results were promising to the extent that R. perennis, the most widespread noxious Rubus species in Hawaii, became significantly infected and succumbed to the disease. Results of testing on the two native species, R. hawaiiensis and R. acrasi, were inconclusive, however. A permit to import this rust fungus to Hawaii for further study under quarantine was submitted.

An exploratory trip to the native habitats of Myrica faya was taken in search for potential biocontrol agents for this alien species in Hawaii. At least one, and possibly two, insect species and two pathogenic fungi were found which were recommended for testing in the biocontrol program. The distribution of M. faya in Hawaii Volcanoes National Park, on the island of Hawaii, and throughout the state was also mapped.
HALPAKALOA AND HAWAII VOLCONEES NATIONAL PARKS

CHEMICAL CONTROL OF ALIEN PLANTS

Project Leader: Donald E. Gardner
CSU/UH, Department of Botany
University of Hawaii at Manoa
3330 Maile Way, Honolulu, HI 96822

NPS Contract Number (if applicable): NA
Date Project Started: 1977; current phase, 1984
Anticipated Termination Date: Indefinite

Research Objectives: To determine effective methods of alien plant control with herbicides in Hawaii's NPS areas.

Progress to Date: Herbicidal work with alien plants such as firetree, ginger, strawberry guava, Christmas berry, fountain grass, kikuyugrass, buffelgrass, blackberry, fuchsia, Formosan koa, nasturtium, and koa 'Aole has been undertaken in past phases of this project, resulting in management recommendations. The present phase includes testing various herbicides in a range of concentrations and using different application methods for blackberry, raspberry, silk oak (2 species), Russian olive (for seedling as well as mature plant control), tibouchina, and Jerusalem cherry. Information gained on each of these species as to appropriate and most effective treatment methods is communicated to management personnel.

Plans for Next Year: Current project funds have been expended and no funding is available for the foreseeable future. Present activity will be temporarily supported from other accounts, after which the project may be discontinued.

Submitted by: D. E. Gardner


Submitted by: D. E. Gardner
Nesoprosopis bees are also common visitors to Dukautia menziesii flowers. At one site where a late blooming silversword overlapped in blooming time with D. menziesii, bees marked while visiting silversword flowers were found visiting D. menziesii a few minutes later.

A small black and white diurnal Auritis moth that has been collected over the last few seasons on A. macrocephalus is an undescribed native species. This species of moth may be very important for silversword pollination. Specimens have been sent to Dr. J. D. Lafontaine, Biosystematics Research Institute, Ottawa, Ontario, Canada for description and naming.

Plans for Next Year: Progeny testing to determine what portion of the seed set in silversword and D. menziesii is lost to hybrid seed production will be begun next year.

Submitted By: Elisabeth Powell, 27 December, 1985
HALEAKALA NATIONAL PARK

HELIUM ISOTOPES IN VOLCANIC ROCKS
FROM HALEAKALA VOLCANO

Project Leader: M. Garcia
Hawaii Institute of Geophysics
University of Hawaii
Honolulu, Hawaii 96822

M. Kurz
Chemistry Department
Woods Hole Oceanographic Institute
Woods Hole, Massachusetts 02543

NPS Contract Number (if applicable): NA (NSF support)
Date Project Started: February 1, 1985
Percent Completion of Project So Date: 40%
Anticipated Termination Date: January 1987

Research Objectives: To evaluate: 1) the variation of He isotopes with age of the volcanic rocks; and 2) with time of exposure to cosmic rays.

Progress to Date: Two suites of samples have been collected from the park. First suite has been analyzed; second suite will be analyzed during 1986. A detailed stratigraphic study of a suite of volcanic rocks from Haleakala volcano reveals dramatic variations in ³He/²¹Ne ratio. Analyses of mineral gapayates from stratigraphically controlled samples yields ³He/²¹Ne ratios from 4.6 to 17.0 times the atmospheric ratio (Ra) with the highest ratios observed in the oldest (Honomanu series) samples, and the younger (Hana and Kula series) samples having values similar to MORB (8 x Ra). These variations are consistent with the volcano-evolution models suggested by Kurz et al. (EPSL 66 (1981) 308), and Chen and Frey (Nature 302 (1983) 705) in which the earlier tholeiitic volcanics are derived from an undepleted source. A single sample from the Kula formation has extremely high ³He/²¹Ne ratios (up to 68 %a in total fusion extractions) that we attribute to cosmogenic ³He, the first such observation on a terrestrial igneous rock. The release of helium with extremely high ³He/²¹Ne (> adular values) at low temperature by stepwise-heating, consideration of the cosmic ray fluxes, the age of the sample, and isotopic stratigraphy of the volcano, strongly suggest cosmogenic ³He from ⁶Li(n, ³He) in this sample.

Plans for Next Year: Complete analysis of samples and prepare manuscript for publication in scientific journal.


Submitted By: Michael Garcia, 20 December 1985

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HALEAKALA NATIONAL PARK
WATER BALANCE OF ALPINE HAWAIIAN ARGOXYRINUM AND DUBAUTIA SPECIES

Project Leader: Robert H. Robichaux  
Department of Botany  
University of California  
Berkeley, California 94720

NPS Contract Number (if applicable): NA (Atlantic Richfield Foundation supported)
Date Project Started: July 1982
Percent Completion of Project to Date: 50%
Anticipated Termination Date: July 1989

Research Objectives: This research examines mechanisms of adaptation to atmospheric and soil water deficits in Argyroxiphium sandwicense and Dubautia menziesii, two sympatric alpine species of Compositae. Specifically, it examines the role of morphological and physiological traits in enabling these species to function efficiently in alpine habitats at Haleakala. These traits include leaf angle and absorptivity, stomatal conductance, and tissue osmotic and elastic properties.

Progress to Date: I recently completed the first major phase of this research, and anticipate submitting two manuscripts on this work for publication in the near future. This phase is concerned primarily with the importance of stomatal responses to atmospheric humidity.

Plans for Next Year: I plan to examine photosynthetic water-use efficiency in the two species during July, 1986. I also plan to examine the responses of seedlings of the two species to substrate water deficits.

Reports and Publication Produced this Year: These will be sent under separate cover. Copies have already been provided to the field research office at Haleakala.

Submitted By: Robert H. Robichaux, 20 January 1986
2) Cover of mamane increased by 20-40% inside the enclosure. This was due to growth of young plants which were already established before the enclosure was built. Large trees changed little.

3) Cover of Ipomoea menziesii, a minor species in the area, declined by 40% outside the enclosure and increased by 80% inside the enclosure. Outside the enclosure, this species was completely eliminated from 25% of the study plots in which it had occurred. Numerous dead Ipomoea shrubs which had been heavily browsed by goats were readily identifiable.

4) Cover changes were minimal for species other than S. chrysophylla and D. menziesii. In this area, goats seem to only rarely browse Coprosma montana and other shrubs.

5) 80% of tagged young mamane trees outside the enclosure died; the other 20% are barely surviving. 100% of the tagged young mamane trees inside the enclosure are still living. Most are growing rapidly, with a meter or more of unbrowsed growth.

6) Some mamane seedlings have germinated and survived as long as 4 years inside the enclosure. They grow very slowly, however, and none are taller than 12 cm. Most seedlings died in the 1983-84 drought.

7) Conclusion: At Puu Mamane, unbrowsed mamane has recovered well, but slowly, from past browsing damage. Much recovery of mamane is to be expected if feral goats can be controlled in the park within the next few years.

Annual monitoring of Haleakala silversword populations in eleven permanent 5 m x 20 m quadrats scattered throughout Haleakala Crater has shown a 34% decline in silversword numbers since 1982. Much of this mortality is apparently due to erosion caused by heavy rains on November 30, 1985, and perhaps by rains at other times in 1985. Substantial seedling establishment occurred during 1984, boosting the total numbers in the quadrats by about 20%, but 70% of these seedlings died or disappeared during 1985. Erosion tends to remove some plants and bury others. This information tends to underscore the precarious nature of the silversword's environment and life history. It is truly remarkable that this monocarpic plant and its associated insect fauna have survived past impacts of man and browsing animals as well as natural environmental hazards.

The aggressive and predacious Argentine ant has survived and expanded its distribution somewhat over the four years since a disjunct population was discovered in a relatively barren site at 2830 m elevation on the rim of Haleakala Crater. To determine the impact of Argentine ants (Iridomyrmex humilis) on the arthropod fauna of high-elevation Haleakala, pitfall trapping and under-rock surveys were carried out in comparable areas with and without ants. Findings suggest that numbers of primarily native Lepidopteran larvae, small spiders,
arthropods are only a minor component of the diet of these game birds.


Submitted By: Lloyd L. Loype, 28 January 1986
HALEAKALA NATIONAL PARK
KIPAHULU VALLEY INTERDISCIPLINARY STUDY

Project Leader: Charles P. Stone
Box 52
Hawaii National Park, Hawaii 96718

Funding Source(s) and Amount(s): WASO (1983-1984), $24,953
Date Project Started: March 1983
Percent Completion of Project to Date: 90%
Anticipated Termination Date: December 1986

Research Objectives: 1) Determine rat densities and movements at 6 elevations in 3 vegetation types; 2) determine rat food habits and predation potential on forest birds and insects; 3) determine feral pig and exotic and native bird abundance and distribution in 3 vegetation types at 6 elevations; 4) determine insect availability and diversity in 3 vegetation types; 5) determine exotic and native plant abundance and distribution in 3 vegetation types at 6 elevations and elsewhere in Valley; 6) determine interrelationships of above; 7) provide management recommendations.

Progress to Date: Field work for the study has been completed. Most of the data have been analyzed; tables and figures have been prepared, and several sections of the final report have been written. The contract for invertebrate work from Bishop Museum is expected to be finished by May, and the final report by October.

Plans for Next Year: Complete final report and Technical report, CPSU/UH.

Reports and Publications:

1) CPSU/UH Progress Report


Submitted by: C.P. Stone, 4 February 1986
BIOLOGY AND CONTROL OF TEPHRITID FRUIT FLIES

Project Leader: Roy T. Cunningham
USDA-ARS
P.O. Box 4429
Hilo, Hawaii 96720

NPS Contract Number (if applicable): NA
Date Project Started: A continuing project.
Anticipated Termination Date: A continuing project.

Research Objectives: The Mediterranean fruit fly population which infests the Jerusalem cherry along the Mauna Loa Truck Trail is an especially interesting niche in which the adult population reaches the vanishing point but resurges with the development of a new fruit crop. This population also provides a different parasite complex and partially isolated gene pool.

Progress to Date: We have not yet devoted sufficient resources to do the thorough study in demography, dispersal, population measurement, etc., which is called for but we recognize the need and the potential of such a study site. We do make periodic Jerusalem cherry collections to obtain wild flies and parasites for other studies.

Plans for Next Year: Continuing periodic small-scale fruit collections.

Submitted By: Roy T. Cunningham
HAWAII VOLCANOES NATIONAL PARK

THE ROLE OF THE ALIEN MYRICA FAYA IN ALTERING PRIMARY SUCCESSION IN HAWAII VOLCANOES NATIONAL PARK

Project Leader: Peter Vitousek
Department of Biological Sciences
Stanford University
Stanford, California 94305

NPS Contract Number (if applicable): NA (NSF funding)
Date Project Started: January 1, 1986
Anticipated Termination Date: December 31, 1987

Research Objectives: To examine whether an introduced nitrogen fixer (Myrica faya) affects the rate and pathway of primary succession on nitrogen-deficient volcanic cinder.

Progress to Date: Four study sites have been established at different successional ages (two at 25 year, one at 200 year, one at 2,000 year). At each site we started factorial fertilization plots, tree dendrometers and leaf litter traps. In early succession sites, studies on the rate of leaf litter decay were started and seed traps placed to measure Myrica seed rain. In the later successional sites native tree ferns were tagged to measure growth and frond turnover rates. Seedlings of native ohia trees are being raised in a greenhouse and by air-layering twigs on ohia trees. These will be transplanted into early successional sites to experimentally determine the influence of Myrica on ohia.

Problems and/or Successes: Occasionally plans have had to be modified to accommodate the facilities here (notably a lack of chemicals, air-flow plant drier, distilled water) but most needs have been amply filled (notably green house facilities, office space, xerox, and computer support). In our set-up phase of this project our main problem has been the rustling of our dendrometer bands. Our main success has been finishing six months of intense set-up activity.

Plans for Next Year: Fertilization, dendrometer, litter trap, and leaf litter decay projects will be monitored. Seeding transplants and experiential sowings of seed will be started. Soil nutrient analyses, vegetation analyses, root analyses, and green house competition experiments will also be started.

Publications Expected: Yes, but journal/dste/title not known at this time.

Submitted By: Lara Walker and Louis Whiteaker, 4 December 1986
HAWAII VOLCANOES NATIONAL PARK
HAWAIIAN INSECT STUDIES

Project Leader: John W. Beardsley
Department of Entomology
University of Hawaii at Manoa
3050 Maile Way
Room 310
Honolulu, Hawaii 96822

NPS Contract (if applicable): NA
Date Project Started: 1970
Percent Completion of Project to Date: NA

Research Objectives: Evaluate entofauna of HAVO.

Progress to Date: On June 20, 1983, in company with Dr. and Mrs. Earl Qatman, University of California, Riverside, I visited Ripuka Puula (Bird Park), Hawaii Volcanoes National Park. There we observed heavy leafminer damage to leaves of an abundant wild grass (Poa sp.). Also observed on and around the damaged grass were numerous individuals of a small black fly which was unfamiliar to me. A quantity of infested grass was collected and held in the laboratory in Honolulu. Several dozen specimens of the small black fly emerged from this material. These were identified by me as Hydrellia tritici Coquillett, through comparison with specimens in the University of Hawaii collection.

Hydrellia tritici has been reported once previously in Hawaii (Mathis and Wirth 1981, Proc. Haw. Entomol. Soc. 23: 371-373). This record was based on two small collections (total 6 specimens) collected by Dr. Steven Montgomery. The earliest collection (2 males) was from the Mauna Loa trail at 13,000 ft. elevation, in August 1969: the second collection was made at Bird Park, Kilauea in September 1975. There are no previous records of larval mines of this species in Hawaii.

Hydrellia tritici was described from specimens from Australia, and it is known also from New Zealand. It has been reported as a wheat pest in Australia.

Also reared from the infested grass collected at Bird Park were several dozen specimens of a Pteromalid parasitoid wasp which I have determined as Cyrtogaster sp. This parasite, which is known to have been present in Hawaii since 1917, has been collected on all of the main Hawaiian Islands (Beardsley 1956, Proc. Hawaii. Entomol. Soc. 16:8). Species of Cyrtogaster are known to parasitize leafmining Diptera larvae in other areas, but this is the first evidence of such a host relationship in Hawaii.

Submitted By: John W. Beardsley, 9 January 1986
HAWAII VOLCANOES NATIONAL PARK

IMPACT OF YELLOWJACKETES ON NATIVE HAWAIIAN FAUNA

Project Leader: Parker Gambino
University of California
Entomology and Parasitology
218 Wellman
Berkeley, California 94720

NPS Contract Number (if applicable): NA
Date Project Started: June 19, 1985
Anticipated Termination Date: Ongoing

Research Objectives: Study prey selection and capture by exotic Vespula species, and impacts on native fauna.

Progress to Date: Local populations of Vespula pensylvanica queens observed.

Problems and/or Successes: 1985 visit was too early in season, and no active colonies with workers were located.

Submitted By: Parker Gambino, 17 December 1985
The technique for obtaining good quality metaphase chromosomes was worked out during this research. No other study of Lepitopteran chromosomes, to our knowledge, has obtained as clear chromosomal spreads as we have been able to obtain using our monolayering technique.

Plans for Next Year: We submitted a grant proposal to do further research on these organisms but were denied funding. We hope to revise this research proposal and to resubmit it to NSF.

Publications Expected: We have not yet submitted any papers for publication because, as mentioned above, this research was primarily to obtain preliminary data. This was accomplished and the data is, for the most part, incomplete and thus any publication at this point would be premature.

Submitted By: Alan T. Ohta, 6 January 1986
HAWAII VOLCANOES NATIONAL PARK
CORRELATING PALEOMAGNETISM,
MINERALOGY AND GEOCHEMISTRY, HAWAII

Project Leader: Joyce Castro
Department of Geology and Geography
University of Massachusetts
Amherst, Massachusetts 01003

NPS Contract Number: NA
Date Project Started: January, 1986
Anticipated Termination Date: August, 1987

Research Objectives: 1) Measure the internal consistency of the magnetic signature of individual flows, 2) determine agreement of magnetic signature with measured geomagnetic field, 3) identify causes of anomalous behavior

Progress to Date: In January 1985 paleomagnetic and geochemical samples were collected from 20 sites in the 1972 Kilauea flow and from 20 sites in the 1950 Mauna Loa flow. Analysis of these samples is in progress.

Problems and/or Successes: Preliminary analyses indicate:
a) the magnetic declination of the 1972 flow varies by 5 degrees from the source to the end, b) the inclination of the 1950 flow is 7 degrees shallower than the measured geomagnetic field for 1980.

Plans for Next Year: Sampling of the 1959-60 Kilauea sequence and the 1907 Mauna Loa flow is expected.

Publications Expected: Ph.D. dissertation and several journal articles.

Submitted By: Joyce Castro, 7 January 1986
HAWAII VOLCANOES NATIONAL PARK

AN EXPLORATORY AND COMPARATIVE STUDY OF ACID AND SULFATE PRECIPITATION AT SELECTED HAWAIIAN AND OTHER SITES

Project Leader: Sanford M. Siegel
Department of Botany and HWEI
University of Hawaii at Manoa
3190 Maili Way
Honolulu, Hawaii 96822

Marlene Nadjbar Hapai
University of Hawaii at Kilo
Biological Sciences
Kilo, Hawaii 96720

NPS Contract Number: HA
Date Project Started: July 16, 1985
Anticipated Termination Date: July 15, 1986

Research Objectives: To confirm the presence of acid precipitation at the SW Rift and determine the presence of acid precipitation at the Visitor's Center and the Sulfur Banks. To determine whether SO₂-free H₂S emission sites are sources of acid precipitation. To determine whether acid precipitation has an adverse effect on surrounding vegetation.

Progress to Date: Thus far, acid precipitation has been confirmed at the SW Rift ranging from 2.61-5.50. The Visitor's Center pH has ranged from 2.91-5.50; the Sulfur Banks: Upwind, 2.93-5.25; Downwind, 3.17-5.50. The SO₂-free H₂S emission site being studied is the HGPa. Puna Geothermal Well. Sites chosen upwind and downwind of the well have yielded the following results, respectively: pH ranges from 3.28-5.50 and 2.99-5.40. Acid precipitation does exist in this SO₂-free H₂S emission area. Our original proposal states that SO₂-free H₂S emission sites should be free of acid precipitation. This is not the case, but other factors may be involved. The presence of acid precipitation does not seem to have an adverse effect on vegetation in 5 out of 6 sites studied. Only the SW Rift is devoid of vegetation. All other sample sites are lush and photographic documentation is being taken to demonstrate this.

Problems and/or Successes: Thus far, there have been no major problems during data collecting periods, except for minor wind and rain problems. Equipment has not been tapered with and is functioning well under given conditions. Successes are listed under the Progress section of this report as most hypotheses have proved correct.

Plans for Next Year: At the time of manuscript preparation, a proposal request is being assembled seeking EPA funding.

SYSTEMATICS OF Clermontia GAUD. (CAMPANULACEAE: LOBELIOIDEAE)

Project Leader: Thomas G. Lammers
Department of Botany
The Ohio State University
Columbus, Ohio 43210-1293

NPS Contract Number: NA
Date Project Started: July 1, 1983
Anticipated Termination Date: June 30, 1987

Research Objectives: A taxonomic revision of the endemic Hawaiian lobeliod genus Clermontia, including a reconstruction of the phylogeny of the genus. Also treatment of Campanulaceae for Bishop Museum's Flora of Hawaii project.

Progress to Date: Field work in Hawaiian Islands completed July 1985. Currently gathering morphological data from dried and liquid-preserved materials. Two manuscripts on bird-pollination in Hawaiian lobeliods recently submitted, a third on origin of the Hawaiian lobeliods is in preparation. Treatments for 8 of the 10 genera of Campanulaceae have been submitted to the authors of the Bishop Museum Flora project.

Problems and/or Successes: Not applicable.

Plans for Next Year: Preparation of the taxonomic treatment and phylogenetic reconstruction of Clermontia. Finish last two genera for Bishop Museum project. SEM study of museum specimen birds for lobeliod pollen.


Submitted By: Thomas G. Lammers, 31 December 1985
on soil specimens collected in the fall of 1985 are being used to corroborate, clarify, and expand upon 1983 and 1984 results. Temperature, nutrition, and other soil-related parameters are being studied in relation to fungal adaptations.

The research continues, in addition, to augment our database and understanding on fungal distribution, community structure in soil, and population stability with or without serious soil perturbations. Much of the data relates directly to soil areas in the Hawai‘i Volcanoes National Park. Data from the 1985 collections will provide a much more detailed picture of fungal populations at Park elevations below 3000 feet.

Problems and/or Successes: PROBLEMS: The only problems encountered have been with research samples, techniques and systems. In 1983 I encountered some difficulty in isolating certain focal fungi from soil samples, apparently because of the unusually high soil moisture at collection time. Laboratory evaluations of environmental tolerances of fungi have been complicated by pronounced changes in fungal growth behavior under certain test conditions, thereby complicating comparisons.

SUCCESSES: In spite of the above-mentioned difficulties, the 1983-4 work yielded very useful focal species which were employed successfully in the first experiments on environmental adaptation. Definite ecotypes were isolated and characterized by laboratory tests. Other fungal isolates reinforced earlier evidence of well established fungal communities in Park soils, particularly in relation to the environmental gradient; and the stability of some communities was underscored.

Administrative and technical support at Hawai‘i Volcanoes National Park in connection with our visits, collecting, and on-site research has been excellent. The assistance of both Park Headquarters personnel and the staff at the Park Research Unit has on all occasions greatly facilitated and simplified our work, thereby allowing us to accomplish all planned work and more within our tight time frame and budget.

The growing data base on fungal ecology and recent progress in our understanding of environmental adaptation are yielding practical insights to soil management which have been used already by some agrotechnologists and, I would hope, will be used in future efforts to manage the total environmental resources, including the soil, in such areas as Hawai‘i Volcanoes National Park.

Plans for Next Year: Continue laboratory isolations (recovery) of fungi from Park soils collected in 1985; subject isolates to comparative environmental tests to reveal adaptation within ecotypes of species; examine phenotypic stability in ecotypes; plan and execute additional needed field sampling at HVNP in the late summer of 1986 while soils are relatively dry.
PROPERTIES OF SULPHUR FROM VOLCANIC SOURCES

Project Leader: Dennis Matson
Jet Propulsion Laboratory
Pasadena, California 91109

NPS Contract Number: NA
Date Project Started: March, 1984
Anticipated Termination Date: 1987

Research Objectives: Understand the physical properties
(viscosity, spectral properties, etc.) of sulphur from volcanic
sources to interpret surface features of the Jovian satellite
Io.

Progress to Date: Laboratory studies have been carried out to
classify the relationship of thermal history with spectral
properties and effects of dissolved volatiles in the sulphur on
foaming and flow properties.

Problems and/or Successes: Not applicable

Plans for Next Year: Continuation of laboratory
investigations.

Publications Expected: Not applicable

Submitted By: Dennis Matson, 3 January 1986
HAWAII VOLCANOES NATIONAL PARK

HAWAIIAN LACEWINGS

Project Leader: Maurice J. Tauber and Catherine A. Tauber
Department of Entomology
Cornell University
Ithaca, New York 14853-0999

NPS Contract Number (if applicable): NA
Date Project Started: January, 1985
Percent Completion of Project to Date: 25%

Research Objectives: To examine the biological and morphological characteristics of the numerous lacewing species that are unique to the Hawaiian Islands.

Progress to Date: This was our first visit, and we made very preliminary collections of green lacewings (Neuroptera: Chrysopidae) in the park during our brief visit in June. Our collections were successful; we collected some adult Anasalochrysa. Unfortunately, none of the females oviposited and we were unable to complete the planned research.

Plans for Next Year: We hope to return to the park for a longer period in the future to undertake our studies at the research station.

Submitted By: Maurice J. Tauber and Catherine A. Tauber, 15 January 1986
Processing the cumulative data and writing up for further publications will also be done during this period.


Submitted By: Setphan Halloy, 21 March 1986
HAWAII VOLCANOES NATIONAL PARK

NEKE RESEARCH

Project Leader: Charles P. Stone
Box 52
Hawaii National Park, Hawaii 96718

Funding Source(s) and Amount(s): None

Date Project Started: October, 1981
Percent Completion of Project to Date: Indefinite
Anticipated Termination Date: Ongoing

Research objectives: 1) Determine nene population and recruitment trends and movements in HAVO, 2) determine habitat use of wild nene in breeding seasons in Ka'u Desert and lowlands, 3) determine relationships of mongoose control and mongoose populations to nene breeding success, 4) improve nene marking methods, 5) improve captive nene flock management and coordinate with State, 6) advise management.

Progress to Date: This project is in an inactive research status at present, as a result of lack of funding. However, coordination with managers in SFS and the Hawaii Department of Land and Natural Resources is maintained, and advice and assistance is rendered to managers. A number of questions critical to maintenance of self-sustaining nene populations in the wild remain to be researched.

Plans for Next Year: Continue assisting management and U.S. Fish and Wildlife Service personnel in research on drop bait toxicant for mongoose control.

Reports and Publications:

Progress Report CPSU/UH


Poster Session presented at 4th Theriological Congress, Edmonton, Canada, on alien animals including mongooses, with J.G. Keith (USFWS)

Paper on same subject submitted to Mammal Control Symposium group at Congress for publication in British journal.

Submitted by: C.P. Stone, 4 February 1986
FERAL PIG RESEARCH

Project Leaders: Charles P. Stone, Paul K. Miyaoshino, Stephen J. Anderson, and Andrew H. Kikuta
Box 52
Hawaii National Park, Hawaii 96718

Funding Source(s) and Amount(s): NPS $43,383
Date Project Started: October, 1983
Percent Completion of Project to Date: 80%
Anticipated Termination Date: October, 1987

Research Objectives: 1) Determine abundance, distribution, and consistency of feral pig damage in NAVA and HALE; 2) Evaluate management of feral pigs through vegetation and digging indices to pig abundance and radio telemetry; 3) Develop and evaluate methods for baiting, crapping, snaring, and hunting feral pigs; 4) Develop and evaluate methods for potential use of pig toxicants; 5) Advise management.

Data from pigs taken in control programs in 6 management units ranging from 1.4 to 18.9 km² continue to accumulate. Age, food habits, parasite load and physical characteristics such as girth and weight are recorded for each animal. Reproductive information is taken for each female. Population structure and dynamics and removal rates as compared with recruitment rates in each fenced unit allow determination of efficacy of control techniques. Costs of different control methods in different areas are also recorded and have shown that hunting at an average of $74/animal is more cost effective than snaring (at $246/animal) and trapping (at $360/animal). However, hunting may reach a point of diminishing return at densities of 1-3 pigs/km² in some areas.

Research emphasis is currently on the removal of pigs from areas with low population densities and the controlled testing of food, scent, and possibly sound, attractants in the Pig Information Gathering Site (PIGS), an 8-celled pen with observation tower. Materials available in bulk will be used in low pig density areas to attempt to control animals. Tests of control methods in PIGS will also be made. Cooperative programs with the U.S. Fish and Wildlife Service, Denver Wildlife Research Center are planned. FWS will also be testing secondary poisoning of pigs by feeding them poisoned moccasins.

Evaluation of vegetation recovery in pig-free or low density pig areas is ongoing. A system of permanent vegetation plots and enclosures is monitored periodically with qualitative and quantitative sampling.


Stone, C.P. 1985. Feral pig (Sus scrofa) research and management in Hawaii (Abstr.). Abstracts of papers and posters, Fourth Internat'l Theriological Congress, Edmonton, Alberta, August 13-20. [A paper with the same title has been accepted for publication in a French journal by the Suidae Workshop at the Congress]

Stone, C.P., and J.O. Keith. 1985. Control of feral ungulates and small mammals in Hawaii's national parks: research and management strategies (Abstr.). Abstracts of papers and posters, Fourth Internat'l Theriological Congress, Edmonton, Alberta, August 13-20. [A paper with the same title has been accepted for publication in a British journal by the Mammal Control Symposium at the Congress]

Stone, C.P., and L.L. Loene. Reducing impacts of introduced animals on native biota in Hawaii: what is being done, what needs doing, and the role of national parks. (To be submitted to Environmental Conservation)


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HAWAII VOLCANOES NATIONAL PARK

FIRE EFFECTS MONITORING

Project Leader: T. Tunison
Hawaii Volcanoes National Park
HI 96718

NPS Contract Number (If applicable): NA
Date Project Started: March 1985
Percent Completion of Project to Date: 10%

Research Objectives: Determine plant succession following wildfire in Hawaii Volcanoes National Park plant communities.

Progress to Date: Five burns have been monitored one month and six months after fires. Two sites are in coastal scrub/grassland, both in the Kalapana area; two are in Ohia/Ulume forest, one at Puu Gc and the other in the the Olaa Forest Reserve; and the fifth site is in Ohia scrub forest just above Footprints Trail. Each burn is monitored using paired transects inside and outside the burn. Each transect is 40m long and data is collected using the point intercept method. Two meter square plots are placed along the transects and the density of the woody vegetation is recorded. Individual trees are tagged and the regrowth is measured.

In all cases, exotic grasses, herbaceous plants and low shrubs have increased in the understory. Most native plants are recovering to a lesser degree.

The continuation of this program is doubtful due to lack of funds.

Plans for Next Year: We hope to continue monitoring the burned areas for another two years at yearly intervals.

Reports and Publications: None.

Project Leader: R. Lani Stemmermann and Paul X. Higashino
Hawaii Volcanoes National Park
Hawaii 96720

NPS Contract Number (if applicable): 5300 NPS CAB013 2 0001
Date Project Started: February 1983
Percent Completion of Project to Date: 100%

Research Objectives: To compile a list of the vascular plants in Puuhonua o Honaunau National Historic Park.

Progress to Date: Three ferns and 123 flowering plants are recorded from Puuhonua o Honaunau National Park. Ninety-two (73%) are alien (introduced after 1776). Six species present in the Park—common sandbur, fountaingrass, iantane, nutgrass, puncture vine, and sourgrass—have been declared noxious by the State of Hawaii. The following ten species will disrupt archaeological sites if left unchecked: Californiagrass, christmasberry, guineagrass, kiawe, klu, koa haole, monkeypod, noni, shrubby fleabane, and tamarind. Six grasses (buffalograss, californiagrass, fountaingrass, guineagrass, natal redtop and pili) provide a fine fuel that, when dry, carries hot fires very rapidly. Some management recommendations are made for alien plant control, fire control, and research on the impact of fire and salt water on archaeological resources.

Plans for Next Year: Publish list as a CPSU/UM technical report.

Reports and Publication Produced this Year: None

Submitted By: R. Lani Stemmermann, 3 February 1986
1. 01-YEAR FIRST PROGRESS REPORT. Anonymous. June 1974
2. PROPOSAL FOR THE STUDY OF RARE AND ENDANGERED BIRDS IN
WAIAI'S NATIONAL PARKS. A. J. Berger. June 1974
4. VEGETATION MAP, HAWAII VOLCANOES NATIONAL PARK. D.
Mueller-Dombois & F. R. Fosberg. October 1974
5. REVISED CHECKLIST OF VASCULAR PLANTS, HAWAII VOLCANOES
NATIONAL PARK. F. R. Fosberg. April 1975
6. 01-YEAR FINAL REPORT. Anonymous. October 1974
7. 02-YEAR FIRST PROGRESS REPORT. Anonymous. March 1975
8. HAWAII VOLCANOES NATIONAL PARK PERN CHECKLIST. T. Herat.
August 1975
9. KALEAKALA NATIONAL PARK 1975 RBI NARRATIVE. C. W. Smith,
ed., with A. J. Berger, J. Beardsley, R. Burkhart,
P. K. Higashino, W. J. Hoe, & H. E. Smith. November
1975
10. HALAPE MARINE SURVEY. F. W. Ball. April 1976
11. KIPAHULU EXPEDITION 1976. C. M. Lamoureux &
L. Steermann. September 1976
12. OHIA DECLINE: THE ROLE OF PFPTUPEHTHA CINNAMOMI.
13. PU'UKOHOLA HEIAU NATIONAL HISTORIC SITE MARINE FAUNA.
14. HAWAII BIRD BIBLIOGRAPHY. K. W. Bridges, M. S. Bridges,
15. PU'UKOHOLA HEIAU NATIONAL HISTORIC SITE PLANT SURVEY.
J. D. MacNeil & D. E. Hemmes. February 1977
16. PU'UKOHOLA HEIAU NATIONAL HISTORIC SITE MARINE FLORA.
F. W. Ball. February 1977
17. LIMNOLOGICAL SURVEY OF LOWER PALIXEA AND PIPIWAI STREAM,
KIPAHULU, MAUI. P. A. Kinzie, III & J. I. Ford. May
1977
55
34. THE PLANT GENUS HYBRISCADELENUM IN HAWAII. J. K. Baker. September 1986

35. VEGETATION MAP - HALAEEKALA NATIONAL PARK. L. D. Whiteaker. October 1980

36. BIRDS OF KALAPANA EXTENSION. S. Conant. October 1980


41. VEGETATION CHANGES IN A SUBALPINE GRASSLAND IN HAWAII FOLLOWING DISTURBANCE BY FERAL GOATS. J. D. Jacob. September 1981

42. A BREEDING ECOLOGY OF THE ENDANGERED PALILA (PSITTIROSTRA BILLENI) ON MAUNA KEA, HAWAI'I. C. van Riper, III. September 1981


44. AVIFAUNA OF KOHALA MOUNTAIN, HAWAII. C. van Riper, III. February 1982

45. PROSPECTS FOR BIOLOGICAL CONTROL OF NONNATIVE PLANTS IN HAWAIIAN NATIONAL PARKS. D. E. Gardner & C. J. Davis. October 1982


47. THE IMPACTS OF MALARIA ON BIRDS IN HAWAII VOLCANOES NATIONAL PARK. C. van Riper, III, S. G. van Riper, M. L. Goff & M. Laird. November 1982

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AVIAN HISTORY REPORTS
HISTORY OF ENDEMIC HAWAIIAN BIRDS
W. E. Barko

1. INTRODUCTION (to overall work)

2. SPECIMENS IN MUSEUM COLLECTIONS (69 TAXA)

   PART I: POPULATION HISTORIES--SPECIES ACCOUNTS

4. INTRODUCTION (to Part 1).

  5A. NEWELL SHEARWATER ('A'O).

  5B. HAWAIIAN DARK-RUMPED PETREL ('UA'U).

  6A. HAWAIIAN HAWK ('IO).

  6B. HAWAIIAN RAVEN/CROW ('ALALA).

  6C/D. HAWAIIAN THRUSHES.

  7A/B. 'ILEPAIO, 'O'O, & KIOEA.

  8A. 'AMAKINI.

  8B/C. 'AMAKIHII, CREEPER, 'AKAPA, & PO'O ULI.

Volume 9 is being proofed before publication.