Field Release of the Exotic Moth, *Pempelia genistella* (Lepidoptera: Pyralidae), for Biological Control of Gorse, *Ulex europaeus* (Leguminosae), in Hawaii

Environmental Assessment

April 1996

Agency contact:
Ronald D. Hennessey, Ph.D.
USDA--APHIS
4700 River Road, Unit #133
Riverdale, MD 20737-1236
Phone: (301) 734-7839
Fax: (301) 734-8700

I. Description of Proposed Action and Statement of Need

The Animal and Plant Health Inspection Service (APHIS) of the United States Department of Agriculture (USDA) has received an application from the Hawaii Department of Agriculture for a permit to release an exotic pyralid moth, *Pempelia genistella* (Dup.), in Hawaii (Appendix 1). The insect feeds on foliage of gorse, *Ulex europaeus* L., a weed in the family Leguminosae.

The applicant proposes to ship moth pupae from Lisbon, Portugal to the insect quarantine facility at Hawaii Volcanic National Park on the island of Hawaii. Insect parasitoids will be screened out in quarantine, and sample pupae will be sent to Berkeley, California to be checked for microbial pathogens. The moth will then be released from quarantine for rearing in field cages at the Hilo Base Yard of the Hawaii Department of Agriculture. Releases of several hundred insects per month will be made first on the island of Hawaii and later on the island of Maui.

Voucher specimens are deposited in the collection of the Hawaii Department of Agriculture and the Bernice P. Bishop Museum (both in Honolulu). The species identity has been determined by Dr. Gaden Robertson at the British Museum of Natural History.

If a permit to release *P. genistella* is issued, the moth will be the sixth nonindigenous biological control agent to be released in Hawaii against the weed gorse (Markin *et al.*, 1995).

The pending application was submitted in accordance with the Federal Plant Pest Act (7 USC 150aa *et seq.*) and the Plant Quarantine Act (7 USC 151 *et seq.*). This EA was prepared in compliance with the National Environmental Policy Act (NEPA) (42 USC 4321 *et seq.*) as described in implementing regulations adopted by the Council on Environmental Quality (40 CFR 1500-1509), by USDA (7 CFR 1b), and by APHIS (60 CFR 6000-6005).

The purpose of the proposed releases of *P. genistella* is to reduce the severity of infestations of gorse. Gorse is listed as a noxious weed in Hawaii (Hawaii Department of Agriculture, 1992; Haselwood *et al.*, 1983). It occurs as a forest and rangeland pest on the islands of Hawaii and Maui (Markin *et al.*, 1988). Gorse infestations often develop into pure stands which displace desirable range vegetation as well as native plants and their associated fauna, including some proposed endangered and threatened species of plants (Smith *et al.*, 1994; Wagner *et al.*,

1990).

II. Alternative to the Proposed Action

The "no-action" alternative to issuing a permit for the release of *P. genistella* is to deny the permit. If the permit is denied, gorse will continue to expand its range in Hawaii, and herbicides will continue to be used for its control on an increasingly larger scale. It is probable also that in some areas burning and hand-removal of plants will continue.

III. Environmental Impacts of the Proposed Action and Alternative

The intended environmental impact of the proposed action is a reduction in severity of infestations of gorse. Collateral effects might include:

--Recovery of populations of rangeland vegetation and native plants, including some plants proposed as endangered species and now subjected to intensive competition from weeds (Smith *et al.*, 1994; Friesen, 1994).

--Recovery of certain indigenous animal species associated with native plants now subjected to intense competition.

--Reduction in costs of controlling gorse in pastures and native ecosystems (Hill and Sandrey, 1986).

--Reduction in herbicide use with consequent decrease in environmental pollution.

The proposed introduction of a nonindigenous, plant-feeding insect into Hawaii raises the question of environmental safety since *P. genistella* conceivably might feed on nontarget plants. Extensive field and laboratory evidence indicates that *P. genistella* is highly host-specific. In Portugal *P. genistella* was never found associated with plants other than gorse; even plants closely related to gorse were not attacked (Burkhart, 1989; Hill, 1982; O'Donnell, 1986; Zwolfer, 1963a, 1963b).

Five groups of plants were subjected to oviposition and feeding by *P. genistella*. Tests were conducted in a laboratory in Hawaii by Markin and Yoshioka (1993). In all tests, the absence of an asterisk indicates negative results.

Broad-spectrum feeding tests with Hawaiian species. Thirty-nine species of crop plants and forest and shrubland species in 29 families were tested: Anacardiaceae, Apocynaceae, Araliaceae, Asteraceae, Betulaceae, Bromeliaceae, Campanulacea, Cucurbitaceae, Dicksoniaceae, Epacridaceae, Ericaceae, Gesneriaceae, Lamiaceae, Lauracea, Malvaceae, Myoporaceae, Myrtaceae, Orchidaceae, Poaceae, Polypodiaceae, Protaceae, Rosaceae, Rubiaceae, Rutaceae, Santalaceae, Sapindaceae, Solanaceae, Thymelaceae, and Urticaceae.

Broad-spectrum oviposition tests with Hawaiian species. Plants of 27 species were exposed to oviposition by 10 male/female pairs of adults. There were five replicates, each consisting of two test plants and a gorse control: *Acacia koa*, *A. koaia*, *A. mearnsii*, *Alnus rubra*, *Alyxnia olivaeformis*, *Ananas comosus*, *Carica papaya*, *Citrus* sp., *Coffee arabica*, *Dendrobium phalaenopsis*, *Desmodium* sp.*, *Erythrina sandwichensis**, *Indigofera suffruticosa*, *Lathyrus japonicus*, *Lotus* sp., *Lupinus arboreus**, *Lychee chinensis*, *Macadamia integrifolia*, *Mangifera indica*, *Metrosideros collina*, *Persea americana*, *Physalis peruviana**, *Psidium guajava**, *Saccharum officinarum*, *Sophora chrysophylla*, *Vaccinium reticulatum*, *Wickstroemia* sp. Key to symbols: *From <1% to 8% of the number of eggs deposited on gorse control plants.

Feeding tests with Hawaiian Leguminosae. Plants of 20 species were exposed to the feeding of first-instar larvae of *P. genistella* by placing 15 eggs on each plant and allowing them to hatch: CAESALPINACEAE: *Cassia nealiae*, *Delonix regia*. MIMOSACEAE: *Acacia koa*, *A. koaia*, *A. mearnsii**, *Calliandra glauca*, *Samanea saman*. FABACEAE: *Desmodium* sp.*, *Erythina sandwichensis*, *Glycine max***, *Indigofera suffriticosa*, *Lotus* sp., *L. hybridus***, *Medicago sativa*, *Phaseolus* sp.*, *Pisum* sp., *Sophora chrysophylla*, *V. sativa*, *Vigna* sp. Key to symbols: *Larvae fed without developing, **Larva fed and developed but did not reach the adult stage.

Feeding tests with U. S. continental species of Leguminosae. Six species in the subfamily Fabaceae were tested by methods identical to those used in tests of Hawaiian species: *Chamaecytisus palmensis***, *Lathyrus japonicus*, *L. latifolius*, *Lupinus albicaulis***, *L. polyphyllus*, *Trifolium pratense*, *T. repens****, *Vicia gigantea*. Key to symbols: *Larvae fed without developing, **Larvae fed and developed but did not reach the adult stage, ***Adult moth emerged (all deformed

and unable to reproduce).

Oviposition tests with U. S. continental species of Leguminosae. The methods used were identical to those used in the broad-spectrum tests: *Chamaecytisus palmensis**, *Lathyrus japonicus*, *Lupinus albicaulis*, *Trifolium pratense**, *T. repens**. Key to symbols: *No. of eggs deposited on tests plants was from <1% to 4% of number deposited on gorse controls.

Four endemic Hawaiian species of Leguminosae are listed as endangered by the U.S. Fish and Wildlife Service--*Canavalia hawaiiensis*, *Sesbania tomentosa*, *Caesalpinia kavaiensis*, and *Vicia menzesii*. In controlled feeding tests conducted in 1995, no larvae survived for more than nine days, and feeding was nil-to-very-light in all cases (B. Harper and C. Horning, pers. comm.). Release of *P. genistella* is therefore expected to present no threat to any endangered or threatened species. In fact, some endangered Hawaiian species probably will benefit if this agent successfully controls gorse.

Because of the remote and inaccessible areas in which gorse is found in Hawaii, it is unlikely that *P. genistella* would be accidentally transported from Hawaii to the continental mainland. However, since gorse is a major weed in at least 18 other countries around the world (Holm *et al.*, 1979), including the coast of Oregon, many other countries are interested in utilizing it as a biocontrol agent. New Zealand has already approved its use and released it in 1994. On the West Coast of North America, particularly the states of Oregon, California, and Washington, gorse is also an important weed (Markin *et al.*, 1995). *P. genistella* is therefore presently undergoing testing funded by the state of Oregon to determine the feasibility of its being introduced as an appropriate biological control agent on the mainland U.S.

The biology of *P. genistella* precludes any direct negative impact the human environment.

The "no-action" alternative is to deny the permit, in which case *P. genistella* will not be released, and herbicides will continue to be used for the control of gorse in Hawaii. However, the use of herbicides is generally undesirable because of hazards to human health and the killing of nontarget plants. Gorse may continue to be removed by hand, therefore, but at best this practice only slows the spread of infestations in very small areas. In some cases hand removal actually facilitates the spread of the weed by disturbing the soil.

Three of the five species of biological control agents introduced against gorse in Hawaii have proved partially effective, but additional species, in this case *P. genistella*, must be introduced to obtain satisfactory control.

In summary, a large body of evidence collected by the U S. Forest Service and the Hawaii Department of Agriculture strongly indicates that *P. genistella* is a highly host-specific biological control agent that is safe to introduce for the control of gorse in Hawaii. If the moth accidentally reaches the continental U.S. from Hawaii, it probably will do so after it has already been approved for release against gorse on the continent.

IV. References

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V. List of Preparators, Consultants, and Reviewers

This environmental assessment was prepared by **George P. Markin**, Ph.D., U.S. Forest Service, Rangeland Weeds Lab, Bozeman, MT; **Kenneth Teramoto**, Hawaii Department of Agriculture, Honolulu, HI; and **Ronald Hennessey**, Ph.D., USDA--APHIS, Riverdale, MD. It was reviewed by **Erik Combs**, Entomologist, Oregon Dept. of Agriculture, Salem, OR; **Kenneth L. Lakin**, OPRA Branch Chief, USDA--APHIS, Riverdale, MD; **Brooks Harper**, Field Supervisor, U. S. Fish and Wildlife Service, Honolulu, HI.

The following specialists and agencies were consulted during the conducting of the host testing and in the preparation of this document: **R. L. Hill**, Ph.D., Lands Care Research, New Zealand, duplicated the results of host-testing of *Pempelia* with a separate colony in New Zealand; **Simon Fowler**, International Institute of Entomology, Silwood Park, United Kingdom, supplied *Pempelia* used in host-testing and identification of this species.

The following members of the Hawaii Department of Agriculture, Advisory Committee on Plants and Animals reviewed and approved the original petition for release of *P. genistella* on which this EA is largely based (members located in Honolulu, HI unless otherwise indicated): **John E. Bardach**, Ph.D., East-West Center; **Gary Gill**, Office of Environmental Quality Control, Dept.of Health; **Oliver Holtzmann**, Ph.D., Dept. of Plant Pathology, Univ. Hawaii at Manoa; **Charles H. Lamoureux**, Ph.D., Director, Harold L. Lyon Arboretum; **Jiro Matsui**, Petland; **Lawrence Milke**, Ph.D., Director, Dept. of Health; **James Nakatani**, Chairperson, Board of Agriculture; **Ken Redman**, Director, Honolulu Zoo; **Michael D. Wilson**, Chairperson, Board of Land and Natural Resources; Hawaii Dept. of Agriculture, Advisory Subcomittee on Entomology; **Arnold H. Hara**, Ph.D., Dept. of Entomology, Univ. Hawaii, Hilo, HI; **Francis Howarth**, Ph.D., Dept.of Entomology, Bernice P. Bishop Museum; **Scott Miller**, Ph.D., Chairman, Dept.of Entomology, Bernice P. Bishop Museum; **Wallace C. Mitchell**, Ph.D., Dept. of Entomology, Univ. Hawaii at Manoa; **Asher K. Ota**, Ph.D., Head, Entomology Dept., Hawaiian Sugar Planters' Association, Alea, HI.

VI. Appendix

Appendix 1: Application for permit to release *Pempelia genistella* in Hawaii.

No permit can be issued to move live plant pests or noxious weeds until an application is received (7 CFR 330 (live plant pests) or 7 CFR 360 (noxious weeds)).

FORM APPROVED - OMB NO. 0579-005

U.S. DEPARTMENT OF AGRICULTURE
ANIMAL AND PLANT HEALTH INSPECTION SERVICE
PLANT PROTECTION AND QUARANTINE
RIDGEDALE, MARYLAND

Appendix 1. Application for a permit to release *Pempelia genistella* in Hawaii

SECTION A - TO BE COMPLETED BY THE APPLICANT

1. NAME, TITLE, AND ADDRESS (Include Zip Code)

Kenneth K. Teramoto
Chief, Biological Control Section
Plant Pest Control Branch
Hawaii Department of Agriculture
1428 South King Street
Honolulu, HI 96814-2512

2. TELEPHONE NO. (808) 973-9524 FAX: (808) 973-9533

3. TYPE OF PEST TO BE MOVED
☒ Arthropods ☐ Noxious weeds
☐ Pathogens ☐ Other (Specify)

4. SCIENTIFIC NAMES OF PESTS TO BE MOVED	5. CLASSIFICATION (Orders, Families, Races or Strains)	6. LIFE STAGES IF APPLICABLE	7. NUMBER OF SPECIMENS OR UNITS	8. SHIPPED FROM (Country or State)	9. ARE PESTS ESTABLISHED IN U.S.	10. MAJOR HOST(S) OF THE PEST
4. Pempelia genistella (Duponchel)	Lepidoptera: Pyralidae	all	hundreds	~~Europe~~ ~~New Zealand~~ Hawaii	No	Ulex europaeus L. (gorse)
5.						
6.						

7. WHAT HOST MATERIALS WILL ACCOMPANY WHICH PESTS (Indicate by line number)
P. genistella larvae may be shipped with gorse cuttings.

8. DESTINATION	9. PORT OF ARRIVAL	10. APPROXIMATE DATE OF ARRIVAL OR INTERSTATE MOVEMENT
~~USFS Rangeland Weeds Lab Quarantine Facility, Bozeman, Montana~~ Field in Hawaii	JFK/HNL	April 1996 - December 1997

11. NO. OF SHIPMENTS	12. SUPPLIER	13. METHOD OF SHIPMENT
10	Cooperating entomologists (IIBC, NZ, USDA, Oregon, California)	☒ Air Mail ☒ Air Freight ☒ Baggage ☐ Auto

14. INTENDED USE (Be specific, attach outline of intended research)
For field release and establishment in Hawaii as a classical biological control agent to contribute to the suppression of infestations of the noxious weed gorse.

15. METHODS TO BE USED TO PREVENT PLANT PEST ESCAPE	16. METHOD OF FINAL DISPOSITION
Not applicable	Inoculative field releases

17. *Applicant must be a resident of the U.S.A. I/We agree to comply with the safeguards printed on the reverse of this form, and understand that a permit may be subject to other conditions specified in Section B and C.*
SIGNATURE OF APPLICANT (Must be person named in Item 1): Kenneth K Teramoto
18. DATE: 19 MAR 96

SECTION B - TO BE COMPLETED BY STATE OFFICIAL

19. STATUS
☒ Approve ☐ Disapprove
☐ Accept USDA Decision

20. CONDITIONS RECOMMENDED
Import into Hawaii Volcanoes National Park Quarantine Facility until sc
for parasites, predators, & diseases before release.

21. SIGNATURE	22. TITLE	STATE	23. DATE
Gary M. Nakahara	Manager, Plant Quarantine Hawaii Dept of Agriculture	Hawaii	3/25/96

SECTION C - TO BE COMPLETED BY FEDERAL OFFICIAL

24. PERMIT NO.: 30641

PERMIT

(Permit not valid unless signed by an authorized official of the Animal and Plant Health Inspection Service)

Under authority of the Federal Plant Pest Act of May 23, 1957 or the Federal Noxious Weed Act of 1974, permission is hereby granted to the applicant named above to move the pests described, except as deleted, subject to the conditions stated on, or attached to this application. *(See standard conditions on reverse side).*

Authorization: This permit authorizes release of *Pempelia genistella* from quarantine into the environment in Hawaii. A separate permit is required to import organisms into quarantine. This permit does not relieve the permittee of the obligation to comply with regulations of other state and Federal agencies, including the U.S. Fish and Wildlife Service. **Conditions:** Material of *P. genistella* is to be released only after it has been properly identified and screened for parasites, predators, and pathogens according to standard procedures in use at the Hawaii Department of Agriculture Quarantine Facility in Volcanoes National Park.

cc: HI, WR, J.C.

25. SIGNATURE OF PLANT PROTECTION AND QUARANTINE OFFICIAL	26. DATE	27. LABELS ISSUED	28. VALID UNTIL	29. PEST CATEGORY
Ronald D. Heimowitz	APR 26 1996	None	APR 24 2006	B2

FINDING OF NO SIGNIFICANT IMPACT

The USDA Animal and Plant Health Inspection Service has received an application for a permit to release a European pyralid moth, *Pempelia genistella*, in Hawaii for biological control of the noxious weed, gorse, *Ulex europaeus* (Leguminosae). Gorse displaces desirable range vegetation as well as native plants and their associated fauna, including some species proposed for listing as threatened and endangered by the U. S. Fish and Wildlife Service.

Releases of *P. genistella* are expected to have no significant impacts on the quality of the human environment. This finding is based on the following considerations:

--In its native home in Europe, *P. genistella* has been recorded only from gorse.

--Results of host-specificity tests conducted with many native Hawaiian plants and various introduced crop species confirmed field evidence that *P. genistella* is highly host-specific.

--Larvae of *P. genistella* survived for only a short time in tests on four endangered Hawaiian species related to gorse, further justifying the conclusion that the moth will not harm threatened and endangered species in Hawaii.

--*P. genistella* is expected to have no direct impacts on humans nor any negative impacts on the human environment.

--Native Hawaiian plants and associated animals are expected to benefit from releases of *P. genistella* and the consequent suppression of gorse.

Sidney Cousins
Assistant Director, Operational Support
Plant Protection and Quarantine
Animal and Plant Health Inspection Service
United States Department of Agriculture

4/26/96
Date