Field release of *Acythopeus cocciniae* (Coleoptera: Curculionidae), a nonindigenous leaf-mining weevil for control of ivy gourd, *Coccinia grandis* (Cucurbitaceae), in Guam and Saipan.

Environmental Assessment

May 2003

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Proposed Action:	The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) is proposing to issue a permit for the release of the nonindigenous leaf-mining weevil, *Acythopeus cocciniae* O'Brien and Pakaluk (Coleoptera: Curculionidae). The agent would be used by the permit applicant for the biological control of ivy gourd, *Coccinia grandis* (L.) Voigt (Cucurbitaceae), in Guam and Saipan.
Type of Statement:	Environmental Assessment

1. Purpose and Need for Action

1.1 The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS) is proposing to issue a permit for the release of the nonindigenous leaf-mining weevil, *Acythopeus cocciniae* O'Brien and Pakaluk (Coleoptera: Curculionidae). The agent would be used by the permit applicant for the biological control of ivy gourd, *Coccinia grandis* (L.) Voigt (Cucurbitaceae), in Guam and Saipan.

Guam is located approximately 3,700 miles west-southwest of Honolulu, Hawaii. It belongs to a chain of islands located in the Western Pacific Ocean called the Mariana Islands. Saipan is the capitol of the Commonwealth of the Northern Mariana Islands. The Northern Mariana Islands are a chain of islands extending northward from Guam (but not including the island of Guam). The three most populated islands in the Northern Marianas are Rota (50 miles north of Guam), Tinian (140 miles north of Guam), and Saipan (150 miles north of Guam). In 1898 Guam was ceded to the United States, following the Spanish defeat in the Spanish-American War. The Northern Mariana Islands became part of the U.S. Trust Territory of the Pacific after World War II.

The applicant's purpose for the proposed releases of *A. cocciniae* is to reduce the severity and extent of infestation of ivy gourd on Guam and Saipan. Native to Africa, Asia, Fiji, and Northern (tropical) Australia (Jeffrey 1967), ivy gourd (a member of the plant family Cucurbitaceae in the order Violales) is a rapidly growing, climbing or trailing vine. In its native habitat it is a common but not serious weed because it is kept in check by competing plants and effective natural enemies. However, in recent years, it has become an invasive weed in Hawaii, Guam and Saipan by forming thick mats that overgrow vegetation, walls, fences, and utility poles (HDOA 1994). Ivy gourd is also a host for most of the pests of the Cucurbitaceous crops, such as pumpkin caterpillar (*Diaphania indica*), red pumpkin beetle (*Aulacophora foveicollis*), melon fly (*Bactrocera cucurbitae*), melon aphid (*Aphis gossypii*), leafminers (*Liriomyza spp.*), black leaf-footed bug (*Leptoglossus australis*), whiteflies (*Bemisia spp.*) and others. Suppression of this weed is a prerequisite to starting a melon fly eradication program in the Mariana Islands (McGregor and Vargas 2002). Rapid spread of ivy gourd after introduction into a new area is attributable to vigorous growth, easy reproduction from stem fragments, and prolific seed production.

The proposed agent, *A. cocciniae* is a leaf-mining weevil, native to Africa. Adults live up to 200 days and feed on the leaves causing numerous holes in the lamina. Eggs are laid singly by insertion into the lamina of ivy gourd leaves. Eggs hatch in about eight days and larvae mine the leaves for nine to ten days. Pupation takes place within the mine and lasts for 15 days. Adult feeding and larval mining can cause drying of the leaves and eventual defoliation of the ivy gourd vines.

In August 1999, USDA, APHIS prepared an Environmental Assessment (EA): Field Release of *Acythopeus burkhartorum* and *A. cocciniae* (Coleoptera: Curculionidae), Nonindigenous

Weevils for Biological Control of Ivy Gourd, *Coccinia grandis* (Cucurbitaceae), in Hawaii. The APHIS EA and the associated Finding of No Significant Impact (FONSI) are being incorporated into this EA by reference. The APHIS EA and FONSI were prepared to assess the possible environmental impacts of releases of two nonindigenous weevils into Hawaii. The ivy gourd control alternatives analyzed in the APHIS EA were: biocontrol, chemical control, mechanical control and no action. The biocontrol alternative was selected and a finding of no significant impact (FONSI) was signed. As a result, permits were issued by APHIS in 1999 for environmental release of *A. burkhartorum* and *A. cocciniae* into Hawaii. However, APHIS has received permit applications requesting release of *A. cocciniae* into Guam and Saipan, areas not considered in the APHIS EA. Before permits can be issued for release of *A. cocciniae* into Guam and Saipan, APHIS needs to analyze the potential effects of the release of this agent into these islands.

1.2 APHIS must decide among the following options:

A. To deny the permit application (no action);
B. To issue the permit as submitted;
C. To issue the permit with management constraints or mitigation measures.

1.3 Issues arising from the field release *A. cocciniae* are:

A. Will *A. cocciniae* attack non-target plants within and around the area infested with ivy gourd?
B. Will *A. cocciniae* affect a federally listed threatened or endangered species or other species of concern?

1.4 The pending application for release of this biocontrol agent into the environment was submitted in accordance with the provisions of the Plant Protection Act of 2000 (7 United States Code (U.S.C.) 7701 *et seq*.). This EA was prepared by APHIS in compliance with the National Environmental Policy Act (42 U.S.C. 4321 *et seq.*) as prescribed in implementing regulations adopted by the Council on Environmental Quality (40 Code of Federal Regulations (CFR) 1500-1509), by USDA (7 CFR 1b), and by APHIS (7 CFR 372).

2. Alternatives Including the Proposed Action

2.1 This chapter will explain the alternatives available to APHIS. Although APHIS' alternatives are limited to a decision whether to issue a permit for release of *A. cocciniae*, other methods available for control of ivy gourd are also described. These control methods are not decisions to be made by APHIS and may continue whether or not a permit is issued for environmental release of *A. cocciniae*. These are methods presently being used to control ivy gourd by public and private concerns and are presented to provide information to the reader.

2.2 Description of APHIS' Alternatives

2.2.1 Alternative 1 - No action: Under this alternative, APHIS would not issue a permit for the environmental release of *A. cocciniae* for the control of ivy gourd on Guam and Saipan. The release of this biological control agent would not take place.

2.2.2 Alternative 2 - Issue the permit: Under this alternative, APHIS would issue a permit for the environmental release of *A. cocciniae* for the control of ivy gourd on Guam and Saipan. This permit would contain no special provisions or requirements concerning release procedures or mitigating measures.

2.2.3 Alternative 3 - Issue the permit with specific management constraints and mitigating measures: Under this alternative, APHIS would issue a permit for the environmental release of *A. cocciniae* for the control of ivy gourd on Guam and Saipan. However, the permit would contain special provisions or requirements concerning release procedures or mitigating measures.

2.3 The following alternatives are presently being used to control ivy gourd. These controls will continue under the "No Action" alternative but may continue even if permits are issued for release of *A. cocciniae.*

2.3.1 Chemical Control: In Saipan, Rota, and Hawaii, the herbicide triclopyr (Garlon®) has been used to control ivy gourd by dipping cut stem ends. On Guam, spraying glyphosate (Roundup®) on ivy gourd foliage had no effect. The use of triclopyr on ivy gourd was found to be expensive and the control was temporary in Saipan.

2.3.2 Mechanical Control: Bulldozing has been used in clearing an area of ivy gourd and is temporarily effective. Hand weeding and cutting of stems is done only in yards or farm hedges. As the cut stems of ivy gourd readily root and sprout, disposal of them is a problem. Often, disposal of the cut stems in vacant lots or roadsides aid in spreading of this weed.

2.3.3 Biological control: No agents to control ivy gourd have been introduced into Guam or the Northern Mariana Islands. Three biological control agents have been released on ivy gourd in Hawaii. A stem and root boring moth, *Melittia oedipus*, was released on the island of Oahu in 1996. In 1999, two weevils (*A. burkhartorum* and *A. cocciniae*) were released on Oahu. Successful control of this weed has occurred in the Hawaiian Islands by these agents (Ken Teramoto, pers. comm.).

3. Affected Environment

3.1 Evidence of host specificity of *A. cocciniae*:

Surveys: Surveys in Kenya by R. Burkhart (Hawaii Department of Agriculture) revealed no other host plants for *A. cocciniae* than ivy gourd. Close examinations of cultivated cucurbits growing with or near to ivy gourd infestations exhibited no trace of *A. cocciniae.*

Museum records: O'Brien and Pakaluk (1998), who described *A. cocciniae*, reported that this insect occurs only on ivy gourd.

Host specificity tests conducted in quarantine in Hawaii: "Choice" (*A. cocciniae* simultaneously exposed to both test plant and ivy gourd) and "no choice" (*A. cocciniae* exposed only to test plant without presence of ivy gourd) tests were conducted with 38 species of plants belonging to 19 families, including cultivated and naturalized cucurbit species, species endemic to Hawaii belonging to orders other than Violales, taxonomically unrelated crop plants that grow adjacent to ivy gourd, plants morphologically similar to ivy gourd, and plants that are major components of Hawaiian ecosystems. These plants are listed in Appendix 1. *A. cocciniae* fed on 14 plants in "no choice" tests, but no mines developed on them (Murai *et al.* 1998).

Additional host specificity tests conducted in quarantine in Guam: In April 2002, a culture of *A. cocciniae* was brought from the Hawaii Department of Agriculture to the Quarantine Laboratory at the University of Guam. In discussions between the University of Guam, Department of Land and Natural Resources of Northern Marianas, the Northern Marianas College, the U.S. Fish and Wildlife Service (FWS), and APHIS, it was decided that *A. cocciniae* specificity tests should be conducted on *Zehnaria guamensis,* a cucurbitaceous plant endemic to Guam (Stone 1970). Both "choice" and "no choice" tests with *A. cocciniae* were conducted on this plant in quarantine on Guam. For discussion of experimental procedures of these host specificity tests, see Appendix 2.

No adult feeding or larval mining was observed on *Z. guamensis* in "choice" tests. Some adult feeding and larval mining occurred on *Z. guamensis* in "no choice" tests but larvae failed to develop and pupate. The results are presented in Table 2.

Table 2. *Acythopeus cocciniae* host specificity testing. Plants within cages were exposed for one month. Mean ± SEM is reported. Four replications of each pair were conducted on Guam in 2002.

Average / Leaf	Choice Test		No Choice Test	Control
	C. grandis	*Z. guamensis*	*Z. guamensis*	C. *grandis*
No. adult feeding holes/leaf	8.01 " 0.54	0.0 " 0.0	4.24 " 1.07	6.11 " 0.71
No. larval mines/leaf	1.07 " 0.4	0.0 " 0.0	0.2 " 0.2	0.87 " 0.25

Length of mines (cm)	18.23 " 6.22	0.0 " 0.0	1.0 " 1.0	20.76 " 0.35
No. of pupae/plant	6.5 " 3.8	0.0 " 0.0	0.0 " 0.0	12.5 " 3.12
Days until newly eclosed larvae placed on plants start feeding	1.0	Did not feed	11.25 " 1.1	1.0

3.1.2 Endangered and threatened species are a special concern because they are protected under the Endangered Species Act of 1973, as amended. One endangered plant (*Serianthes nelsonii*) and three plants proposed for endangered listing occur on Guam and the Northern Mariana Islands (*Tabernaemontana rotensis, Nesogenes rotensis* and *Osmoxylon mariannense*).

3.1.3 No minority, low-income populations, or children should be negatively impacted due to the proposed action. Potential reduction in herbicide usage to control ivy gourd may even be beneficial to human populations.

4. Environmental Consequences

4.1 This chapter will analyze the potential environmental consequences of each alternative on the resources described in Chapter 3.

4.2 Effects of Alternative 1 - No action

4.2.1 Effects on non-target organisms: The continued use of chemical herbicides and mechanical controls at current levels would be the result if the "no action" alternative is chosen. Chemical control is expensive, temporary and often ineffective. It poses some environmental concerns, such as soil contamination, negative effects on non-target species, and human health hazards. Since ivy gourd grows in a canopy over other plants, herbicide application may damage non-target plants. Bulldozing has the undesirable effect of killing all native plants in the cleared area while leaving some viable ivy gourd tubers to remain below ground to regrow. Cutting is a temporary solution but since cut stems of ivy gourd readily root and sprout, disposal of them is a problem. Often, disposal of the cut stems in vacant lots or roadside aids in spreading this weed. Chemical and mechanical controls have not been successful in curbing the spread of ivy gourd and if no effective action is taken, ivy gourd will continue to cover fences, utility lines and cultivated fields, and will smother native vegetation.

4.2.2 Effect on threatened and endangered species: Impact on threatened and endangered species as a result of existing chemical and mechanical controls on Guam and Saipan would be similar to effects on non-target species and habitats described in section 4.2.1.

4.3 Effects of Alternative to Issue Permit:

4.3.1 Evidence indicates that *A. cocciniae* is highly host-specific and will not have negative impacts on native or cultivated plant species.

Surveys: Surveys in Kenya by R. Burkhart (Hawaii Department of Agriculture) revealed no other host plants than ivy gourd. Close examinations of cultivated cucurbits growing with or

near to ivy gourd infestations exhibited no trace of *A. cocciniae.*

Museum specimens: A study of specimens in large collections of major museums revealed no host plants for *A. cocciniae* other than ivy gourd.

Host specificity tests: Testing of 38 species of plants belonging to 19 families in Hawaii and the endemic cucurbit species *Z. guamensis* on Guam have demonstrated that *A. cocciniae* is specific to ivy gourd.

4.3.2 Plants belonging to the families Fabaceae and Apocynaceae were tested in Hawaii but *A. cocciniae* did not feed on plants in these families. Therefore, no negative effect is expected to occur on the endangered species *Serianthes nelsonii* (Fabaceae) and the proposed species, *Tabernaemontana rotensis* (Apocynaceae). Other plant species proposed for the endangered species list, *Nesogenes rotensis* (Verbenaceae) and *Osmoxylon mariannense* (Araliaceae), are not related to ivy gourd and do not occupy the same habitat as ivy gourd. The release of *A. cocciniae* is not likely to negatively impact these species.

No listed endangered, threatened, proposed or candidate animals utilize ivy gourd and none are expected to be adversely affected by the release of *A. cocciniae*.

Dr. Michael Richardson, Pacific Invertebrates Recovery Coordinator, U.S. Fish and Wildlife Service, Honolulu, HI, was informally consulted in regards to releases of this insect and concurred with APHIS' finding of no effect on threatened and endangered species (M. Richardson, pers. comm.).

4.4 Effect of Alternative 3- Issue the Permit with Specific Management Constraints and Mitigating Measures.

4.4.1 No specific management constraints or mitigating measures have been recommended for this species. Therefore, under this alternative, impacts on non-target organisms would be identical to those described in 4.3.1.

4.4.2 No specific management constraints or mitigating measures have been recommended for this species. Therefore, under this alternative, impacts on threatened and endangered organisms would be identical to those described in 4.3.2.

4.5 No disproportionate effects are expected to impact low income or minority populations or pose undue risks for children.

4.6 An unavoidable effect of the proposed action would be the unsuccessful control of the target pest. Should the proposed action be unsuccessful, the present chemical and mechanical activities would continue and ivy gourd would continue to infest habitats.

4.7 Once a biological control agent such as *A. cocciniae* is released into the environment and it becomes established, there is a slight possibility that it could move from the target plant to non-target plants and itself become a pest. Host shifts by introduced weed biocontrol agents to unrelated plants are uncommon (Pemberton 2000). However, if a host shift does take place, the effects could result in environmental impacts not easily reversed. Biological control agents such as *A. cocciniae* generally spread without the agency of man. In principle, therefore, release at even one site must be considered equivalent to release over the entire area in which potential host plants occur and in which the climate is suitable for reproduction and survival.

5. List of Preparers

This environmental assessment was prepared by Dr. Rangaswamy N. Muniappan, Professor Emeritus, University of Guam, Mangilao, Guam, and Dr. Tracy A. Horner, Entomologist, USDA- APHIS - Policy and Program Development, Riverdale, MD.

6. List of Agencies Consulted

Dr. Michael Richardson, Pacific Invertebrates Recovery Coordinator, U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawaii, was consulted under section 7 of the Endangered Species Act.

7. List of Reviewers

This document was reviewed by Dr. Michael Firko, Assistant Director, Plant Health Programs and Dr. Robert Flanders, Branch Chief, Pest Permit Evaluation, USDA-APHIS-PPQ.

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Appendix 1. Plants tested for host specificity of *Acythopeus coccinae* at the Hawaiian Department of Agriculture

Plant Family	Species
Aristolochiaceae	*Aristolochia littoralis*
Asteraceae	*Helianthus annuus*
Begoniaceae	*Begonia hirtella*
Bromeliaceae	*Ananas comosus*
Carpophyllaceae	*Dianthus carpophyllus*
Portulacaceae	*Portulaca lutea*
Apocynaceae	*Alyxia oliviformis*
Convolvulaceae	*Ipomoea obscura*
Bixaceae	*Bixa orellana*
Caricaceae	*Carica papaya*
Cucurbitaceae	*Bebincasa hispida*
	Citrullus lanatus
	Coccinia grandis
	Lagenaria siceraria
	Luffa aegyptiaca
	Luffa acutangula
	Cucurbita moschata
	Cucurbita pepo
	Momordica charantia
	Cucumis dipsaceus
	Cucumis melo
	Cucumis sativus
	Sechium edule
	Sicyos hispidis
	Sicyos erostratus
	Siscyos pachycarpus
	Sicyos waimanaloensis
	Trichosanthes anguina
Flacourtiaceae	*Xylosma hawaiiense*
Passifloraceae	*Passiflora edulis*
Violaceae	*Isodendrion laurifolium*
	Viola chamissoniana ssp. *traacheliifolia*
Turneraceae	*Turnera ulmifolia*
Fabaceae	*Acacia koa*
	Sophora chrysophylla
Dickinsoniaceae	*Cibotium hawaiiensis*
Sapindaceae	*Dodonaea viscosa*

Myrtaceae	*Metrosideros ploymorpha*

Appendix 2. Host specificity test methods conducted in Guam in 2002.

Host specificity testing of *Zehneria guamensis*.

Four replications were used for both "choice" and "no choice" tests. All plants were raised in 12-inch diameter plastic pots filled with soil. Twelve-inch long, 1-inch diameter *Coccinia grandis* cuttings were brought from the field, planted in pots, and maintained in a screen house until sprouts grew to about 18 inches in length. Seeds collected from *Z. guamensis* were planted in pots and kept in a screen house until the plants grew to approximately 18-inches in length. Five pairs of *Acythopeus coccinae* were released into each cage. For both "choice" and "no choice" tests, plants and insects were kept in cages for approximately one month. Daily observations were made for adult feeding, leaf mines, length of mines and larval survival.

Decision and Finding of No Significant Impact
for
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The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), is proposing to issue permits for release of a nonindigenous, leaf-mining weevil, *Acythopeus cocciniae* O'Brien and Pakaluk (Coleoptera: Curculionidae). The agent would be used for the biological control of ivy gourd, *Coccinia grandis* (L.) Voight (Cucurbitaceae) in Guam and Saipan.

The alternatives available to APHIS are No Action (no permits), Issue Permit, and Issue Permit with Management Constraints or Mitigating Measures. Because of the action being proposed by APHIS, the Issue Permit and the Issue Permit with Management Constraints or Mitigating Measures alternatives will result in the release of the biological control agent into the environment. APHIS has therefore analyzed the potential effects of the release of the agent into the environment. The No Action alternative, as described in the environmental assessment (EA), would likely result in the continued use at the current level of chemical and mechanical control methods for the management of ivy gourd. These control methods described are not alternatives for decisions to be made by APHIS, but are presently being used to control ivy gourd in Guam and Saipan and may continue regardless of permit issuance for field release for *A. cocciniae*.

I have decided to issue permits for the field release of *A. cocciniae* without management constraints or mitigating measures. The reasons for my decision are:

- This biological control agent is sufficiently host specific and poses little, if any, threat to the biological resources of Guam or Saipan.

- This species will not disproportionately affect minority or low- income populations, nor will they disproportionately affect children or result in any environmental health risks or safety risks to children.

- *A. cocciniae* poses no threat to the health of humans or wild or domestic animals.

- *A. cocciniae* is not likely to adversely affect endangered or threatened species or their habitat.

- While there is not total assurance that the release of *A. cocciniae* into the environment will be reversible, there is no evidence that this organism will cause any adverse environmental effects.

Based on the analysis found in the EA, I find that issuance of permits for the field release of *A. cocciniae* without management constraints or mitigating measures will not have a significant impact on the quality of the human environment.

/s/
Michael J. Firko May 14, 2003
Assistant Director
APHIS Plant Health Programs
Plant Protection and Quarantine