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HERBIVOROUS INSECT FAUNA OF KUDZU, *PUERARIA MONTANA* (LEGUMINOSAE), IN JAPAN

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Kudzu, *Pueraria montana* (Lour.) Merr. var. *lobata* (Willd.) Maesen et S. Almeida (Leguminosae), is an aggressive invasive weed introduced to the United States in the early 20th century for forage and erosion control (Piper 1920). Kudzu turned out to be harmful, causing economic loss and suppressing native plants (Alderman 1998). The USDA removed it from the list of recommended ground cover plants in 1953, and it was listed as a U.S. federal noxious weed in 1998 (U.S. Forest Service 2008). Kudzu infests 7 million acres in the United States (Miller & Edwards 1983; Britton et al. 2000), and kudzu's range in North America is still expanding.

Sun et al. (2006) identified plant pathogens and 116 insect species associated with kudzu in China, and Tayutivutikul & Kushigemati (1992) made a similar survey in the southwestern part of Japan, and noted that 109 insects and 2 spider mites in Japan feed on kudzu. Here we report the first field surveys for kudzu-feeding insects in central Japan (12 sites in the Kinki District, N34°-36°, E135°-137°; 4 sites in Shiga prefecture, 3 sites in Kyoto prefecture, 2 sites in Hyogo prefecture, and 1 site in Osaka and Nara prefecture), and in other regions (7 sites, N31°-42°, E130°-141°; 1 site in Hokkaido, Miyagi, Toshigi, Shizuoka and Kagoshima prefecture, and 2 sites in Tokyo prefecture).

Timed visual searches in plots with kudzu were conducted from May to Oct in 2004-2005. Three to 6 plots (2-15 m^2) were marked per site, and each was searched for 15 min in 2004 and 5 min in 2005. The total time spent searching was 2050 min in the Kinki District and 395 min in other regions. All of different morphotypes found were captured and identified in the laboratory. Immature insects were reared on kudzu at 25°C and 16:8 L:D to obtain adults for identification.

Forty-seven potential kudzu-feeding species were identified during the 2-year survey. Three are new records from kudzu, 28 are previously reported kudzu-feeding species (Tayutivutikul & Kushigemati 1992; Sun et al. 2006), 4 are species without host-plant information, and 12 are species known to feed on fabaceous plants (Inoue 1982; Hayashi et al. 1984; Tomokuni 1993; Anonymous 2006) and included as potential kudzu feeders because kudzu was almost the only fabaceous plant in the research sites.

Of the 47 potential kudzu-feeding species collected, 20 were not listed in Tayutivutikul & Kushigemati (1992; Table 1). Four of these 20 were confirmed as kudzu feeders by our observations and Sun et al. (2006). Further study is needed to determine if the other 16 species are kudzu-feeding specialists. All 5 specialists collected, *Trachys auricollis* E. Saunders (Buprestidae), 2 cecidomyiids, *Pitydiplosis* sp. and *Genus* sp., *Mesalcidodes trifidus* Pascoe (Curculionidae), and *Borowiecius ademptus* (Sharp) (Bruchidae), were recorded as such in Tayutivutikul & Kushigemati (1992).

The leaf miner *T. auricollis* and 2 leaf galler *Pitydiplosis* sp., and *Genus* sp. are specialists not reported in Sun et al. 2006, but abundant in Japan. Larvae of *M. trifidus* form stem galls on kudzu, and cannot complete their development on soybean (Sun et al. 2006). The adults feed on kudzu petioles (Sun et al. 2006) but also on soybean, kidney bean, adzuki bean, and cowpea (Anonymous 2006). The seed-feeder *B. ademptus* is naturalized in North Carolina (Sun et al. 2006).

Three species of Lepidptera (*Endoclyta signifier* Walker, *Endoclyta excrescens Buutler*, and *Ostrinia* sp.) feed on kudzu roots (Tsugawa & Kayama 1985), 2 of which are hepalid (*Endoclyta* spp.) generalists and pests of economically important plants (Anonymous 2006).

Only 11 of the 129 potential kudzu-feeding insects from Japan (this report and Tayutivutikul & Kushigemati 1992) have been reported from China (Sun et al. 2006)

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TABLE 1. NEW POTENTIAL KUDZU-FEEDING INSECTS COLLECTED.

Order	Family	Species	Confirmed feeding[a]	Host range[b]	Region of collection[c]
Coleoptera	Cerambycidae	*P. rigida* Bates		P	K
	Chrysomelidae	*Aulacophora femoralis* (Motschulsky)		P	K
		A. nigripennis Motschulsky		P	K
	Curculionidae	*Scepticus griseus* Roelofs		P	K
	Elateridae	*Paracardiophorus subaeneus* yasudai		—	OK (Tochigi)
	Scarabaeidae	*Anomala orientalis* Waterhouse		P	K
		A. rufocuprea Motschulsky		P	K
		Maladera japonica Motschulsky		P	K
Heteroptera	Alydae	*Leptocorisa chinensis* Dallas		P	K
	Pentatomidae	*Carpocoris purpureipennis* (De Geer)		P	OK (Hokkaido)
	Rhopalidae	*Leptocoris augur* (Fabricius)		P	K
Homoptera	Aphrophoridae	*Aphrophora ishidae* Matsumura		—	K
	Cixiidae	*Reptalus quadricinctus* Matsumura		—	K
	Membracidae	*Gargara genistae* (Fabricius)	+	PO?	K
Lepidoptera	Geometridae	*Jodis angulata* Inoue	+	—	K
	Lymantriidae	*Cifuna locuples confusa* Bremer	+	P	K
	Noctuidae	*Agrotis segetum* Denis et Schiffermuller	+	P	K
Orthoptera	Acrididae	*Locusta migratoria* L.		P	OK (Shizuoka)
	Oecanthidae	*Oecanthus longicauda* Matsumura		P	OK (Hokkaido)
	Tettigoniidae	*Homorocoryphus jezoensis* (Matsumura et Shiraki)		P	OK (Hokkaido)

(a) +, Insects observed feeding on kudzu in Sun et al (2006), or this study.
(b) M, Monophagous, feeds on kudzu; O, Oligophagous, feeds mainly on Leguminosae; P, Polyphagous, feeds on plants from other families than Leguminosae; —, species without host-plant information. Host range based on Japanese literature (see text).
(c) K, species collected in the Kinki district; OK, collected outside it. Specific locations (prefecture) were indicated for OK.

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SUMMARY

Kudzu is an aggressive invasive weed introduced from Japan to the United States. A 2-year survey of herbivorous insects on this plant in central Japan found 47 potential kudzu-feeding species, including 5 likely specialists. The leaf-miner *Trachys auricollis* is the most promising agent for biological control of kudzu.

REFERENCES CITED

ALDERMAN, D. H. 1998. A vine for postmodern times: an update on kudzu at the close of the twentieth century. Southeast Geogr. 38: 167-179.

ANONYMOUS. 2006. Major Insect and other Pests of Economic Plants in Japan, Revised Ed. Japanese Soc. Appl. Entomol. Zool., Tokyo, Japan (in Japanese).

BRITTON, K. O., ORR, D., AND SUN, J. H. 2002. Kudzu, *In* R. G. Van Driesche [ed.], Biological Control of Invasive Plants in the Eastern United States. USDA Forest Service Publication FHTET-2002-04.

HAYASHI, M., MORIMOTO, K., AND KIMOTO. S. 1984. The Coleoptera of Japan in Color. Vol., IV. Hoikusha Publishing Co., Ltd. Osaka, Japan. (in Japanese).

INOUE, H. 1982. Moths of Japan. Kodansha Publishing Co., Ltd. Tokyo, Japan.

MILLER, J. H., AND EDWARDS, B. 1983. Kudzu: where did it come from? And how can we stop it? South. J. Appl. For. 7: 165-169.

PIPER, C. V. 1920. Kudzu. USDA Circular No. 89:1-7.

SUN, J. H., LIU, Z. D., BRITTON, K. O., CAI, P., ORR, D., AND HOUGH-GOLDSTEIN, J. 2006. Survey of phytophagaous insects and foliar pathogens in China for a biocontrol perspective on kudzu Pueraria montana var. lobata (Willd.) Maesen and S. Almeida (Fabaceae). Biol. Contr. 36: 22-31.

TAYUTIVUTIKUL, J., AND KUSHIGEMATI, K. 1992. Biological studies of insects feeding on the kudzu plant, Pueraria lobata (Leguminosae). I. List of feeding species. Mem. Fac. Agric, Kagoshima Univ. 28: 89-124.

TOMOKUNI, M. 1993. A Field Guide to Japanese Bugs—Terrestrial Heteropterans. Zenkoku Noson Kyokai, Publishing Co., Ltd, Tokyo (in Japanese).

TSUGAWA, H., AND KAYAMA, R. 1985. Studies on population structure of Kudzu 144 vine (Pueraria lobata

Ohwi). VI. The structure of overwintering aboveground 145 parts of individual plants which constitute a natural kudzu population. J. Japan. 146 Grassl. Sci. 31: 167-176. (in Japanese with English title and abstract).

U.S. FOREST SERVICE. 2008. http://www.fs.fed.us/global/globe/asia/china.htm

YUKAWA, J., AND MASUDA, H. 1996. Insect and Mite Galls of Japan in Color (in Japanese, with English explanation for color plates). Zenkoku Nôson Kyôiku Kyôkai, Tokyo.