



## Research Article

# Survey and surveillance of storage insect pests of cereals and pulses and their natural enemies, in Vijayapur district

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**ABSTRACT:** The survey and surveillance was carried out during 2013 at the seed unit (central store) College of Agriculture Vijayapur, Agricultural Produce Market Committee (APMC) market, Food Corporation of India (FCI) and State Warehousing Corporation (SWC) in Vijayapur, houses at monthly intervals for three months, (July to December 2013) and farmers in five taluks (Indi, Sindgi, Vijayapur, Basavan bagewadi and Muddebihal) in Vijayapur district. During the survey and surveillance, natural enemies found were *Amphibolus venator* on *Tribolium castaneum* and *Corcyra cephalonica* in sorghum and pearl millet, *Xylocoris flavipes* on *T. castaneum*, *Sitotroga cerealella* and *Callosobruchus chinensis* in sorghum, wheat and bengal gram respectively. *Dinarmus* sp. on *Callosobruchus chinensis* in pulses like chickpea, redgram, black gram and moth bean.

**KEY WORDS:** *Amphibolus venator*, *Dinarmus* sp., survey, surveillance and *Xylocoris flavipes*

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## INTRODUCTION

It is well established fact that lot of efforts should be put for the production of “every single grain” but this is of no use if the produced grains seeds are not saved, which recalls the proverb “A grain saved is a grain produced”. This adage depends mainly on how best we protect the quality of grains during storage.

Control of stored grain insect pests attacking food grains is also a difficult task particularly in bag storage where still jute bags are important receptacles for the storage of grains. The rise in consumption of synthetic pesticides in modern agriculture has been alarming. The use of plant products is considered as a novel approach, though they are good age old methods. The uses of natural enemies are ecologically safe.

Certain parasitoids and predators of field and storage pests are notable for their potential as biological control agents. Because *Bracon hebetor* (Say) development time from egg to adult is half that of its host and several adult wasps can be produced from one parasitized host; this species is considered as an excellent candidate for biological control since its population can increase rapidly and over take that of the host. Other important wasps that can control

internal feeding grain beetles are the pteromalids, *Anisopteromalus calandrae* (Howard) and *Choetospila elegans* (Westwood). Pirate bugs such as the warehouse pirate bug, *Xylocoris flavipes* (Reuter), nymphs of which feed on any life stages that can be subdued. The species are now commercially mass produced for sale. As the adult natural enemies occur outside grain kernels, they can be cleaned from grain before milling. An attempt was made to document the natural enemies of storage pests in Vijayapur district of Karnataka and the results are presented in this article.

## MATERIALS AND METHODS

The survey and surveillance was carried out for three and six times at one month interval from July to December and July to September 2013 respectively. Surveillance were carried out in the Seed unit (central store) at the College of Agriculture Vijayapur, State Warehousing Corporation (SWC), Food Corporation of India (FCI), Agricultural Produce Market Committee (APMC), Vijayapur and survey work carried out in farmers storages in five taluks viz., Indi, Sindgi, Muddebihal, Basavana Bagewadi and Vijayapur. Later, villages viz., Almel, Chikkabevanur, Hittinahalli, Ronihal and Hirur were also included. Observations were taken on commodity stored, number of insects (live and dead) per 250g of sample, per cent of infestation, duration

of grains stored (months) and any insect, parasitoids and predators found in storage units.

In each locality 250g of infested seed samples were collected, brought to the laboratory, the pest activity was recorded. Both adults as well as immature stages were observed under stereo binocular microscope. The sample was observed for emergence of parasitoids and predators if any. The parasitoids and predators emerged were preserved and they were sent to the ICAR- National Bureau of Agriculturally Important Insects (NBAII) Bangalore, for identification.

### RESULTS AND DISCUSSION

In survey conducted in farmers' houses, in Hirur, *Dinarmus* sp. was found in red gram infested with *C. chinensis*. *X. flavipes* was recorded in bengal gram seeds infested with *C. chinensis*. In Chikkabevanur village, *Dinarmus* sp. were recorded on moth bean seeds infested with *Callosobruchus maculatus* and *X. flavipes* was recorded in wheat seeds infested with *S. cerealella* and *T. castaneum*. In Hittinahalli, *Dinarmus* sp. were recorded in redgram seeds infested with pulse beetle. In Almel village *X. flavipes* was recorded

in sorghum grains infested with *Tribolium castaneum*. In Ronihal village, *X. flavipes* was recorded in wheat and bengalgram infested by *T. confusum* and *C. chinensis* respectively (Table 1).

Similar work was done by Vaclav Stejskal, Petr Kossina and Luke Kanyomeka (2006) on stored product pests, their natural enemies, grain storage and pest management approaches in northern Namibia. The survey revealed five types of crop commodities pearl millet, sorghum, cowpea, maize, feed mixture. Ten insect pest species were found affiliated to the orders of Coleoptera (*Attagenus fasciatus*, *Callosobruchus subinnotatus*, *Cryptolestes ferrugineus*, *Oryzaephilus surinamensis*, *Rhyzopertha dominica* and *Tribolium castaneum*), Lepidoptera (*Corcyra cephalonica*, *Sitotroga cerealella*), Psocoptera (*Liposcelis paeta*) and Blattodea (*Blattella germanica*). Out of these, seven species were recognized as new stored-products pests for Namibia. Although listed for southern Africa region, no storage pest-mites (Acari) and *Sitophilus* spp., *Prostephanus* sp. or *Trogoderma* sp. beetles were traced and they found four new species of natural enemies of storage pests recruiting from insects (*Habrobracon hebetor*, *Cephalonomia wattersoni*, *Brachymeria* sp.) and mites (*Blattisocius tarsalis*).

**Table 1. Survey for presence of storage pests and their natural enemies [parasitoids and predators] during July to December 2013**

Place	Commodity stored	Duration of grains stored (months)	Pest observed	Per cent Infestation	No of pests/250g sample		Para-sitoids emerged	Parasitoid Numbers	Predators emerged	Predator Numbers
					Live	Dead				
Hirur	Wheat	03	<i>T. castaneum</i>	08	28	02	-	-	<i>Xylocoris flavipes</i>	04
Hirur	Red gram	05	<i>C. maculatus</i>	03	43	05	<i>Dinarmus</i> sp.	04	-	-
Ronihal	wheat	06	<i>S. oryzae</i> and <i>Tribolium confusum</i>	10	44 and 54	07 and 10	-	-	<i>Xylocoris flavipes</i>	07
Ronihal	Bengal gram	04	<i>C. maculatus</i>	03	42	08	-	-	<i>Xylocoris flavipes</i>	04
Chikkabevanur	Sorghum	03	<i>C. cephalonica</i>	12	54	10	-	-	<i>Xylocoris flavipes</i>	06
Chikkabevanur	wheat	03	<i>S. cerealella</i> and <i>Tribolium castaneum</i>	10	44 and 35	04 and 07	-	-	<i>Xylocoris flavipes</i>	07
Chikkabevanur	Moth bean	02	<i>C. chinensis</i>	03	39	02	<i>Dinarmus</i> sp.	18	-	-
Hittinahalli	Sorghum	05	<i>C. cephalonica</i>	07	61	12	-	-	<i>Xylocoris flavipes</i>	04
Hittinahalli	Red gram	01	<i>C. maculatus</i>	04	39	07	<i>Dinarmus</i> sp.	04	-	-
Almel	Sorghum	05	<i>T. castaneum</i>	17	77	21	-	-	<i>Xylocoris flavipes</i>	06

In Curculionidae family number of species of *Sitophilus* have been identified of which, *S. oryzae* is cosmopolitan in distribution. *Sitophilus* spp. are major pests of whole cereal grains and dried root crops such as cassava. They rank as the most important pests of whole grain. *Sitophilus oryzae* is a well known pest of dried pasta. Certain strains of *S. oryzae* can attack stored pulses, including chickpea (*Cicer arietinum*), cowpea (*Vigna unguiculata*) and pea (*Pisum sativum*). If left unchecked, infestations of *Sitophilus* spp. can cause devastating damage to stored grain. They remain a serious pest of farm-stored grain and of bag-stored grain in warehouses, especially under tropical conditions. *S. oryzae* is a key pest of stored cereals and their products. *S. granarius* is found in temperate regions and *S. zeamais* is found on maize as preferred host. Only *S. oryzae* has been noticed in Hirur, Hittinahalli, Chikkabevanur, Ronihal, APMC, FCI and seed unit Vijayapur on sorghum, maize, wheat and pearl millet. It was found to breed throughout the year. Awaknavar (1991) also recorded *S. oryzae* but not *S. zeamais* and *S. granarius* at Dharwad.

In Tenebrionidae: A large number of species belonging to different genera have been recorded worldwide. From among them, *T. castaneum* and *T. confusum* are important secondary pests of grains products worldwide. They attack virtually any dried material of animal or plant origin but are especially important as pests of cereal and cereal products and are major pests of mills. *T. castaneum* occurs in both stores and mills, however, *T. confusum* is more often found in mills. *T. audax*, *T. destructor* and *T. madens* are also pests of cereal grain and grain products and can be locally important in regions where they are found. For example in southern Canada, *T. destructor* can be as important pest as *T. castaneum* and *T. confusum*. *T. castaneum* has been recorded from Almel, Hirur, Hittinahalli, Chikkabevanur, Ronihal, APMC, FCI and seed unit Vijayapur on sorghum, maize, wheat and pearl millet. Whereas *T. confusum* is usually restricted to temperate regions. From Vijayapur *T. castaneum* has been a pest of regular occurrence on broken grains and flour of various regions. *T. confusum* also has been recorded to lesser extent on sorghum wheat and maize at Vijayapur. In the other genus *Alphitobius*, *A. diaperinus*, *A. laevigatus* and *A. viator* have been recorded. *A. diaperinus* and *A. laevigatus* are scavengers, mould feeders and minor pests of a wide range of cereals and cereal products, especially in damp. They are found in residues and sweepings and not usually in clean dry grain. *A. diaperinus* is a common inhabitant of intensive poultry houses where it helps to compost the large amount of manure produced by birds. Among *Alphitobius* species only *A. diaperinus* has been recorded from FCI godown at Vijayapur on sorghum. The other tenebrionids like *Tribolium*

includes *T. distructer*, *T. audax*, *T. madens* and *Palorus* spp. etc. are not recorded during the present investigation.

In Bostrychidae: *R. dominica* has been recorded from Almel (Vijayapur) on sorghum. This investigation is in agreement with Awaknavar (1991) who reported it in Dharwad feeding on paddy, jowar and wheat. Its occurrence in the related species *Prostophanus truncatus* was not recorded.

The pulse beetles are the major pests of stored pulses. They are internal feeders causing heavy loss to stored pulses. *Acanthoselides obtectus*, *Callosobruchus* spp. and *Zabrotes subfasciatus* rank among the most important insect pests of stored products. These pests cause considerable economic damage especially under conditions of tropical subsistence agriculture where climatic conditions for optimal population growth, use of small storage structures (e.g. bags and baskets) that allow easy access by the beetle to the stored commodity, close proximity of production and storage places-making pre harvest infestation likely, and limited availability and use of chemical control measures. Even in economical storage, infestation can be severe, especially warm to hot climates and when commodities are stored in bags. Damage to bulk-stored pulses is likely to be less severe and be limited to surface layers as bruchid cannot easily penetrate deep into bulks, especially of small-seeded commodities. Bruchids species are quite specific as to which pulse they attack. Species that attack beans (*Phaseolus* spp.) generally do not attack pulses of genus *Vigna* and vice versa. This is an important aid to the identification of the genus involved. Among the genera *Callosobruchus* is the most important genus. Awaknavar (1991) recorded *C. chinensis* and *C. maculatus* feeding on a number of pulses. *C. analis* on soyabean, *C. phaseoli* on beans, *C. cajanis* on redgram in north Karnataka. However, during the present study only *C. chinensis* and *C. maculatus* were recorded in Almel, Hirur, Hittinahalli, Chikkabevanur, Ronihal, APMC, FCI and seed unit Vijayapur on Chickpea, redgram, greengram, blackgram, cowpea and mothbeans.

In Dermestidae family, by far the most important species worldwide are *T. granarium* and *T. variabile*. *T. granarium* is a feared pest of stored products and is serious especially grain and oil seeds stored in bags in hot dry climate. Under such conditions, population can cause total loss of infested commodities. Formerly it was a pest of malting in Japan and northern Europe where it infested kilned grain or residues near the kilns. It also attacks a wide range of other plant-based materials, like in retail packs of dried cucurbits seeds sold as snacks in the Middle East and southwest Asian region. Due to its ability to diapause, structural

infestations of ships, rail cars and containers can persist for years after initial infestation, only to cross-infest other material at a later date. While not usually a serious pest of bulk grain, it can become a damaging pest of bagged grain processed and packed foods. In Australia, *T. variabile* has recently become a pest of bulk stored canola seed. Larvae of *Trogoderma* spp. can penetrate most common packaging materials and commonly infest packaged foods of all kinds. They are also sometimes found attacking material of animal and plant origin in museums and private collections. As with other dermestids, bodies and cast skins of *Trogoderma* species are highly allergic to humans. Quarantine legislation exist in many countries to prevent the introduction of *Trogoderma* spp. especially *T. granarium* (Devid, 2008). *T. granarium* has been recorded from Seed unit A. C. Vijayapur in sorghum. *T. granarium* has been recorded as serious storage pest especially in wheat from North India. However it was noticed from Dharwad on wheat and other genera of Dermestidae have also been recorded (Awaknavar, 1991).

Silvanidae includes two important species of cosmopolitan distribution namely *O. surinamensis*, the rusty grain beetle and *O. mercator* the merchant grain beetle. The former occurs as a secondary pest of stored cereal and other grain products. While latter occurs on stored oilseeds. Both the species have been recorded by Awaknavar (1991) and in addition the foreign grain beetle, *Ahasverus advena* has also been recorded by him at Dharwad. However, in Vijayapur during the present survey, only *O. surinamensis* has been recorded only from seed unit A. C. Vijayapur on sorghum.

Cucujidae (Laemoploeidae) includes a number of species of flat grain beetles belonging to the genus *Cryptolestes* namely *C. ferrugineus*, *C. pusillus*, *C. klapperichi*, *C. pussiloides*, *C. ugandae*, *C. divaricatus*, *C. capensis*, *C. cornutus* and *C. turcicus* (Halstead, 1993). Among these only *C. ferruginous*, *C. pusillus* and *C. pussiloides* occur in dry hot conditions. *Cryptolestes* are important pests of cereals, cereal products, oil seeds and dried processed foods of vegetable origin. Under tropical condition they are found on a wider range of commodities including nuts, cocoa, copra and cassava. When infesting cereal-based products, *Cryptolestes* breed most rapidly on milled produce or on grain previously damaged by insects or by poor harvesting, storing or handling. They are often associated with heating grain. Being small and highly flattened, adult larvae easily enter imperfections in packed goods. Worldwide the most important species are *C. ferrugineus* and *C. pusillus*. They are minute secondary pests found feeding on sorghum and wheat. They are small or very small beetles usually strongly depressed bodies although a few subcylindrical

(Devid, 2008). Most of them live under bark of dead tree, some occur in the galleries of wood boring beetles. *Cryptolestes* is cosmopolitan in distribution, other genera of the Leamophloeidae are of comparatively minor importance, most being encountered due to their association with duunage, unbarked structural and commercial timbers. Awaknavar (1991) recorded *C. ferrugineus* and *C. pusillus* from Dharwad region on sorghum flour and wheat flour. During the present investigation at Vijayapur also the same two species have been recorded from Almel and Seed unit A.C. Vijayapur on pearl millet and sorghum, respectively.

In Gelichiidae family, *S. cerealella* is a pest of whole cereal grain, especially of barley, maize, millet, sorghum, and wheat. Infestation often begins in the field as the grain matures, especially under tropical conditions. It is most serious pest of bagged and traditionally stored produce and commodities such as maize and sorghum, which are often left in field or in the open to dry. It is less serious as a pest of bulk-stored grains where infestations are usually restricted to surface layers. *Sitotroga cerealella* is another primary pest and internal feeder was observed from Almel, Hittinahalli, Ronihal, Hirur, Chikkabevanur, APMC and FCI godown at Vijayapur on sorghum, maize, wheat and pearl millet. It has been recorded to feed on cereal grains by number of authors.

In Phycitidae most important genus of storage concern is *Ephestia*. About six species of *Ephestia* namely *E. cautella*, *E. kuehniella*, *E. elutella*, *E. figulilella*, *E. calidella* have been recorded on stored grains causing serious damage. In temperate regions *C. cautella* tends to be replaced by *E. kuehniella* and/or *E. elutella*. As an example, in southern Australia, *C. cautella* and *E. kuehniella* can both be found infesting cereal processing plants with the former being mostly confined to warm or heated areas and the latter found in unheated facilities or areas expose to ambient conditions. As well as being a pest of mills, *E. elutella* is also known as pest of cured tobacco. *E. figulilella* and *E. calidella* are relatively minor pests and typically infest dry and drying fruit-infestations can begin on the vine before harvest. *C. cautella* and *E. kuehniella* also infest bulk and bag stored grain. Infestations of bulk grain tend to be restricted to surface layers (Devid, 2008). *E. cautella* were recorded from FCI godown Vijayapur on sorghum. The Indian meal moth *Plodia interpunctella* also belongs to the name family but has not been recorded in Karnataka

Galleridae includes *Corcyra cephalonica* which has been found as a regular pest in Vijayapur feeding as a secondary pest on a number of commodities, particularly broken grain and damaged grains. In Vijayapur it has been recorded on sorghum, wheat, pearl millet and maize.

The families Nitidulidae, Ostomatidae and Ptinidae have been recorded at Dharwad by Awaknavar (1991). Vijayapur being dry region only few cereals and pulses are grown and none of these families were encountered during the present investigation at Vijayapur.

Surveillance conducted in Seed unit, at the College of Agriculture Vijayapur, the natural enemies recorded were *Amphibolus venator* (Plate.1) predating on *S. oryzae*, *T. castaneum*, *C. cephalonica* in sorghum and Pearl millet seeds and *Dinarmus* sp. on *C. chinensis* infested chickpea seeds. In APMC market Vijayapur *X. flavipes* (Plate.2) was found on *T. castaneum* infesting sorghum grains. In case of FCI Bijapur, *Dinarmus* sp. (Plate.3) on *C. chinensis* infesting pulse crops like blackgram, cowpea and moth bean. In case of SWC Vijayapur, sorghum was stored for two months in gunny bags had 3 per cent infestation by *T. castaneum* but no natural enemies were recorded. During our last two months surveillance there were no storage pests, parasitoids and predators observed in State Warehousing Corporation, where they stored fertilizers (Table 2).

Similar work was done by Khalafalla, (1996) on the Ectoparasitoid, *Anosopteromalus* sp. (Howard) (Hymenoptera: Pteromalidae) as a biocontrol agent against the lesser grain borer, *Rhyzopertha dominica* in Saudi Arabia and Habibpour *et al.* (2002) conducted a survey on pests and their natural enemies associated with stored products and they identified species were listed in 3 categories: I) Destructive insects and mites. A total of 29 species from 20 families belonging to 8 orders were collected and identified; II) Insect predators and parasitoids, *Xylocoris* sp., *Habrobracon hebetor* (say), *Habrobracon brevicornis* (Say), *Choetospila elegans* (Westwood), *Pteromalus* spp., *Anisopteromalus* spp. *Cephalonomia tarsalis* (Ashmead), *Laelius anthrenivorus* (Trani); III) Predatory mites: *Hypoaspis (Geolaelaps) aculeifer* (Canestrini), *H. (Pneumolaelaps) sclerotarsa* (Costa), *Proctolaelaps pygmaeus* (Murlen), *Macrocheles* sp., *Acarapsis docta* (Berlce), *Cheyletus malaccensis* (Oudemans).

**Table 2. Surveillance for presence of storage pests and their natural enemies [parasitoids and predators] during July to September 2013**

Place	Commodity stored	Duration of grains stored (months)	Pest observed	Per cent Infestation	No of pests/250g sample		Parasitoids emerged	Parasitoid Numbers	Predators emerged	Predator Numbers
					Live	Dead				
APMC Vijayapur	Sorghum	05	<i>T. cateneum</i>	10	67	19	-	-	<i>Xylocoris flavipes</i>	03
FCI Vijayapur	Maize	03	<i>T. confusum</i>	05	84	18	-	-	<i>Xylocoris flavipes</i>	06
FCI Vijayapur	Black gram	02	<i>C. chinensis</i>	02	55	09	<i>Dinarmus</i> sp.	3	-	-
FCI Vijayapur	Cowpea	05	<i>C. chinensis</i>	30	119	32	<i>Dinarmus</i> sp.	13	-	-
FCI Vijayapur	Moth bean	02	<i>C. maculatus</i>	10	57	04	<i>Dinarmus</i> sp.	8	-	-
Seed unit A C Vijayapur	Sorghum	15	<i>T. confusum</i> and <i>S. oryzae</i>	45	54 and 43	06 and 04	-	-	<i>Amphibolus venator</i>	25
Seed unit A C Vijayapur	Sorghum	13	<i>C. pusillus</i> and <i>Trogoderma granerium</i>	45	18 and 18	01 and 11	-	-	<i>Amphibolus venator</i>	27
Seed unit A C Vijayapur	Sorghum	12	<i>C. cephalonica</i> and <i>Oryzaephilus surinamensis</i>	60	205 and 198	43 and 38	-	-	<i>Amphibolus venator</i>	56
Seed unit A C Vijayapur	Pearl millet	05	<i>T. cateneum</i>	05	74	05	-	-	<i>Amphibolus venator</i>	12
Seed unit A C Vijayapur	Chick pea	10	<i>C. maculatus</i>	50	185	41	<i>Dinarmus</i> sp.	36	-	-

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## REFERENCES

- Abass AB, Ndunguru G, Mamir P, Alenkhe B, Mlingi N, Bekunda M. 2013. Post-harvest food losses in a maize-based farming system of semi-arid savannah area of Tanzania. *J Stored Prod Res.* **57**: 49–57.
- Awaknavar JS. 1991. Faunastic study of the coleopterous storage pests of Dharwad, Karnataka. *Karnataka J Agric Sci.* **4**(3&4): 179–180.
- Devid R. 2008. *Insects of stored products*. SBS Puplichers and pvt. ltd., 132pp.
- Espino LA, Greer CA, Mutters RG, Thompson JF. 2014. Survey of rice storage facilities identifies research and education needs. *California Agric.* **68**(1):38-46. DOI: 10.3733/ca.v068n01p38. *January-June 2014* **68**: 1–2.
- Habibpour B, Kamali K, Meidani J. 2002. Insects and mites associated with stored products and their arthropod parasites and predators in Khuzestan province (Iran). *Integrated Protec Stored Prod, IOBC Bull.* **25**(3): 89–91.
- Halstead DGH. 1993. Keys for the identification of beetles associated with stored product. Laemophloeidae, Passandridae and Silvanidae. *J Stored Prod Res.* **29**: 99–197.
- Hossaein MA, Ali AT, Hashem K, Somayeh K. 2009. Stored product pest and their parasitoid wasps in Mashhad, Iran. *Adv Env Biol.* **3**(3): 239–243.
- Khalafalla S. 1996. Studies on the Ectoparasitoid, *Anisopteromalus calandrae* (Howard) (Hymenoptera: Pteromalidae) as a biocontrol agent against the lesser grain borer, *Rhyzopertha dominica* in Saudi Arabia. *J Stored Prod Res.* **32**: 137–140.
- Konishi K, Thekke C, Narendran IT, Visarathanonth P. 2003. Chalcididae (Hymenoptera) from rice stores in Thailand, with description of two new species. Entomology Laboratory, National Agricultural Research. Center for the Hokkaido Region. Japan.
- Rahman MM, Islam W, Ahmed KN. 2009, Studies on functional response of the predator *Xylocoris flavipes* to three stored product insect pests. *Intl J Agric Biol.* **3**(11): 316–320.
- Richard T, Arbogast. 1991. Identification of *Cryptolestes ferrugineus* and *Cryptoleptes pusillus* (Coleoptera: Cucujidae) a practical character for sorting large samples by species. *Ent News* **102**(1): 33–36.
- Stejskal V, Kosina P, Kanyomeka L. 2006. Arthropod pests and their natural enemies in stored crops in northern Namibia. *J Pest Sci.* **79**(1): 51–55.
- Thomas MC, Stewart BP. 1991. Survey of insects of South Florida and the Florida Keys: Flat Bark Beetles. (Coleoptera: Cucujidae (Sens. lat.) [Laemophloeidae: Passandridae:Silvanidae]). *Florida Entomol.***74**(4): 536–543.