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Rice Stink Bug, *Oebalus pugnax* (Fabricius) (Insecta: Hemiptera: Pentatomidae)[1]

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The Featured Creatures collection provides in-depth profiles of insects, nematodes, arachnids and other organisms relevant to Florida. These profiles are intended for the use of interested laypersons with some knowledge of biology as well as academic audiences.

Introduction

The rice stink bug, *Oebalus pugnax* (Fabricius) (Figure 1), belongs to the order Hemiptera (the true bugs), family Pentatomidae. Adults of this family are recognized by their shield shape and a pair of five-segmented antennae, but especially by a characteristic malodorous scent.

This insect is a serious pest that feeds on a variety of crops, like many other stink bug species. These stink bugs particularly prefer to feed on rice plants, affecting yield and quality. *Oebalus pugnax* is widespread through the southeastern United States (Bhavanam et al. 2021), Mexico (Sailer 1944), Cuba, Dominican Republic (Feakin 1976), and Puerto Rico (Franqui et al. 1988). Rice is the preferred host for all *O. pugnax* stages, and from early nymphs to reproductive adults, this insect is likely to abandon weedy host plants to go feed on developing rice kernels from heading rice plants, if the crop is found nearby.

Figure 1. Adult rice stink bug, *Oebalus pugnax* (Fabricius).
Credit: C. Camarozano, UF/IFAS.

Taxonomy

This insect belongs to the order Hemiptera, known to have individuals with piercing-sucking mouthparts, and suborder Heteroptera, the true bugs. Stink bugs are classified within the family Pentatomidae, and the rice stink bug binomial name is composed by the genus *Oebalus* and the species *pugnax*.

Oebalus pugnax (Fabricius, 1775) is also known by the synonyms *Cimex typhoeus* Fabricius, 1803 and *Oebalus typhoeus* (Fabricius, 1803) (ITIS 2025). The genus name "*Solubea*," which also refers to this insect, was widely used in older literature but has been replaced by "*Oebalus*" (Sailer 1944; Bhavanam et al. 2021).

This stink bug has two subspecies: *Oebalus pugnax pugnax* (Fabricius, 1775) and *Oebalus pugnax torrida* (Sailer, 1944) (ITIS 2025).

Distribution

The genus *Oebalus* is native to the Neotropics. *Oebalus pugnax* is a species with a wide distribution, commonly found in all rice-producing regions of the United States, excluding California (Bhavanam et al. 2021). Recent references on the geographical distribution of *O. pugnax* in the United States have mentioned the active and damaging presence of the species in Arkansas (Cato et al. 2020), Louisiana (Hernowo et al. 2020), Mississippi (Awuni et al. 2024), and Florida (VanWeelden et al. 2020). However, *O. pugnax* co-occurs with *O. insularis*, and *O. ypsilongriseus* in Florida rice fields (VanWeelden et al. 2020). Additionally, *O. pugnax* has been reported in Mexico (Sailer 1944), Cuba, the Dominican Republic (Feakin 1976), and Puerto Rico (Franqui et al. 1988).

Description

Adults

The adults of *O. pugnax* are elongated and narrow, distinguishable from closely related species by their elongated shield shape and the sharp shoulder spines that project forward (Figure 1). The size of the second antennal segment (counted from the base towards the tip) is another morphological character used for identification of *Oebalus* spp. feeding on rice. The second antennal segment is at least 1.2 times the length of the first segment in *O. pugnax* (Figure 1) and *O. insularis*, whereas it is half the length of the first segment in *O. ypsilongriseus* (Sailer 1944; McPherson and Bundy 2018).

Oebalus pugnax males are 9 mm–10 mm (approximately 1/3 in–3/8 in) long and 3.75 mm–4 mm (approximately 1/8 in) wide whereas females are 9.5 mm–11.5 mm (approximately 3/8 in–1/2 in) long and 4 mm–4.75 mm wide (approximately 3/16 in) (Ingram 1927; Sailer 1944). Females of *O. pugnax* have a horizontal opening at the end of the abdomen (Figure 2). This opening, which is absent in males, is green because of the presence of eggs in gravid females. For both *O. pugnax* males and females, there is a period of approximately 2.4 days after they become adults until they start mating (Nilakhe 1976). Mating is more frequent in the evening but may occur all day. For adults reared on rice after being inactive during the winter, the average lifespan is 39 and 51 days for males and females, respectively. The egg-laying period lasts approximately 45 days, during which females produce an average of 915 eggs (Nilakhe 1976; Bhavanam 2021).

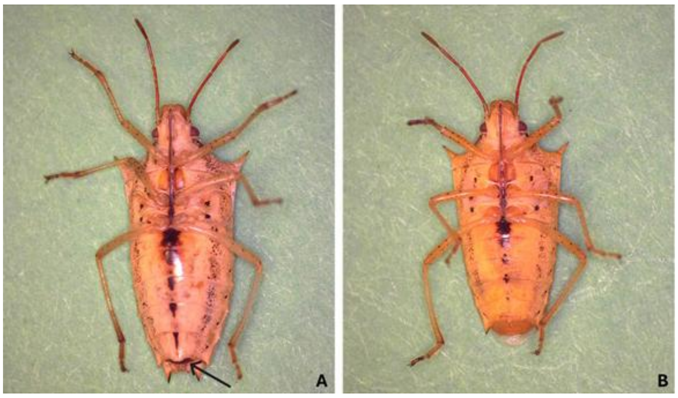

Figure 2. *Oebalus pugnax* adult (A) female and (B) male. See horizontal opening at the tip of the female's abdomen (black arrow), a character that can be used to distinguish the two sexes.
Credit: C. Camarozano, UF/IFAS.

Eggs

Oebalus pugnax females lay barrel-shaped green eggs mainly on the stems and leaves of host plants, in masses arranged in two rows of 8 to 44 alternating eggs (Ingram 1927; Esselbaugh 1946; Nilakhe 1976; Bernhardt 2009). As the embryos develop, the green eggs first exhibit two parallel red lines visible through the transparent external layer of the egg and then turn red (Figure 3), exhibiting a light-colored "W" or "M" mark visible through the egg top (Esselbaugh 1946; Bernhardt 2009). Eggs hatch at temperatures ranging from 15°C to 37°C (59°F to 98.6°F), and the incubation period is 4 to 5 days at 29°C (84.2°F) (Rashid et al. 2005; Bernhardt 2009).

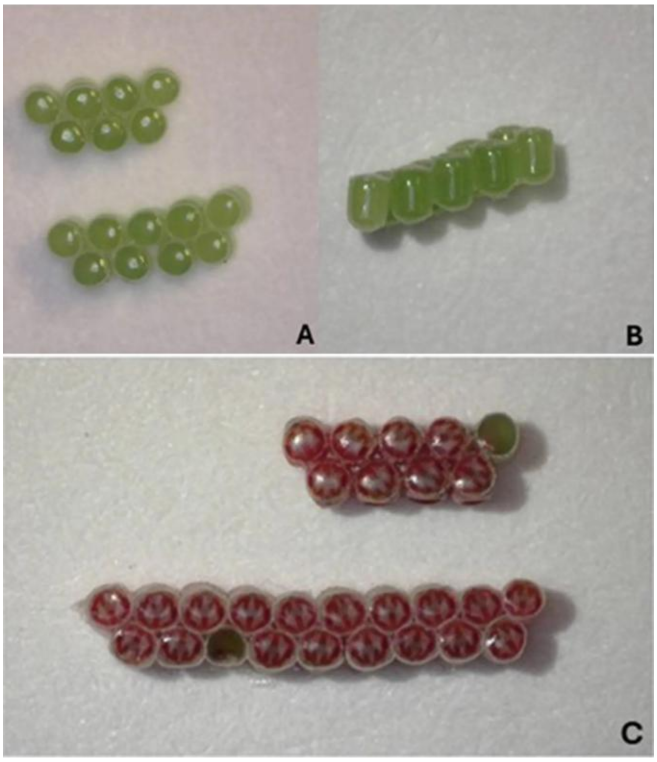

Figure 3. *Oebalus pugnax* eggs when first laid, green colored, in up (A) and side (B) view and during maturation, turning to a red color (C).
Credit: C. Camarozano, UF/IFAS.

Nymphs

Oebalus pugnax develops through five nymphal stages ("instars") before turning into an adult (Rashid et al. 2005). Nymphs have piercing-sucking mouthparts and a four-segmented pair of antennae (Decoursey and Esselbaugh 1962; Bhavanam et al. 2021). First and second instars have a red-orange color and a circular shape, that starts fading to a light tanned color and elongated shape on the third instar, reaching fourth and fifth instars with a pale tan and more elongated body (Figure 4). The average length and width of a first instar is 1.2 mm (approximately 1/16 in) and 0.8 mm (approximately 1/32 in), respectively. With second to fifth instars ranging from 2.0 mm (approximately 3/32 in) long and 1.3 mm (approximately 1/16 in) wide to 4.7 mm–8.6 mm (approximately 3/16 in–1/3 in) long and 3.0 mm–4.1 mm (approximately 1/8 in–3/16 in) wide (Decoursey and Esselbaugh 1962; Bhavanam et al. 2021). Wing pads develop as the insects grow through the stages, and fifth instar males and females may already be differentiated, as the red male reproductive organs can be seen through the abdominal surface (Nilakhe 1976). The development, growth, and survival of nymphs is dependent on food source and temperature (Rashid et al. 2005; Awuni et al. 2014).

Under field conditions in Louisiana, development time from egg to adult is approximately 21 days, and nymphal survival is approximately 35% (Blackman and Stout 2017). Under laboratory conditions, survival rate is higher than in the field, with 80% of the nymphs developing into adults at

29°C (84.2°F) (Rashid et al. 2005). Even though high temperatures near the optimal 29°C (84.2°F) promote relatively high survival, second and third instars can still develop at minimum temperatures of 12°C (53.6°F) and 14°C (57.2°F), respectively (Rashid et al. 2005).

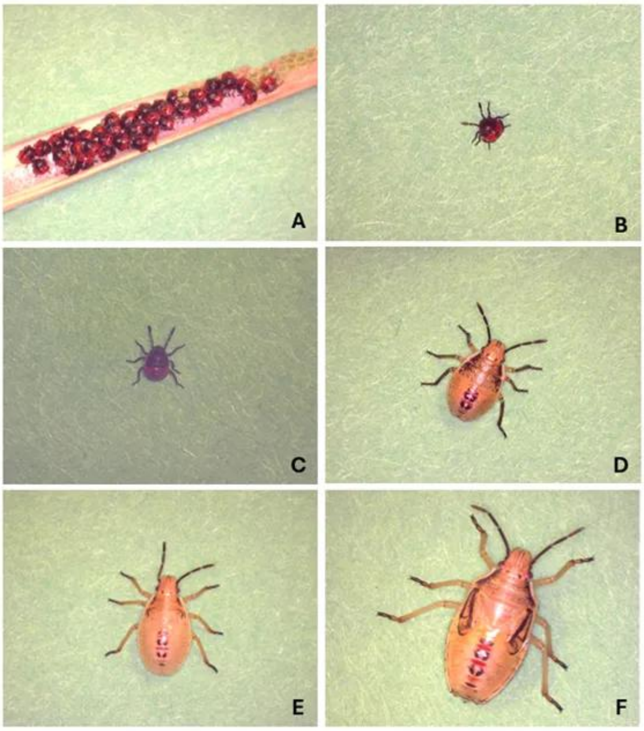

Figure 4. *Oebalus pugnax* hatched egg mass (A), first instar (B), second instar (C), third instar (D), fouth instar (E), and fifth instar (F) nymphs.
Credit: C. Camarozano, UF/IFAS.

Host Plants

Rice is the preferred host for all *O. pugnax* stages, and from early nymphal stages to adult reproductive stages, this insect is likely to abandon weedy host plants to go feed on rice if the crop is found nearby. The insects feed only on kernels developing on rice plants starting at heading stage. In addition to rice, *O. pugnax* is found on a variety of secondary hosts that serve as food, reproductive sites, and shelter. Other crop hosts include wheat (*Triticum aestivum* L.), corn (*Zea mays* L.), millet (*Panicum miliaceum* L.), grain sorghum (*Sorghum bicolor* L.), barley (*Hordeum vulgare* L.), oats (*Avena sativa* L.), and rye (*Secale cereale* L.). Weedy hosts include fall panicum (*Panicum dichotomiflorum* Michx.), vaseygrass (*Paspalum urvillei* Steud.), barnyardgrass (*Echinochloa crus-galli* Beauv.), broadleaf signalgrass (*Urochloa platyphylla* (Munro ex C. Wright) R.D. Webster), crabgrass (*Digitaria* spp.), jungle rice (*Echinochloa colona* L.), browntop millet (*Urochloa ramosa* L.), prairie cupgrass (*Eriochloa contracta* Hitchc.), Italian ryegrass (*Lolium perenne* L.), southwestern cupgrass (*Eriochloa acuminata* J. Presl Kunth), bahiagrass (*Paspalum notatum* Flugge), johnsongrass (*Sorghum halepense* L.), and dallisgrass (*Paspalum dilatatum* Poir.) (Naresh and Smith 1984; Rashid et al. 2005; Cherry and Bennett 2005; Espino and Way 2008; Cherry and Wilson 2011; Awuni et al. 2015a; Bhavanam et al. 2021).

More than providing a favorable environment for the pest, these secondary hosts may contribute to the development of successive generations of *O. pugnax* in the field (Awuni et al. 2015a). When there is no rice or when rice is not at an attractive phenological stage (i.e., vegetative stage before flowering), *O. pugnax* will change feeding sites, moving to areas with more vigorous plant hosts (McPherson and McPherson 2000; Bhavanam et al. 2021).

Economic Importance

The different developmental stages of rice plants vary in their attractiveness to *O. pugnax* and depending on the stage when injury occurs, damage may vary. The reproductive stages of rice include, but are not limited to, the boot and the heading stages, also known as pre-flowering and flowering stages, respectively. The ripening phase comprises the milk, soft dough, hard dough, and grain maturity stages (Awuni et al. 2015b). Although the pest may cause rice injury from flowering to grain maturation, the most susceptible stage for yield losses is bloom and the most vulnerable stages for grain quality decrease are milk and soft dough (Awuni et al. 2015b). Coincidentally, the most vulnerable stages for grain quality losses, milk and soft dough, are the most attractive stages to *O. pugnax* (Espino and Way 2008). Feeding on rice panicles at the milk stage may remove all the rice kernel content, resulting in empty grains, or part of the content, producing atrophied grains, consequently decreasing yield and quality of production. Feeding on panicles between the soft and hard dough stages may cause what is called “pecky rice,” in which kernels develop chalky, discolored areas around the feeding sites, resulting in loss of quality (Patel et al. 2006). This visible damage is a result of the insect’s feeding but also of secondary infections to the plant, as the feeding creates wounds in the plant that may serve as entry to fungal diseases (Hollay 1987). Grain discoloration is a common rice issue in Florida and has been linked to fungal species associated with *Oebalus* spp. feeding activity (Datnoff et al. 1999).

Management

Cultural Practices

The presence of weeds in rice fields and in habitats bordering fields facilitates early movement of rice stink bugs into the crop, as they utilize the weeds as alternate hosts and migrate to rice once it reaches grain filling stages. Thus, weed management is recommended for reducing alternate hosts for *O. pugnax* populations (Bhavanam et al. 2021).

Chemical Control

Rice stink bug infestations are determined by scouting fields with a 15-inch sweep net (entomological net)

(Cherry 2013). The action threshold is comparable in all regions where the rice stink bug infests rice fields, with little variation in the number of insects. In Louisiana and Florida, the threshold is 3 stink bugs per 10 sweeps (net swings) during the first 2 weeks of heading (most vulnerable stage) and 10 stink bugs per 10 sweeps thereafter. In Mississippi and Arkansas, thresholds are 5 stink bugs per 10 sweeps during the first 2 weeks after heading and 10 stink bugs per 10 sweeps thereafter (Bhavanam et al. 2021; Hardke and Mazzanti 2025). This approach ensures that insecticides are applied only when damaging populations are detected in the field and rice is at a susceptible stage. In Florida, some rice producers follow this recommendation whereas others co-apply a fungicide and an insecticide (pyrethroid) before rice heading regardless of stink bug infestation levels (J.M.B. personal observation).

Application of chemical insecticides is the most widely used strategy to manage *O. pugnax* populations in the United States. Insecticides labeled for stink bug control in conventional rice production include pyrethroids and the organophosphate malathion. In the Mid-South, several neonicotinoids, such as clothianidin and dinotefuran, have also been registered for use in rice (Blackman et al. 2015). Thus, aerial applications of two pyrethroids, zeta-cypermethrin or lambda-cyhalothrin, are common for management of stink bugs when populations reach the threshold. In Florida, one to three pyrethroid treatments are typically applied on a rice crop.

Pyrethroid reliance for rice production in the United States has been associated with concerns of insecticide resistance, as recently observed in Texas (Blackman et al. 2015), Arkansas (Bateman et al. 2021), and Mississippi (N.R. Bateman, personal communication). In addition, pyrethroids are broad spectrum insecticides, affecting the target pests but also beneficial insects present in the field (Pazini et al. 2016; Roldán et al. 2020). Therefore, pyrethroids have potential impacts on aquatic wildlife (Werner and Moran 2008) and represent a barrier to the expansion of organic production practices, which do not allow the use of synthetic pesticides.

Biological Control

The parasitic wasp *Telenomus podisi* (Ashmead) (Hymenoptera: Scelionidae) (Figure 5) parasitizes the eggs of many stink bug species, including *Oebalus* spp. The suppression of *O. pugnax* populations by *T. podisi* is usually high, with the parasitoid attacking up to 100% of egg masses naturally occurring in Georgia corn fields (Tillman 2010). Similarly, a recent study showed that the parasitism of *Oebalus* spp. eggs found in Florida rice fields by *T. podisi* reached over 80% (Camarozano 2023), making it a potential agent for a novel augmentative biological control program.

Figure 5. Adult *Telenomus podisi* emerging from a mass of *Oebalus* sp. eggs.
Credit: E. Talamas, FDACS-DPI.

In addition, adult stink bugs are attacked by parasitic flies such as *Beskia aelops*, *Gymnosoma* spp. and *Gymnoclytia* spp. (Diptera: Tachinidae) and can be preyed on by birds, dragonflies, grasshoppers, and frogs (Ingram 1927; Bhavanam et al. 2021).

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