

*These rearing procedures are from Dr. Steve Naranjo ([Steve.Naranjo@ars.usda.gov](mailto:Steve.Naranjo@ars.usda.gov)) who allowed us to put them on our website.*

## Rearing protocol: Orius

**Rearing Conditions:** Approximately 27C and 50% RH with 14L:10D light cycle

**Rearing Containers:** Large Petri (14 cm dia.) dishes with round filter paper in the bottom to absorb excess moisture and fecal material. The small little stays on the underside of the lid are filed down or cut off. These normally help to provide a small amount of ventilation but also allow the small nymphs and sometimes the adults to escape. Add several waded pieces of tissue or KimWipes to provide hiding places in the dish. This will reduce cannibalism. Can also use clean shredded-paper.

**Food Sources:** Lepidopteran eggs are provided as prey. We used pink bollworm eggs for many years but have discontinued that culture. We are now using *Ephestia* eggs from Beneficial Insectary in Redding, CA (**1-530-226-6300 or 1-800-477-3715**). We buy in large quantity and then store in the freezer. The eggs are sprinkled on copy paper painted with a thin layer of egg whites as an adhesive. We are currently exploring soymilk, Egg Beaters, and non-fat dry milk as adhesives. After drying, the sheets can then be cut into small squares (roughly 1.5 in sq.). Best to prepare and use these immediately for *Orius*. They are more sensitive to prey quality. 1-3 squares of eggs are provided at each feeding depending on the number of insects per dish. Two 1.5" sections of green beans are added for supplemental moisture and as an oviposition sites when dishes contain adults. The ends of each green bean section are dipped in paraffin wax to keep them from drying out too quickly. These green bean sections need to remain somewhat turgid long enough for eggs to hatch (ca. 3-7 days). Eggs and green beans should be replenished every 3-4 days. The egg squares are removed and discarded. The green bean sections from adult dishes are saved and used to start a new colony dish.

**Rearing Nymphs:** Start a new colony dish with 3 green bean sections that were exposed to adults for 3-4 days. Mark the date on the lid of the dish. Eggs will begin hatching after 3-4 days from the time they are laid and so it is best to provide at least one egg square and one green bean sections for hatching nymphs immediately. As more nymphs hatch out the number of egg sheets can be increased. Old egg sheets and green bean sections should be brushed with a soft, small paintbrush to dislodge the insects and then removed. Leave the bean section in which adults have oviposited in the dish for at least one week to be sure all eggs hatch. Nymphs will take approximately 7-10 days to develop into adults. To the extent possible, remove dead insects and exuvia from the dish with an aspirator when new food is added.

**Rearing Adults:** Once adults begin to emerge (this will happen over a period of days due to a somewhat mixed age distribution) the normal green bean sections are replaced with those dipped in wax. The bean sections are collected at each feeding interval and added to new colony dishes. At this time it is best to mix the bean sections coming from different adult dishes to maximize interbreeding. The same dish can be used throughout the life cycle. To the extent possible,

remove dead insects from the dish when new food is added. We normally continue to rear adult dishes until all adults are dead. As individual dishes get sparse, adults are aspirated and combined into fewer dishes. In a large Petri dish you can culture about 100 adults. Higher densities lead to excessive cannibalism.

## Rearing protocol: *Geocoris*

**Rearing Conditions:** Approximately 27C and 50% RH with 14L:10D light cycle

**Rearing Containers:** Large Petri (14 cm dia.) dishes with round filter paper in the bottom to absorb excess moisture and fecal material. Add several wadded pieces of tissue or KimWipes to provide hiding places in the dish. This will reduce cannibalism. Can also use clean shredded-paper.

**Food Sources:** Lepidopteran eggs are provided as prey. We used pink bollworm eggs for many years but have discontinued that culture. We are now using *Ephestia* eggs from Beneficial Insectary in Redding, CA (**1-530-226-6300 or 1-800-477-3715**). We buy in large quantity and then store in the freezer. The eggs are sprinkled on copy paper painted with a thin layer of egg whites as an adhesive. We are currently exploring soymilk, Egg Beaters, and non-fat dry milk as adhesives. After drying, the sheets can then be cut into small squares (roughly 1.5 in sq.). 3-5 squares of eggs are provided at each feeding depending on the number of insects per dish. Two 1.5" sections of green beans are added for supplemental moisture. Eggs and green beans should be replenished every 3-4 days. The old egg squares and beans are removed and discarded. One small section of cotton (from cosmetic cotton balls), approximately 1-1.5" in diameter are provided to adult dishes as an oviposition substrate.

**Rearing Nymphs:** Start a new colony dish with 4-5 cotton balls, one green bean section and one egg sheet. Keep an eye on this egg sheet because if the larvae emerge before the predator eggs hatch it can get messy as the larvae will try to feed on the bean. Mark the date on the lid of the dish. Eggs will begin hatching after 4-5 days but leave the cotton ball in for about a week. As more nymphs hatch out the number of egg sheets can be increased. Old egg sheets and green bean sections should be brushed with a soft, small paintbrush to dislodge the insects and then removed. Nymphs will take approximately 7-10 days to develop into adults. To the extent possible, remove dead insects and exuvia from the dish when new food is added with an aspirator. Exuvia in this case can be effectively removed by blowing gently over the open dish.

As the nymphs age to the 3 and 4<sup>th</sup> instar begin to provide 4-6 egg squares and 2 green bean sections.

**Rearing Adults:** As adults begin to emerge (this will happen over a period of days due to a somewhat mixed age distribution) cotton balls are added for oviposition and mark the date on the dish lid. The cotton balls are then collected at each feeding interval to begin new dishes. At this time it is best to mix the cotton balls coming from different adult dishes to maximize interbreeding. The same dish can be used throughout the life cycle. Add 2 bean section, 6-8 egg squares, and two cotton balls at each feeding. To the extent possible, remove dead insects and

exuvia from the dish when new food is added. In a large Petri dish you can culture 75-100 adults. Higher densities lead to excessive cannibalism. Adults dishes are maintains about 3 weeks. After this point adults can be frozen or released outside if appropriate.