Controlling Armyworms in Late Planted Crawfish Forage Crops

Fall armyworm can present a substantial threat to production of a forage crop for crawfish, whether it is rice or sorghum-sudangrass. Large populations of fall armyworms may invade the forage crop for a variety of reasons, the primary one being that their previous host has been harvested. This movement into the crawfish forage crop has typically been observed in areas where corn, grain sorghum or milo or other grass-type plants have been harvested near a rice field. Armyworms are not afraid to march across soil in search of a new plant to devour.

Fall armyworms have a distinct Y-marking on their head capsule which can be used to distinguish them from other species of caterpillars (photo 1). Armyworms damage forage crops by cutting down seedlings or defoliating plants. This damage can be extensive enough to require replanting (photo 2). To scout for armyworm damage, look for cut and ragged leaves and then for the armyworm caterpillars on the plants or in the whorls (photo 3). You can also scout for armyworms using a sweep net to brush across the surface of plants and catch armyworms (photo 4). Another sign is the presence of cattle egrets or other birds foraging in the field (photo 5). These birds will often flock to fields with insect infestations.

Because the crop you are trying to protect will soon be food for crawfish, it is important to avoid applying chemicals to that crop that could potentially kill crawfish. Most synthetic insecticides are highly toxic to crawfish. This is true because crawfish have physiology that is similar to insects. At this time, there are limited options for control of fall armyworm attacking a crawfish forage crop. It is possible that the fall armyworms will
be controlled by natural enemies – such as parasitoid wasps, bacterial infections or diseases. Although, oftentimes the natural controls will not control the population quickly enough to avoid extensive crop damage.

If you are experiencing crop defoliation or plant loss from an armyworm infestation, the first option is the application of *Bacillus thuringiensis* (*Bt* foliar spray). It is important that *Bt* be applied to young caterpillars. First and second instar caterpillars are most susceptible to *Bt* (photo 6). A second option for rice is to flood the field for two to three days to drive armyworms up onto plants where they will be more susceptible to attack by predators such as birds. The flooding may also drown the armyworms. Be sure to avoid completely submerging plants which may cause plant mortality from the flooding. Flooding in young sorghum-sudangrass is not an option in most cases because fields cannot be flooded and drained quick enough to prevent crop failure or set back from water-logged soils. Finally, try to avoid planting a forage crop near a host field (milo, sorghum, etc.) that will be harvested soon.

So is insecticide use for control of armyworms a potential option? Crawfish in capped or sealed burrows are probably not exposed to insecticides used in foliar applications for control of fall armyworms but the potential impact of residues on crawfish health is not known. The insecticides Karate Z, Mustang Max, Prolex and Proaxis, labeled for use in controlling fall army worms in rice, have label restrictions that state “Do not use treated rice fields for the aquaculture of edible fish and crustaceans.” Other insecticides used to control fall armyworms in pasture and forage crops, including sorghum-sudangrass, include Sevin, Lannate and Tracer. Although the labels for these chemicals do not specifically state that the fields cannot be used for the aquaculture of edible fish and crustaceans, most have specific warnings as to their toxicity to aquatic invertebrates, which, of course, includes crawfish. Contact your local county agent if fall armyworms attack your crawfish forage crop. They can provide you with the latest information and best course of action for fall armyworm control.

Contributed by Dr. Natalie Hummel, Assistant Professor and Extension Rice Entomologist (nhummel@agcenter.lsu.edu; office: 225-578-7386) and Dr. Jack Baldwin (jbaldwin@agcenter.lsu.edu; office: 225-578-2369), Professor and Extension Entomologist, LSU AgCenter, Department of Entomology, Baton Rouge, LA 70803-4505.

**Crawfish Predators... Some Get Our Attention, Others Deserve More Attention**

It’s easy to notice the negative impacts of predators like birds and raccoons in crawfish ponds, but in many crawfish farms tremendous losses to other types of predators often go unnoticed. Trash fish like bullhead catfish (photo 7, also called mudcats or polliwogs) carp and green sunfish (photo 8, green perch, slick perch) find their way into many ponds. Some crawfish producers view fish in their ponds simply as a nuisance when harvesting, but it has been estimated that a single two-inch long green sunfish could consume the equivalent of a whole sack of crawfish over its lifetime if it began eating newly hatched crawfish shortly after fall flood-up.
Of course, trash fish are more common in ponds that are filled with surface water from canals and bayous, but they can become a serious problem even in ponds that are filled with well water. There is probably some truth to the common belief that birds can introduce fish into crawfish ponds on their feet or feathers, but the numbers are usually negligible. A more common path of entry for trash fish involves backflow of water up drains and into ponds when ditches and canals are filled from heavy rains or tropical storms. Many farmers may not realize how often this can occur. Larger fish also have a tendency to swim against a current all the way up a drain pipe. Producers can minimize the entry of fish through drain structures by installing grating over drain openings, but provisions should be made to remove the grating when needed to prevent clogging with vegetation or other debris.

Efforts to reduce, prevent or eliminate fish populations in crawfish ponds should focus on two key strategies. The first applies to ponds filled with surface water and it’s one thing we’ve all learned over the years: thoroughly screening (filtering) and breaking up the water as it’s pumped into the pond is critical (photo 9). The second strategy can be just as critical: drying or treating any standing water where fish (or their eggs and larvae) might be able to survive over the summer to repopulate in the fall. Examples include low spots within ponds (such as ditches along the interior of the perimeter...
levees), drainage ditches and canals around pond levees, and drain structures and pipes that remain filled with water.

If standing water cannot be dried out due to weather conditions or pond and drain designs, several options are available to eliminate any fish that may be present. The compounds registered as fish toxicants by the United States Environmental Protection Agency (EPA) include Rotenone, Calcium Hypochlorite, Sodium Hypochlorite and Antimycin-A. Rotenone and Antimycin-A are restricted use pesticides and their application requires an applicator’s license. In contrast, Calcium- and Sodium Hypochlorite are widely available. Calcium Hypochlorite is commonly used as a source of chlorine for swimming pools and Sodium Hypochlorite is found in household bleach. Not all of these products are registered specifically for use as fish toxicants, by any means, but some examples of such products that are registered include HTH granules and tablets, Tru shock tablets and many brands of bleach. A complete list of registered fish toxicants can be found on the internet at http://aquanic.org and search for “registered fish toxicants.” Click on Guide to Drug, Vaccine and Pesticide Use.

Always wear the proper protective clothing and safety equipment (gloves, safety glasses, etc.) when treating water with fish toxicants. Since chlorine content will vary from one product to the next, start out with a small dose and try to confirm the death of any fish that may be present. Then bump up the dose if needed.

Working Wetlands and Waterbirds

Working wetlands are impoundments used to farm rice, crawfish and finfish. In Louisiana, there is very little finfish farming so the bulk of the working wetlands involve rice and crawfish with crawfish most often being farmed in a rotation with rice and other crops. Over half a million acres of rice is cultivated in the state with around 175,000 acres devoted to crawfish. The crops complement each other as rice is a grown in spring, summer and early fall and crawfish are grown from late fall, winter and spring.

Louisiana’s working wetlands provide shallow water and moist soil habitat for about 100 waterbird species including pelicans, cormorants, anhingas, grebes, waterfowl, wading birds, marsh birds, shorebirds, gulls, terns and kingfishers. Farmers have focused on waterfowl as sources of income from hunting leases and family recreation for many years. Since the advent of the modern crawfish farming industry, they have also focused concern on damage done to crawfish crops directly through predation of crawfish by wading birds and indirectly through removal of crawfish forage vegetation by waterfowl, especially geese and coots.

Conservationists have watched with delight the growing numbers of waterbirds using working wetlands over the past half century. This has been directly associated with the addition of crawfish to the landscape. As a result, there is shallow water and moist soil habitat every month of the year and high quality animal prey has become widely available to carnivorous and omnivorous bird species. That high quality animal prey includes the crawfish crop which generates conflict between farmers and conservationists about crop damage. The loss of over 1.5 million acres of adjacent coastal wetlands during that period makes the working wetlands even more important as waterbird habitat.

Birding is a very important outdoor sport in North America. Waterbirds using our working wetlands are recorded by birders across the continent. Spring is an important time for birders because so many species migrate northward from southern climes to either stay and
breed in our region or stop and “refuel” before moving northward to breeding grounds. So, too, is fall when the adult and young birds return and stop before flying onward to wintering grounds.

Birders with their binoculars and spotting scopes are becoming more and more visible enjoying their sport in our working wetland landscape. Most respect private property and birds from public right of way or ask permission to use headlands to get closer to concentrations of birds. As with hunters and fishermen, there are always “bad actors” who trespass without permission or block roadways. Birders, however, rarely, if ever, litter when birding.

**Fall – A Critical Time for Waterbirds**

Fall is an especially critical time for all waterbirds in our working wetland landscape because it is so dry that there is little natural moist soil and shallow water habitat for resident, migratory and incoming wintering birds. That is why water associated with working wetlands is so important to waterbird conservation. There is precious little of this habitat because rainfall is minimal and cost of pumping water onto fields is very high. Shorebirds begin to arrive in Louisiana in mid-July following breeding in northern nesting grounds. Adults arrive first and are followed by their offspring. Most of these 30-40 species are considered to be of conservation concern. Various waterfowl, especially teal, pintail and shoveler begin to arrive in late August.

**Do Waterbirds Cause Measureable Damage to Crawfish Crops?**

Frankly, we do not know because the research needed to determine conclusively what impact waterbirds have on crawfish production has not been conducted. However, farmers who see hundreds of ibis feeding on crawfish in their ponds and similar numbers of coots and/or geese destroying the stubble in their fields are legitimately concerned about the issue. A discussion of the topic follows.

**Direct Predation of Waterbirds on Crawfish.** Mature crawfish reproduce in burrows primarily in the warm summer and early fall months. They emerge with young in the fall when fields/ponds are flooded and are harvested from late fall into early summer.

**Times when direct predation is perceived to be a problem are as follows:**

- **Mid-Fall into Winter.** Small crawfish reach two to three inches in size and large numbers of wading birds, especially great egrets, snowy egrets, dark ibises and white ibis (photo 10) feed heavily in impoundments. These crawfish are the current season’s crop.
- **Winter and Early Spring.** Gulls and terns will often feed heavily on crawfish molting near the surface on vertical vegetation in deeper waters that are not accessible to wading birds. These crawfish are the crop for the current season.
- **Winter into Mid-Spring.** Cormorants, pelicans and coots can feed heavily on crawfish in deeper waters not accessible to wading birds. These crawfish are the current season’s crop.
- **Mid- to Late Spring.** Yellow-crowned night-herons (photo 11) feed heavily on the periphery and take crawfish from traps in deep water. These crawfish are both the current season’s crop and the next season’s brood stock.
- **Spring and Summer** when ponds are being drained. All wading bird species assemble in large numbers to feed on stranded prey including crawfish. Depending on production strategy these crawfish may or may not serve as brood stock for the coming season.
- **Mid-late Spring and Summer** when new ponds are being stocked. Wading birds may concentrate in large numbers, especially if water quality deteriorates and crawfish are clinging to vegetation near the surface, or are in shallow water near the perimeter levee, to gain access to atmospheric oxygen. These crawfish are the brood stock for the coming season.
- **Any time that a pond loses water during production season and becomes very shallow, especially when vegetation is sparse.** This can be the result of a levee break or evaporation. All wading birds assemble in...
large numbers to feed on the crawfish and other prey present. Computer simulations, based on food energy requirements of wading birds and observed bird densities in such systems, suggest that the crawfish crop could potentially be severely impacted within three days with water losses and exposure of the crawfish to avian predators.

**Competition of Waterbirds with Crawfish for Food and Loss of Substrate.** Waterfowl and coots feed on seeds, plant corms and roots and, to some extent, invertebrates including small crustaceans, insects and snails – all that are known to be important crawfish foods. These waterbirds can dislodge standing vegetation, often eating parts of it. Standing vegetation provides crawfish protective cover from predators, access to the water surface and atmospheric oxygen during periods of low dissolved oxygen, as well as providing additional surface area for the crawfish which effectively reduces the density of crawfish per unit area – an important consideration in ensuring maximum crawfish growth rates.

This competition for food resources and loss of standing vegetation has, at present, an unknown impact on crawfish harvest in commercial ponds. However, by quantifying bird utilization of specific crawfish fields, one should be able to determine the amount of vegetation they remove that might otherwise be a food resource for crawfish. Experimental studies some years ago at the University of Louisiana Lafayette Crawfish Research Center and the LSU AgCenter showed that crawfish growth is reduced in the absence of standing vegetation and the presence of standing vegetation (cultivated rice) increased potential crawfish production by a factor of approximately three.

**Interference with Harvesting of Crawfish.** Crawfish traps extend vertically from pond bottoms to and through the water surface. This facilitates access to the traps by harvesters and provides trapped crawfish with access to atmospheric oxygen during periods of low dissolved oxygen. Traps typically have open tops with retention collars. Open tops permit easy removal of crawfish and baiting. Rods, either attached or placed in the impoundment substrate, are used to reduce trap dislodgement by wave/wind action or animals, especially birds.

During cold and cool weather, cut fish is the bait of choice in crawfish traps. Great Blue Herons and Double-crested Cormorants are notorious for stealing this bait from traps. Roughly one-quarter pound of bait is lost [$0.08-0.10 per bait] and crawfish cease to enter traps because the bait is no longer present.

While all predaceous waterbirds can be expected to catch crawfish on outer trap surfaces and from the inside of traps, the Yellow-crowned night-heron is especially notorious for removing crawfish from inside of traps from mid-late spring. This action often dislodges traps as well or destabilizes the traps. An added problem is death of herons that fall into traps while removing crawfish. These birds invariably die because they become trapped long before the harvesters return to tend traps. Because the birds are protected by state and national statutes, the harvesters could potentially be cited for illegal take of the birds with serious legal ramifications.

**Waterbird Control Methods**

To the best of our knowledge, no permits for lethal harassment of any waterbird have ever been awarded to concerned crawfish farmers. Geese, ducks and coots may be legally hunted during waterfowl hunting seasons during the day. However, if impoundments are especially attractive to them as feeding sites, geese and ducks change their behavior patterns and forage in the ponds at night. Once the hunting season ends, they return to foraging in the impoundments during the day. Various recommendations for dealing with waterbirds perceived to be predators and/or competitors in crawfish impoundment areas follows.

- **Non-lethal Harassment** – Propane cannons and similar noise making devices are ineffective because the birds quickly become acclimated to the sounds when they realize that nothing will happen to them. Shotgun and rifle fire used around birds will drive them away from crawfish ponds but the birds usually return when no one is present. Birds will leave an area that is patrolled by foot, horse, all-terrain vehicle, etc. This effort is most effective when non-lethal firearm discharge is used. However, it is labor intensive and, therefore expensive, especially in large crawfish production units involving multiple owners and hundreds of acres. There is always a safety concern when rifles are used as stray bullets could harm humans, pets and livestock at some distance from the point of discharge.

- **Increase Water Depth** – Increasing water depth can reduce wading bird pressure within an impoundment. However, diving birds including waterfowl and cormorants and those birds that take prey from the surface or near the surface are not deterred from feeding in deeper waters.

- **Increase Vegetation Density** – All birds have greater difficulty in foraging in heavy vegetation.

- **Improve Trap Support Rods and Close Trap Tops** – Birds dislodge traps constructed with support rods. Support rods can be lengthened. Alternatively, permanent support rods can be placed into impoundments. However, if not removed at the conclusion of a production season, permanent support rods can damage equipment and be safety hazards. Some farmers are now using flaps to cover open tops...
of traps. This prevents birds from removing bait and crawfish from traps. But, such covers create operational problems.

**Can Waterbird Predation Benefit Crawfish Production?**

It is well known that crawfish growth is directly proportional to their population density. As discussed in other Crawfish News newsletters, crawfish density simply cannot be easily controlled because the recruitment of young crawfish is directly related to the survival, reproductive success and emergence of brood crawfish in burrows. Crawfish do not emerge from burrows at one time. As a result, there are multiple age classes of young crawfish with numbers dependent on survival and reproductive rates of brood crawfish. This can become a serious problem after several seasons in permanent crawfish ponds where, once stocked initially with brood crawfish, un-harvested crawfish serve as brood stock for the following season when ponds are drained. The numbers of surviving adult crawfish can reach levels that high densities of young crawfish result in smaller, less valuable crawfish. Farmers who rotate crawfish and rice through among various fields several seasons usually produce low densities of large, valuable crawfish.

An argument can then be made that heavy waterbird predation in a high density crawfish system will reduce crawfish densities and enhance production of large, more valuable crawfish. Countering this argument, however, is the results of several experimental studies where crawfish populations were intentionally thinned during the production season, but little or no compensatory growth of the remaining crawfish was observed.

Another contrary argument could be made that many waterbirds consume insects and fishes which are found in crawfish ponds, and many of these insects and fishes consume numerous small crawfish. Thus, if birds eat other organisms that prey on juvenile crawfish, this could increase crawfish survival and potentially increase crawfish production, assuming the pond is not overpopulated with crawfish to begin with. However, this also has not been studied.

**Can Farmers and Conservationists Find Common Ground?**

Crawfish impoundments within the working wetland landscape provide significant waterbird habitat in Louisiana and are especially important because shallow water/moist soil habitat is present year round. Over the past two years efforts have been made by the rice and crawfish industries in collaboration with the conservation community and the United States Department of Agriculture’s Natural Resources Conservation Service (USDA-NRCS) to secure conservation program funding to support working wetlands as waterbird habitat. Recently, funds have been made available for “early” fall flooding of working wetlands for waterbird habitat in hopes that birds will use inland habitat rather than put themselves at risk to oiling as a consequence of the BP oil spill catastrophe. This is certainly a positive development. That representatives of the Audubon Society consider the crawfish aquaculture “landscape” to represent a potential “Important Bird Area” is an equally positive development. Furthermore, the inaugural Yellow Rails and Rice Festival in November 2009 in Jefferson Davis Parish represents a partnership between the conservation and farming communities to focus the ecotourism potential of our working wetlands.

Crawfish farming can be risky. Crop failure in individual production units (ponds/fields) is not an uncommon problem and many farmers counter this problem by spreading their farming operation over multiple fields. Conservationists should realize, however, that all fields, regardless of income derived from crawfish, provide wonderful habitat for all waterbird species.

Managed Excess Water From Tropical Storms and Hurricanes

Should we receive heavy rainfall associated with tropical storms, depressions, or hurricanes prior to the recommended fall flooding dates of mid- to late-September or October it may be tempting for you as a producer to hold this water to reduce pumping costs and to “save” early emerging crawfish. Heavy rains will likely cause some, but not all, brood females to emerge from burrows. Holding storm water in mid- to late-August or early September to save early emerging crawfish is not a good idea. Losing some crawfish that emerge early will not hurt your crawfish crop as much as holding deep storm water in your ponds/fields when water temperatures are in the high 80s or 90s. If your drainage ditches are full this may prevent you from getting rid of excess water in your ponds quickly, but drain or pump most or all of the storm water from your fields as soon as possible. Cut-over rice fields can benefit by holding a few inches of storm water for a few weeks to get a head start on decomposing the rice straw, but drain that oxygen deficient water from the field before the permanent deep flood for crawfish.
Additional information on crawfish aquaculture is available on the LSU AgCenter Web site at www.lsuagcenter.com/en/crops_livestock/aquaculture/crawfish

To receive the online full-color version of “Crawfish News” send an e-mail to rdjohnson@agcenter.lsu.edu with “SUBSCRIBE CRAWFISH NEWS” in the subject line. There is no need to re-subscribe to the online version if you already receive it. To be removed from the electronic mailing list, write “UNSUBSCRIBE CRAWFISH NEWS” in the subject line.

Contributors to this Newsletter

Richard Johnson, Regional Aquaculture Agent
Southwest Louisiana / Rice Research Station
E-mail: rdjohnson@agcenter.lsu.edu

Dr. Greg Lutz, Professor
Aquaculture Research Station
E-mail: glutz@agcenter.lsu.edu

Dr. Ray McClain, Professor
Rice Research Station
E-mail: rmclain@agcenter.lsu.edu

Dr. Robert Romaire, Professor
Aquaculture Research Station
E-mail: rromaire@agcenter.lsu.edu

Mark Shirley, Area Specialist (Aquaculture & Coastal Resources)
Vermilion Parish Extension Office
E-mail: mshirley@agcenter.lsu.edu

Industry News

Crawfish Legislation

Two bills of interest to the crawfish industry were passed and signed into law by the governor in the 2010 regular session.

Act 495, (Senate Bill No. 148 by Senators Thompson, Long, Nevers, Riser, Smith and Walsworth), which became effective date June 24, 2010 amended R.S. 3:556.3 and 556.4 relative to the Louisiana Crawfish Promotion and Research Board to give the board more autonomy. R.S. 3:556.3 reduced the membership of the board from 14 members to 13 members by abolishing the ex-officio position held by the commissioner of agriculture and forestry. R.S. 3:556.4 was amended to authorize the board to hire and supervise its own personnel, including a director and an assistant director.

Act 585 (House Bill No. 555 by Representative R. Jones) which becomes effective on August 15, 2010 provides for more severe criminal penalties for theft of crawfish depending on the value of the crawfish that is stolen. If less than $500 worth of crawfish is stolen then the penalty may be up to a $500 fine, or 6 months in the parish jail, or both. If $500 worth of crawfish but less than $1,500 worth is taken then the penalty may be up to a $2000 fine, or 5 years in either the parish jail or state prison, or both a fine and imprisonment. If $1,500 or more of crawfish is stolen or the person is being convicted for the second or more times of stealing crawfish, then the penalty may be up to a $3,000 fine, or 10 years in either the parish jail, or state prison, or both a fine and imprisonment.

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Summer newsletter, we will have four-page newsletters in September and November. If there is topic you would like us to address in an upcoming or future crawfish newsletter, do not hesitate to let one of us know (either Robert, Greg, Richard, Mark or Ray).