Biology, Ecology, and Physiology of the Non-Indigenous Asian Green Mussel, *Perna viridis* (Mytilidae), in the Southeastern United States

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The first report of *Perna viridis* in North America came from Tampa Bay in 1999, when specimens were found clogging the intake pipes of a power plant. Since that time the mussels have spread south along the west coast of Florida and established new populations along the northeast coast of Florida and into Georgia. *Perna viridis* reaches high densities and large size in a short period of time while out-competing native fouling organisms on most artificial substrates. Tolerance studies have demonstrated the ability of *P. viridis* to withstand almost the full range of Florida's coastal habitats with regard to temperature and salinity. Additionally, native *Crassostrea virginica* reefs seem to be negatively affected by *P. viridis* settlement. The mussel's high ammonia output may provide enough nutrients to Tampa Bay waters in such a way that phytoplankton communities may experience no net loss from the increased grazing. High densities combined with high clearance rates may lead to an increase in benthic sediment around artificial substrate. Pilings, buoys, bridges, piers, jetties, and bottom debris appear to first recruit *P. viridis* to an area. Evidence of recreational harvest in some areas has been noted.

Special Session – Coastal Molluscan Assemblages as Environmental Indicators and Monitors of Restoration Efficiency

The Slug *Veronicella sloanei* (Cuvier, 1817) — an Important Pest in the Caribbean

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Veronicella sloanei (Cuvier, 1817) is believed to be native to Jamaica, but has spread to a number of the Greater and Lesser Antilles, as well as Bermuda. We have documented its presence in Grand Cayman, the Dominican Republic, Barbados, Dominica, and St. Lucia, and it has been introduced recently into St. Vincent. It is the largest of the veronicellid slug species found in the eastern Caribbean, reaching an extended length of 12 cm. The colour of the notum is highly variable and can be a pale cream, brown, or grey with varying degrees of mottling. *Veronicella sloanei* is an aggressive, phytophagous, opportunistic pest and will attack a wide range of horticultural and agricultural crops including varieties of *Hibiscus*, *Bougainvillea,* leafy vegetable crops such as cabbage, spinach and lettuce, papaya, citrus, bean (*Phaseolus*), and peanut. In addition to leaf damage, this slug can "debark" sections of stem of plants such as *Datura* and gardenia, and will attack the corms and cormels of tannia, dasheen, banana, and plantain. Control methods used in the islands include the use of table salt, tobacco dust, Vydate®, methaldehyde powder, and Sluggit® in liquid or pellet form.

Special Session – Snails and Slugs as Agricultural and Horticultural Pests

A Cladistic Reevaluation of the *Strombina* Group (Buccinoidea: Columbellidae) Jung, 1989

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The *Strombina* group has been used as a model system to document patterns of geographic and temporal changes in species composition, evolution at species level, and adaptive trends related to the closure of the Panamanian gateway. They were also used to evaluate the contribution that factors such as environmental conditions versus predation may have in shaping life histories. Part of the gastropod family Columbellidae, the *Strombina* group has more than 100 fossil and living species classified in five genera (*Strombina*, *Cotonopsis*, *Clavistrombina*, *Sincola*, *Bifurcium*) proposed in 1989 by P. Jung after an extensive revision. Nevertheless, the group never received a formal taxonomic assignment and the relations of these genera to other columbellids and to each other is poorly known. Cladistic analyses based on 69 (205 states) characters, including shell and radular morphology, as well as gross anatomy of the alimentary and reproductive tracts, were used to reconstruct the phylogenetic relationships of these taxa and evaluate their monophyly. Thirty-six most parsimonious trees were obtained and the majority consensus tree supports the monophyly of the whole *Strombina* group. Of the five taxa analyzed, only *Strombina* does not keep its traditional constituency and results paraphylectic. The results seem to agree with some patterns of evolution seen in tropical mollusks such as the heightened extinction rates in the Caribbean during the closure of the Panamanian seaway followed by a pulse of origination in the eastern Pacific.

Symposium – Relationships of the Neogastropoda

Bradybaena similaris (Rang, 1831): A Potentially Serious Pest for *Citrus* Crops

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The Asian tramp snail, *Bradybaena similaris* (Rang, 1831), originated probably in eastern Asia, but has spread throughout the tropics and subtropics worldwide. In the United States, it is established in the Hawaiian Islands, Puerto Rico, and several southern states, including Florida, Mississippi, Alabama, Louisiana, and Texas. Although it has long been known as a pest of coffee, it is also reported as a serious pest of grape (*Vitis*) and a wide variety of tropical fruits, especially longan (*Dimocarpus longan*) and mango (*Mangifera indica*) in Taiwan, as well as *Citrus* in Louisiana. In Puerto Rico, the Asian tramp snail is now reported as causing feeding damage to three economically important citrus crops, *Citrus medica*, *C. paradise,* and *C. sinensis*. Further research is required to determine whether this snail represents a potentially serious threat to the citrus industry in the United States.

Special Session – Snails and Slugs as Agricultural and Horticultural Pests

Distribution and Control of the Giant African Snail (*Achatina fulica*) in Barbados

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The giant African snail *Achatina fulica* Bowdich (Pulmonata: Achatinidae) was first found in Barbados in September 2000, near the Bridgetown Port. To date it has only been recorded feeding on wild plants of no economic importance. It has spread to four of the 11 parishes of the island and attempts to control it focus mainly on the use of the molluscide metaldehyde. Successes and problems encountered with its control, a public awareness campaign for this pest, and its potential threat to the agricultural and public health sectors are discussed.

Special Session – Snails and Slugs as Agricultural and Horticultural Pests

Biogeographic Distribution of Developmental Types in Opisthobranch Mollusks Across the Isthmus of Panama

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The developmental pattern of invertebrates is a significant component of life history, influencing population distribution, recruitment, genetic variation, and extinction. Existing data suggest that in opisthobranch gastropods, planktonic development dominates in the eastern Pacific and aplanktonic development dominates in the western Atlantic. This dichotomy could result from differing environmental parameters, phylogenetic relationships, or sampling bias. This hypothesis was tested through collections of five major groups of opisthobranchs from the Pacific and Atlantic coasts of Panama. Specimens and their egg masses deposited in the field laboratory provided data for determining developmental mode and comparing proportions of developmental types between Atlantic and Pacific faunas. Of the 67 species that spawned in the laboratory, all 39 Pacific species (100%) and 23 of 28 (82%) Atlantic species released planktonic larvae in the laboratory or were inferred as such using other factors. Mean egg size was larger for Atlantic than Pacific species. Analysis of developmental types indicates that even though the Panamanian opisthobranch fauna was predominately planktonic on both coasts, there was a significant relationship between ocean and developmental type. The occurrence of both larger eggs and aplanktonic development in the Atlantic supports the dichotomous theory of development for opisthobranchs of Panama. The occurrence of aplanktonic development on the Atlantic coast could be related to substratum and low primary productivity. The Pacific coast of Panama experiences higher primary productivity levels, and presumably can more reliably support planktonic larval feeding.

Contributed Session I – Marine Gastropods

Mollusk Shells as Habitat for Anthozoans and Hermit Crabs in the Colombian Caribbean and Pacific Continental Shelves and Slopes

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Some mollusk species worldwide are known as habitats for several invertebrate species, such as sea anemones, stony corals, sipunculans, and hermit crabs. Most of these associations have been described from shallow water environments. However, in extensive continental shelf and slope sedimentary plains these associations are not well documented. During an extensive biodiversity survey carried out by INVEMAR in both Pacific and Caribbean Colombian continental shelves and slopes (20–500 m depth) several associations of mollusks + sea anemones, mollusks + stony corals, and hermit crabs + empty mollusk shells + sea anemones were documented. In the Pacific, more than 90% of the live-collected specimens of *Nassarius miser* alive were associated with the sea anemone *Hormathia* sp. The muricid *Pteropurpura centrifuga* was associated with the transisthmian azooxanthellate scleractinian *Tetocytahus prahli*. It is noteworthy that *T. prahli* specimens found in the Caribbean were associated with another muricid species, *Siratus beauii*. Additionally, the gastropod *Polystira* sp. was found associated with the azooxanthellate scleractinian *Heterocyathus* sp.; this coral genus was previously recorded only from the Western Pacific. While in the Pacific most of the mollusk-sea anemone individual associations were collected alive, in the Caribbean the sea anemone *Monactis vestita* was found attached to empty shells of gastropods and scaphopods; these in turn were often inhabited by hermit crabs of the genus *Pagurus*. These results are new evidence of interesting ecological relationships displayed by mollusks, which represent a hard microhabitat that makes possible the presence of some species of azooxanthellate corals, sea anemones, and hermit crabs on soft bottoms of the shelf and upper slope.

Poster Session

Mollusks Associated with Deep-Water Coral Habitats in the Southern Caribbean Sea: Preliminary Observations

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During marine biodiversity surveys carried out by INVEMAR between 1998 and 2002 in the Colombian continental shelf and margin, three azooxanthellate coral banks were discovered. The corals *Madracis myriaster* and *Cladocora debilis* were the main builders of the bank matrix. These formations were located off La Guajira (70 m depth), off Santa Marta (200 m) and off San Bernardo Islands (150 m). The sampled fauna was composed mainly of hard bottom dwellers; the main groups found were anthozoans, mollusks, echinoderms, sponges, and other sessile invertebrates. Mollusca was the richest group (125 species), followed by echinoderms (75 species), crustaceans (68 species), cnidarians (62 species), and fishes (47 species). Among the mollusks collected, 85 species were gastropods, 35 bivalves, three cephalopods, and two scaphopods. La Guajira was the most mollusk-rich coral bank formation with 85 species; *Arca zebra, Chlamys munda*, *Pecten chazaliei*, *Diodora cayennensis, Vermicularia spirata,* and *Petaloconchus erectus* were the most abundant species in that bank. At Santa Marta, 13 species were found; *Coralliophila squamosa, C. caribaea, Babelomurex dalli, Pseudosimnia vanhyningi, Sthenorytis pernobilis,* and *Limaria* sp. were typical dwellers of those coralline and other hard substrates. At San Bernardo, 35 species were found; including *Calliostoma* sp.*, Eudolium crosseanum, C. caribaea, Barbatia candida*, but in low abundances. There is published evidence of the ecological interactions between some of the collected mollusks and zooxanthellate coral colonies. Nevertheless, associations among mollusks and azooxanthellate corals in the southern Caribbean were not previously reported and they are far from being understood; future studies will provide new knowledge about the ecology of these particular ecosystems.

Poster Session

Measuring and Modeling Seston Uptake by Restored Oyster Reefs

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A typical goal of oyster restoration projects is to enhance water quality because of increased water filtration rates by the oysters. However, the literature on the topic indicates that this is not always the case. There is a need to develop practical methods for predicting the impacts of restored molluscan shellfish populations on water quality. We developed a simplified, spreadsheet-based model to predict the percent of the total water column cleared of seston by suspension-feeding bivalve mollusks:

$$\% \text{ Water Clearance} = (A \times B \times C)/(D \times E) \times 100$$

where A = mean bivalve density (# ind/m^2), B = mean individual clearance rate (m^3/individual/hr), C = bottom area of reef (m^2), D = cross-sectional area of water column (m^2), and E = mean water flow speed (m/hr). The variables typically can be easily measured (or estimated), except mean clearance rate, which is based on literature values. The major simplifying assumption is a completely mixed water column. Field tests over oyster reefs, mussel reefs, and hard clam aquaculture beds thus far indicate reasonably good agreement with model predictions when the major assumptions are met.

Special Session – Coastal Molluscan Assemblages as Environmental Indicators and Monitors of Restoration Efficiency

Slugs as Pests of Agricultural Crops

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Slugs are known to cause severe injury to field crops on many continents, including Europe, Australia, and North and South America. The problem is an increasing concern when conservation tillage practices, those that leave previous crop residue on the soil surface, are used. Slugs have become a major impediment to the continued adoption and acceptance of these practices in the United States, most notably in the eastern Corn Belt and eastern states. The major slug species damaging to field crops is *Deroceras reticulatum*, more commonly known as the gray garden slug. This slug can cause significant injury to most crops, including corn, soybean, legume and grass forages, and cotton. *Deroceras reticulatum* usually has a single generation per year, with newly hatched juveniles causing injury in the spring, and full-grown adults more damaging in late summer or fall plantings. Management for slugs includes sampling for the presence of adult slugs in the fall and eggs in the spring, and taking preventive measures involving various cultural tactics. When injury becomes severe, the grower must take curative action, which usually is the application of molluscicide bait. Most bait currently in use in the United States contains metaldehyde. Future tactics being examined include the use of pathogenic nematodes and alternative baits.

Special Session – Snails and Slugs as Agricultural and Horticultural Pests

Origin and Early Evolutionary History of the Neogastropoda: Evidence from Nuclear and Mitochondrial DNA Sequences

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The Neogastropoda comprise a diverse and extremely successful group of predatory marine gastropods that appear abruptly in the fossil record during the Albian (100 mya) with nearly all of families present in essentially modern form by the end of the Cretaceous. While neogastropods are easily recognized by their distinctive shell morphology, radular morphology, and anatomical features, their relationships to other gastropods are poorly understood. Hypotheses of origins have included "archeogastropod" or lower caenogastropod ancestors, and enigmatic fossil groups such as the Subulinidae. Other authors have proposed various higher caenogastropod groups including Littorinimorpha, Cypraeoidea, Tonnoidea, and Ficoidea as sister taxa. Relationships among the many lineages within Neogastropoda have also been difficult to discern because of high rates of homoplasy and high incidence of highly derived, autapomorphic features. It has been speculated that Neogastropoda have arisen by polyploidy, as they have twice the chromosomes and twice the DNA per cell of most caenogastropods. Thus, it may be possible that the homoplasies that have confounded resolution of phylogenetic relationships are the products of differences in expression of paralogous or orthologous nuclear genes. Phylogenies based on DNA sequences from nuclear as well as mitochondrial genes are compared, and the various genes and genomes evaluated for their utility in resolving the origin and early evolutionary history of the Neogastropoda.

Symposium – Relationships of the Neogastropoda

Exotic Mollusks Intercepted or Established in California and Their Impact Upon California Agriculture

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Intercepted and introduced exotic mollusks in the state of California are briefly discussed. These include both terrestrial and freshwater genera. The economic and environmental issues for some species are mentioned. The most economically significant, established species is the brown garden snail, *Cryptomphalus aspersa*. Molluscicide usages for production of citrus and in the nursery industries are given. State and local governmental programs for detection and identification of introductions are briefly discussed.

Special Session – Snails and Slugs as Agricultural and Horticultural Pests

2003 Follow-Up of a 2002 Unionid Translocation, Mississippi River Mile 818.9, Cottage Grove, Minnesota

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In May 2003 we conducted the follow-up of a 2002 unionid translocation. The 52258 m^2 project area extended from the Left Descending Bank to the Mississippi River main channel. The translocation, done prior to burial of a wastewater pipe, yielded a density of 0.38/m^2 (23 living species, 19630 unionids); 7.33% represented two Minnesota endangered and five Minnesota threatened species. In 2003, 609 live unionids (18 species) were recovered; 515 were numbered or hash-marked; 53.9% were Minnesota endangered species (most measured and aged). Of 232 individuals of *Quadrula nodulata,* 98.3% survived; 98.7% of *Arcidens confragosus* survived. One each of *Tritogonia verrucosa, Obovaria olivaria*, and *Ligumia recta* were recovered alive. The survival of all Minnesota special status unionids was 98.36%, most of which were recovered from an area <1 meter deep. Most numbers on T & E unionids were legible. A total of 12.6% of the numbered unionids had disturbance rings, as evidenced by uneven periodicity of rest rings; 3% of the numbered unionids showed little or no growth. Five additional species were represented by sub-fossil shells. The substratum was mostly mud with woody debris. Immediately upstream of Site 1, the substratum became sandy; no numbered unionids moved into that area. Slightly more *Dreissena* were found in 2003, with one to several on a unionid. Three PVC pipes marking the area remained in place in 2003; therefore construction impacts were unlikely to have extended past the project area. Translocation was successful with 97.2% survival of all marked unionids after one year, in both deep and shallow habitats.

Contributed Session IV – Freshwater Mollusks

Morphological Variation in *Elimia comalensis* from the Edwards Plateau

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Elimia comalensis (Pilsbry, 1890) (Gastropoda: Pleuroceridae) occurs in springs and spring-fed systems on and along the Edwards Plateau in Texas. The species represents the southwestern-most distribution of the genus, and is disjunct from the geographically nearest species by hundreds of miles. As part of a project examining the ecology and systematics of *E. comalensis*, we studied morphological variation in the species across its range. We identified and digitized ten shell landmarks in four populations from the plateau proper (Leakey Creek and Guadalupe River) and the Balcones Fault (eastern edge of the plateau; Comal River and Del Rio springs). Geometric morphometric analysis on Procrustes distances indicated that while the plateau populations did not differ significantly (Goodall's F-test, $p>0.6$) from each other, they did differ significantly from the Comal and Del Rio populations ($p<0.001$). The Comal and Del Rio populations also differed significantly ($p<0.05$). Our data suggest that *E. comalensis* is comprised of three distinct morphological groups. Future research employing ecological and DNA sequence data will test whether these morphotypes represent distinct evolutionary units.

Poster Session

Systematics, Phylogeography, and Evolution of Apple Snails, *Pomacea* spp.

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The freshwater apple snail genus *Pomacea* (Ampullariidae) has a native range covering most of South and Central America and the southeastern United States. Species of *Pomacea* have been introduced widely in southern and eastern Asia, Hawaii and other Pacific islands, and in the mainland United States. In their introduced ranges they have become major pests of wetland crops, notably rice and to a lesser extent taro. The taxonomy of *Pomacea*, including the identity and precise geographic origins of the pest species, is poorly understood. This lack of understanding has implications for research on many aspects of ampullariid biology, including development of effective pest management programs. Ampullariids are a major component of freshwater diversity throughout the tropics and subtropics. *Pomacea*, with 117 recognized species, is the largest genus. Species of *Pomacea* are therefore important from various perspectives, including ecosystem and human health (as vectors of human parasites). They also offer a valuable model for investigating Neotropical biogeography. As part of a systematic revision of the genus *Pomacea*, DNA sequence data are being used to develop a phylogenetic basis for hypotheses of the evolution of Neotropical freshwater biodiversity. So far, 56 individuals of five putative *Pomacea* species have been analyzed. Snails from Hawaii, numerous locations in southeastern Asia, and Argentina cluster together and are probably *Pomacea canaliculata*. Snails from introduced populations in Sri Lanka and Australia are *Pomacea bridgesii*. Snails intercepted by quarantine in Hawaii cluster with specimens from Venezuela and Thailand and are probably *Pomacea lineata*, a species native to northern South America.

Special Session – Snails and Slugs as Agricultural and Horticultural Pests

Insights on Neogastropod Phylogeny from Ontogenetic Records of Shell and Radular Characters: A Case Study Using the Muricidae

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The Cenozoic radiation of the neogastropod family Muricidae resulted in extraordinary morphological diversity. Significant components of muricid morphology, however, remain too superficially defined by traditional descriptive methods to begin documenting this radiation using cladistic tools. Spiral cords on the body whorl and cusps on the rachidian tooth, for example, are often counted without being precisely identified. Major morphological transformations between early and late ontogenetic stages are also rarely considered in character construction. Our study examines muricid morphology more closely by investigating structural homologies of the shells and radulae using ontogenetic data. Cord homologies on the adult whorls are identified by tracing cords to their origin at the protoconch-teleoconch transition, where cord morphology and position are presumably at their most evolutionarily conservative and primitive states. Even muricids that differ greatly in cord number and morphology as adults often have similar, if not identical, cord arrangements as early post-larvae. Ontogenetic analyses of radulae for representatives of six muricid subfamilies show a similar pattern. Species that are now assigned to different subfamilies based on radular features of adults are shown to have similar rachidian teeth as early post-larvae. Characters constructed using ontogeny are then tested by a cladistic analysis. Tree topologies are highly congruent with independent cladistic analyses based on anatomical and molecular data. This implies that morphological characters previously assumed to be unreliable may carry substantial phylogenetic signal when described from an ontogenetic perspective. This method may have bearing on studies of early fossil neogastropods, where only shell morphology is available.

Symposium – Relationships of the Neogastropoda

Molluscan Diversity and Function in Seagrass Ecosystems

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Seagrasses are remarkable in their ability to form dense meadows of high standing crop and productivity in shallow marine environments in both tropical and temperate settings throughout the world. Marine angiosperms originated during the Cretaceous Period and had achieved broad geographic distribution in shallow marine environments by the Eocene Epoch. Because the plants are seldom preserved in the fossil record, inference of the ecosystem is based primarily on the mineralized skeletons of associated invertebrate indicator taxa. Mollusks are among the most abundant invertebrates in modern grass beds, living within the rhizosphere (*e.g.* lucinid and solemyid bivalves) as well as on blades and in leaf axils (*e.g.* trochoidean gastropods, chitons, and patelloidean gastropods). Although very few molluscan species occur exclusively on marine angiosperms, their density in grass beds, coupled with distinctive structural and anatomical traits, suggests an evolutionary response to the physical, chemical, and biological peculiarities of these ecosystems. Infaunal bivalves have exploited reduced sulfur as an energy substrate via endosymbiotic bacteria in their gills, while epifaunal gastropods and chitons have altered their geometry relative to blade morphology and hydrodynamic parameters. Life history traits of seagrass mollusks and the flow regimes in these systems act in concert to prevent dispersal away from grass beds as well as to promote settlement and metamorphosis of molluscan larvae from outside the bed.

Contributed Session III – Marine Mollusks

Threats to Agriculture from Exotic Terrestrial Stylommatophora and Early Detection Strategies

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Many species of terrestrial snails and slugs (Stylommatophora) are spread globally through human activity, and cause economic impact on agriculture. Exotic helicid and hygromiid snails such as *Theba pisana* (Müller), *Cernuella virgata* (da Costa), and *Cochlicella barbara* (Linnaeus) are pests on small grain and seedling production. The brown garden snail, *Cryptomphalus asperses* (Müller) (=*Helix aspersa*) is a recognized pest of tree fruit orchards and vineyards, downgrading the quality of fruit through feeding damage and the transmission of plant pathogens. Giant African land snails (Achatinidae) cause damage to many crops. These species and others are frequently intercepted at United States ports of entry, and in some cases have established populations in North America. Through the Cooperative Agricultural Pest Surveys (CAPS), the USDA Animal and Plant Health Inspection Service (APHIS) works cooperatively with federal, state and local authorities to detect and identify, eradicate or manage new introductions of high-risk invasive species. The APHIS Safeguarding, Intervention and Trade Compliance program (SITC) has recently discovered *Achatina fulica* Bowdich in retail pet stores, and at least one breeding operation in the United States. Populations of *A. fulica* in Hawaii and in the Caribbean Islands also pose a significant threat to the United States mainland. The APHIS Mollusk Working Group is currently developing guidelines to aid in early detection and eradication of introduced achatinid snail populations in the U.S. and neighboring territories.

http://www.aphis.usda.gov/ppq/ep/gas.html

Poster Session

Chemical Alternatives to Metaldehyde and Methiocarb: Current Status and Prospects

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Slugs and snails are important pests of agriculture, yet few toxicants are available for their control. Most chemical treatments applied against slugs and snails use metaldehyde or methiocarb as the active ingredient. Despite the usefulness of these toxicants, there are many situations in which products containing these chemicals are inappropriate, ineffective or unavailable. Inexpensive, safe chemical alternatives that can be used in food baits or applied to foliage are needed. A bait product marketed as "Sluggo®" contains 1% iron phosphate and appears to be a viable substitute for metaldehyde baits under certain circumstances. Although this product has no adverse environmental effects, its higher cost and lower efficacy may limit its use to homeowners and organic growers. Copper sulfate has been used in solution to control aquatic snails, and as an ingredient in latex paint to repel slugs and snails and to prevent them from gaining access to the canopy of tree crops. Many other alternative mollusk controls are derived from plants, including the toxicants uscharin (from the latex of an Egyptian desert plant), vulgarone-B (an extract of mugwort), and caffeine (extracted from coffee or tea). Repellents such as myrrh, neem, and yucca are effective but expensive and must be reapplied frequently. Major obstacles to the use of alternative chemicals include the costs of the active ingredient, development of effective formulations, and registration requirements.

A Preliminary Basommatophoran Phylogeny Based on the Nuclear Ribosomal LSU Gene

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In order to test the monophyly and determine the sister family-group of Physidae, a member of the pulmonate order Basommatophora, a molecular study of this order was undertaken. Most studies to date have focused on particular families within the order (e.g. Physidae and Planorbidae) using short fragments of mitochondrial genes with limited success. To examine the relationships of Basommatophora we investigated the utility of the nuclear ribosomal LSU gene. We present a preliminary phylogeny based on a 3000 bp portion of the LSU gene.

Poster Session

Current Status of Channeled Applesnail (*Pomacea canaliculata*) in Texas

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South American applesnails, considered to be *Pomacea canaliculata*, were discovered in a rice irrigation canal in southeastern Texas in 2000. Because this site was centrally located in the Texas rice belt, concerns arose at both the state and federal level. Since that time, the species has been documented in five counties in the Houston-Galveston area, as well as in one pond in northern Texas near Fort Worth. In late 2003, particularly large population increases were noted in eastern Galveston and southern Waller counties. Because of potential economic and ecological threats this snail poses, in 2001, Texas Parks and Wildlife Department moved to legally prohibit *P. canaliculata* as a harmful exotic shellfish. However, despite legal restrictions, this species continues to regularly appear in the aquarium trade in Texas. Although both adults and juveniles have been found in area rice fields, no significant crop damage has been reported to date. Presumably local rice farming methods, water level manipulations, and pesticides have limited negative agricultural impacts thus far. In 2004, expanded state regulations were proposed and research initiatives developed.

Special Session – Snails and Slugs as Agricultural and Horticultural Pests