

# Shipping Nursery Stock to States With Snail Restrictions

Know your Options and Responsibilities

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Agriculture, Weights and Measures

# San Diego County Nursery Industry

- Number one producer in nation
- Over 600 licensed production nurseries
  - Approximately 400 ship interstate
- Over 12,000 acres in production
- \$1.1 billion annual crop value



# San Diego County Exports

- State certificates issued
  - Prior to Snail-Free Master Permit
    - Approximately 7,500 annual certificates- most to states with snail restrictions
    - Other destinations- Arizona, Nevada, Hawaii
  - After Snail-Free Master Permit Program
    - Expect reduction of approximately 70%

# States With Snail Restrictions

- Alabama, Arkansas, Florida, Idaho, Louisiana, Mississippi, North Carolina, Oregon, South Carolina, Tennessee, Texas, Virginia, Washington, West Virginia
- States may have additional restrictions
  - National Plant Board
- Canada
  - Nurseries shipping to Canada must be under compliance agreement



# Snail-Free Master Permit Program – Background

- Prior to Summer 2012
  - Nurseries under compliance
    - Two annual BGS inspections- both charged for time
    - One annual nursery inspection – no cost
    - Final inspection of shipment- certificate issued
    - Treatment
      - Approximately 6,500 certificates annually

# Snail- Free Master Permit Program Background

- New shipping procedures to states with snail restrictions - effective summer 2012
- Two Options
  - Snail-Free Master Permit Program
  - Single Shipment Certification
- Voluntary Participation: Opportunity and Responsibility
- Cooperative Effort Required



# Snail-Free Nursery

- Snail-Free Nursery Requirements
  - Compliance Agreement with AWM
    - Maintain entire nursery free of BGS and other snails/slugs
    - Perform “active” prevention- scouting, treatment, inspecting incoming plants, weed and rubbish control, perimeter inspections
    - Maintain records of treatment
    - Train all employees on snail ID

# Snail-Free Holding Area/Greenhouse

- Compliance Agreement with AWM
  - Specific Holding Areas identified by map
    - Perform “active” prevention: scouting, treatment, inspecting incoming plants, weed and rubbish control, establish buffer zone.
    - All material must be held for 30 days
    - Inventory records required
    - Plants identified by date placed in holding area
    - Treatment records



# Shipping With Master Permit

- Qualified nurseries given Master Permit authorization
  - Stamp or copy of Master Permit sent with each shipment

# Enforcement

- Snails found during annual inspections
  - Portion of nursery removed from Master Permit for at least 30 days
  - All follow-up inspections are charged
- Snails found at destination
  - Suspension of Master Permit until investigation completed
  - Minimum 30 day suspension of area involved
  - CDFA involved - destination state may refuse reinstatement
  - Canadian interceptions - USDA involved



# Single Shipment Certification

## No Master Permit

- Not required to be participating in Master Permit Program
- Most shipments will require a 30 day hold period
  - Requirements during hold period similar to MP
  - Inspection/certification at end of 30 day hold period
- Some shipments may qualify for “same day” inspection and certification
  - Example: plug size plants bench grown inside greenhouse with no evidence of snails

# Cut Flowers and Foliage

- Specific Compliance Agreement
  - Requires quarterly inspection of shipping facility – charge for time
  - Treatment of outside landscaped areas
  - Careful inspection of incoming plant material
  - Careful inspection of shipment



# Economics of Snail Certification

- Costs of Master Permit
  - Two Annual Inspections required
    - One inspection conducted with annual nursery inspection
      - No charge for this inspection **unless snail problems found**
      - **Additional time spent by inspectors charged at \$67/hour**
    - One additional inspection
      - Time charged at \$67/hour
      - The cleaner a nursery....
  - CDFA Annual Master Permit fee - \$125/year

# Economics of Snail Certification

- Single Shipment Certification
  - Shipments eligible for immediate inspection/certification
    - \$35/certificate + \$5.30 CDFA fee
    - Treatment verification- \$67/hour (1/2 hour minimum)
  - Shipments requiring 30-day hold period
    - Initial oversight, treatment: \$67/hour
    - Final inspection/certification: \$35/certificate + \$5.30 CDFA Fee
    - Treatment verification at time of shipment: \$67/hour (1/2 hour minimum)



# Questions

- Jim Wynn 760-752-4710 or 760-752-4700
- [James.Wynn@sdcounty.ca.gov](mailto:James.Wynn@sdcounty.ca.gov)

## MEET RAT LUNGWORM *Angiostrongylus cantonensis*



PHYLUM: Nematoda  
CLASS: Rhabditea  
ORDER: Strongylida  
SUPERFAMILY: Metastrongyloidea  
FAMILY: Angiostrongylidae

- Around 19 species are recognized worldwide in the genus *Angiostrongylus*
- Two species infect humans widely:
  - *Angiostrongylus costaricensis* Morera & Céspedes, 1971 causes abdominal angiostrongyliasis, especially a problem in South America
  - *Angiostrongylus cantonensis* (Chen, 1935) causes eosinophilic meningitis



Adult female with characteristic red (gut) and white (uterine tubules) spiral appearance



### ADULT SIZE

- Female: 17-34 mm long, 0.28-0.56 mm wide
- Male: 15-25 mm long, 0.25-0.42 mm wide

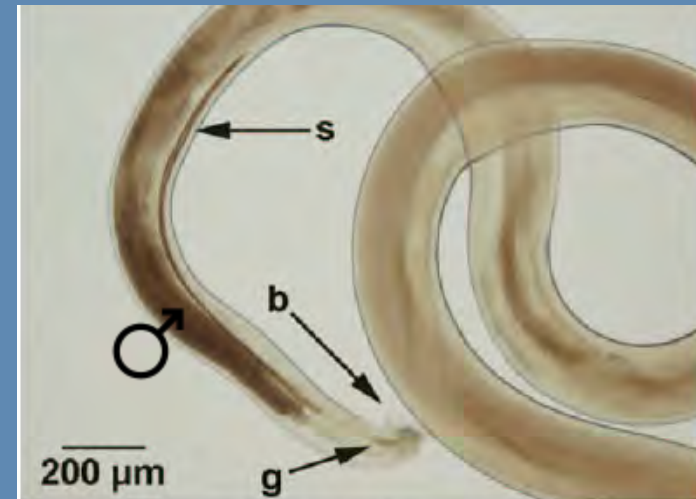


Figure 2. Morphologic features of a male nematode recovered from the central nervous system of a gibbon (*Hylobates lar*). The characteristics used for specific identification of *Parastrongylus cantonensis* were the presence of a bursa (b), a gubernaculum (g), and the size of spicules (s).



Snail hosts: “all species of native and exotic terrestrial mollusks can serve as intermediate hosts.”\*

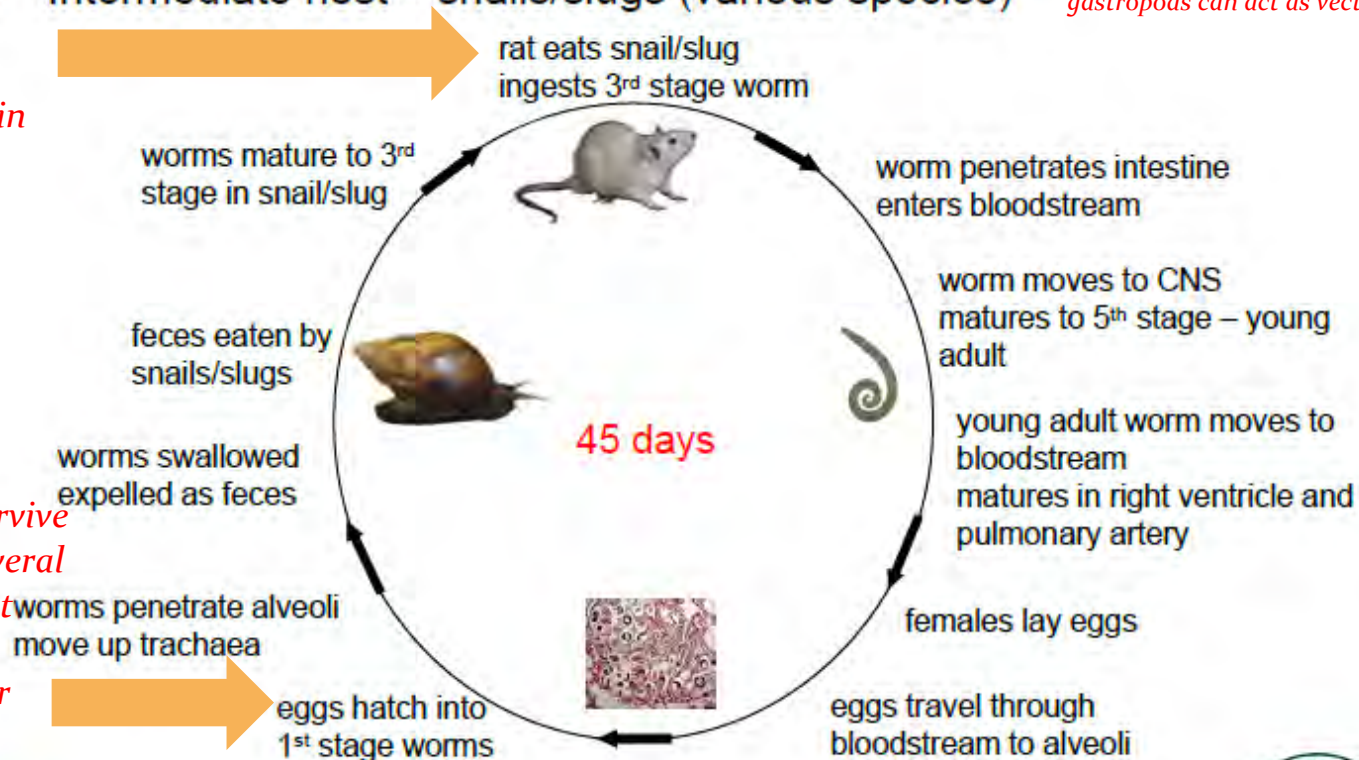
## LIFE-CYCLE

- Definitive host – rats (various species)
- Intermediate host – snails/slugs (various species)

*Thirteen out of Sixteen species of snails and slugs from the Hawaiian Islands were tested positive for A. cantonensis, these were a wide taxonomic range of snails and slugs, suggesting that most gastropods can act as vectors.*

*3rd stage larva outside a host survives 7 days in water*

*1st stage larvae survive in rat feces for several weeks under moist conditions then consumed by their mollusk host*



RAT LUNG WORM DISEASE SCIENTIFIC WORKSHOP  
HONOLULU, HAWAII AUGUST 16 - 18, 2011



## RANGE OF RAT LUNGWORM-30 COUNTRIES (SOME NOT SHOWN)



Hawaii  
Cuba  
Jamaica  
Puerto Rico  
Haiti  
Dominican Republic  
Bahamas  
Ecuador  
Brazil

Florida  
Louisiana  
Mississippi

Africa  
Madagascar  
Egypt  
Australia  
Japan  
India

Thailand  
Taiwan  
China  
Pacific Islands  
Southeast Asia  
South Pacific



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## Three Main Offenders Associated with Infection- Giant African Snail, Apple Snails, and Semi-Slugs



giant African land snail (*Achatina fulica*).



the semi-slug, (*Parmarion martensi*)



Enlargemen  
t of snail  
eggs



“Apple Snails”  
(*Pomacea*, *Pila* and *Asolene/Pomella*)



# Known Hosts versus AWM Interceptions 2011-12

## Known Hosts of Rat Lungworm

Family	Scientific Name	Common Name
Achatinidae	Achatina fulica	Giant African Land Snail
Agriolimacidae	Deroceras laeve	
Agriolimacidae	Deroceras reticulatum	Grey Field Slug or Grey Garden Slug
Ampullariidae	Pila ampullacea	
Ampullariidae	Pila angelica	
Ampullariidae	Pila gracilis	
Ampullariidae	Pila polita	Pila scutata
Ampullariidae	Pila scutata	
Ampullariidae	Pila turbines	
Ampullariidae	Pomacea canaliculata	Channelled Applesnail
Ariophantidae	Hemiplecta siamensis	
Ariophantidae	Sarika resplendens	
Bradybaenidae	Bradybaena similaris	Asian Trampsnail
<b>Helicarionidae</b>	<b>Parmarion martensi</b>	<b>Semi-slug (70% HI infected)</b>
Helicidae	Cornu aspersum	Garden Snail
Spiraxidae	Euglandia rosea	Rosy Wolfsnail or Cannibal Snail
<b>Subulinidae</b>	Paropeas achatinaceum	
<b>Subulinidae</b>	Subulina octona	
	Melanoides tuberculata	Red-Rimmed Melania
Thiaridae	Laevicaulis alte	Tropical Leatherleaf
Veronicellidae	Sarasinula marginata	
		Bean Slug or Caribbean Leatherleaf Slug
Veronicellidae	Vaginulus plebeius	
Veronicellidae	Veronicella cubensis	Cuban Slug
Veronicellidae	Veronicella siamensis	
Viviparidae	Filopaludina martensi	

## A & Q Rated Slugs n' Snails 2011-12

Camaenidae	Zachrysia provisoria	Camaenid Snail (Land Snail)
Helicarionidae	Parmarion sp.	Semi-Slug (Land Slug)
Hydrobiidae		Mud Snail (Freshwater Snail)
Limacidae		Keelback Slug (Land Slug)
Lymnaeidae		Lymnaeid Snail (Freshwater Snail)
	Meghimatium bilineatum	
Philomycidae		Philomycid Slug (Land Slug)
	Meghimatium bilineatum	
Philomycidae		Philomycid Slug (Land Slug)
Subulinidae	Allopeas gracile	Graceful Awl Snail (Land Snail)
Subulinidae	Allopeas sp.	Awl Snail (Land Snail)
Subulinidae		Subulina Snail (Land Snail)



Photo: Kenneth Hayes

*Bradybaena similaris*

Most Common Snail Intercepted by AWM is *Bradybaena similaris*- B rated, known carrier  
Most Common Snails in San Diego are brown garden snail, milk snail and white garden snail in Family Helicidae, to have known susceptible relatives