Biology, Ecology and Control of *Pomacea* spp.

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Some biological aspects important for the control of GAS

- Species Identity
- Life cycle
- Rate of growth, fecundity
- Diet
- Dispersion
- Damage assessment
- Control / management

Species identification

- Too few external features for use in species identification
- Based on genetic characteristics
- Species found in its native land (South America) : Amazon basin, Guyana, Colombia, Argentina

Pomacea canaliculata	*P. sordida*
P. Peludosa	*P. flagellata*
P. haustrum	*P. poeyana*
P. lineata	*P. falconensis*
P. glauca	*P. bridgesi*
P. urseus	*P. Insularum*

Unresolved species identity in Asia

Life cycle

- Mostly investigated in lab condition, fed with vegetable
- Grow quickly, 2-3 mths. Lay eggs several time a year
- No of eggs depending on size of female. Recorded 3000 eggs in a cluster



Ecology

- Cosmopolitan: Survive well in its new territories due to favorable environment and food
- Overwintering and aestivating
- Fresh water strictly
  - ✓Sensitive to brackish water (salinity 8 and above) and aluminous water (pH 5 and below)

Population

- Expressed as or unit normally used - Number of snail per area in a certain time
- Other unit can be applied – man effort method, i.e. number of snail counted by one person per hour

Control with fish

Field trial (3 months) in rice field of Vietnam

Fish	Increment	Survival	Consumption
Common carp *Cyprinus carpio*	3.5 – 4.4 x	27 -87%	7.2 % bw
Black carp *Mylopharingodon*	2.4 – 3.2 x	20 -85%	254 % bw
Hybrid catfish *Clarias gariepinus*	1.9 – 2.0 x	85 -96%	5 % bw

Problems in fish-rice culture:

- Water availability and water quality
- Pesticides usage –killing fish
- Climate – too hot, El Nino
- Escapade – fish disappearing to nearby
- Good quality fries
- Predators
  - Snake
  - Bird
  - Crabs
  - Wild cat
  - Monitor lizard
  - Otters







SMALL-CLAWED OTTER
Amblonyx cinereus



SMOOTH OTTER
(*Lutra perspicillata*)



HAIRY-NOSED OTTER
Lutra sumatrana

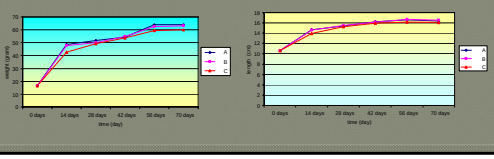


EURASIAN OTTER
Lutra lutra





- Results from stocking of 4,000; 8,000 and 12,000 fingerlings/ha. with no supplemental food given, showed no significant difference in its final length and weight at harvest (70 days after introduction). The use of insecticides was also refrained.
- The size of fish at harvest might be a little small for dinner table, nevertheless it was quite perfect for the production of fermented fish (ikan pekasam).



Used for animal feed

Table 15: Chemical composition of snail (*Coturnix coturnix japonica*) meal (%)

Materials	DM	Ash	CP	Fat	CF	Ca	P
Whole snail	96.7	32.4	32.0	3.2	1.8	26.3	0.29
Shell	99.0	53.8	3.3	0.18	4.7	51.5	0.02
Flesh	91.8	8.4	50.8	3.3	0.58	5.4	0.49

Note: DM: dry matter, CP: crude protein, CF: crude fibre, Ca: Calcium, P: Phosphorous



Chemical control

- Banned molluscicides
  - Triphenyltin acetate
  - Triphynyltin chloride
  - Triphynyltinnhydroxide
  - Triphynyltin oxide
- Registered molluscicides
  - Metaldehyde
  - Isazophos
  - Nicloamide/Baylucide
  - Botanical

Development of biopesticides

- Toxicity assessment of biomaterials
- Formulation
- Field trial
- Registration

Probit analysis

- Useful in determining the toxicity of materials tested



Estimation of LC_{50} in screening toxic plants to snail

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This exercise is designed for the participants of this workshop who are interested in screening plant products that are toxic to aquatic organisms, not only *Pomacea* but also an array of organisms living in the same environment. The drastic effect of a compound to organisms is death in short time. This is referred as acute effect. The longer effect that causes some effect to the physiology, behaviour or morhogenesis is called chronic effect.
The simple index to express the acute toxicity is LC50 which refers to the concentration that kill 50% of population or the number of organisms exposed in the test (Median lethal concentration). There are a few requirements needed in the technique for estimating the median lethal concentration (LC50) which can be analysed by Probit Analysis.

- every test must include control.
- there should be replicates
- There should be at least 4 concentrations that kill between 20% to 80%.
- Mortality in the control should not exceed 20%. If mortality is more than 20% data can not be used because test organisms may be handled roughly or they are not very healthy. Therefore the death may not be because of the exposure to test compound.
- An extra requirement is needed in snail test. After exposure (for example 24 hours), the remaining living nail should be cleaned and placed in clean water for 3 - 4 days. Water changed every day and dead snails removed. Snails are considered dead when they are not responding to touch with blunt needle. The accumulated rate of mortality at the end of this recovery period is used in determining LC50.

Computer package to determine LC50 based on Finney is provided.

In order results obtained from various tests can be compared, the following criter a have to be clearly stated and if possible standardised.

Source, weather lab raised or collected from field
Size/age of test organisms
Diet if lab raised