LARGE SCALE PRODUCTION OF MALE MONOSEX FRESH WATER GIANT PRAWN (*Macrobrachium rosenbergii*, Deman, 1879) IN VIETNAM

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Source: Hoang Thi Thuy Tien and et all. & Nguyen Nhut and et all.

Introduction

Giant fresh water prawns are farmed in many countries in the world. There are several constraints as below:

- Female prawns get early maturation
- Small size
- Low price

Male monosex prawns give higher productivity

For crustaceans, the androgenic gland plays an important role to:

- - Sex formation
- - Supplementary sexual characteristics
- - Growth rate

Successes in sex reversal with mini-surgical technique for androgenic gland ablation by Sagi and et all., (1990) have generated populations of male monosex prawns.

Initial projects

- The technology was found by a group of researchers from Ben-Gurion University, Israel: production of 2 artificial females

- Transfer to Vietnam: received by RIA I & RIA II from 2001-2004.
  - Production: 500 individuals

- Trial production: a project at ministerial level
  - Production: 7,000 individuals

Scientific basis

- Androgenic gland ablation for young crustaceans whose supplementary sexual signs have not been clearly shown will not allow development of the supplementary sexual signs.

- Without male gland, crustaceans will reverse into female.

- Sagi and et all. in 1990 discovered that the androgenic gland played an important role to the formation of sex and supplementary sexual characteristics as well as growth rate of prawns.

- Ablation of androgenic gland when prawns are of small size and age leads to a higher percentage of reversal into females.

- Research on genetic sex chromosome of fresh water giant prawns: males are of homogamete ZZ, while females are of heterogamete WZ

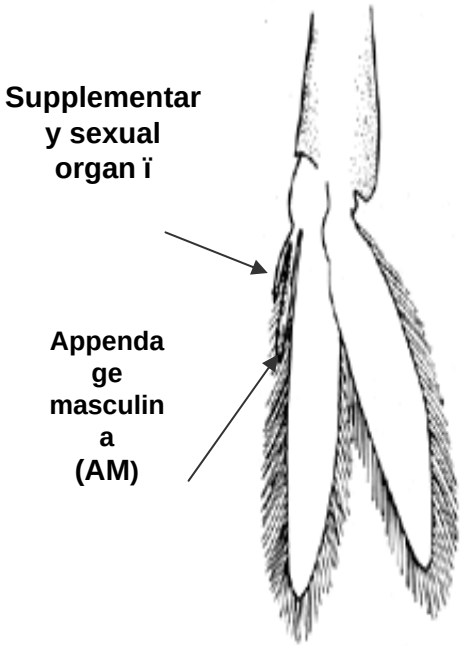
- Normal female prawn (WZ):
- Mother prawn: WZ x ZZ Male prawn
- Gamete: W, Z Z
- F1: 50% WZ : 50% ZZ

  (50% female prawns : 50% male prawns)

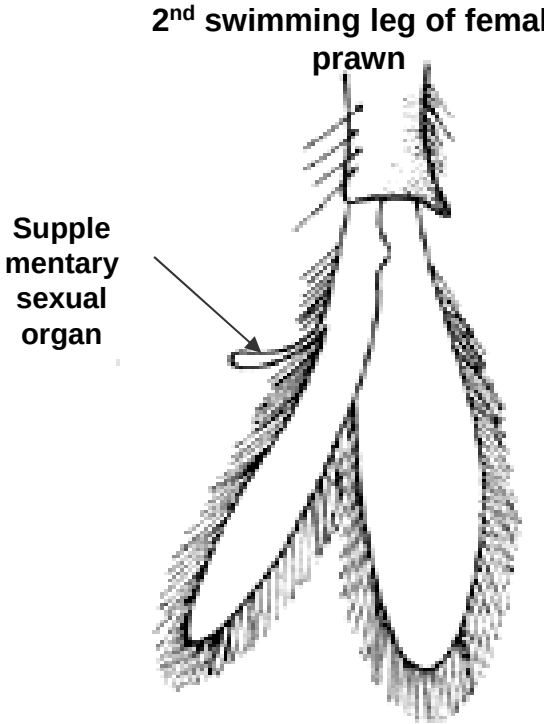
- Artificial female prawn (ZZ):

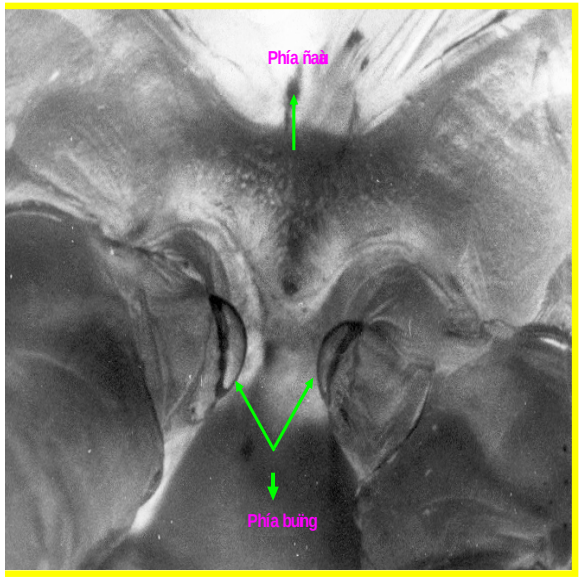
- Artificial female prawn ZZ x ZZ Male prawn
- Gamete: Z Z
- F1: 100% ZZ
- (100% male prawns)

2nd swimming leg of male prawn

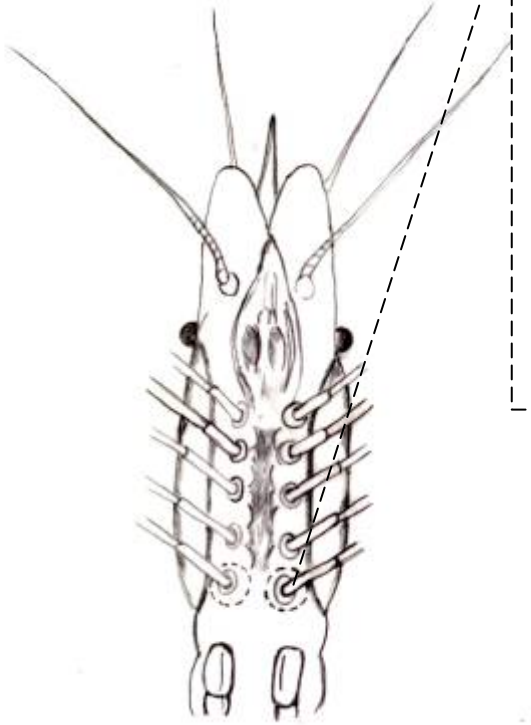


2nd swimming leg of female prawn





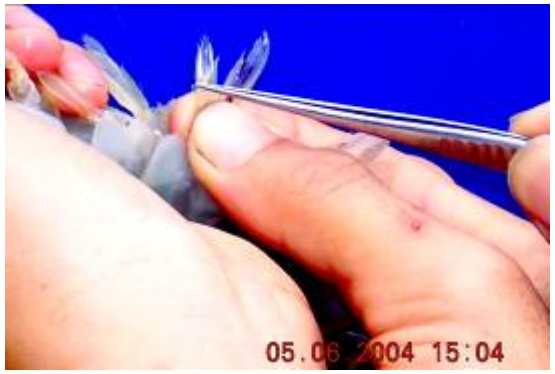
- Nursing of fresh water giant prawns from PL5 to PL30-50, selection of male prawns (ZZ)
- Mini-surgery for male gland ablation



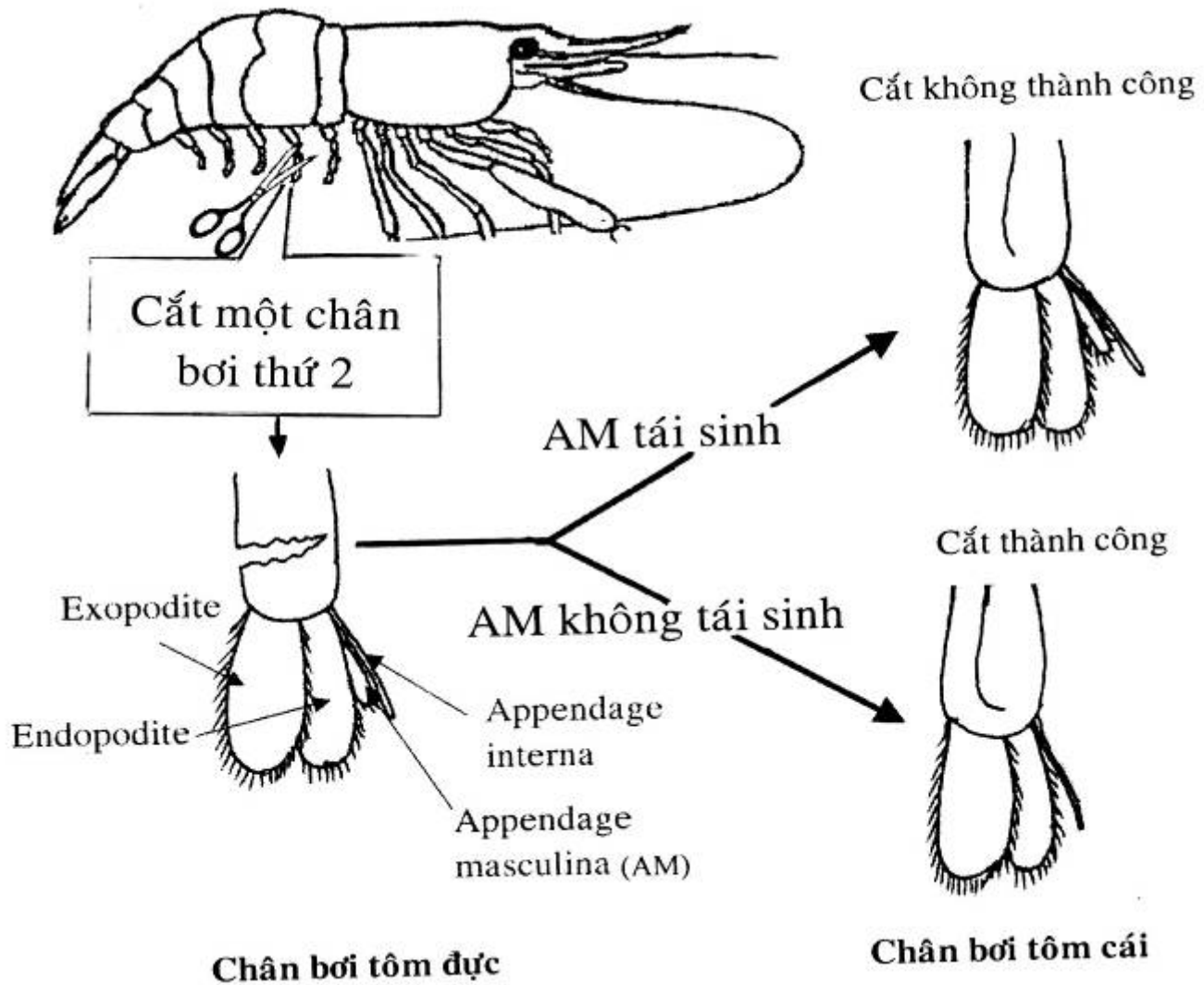
Ablation of the surrounding parts of the 5th moving leg, removal of the male gland.

Remove the 2nd swimming leg for later quality checking

- Generating artificial female prawns (ZZ) by sex-reversal of male prawns



- Prawn quality checking after male gland ablation: check the development of the 2nd swimming leg and only keep those prawns whose the 2nd swimming leg does not contain male supplementary sexual organ (ZZ), i.e. artificial females (30 days after mini-surgery)


Cắt không thành công
Cắt một chân bơi thứ 2
AM tái sinh
Cắt thành công
Exopodite
AM không tái sinh
Endopodite
Appendage interna
Appendage masculina (AM)
Chân bơi tôm đực
Chân bơi tôm cái

- Growing until maturation

- Crossing of artificial female (ZZ) and normal male (ZZ)

- Checking chromosomes of mother prawsn based on her children: keep those mother prawsn with F1 generation of 100% males (artificial mother ZZ)

- Let the artificial mother prawn to get the 2nd breeding and then carry out male gland ablation for all of male PL30

- Massive production of artificial female pra

- Cross the artificial female prawns (ZZ) with normal male prawns (ZZ)

- Massive production of monosex male prawn

- Avoid mixing male monosex prawns with those prawns of both sexes

- It is fast to use male monosex PL for production of artificial female prawtns, with high rate of sex reversal and confidence level.

Results

- **- Nursing PL30 as materials for mini-surgery**

- Survival rate (%): 66 - 93
- Percentage of mini-surgery size (0.2g/ind) (%): 60 -72

- Nursing time (days): 30
-
- **- Results of mini-surgery for male gland ablation**

- Sex reversal rate (%): 49-63
- Survival rate after 24h (%): 80-90
- Survival rate after 30 days (%): 65 - 93

Results of growing activities for maturation and production of artificial female prawns û

- **Survival rate (%): 60-70**
- **Time for the first maturation (days) for 100% of the population: 120 ± 5**
- **Time for re-maturation (days): 10 ± 5**
- **Actual breeding capacity (larvae/g of mother prawn): 750 ± 171**
- **Survival rate from larvae to PL (%): 10 – 51**
- **Size after 6 months of commercial farming (g/ind.): 75 - 120**

Commercial farming of male monosex fresh water giant prawns

- **Size after 6 months of commercial farming (g/ind.): 75 – 120**

- **Profit: double as compared to normal prawn farming**

Plans for the coming time

- Massive production:
  - 2009: supply 6,000 artificial female prawns/month
  - 2010: supply 10,000 artificial female prawns/month: meeting 30% of the market demands for PLs in the Mekong Delta area

- Technology transfer
  - Upon the practical demands
  - Management of large scale production

Genetic improvement program for enhancing seed quality

- Hybrid advantages
  - Growth rate
  - Survival rate

- Selection:
  - Body weight
  - Edible parts
  - Percentage of male prawns
  - Percentage of giant prawns, red and small prawns

Hybrid advantages

Strains	Mekong	Dong Nai	Hawaii
Mekong	x	X	X
Dong Nai	X	X	X
Hawaii	x	x	x

Mekong (Dong Nai) female x Hawaii male

Hybrid advantages

Strains	Mekong	Dong Nai	Malaysia
Mekong	x	X	X
Dong Nai	X	X	X
Malaysia	x	x	x

Generation of population for seed selection

- **Generating population for seed selection, based on the above 9 hybrid steps**

- **Breeding based on family and marking**

- Successful breeding for 80 families belonged to 9 hybrid groups in 1 month.
- Marking the families with Elastomer fluorescence (use 5 colors of red, orange, green, yellow, pink) at 2 places, i.e. The 1st and the 6th internode (on the left and on the right).
- The survival rate after marking was 99% (checking after 3 days of observation in composite tank since marking date).

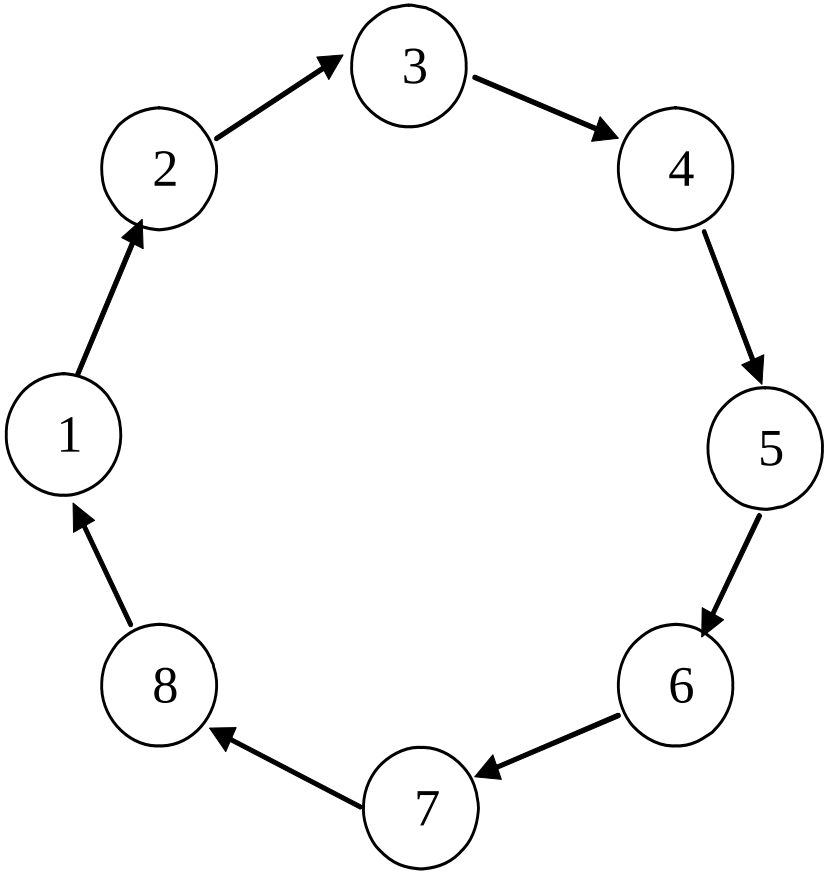
Selection results

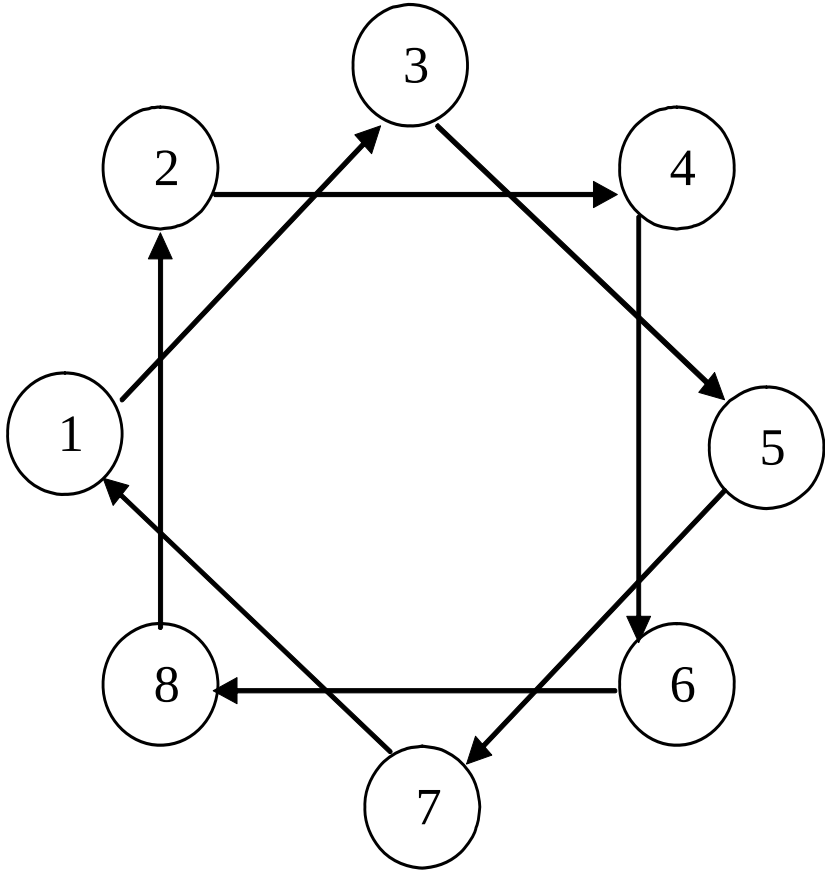
- Percentage of prawns with mark retained: 98%
- Survival rate: low
- Genetic coefficient: 0.18
- Selection method: selection within the family
- Estimated selection effectiveness: 6%

Plans for the coming time

- Avoid inbreeding
- Selection of different characters
- Experimental farming in household commercial farming models
- Dissemination of high quality reserved prawns
- Based on the actual needs, it may continue the program of basic selection or individual selection, combined with rotational hybriding method.
- Individual selection in combination with rotational hybriding method: can be applied for hatcheries: technology transfer can be carried out

Methods of inbreeding avoidation and rotational hybriding





Mixture of 2 technologies

- To create seeds with high genetic variability, high growth rate, high amount of flesh, etc.
- Use of selected seeds for male monosex production
- Crossing of artificial females with normal males of rich gene sources.