FRDC
2005/024

Training for abalone stakeholders

a syllabus prepared by Rob Day
with contributions from Jeremy Prince, Harry Gorfine

Module 1: How do abalone live?
Module 2: Management of abalone fisheries
Module 3: Fine Scale Management
Module 4: What makes a fishery sustainable?

Australian Government
Fisheries Research and Development Corporation


Photo: K. Gowlett-Holmes


Photo: James Brook

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How do abalone Live?

Prepared by
Rob Day


Photo: David Paul


Source: VADA

Training syllabus Module 1
for the Abalone Fishing Industry
delivered as part of FRDC project 2005/024

Australian Government
Fisheries Research and Development Corporation

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Warning

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COMMONWEALTH OF AUSTRALIA

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Abalone : 3 harvested species

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All feed on algae – catch drifting pieces or eat attached algae

Blacklip:
Haliotis rubra
(Rocky reefs)

Greenlip: *Haliotis laevigata*
(seagrass beds)

Roe's abalone: *Haliotis roei*
(W.A. shallow reefs)

Non-commercial species

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Photos: Harry Gorfine

- *Haliotis coccoradiata* is a small abalone in NSW, often in areas with black urchins

There are other small species, but these are the common ones in southern Australia

- *Haliotis scalaris* is common in Vic, Tas and SA, always under rocks

Life cycle

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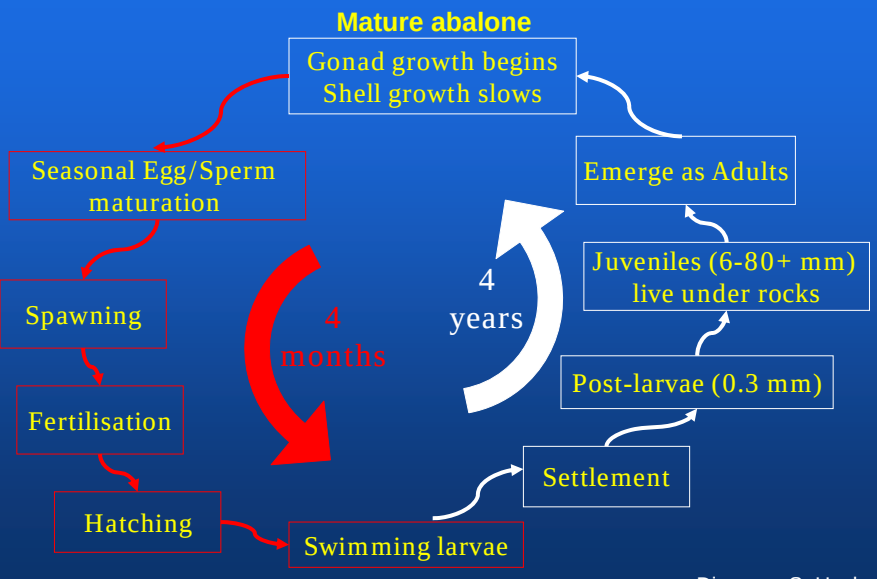

Diagram: S. Huchette

Seasonal maturation of eggs & sperm

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- In aquaculture, abalone are 'conditioned' for 3 months at a warm temperature
- In the sea, warmer water in spring starts the maturation of eggs & sperm
- In aquaculture, a sharp rise in temperature + UV light sets off spawning
- We don't know what sets off spawning in the wild

Photos: Great Southern Waters

Spawning, Fertilisation

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- Abalone squirt eggs and sperm into the water

  They raise the shell, or climb to a high point
- In the water, the sperm find the eggs if they are close enough
- We think if abalone are too sparse, few eggs will be fertilised
- Hatching occurs 24 hr after fertilisation

Ready to go!

Male releasing sperm in a tank

Photos: Great Southern Waters

Larvae settle on pink crusts

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- These crusts are a form of seaweed (algae)
- They provide a surface with food, and few predators

Larval settlement in aquaculture

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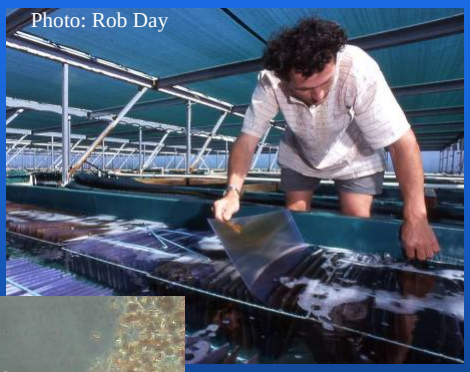

Photo: Rob Day

They are settled on vertical plates coated with algae and diatoms

Diatoms are single celled plants that stick to surfaces in millions

Photo: Anton Krsinich

Here a large post-larva is feeding by scraping diatoms and algae from the plate.

You can see the head beneath the shell

Wrasse:
a predator of post-larvae on pink crusts

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Photo: Rob Day

Juveniles live under rocks

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Photo: Harry Gorfine

They stay under rocks until they begin to mature

Juveniles move under rocks from 15 mm to escape predators

Photo: Simon Foale

Juveniles have many enemies

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40 mm abalone attacked by an 11-arm seastar in aquarium

We found that they run away, but are often eaten when seastars aggregate

Photo: David Paul

Leatherjackets and other fish are also predators of juveniles

Photo: Harry Gorfine

Crabs: predators of juveniles in the cracks

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Photo: Mick Keough

Photo: Rob Day

They chip the shells to get to the flesh

Larger juveniles in ledges /cracks

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Photo: Anne Leorke

- Less food under boulders than outside
- Flat shells fit and wedge in the cracks

Blacklip feeding

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Abalone grab floating weed with the sticky front part of the foot

Photo: Rob Day

How fast do they grow?

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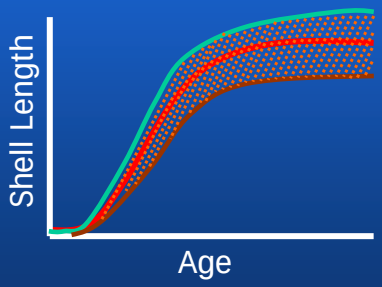
- Shell growth starts slow and speeds up
- Then slows as they start to mature
- Eventually they reach maximum shell length



But growth is variable:

- it depends on the food
- each year some grow faster, some slower
- So some get bigger than others

This means that at any site, some will stay smaller

Growth varies more between reefs

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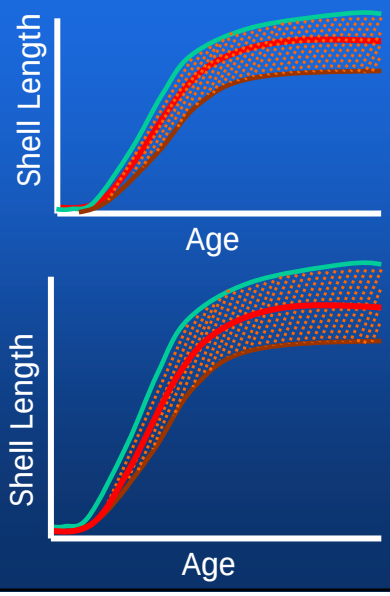

- Growth tends to be slow, to small maximum sizes
  - In sheltered areas, and some shallow high surge areas
- Growth is faster, to larger maximum sizes
  - On the exposed sides of points
  - Where there is upwelling of cold water
  - In high current areas

Weight growth lags length growth

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- Juveniles grow long and flat
- As length growth slows, the foot gets bigger, and the gonad starts to grow, rapidly increasing the number of eggs
- Thus the shell gets high and round

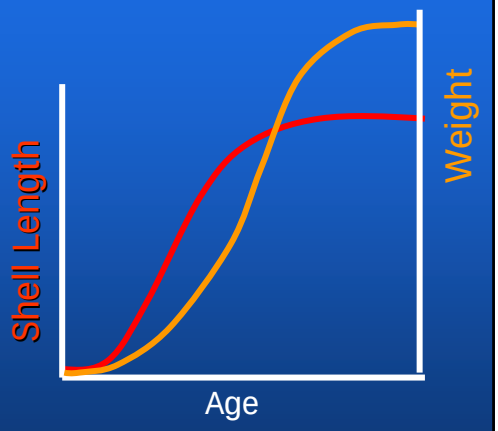

Photo: Rob Day

They emerge when mature

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Newly emerged

Photos: K Gowlett-Holmes

Older adult, fouled by weed

- Eggs and sperm need water flow to mix and carry them away

Fewer predators for larger abalone

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Except for divers!

Predators of juveniles: Seastars, crabs, lobsters, octopus, leatherjackets, morwong, etc.

Cartoons: Mark Norman

Adults have:

- Thicker, stronger shell
- Strong muscle to swing shell around
- Faster movement

Seastar attacks large abalone

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Photo: Paul McShane

Abalone twists – and runs away

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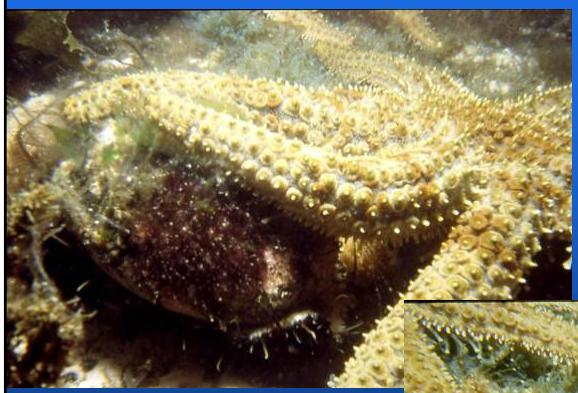

Photos: Paul McShane

Crushed by an Eagle Ray

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Photo: Harry Gorfine

Photo: Anne Leorke

- Abalone in the open can be knocked off the rock, then crushed by the flat teeth of the ray

Abalone Life Cycle - Review

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- Eggs and sperm released into water.
  - Larvae drift for 1-4 days
- Settle on coralline algae, feed on surface diatoms
  - Become pink, camouflaged from predators
  - Many predators, especially fish
- Move under boulders when 10-15 mm
  - Feed on small algae and bits that drift into cracks
  - Small abalone have many predators: crabs, starfish, fish
- Growth variable – within and between areas
  - Shell growth ahead of weight growth
- Emerge onto tops of rocks when adults
  - “Cleanskins” in Tasmania.
  - Fewer predators: Eagle rays, large starfish, humans
  - Gonad growth increases no. of eggs over time