

# Biology and Behavior in fish



# Types of hermaphroditism

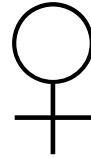
- Protogyny- Female first
- Protandry –Male first
- Simultaneous –Can spawn as both at the same time

# Sex change patterns

Immature



Mature



Mature



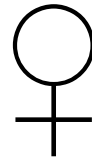
Immature



Mature



Mature

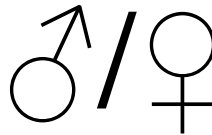


Immature

U



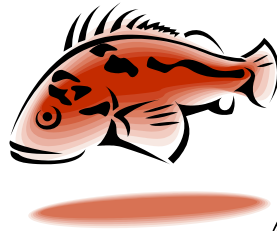
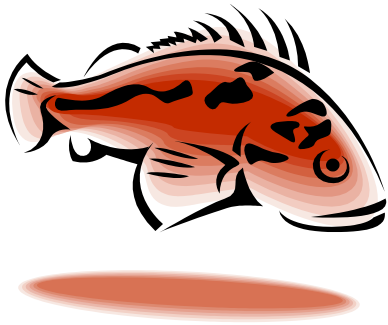
Mature



Mature



# Social control of sex change



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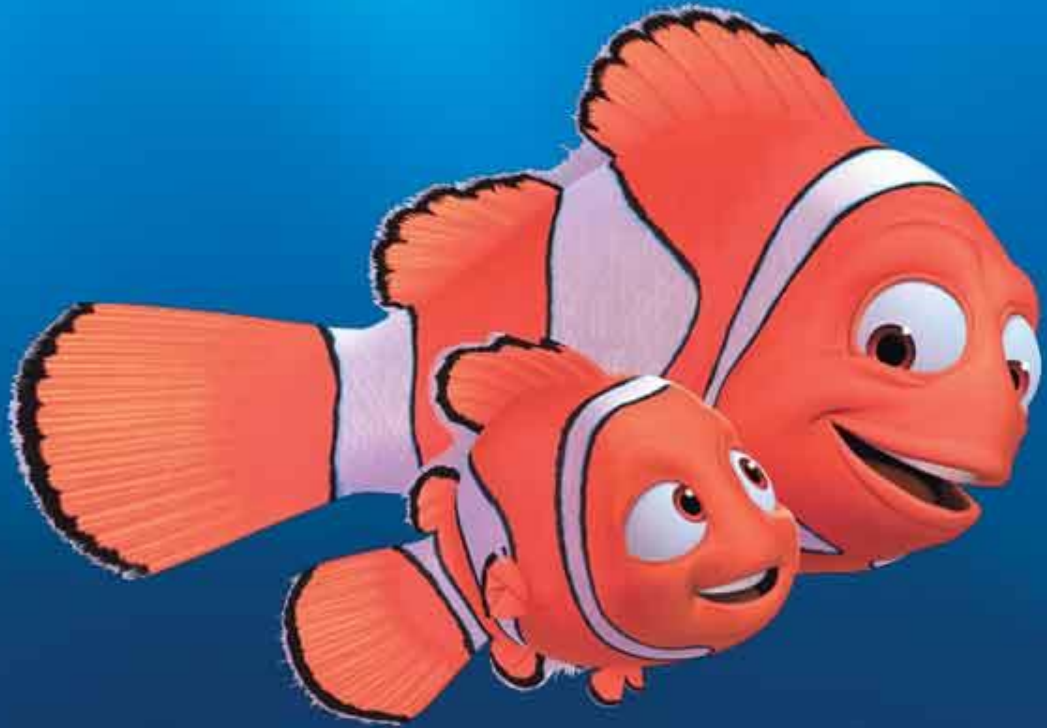
## Warner and Swearer (1991)

- Behaviors exhibited within minutes
- Color changes within a day
- Mature sperm within 8 days

- Semsar, Godwin, Grober, Bass

- Linked to Arginine Vasotocin production in the brain
- Not necessarily linked to gonad production of steroids

Marlin explains to Nemo the sociological aspects of sexuality and parental role patterns within the context of the identity model for transgender and intersex inclusion



**Gonochorist, M=0.1**



Sex ratio = 1:1 female:male

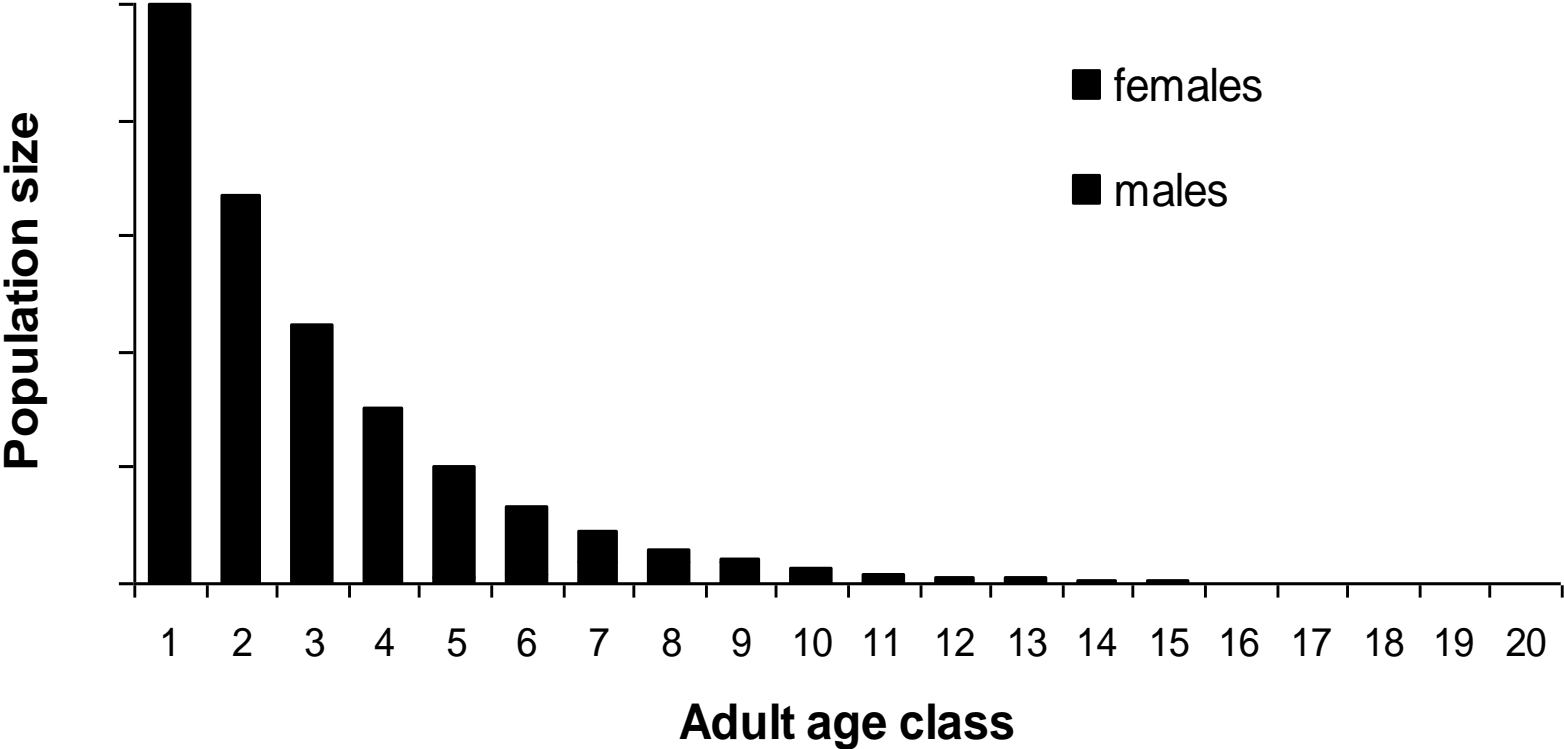
Hermaphrodite,  $M=0.1$



Sex ratio = 1.5:1 female:male

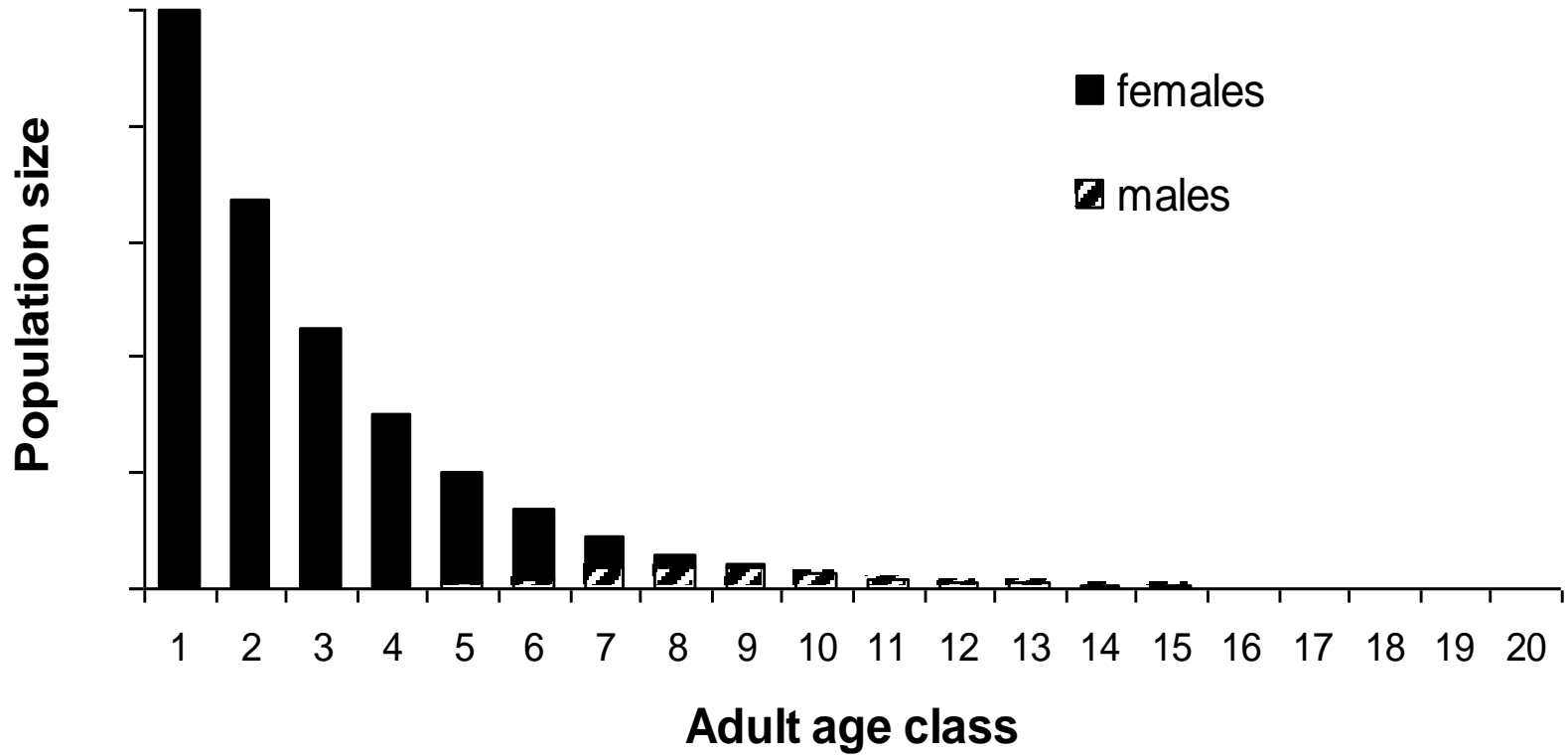


**Gonochorist, M=0.1, F=0.3**



Sex ratio = 1:1 female:male

Hermaphrodite, M=0.1, F=0.3



Sex ratio = 13:1 female:male

**Behavior, physiology, and life history  
comparisons in four species of grouper: What  
do they mean for grouper management?**

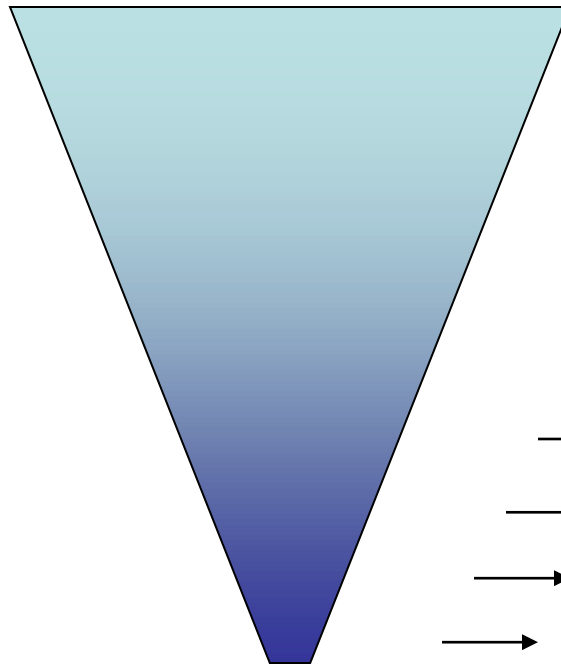


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# Marine fisheries ecology at multiple scales of biological organization



→ Grand unifying theory



→ Ecosystems

→ Habitats

→ Communities

→ Species

→ Populations

→ Individual fitness

→ Behavior

→ Physiology

→ Cell



→ Molecule

Integration

Management