

## LECTURE 4 - OUTLINE



### Diversity & General Morphology III

1. General Morphology ✓
  - Integument ✓
  - Scales ✓
2. Life in Water ✓
3. Unique Habitats & Adaptations
  - Depth
  - In a Sea Cucumber?

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### Unique Habitats & Adaptations

1. Find a fish species that lives in a "unique" habitat
2. Consider how that species has adapted to life in the "unique" environment

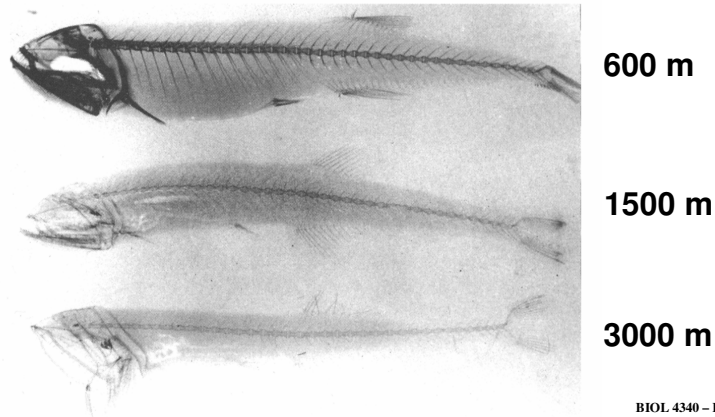
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## Unique Habitats & Adaptations

### Life at Depth - Buoyancy

1. Pressure 2. Temperature 3. Space 4. Light 5. Food

*Gonostoma* spp (bristlemouth)



## Unique Habitats & Adaptations

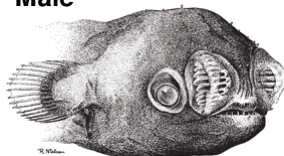
### Life at Depth - Reproduction

1. Pressure 2. Temperature 3. Space 4. Light 5. Food

Ceratioid Anglerfish

- sexual dimorphism directly associated with mate localization
- female density of 1 per 800 000 m<sup>3</sup>

Male



- highly developed olfactory apparatus
- large eyes
- extensive red muscle fibers
- large lipid reserves



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## Pearlfish (Carapidae) and Sea Cucumbers

- Order Ophidiiformes (“snake form”) that lives in association with marine invertebrates (e.g. sea cucumbers)



- elongate slender bodies (tapering to a point). Pelvic, caudal and sometimes pectoral fins absent. Scales small or absent



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## Pearlfish (Carapidae) and Sea Cucumbers

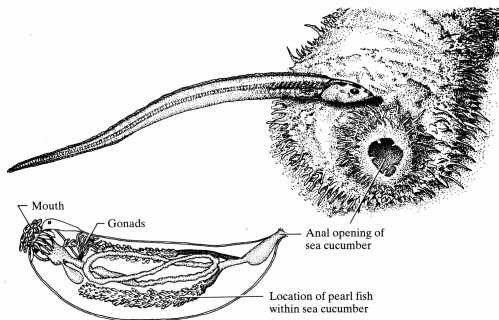
- Order Ophidiiformes (“snake form”) that lives in association with marine invertebrates (e.g. sea cucumbers)

1. Stridulatory
2. Swim bladder vibration

### Why Produce Sound?

Sound only produced inside & when another fish is present

- courtship
- agonistic interaction
- competition
- alarm or territorial interaction



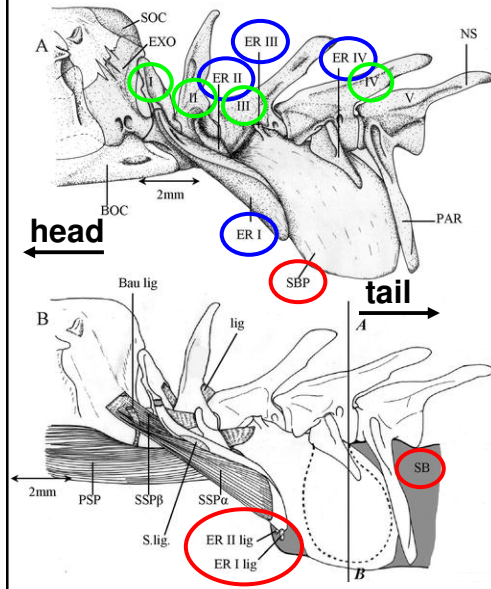
*Carapus boraborensis*

*Carapus homei*

*Encheliophis gracilis*

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## Sound production in Pearlfish



### Swim Bladder Vibration

Sound production by deformation of bladder wall

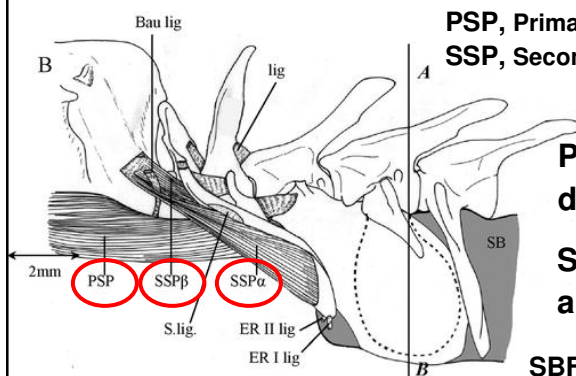
### Strategies

- intrinsic muscles, completely attached to bladder wall
- extrinsic muscles, attached to bladder and on osseous structures (e.g. ribs)

ER I – IV, Epipleural ribs 1 to 4  
SBP, swim bladder plate

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## Sound production in Pearlfish

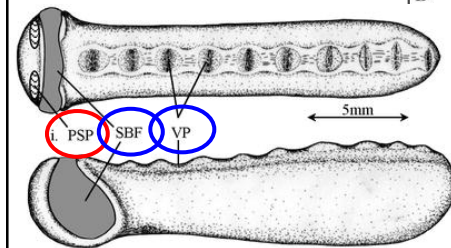


PSP, Primary Sound Producing Muscles  
SSP, Secondary Sound Producing Muscles

PSP attached to antero-dorsal region of bladder

SSPs attached to ERs I and II

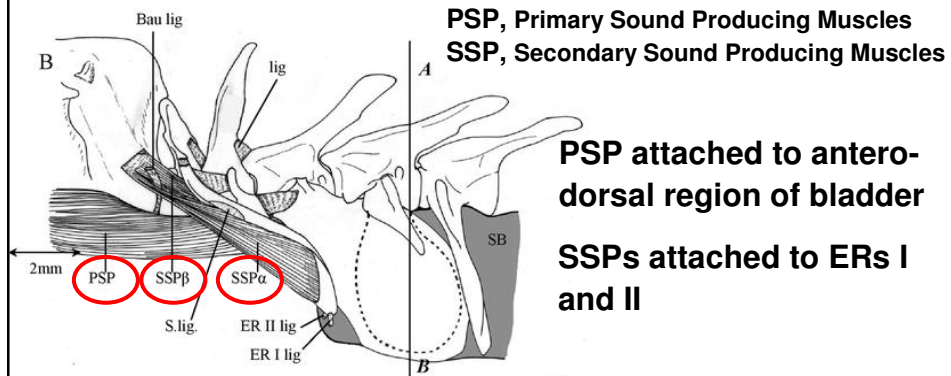
SBF, Swim Bladder Fenestra  
VP, Vertebral body Print



Rapid muscle contraction vibrates bladder (at the anterodorsal region) while ER III & IV, and vertebral bodies immobilize the posterior

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## Sound production in Pearlfish



### Role of the SSPs

- alter "range" of sounds (pitch/tone etc.)
- offset pressure differentials at different depths (physoclistous fishes)

Parmentier *et al* (2003) *J Comp Physiol A* 189: 283-292

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