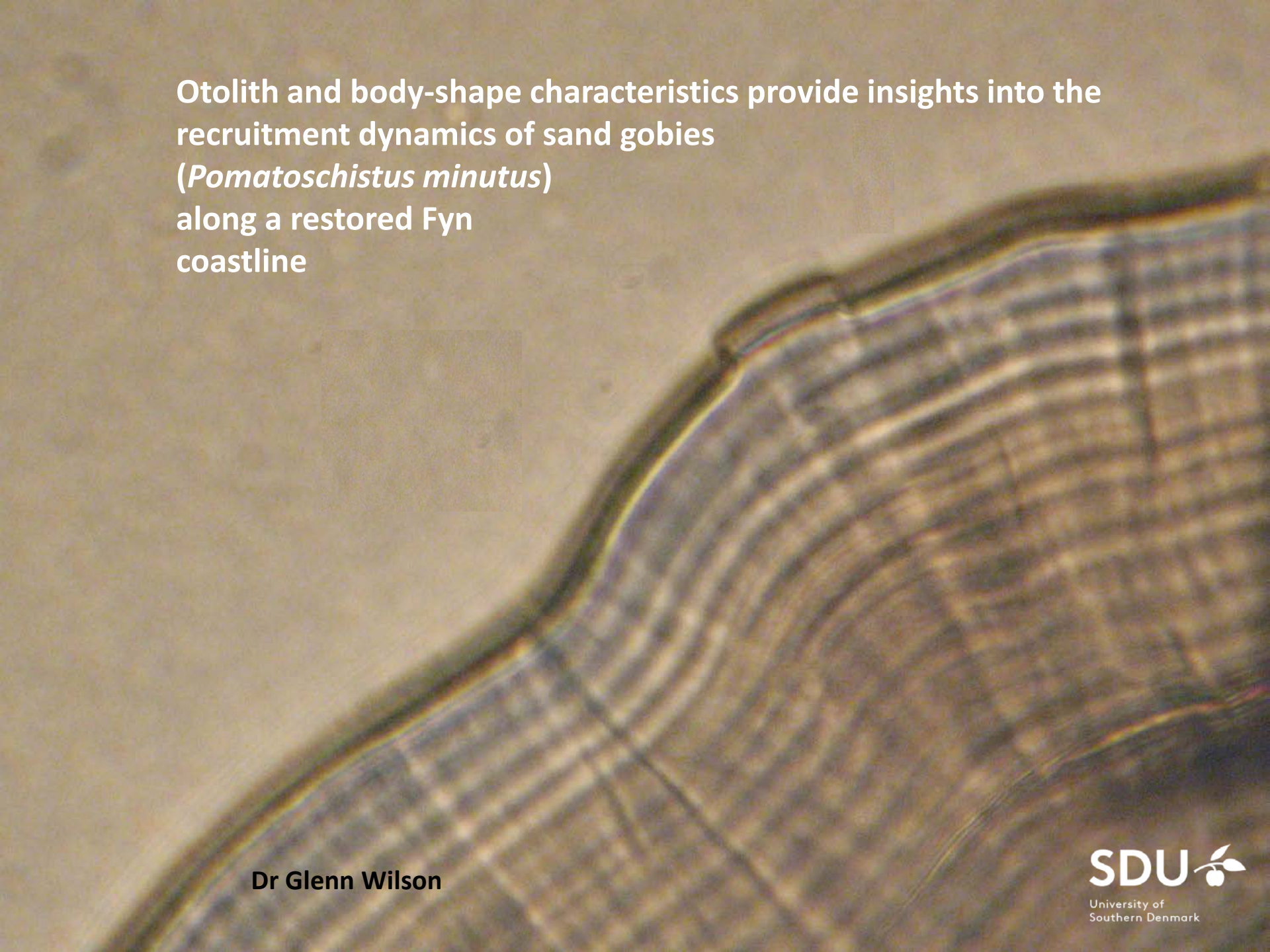
Otolith and body-shape characteristics provide insights into the recruitment dynamics of sand gobies (*Pomatoschistus minutus*) along a restored Fyn coastline



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Introduction

Fisheries or habitat restoration – recruitment is a key underpinning process

But we need to understand the timing of key early lifecycle points, to understand what the critical regulatory factors are

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Introduction

Conventional to approach is to identify these in terms of coarse habitat shifts or external development

But other tools may provide additional insights

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But why sand gobies?

We know something of their general life history
- spawn inshore
- larvae hatch at ca. 2.5 mm, after 10-15 days
- larval metamorphosis completed at around 9-10 mm, but remain pelagic until ca. 17-18 mm

- shift offshore for winter, returning in early to mid Autumn

Very abundant
- ought to be a key species with which to establish how fishes contribute to the Baltic/Wadden coastal ecology

But, there is still lots that we don't know – particularly during early life history
- direct descriptions of their age – growth
- the timing of key developmental transition points

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Study objectives

How much morphological change occurs during sand goby early life history? When are the significant transition points in their early development?

1. Establish direct relationships between age and body-size;

2. Examine how early body shape varies with body size; and

3. Examine whether the timing of any shifts in body shape are mirrored in development of the otoliths

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Study methods

1. Monthly sampling at Gyldensteen Lagoon with a fine beach-seine net, May to September 2018;

2014 2018

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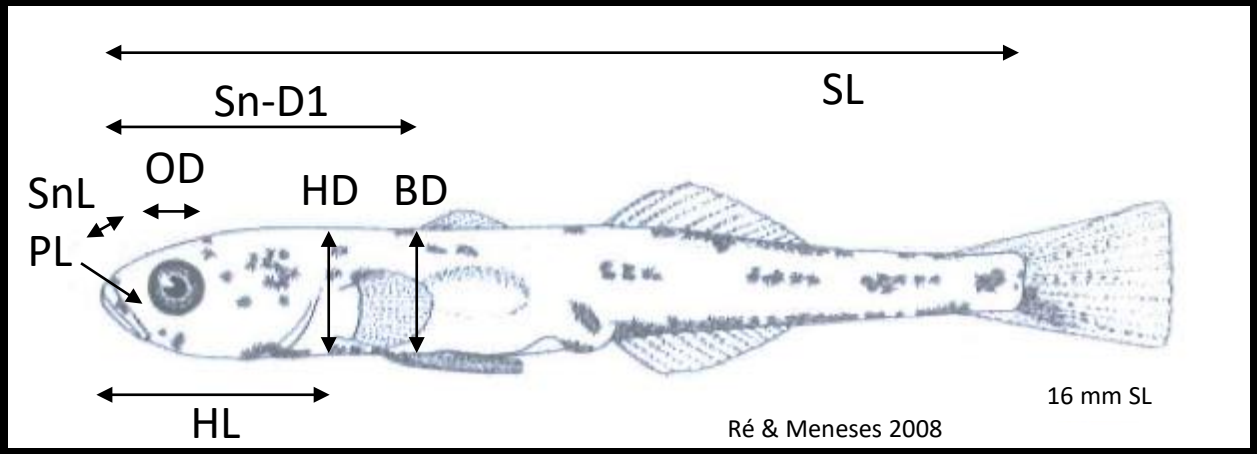
Study methods

2. Measurements of head and body dimensions recorded from fish of 3.6 to 32 mm SL;



Ré & Meneses 2008

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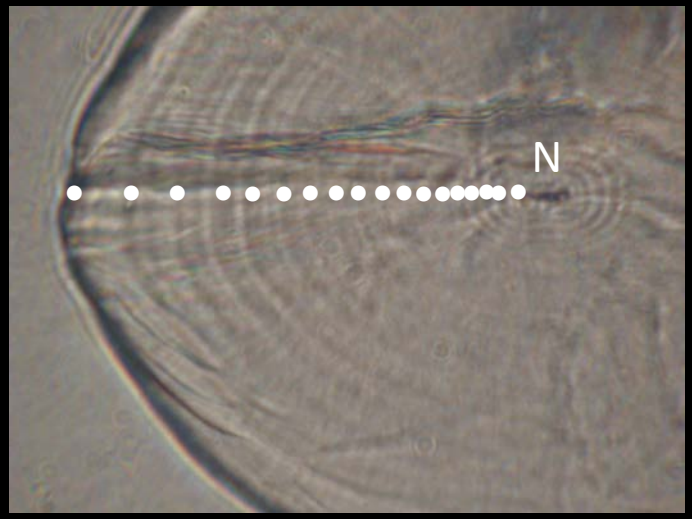
Study methods

3. Sagittal otoliths were removed and mounted, then measured, photographed, and increment counts obtained (May to July fish to date).



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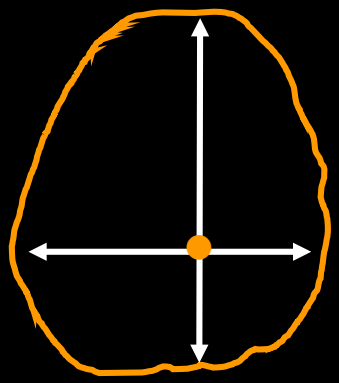
OL length (µm)

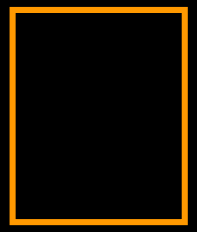


AR aspect ratio

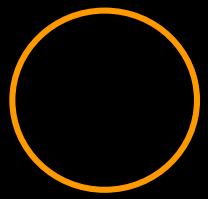
OW width (µm)

OP perimeter (µm)

OA area (µm$^{2)}$



ORect rectangularity



ORoun roundness

OSin sinuosity

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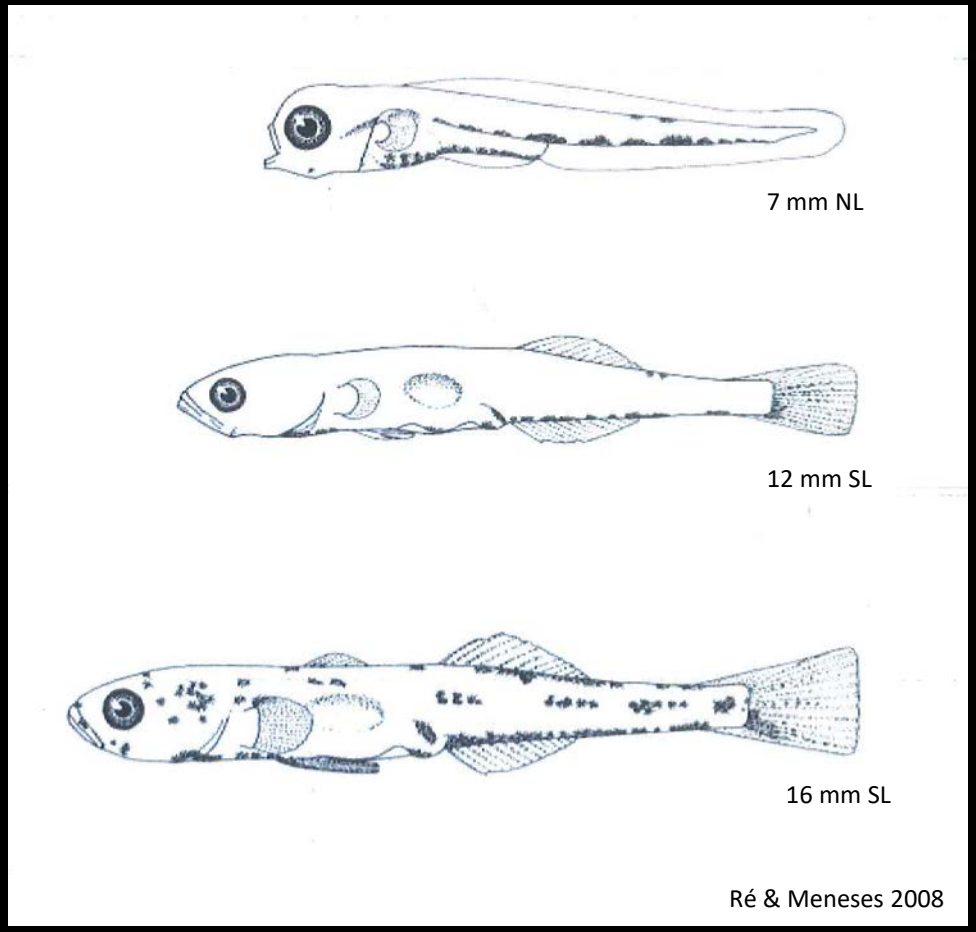
How does body shape vary with early growth?



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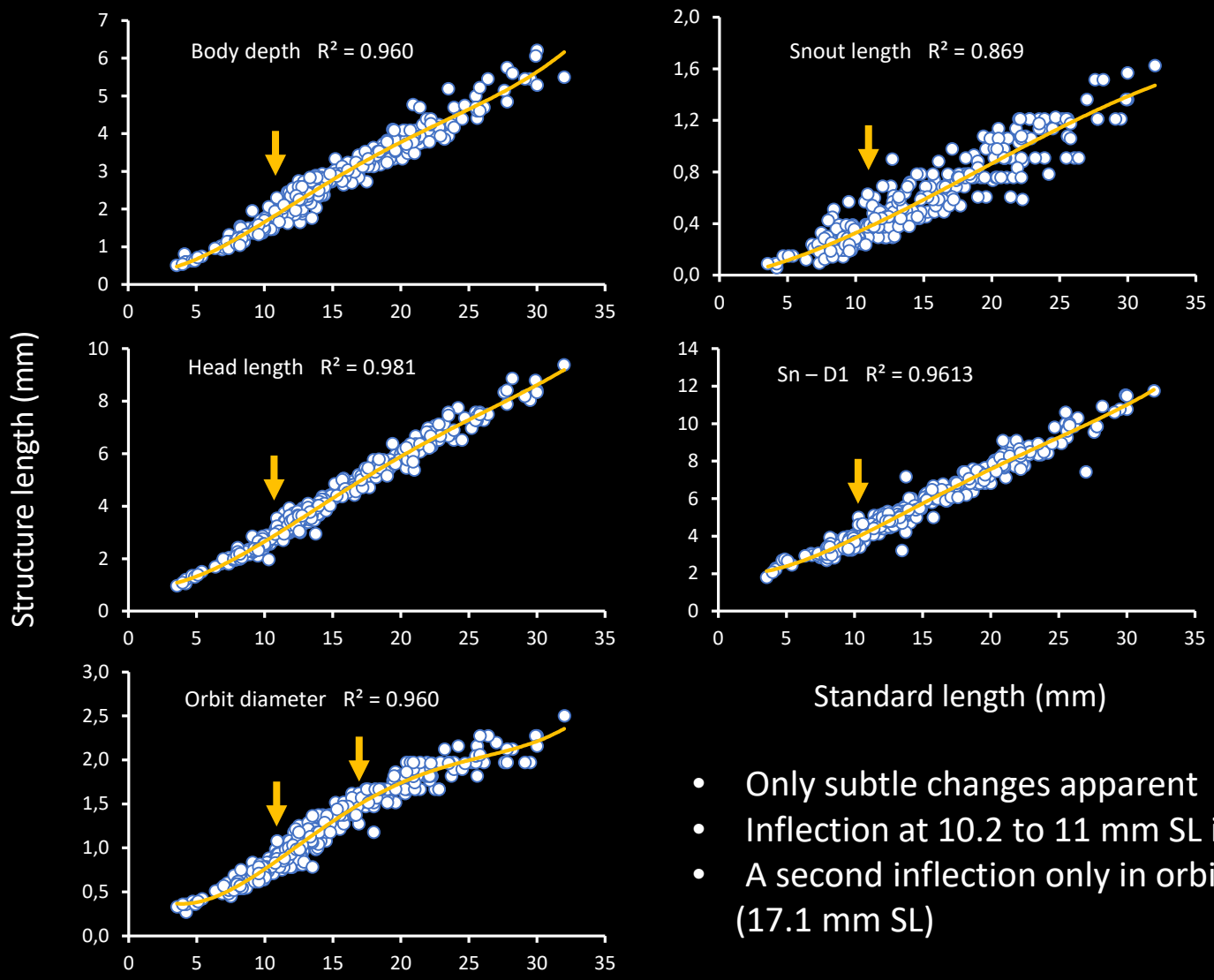
How does body shape vary with early growth?



- Only subtle changes apparent
- Inflection at 10.2 to 11 mm SL in all characters
- A second inflection only in orbit diameter (17.1 mm SL)

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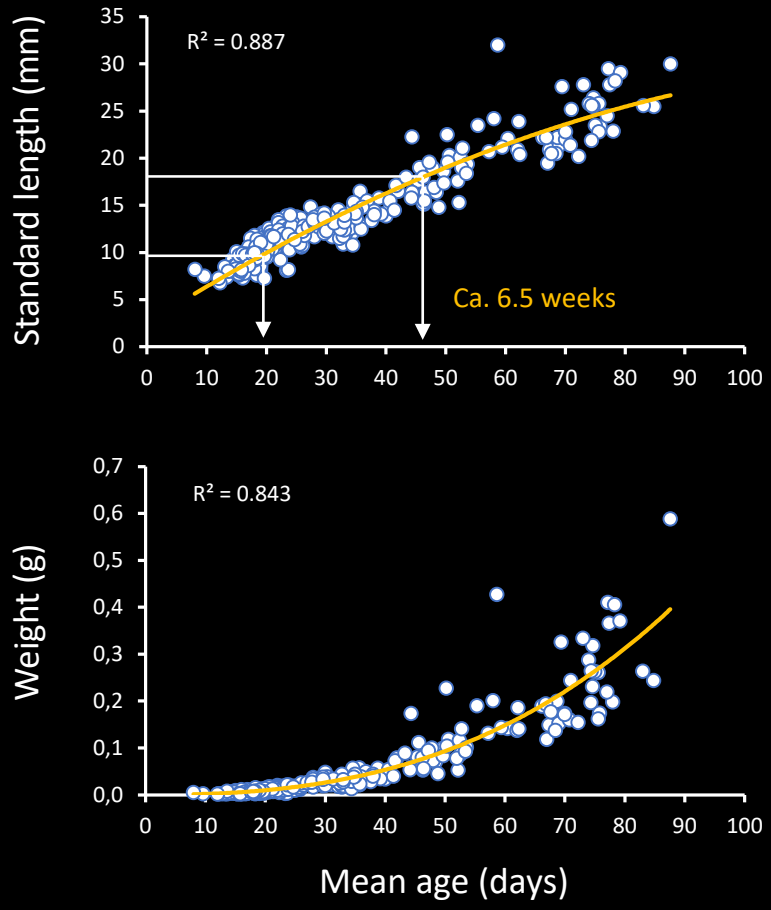
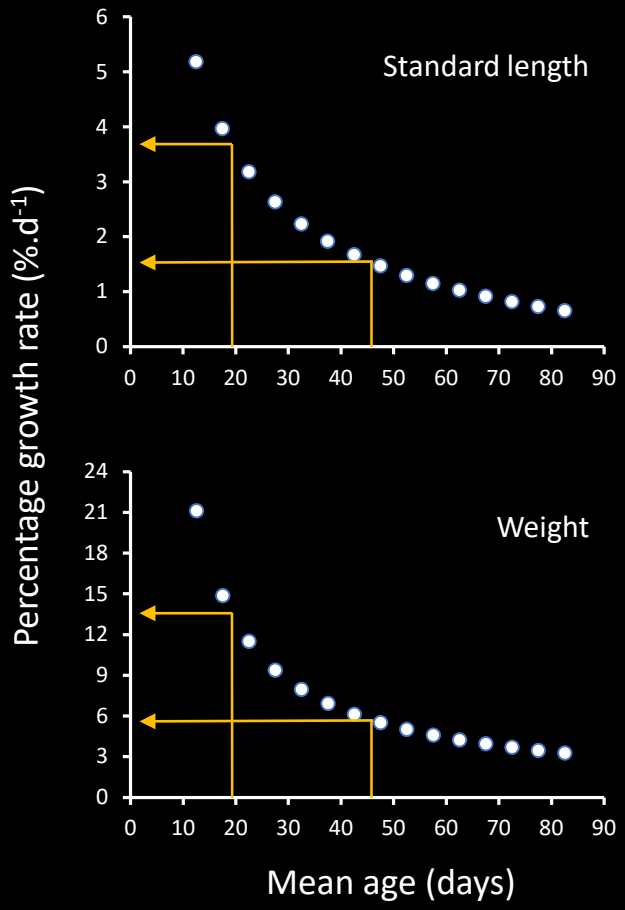
But what do otolith characteristics reveal?

Early somatic growth is quite rapid





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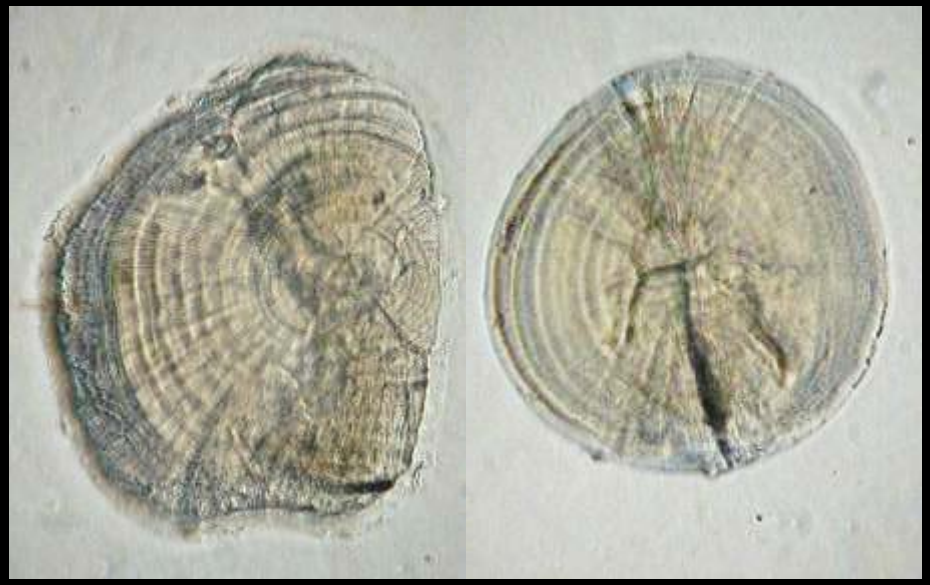
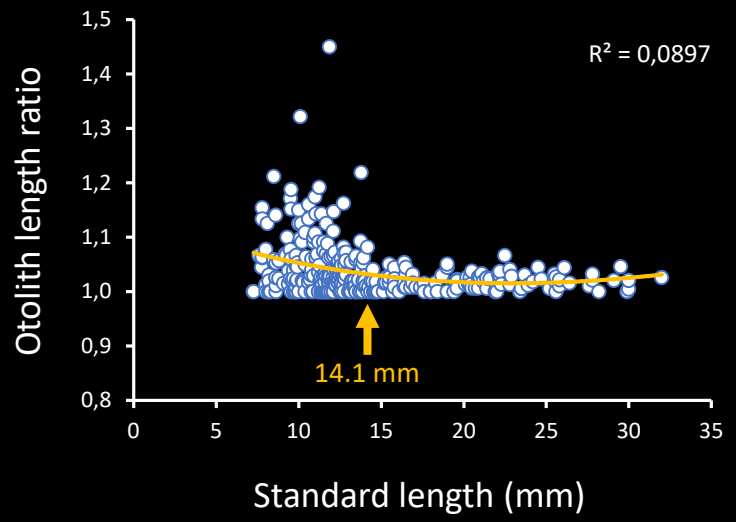
But what do otolith characteristics reveal?

Lateral variation can be substantial





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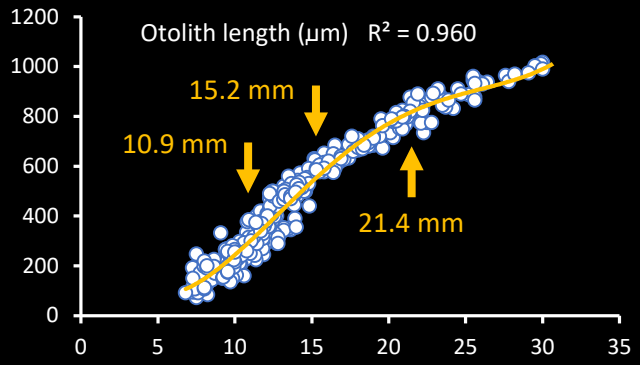
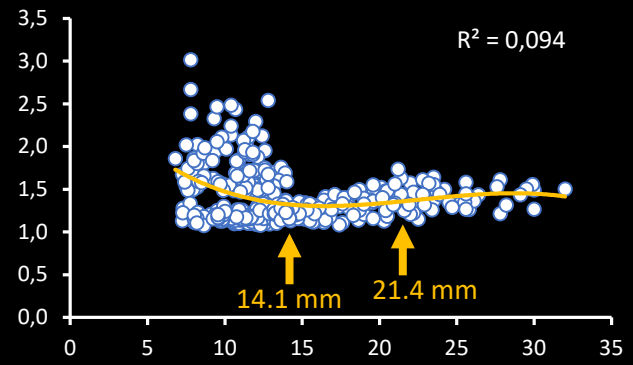
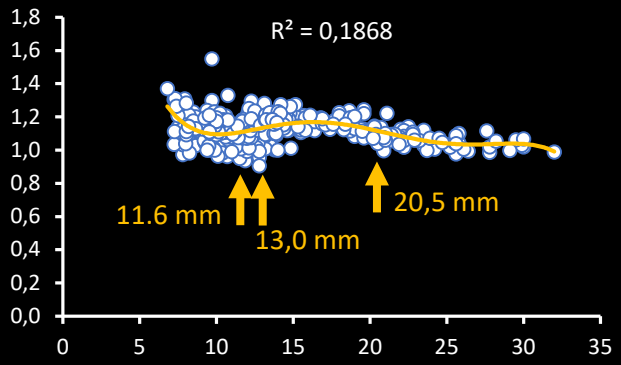
But what do otolith characteristics reveal?

Otolith shape varies with early growth







Standard length (mm)

Standard length (mm)

- Multiple inflections apparent, following transition to both pelagic juvenile and demersal juvenile stages
- Sharp decrease in variation among fish at ca. 14 mm

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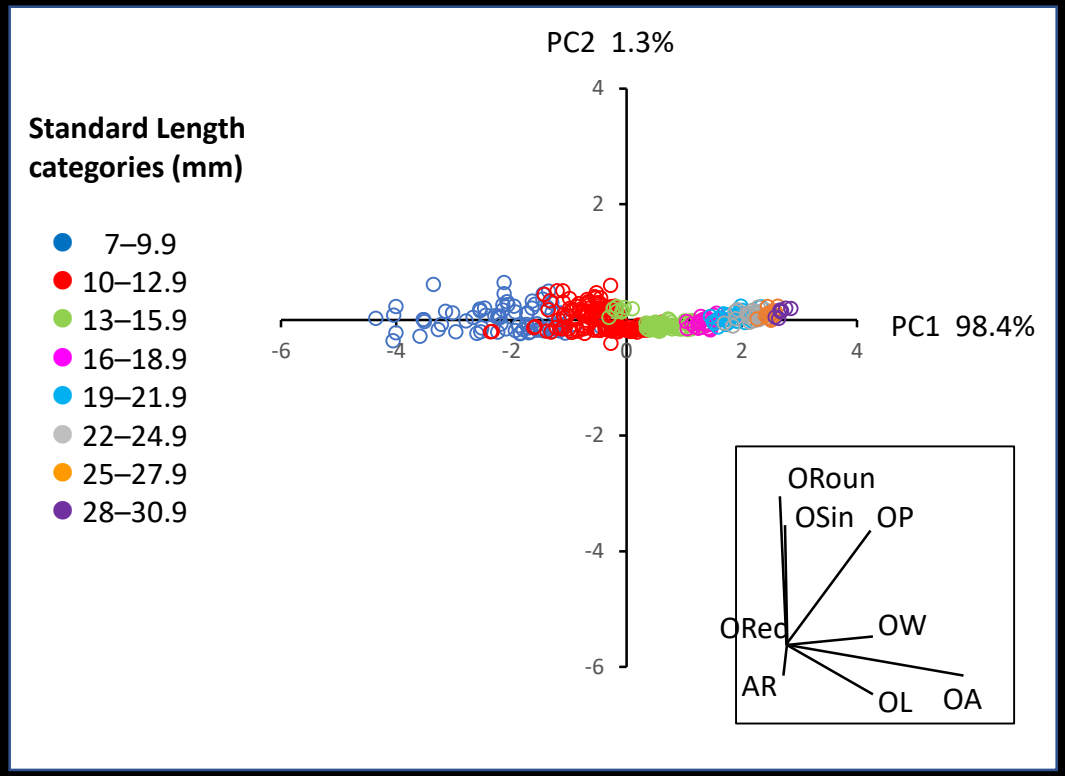

- Greater shape variation among otoliths of smaller fish (PC2)
- Mostly characterized by roundness, sinuosity and perimeter

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So what?

Recruits appear driven by a short lifespan – brief onshore interval (3–5 months)
– annual longevity

- Rapid somatic growth, with minimal external change
- BUT, metamorphosis appears to be a protracted process

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Developmental complexity particularly obvious in the otoliths

- Substantial lateral variation within individuals
- Transition points in growth and shape-change shortly after both the shift to the juvenile phase and to the demersal environment, but also at points in-between

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Extended pelagic phase suggests a particular vulnerability to factors influencing the habitat quality of the coastal water column

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Thanks…

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