

Duiken als een vis

Max Janse

Duiksymposium
25 September 2025



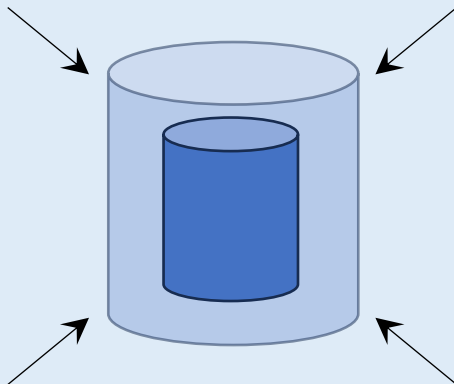
Introduction

- Primaire vis/duiker ziekten
- Secondaire vis/duiker ziekten
- Zwemmen
- Kijken

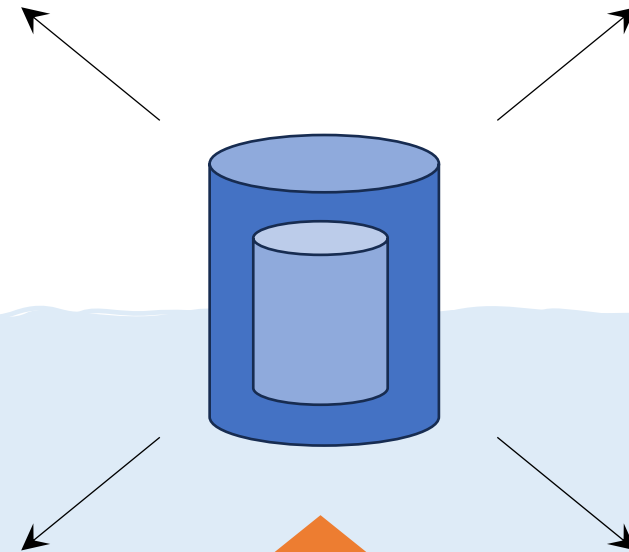
'Primaire duikersziekten' – Barotrauma

Wet van Boyle
 $p \times V = C$

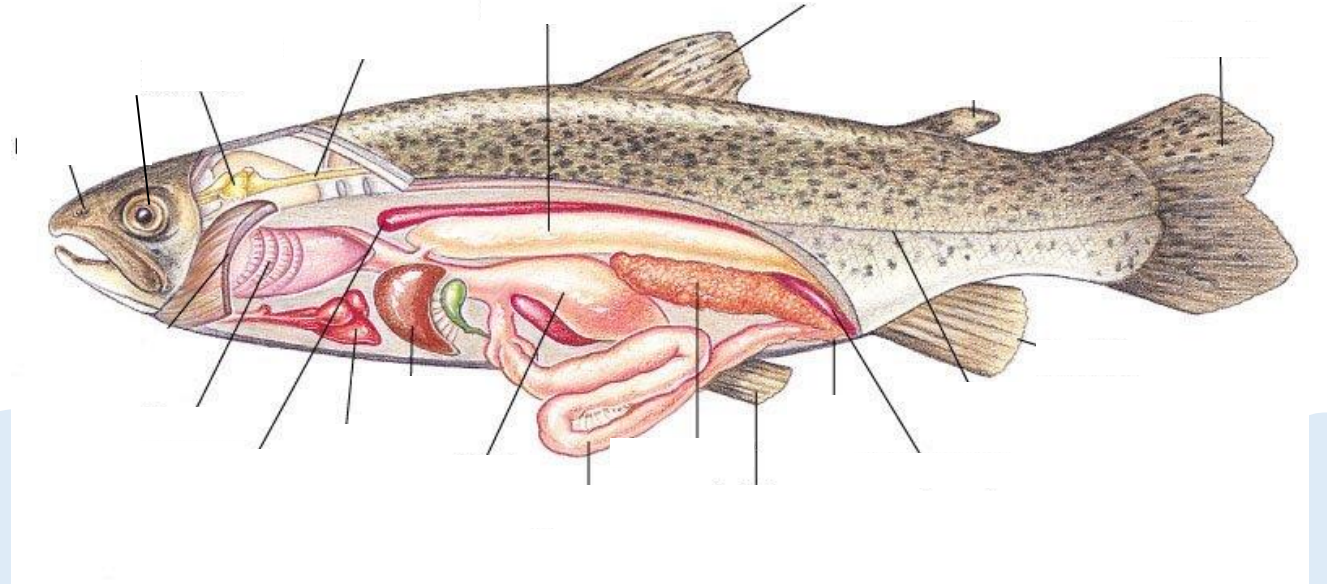
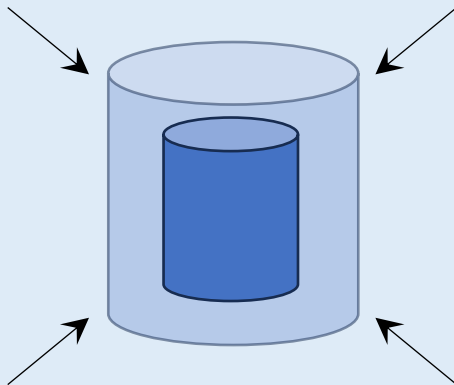
Onderdruktrauma
Squeeze



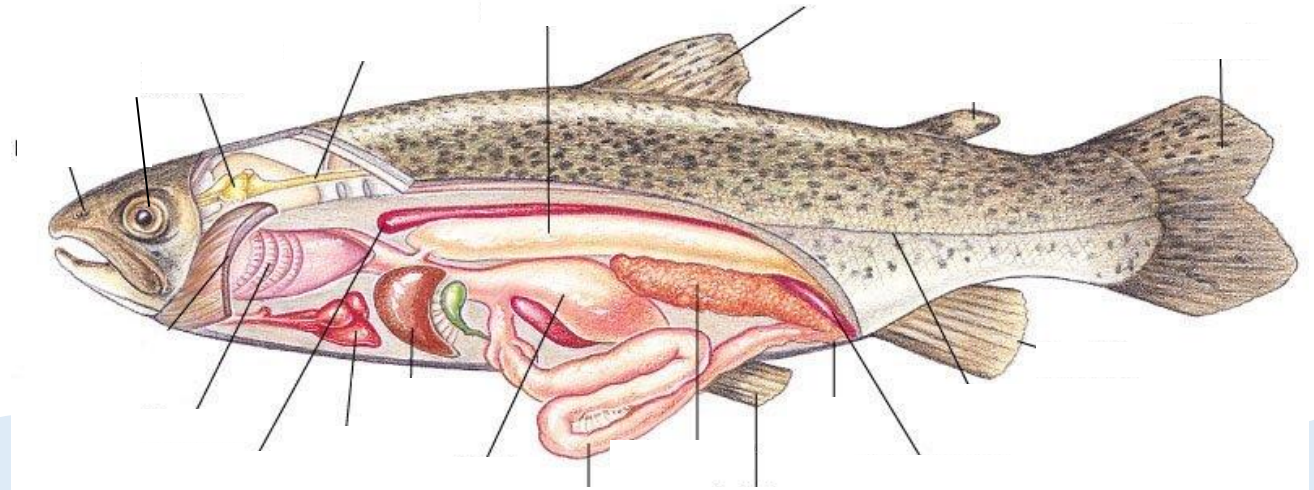
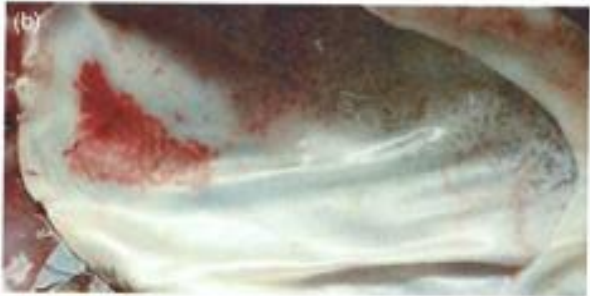
Overdruktrauma



'Primaire visziekten' - squeezezen



'Primaire visziekten'



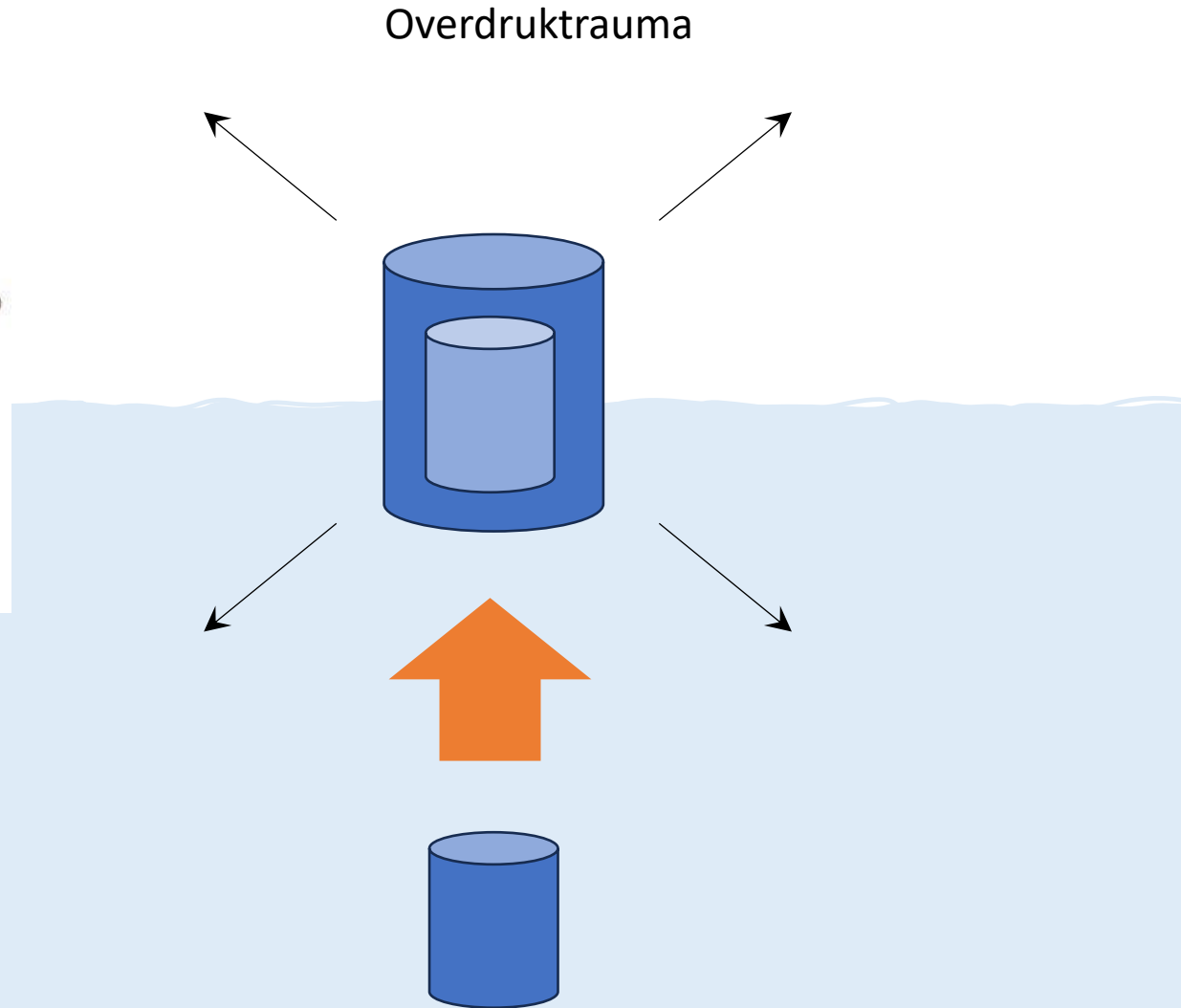
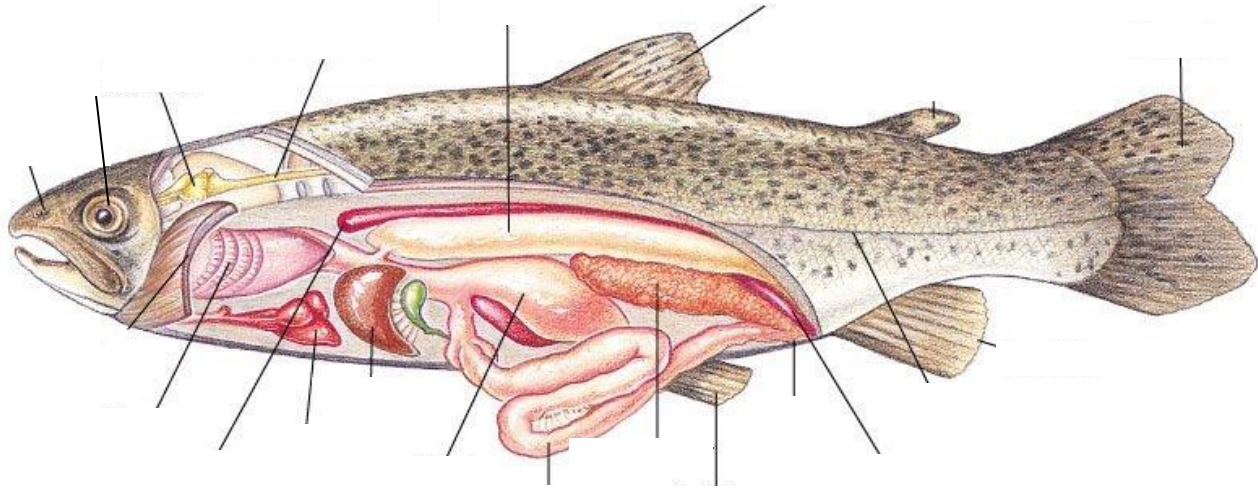
©Hadfield and Clayton, 2021

“Negative buoyant”- zinken:

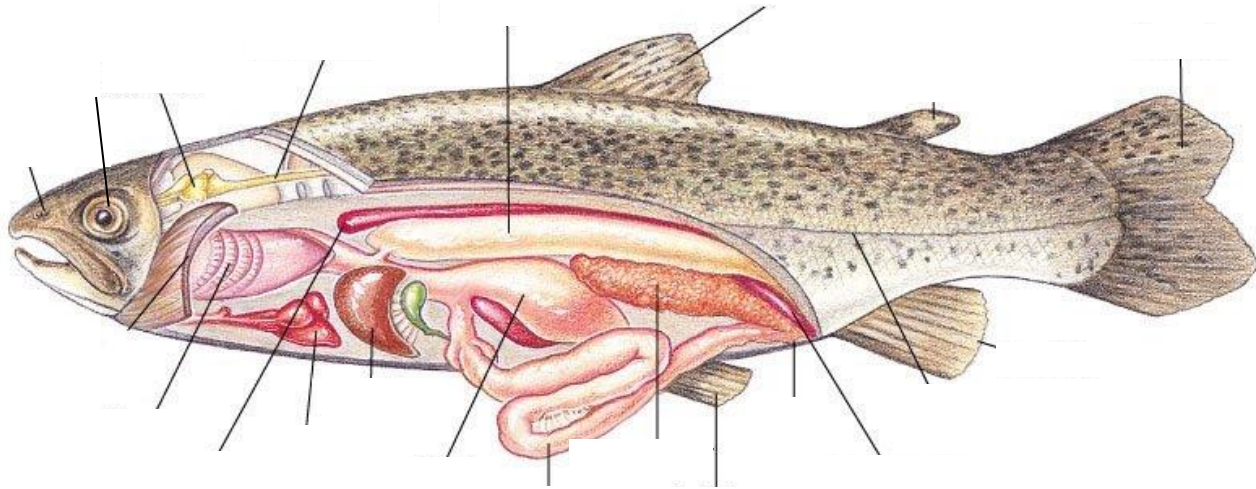
- Normaal voor bodem vissen (geen zwemblaas)
- Lucht in maag (zandtiger haai)
- Zwemblaas ziekte
- Larvale issues
- ...



'Primaire visziekten' - overdruktrauma



‘Primaire visziekten’

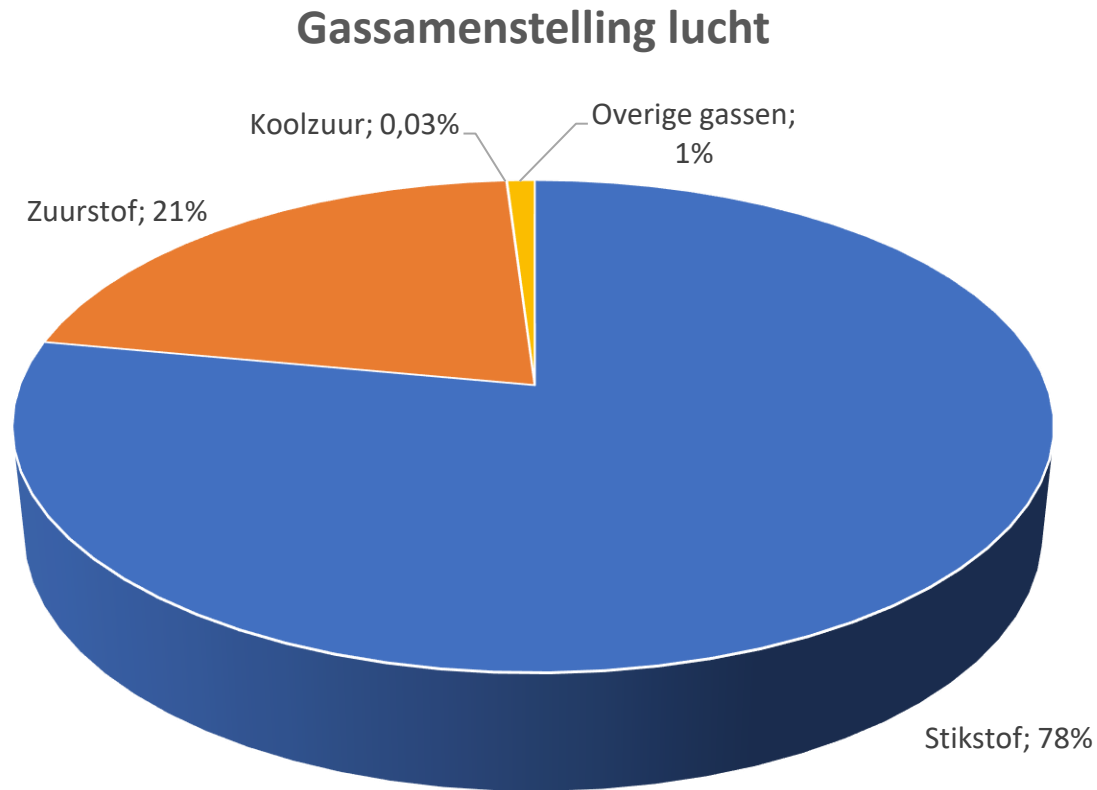


“Positive buoyant” - drijven:

- Infectie
- Snelle diepte verplaatsing
- Lucht in maag
- ...

Secundaire vis/duikers ziekte

door te hoge of lage partiele gasdruk



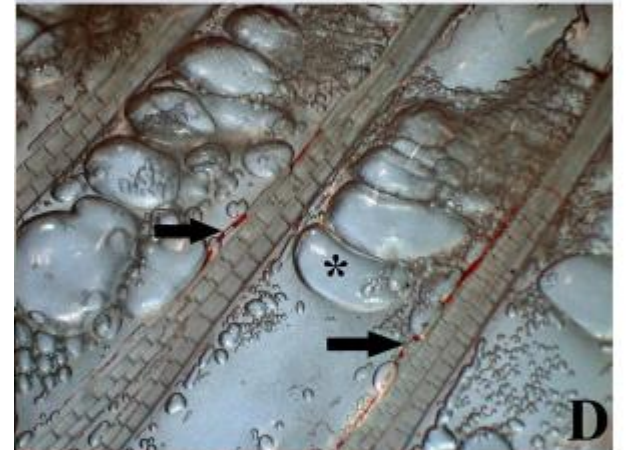
Gassamenstelling water

?

- Oplosbaarheid in water
- Temperatuur
- Zoutgehalte
- Druk
- Biologische activiteit
- ...

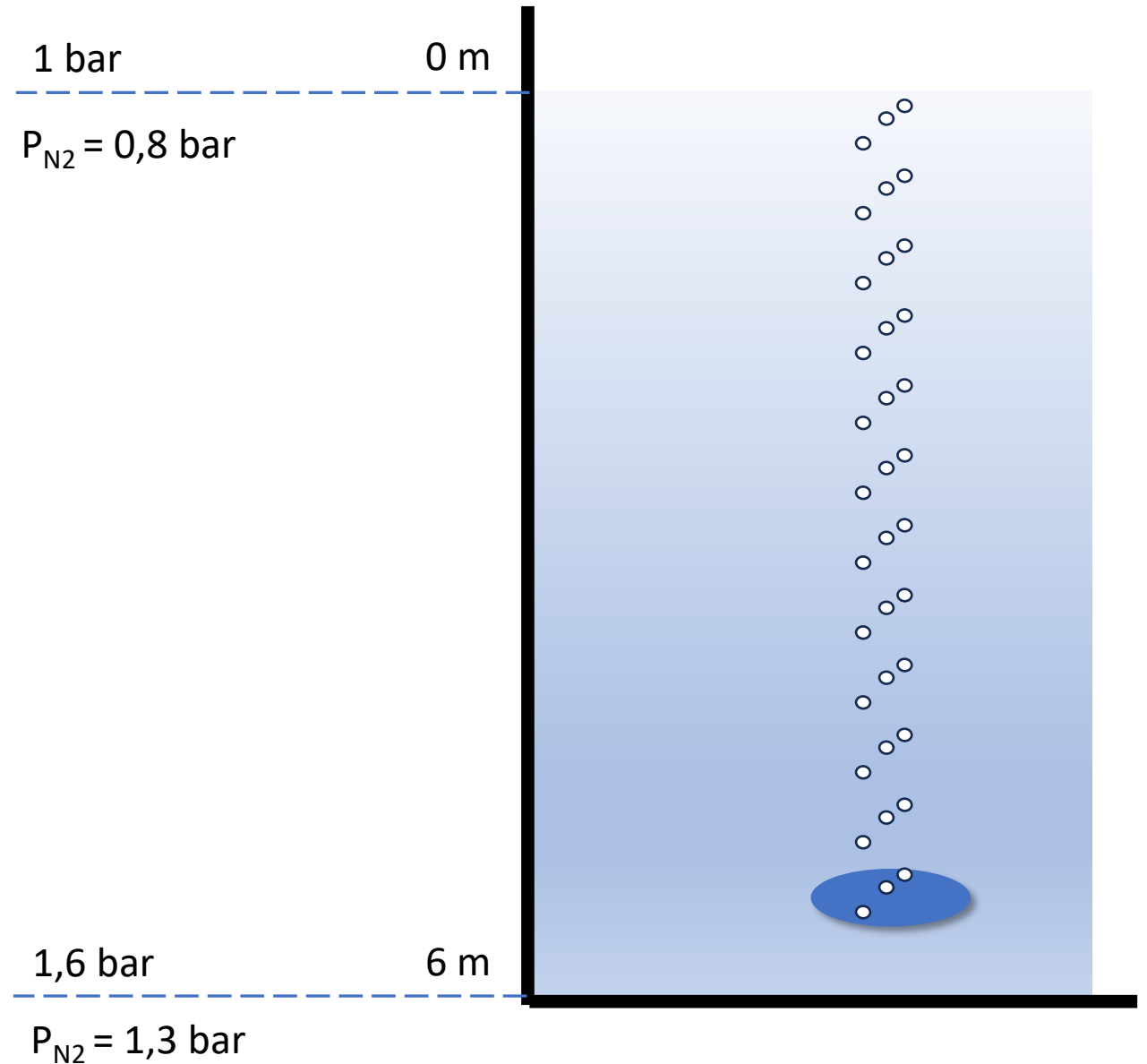
Partiële gasdruk problemen in vis

- Gas in vinstralen
- Bloedvat problemen
- Zwemblaas problemen
- Gas in ogen
- Kraakbeenvissen krijgen problemen met lever
- ...



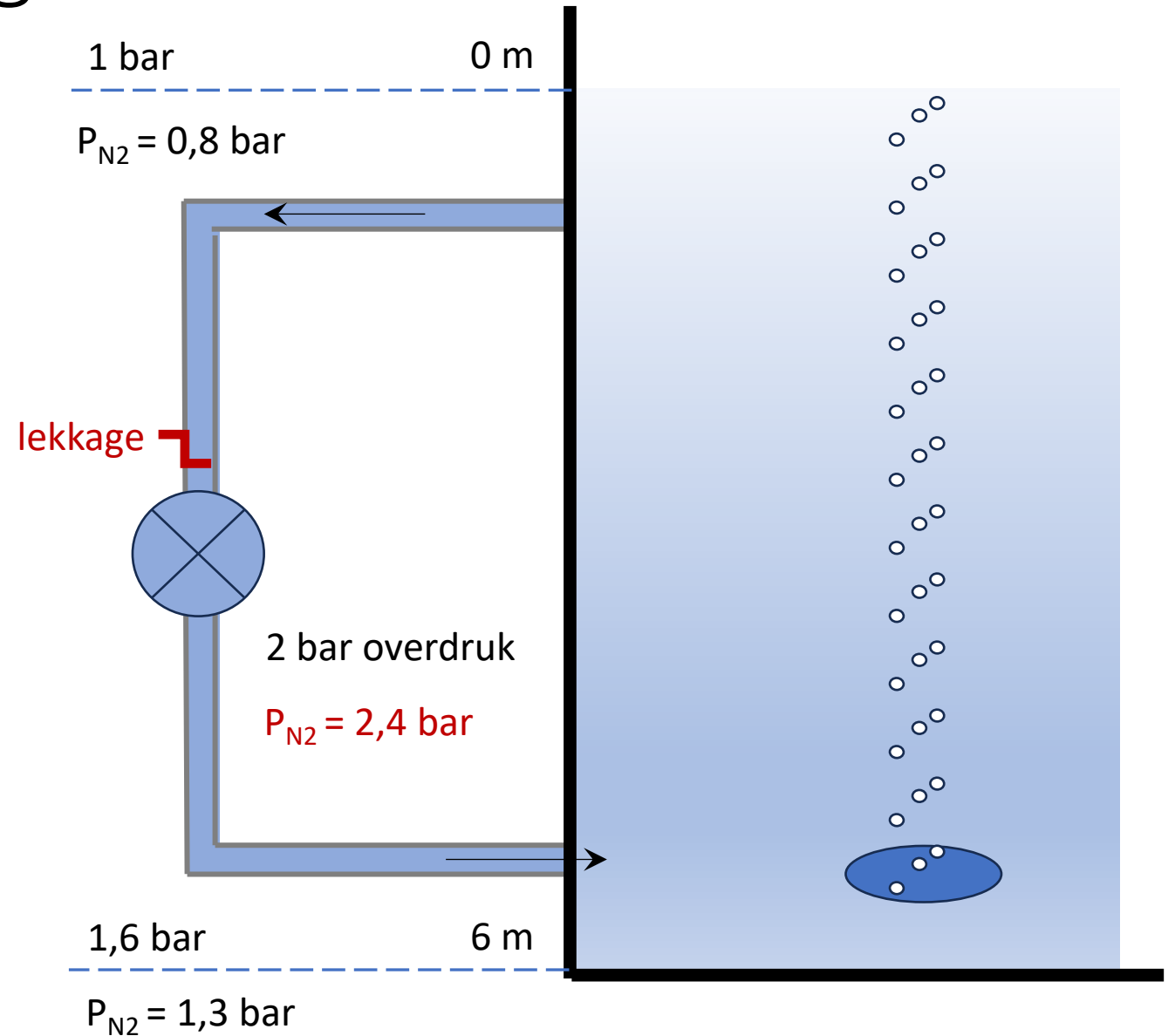
Case: Gasbellen in ogen

Burgers' Zoo



Case: Gasbellen in ogen

Burgers' Zoo



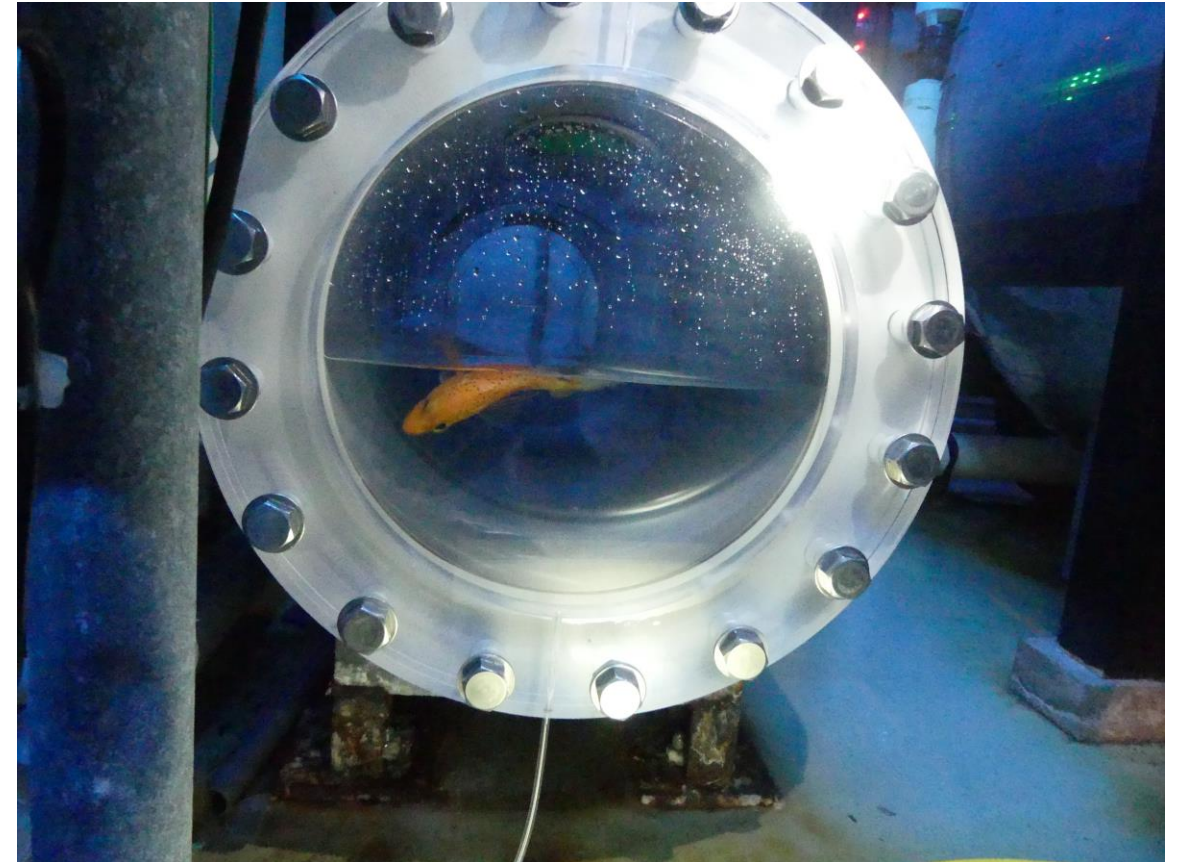
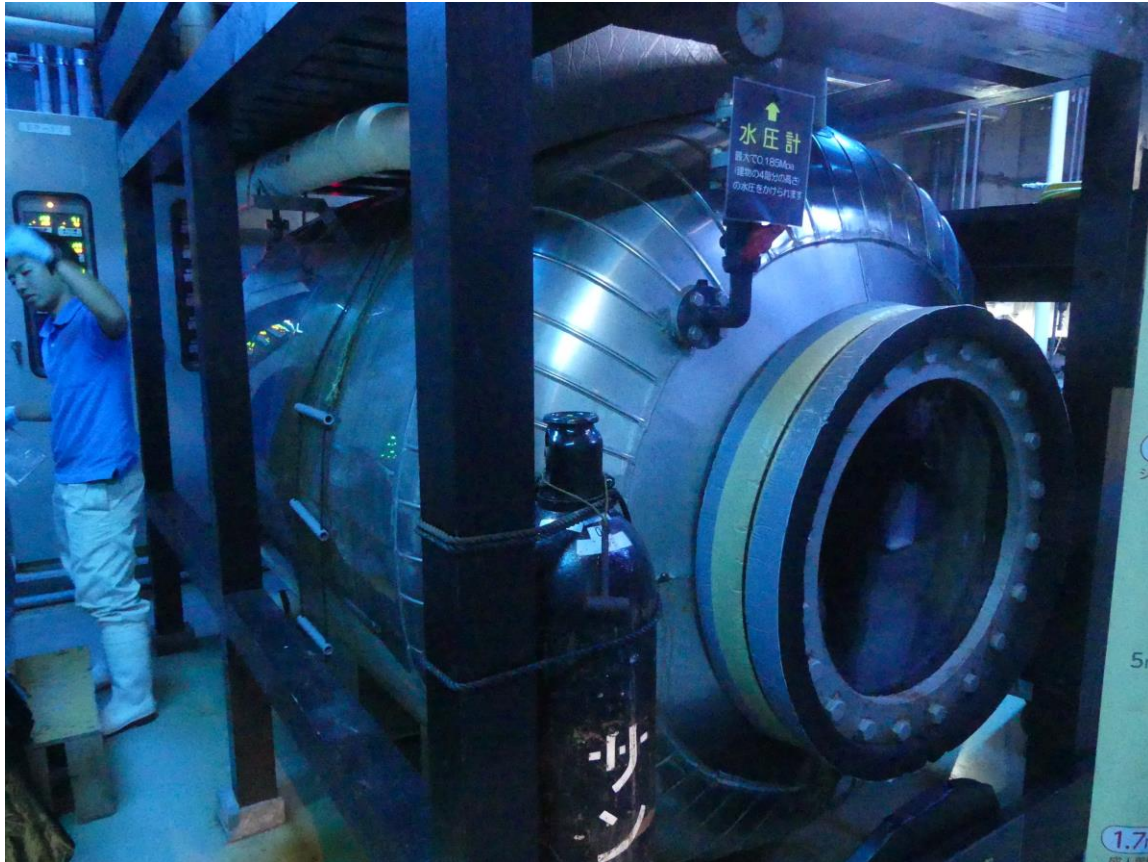
Case: Compressietank

Burgers' Zoo



Compressie tank

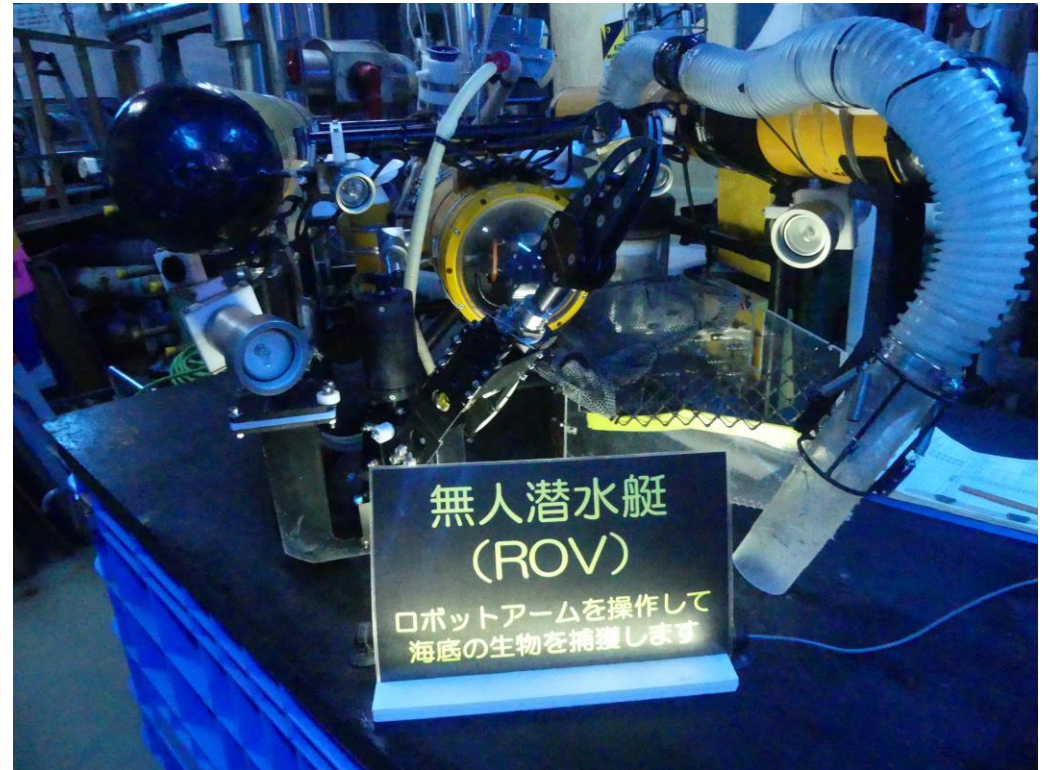
Diepzeevis - Okinawa Aquarium, Japan



1 tot 2,8 bar
Duur maximaal 1 week

ROV

Okinawa Aquarium - Japan

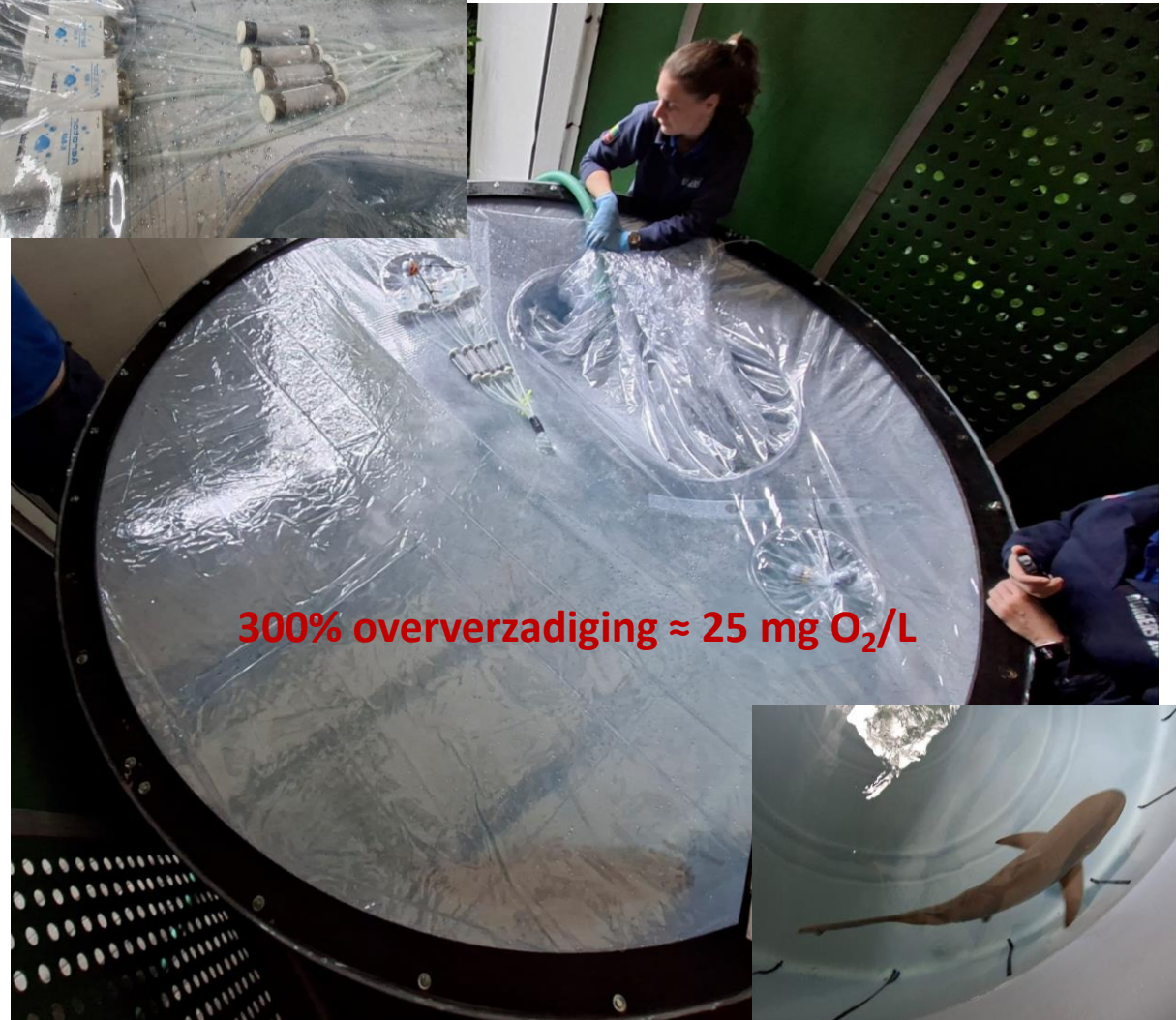


Hypoxia

zuurstoftekort in weefsels



Zuurstofvergiftiging

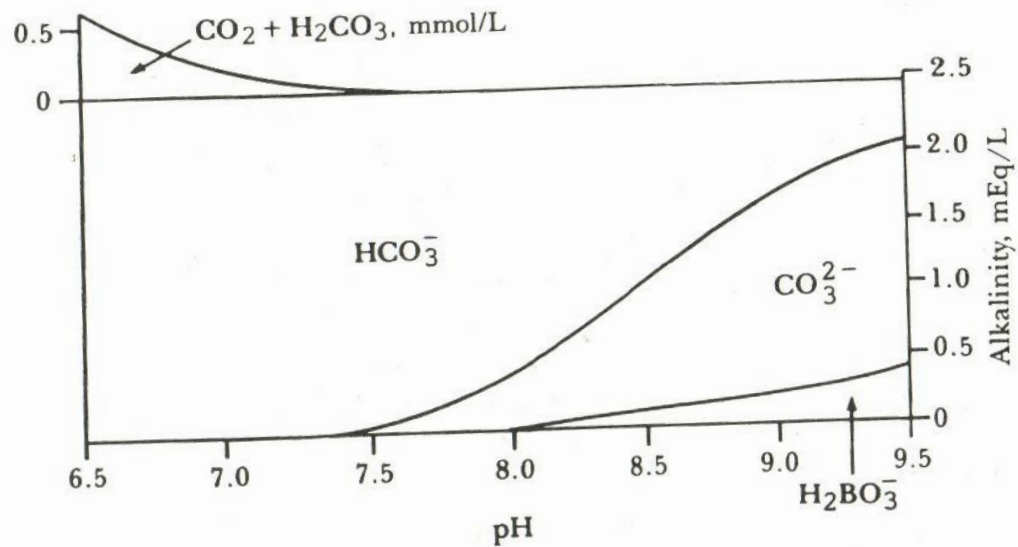


Hypercapnie

verhoogd gehalte aan
koolstofdioxide (CO_2) in
het bloed

$\text{pH}_{\text{zeewater}} = 8,2$

Buffercapaciteit = 2,5 mEq/L



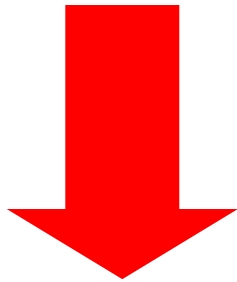
Vrijzwemmende haaien

- Zwemmen
24 uur
 - Ademhaling
 - Bloed
circulatie

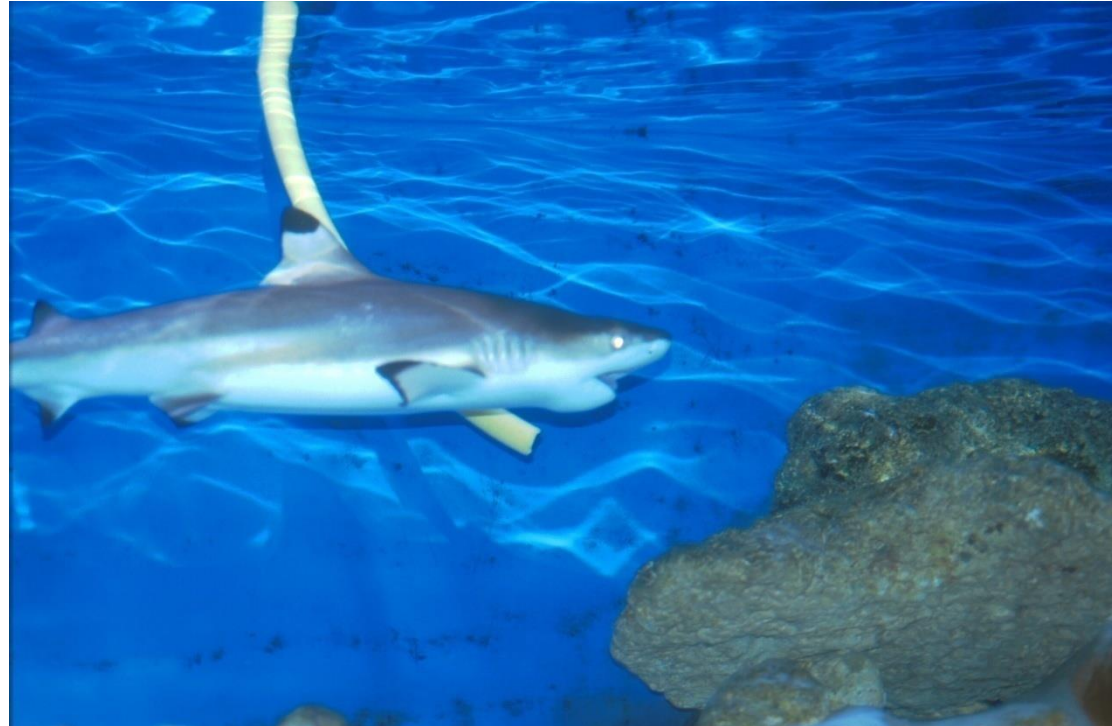


Energie probleem

Uitputting

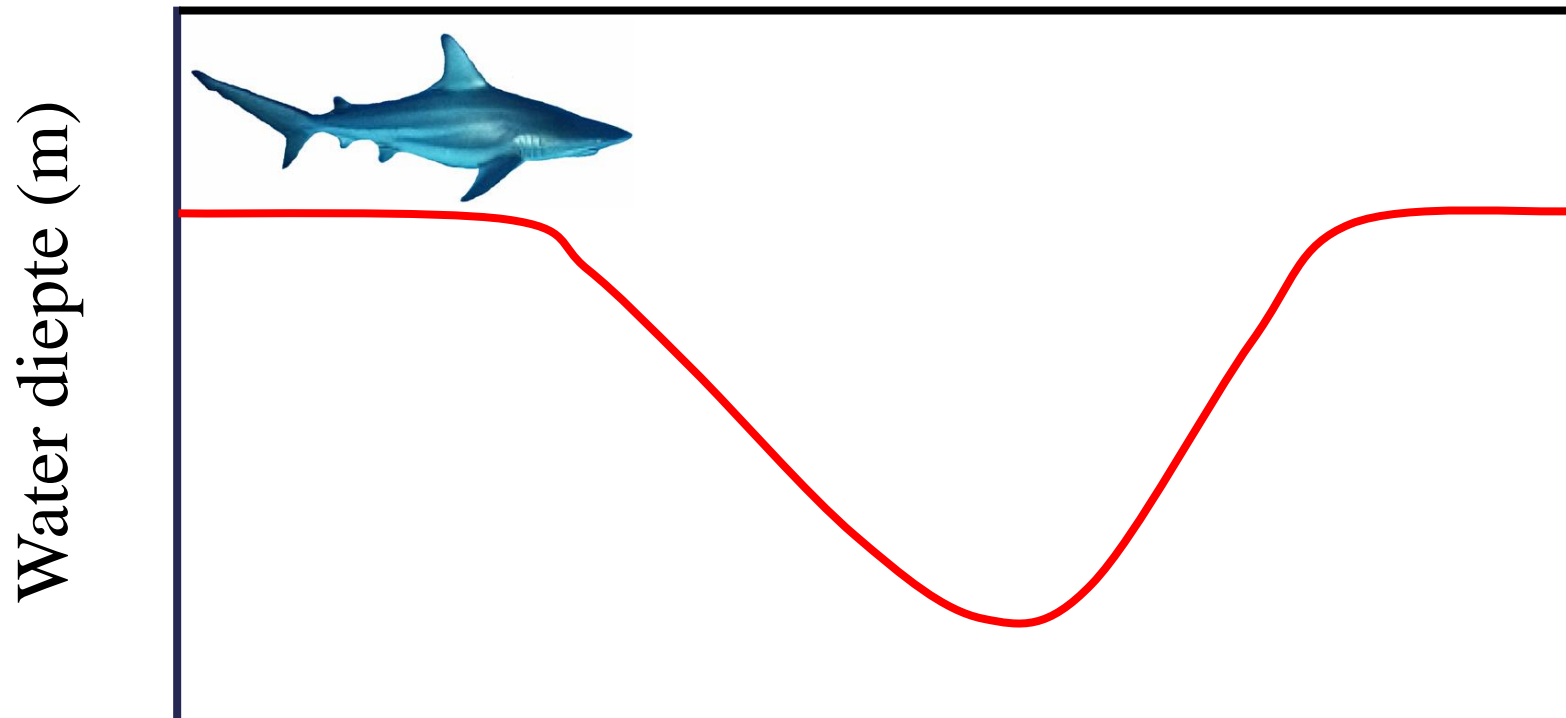


R.I.P.



Zwempatroon

< cruising > < glijden > < bijkomen > < cruising >



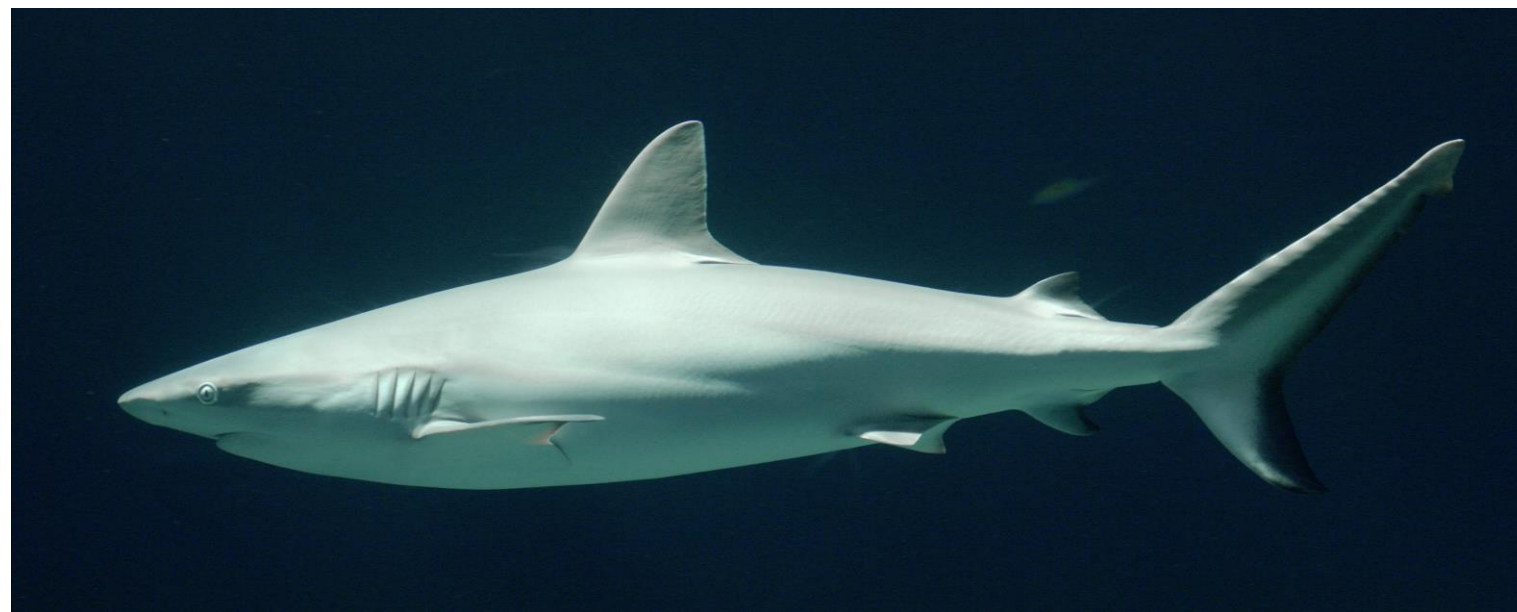
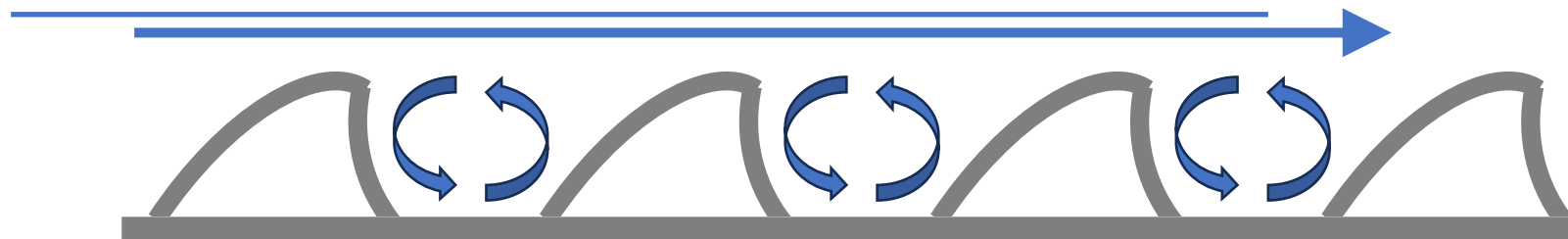
(Klay, 1977)



Huidtandjes

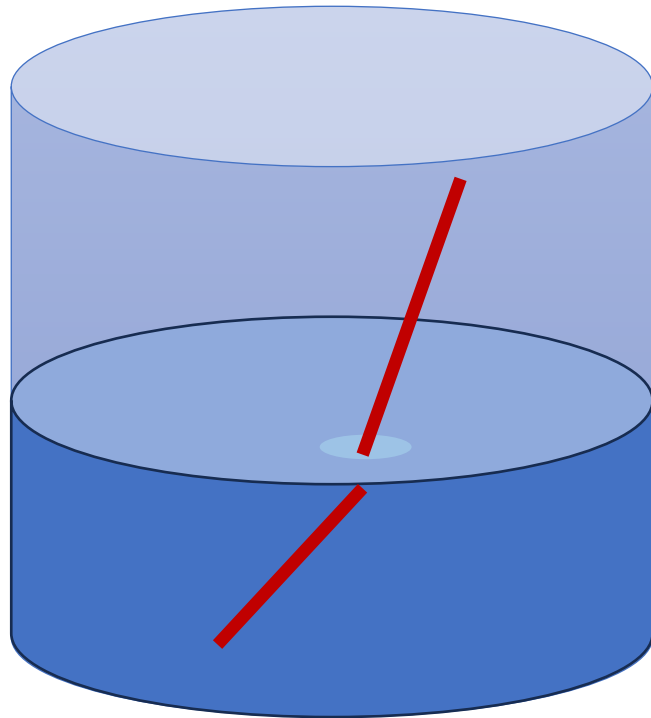


Huidtandjes



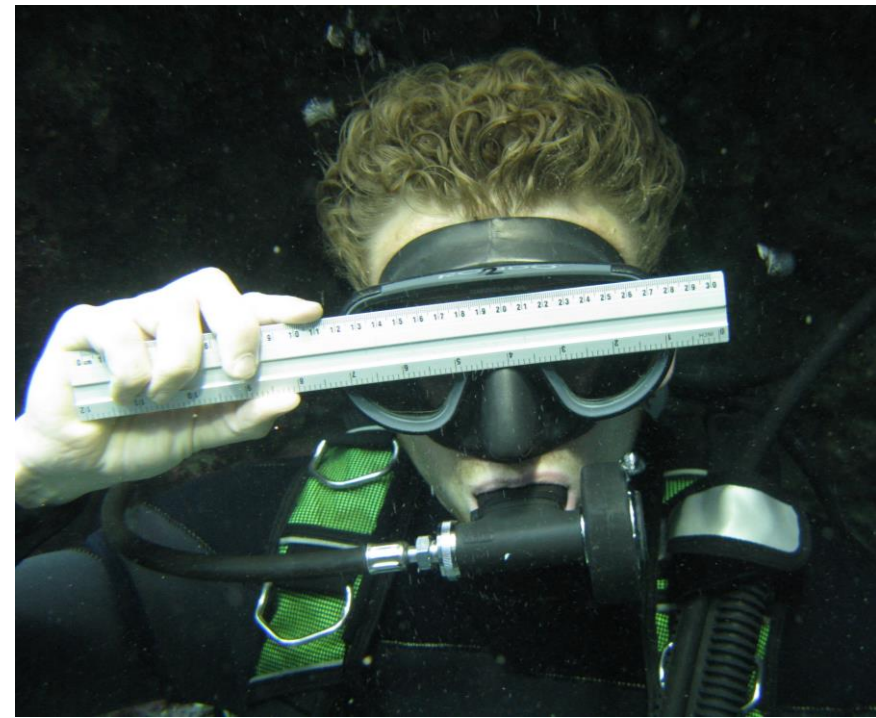


Zien onder water

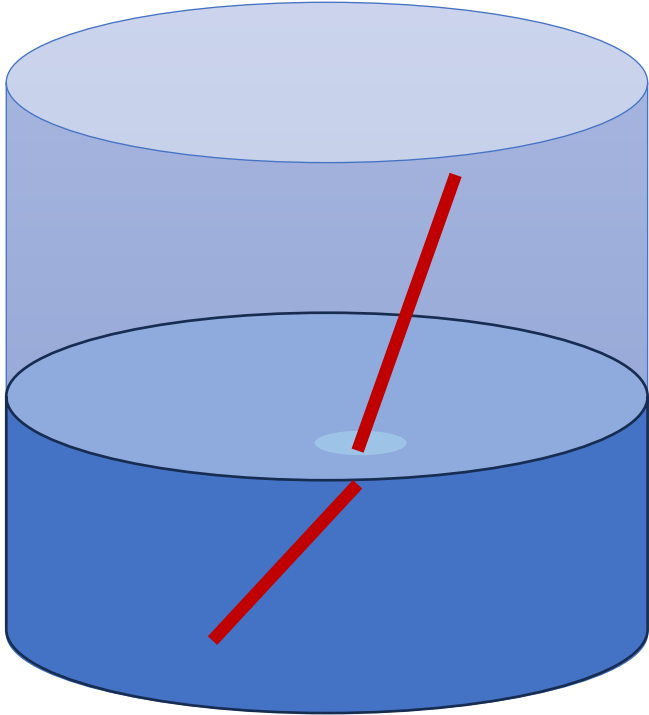


Brekingsindex lucht
1.0003

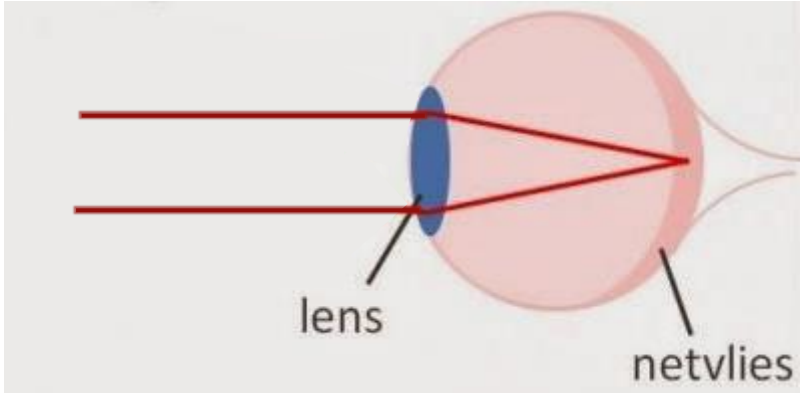
Brekingsindex water
1.333



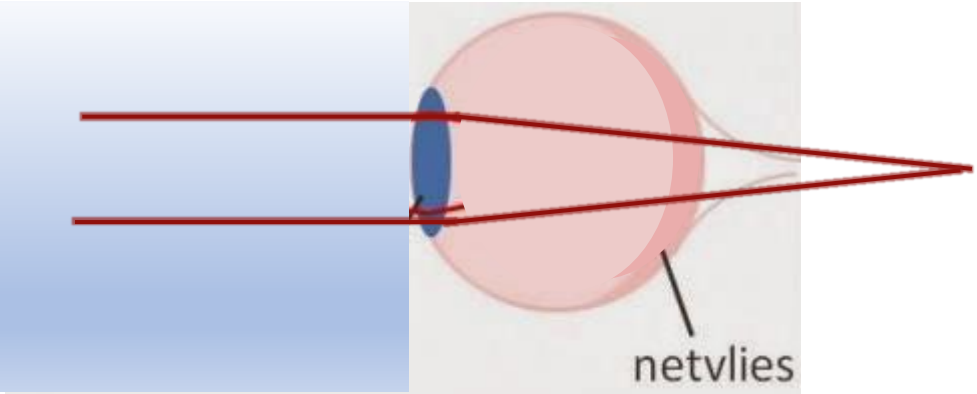
Zien onder water



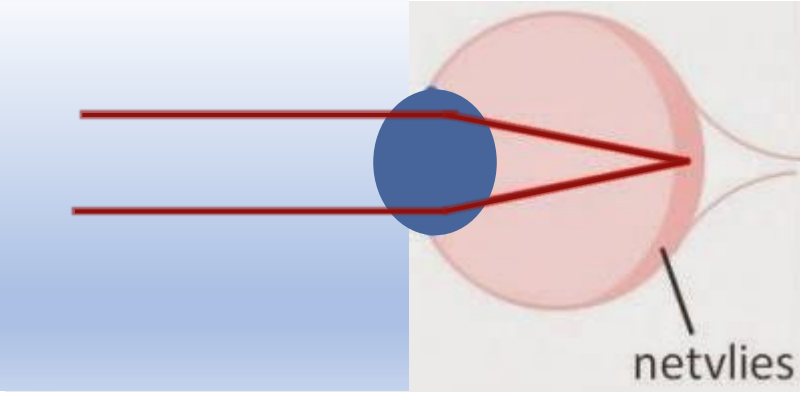
mens



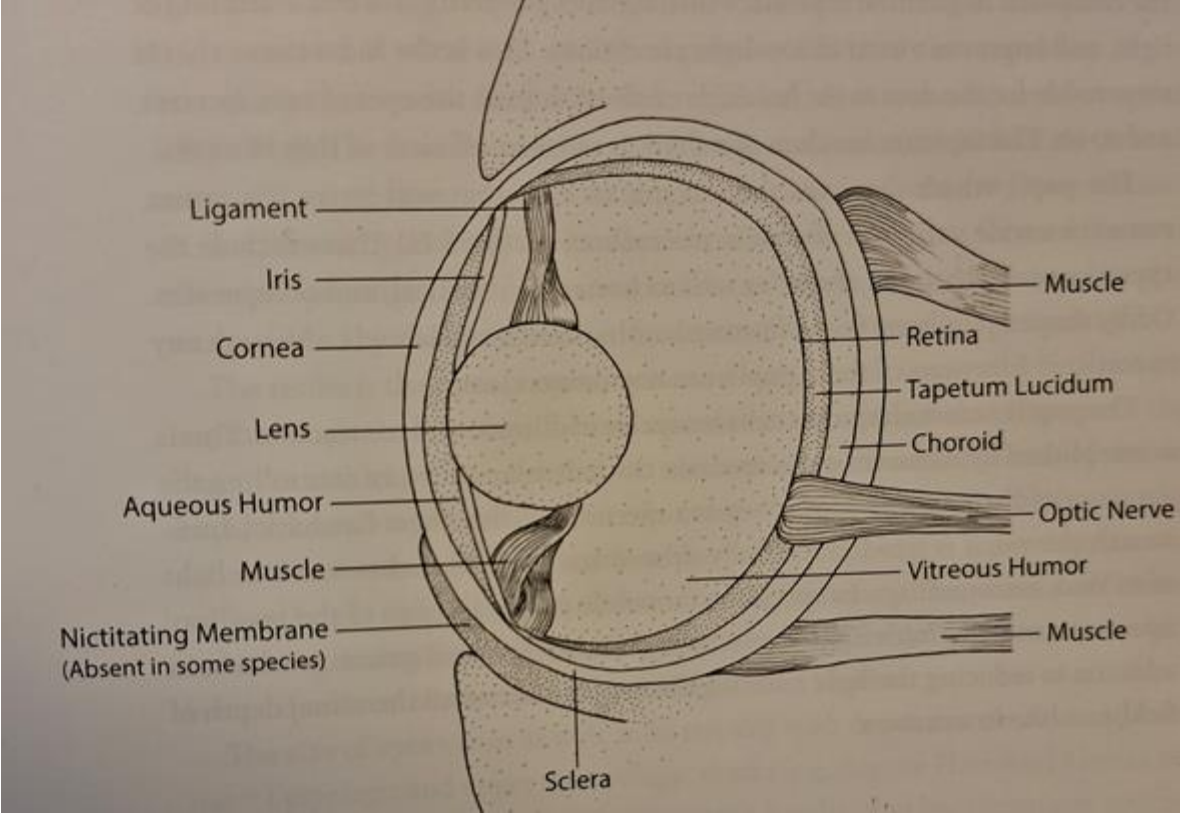
mens



vis



Zien onder water



©Hart et al., 2006; Com. in Fish 2:337-392.

“Derde oog” – pineal gland



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