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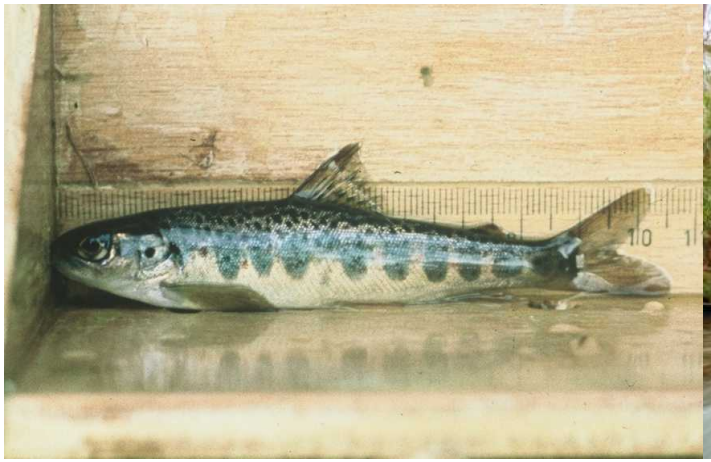
In search of a Conservation Limit for the Allier A. Salmon population: How and what for ?

Etienne Prévost

INRA - UMR Ecobiop

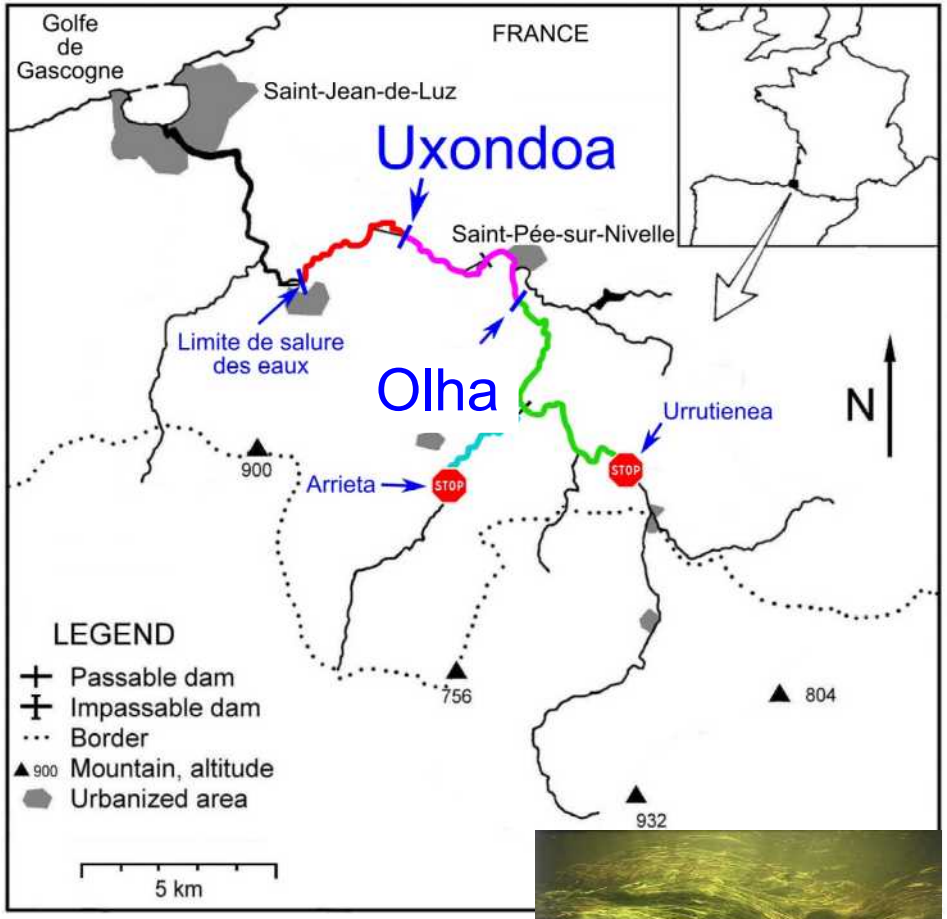
Saint-Pée-sur-Nivelle - France



NASCO Conservation Limit

- Conservation Limit is a Biological Reference Point
  - BRP: Abundance benchmark against which population status can be assessed
- Conservation Limit (CL): abundance level above which population should be maintained
  - If falling below, remedial management action should be taken
- NASCO CL: spawning escapement producing MSY
  - Derived from Stock-Recruitment analysis
- An illustration using the Nivelle R. data series

The Nivelle R.: the southernmost Index River in Europe



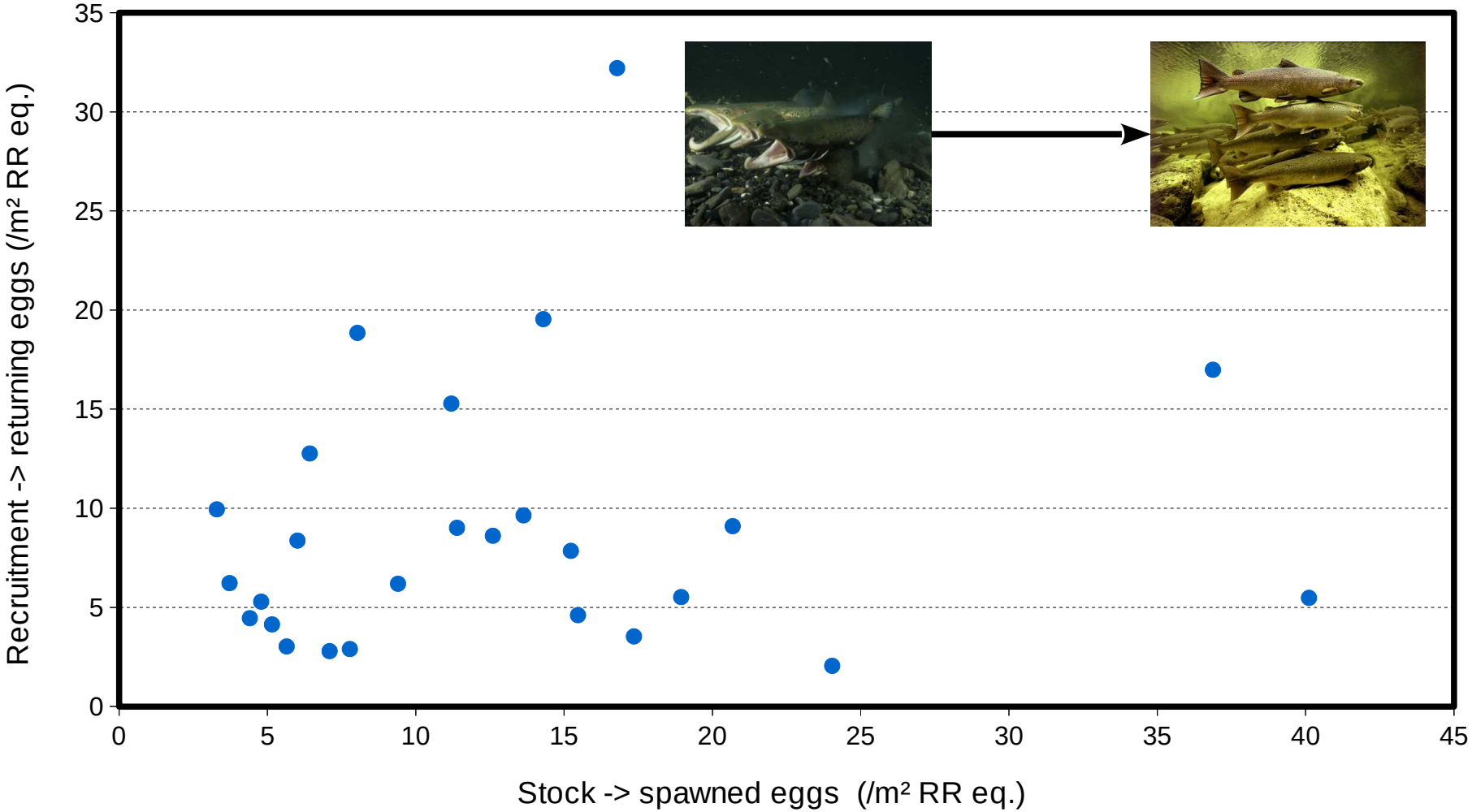
Uxondoa trapping station

Redd counts

Olha trapping station

Adult returns estimation

The egg-to-egg Stock/Recruitment series of the Nivelle R.



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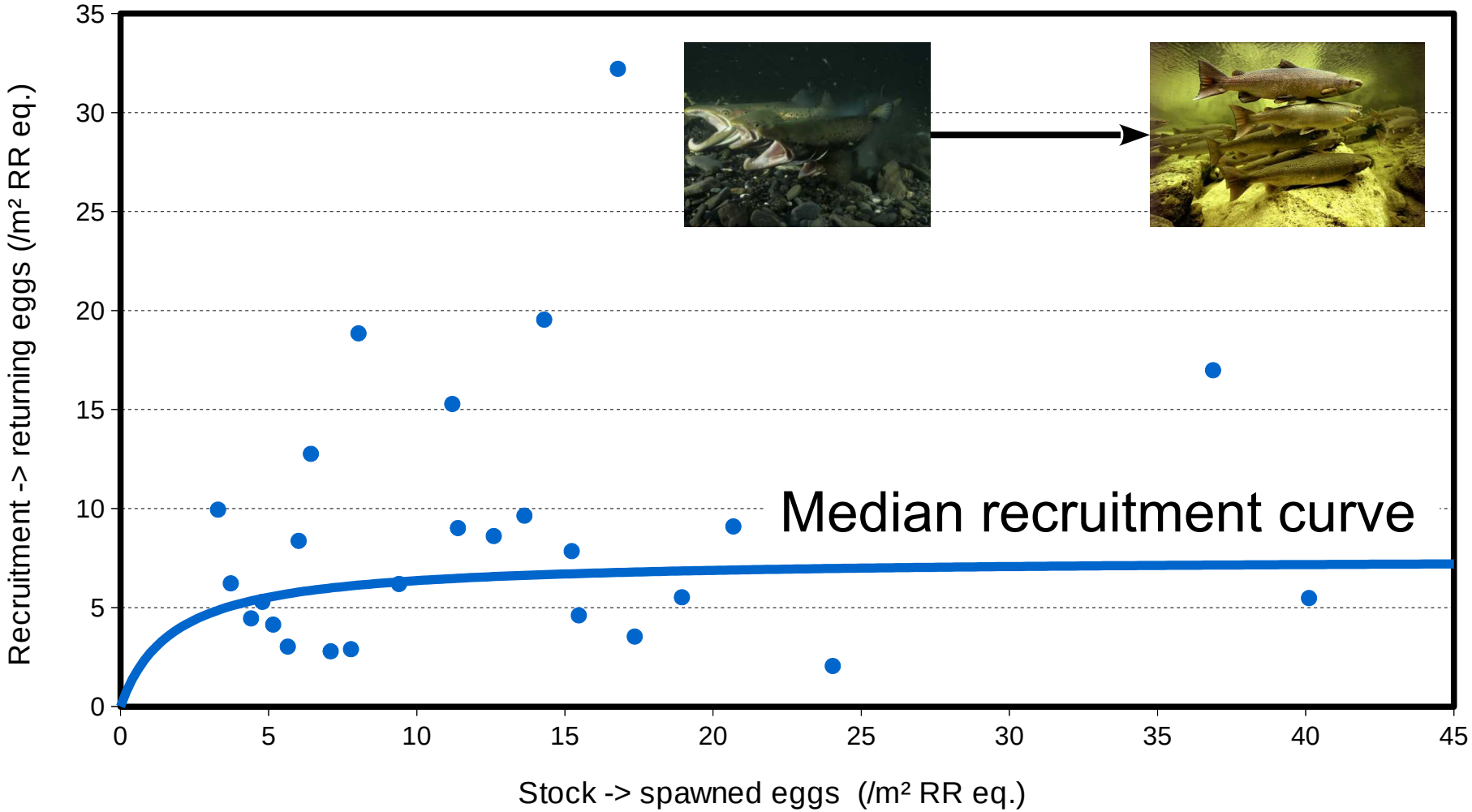

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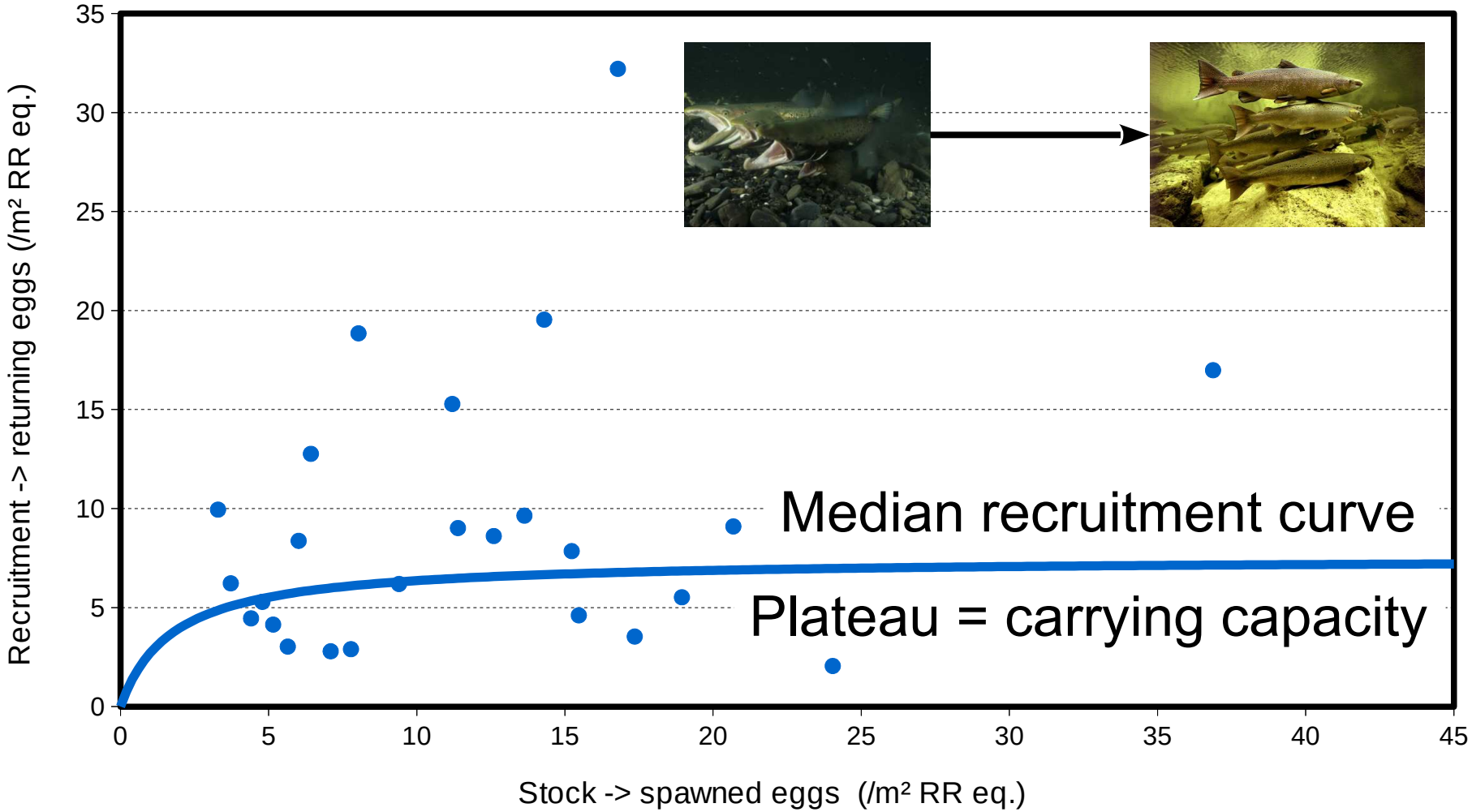

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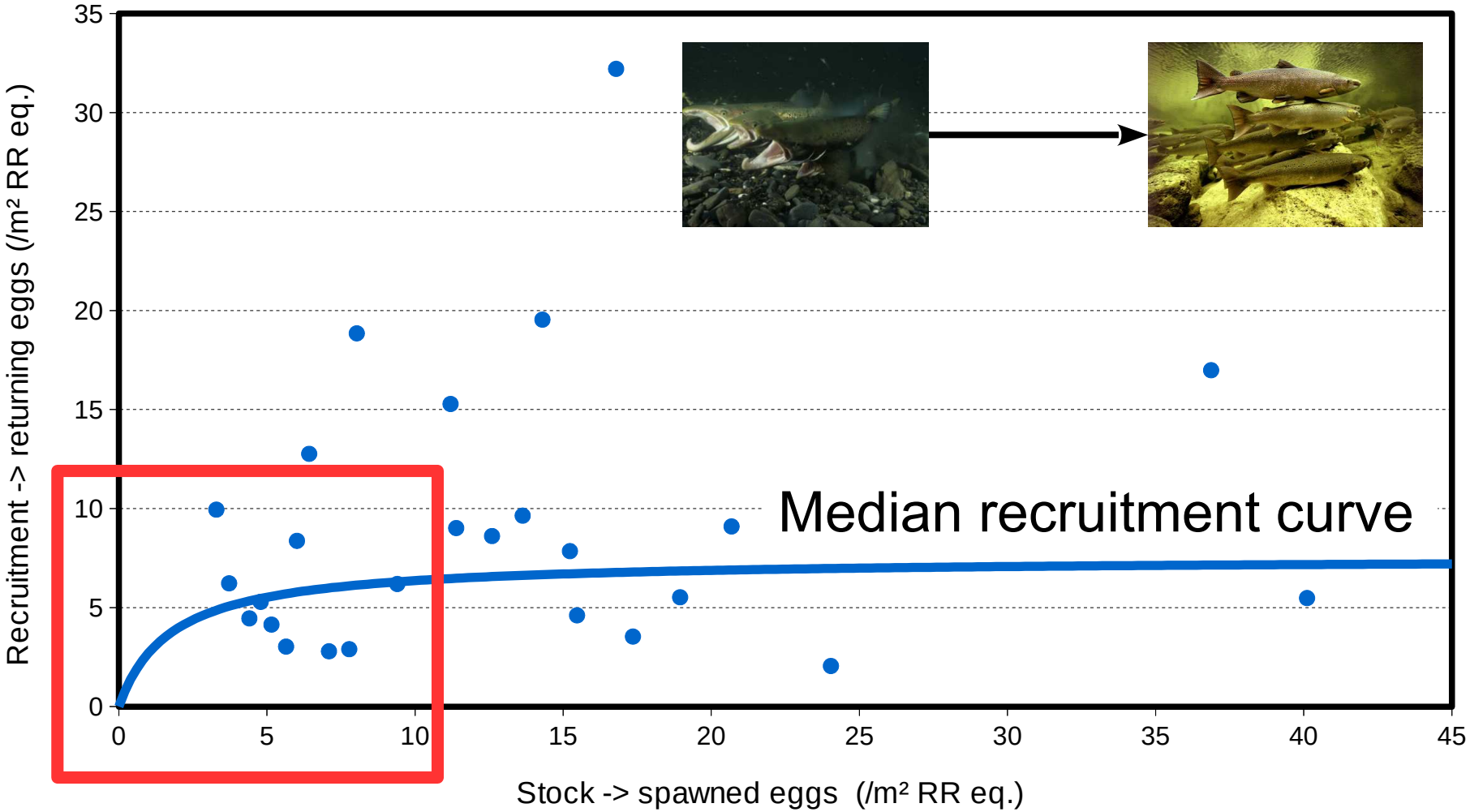

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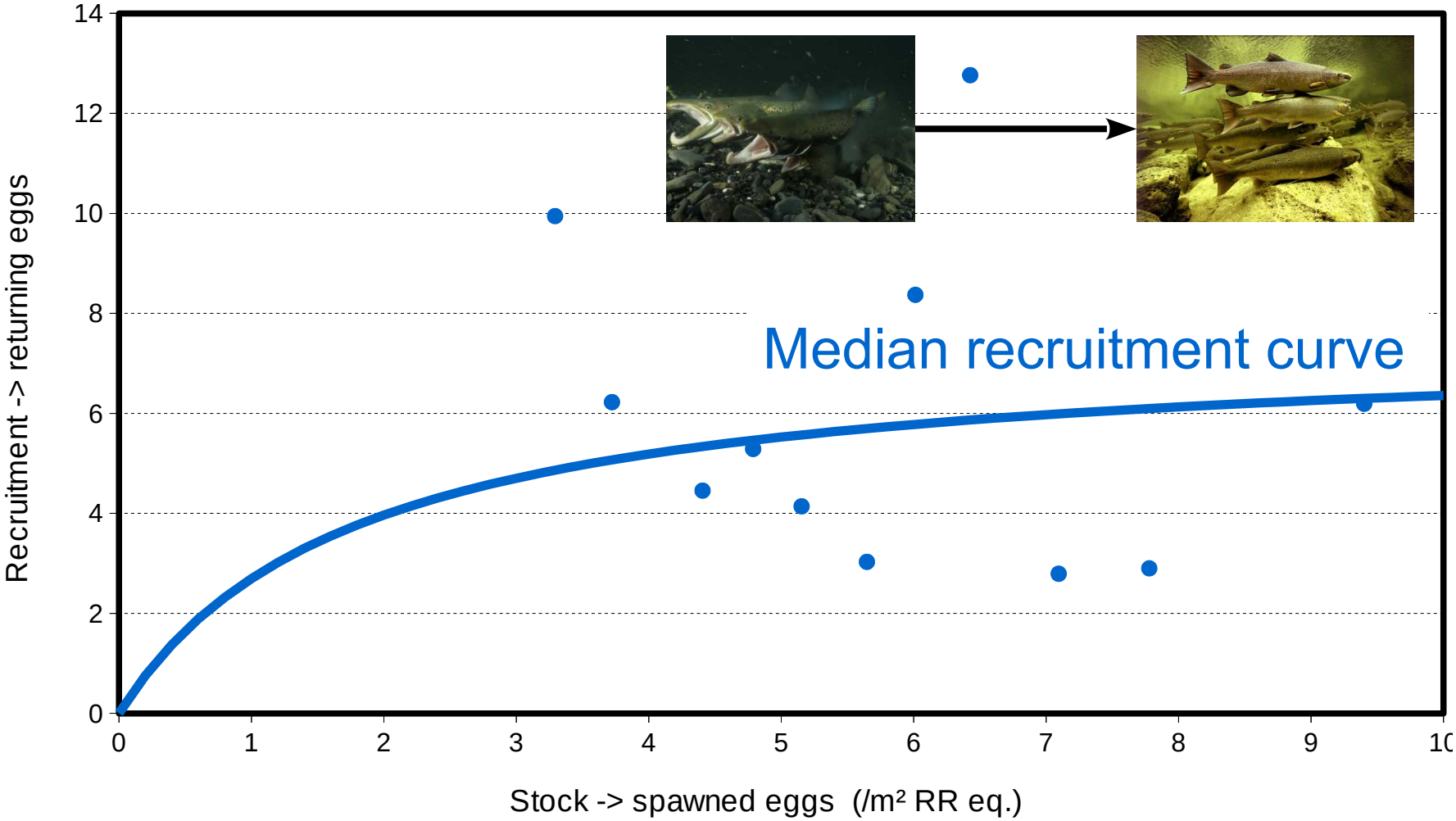

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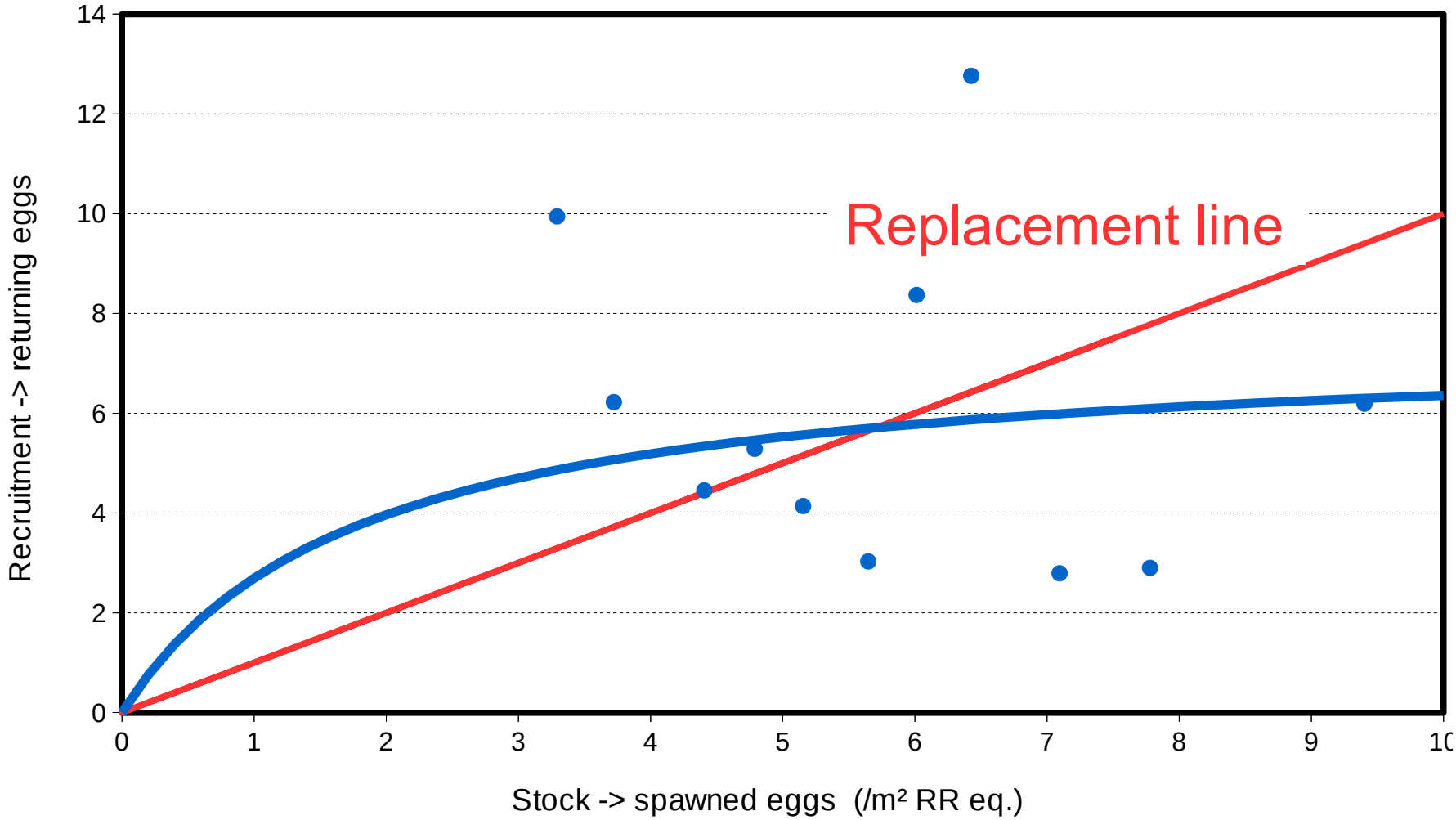

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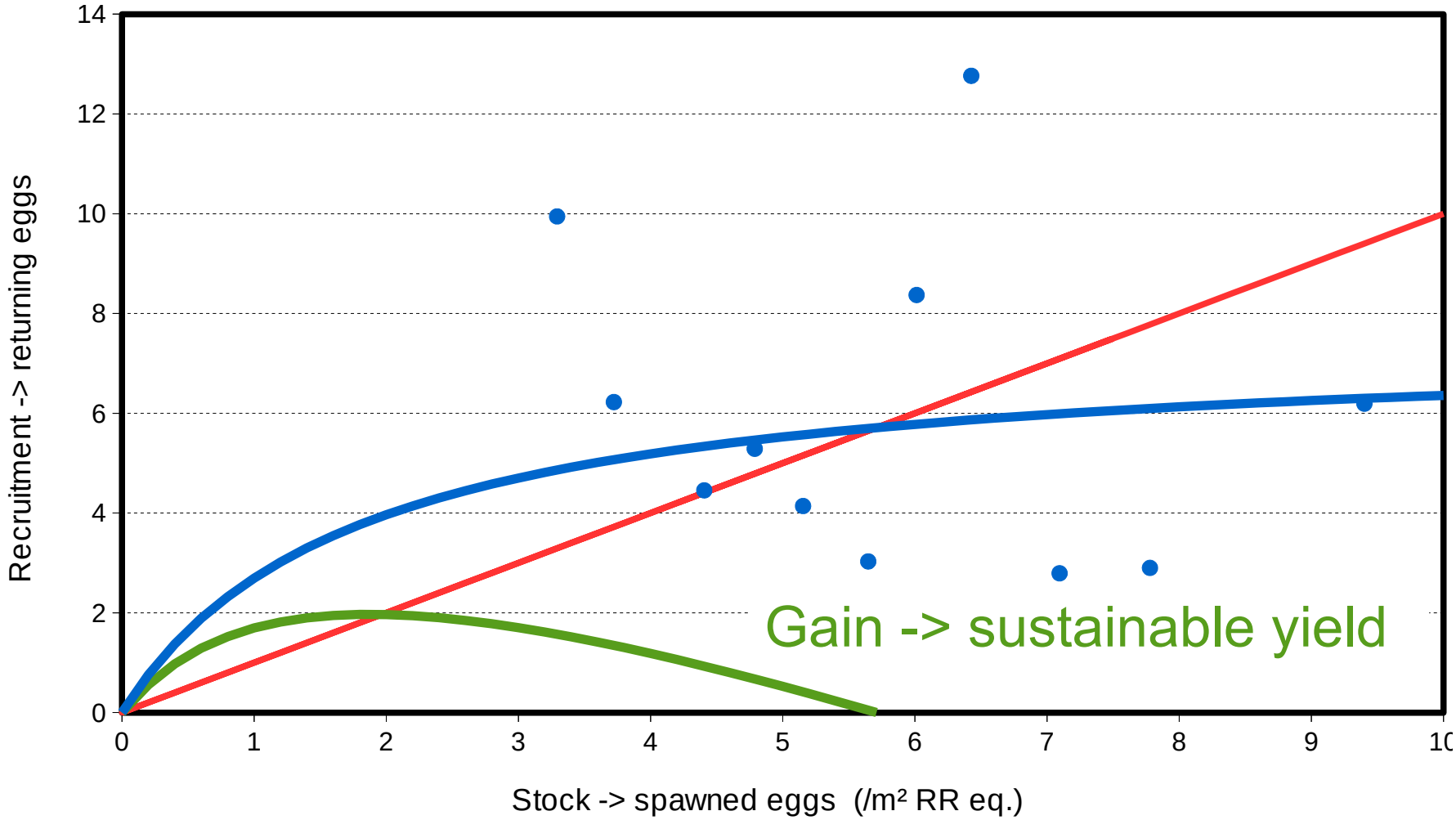

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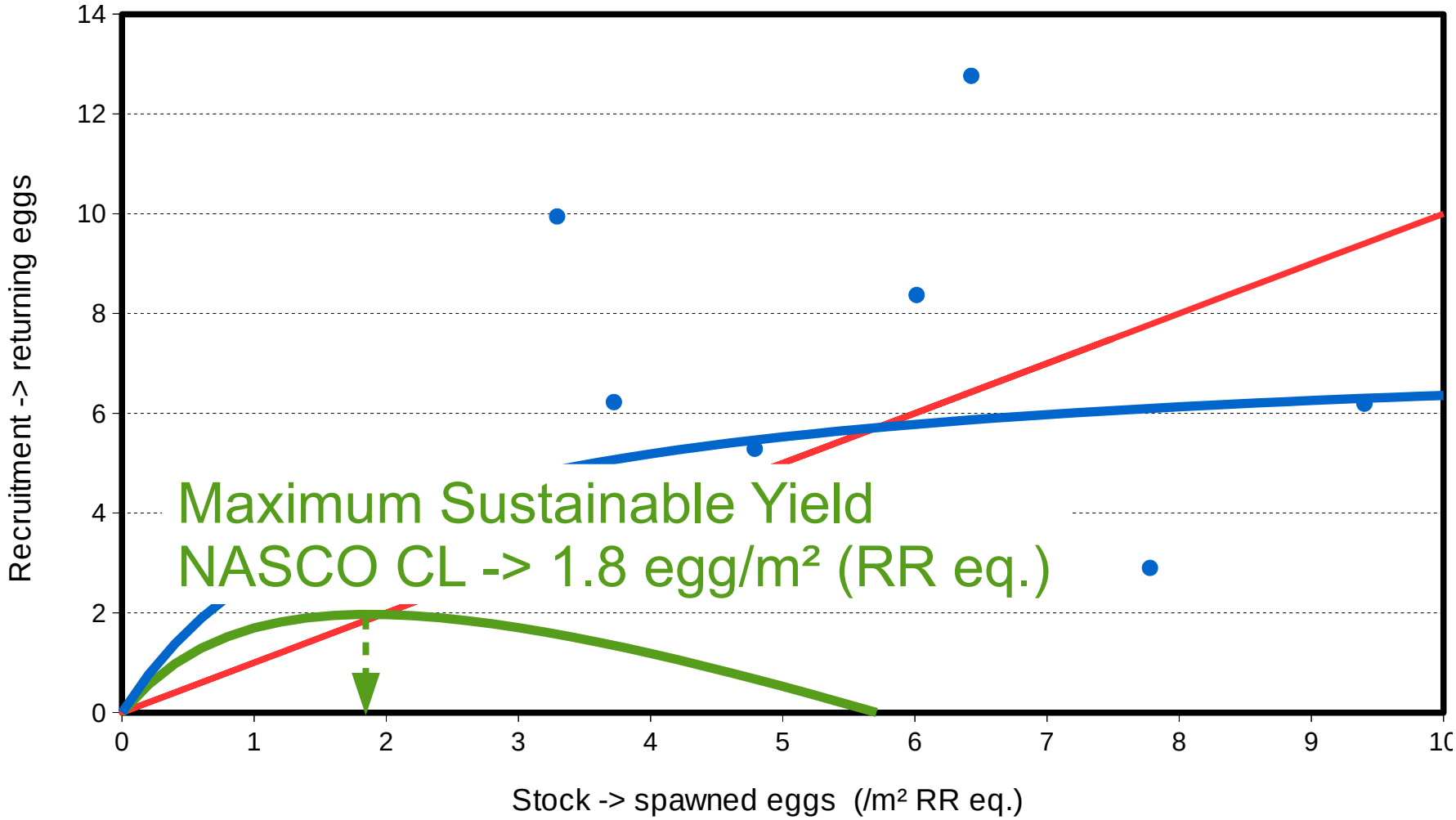
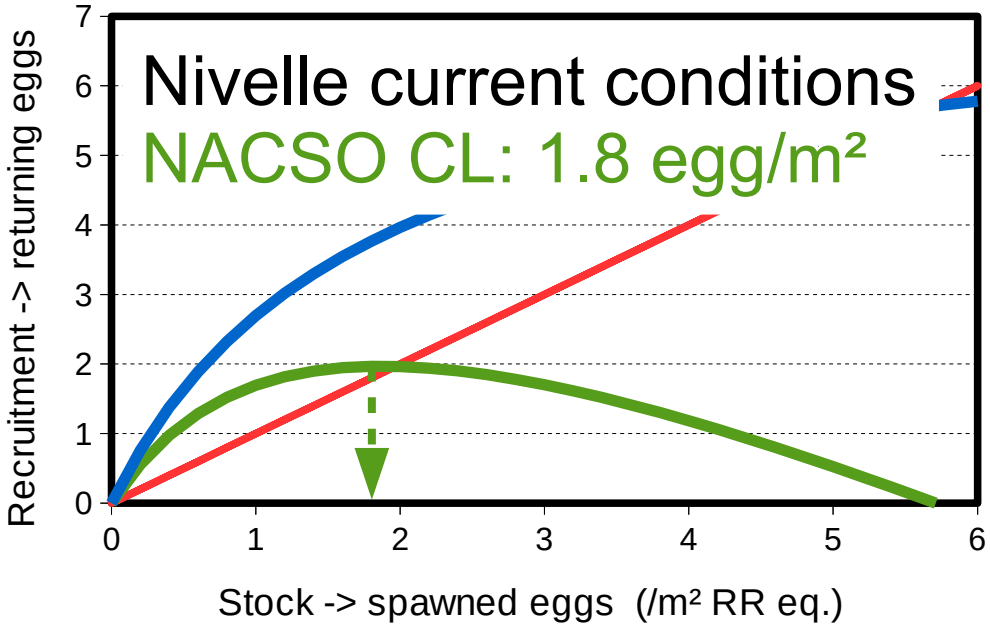


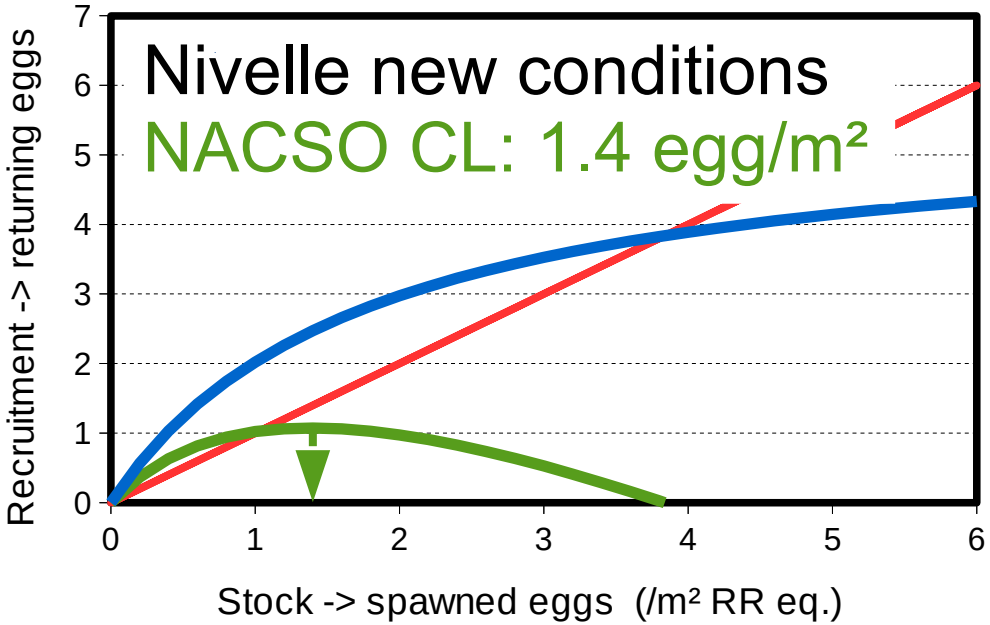
Troubles with NASCO CL definition

- Assume catches (at sea and in rivers) are well known or negligible
  - Generally not true
    - E.g. in the Nivelle: significant but unknown coastal exploitation
- Spawning stock producing MSY: is this relevant to conservation?
  - Rather aims at fisheries exploitation optimization
- What if survival (e.g. at sea) drops?

Evolution of NASCO CL if sea survival drops



Sea survival drops by 25%



Recruitment curve flattens
→ NACSO CL decreases

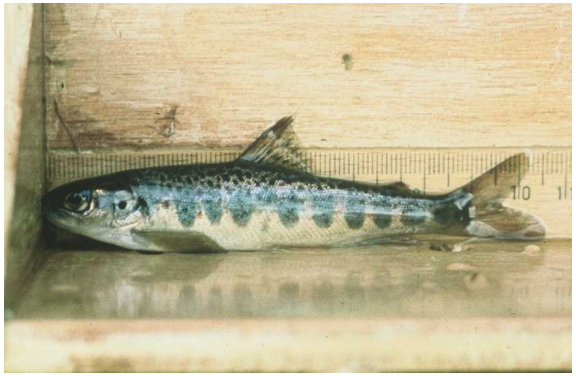
CL definition: time for a change?

- NASCO CL: based on fisheries optimization principle
  - when times become harder for salmon CL should be revised downward
  - for populations below replacement (i.e. non viable; e.g. Allier): NASCO CL is not defined
- Fisheries optimization ≠ Conservation
- But how can we define Conservation?
- An operational (and partial) proposal: conservation should ensure that wild juvenile recruitment does not fall too low
- Associated CL definition: spawning escapement threshold that ensure wild juvenile recruitment does not fall too low

The Nivelle R.:
the southernmost Index River in Europe

Uxondoa trapping station

Spawning



Juvenile
(0+ parr in the fall)
recruitment

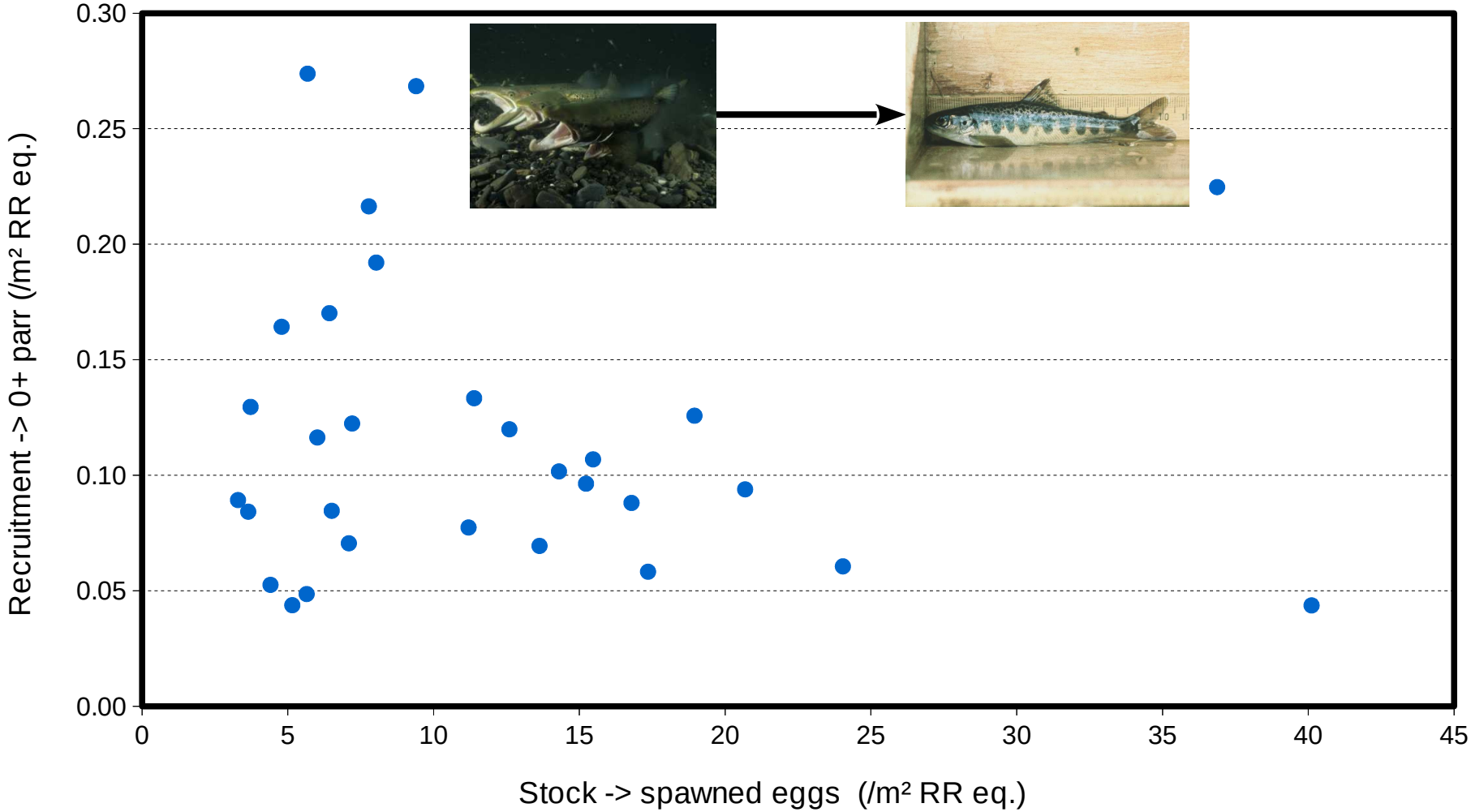
Redd
counts

escapement

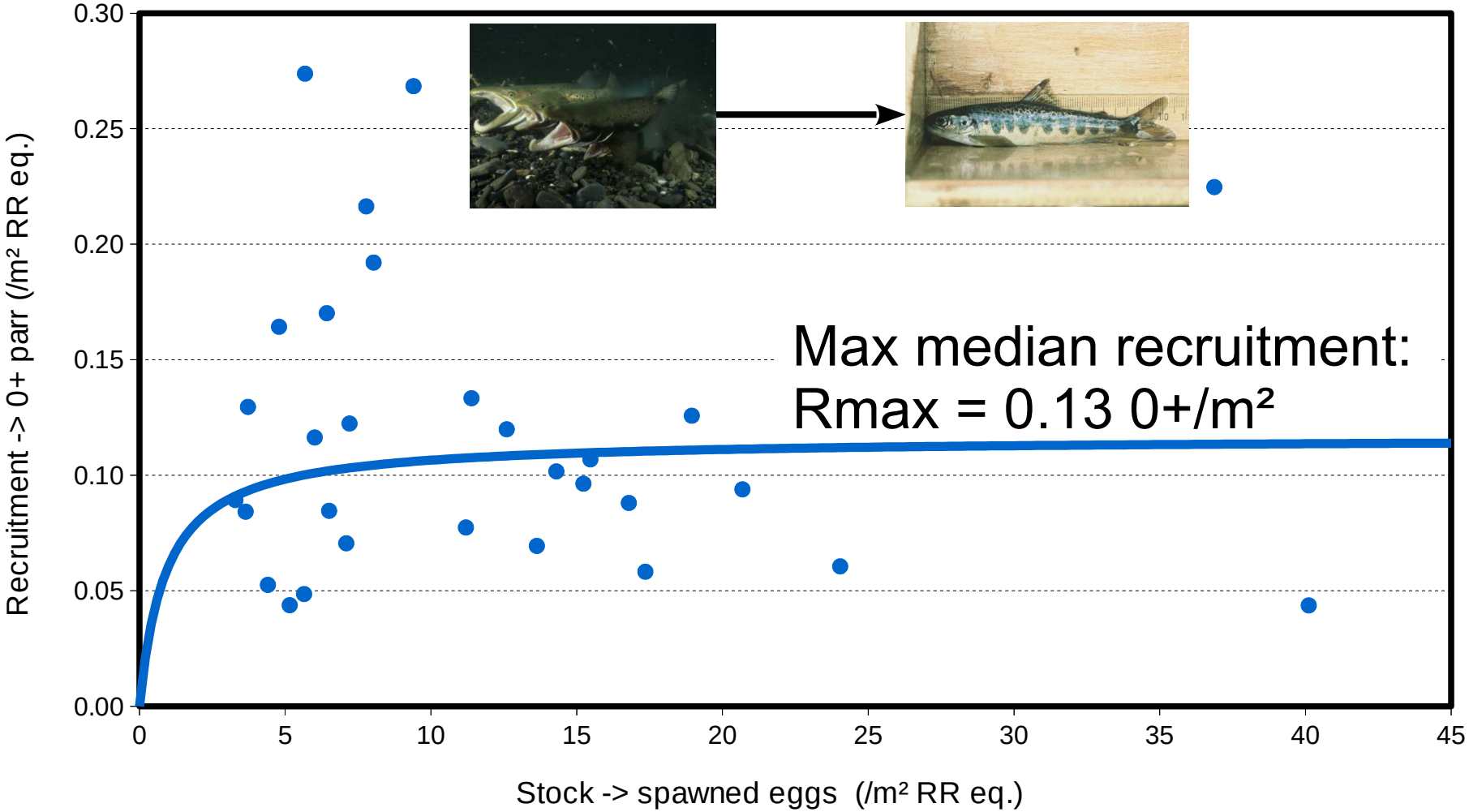
Olha trapping station

Electrofishing

The egg-to-0+ parr Stock/Recruitment series of the Nivelle R.



The egg-to-0+ parr Stock/Recruitment series of the Nivelle R.



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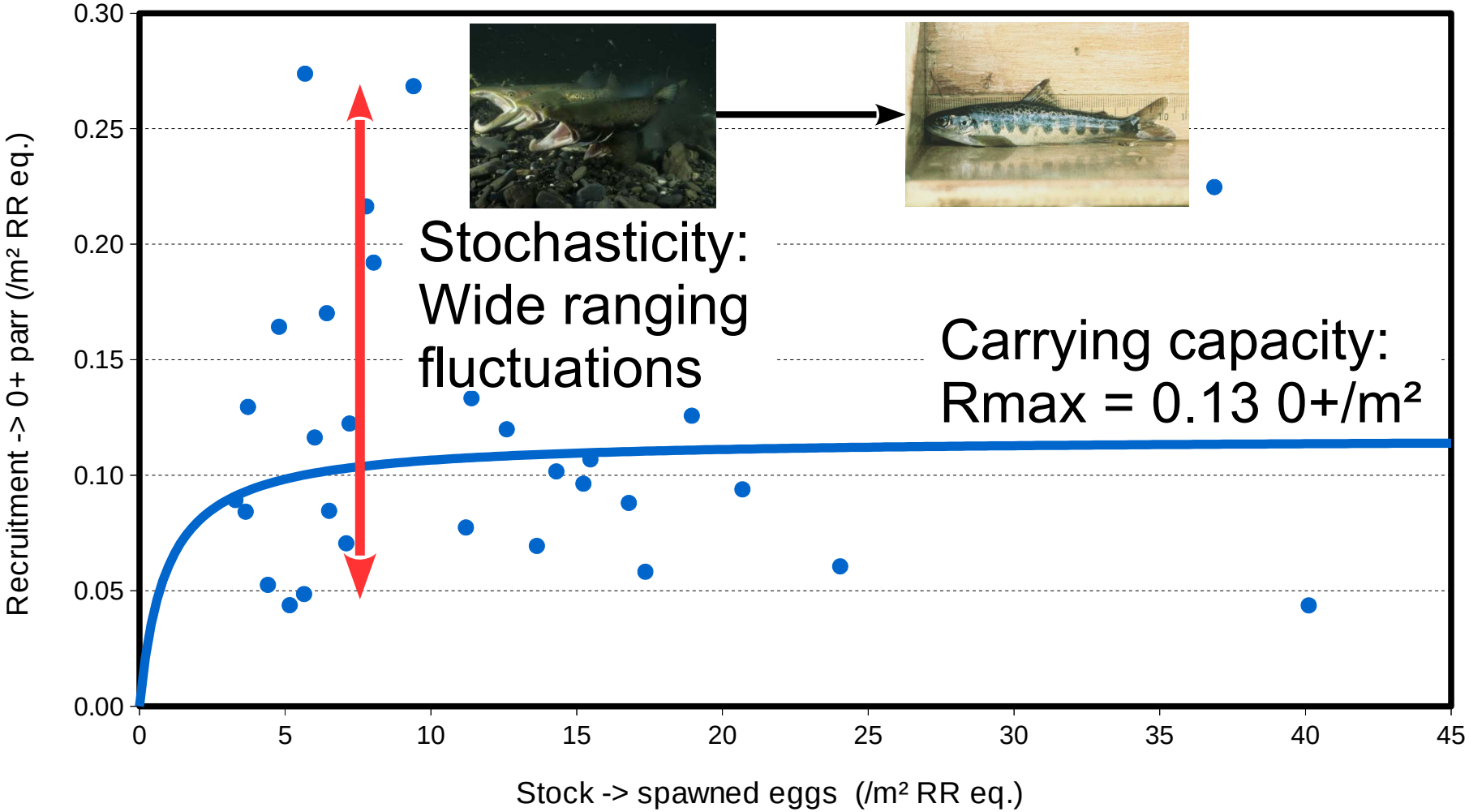
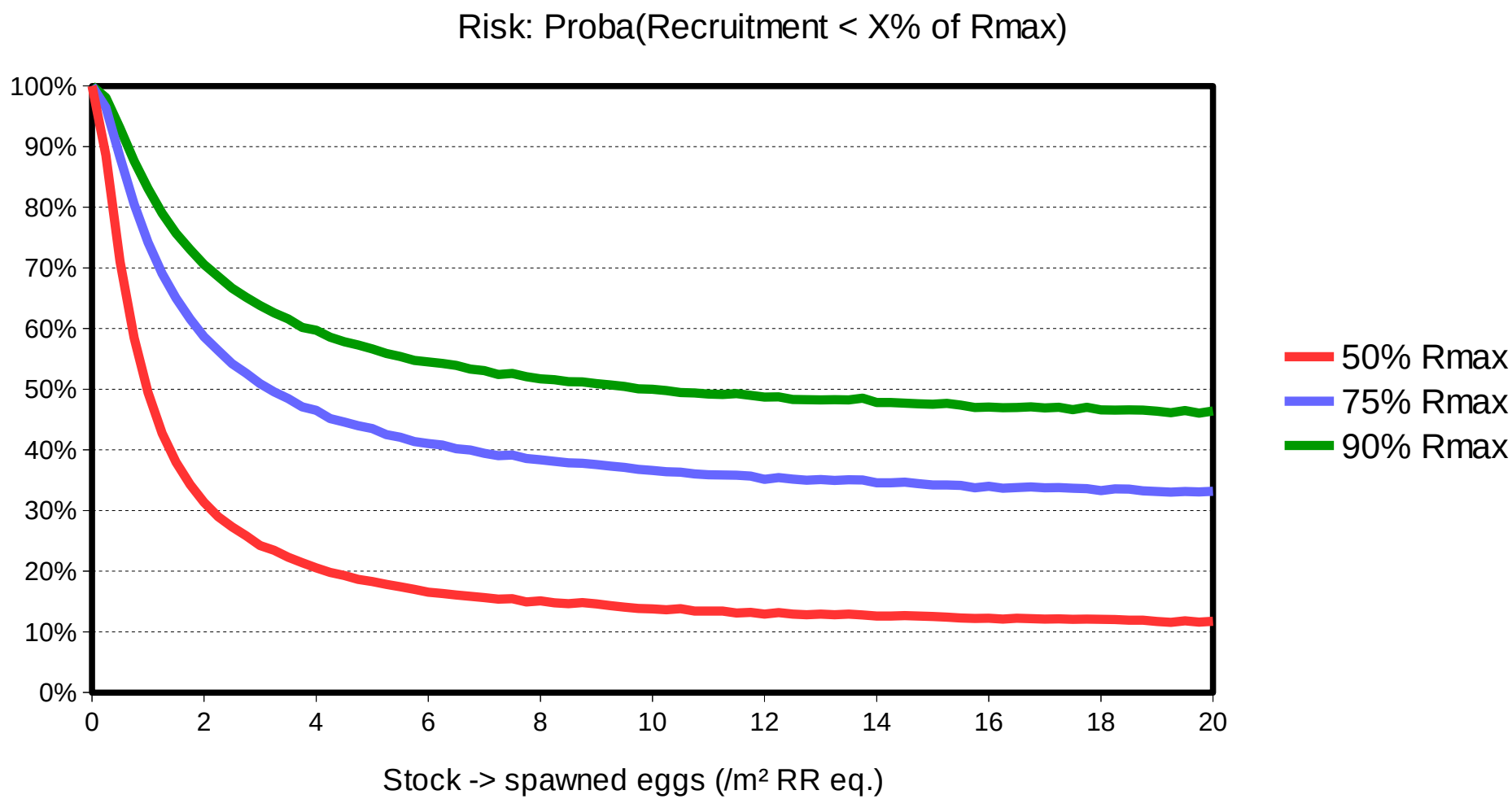


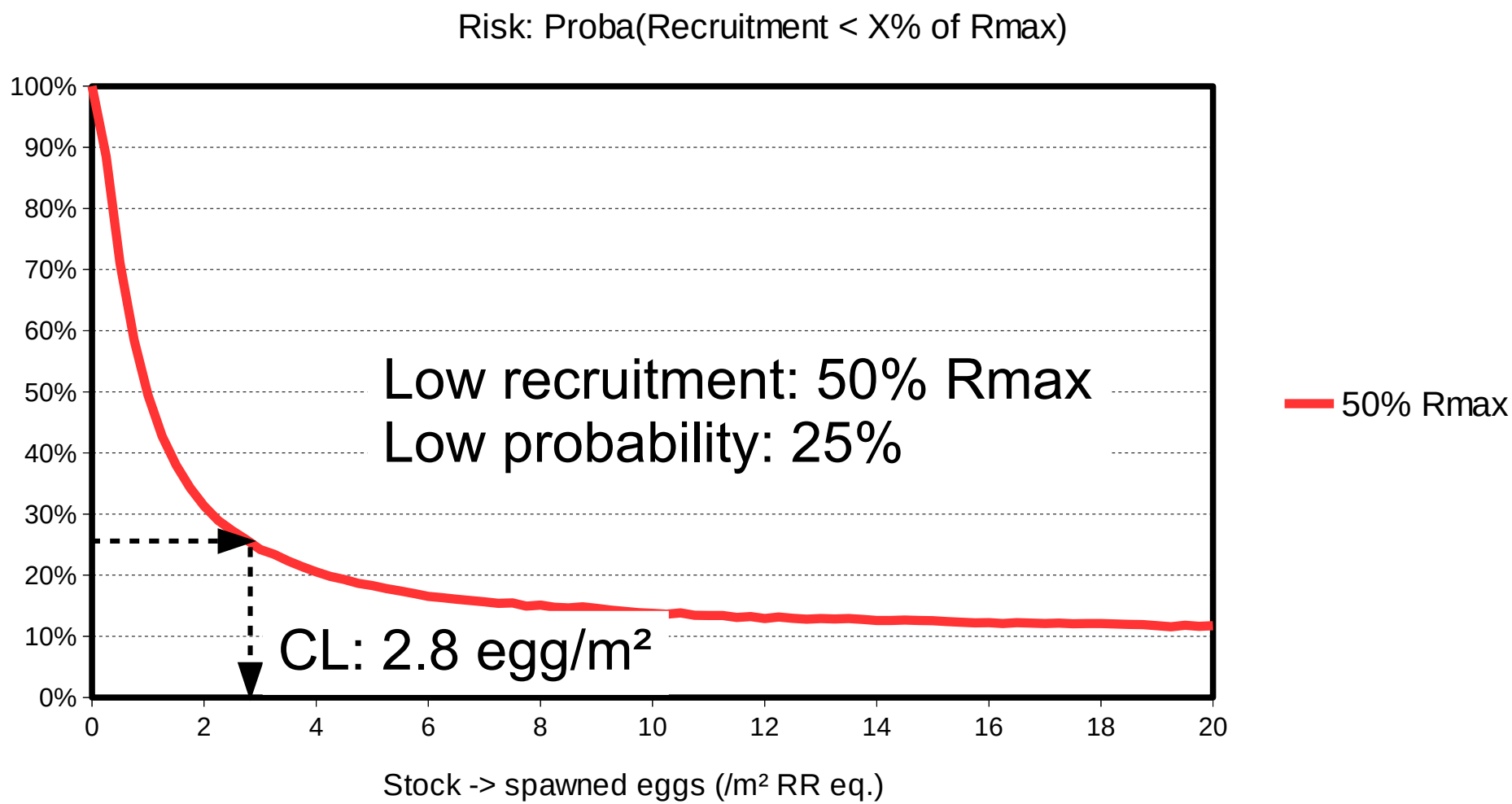
CL definition: time for a change?

- Acknowledge recruitment stochasticity (uncertainty)
- Modified CL definition: spawning escapement threshold that ensure a <u>low probability</u> of wild juvenile recruitment falling too low
  - Conservation aims at controlling the risk of low recruitment
- But what is low recruitment?
  - A management decision
  - An operational proposal: set as a proportion of the carrying capacity (Rmax)
- And what is low probability?
  - A management decision
- Scientific advice: produce (risk) plots that help management decision

Risk plot for 3 options of low recruitment level

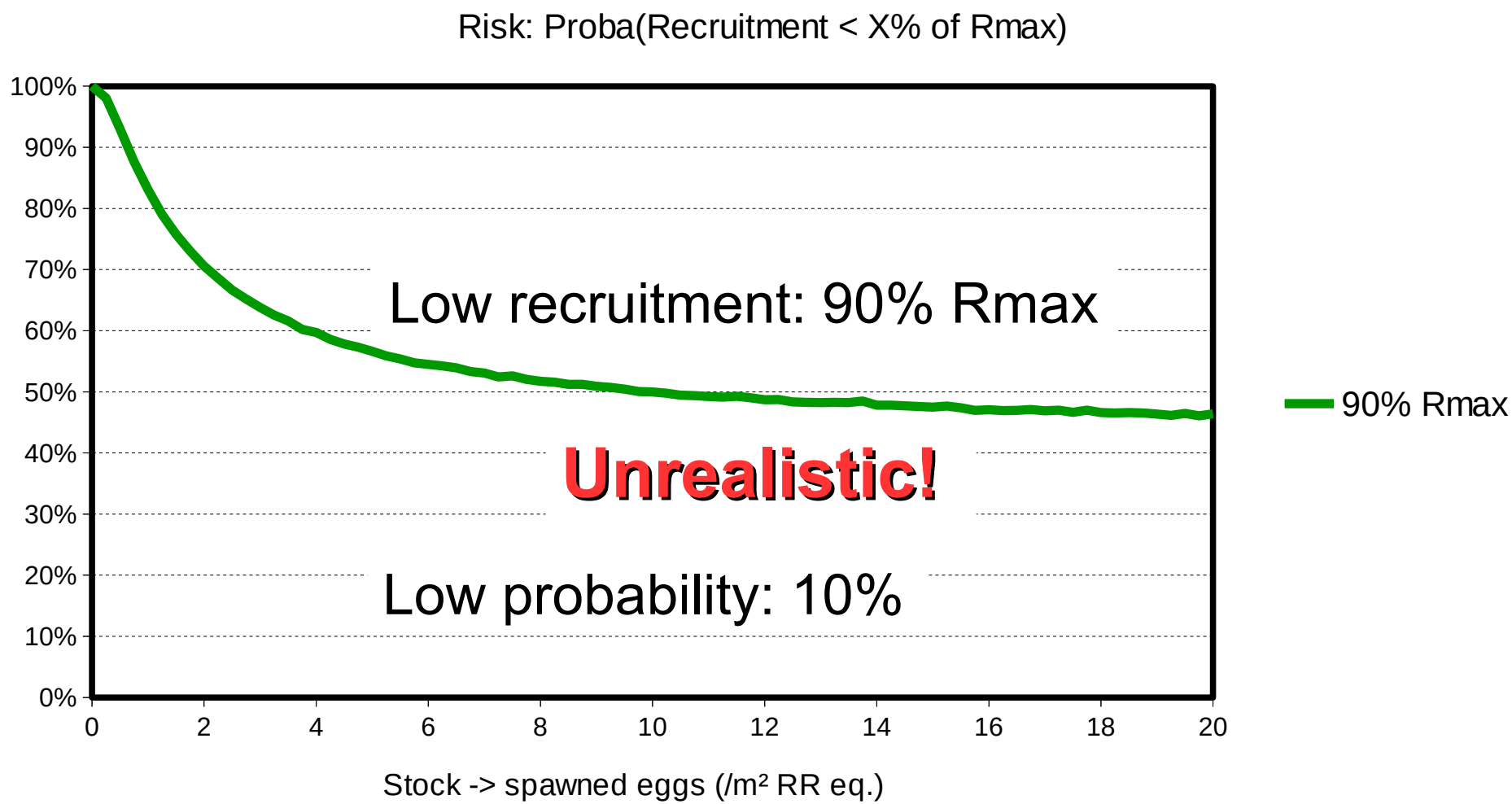


Risk plot: an example of management decision



New CL definition adopted by DFO for A. Salmon stocks in Canada *(apart from Québec)*

Risk plot: being too risk averse is not realistic



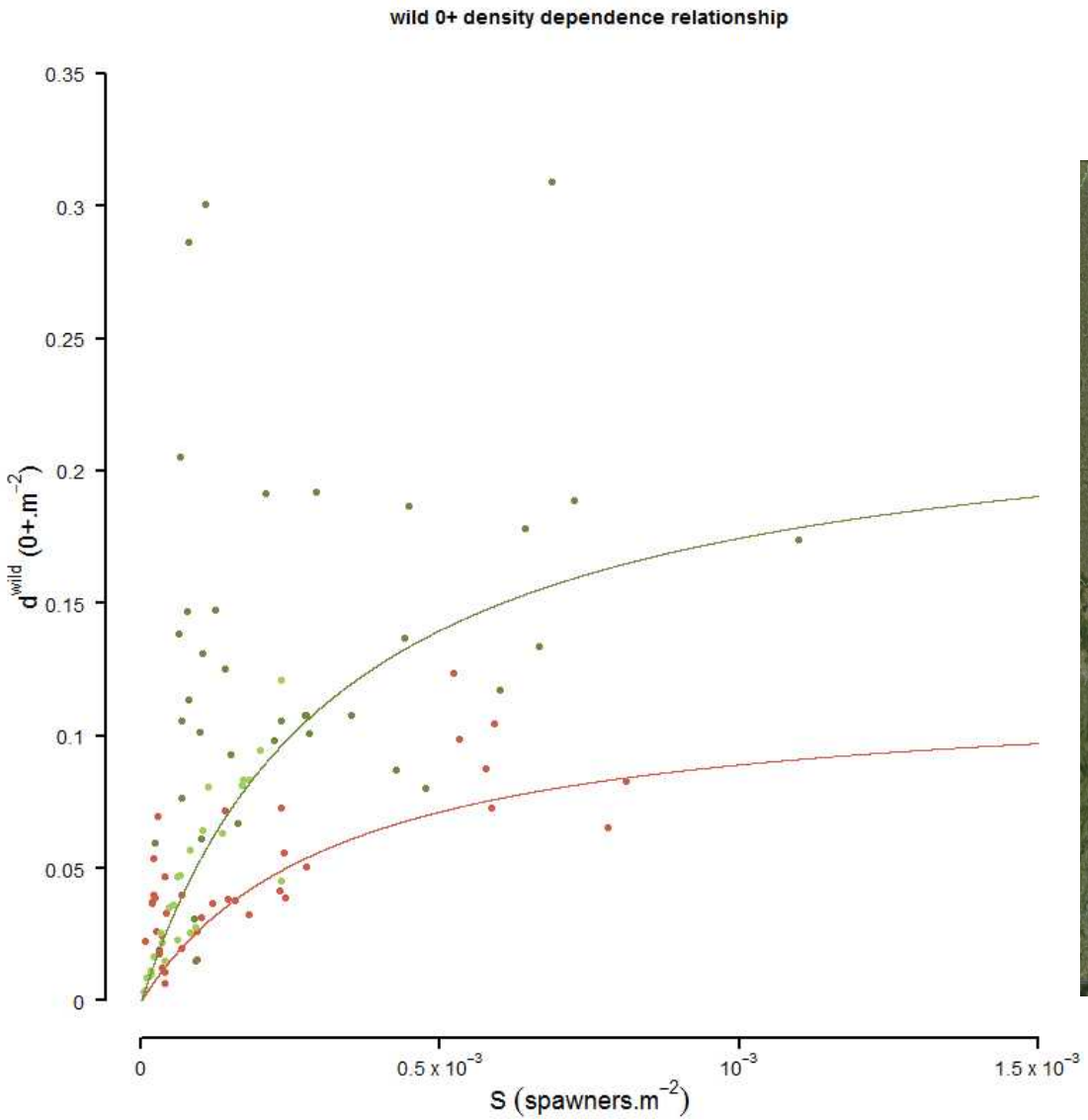
New CL approach: pros & cons

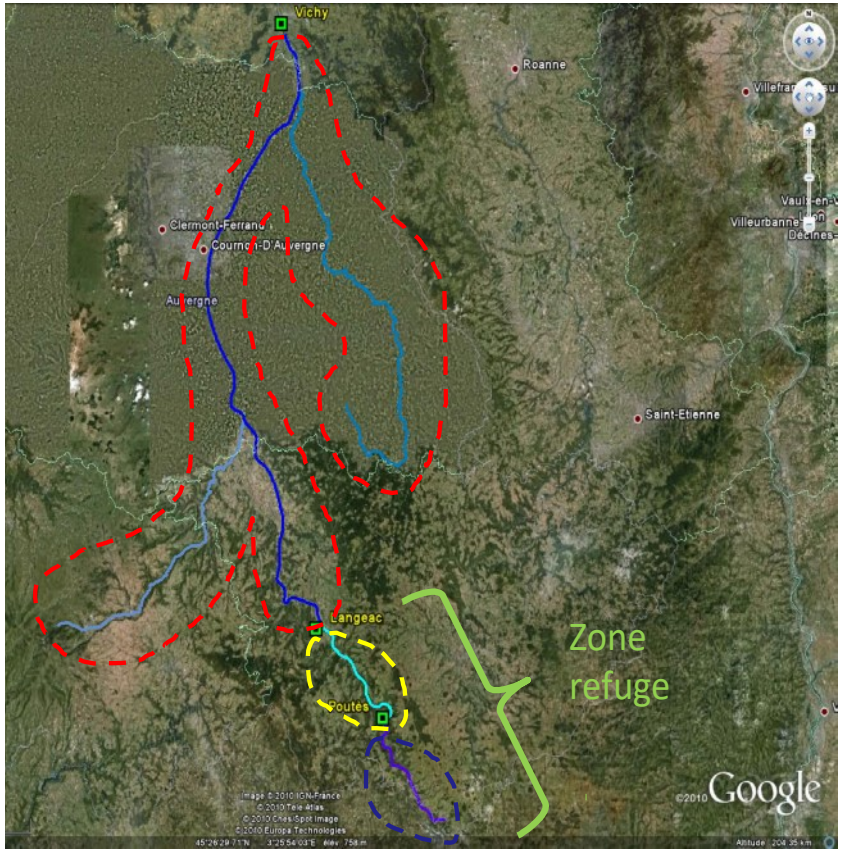
- PROs
  - Based on a conservation principle/definition in a risk control context
  - Identify the risk of low recruitment level as a management decision
    - Easier to communicate to management stakeholders (?)
  - Uses scientific and fisheries independent data only
  - Not sensitive to changes in density independent mortality (e.g. at sea)
- CONs
  - CL estimation sensitive to recruitment rate at low spawning escapement
    - A quantity usually difficult to estimate from SR data
  - Do not take into account potential density dependence of survival after the juvenile recruitment stage considered

CL for the Allier A. Salmon population ?

- NASCO CL: not an option
  - Population currently below replacement
- Definition of a new CL based based on a low risk of low recruitment: can be done
  - The Allier salmon population model (INRA – LOGRAMI) includes a density dependent SR sub-model

A CL for the Allier A. Salmon population ?





CL for the Allier A. Salmon population ?

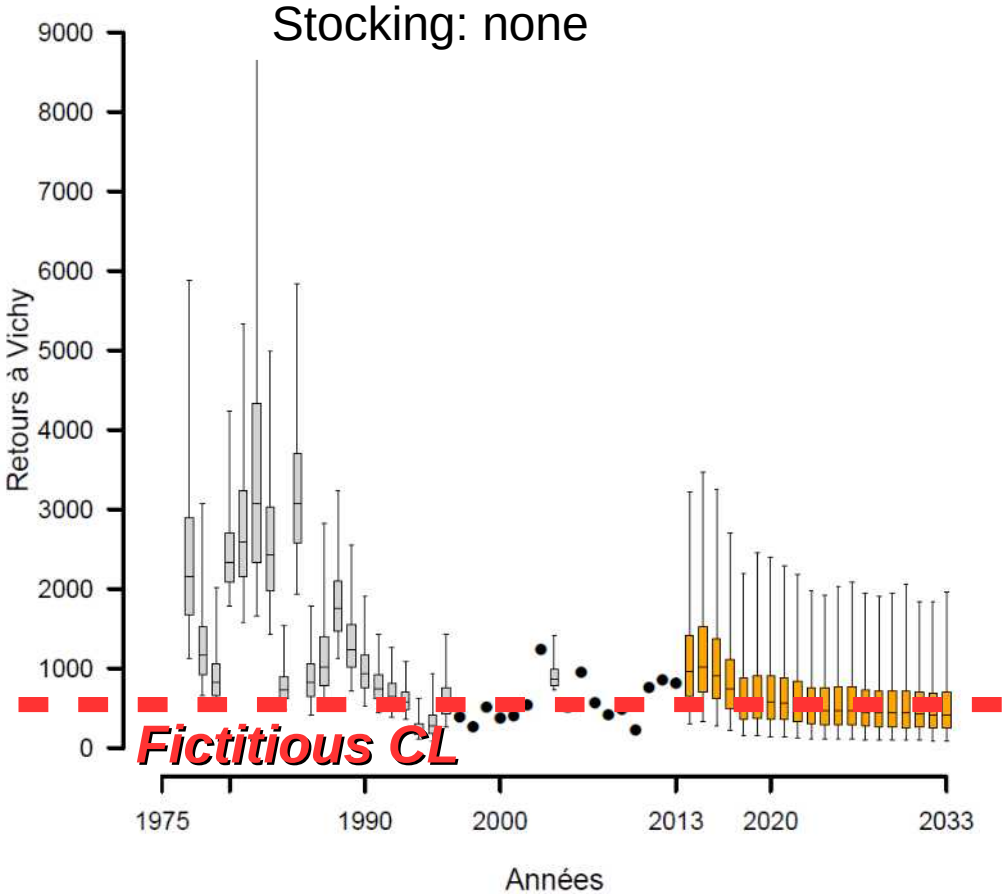
- NASCO CL: not an option
  - Population currently below replacement
- Definition of a new CL based based on a low risk of low recruitment: can be done
  - The Allier salmon population model (INRA – LOGRAMI) includes a density dependent SR sub-model
  - Plots of risk of low recruitment vs number of spawners reaching Vichy can be produced
  - Management (stakeholders) should decide on the definition of low recruitment and low risk (probability)

CL for the Allier A. Salmon population: so what?

- CL is a useful benchmark for assessing conservation status of the population
  - **Caution**: CL is purely demographic → makes no consideration of genetics
  - CL does not "generate" management measures: it helps assessing consequences of management measures
  - Given the model available for the Allier salmon, a CL is not a necessity: we can directly assess conservation achievement (provided we agree on an operational definition of conservation)
- Retrospective (up to present) assessment:
  - What is current conservation status of the population?
  - Have past management measures improve conservation?
- Prospective assessment:
  - Predicted evolution of conservation according to various management options (habitat improvement and/or stocking)
  - Beyond viability → identification of exploitable surplus (if any)

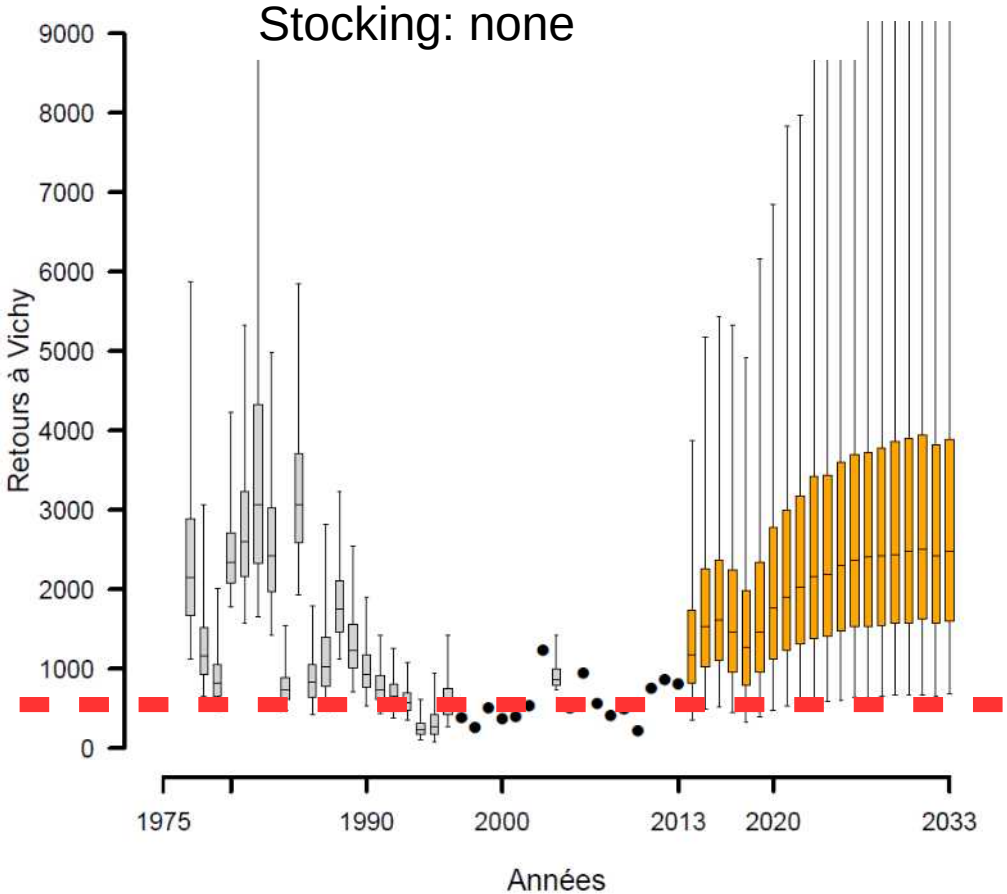
A (fictitious) illustration of the use of CL for the Allier A. Salmon population ?

Habitat: status quo
Stocking: none



Conservation not achieved

Habitat: major improvement
Stocking: none



Conservation achieved
& surplus available for exploitation

Thanks for your attention