Monitoring and conservation of aquatic genetic resources

CGN – Genetic Diversity Event

March 15, 2023, Wout Abbink, John Bastiaansen

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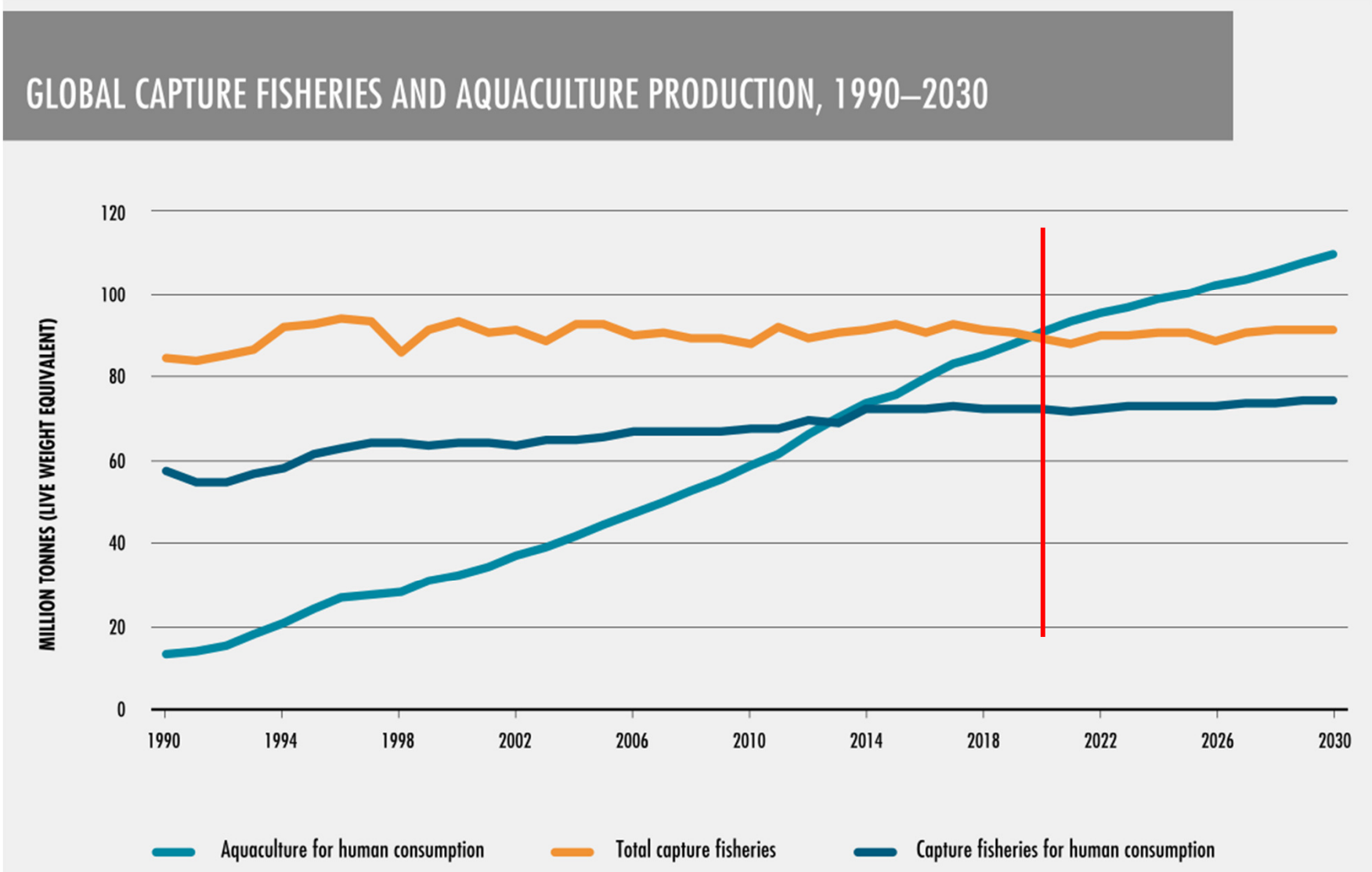
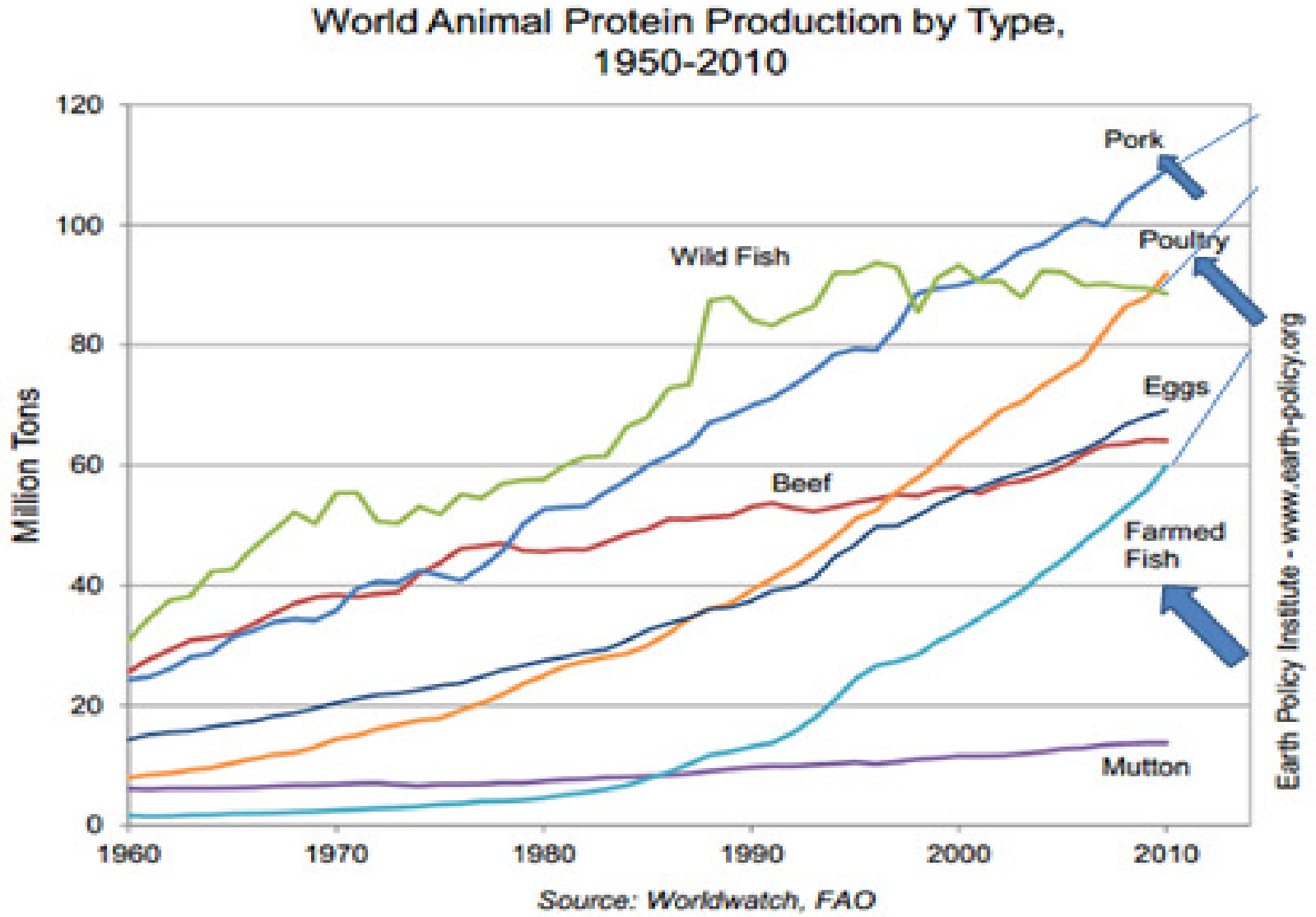
Aquaculture worldwide



Animal protein production



Background – Aquatic genetic resources monitoring and conservation

- 2017 – Overview of the AqGR in Dutch aquaculture
- 2020 – Study to prioritize tasks for monitoring AqGR
- 2021 – WOT 2022-2026 plan of action
- 2022 – Start genetic monitoring
  - Sampling for genotyping
  - Genotyping of samples
  - Investigate possibilities for cryo-preservation

Which are the relevant species?

- farmed aquatic species and their wild relatives
  - Produced in aquaculture in the Netherlands
  - Found in the wild in the Netherlands

Shellfish

Crassostrea gigas (Pacific oyster)
Ostrea edulis (flat oyster)
Mytilus edulis (blue mussel)

Fish

Anguilla anguilla (European Eel)
Scopthalmus maximus (turbot)
Sander lucioperca (pikeperch)

Seaweed

Saccharina latissima (sugar kelp)
Ulva spp. (sea lettuce)
Laminaria digitata (oarweed)
Undaria pinnatifida (wakame)

Monitoring - Goals

- For all the relevant species establish:
  - Genetic monitoring of wild populations
  - Cryo-preservation of starting material

- A complete picture of the genetic diversity in the wild for all relevant species

Importance of genetic diversity

- Monitoring genetic diversity in wild relatives of relevant species for Dutch aquaculture is of interest for current and future sustainable use of these AqGR in aquaculture
- Broodstock in aquaculture:
    - From the wild
    - Offspring of wild animals
    - Often without a breeding program

Genetic diversity of aquaculture breeding populations

- Important for:
  - Selection response
  - Avoiding high inbreeding rates
  - Insurance against lost variation

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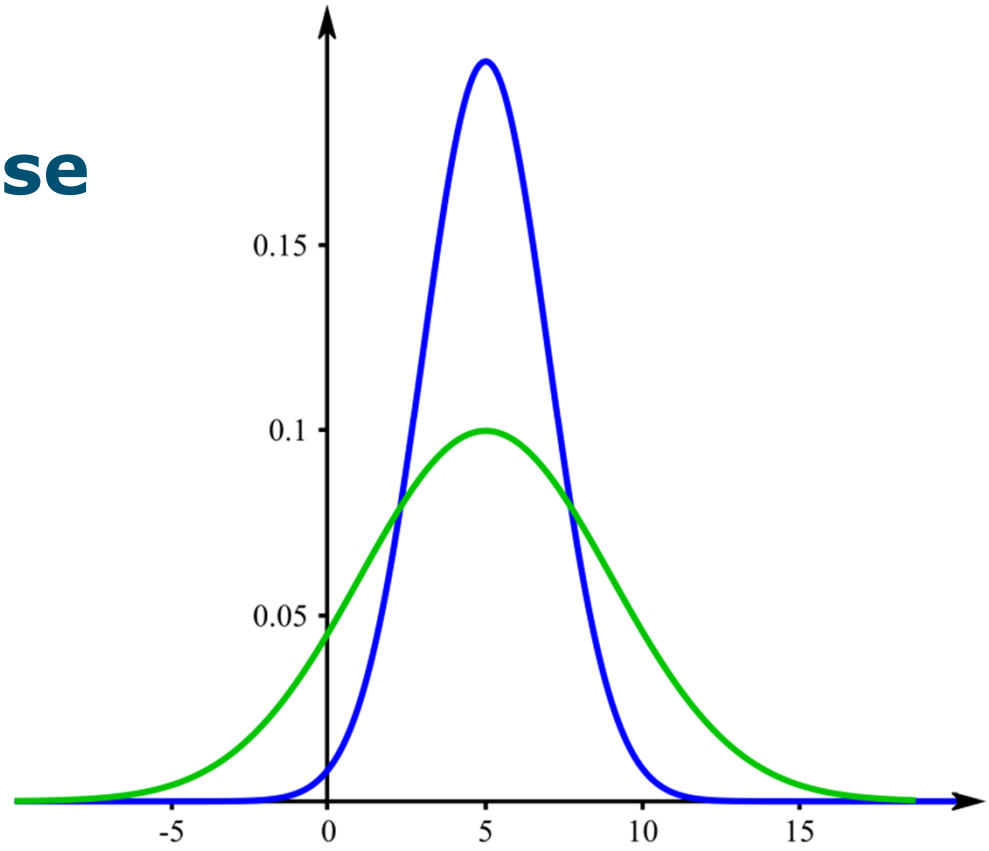


Genetic diversity of aquaculture breeding populations

- Important for:
  - Selection response
  - **Avoiding high inbreeding rates**
  - Insurance against lost variation

Relevant species are being domesticated

Important to start with much diversity

Using relatives from the wild is possible

Genetic diversity of aquaculture breeding populations

- Important for:
  - Selection response
  - Avoiding high inbreeding rates
  - **Insurance against lost variation**

Importance of genetic diversity - Breeding

- Genotype by Environment interaction
  - Genetically best animals in one environment are not the best in another environment

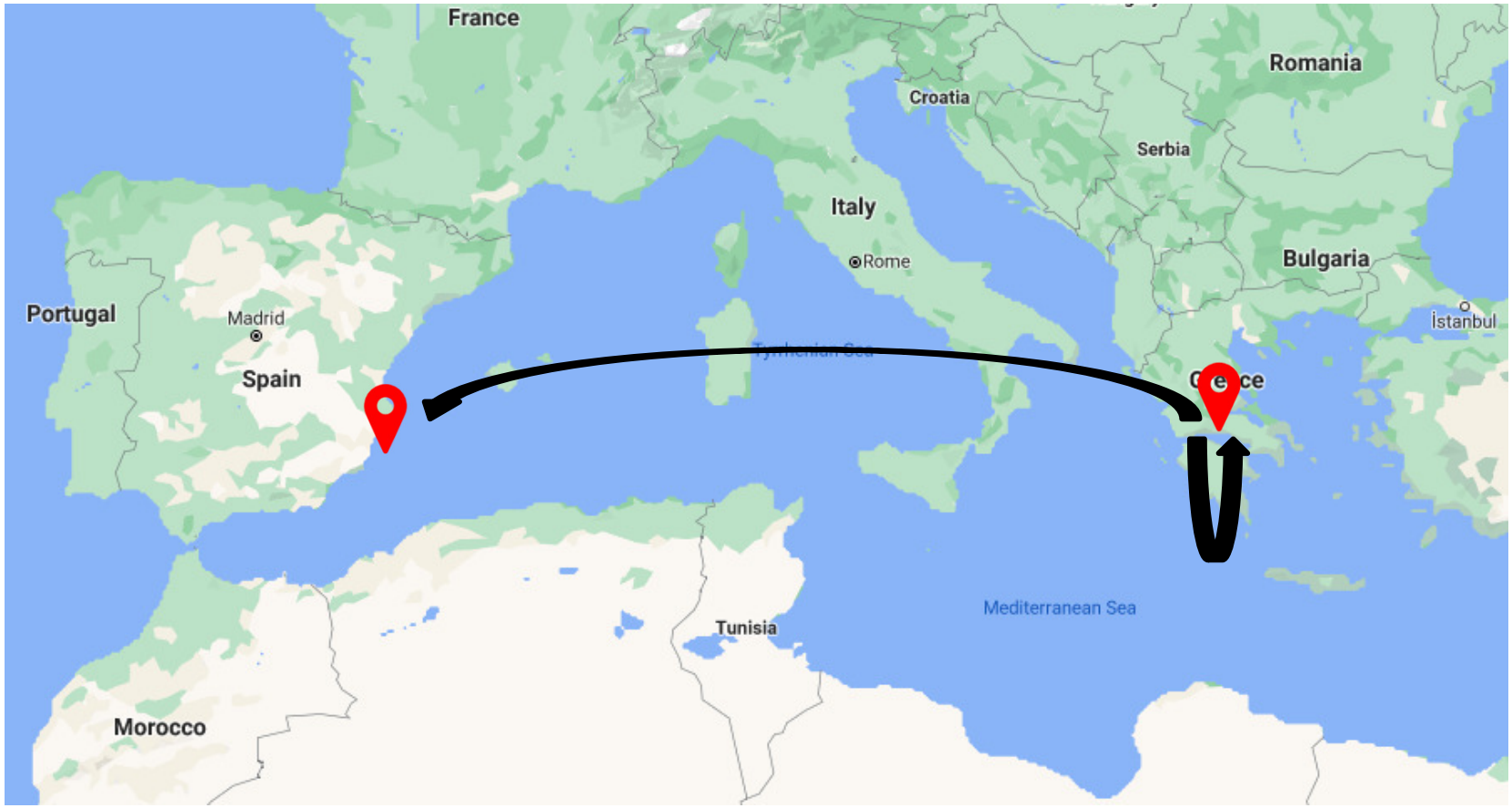
    or

  - The *good genes* for one environment are not the best in another environment

genetic variants with positive effects

Importance of genetic diversity - Breeding

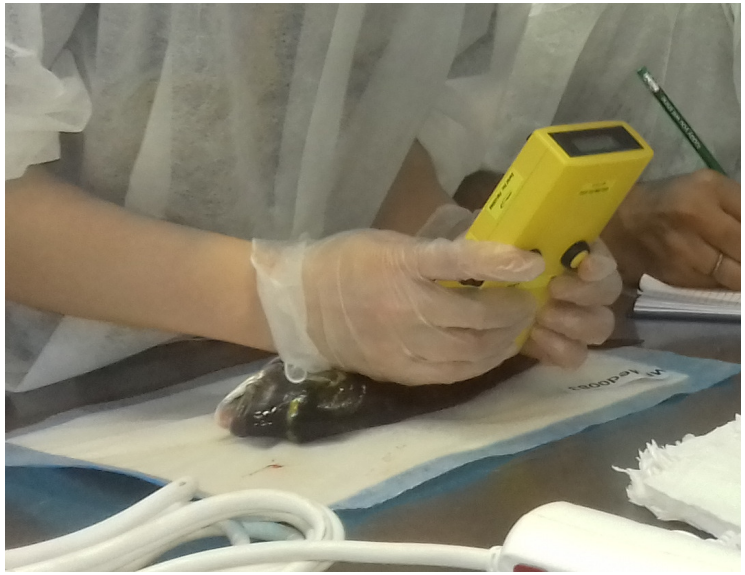
- Genotype by Environment interaction



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 727315

Importance of genetic diversity - Breeding

- Data collection
  - Weight
  - Fat percentage
  - Fillet Yield
- Estimate breeding values
  - Colder water
  - Warmer water



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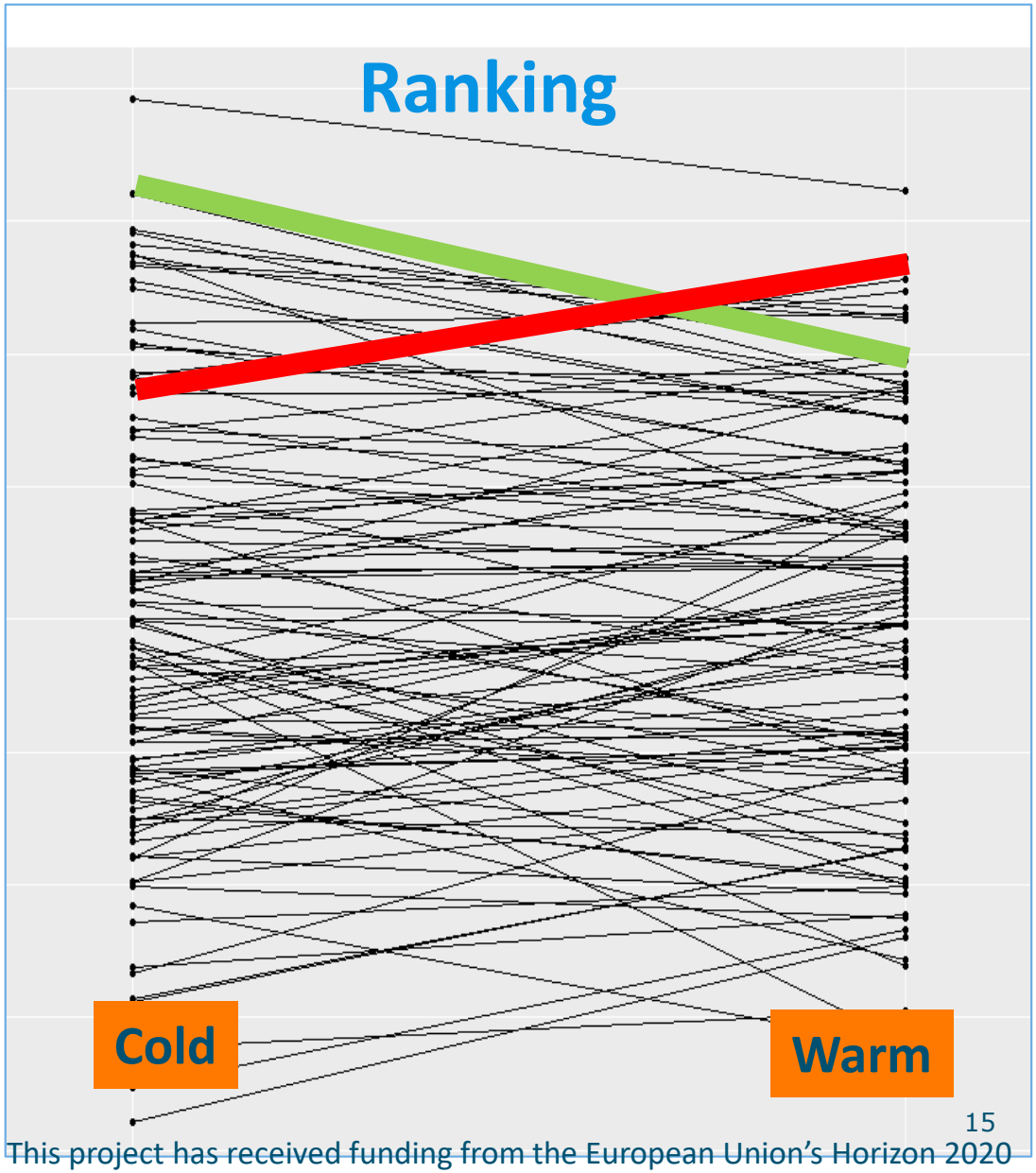
Importance of genetic diversity - Breeding

- Compare the ranking in different environments
- Different temperatures may require different variants



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Questions?

Foto: https://www.fishinginholland.nl/vissoorten/snoekbaars-(video).html

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Discussion

1. Maintaining genetic diversity in aquaculture breeding populations is more important than having genetic diversity in the wild ancestor
2. Commercial importance of a species for aquaculture is a threat to genetic diversity of the wild ancestor
3. For species that are cultured and occur naturally in the Netherlands, preservation of genetic material from breeding programs is important even though the aquaculture volumes are small