



biodiversa



Evaluating and managing connectivity in a network of marine reserves to maintain genetic diversity and deliver fish beyond protected limits

RESERVEBENEFIT

Manel Stéphanie (Coordinator, Partner 1: EPHE)

Funded projects final conference, 12-13 November 2019, Brussels

BiodivERsA COFUND Call (2015-2016)

« Understanding and managing biodiversity dynamics to improve ecosystem functioning and delivery of ecosystem services in a global change context: the cases of soils and sediments, and land- river and sea-scapes »



CONSORTIUM DESCRIPTION



- ❖ **Partner 1** (*coordinator*): EPHE, Centre d'Ecologie Fonctionnelle et Evolutive, **France**, funded by ANR
- ❖ **Partner 2**: GEOMAR, Helmholtz Centre for Ocean Research Kiel, **Germany**, funded by DLR
- ❖ **Partner 3**: CNRS-MARine Biodiversity, Exploitation and Conservation, **France**, funded by ANR
- ❖ **Partner 4**: University of Murcia, **Spain**, funded by AEI
- ❖ **Partner 5**: Stockholm Resilience Centre (University of Stockholm), **Sweden**, fby Formas

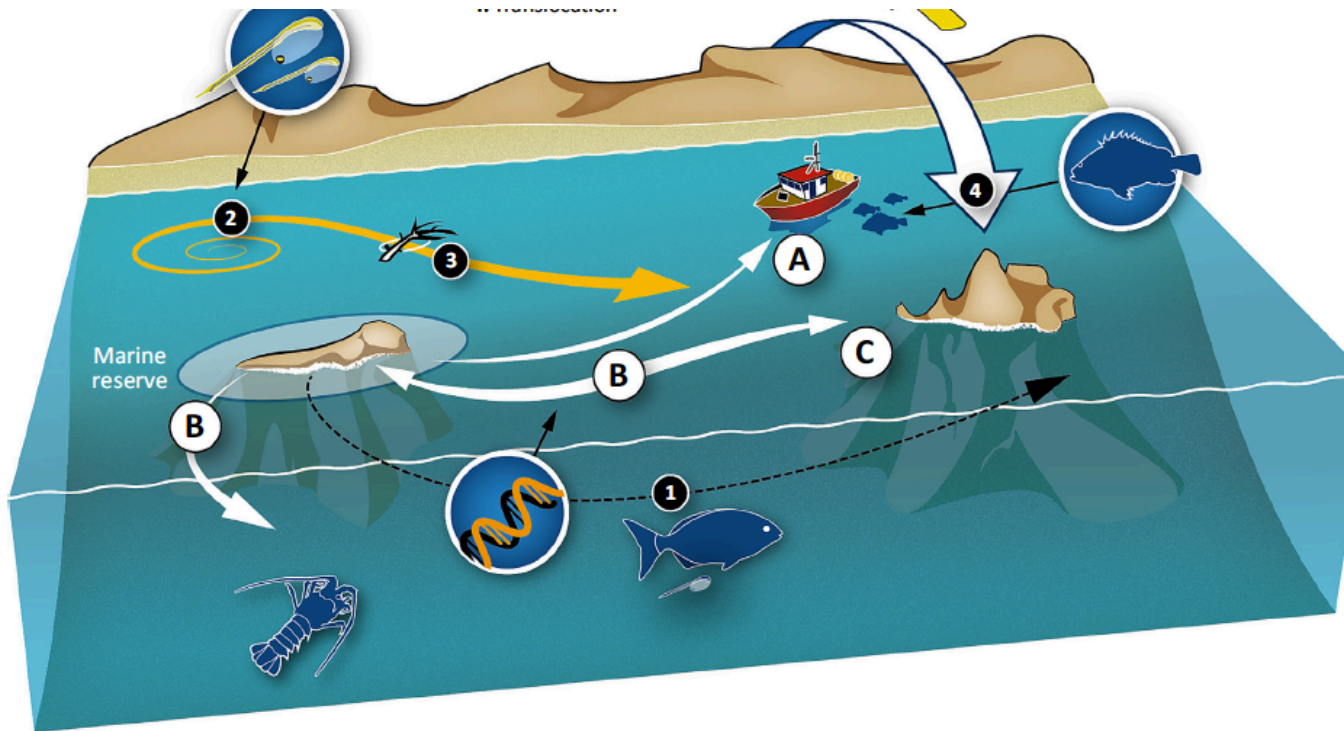
Self-funded or sub-contracted partners

- ❖ **Partner 6**: Instituto Español de Oceanografía (Spain)
- ❖ **Partner 7**: University of Perpignan (France)
- ❖ **Partner 8**: University of Alicante (Spain)
- ❖ **Partner 9**: MEDPAN (network of Marine Protected Areas managers in the Mediterranean) (France)

PROJECT DESCRIPTION



Long distance benefits from marine reserves (>40km)



Review paper : Manel
et al. 2019 Tree

- Long dispersal distance (> 40km)
- Dispersal has been underestimated because of limited geographic extend of sampling designs



Striped red mullet



Comber

PROJECT DESCRIPTION

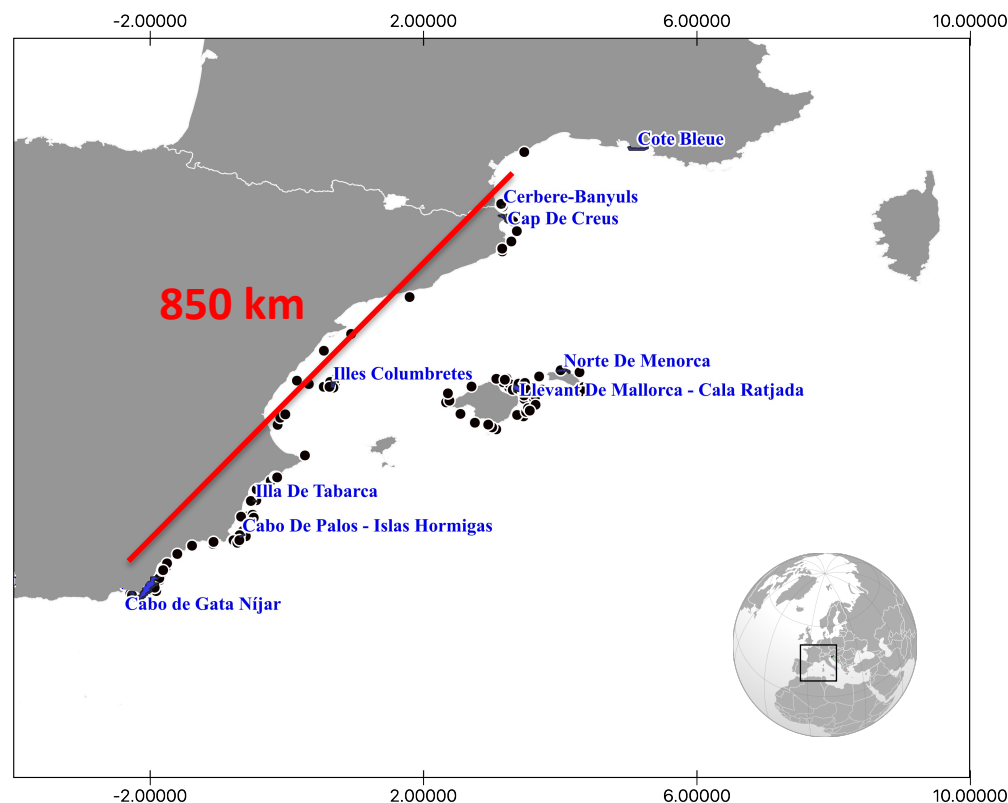


White seabram



Spiny lobster

Connectivity in a network of marine reserves to ensure network sustainability and deliver fishes beyond protected limits



-Extensive sampling of 4 species

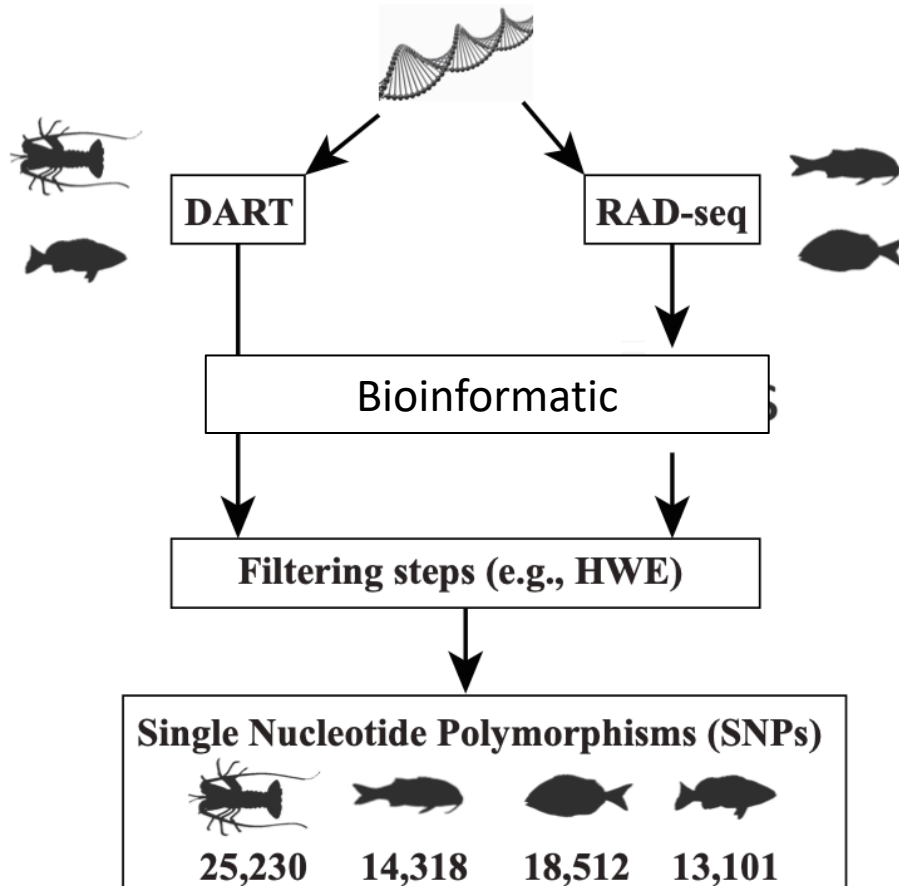
- Coll with fishers : 2064 ind

PROJECT DESCRIPTION



Genomic datasets

- ❖ **1,299** (243 – 468 individuals per species)
- ❖ Filtering steps. (e.g. HWE, remove of outliers)
- ❖ **Sequence genomes** for *mullet*, *seabram*, *comber*
- From **13,101 to 25,230 SNPs** genotyped

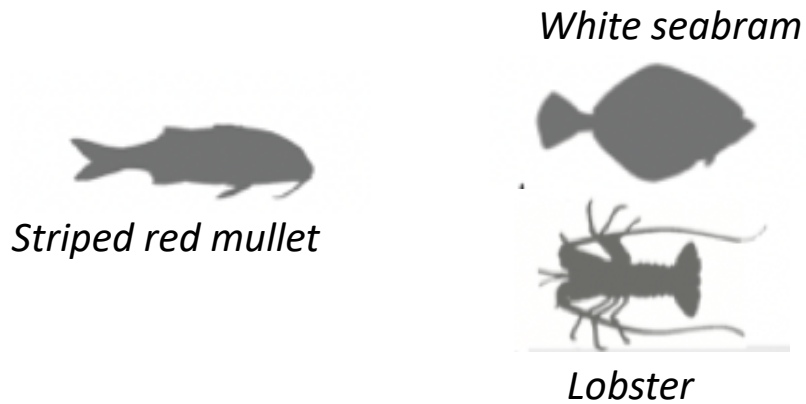


PAPER 1: Fietz et al. Submitted MER. Genomic resources for mediterranean fishes

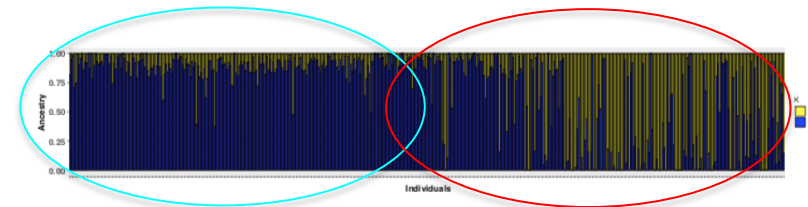
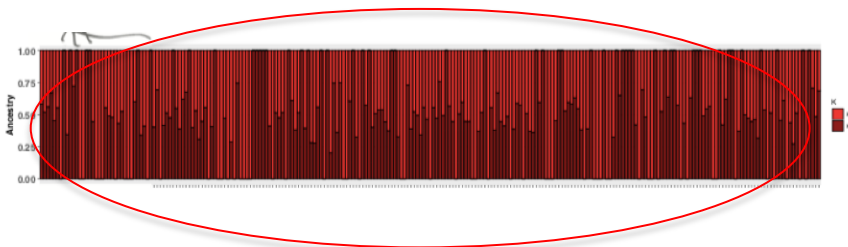
SCIENTIFIC OUTPUTS



❖ Long dispersal distance (dispersal distance > 40km)



Comber



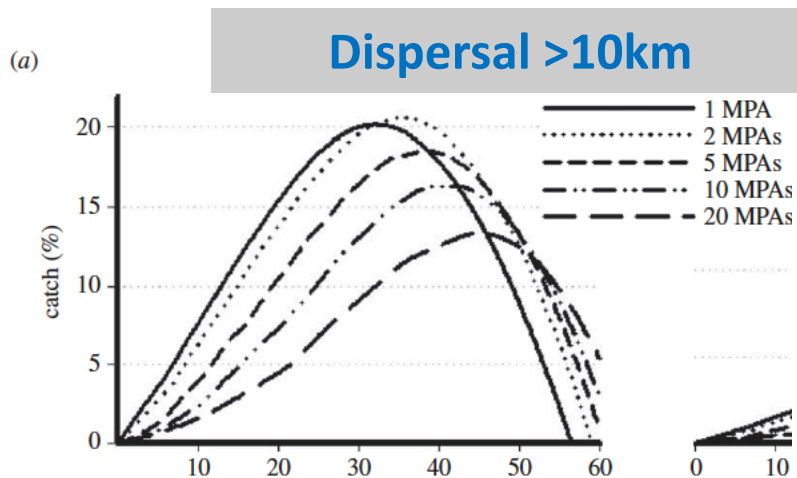
❖ Low genetic structure : high gene flow

SOCIETAL / POLICY OUTPUTS



➡ Implications for biodiversity conservation and fishery

- ❖ **Marine reserves are connected** (median nearest-neighbor distance between marine reserves : 12 km globally)
- ❖ **1 or 2 large reserves are more appropriate for fishery gains** *that a network of 10 small reserves covering the same area*



Deleo et al. 2015

➡ *Big females over-contribute to reproduction*

SOCIETAL / POLICY OUTPUTS



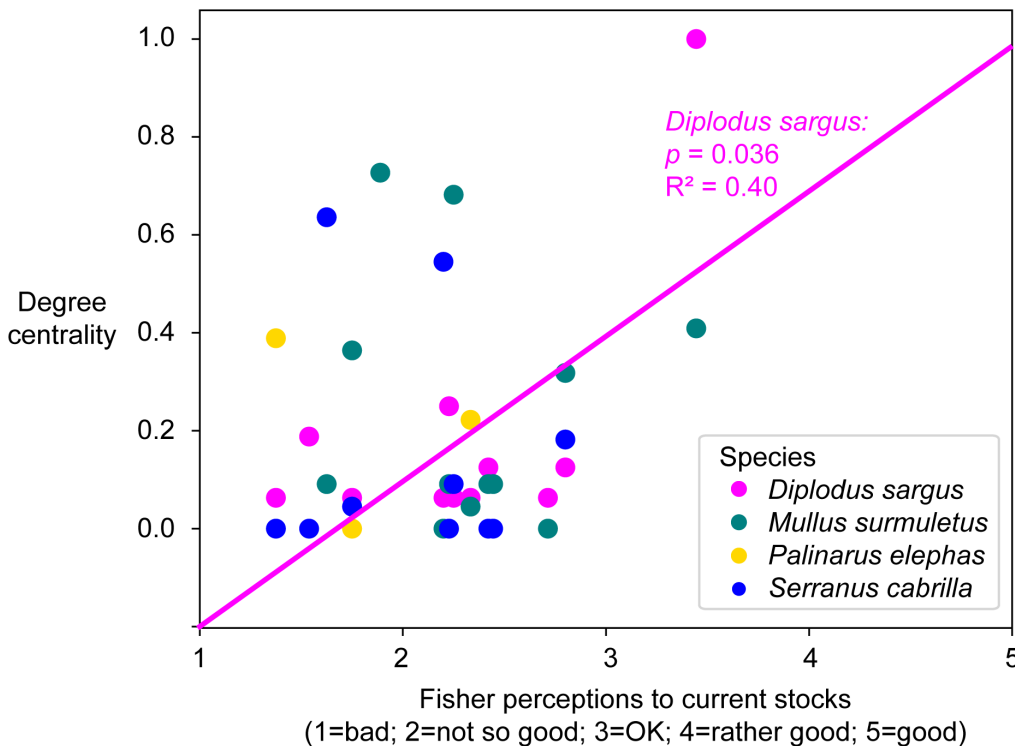
A single large reserve is able to seed overexploited areas through dispersal and result in higher populations growth within reserve boundaries and shorter recovery times after overexploitation outside the reserve.

SOCIETAL / POLICY OUTPUTS




Survey to better understand the perceptions of fishers of the benefit of marine reserves

Interview of 169 fishers in the study area (82 France, 87 Spain)



This positive relationships should help to convince fishers and reserve managers of the importance to use connectivity to improve reserve design



SOCIETAL / POLICY OUTPUTS

Dissemination of our recommendations

- ❖ A policy brief: Guidelines for the spatial management of European marine living resources (Biodiversa) (Acuna & Manel) coll PERCEBES project
- ❖ A report for stakeholder : What can genomics bring to MPA reserve design ? (Fietz et al. in prep)
- ❖ An article in Medpan Newsletter (listing of >6000 stakeholders)



SCIENTIFIC OUTPUTS

Scientific papers (no exhaustive list)

Published:

- 1-Manel S, Loiseau N, Puebla O. Long-Distance Marine Connectivity: Poorly Understood but Potentially Important. *Trends in Ecology & Evolution* **34**, 688-689 (2019).
- 2-Manel S, *et al.* Long-Distance Benefits of Marine Reserves: Myth or Reality? *Trends in Ecology & Evolution* **34**, 342-354 (2019).

Submitted or in prep

- 3-Fietz et al. Submitted MER. Genomic resources for mediterranean fishes
- 4-Benestan et al. (in prép) dispersal in a sea of gene flow: consequences for the network of MPA
- 5-Benestan et al. (in prep) Landscape genomics for mediterranean fishes
- 6- Ford et al. (in prep) MPA network misalignment with genetic connectivity: Mediterranean Sea case study

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ACKNOWLEDGEMENTS



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Partners



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