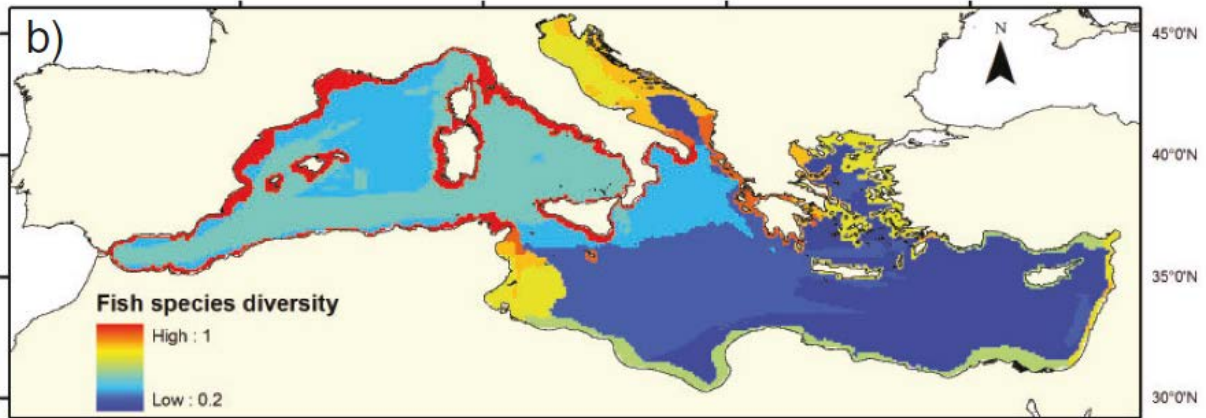


Coastal fish nurseries: the need for a wide vision at habitat and ecological function scales

Pr Patrice Francour

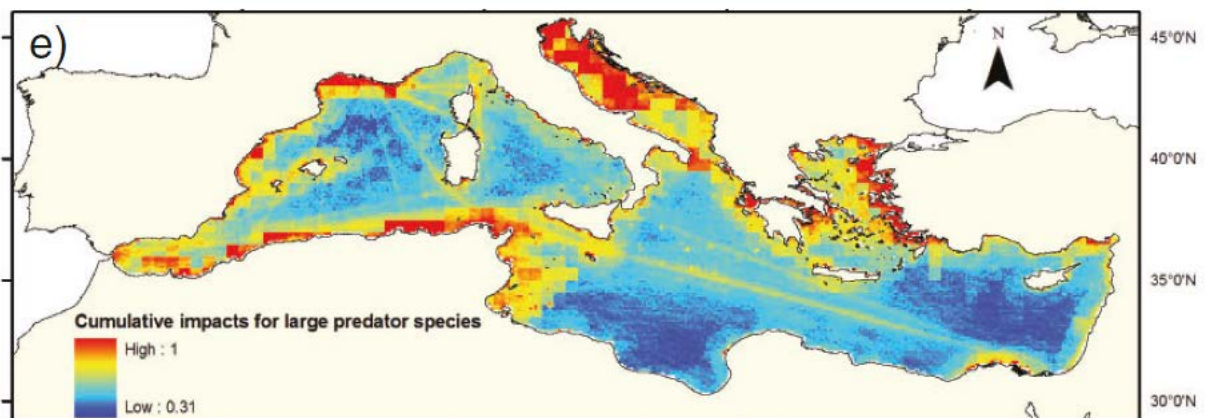
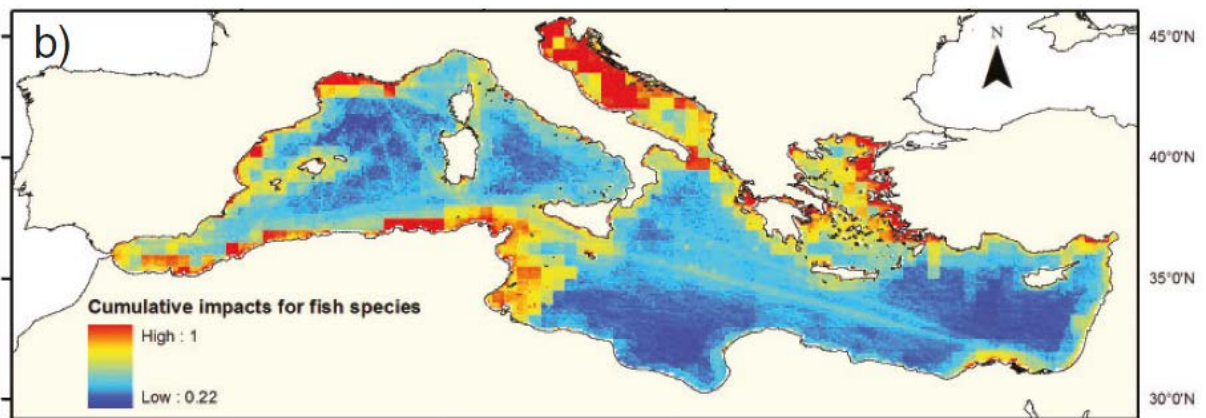
Dr Adrien Cheminée; ECOMERS Laboratory

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Mediterranean coastal areas:

- Highest fish diversity
- Highest cumulative impacts



| Threats | | How to limit them? |
|---|---|---|
| Coastal-based impacts | <ul style="list-style-type: none"> • coastal development with destruction of shallow areas (harbors, dykes, <i>etc.</i>) • invasive species • fish farming | <ul style="list-style-type: none"> • limitation/restoration • control/MPAs (top predators) • limitation |
| Pollution | <ul style="list-style-type: none"> • organic/inorganic pollution • sediment areas as secondary reservoirs | <ul style="list-style-type: none"> • sewage treatment plants • sediment restoration/capping |
| Trawling and dredging disturbance | <ul style="list-style-type: none"> • habitat (3D) destruction | <ul style="list-style-type: none"> • prohibition/limitation • habitat restoration |
| Exploitation of marine resources by fisheries | <ul style="list-style-type: none"> • overfishing • by-catch • habitat modifications (trophic cascades) | <ul style="list-style-type: none"> • limitation/quotas/prohibition • regulation/adaption of gears • MPAs/restoration |
| Maritime activities | <ul style="list-style-type: none"> • commercial shipping lanes • benthic oil rig structures | <ul style="list-style-type: none"> • regulation • ? |
| Impacts of climate change | <ul style="list-style-type: none"> • sea surface temperature anomalies • acidification | Regulations at large scales (political actions) |

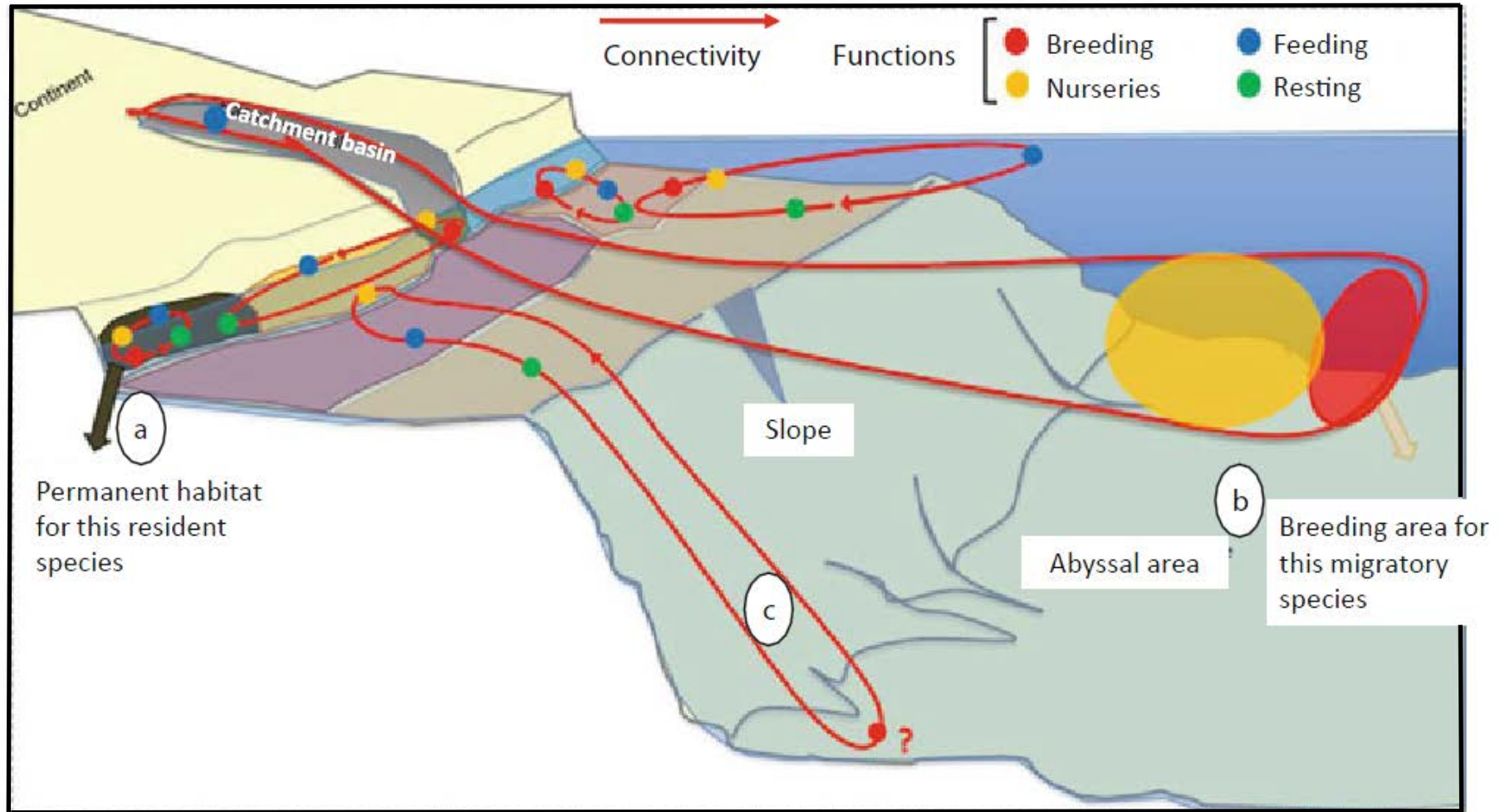
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- How to solve this dilemma? i.e. how to take into consideration these cumulative impacts with solutions designed for a single impact?
- example, the fish assemblages

Fish assemblages: different life cycle strategies



ESSENTIAL FISH HABITAT (EFH) is a habitat identified as essential to the ecological and biological requirements for critical life history stages of fish species, and which may require special protection to improve long term sustainability.

Essential habitats of the life cycle: altogether or confined into a limited space

reproduction

nurseries

feeding

resting

reproduction

nurseries

feeding

resting

Essential habitats of the life cycle: separated

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SENSITIVE HABITATS (SH) are fragile habitats that are recognized internationally as ecologically important and which support important assemblages of fish species and which may require special protection (e.g. *Posidonia* beds).

Essential habitats of the life cycle: altogether or confined into a limited space

reproduction

nurseries

feeding

resting

« Resident species »

Dispersion
capacity

« Migrant species »

Low connectivity

Connectivity
between
habitats

High connectivity

reproduction

nurseries

feeding

resting

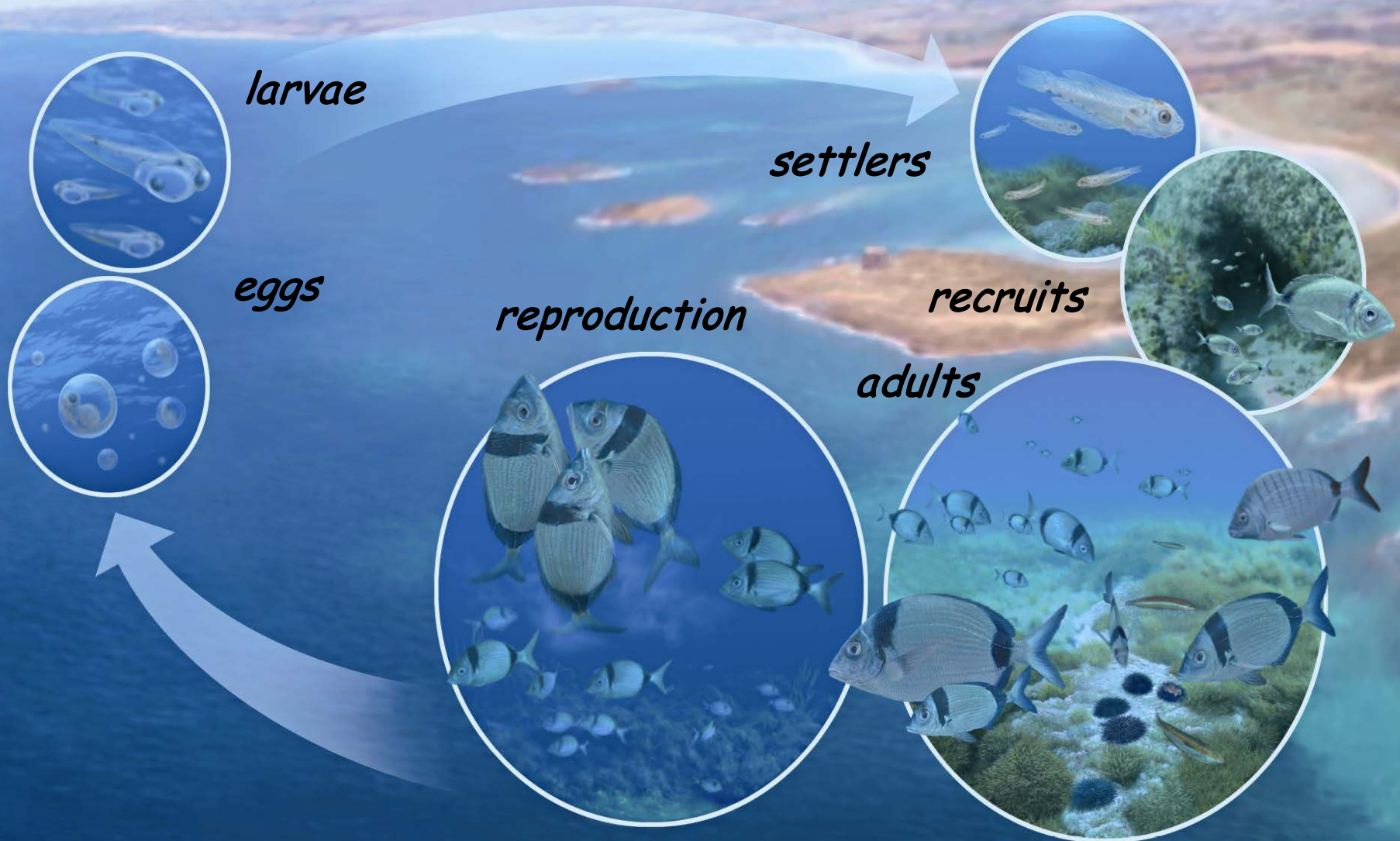
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Common two banded sea breams - life cycle

(from Di Franco et al., 2012, 2013; 2014)



Common two banded sea breams - life cycle

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open coastal sea

larvae

settlers

special microhabitats in shallow waters

eggs

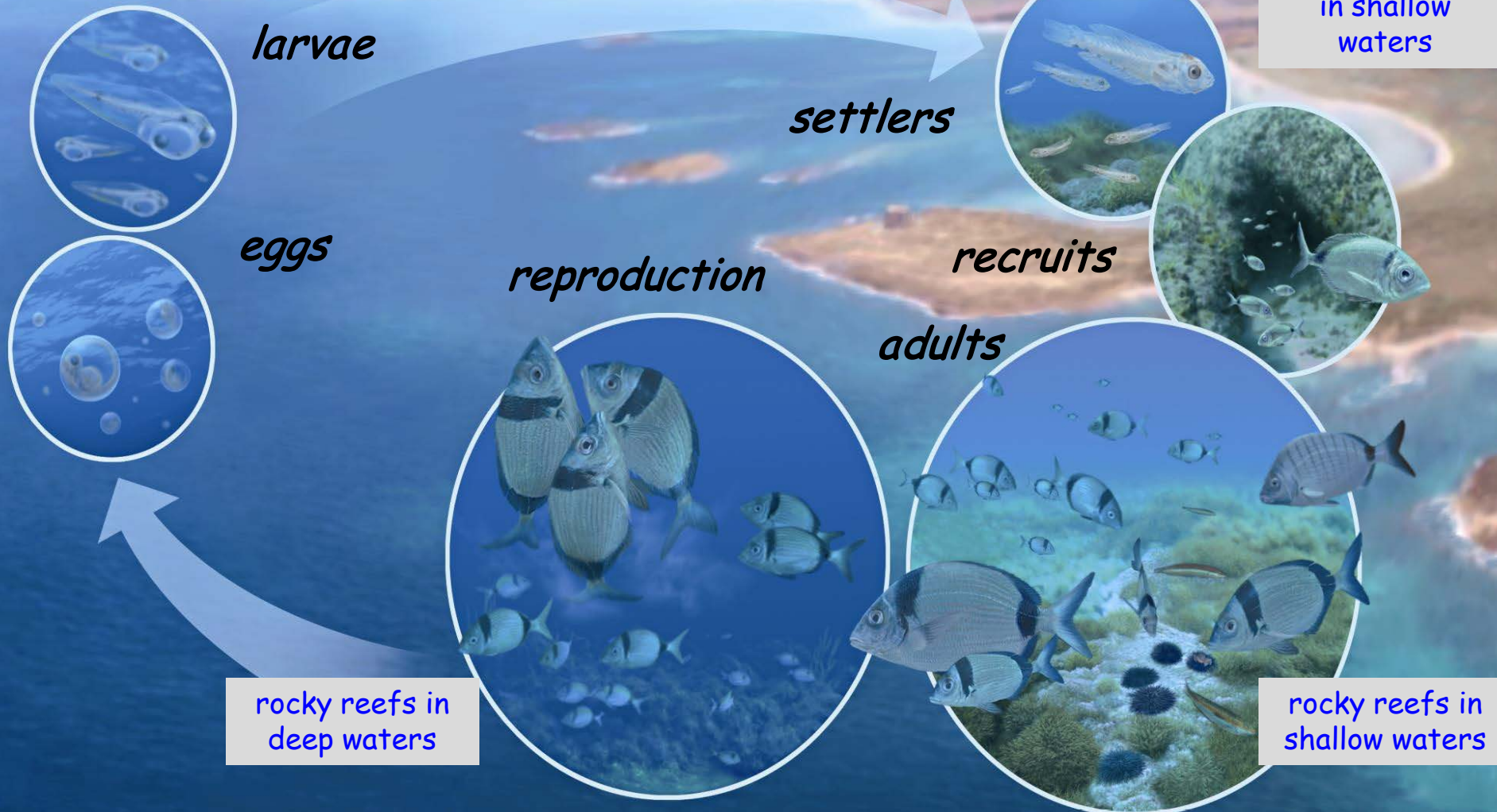
reproduction

recruits

adults

rocky reefs in deep waters

rocky reefs in shallow waters



Common two banded sea breams - life cycle

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Different EFHs have to be present

open coastal sea

larvae

eggs

reproduction

settlers

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Different EFHs have to be present

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larvae

Pollution
Coastal development
Overfishing
Trophic cascades

settlers

special microhabitats in shallow waters

eggs

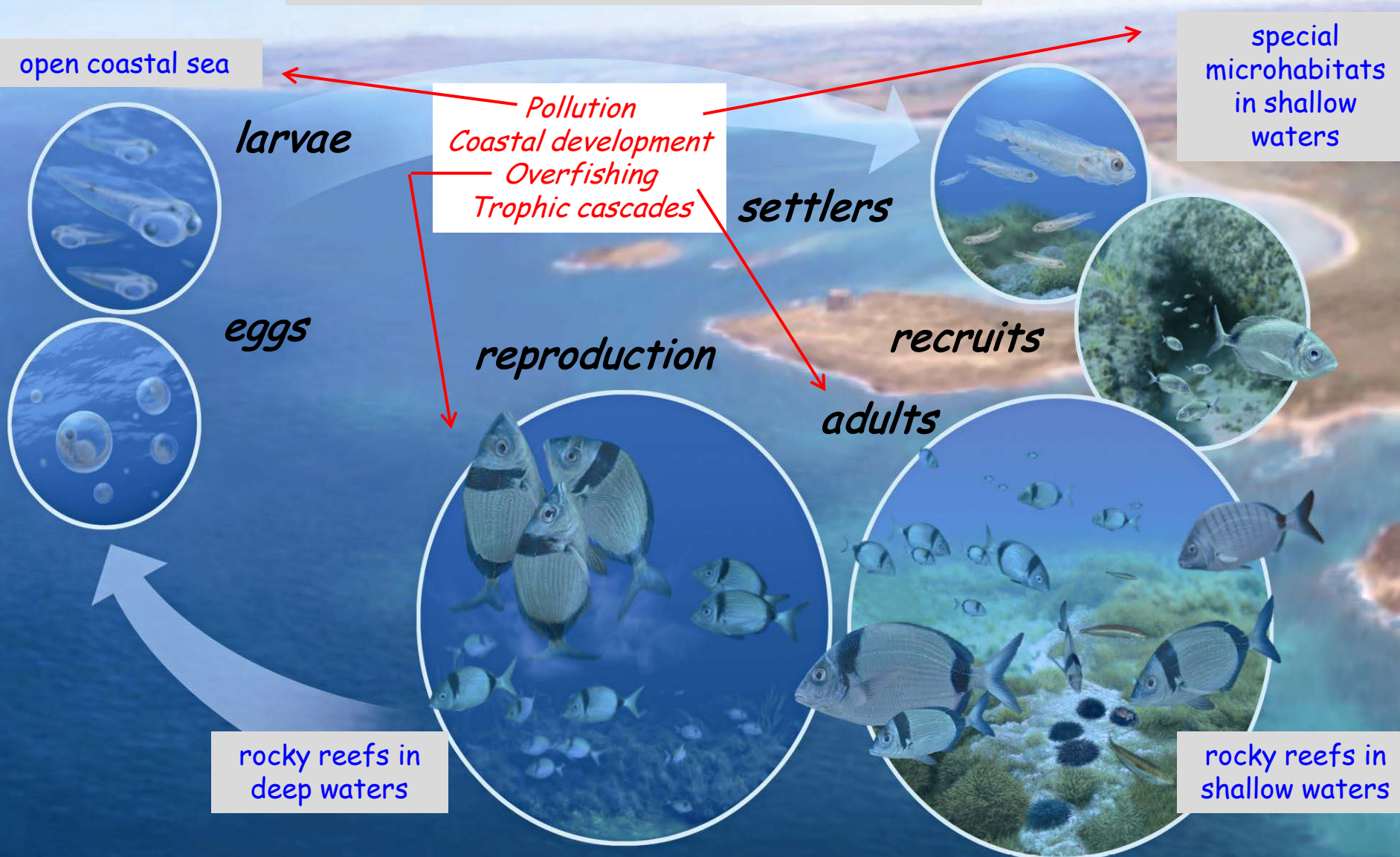
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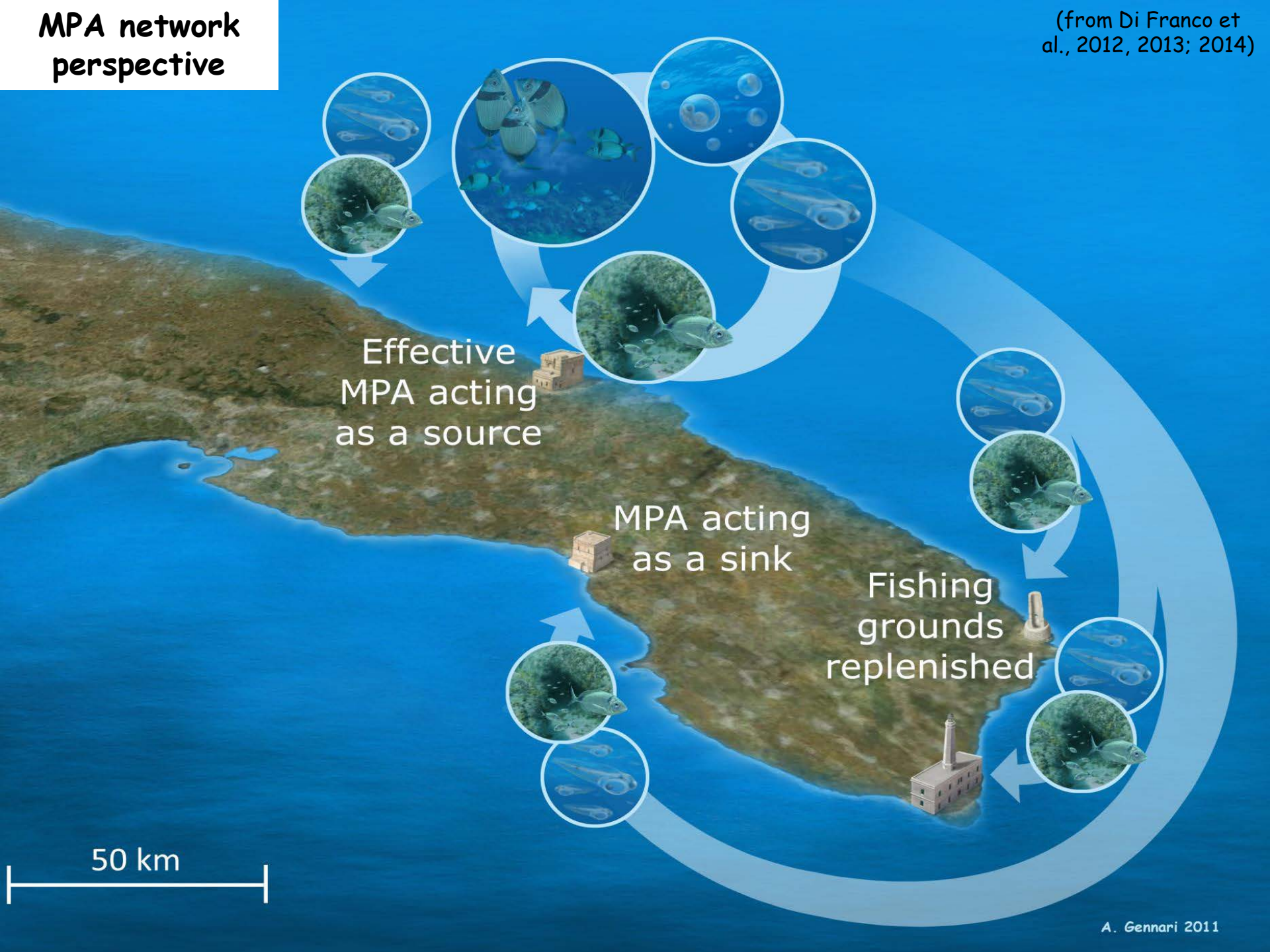


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 - Threats (single/cumulative) impact generally several habitats and then several functions

MPA network perspective

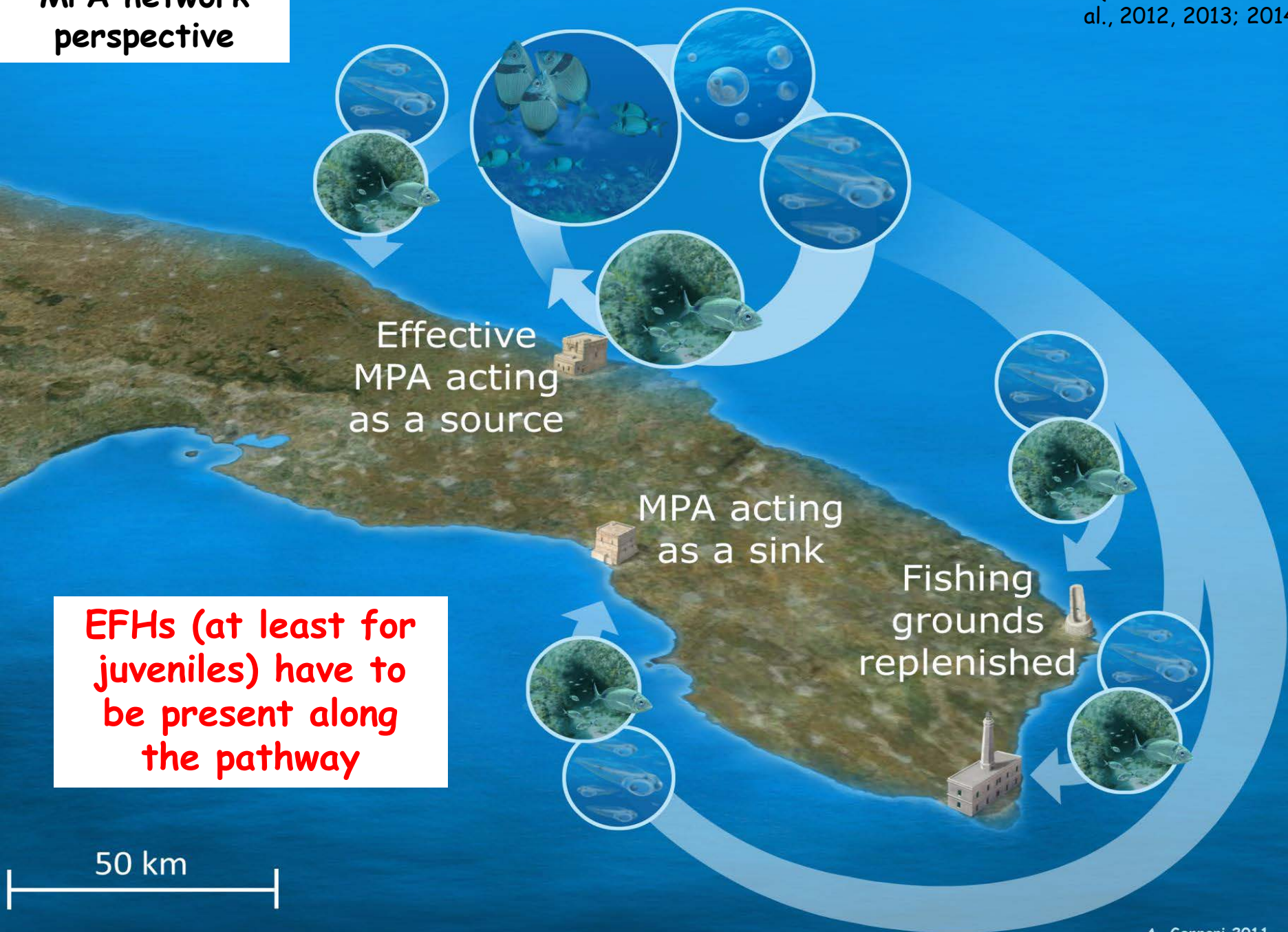
(from Di Franco et al., 2012, 2013; 2014)



50 km

MPA network perspective

(from Di Franco et al., 2012, 2013; 2014)



Effective MPA acting as a source

MPA acting as a sink

Fishing grounds replenished

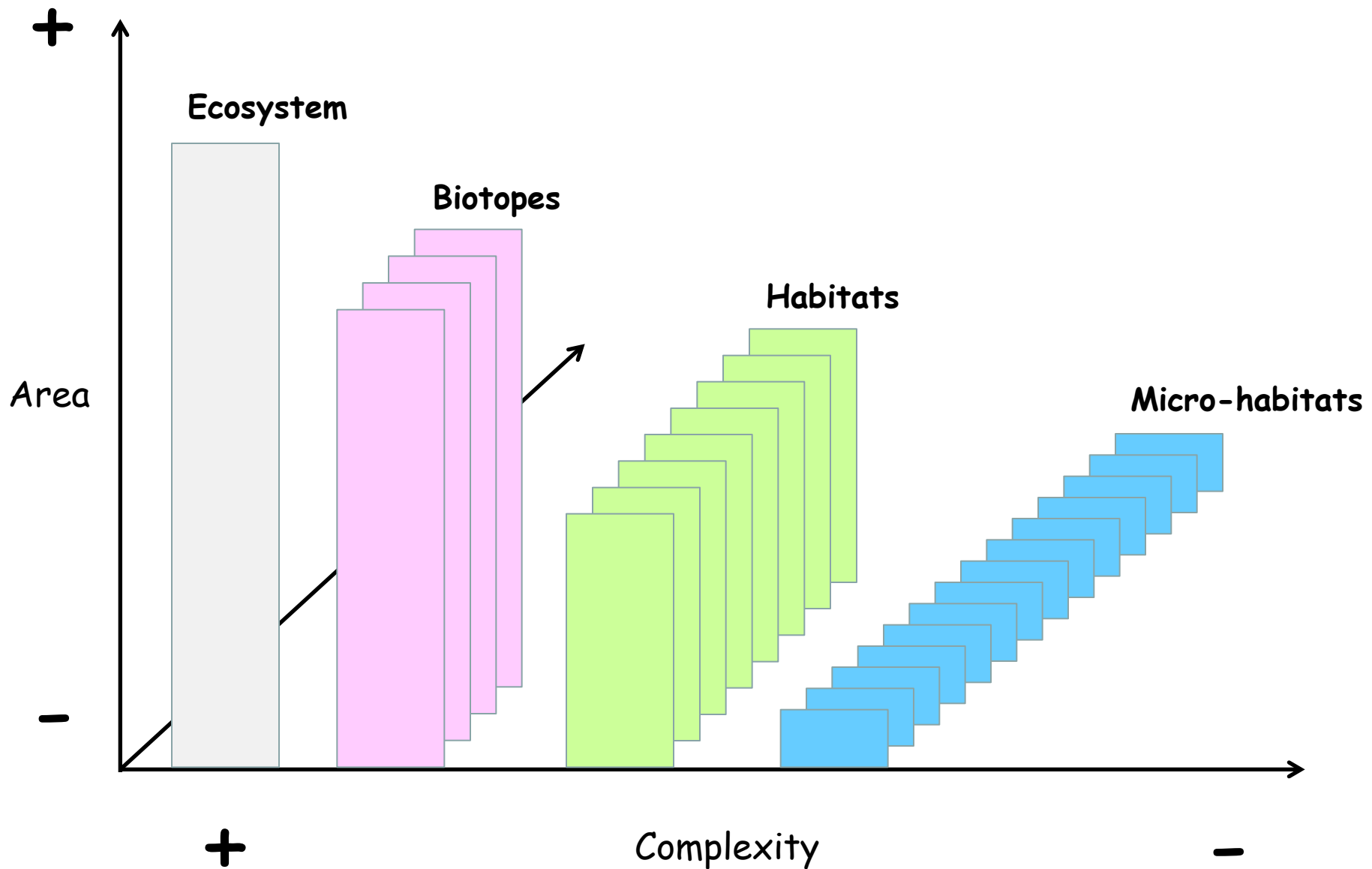
EFHs (at least for juveniles) have to be present along the pathway

50 km

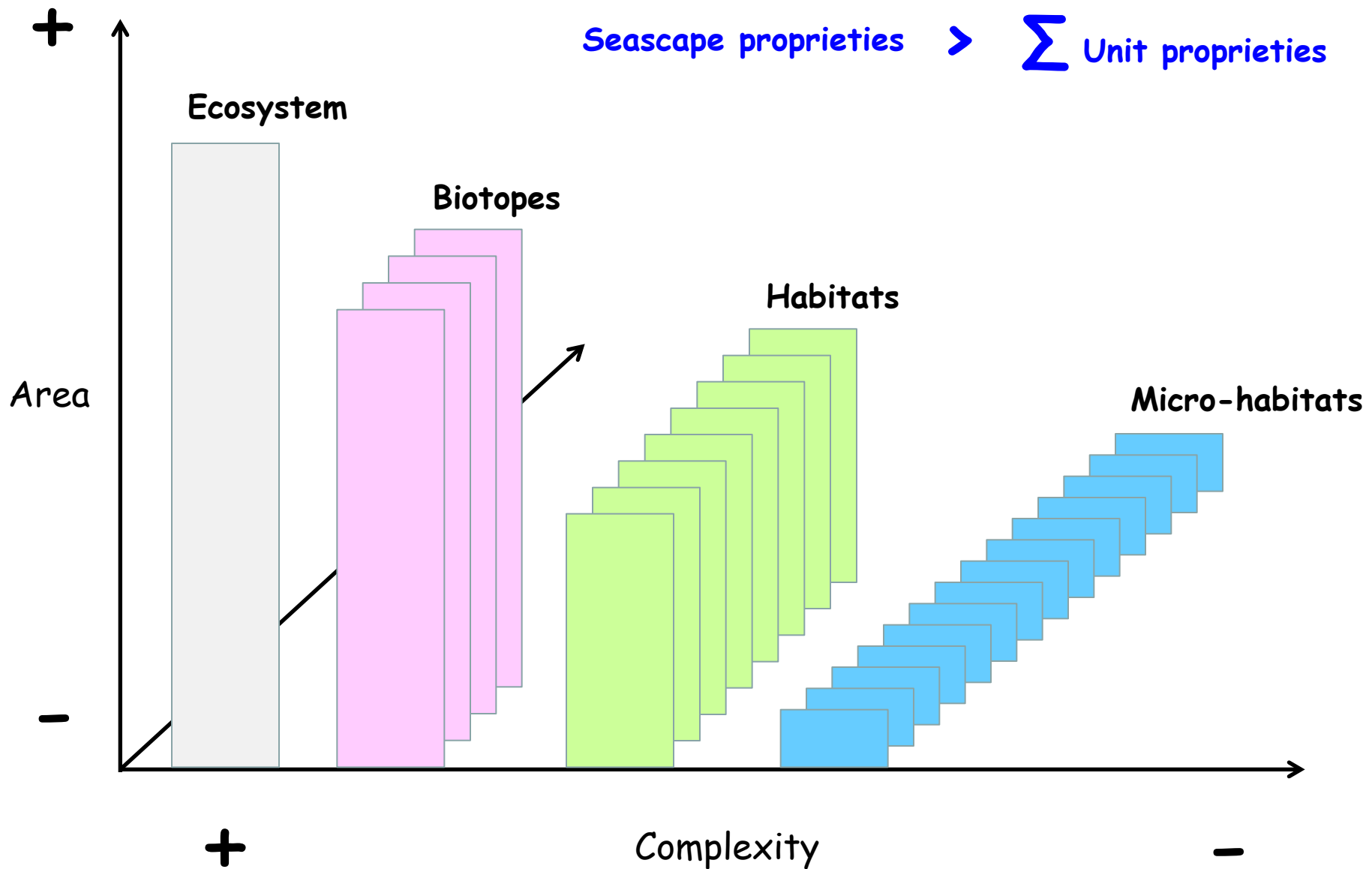
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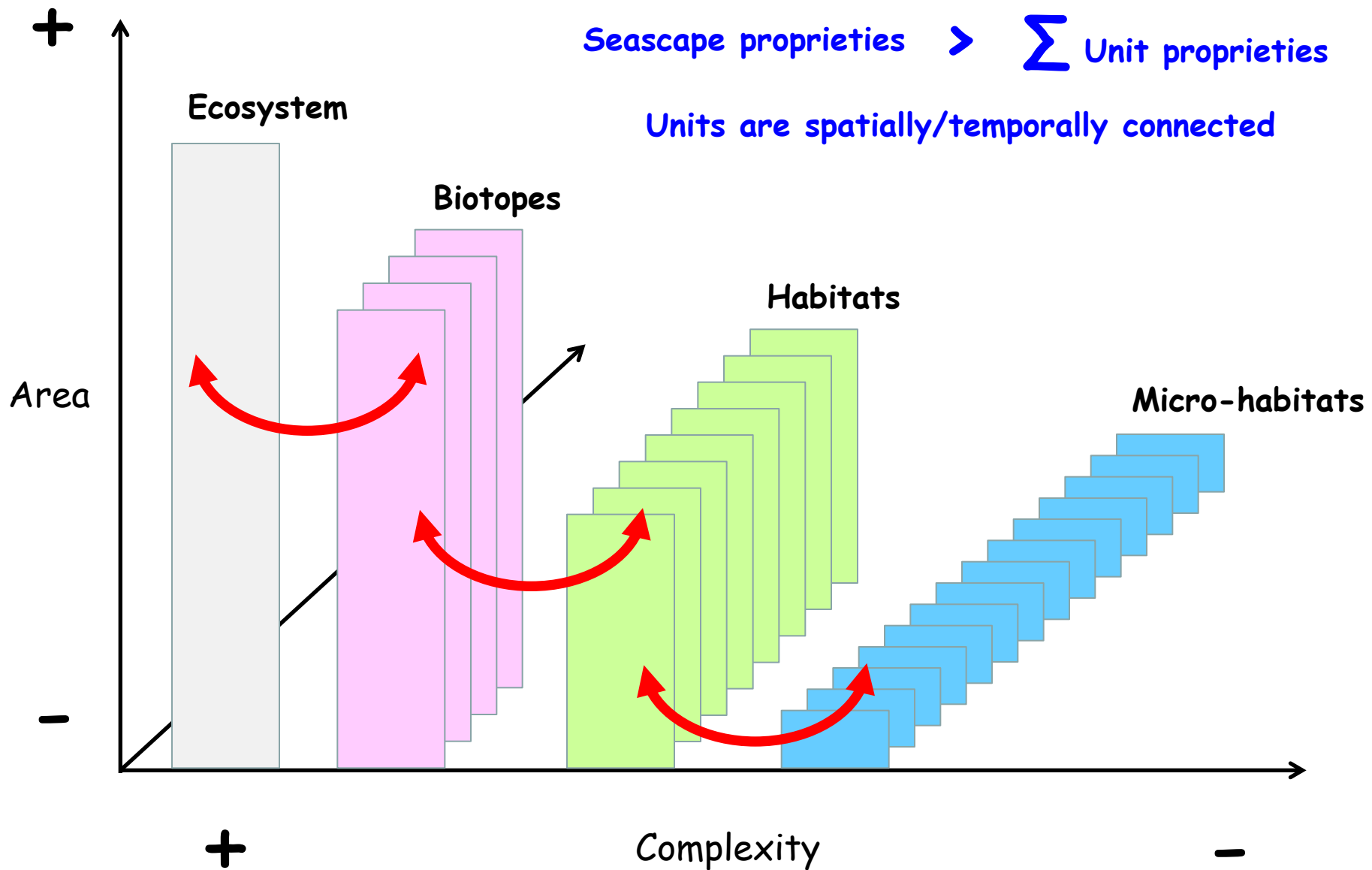
Seascape: a mosaic of nested spatial units, allowing different ecological functions



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 - Seascape scale has to be considered to deal with fish assemblage sustainability

Traditional management of impacts in coastal areas

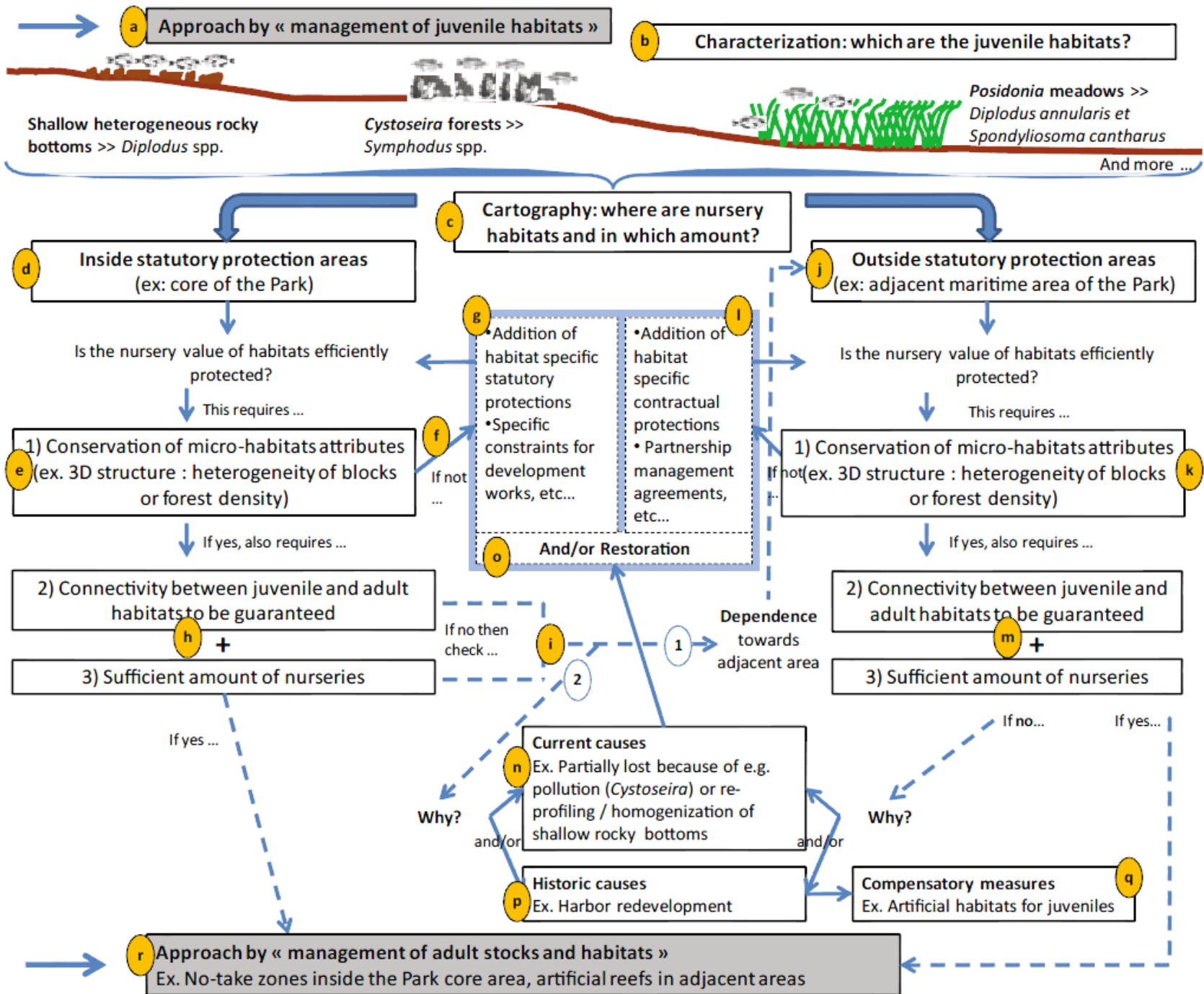
- 1 impact = 1 management/action
- main triggers: natural value (species, ecosystem), economical importance; rarely to sustain an ecological function (e.g. nursery)
- consequences: coastal fish nurseries are frequently not considered to implement a management plan or a MPA

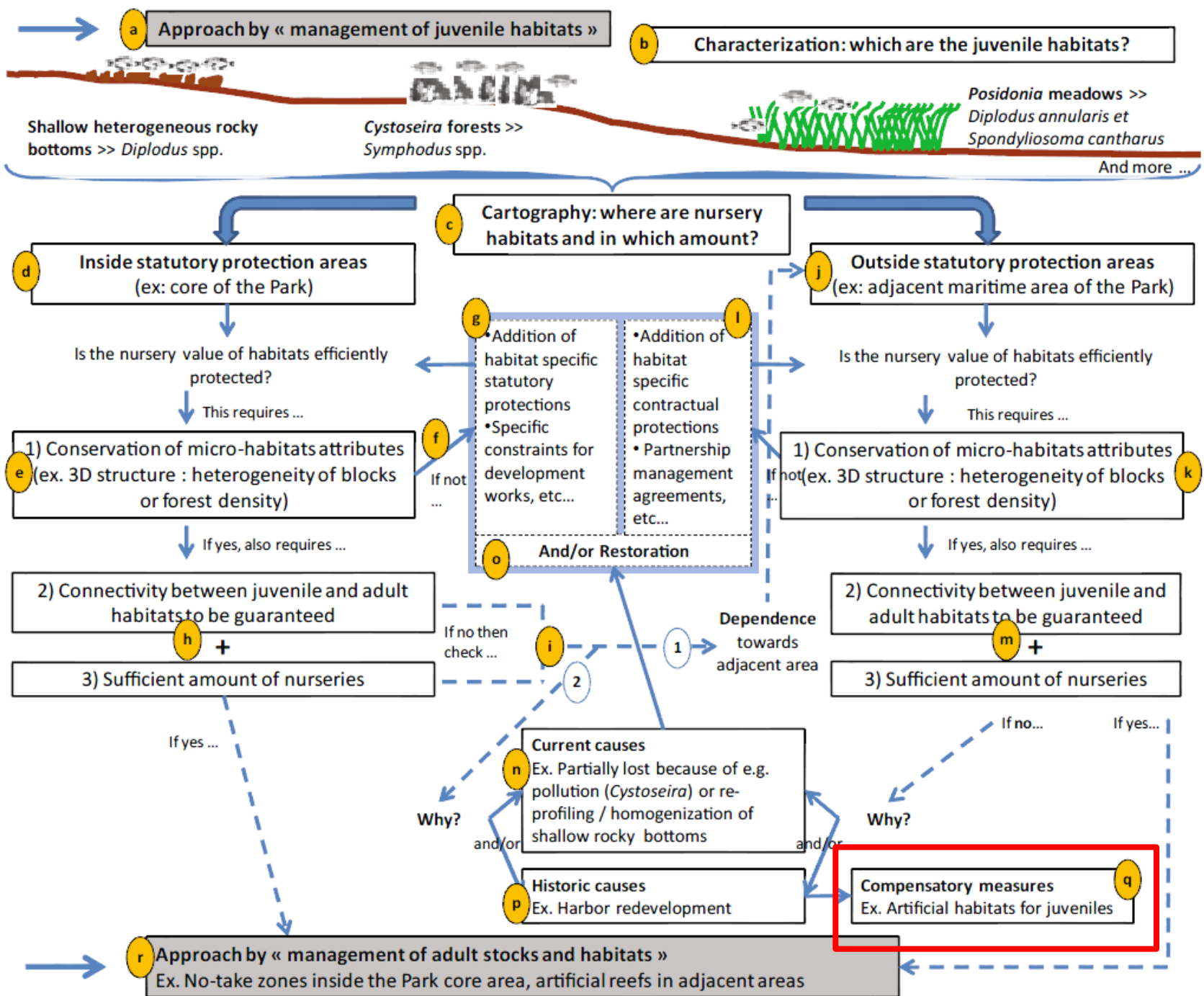
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Management of impacts to adopt in coastal areas

- Integrity of seascape = all the ecological functions are available
- Good Ecological Health: (1) diversity of Essential Habitats, (2) 3D structure, (3) connectivity between nested units and also surrounding areas
- Approaches by management of juvenile habitat and not only management of adult stocks and habitats (Cheminée et al., 2014)





Management of juvenile habitats

- due to their shallow distribution, juvenile habitats are probably the most threatened EFHs
- restoration of this crucial EFH could be mandatory to sustain the whole life cycle
- restoration have to be considered as “restoration of a function”
- **consequently, the traditional (political) restoration process following the ratio of surfaces has to be prohibited (destruction of H hectares; restoration of $H \times R$ hectares)**
- the restoration process will be considered as efficient if, and only if, the ecological functions are restored: assessment of the nursery value