Snook are just awesome Woodstorks pt2: assessing the importance of foraging habitat at spawning aggregation sites for an estuarine species

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Spawning aggregation definition

- Group of conspecifics at above average densities
- Specific place and time
- There to reproduce

Spawning aggregation characteristics

- Predictable in space and in time
- High densities
- Fish are easy to catch
- Largest individuals in population

Catch rates are very high

Fished to exhaustion within years

Fishery crashes once aggregations breakdown

Market floods during spawning

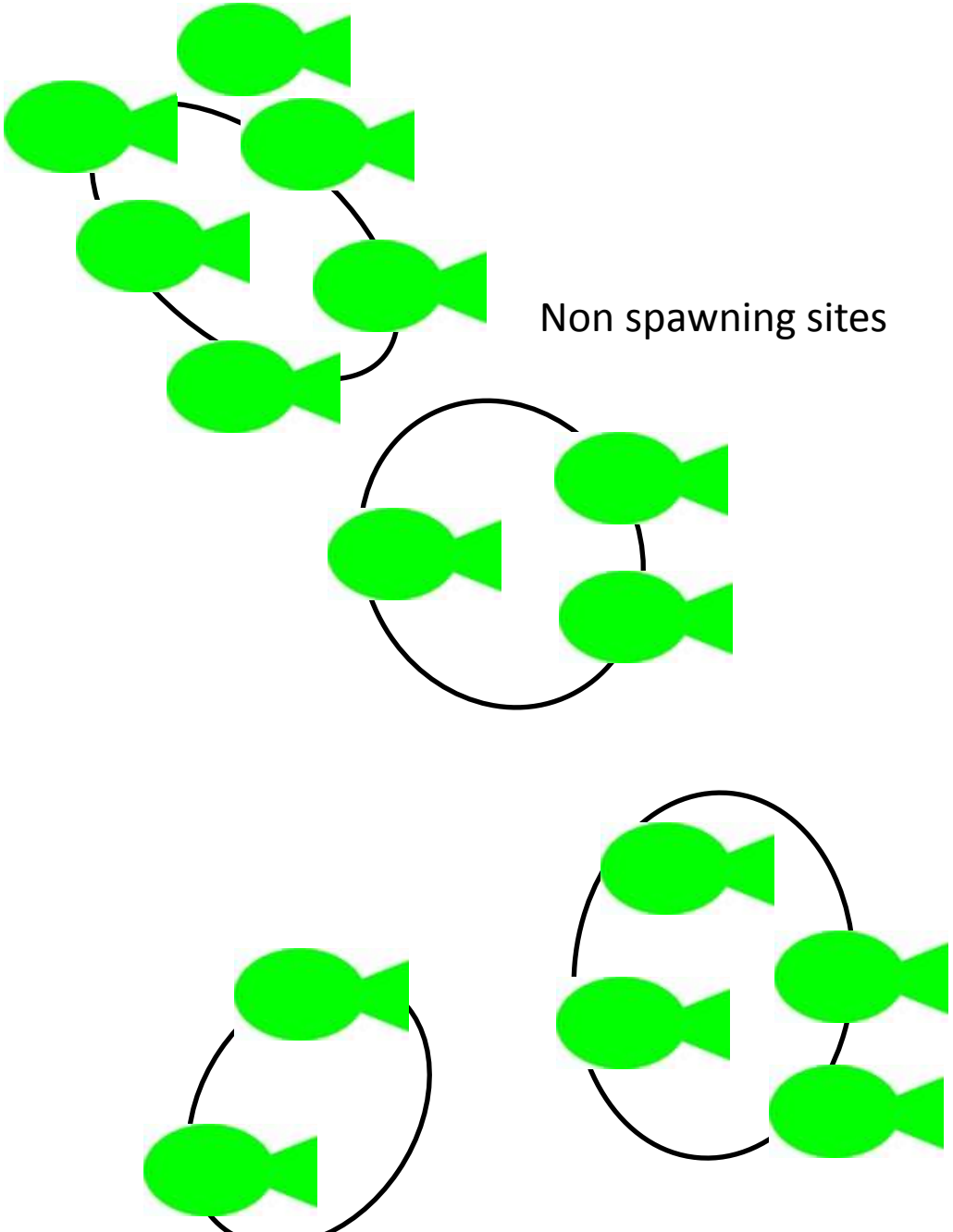
Price per fish very low

In order to manage marine species sustainably, we must protect spawning aggregations.

Spawning aggregation conceptual models developed studying tropical reef fish

Reef fish aggregation conceptual models

Non-spawning window



Reef fish aggregation conceptual models

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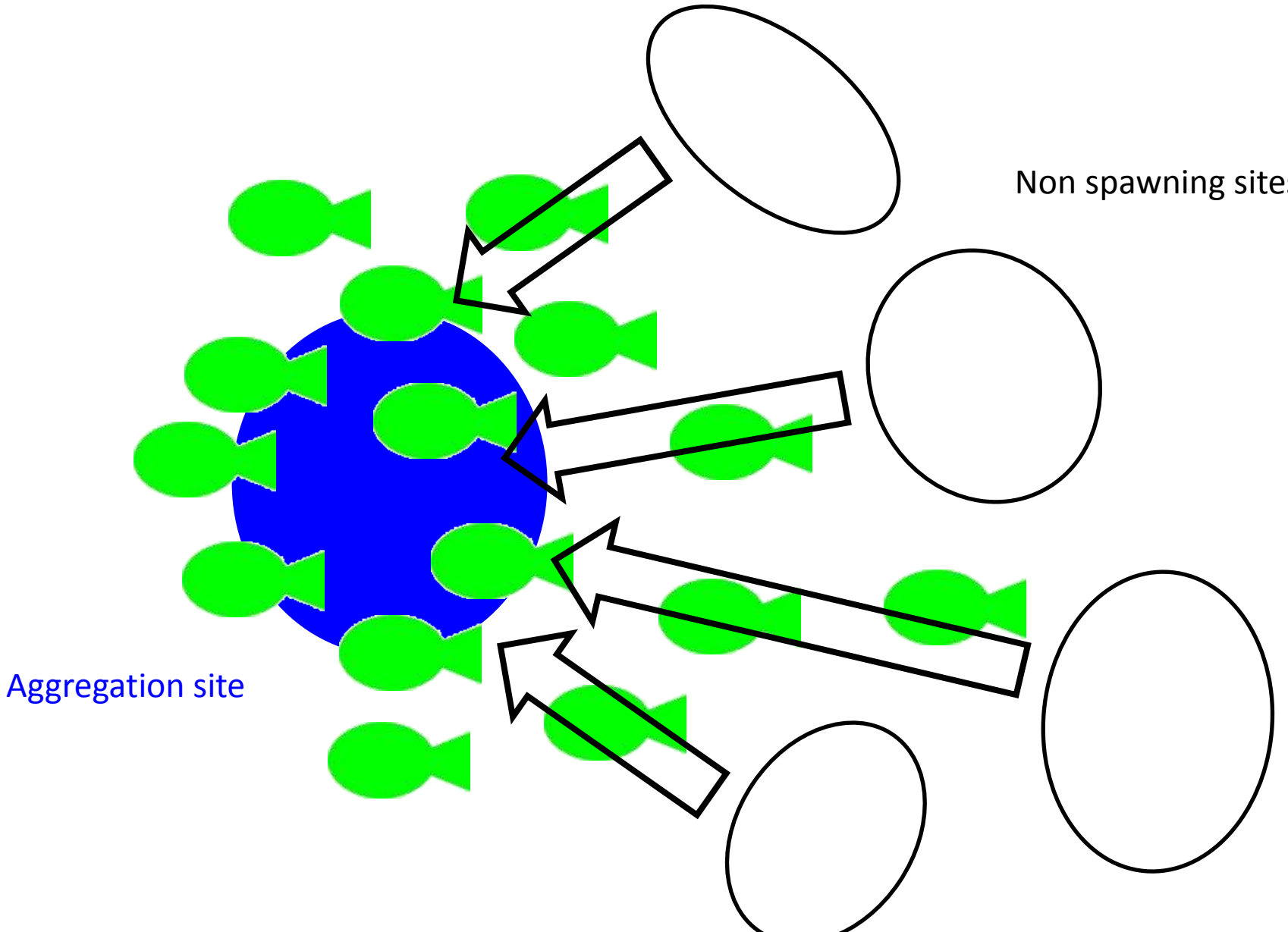

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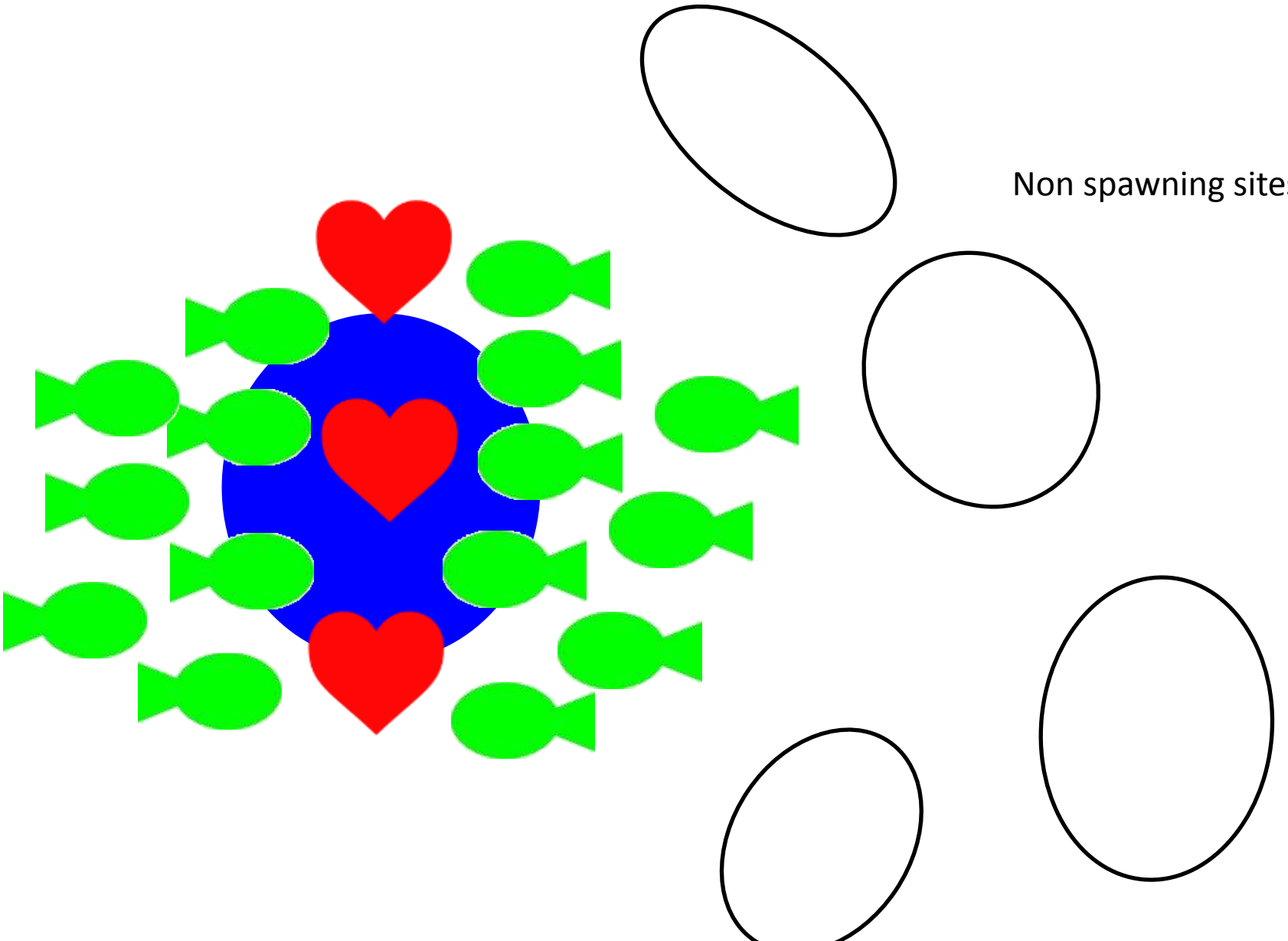

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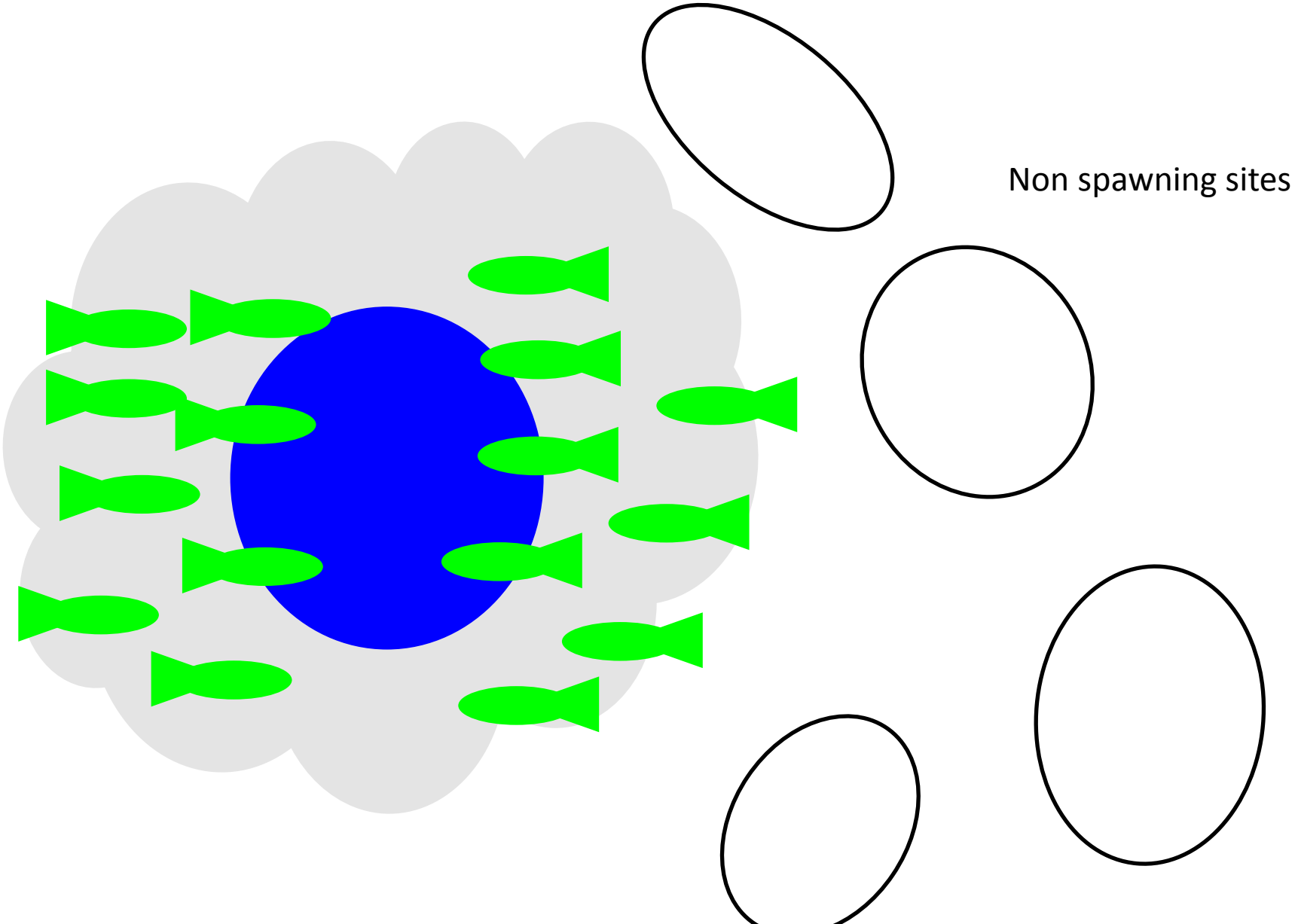

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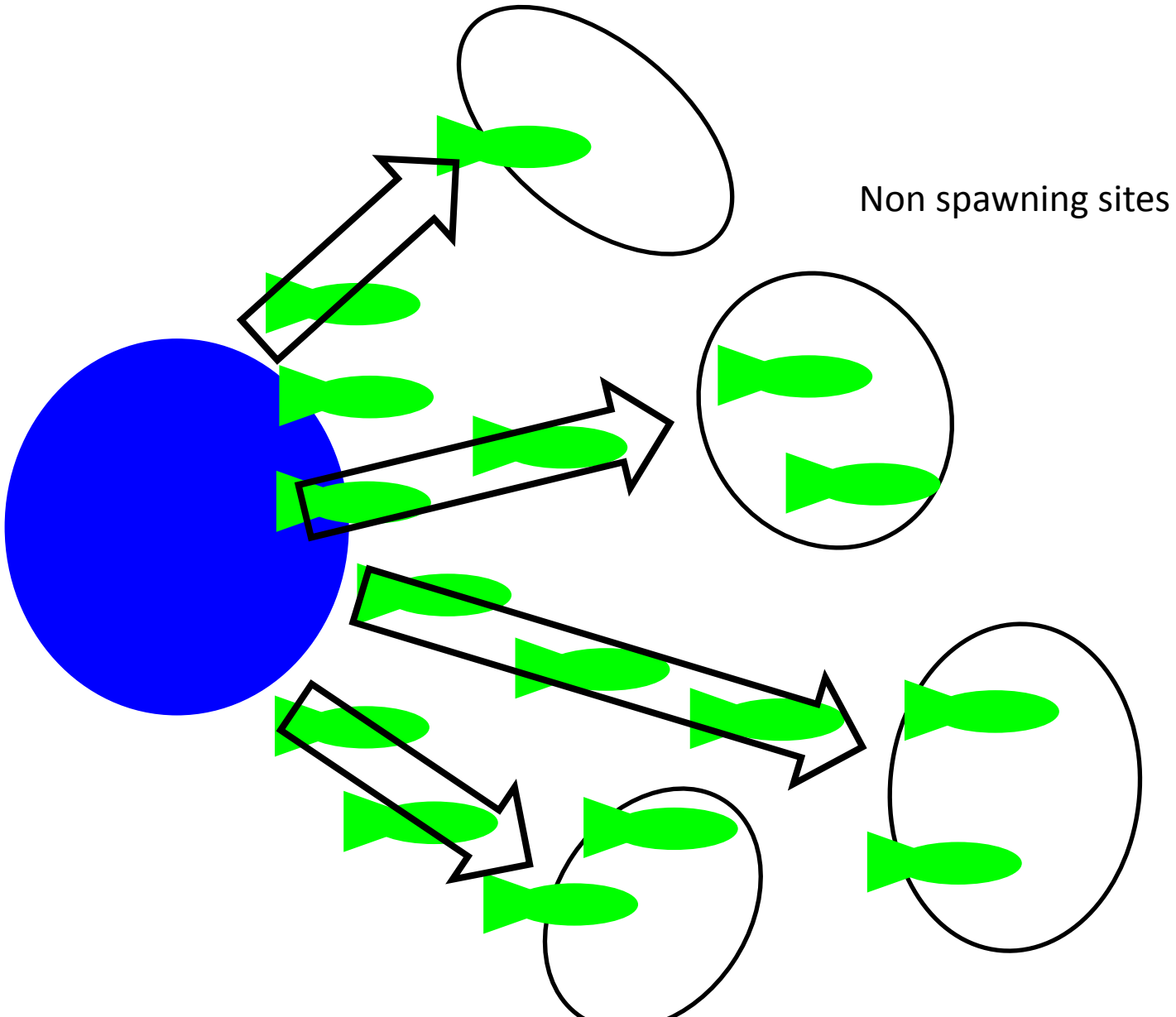

Tropical reef fish spawning aggregations

- Aggregations are 10s of thousands of fish
- Short lived
- Single spawning event

Spawning site selected based off of a single driver

Tropical fish spawning aggregation sites selected for larval transport

Spawning aggregation sites may be more complex for other species

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- Species that spawn multiple times per season

  -Some species spawn up to 60 times per season

Lowerre-Barbieri et al. 2016 Fish and Fisheries

Spawning aggregation sites may be more complex for other species

- Species that spawn multiple times per season
  - *Some species spawn up to 60 times per season*

- Spawning season lasts weeks to months

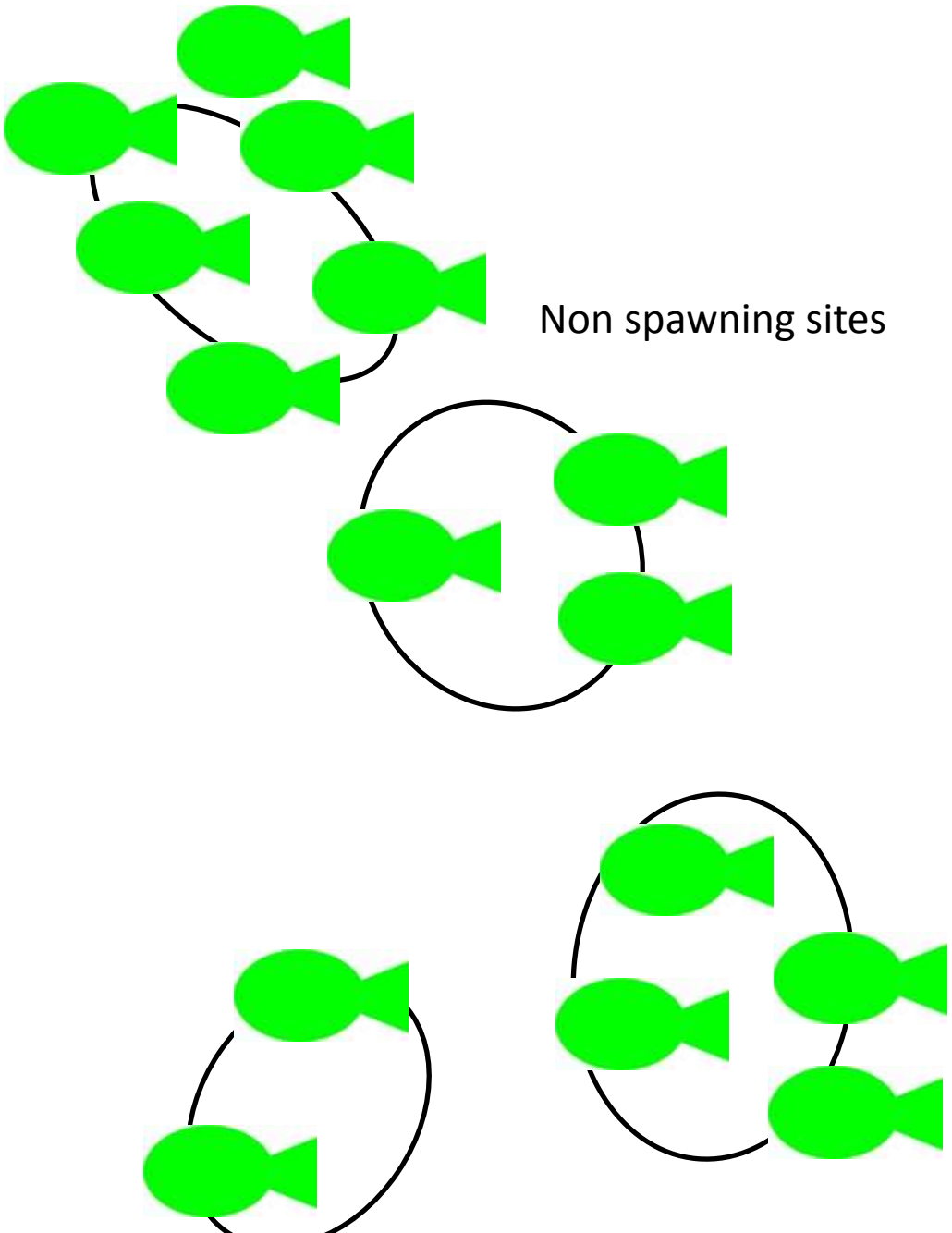
Lowerre-Barbieri et al. 2016 Fish and Fisheries

Spawning aggregation sites may be more complex for other species

Cannot sustain that level of reproduction without energy subsidies from the aggregation site

For species that spend weeks to months at aggregation sites

Non-spawning window



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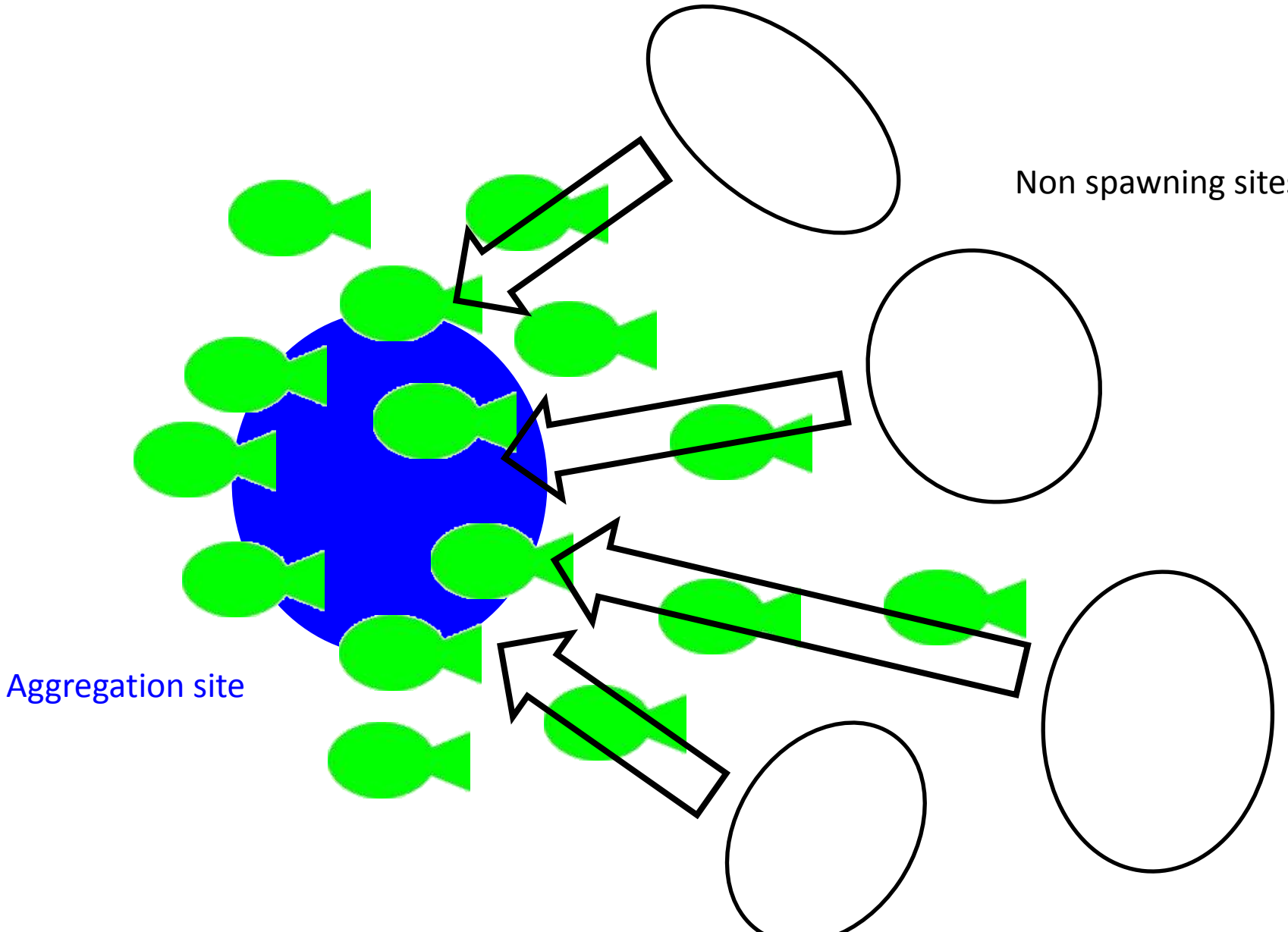

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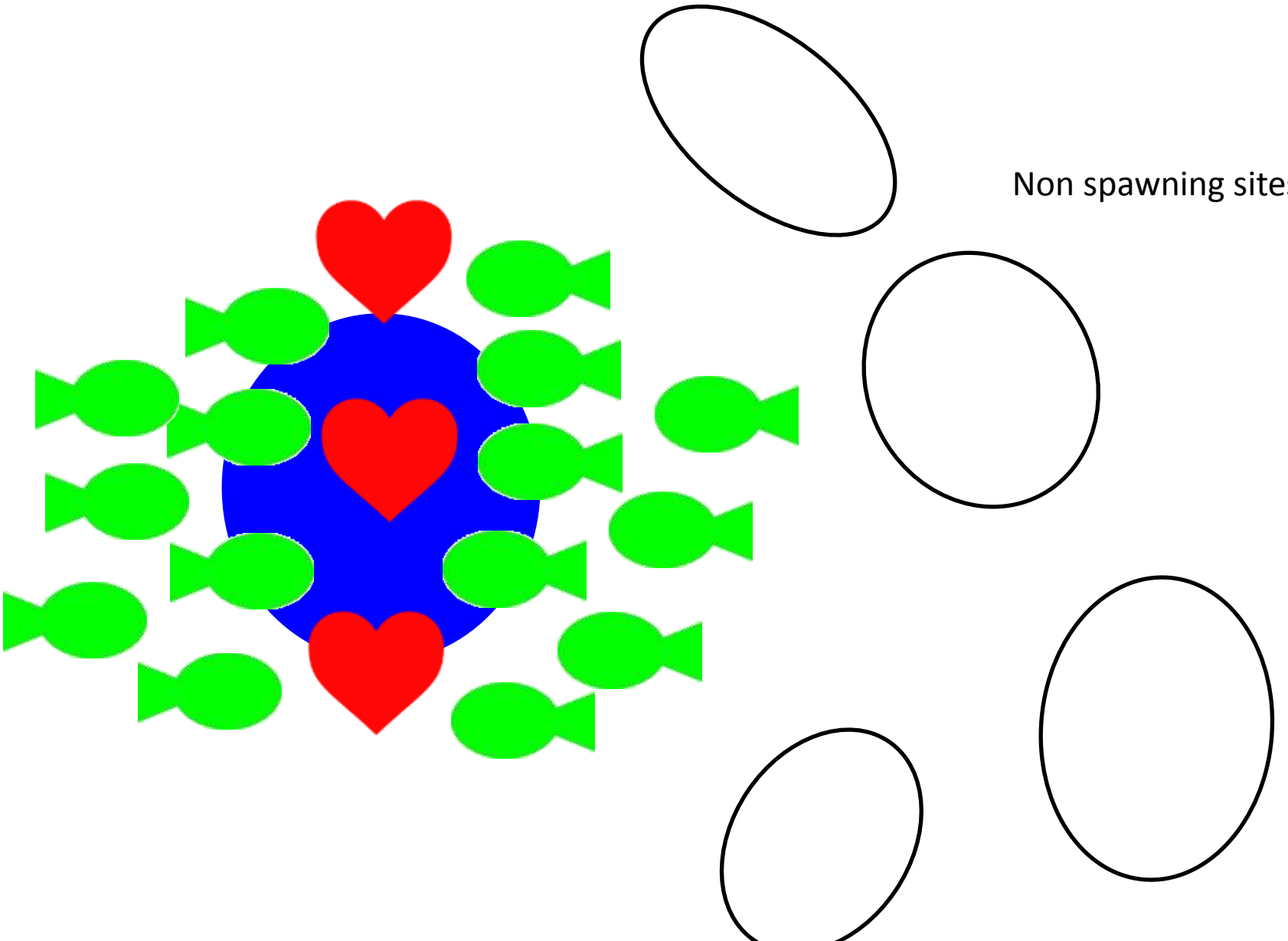

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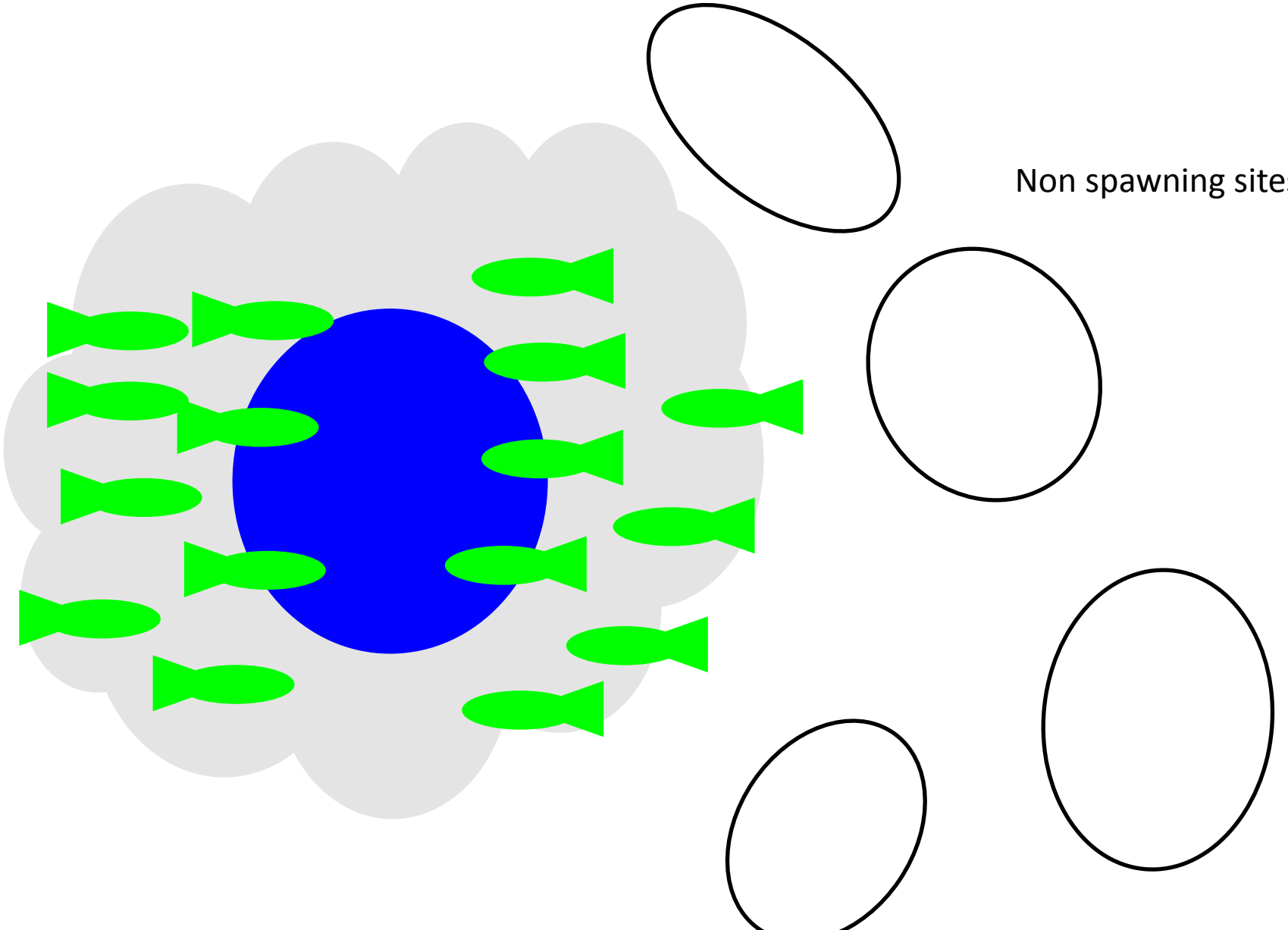
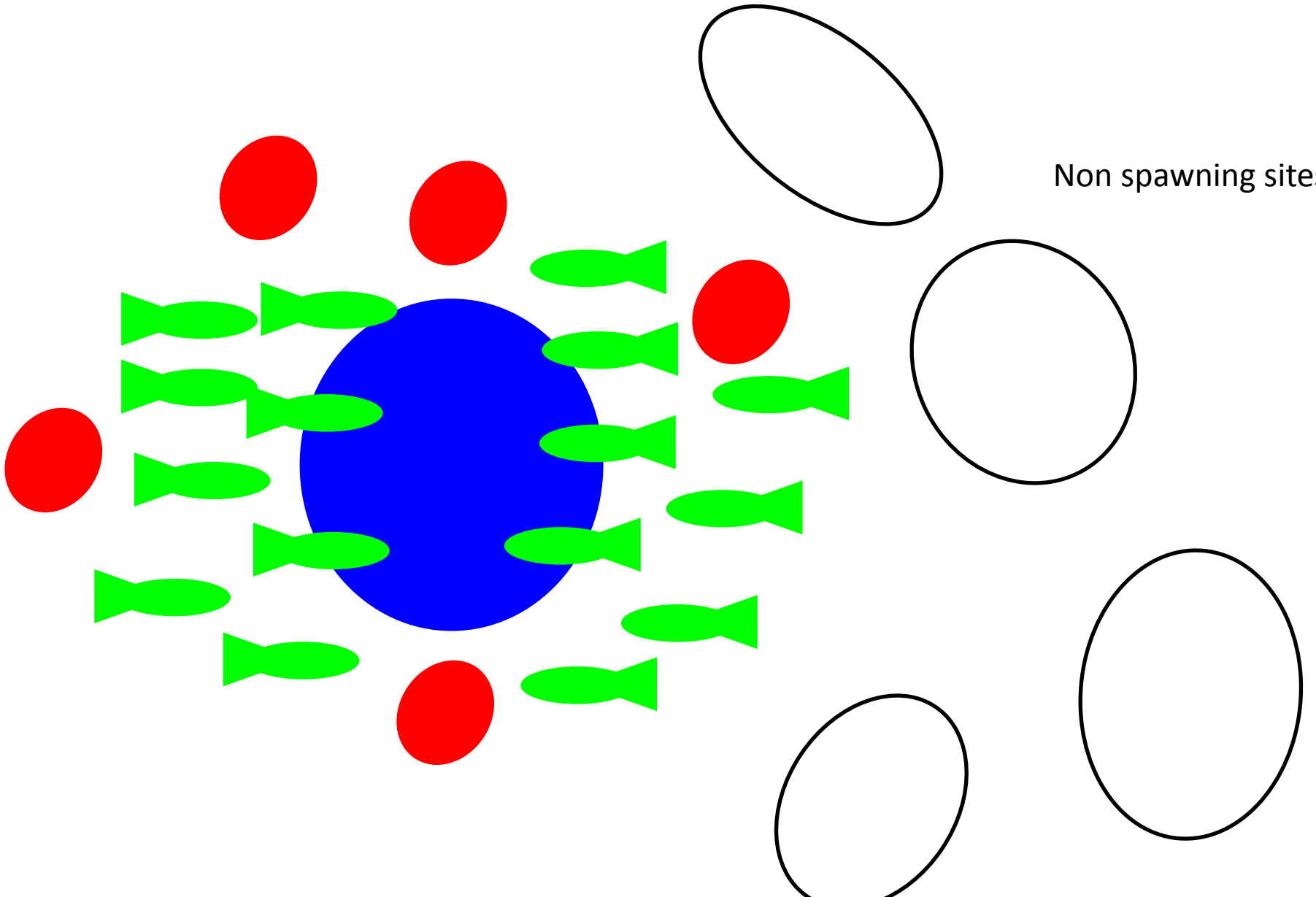


May need to rely on nearby prey to fuel reproduction

Spawning window



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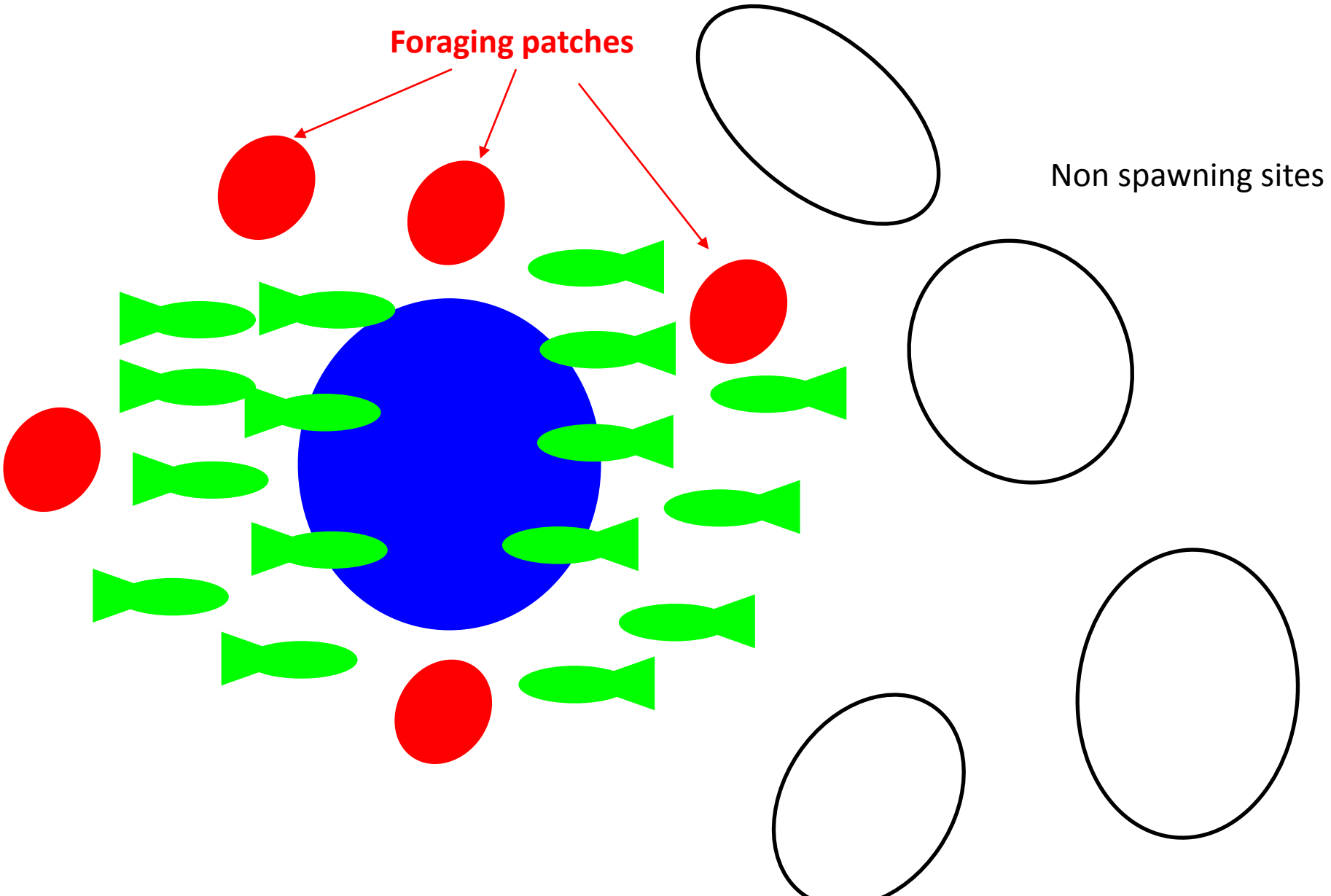

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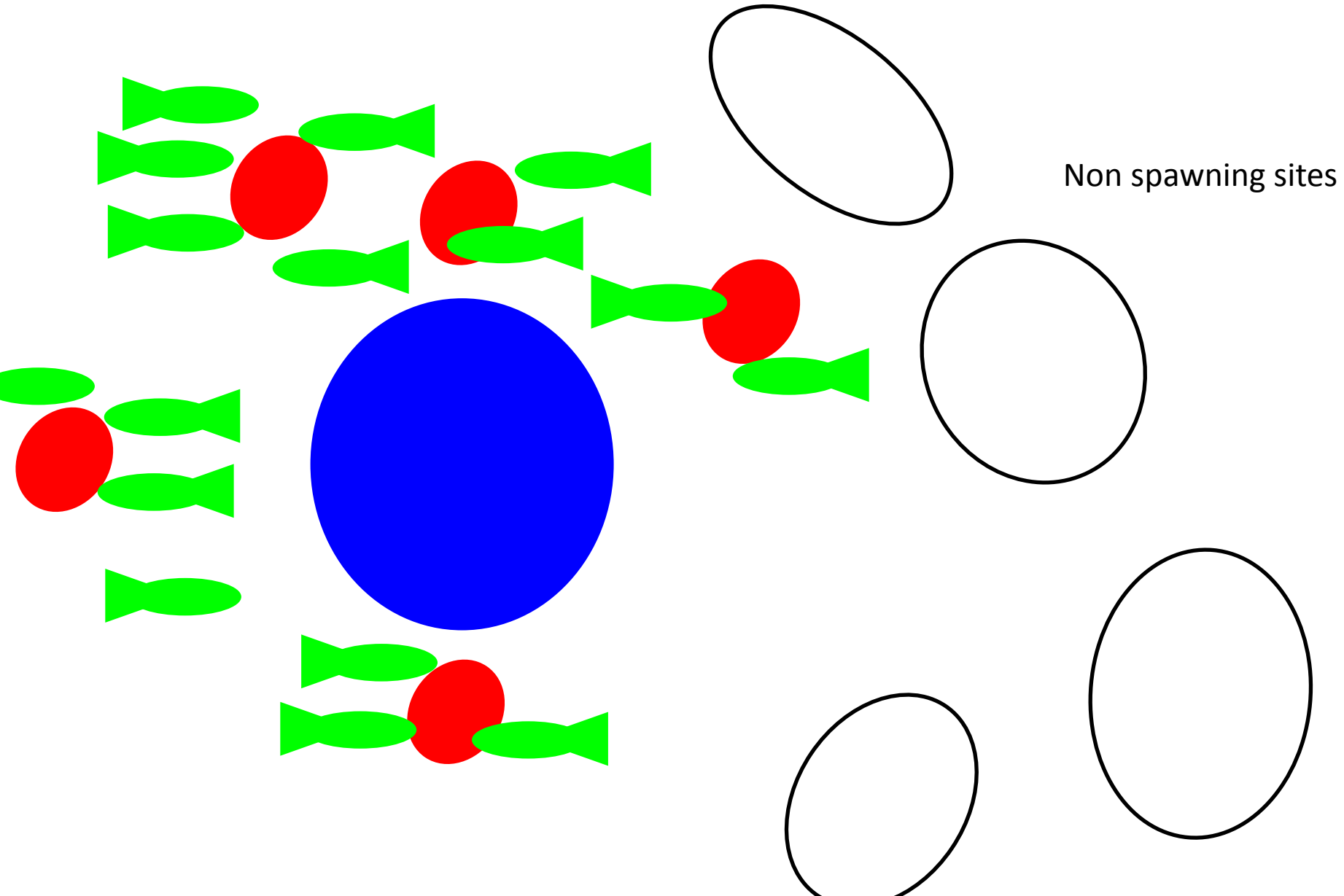

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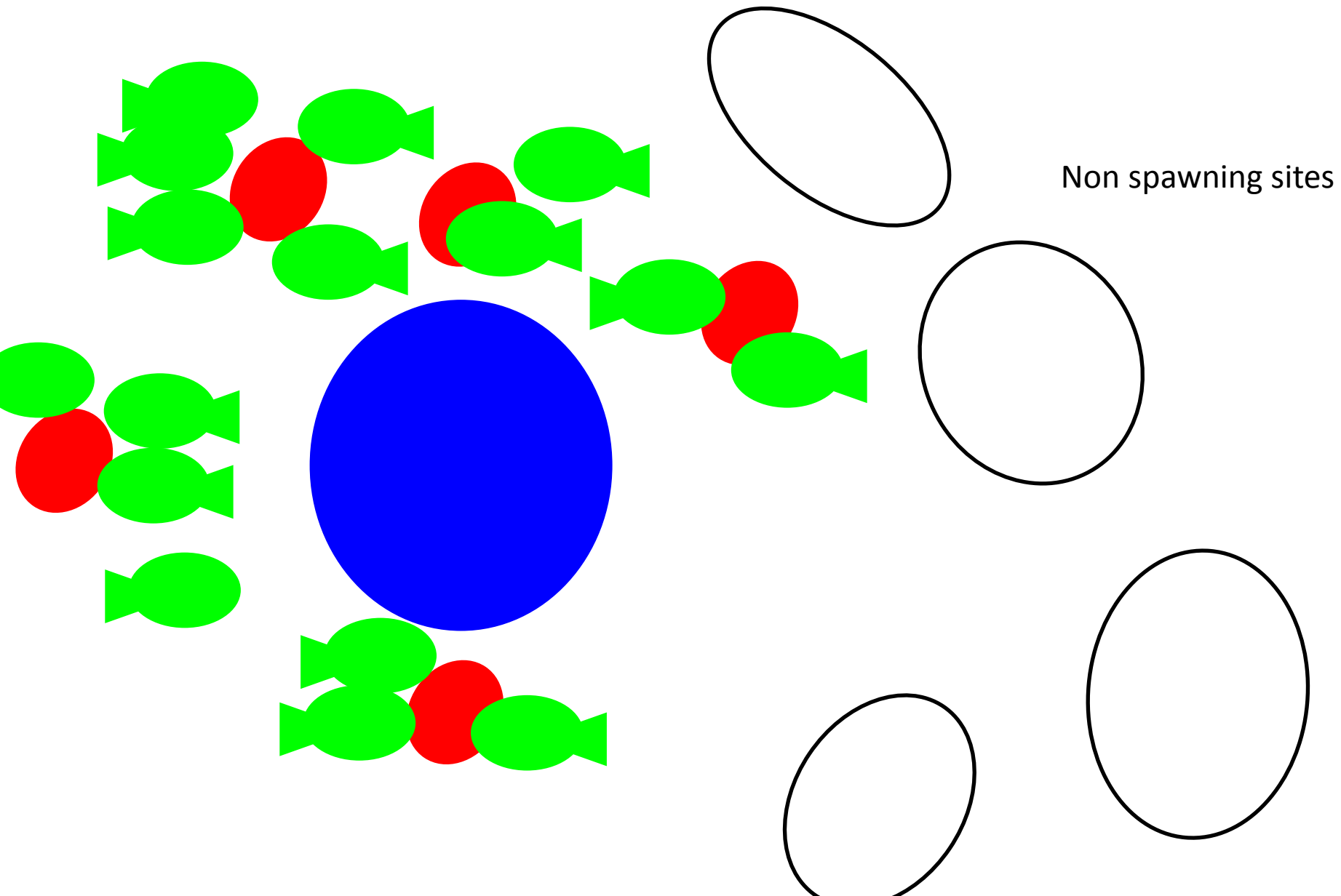

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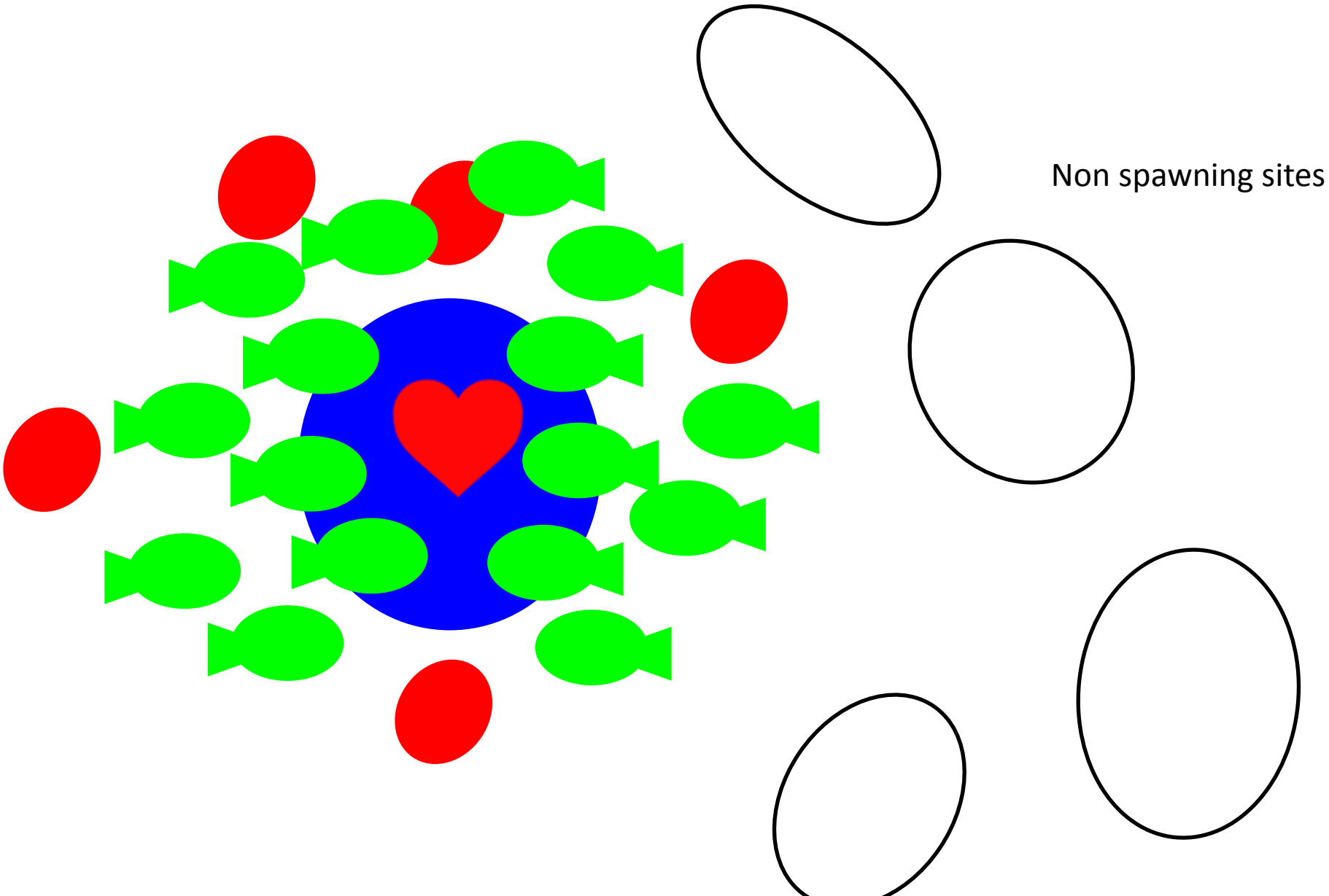

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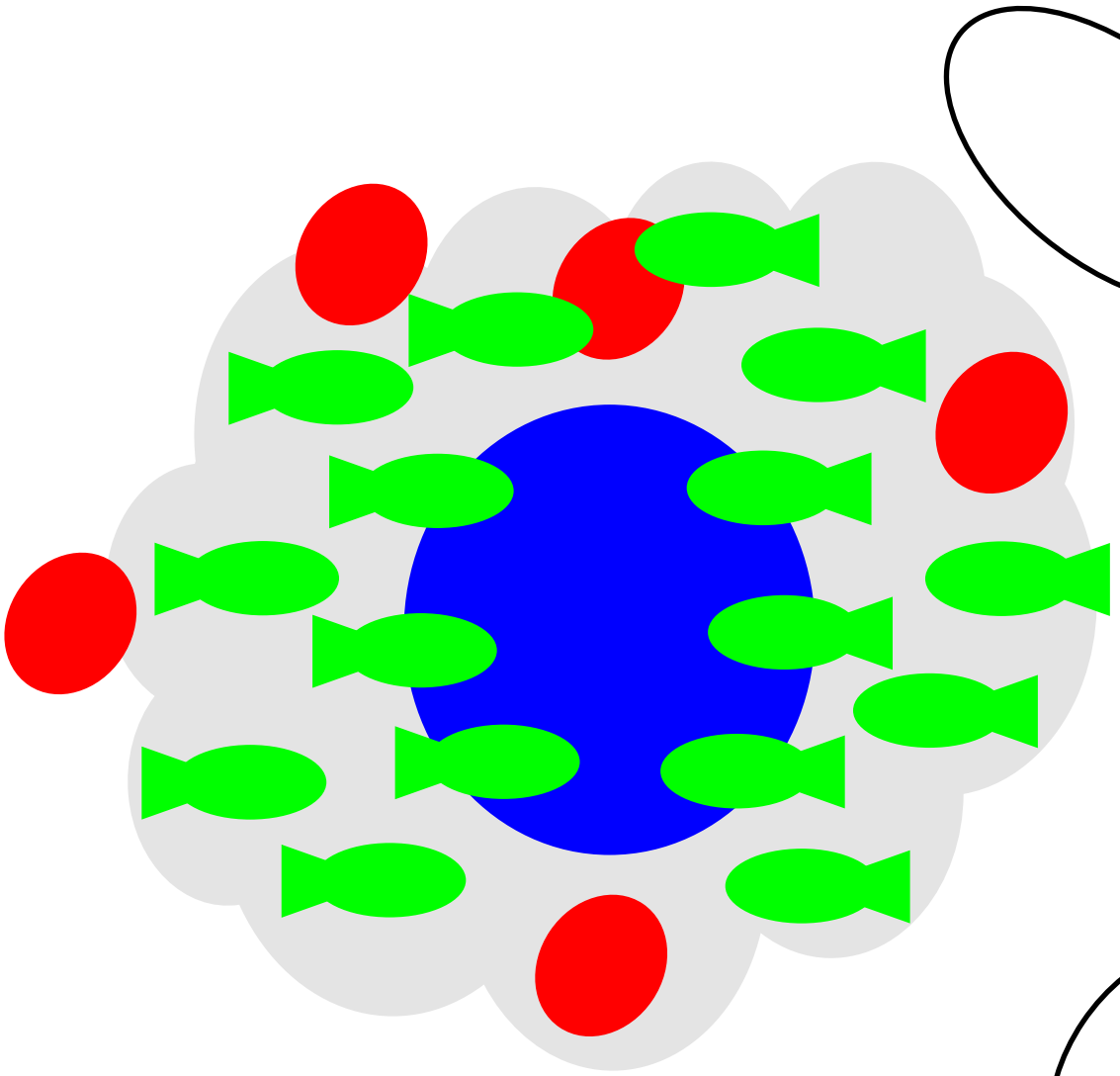
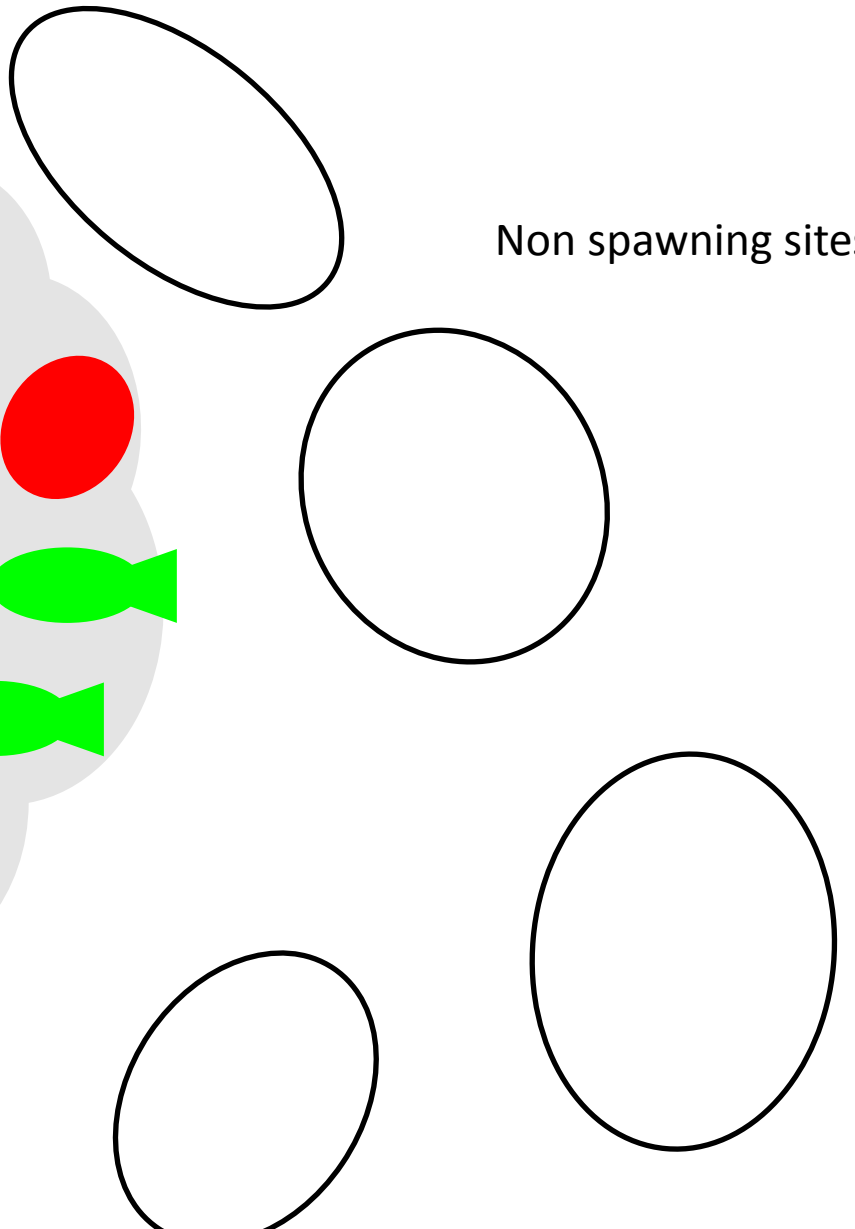


Non spawning sites



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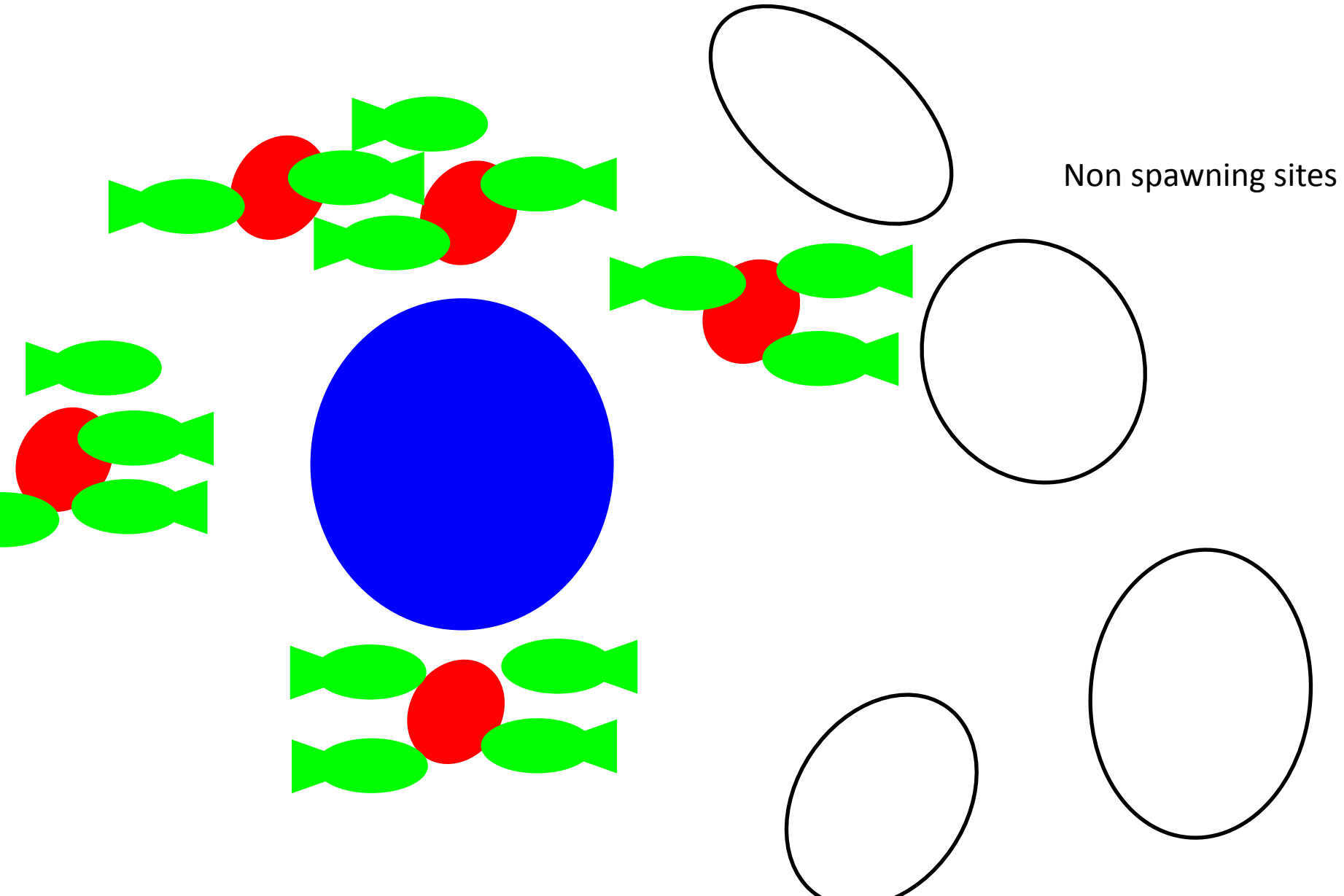

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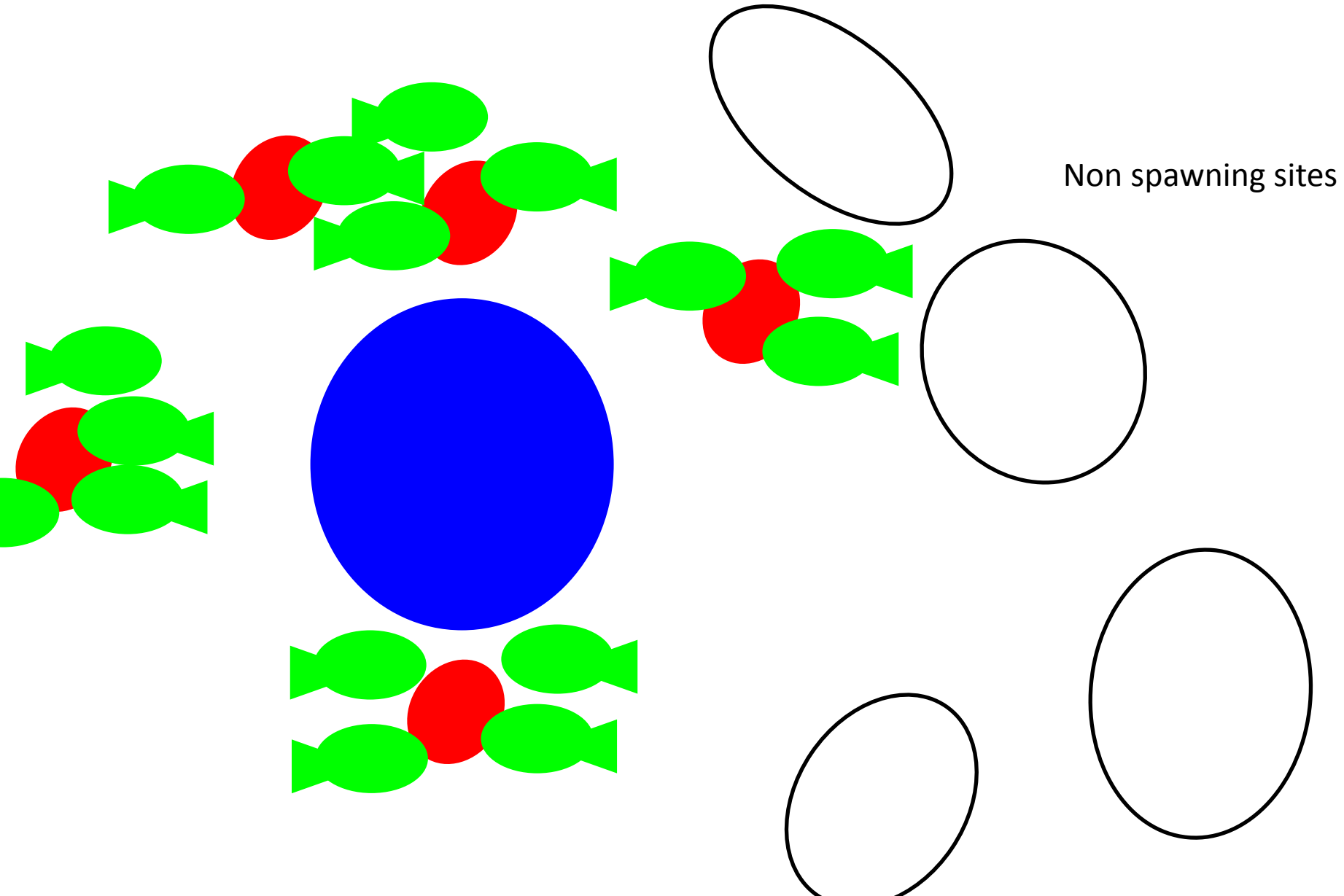

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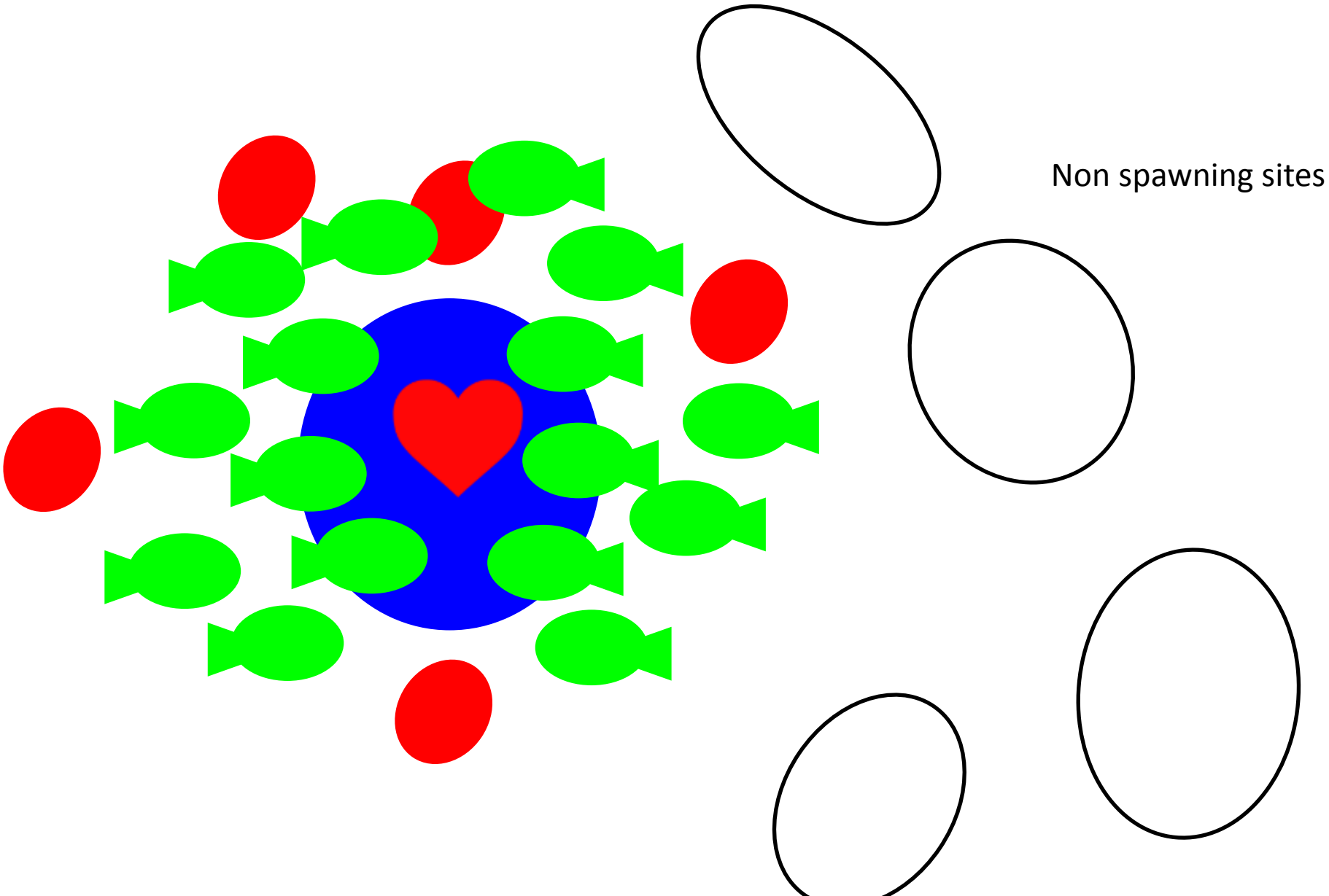

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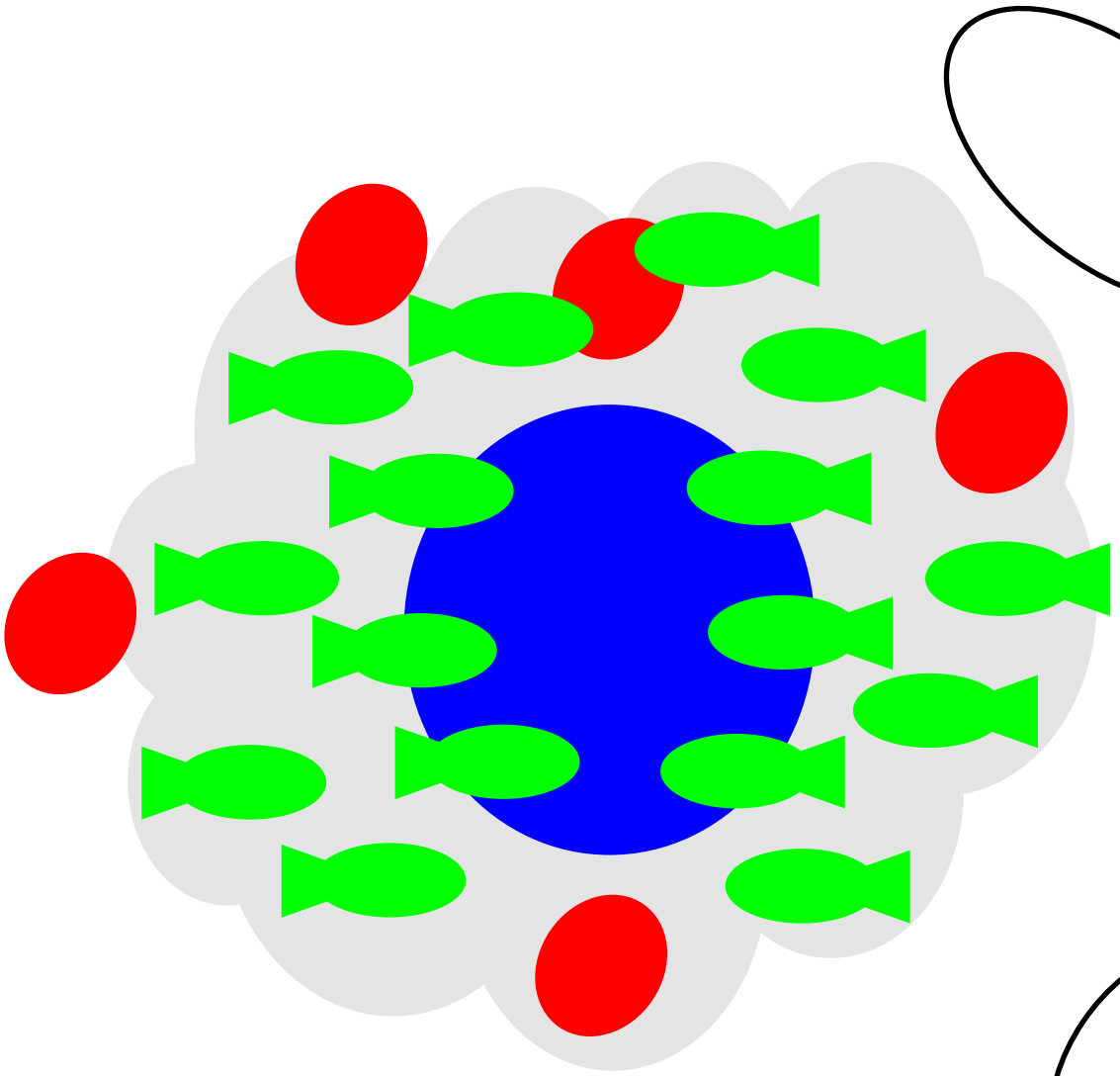

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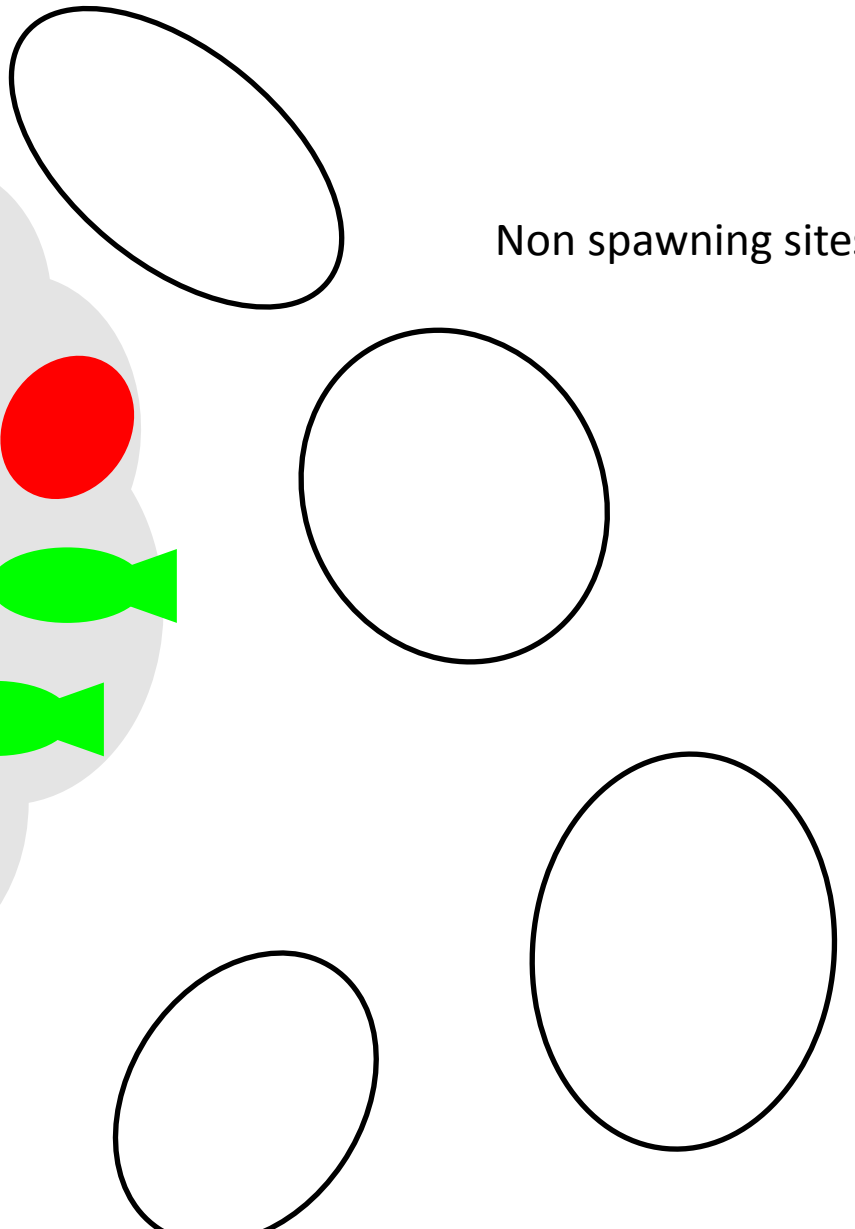

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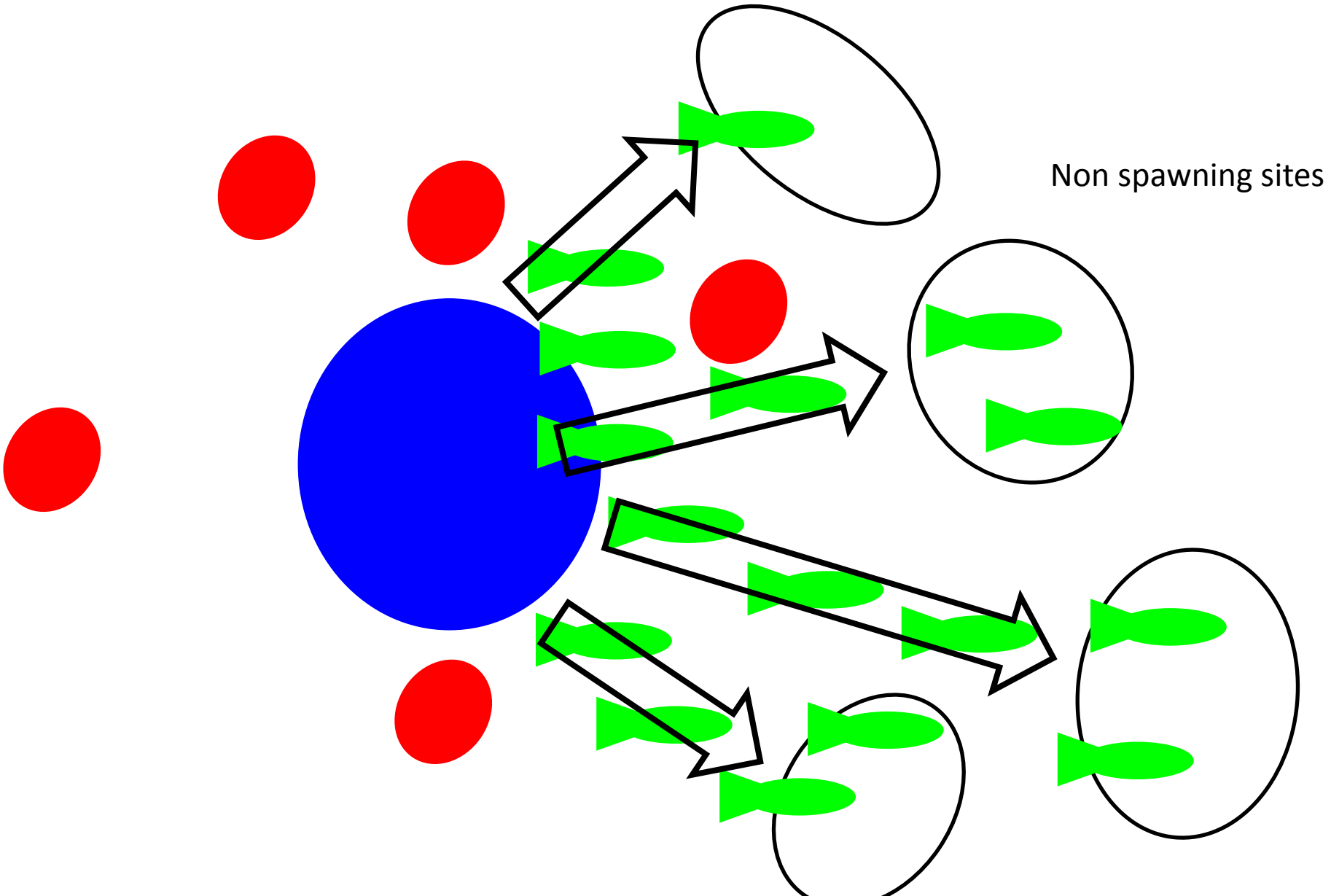
Post spawning



Protracted aggregators vs. Woodstorks

Protracted aggregators vs. Woodstorks

Woodstorks

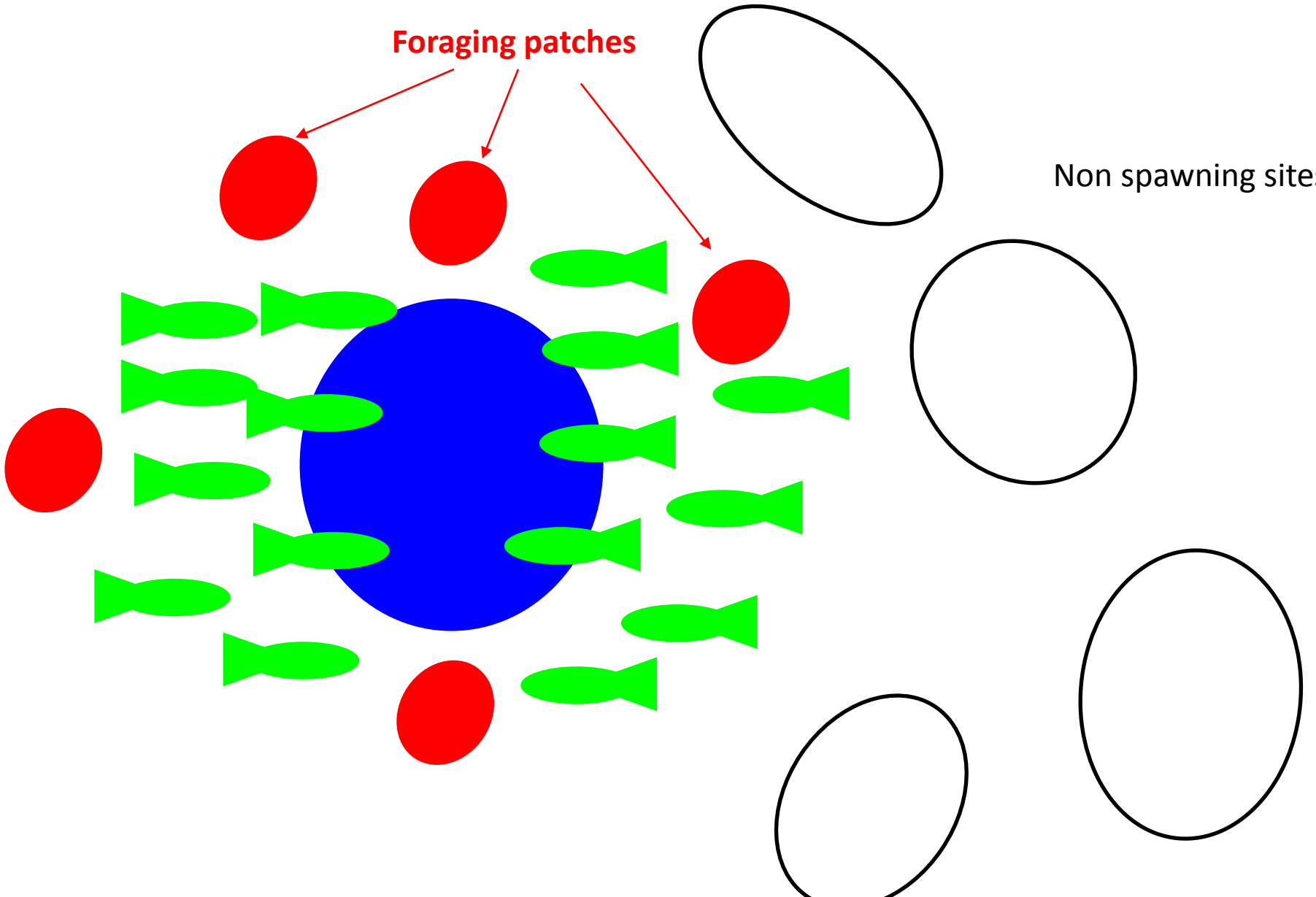
Nesting season length (60-130 days)

Must feed rapidly growing chicks

Prey availability main driver of nesting success

When prey is lessened, Woodstork Nest failure rates are high

If the productivity of foraging habitats were to change, then spawning effort may change with it



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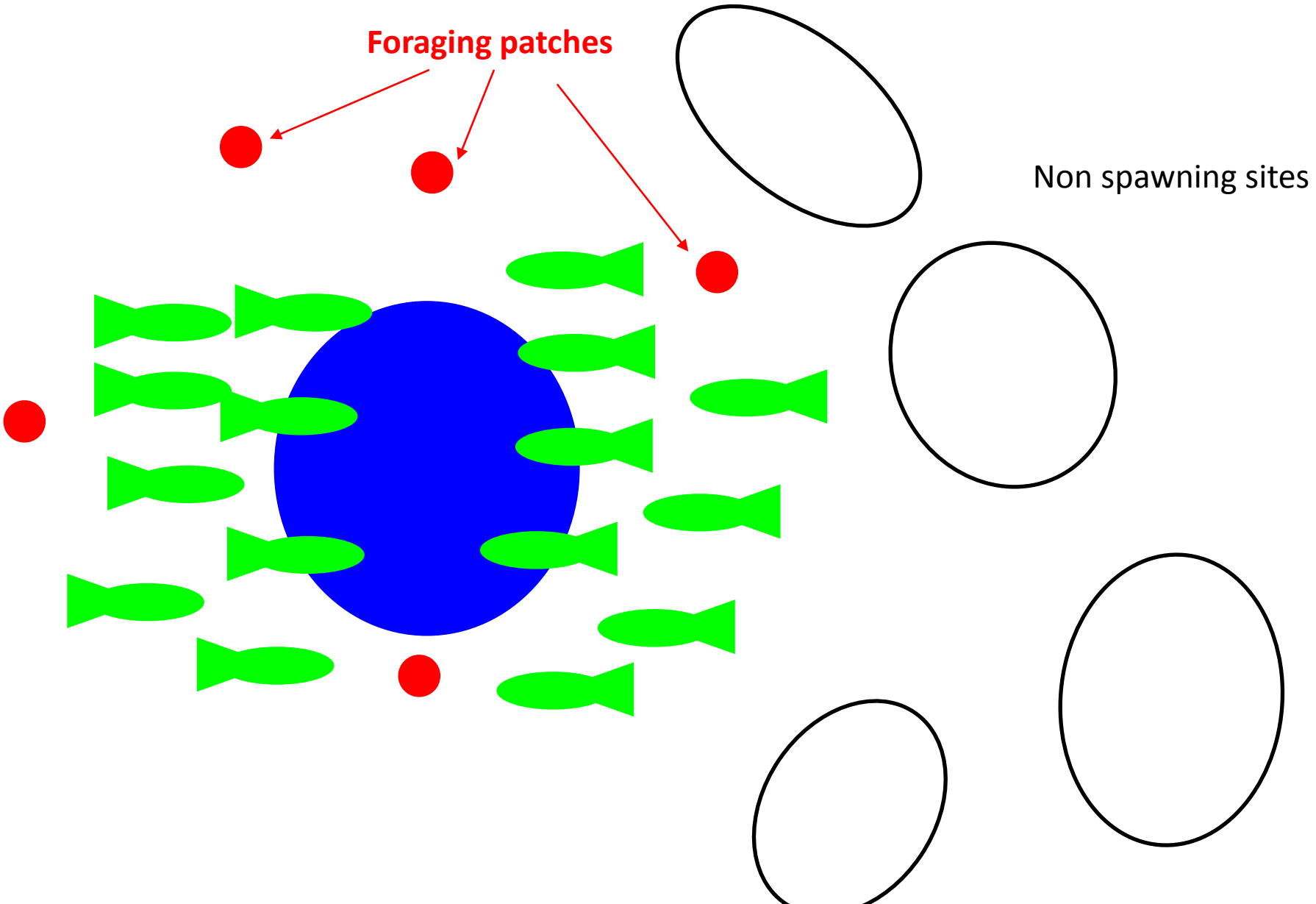


For Protracted aggregations, spawning success could be linked to the productivity of prey at or near spawning sites

Snook: Aggregating species with protracted spawning seasons

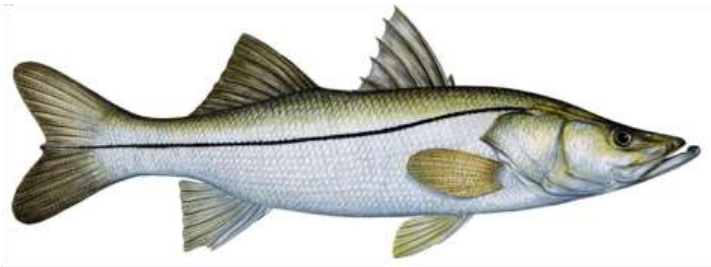
Tropical

Euryhaline

Most lucrative fishery in the GEE

Spawn spring-fall

At aggregations for 40-70 days

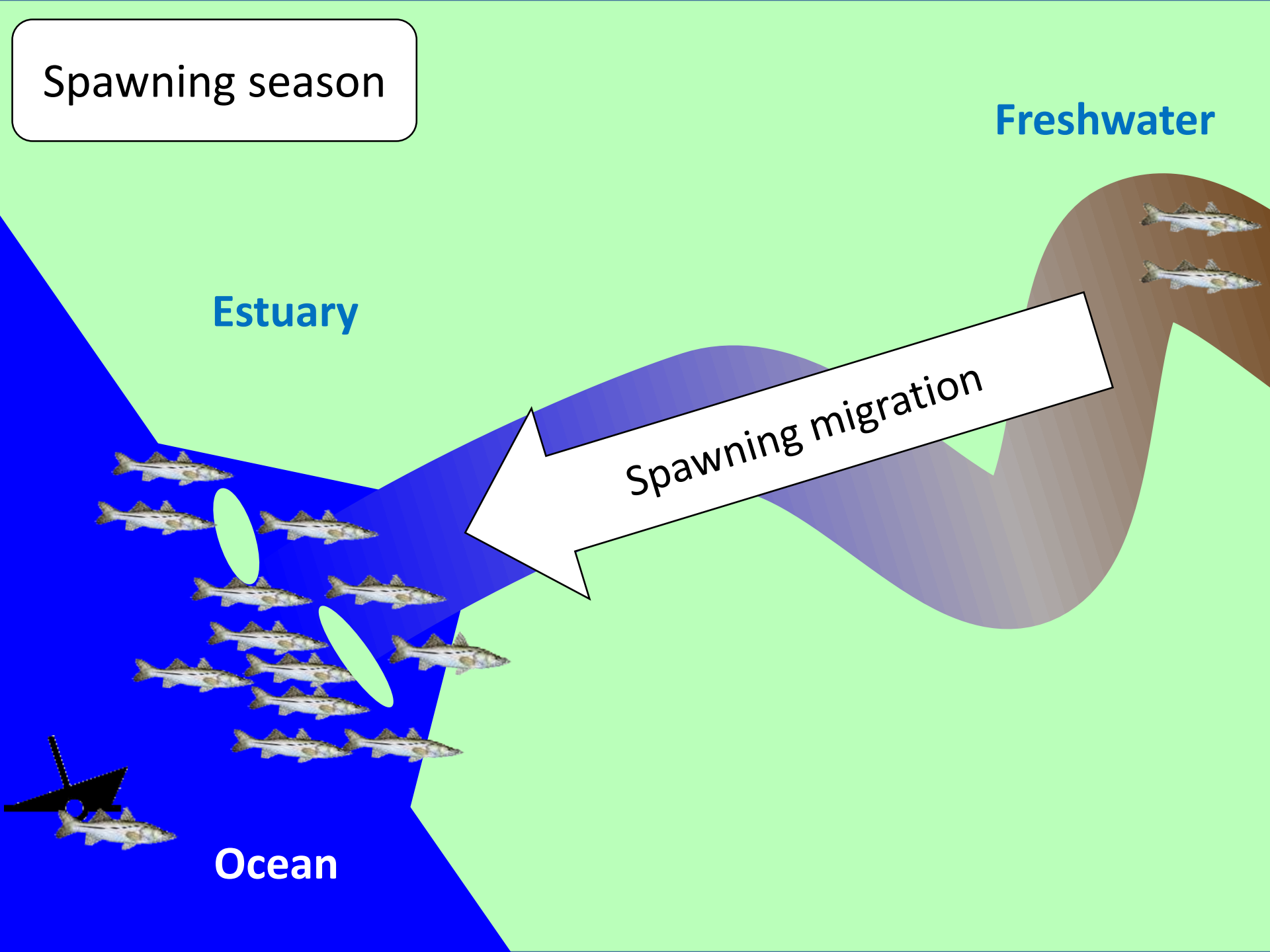


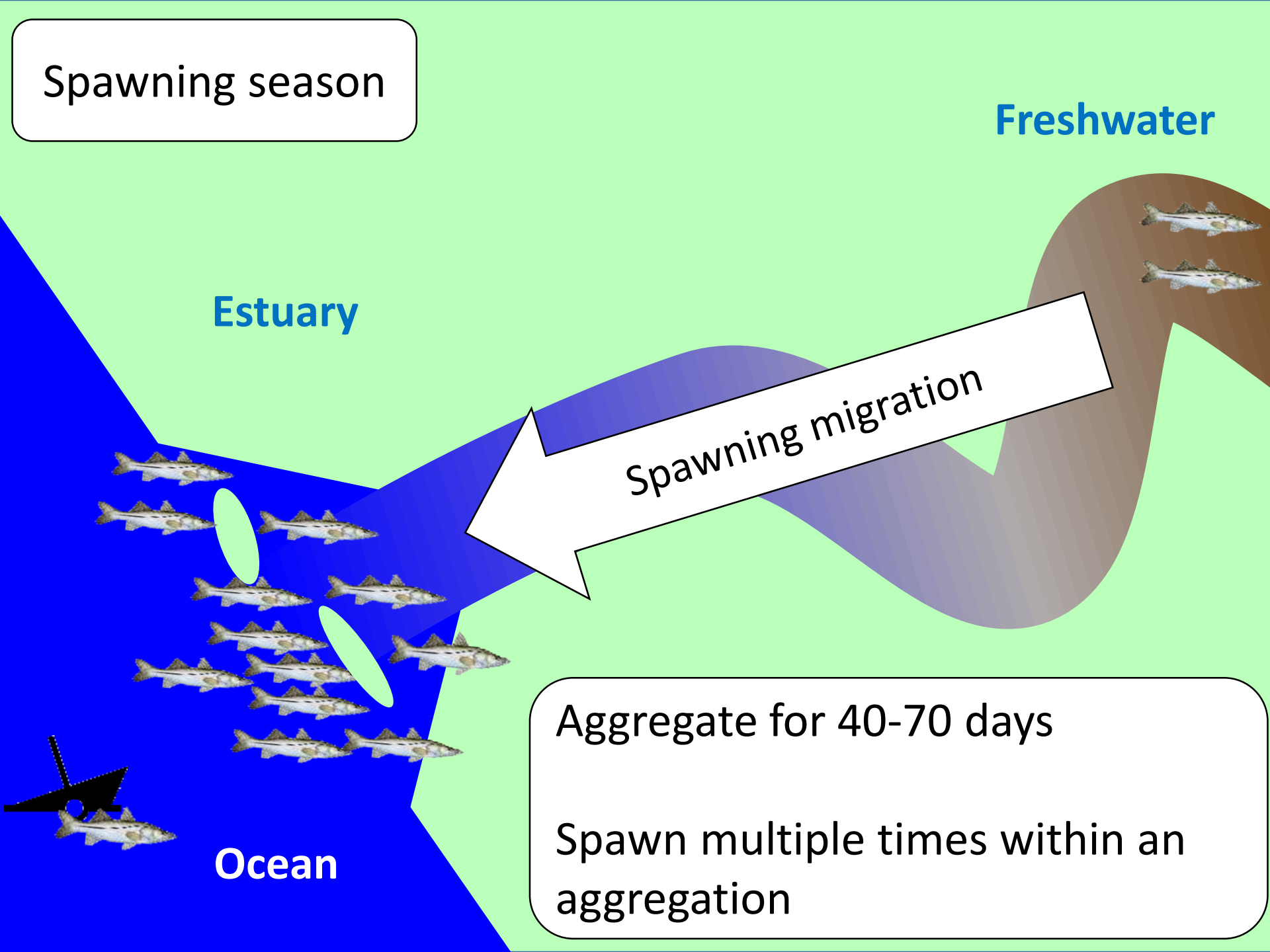
Non spawning season

Freshwater

Estuary

Ocean

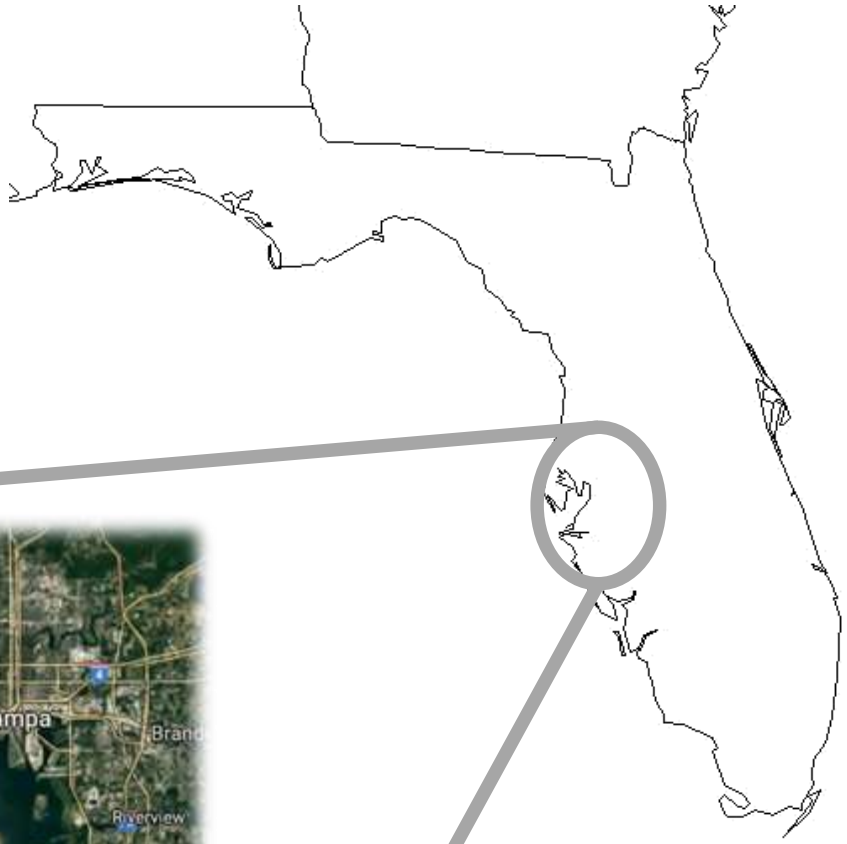

Spawning season
Freshwater
Estuary
Spawning migration
Ocean


Spawning season
Freshwater
Estuary
Spawning migration
Ocean
Aggregate for 40-70 days
Spawn multiple times within an aggregation

Research Question

- Relative to where spawning occurs, to what extent are Snook using foraging habitats at aggregation sites?

Focal site: Tampa Bay
spawning site, long-term and comprehensive study



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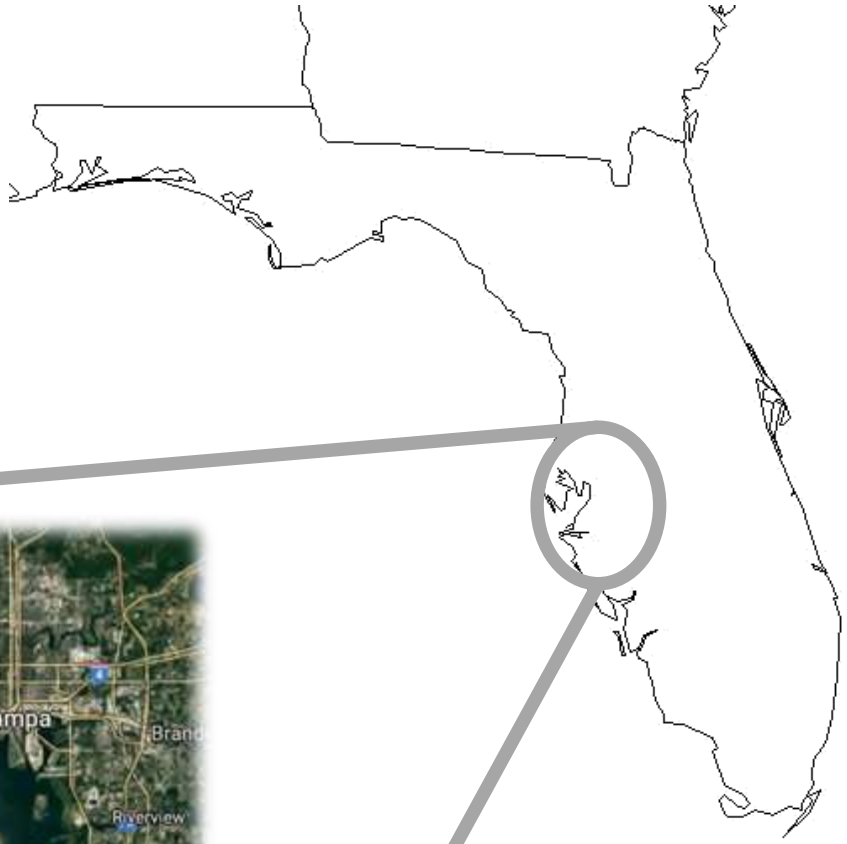

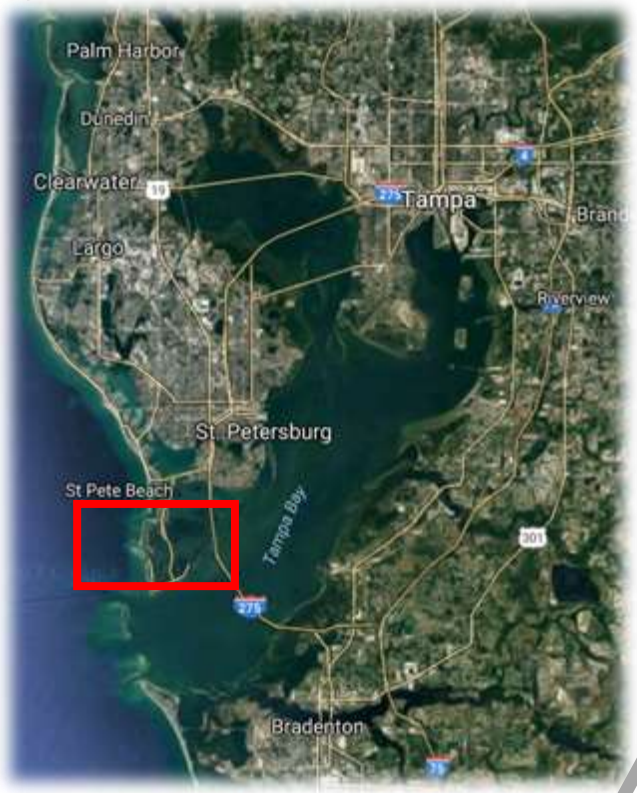

Focal site: Tampa Bay
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Snook spawning has been observed

Spawning occurs at the inlet

Adjacent, extensive seagrass beds exists

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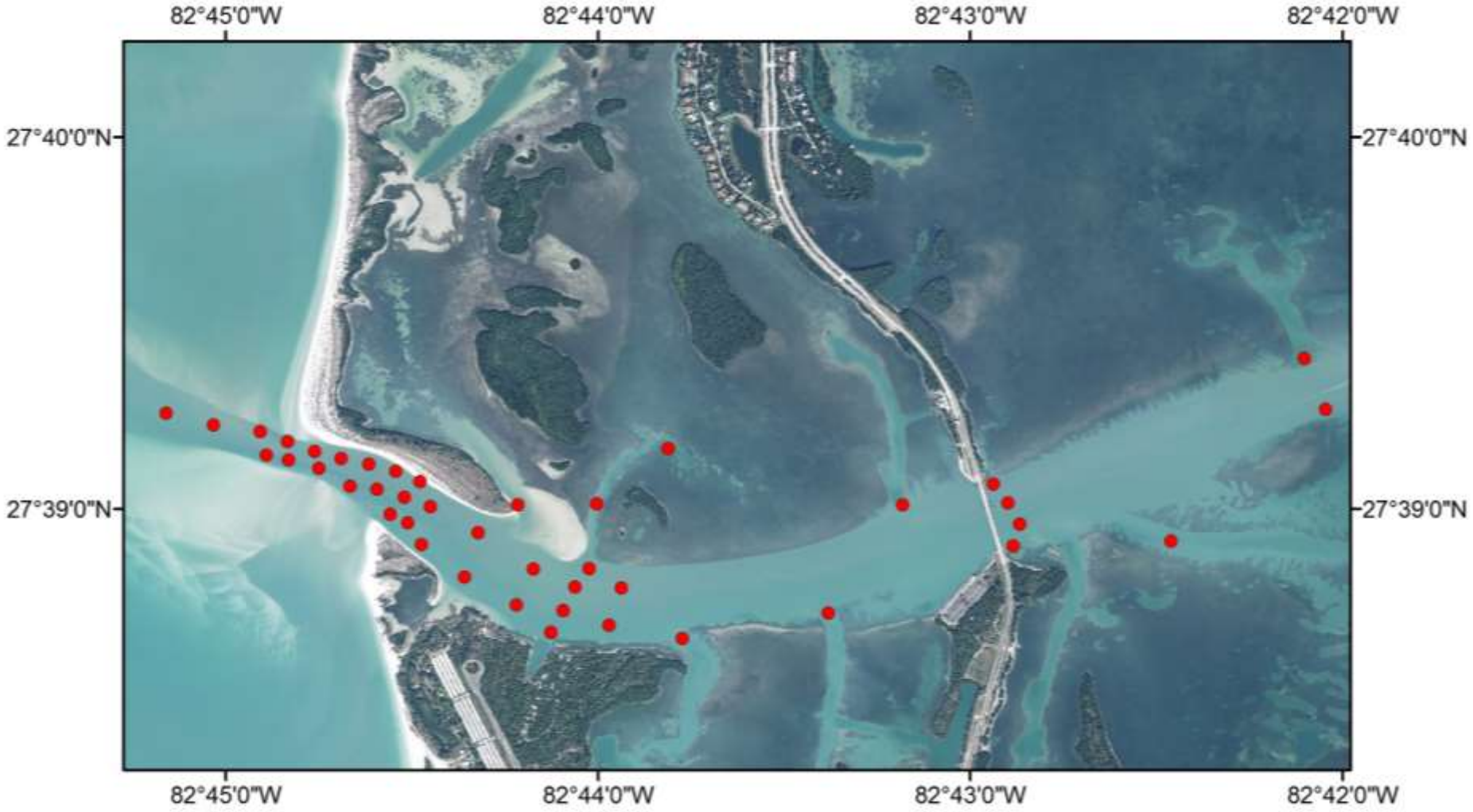
Tracked snook at the aggregation site with acoustic telemetry

- 31 snook, VEMCO V-13 Transmitters
- 15 Male, 16 Female
- Spawning season of 2007

Acoustic Array



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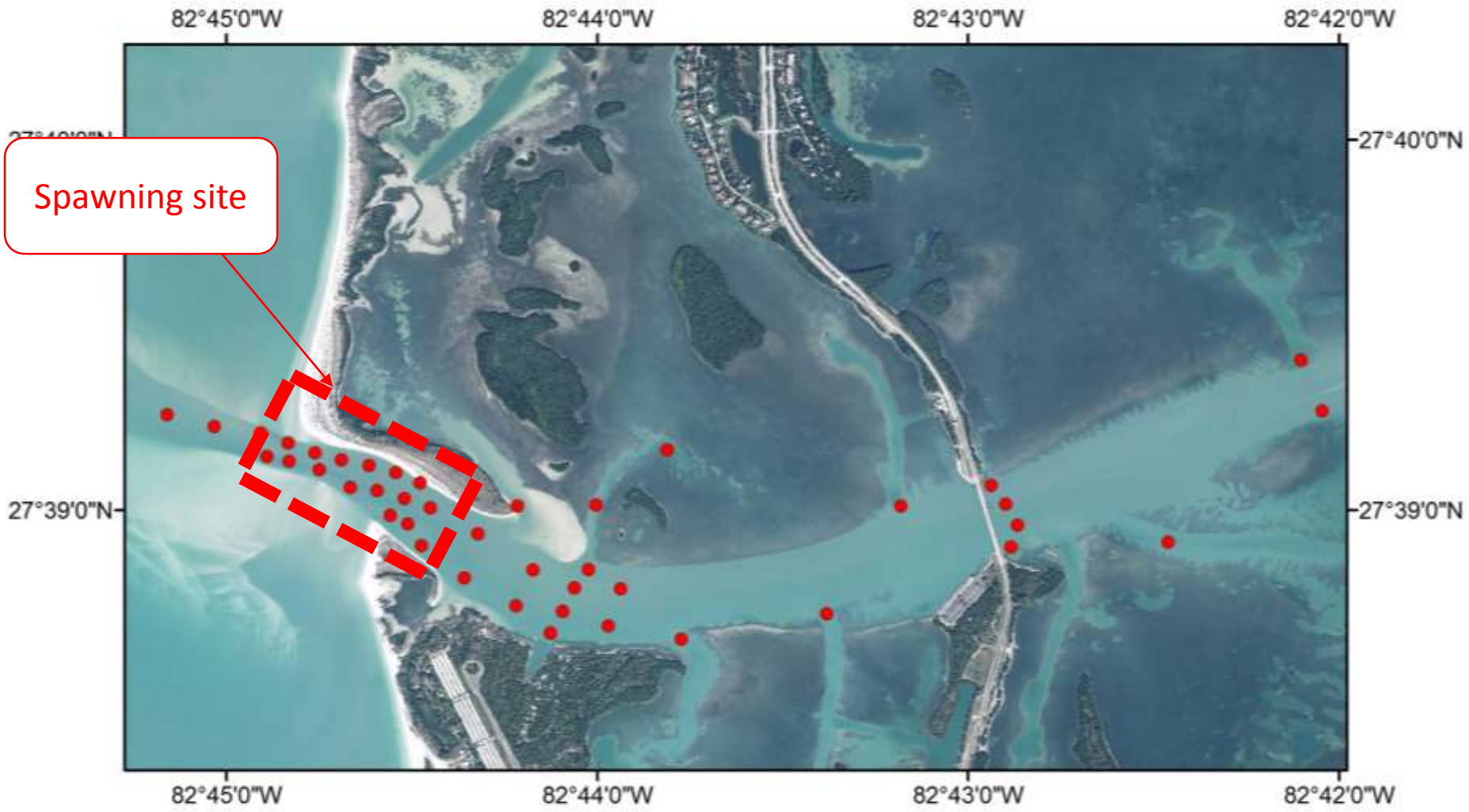

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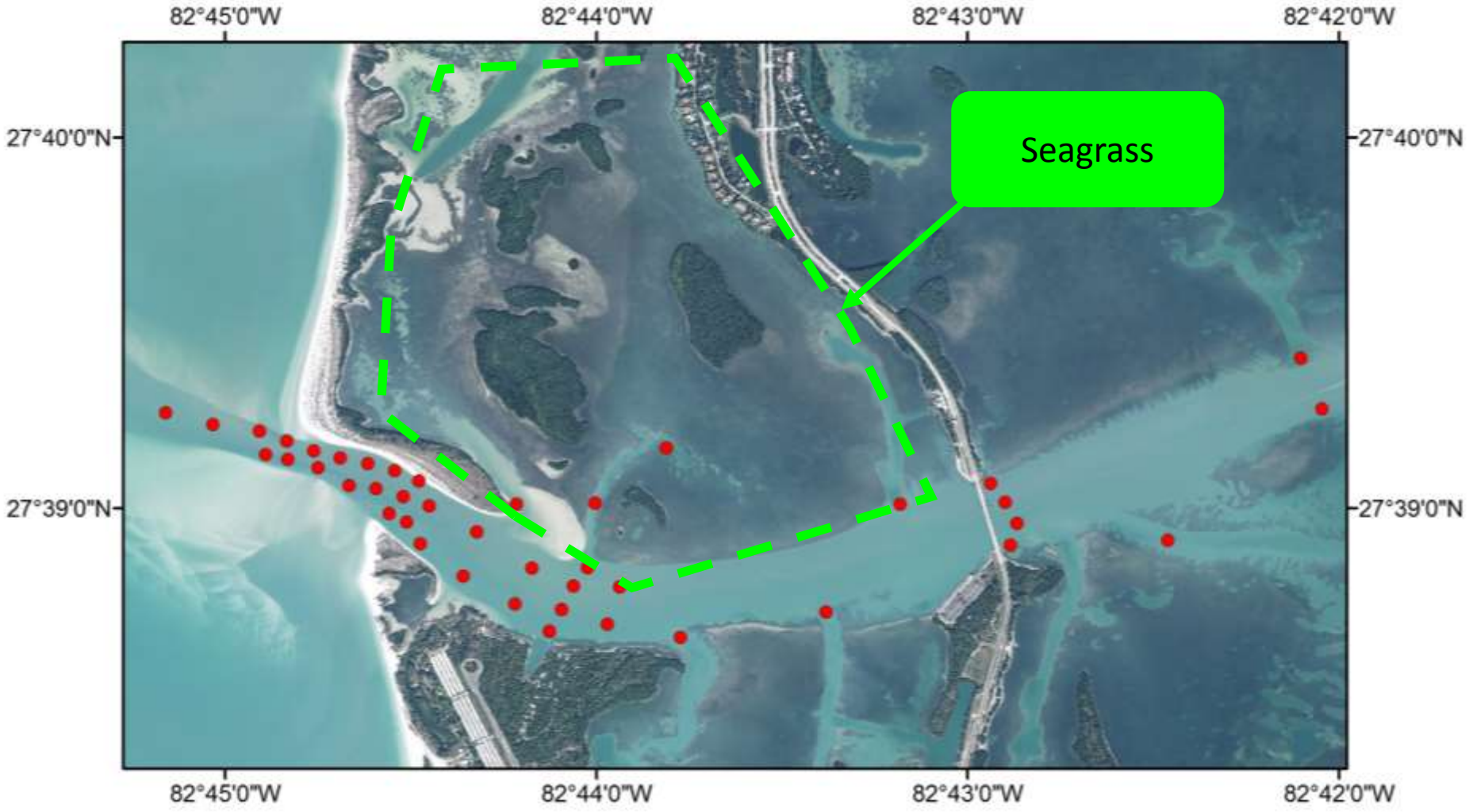
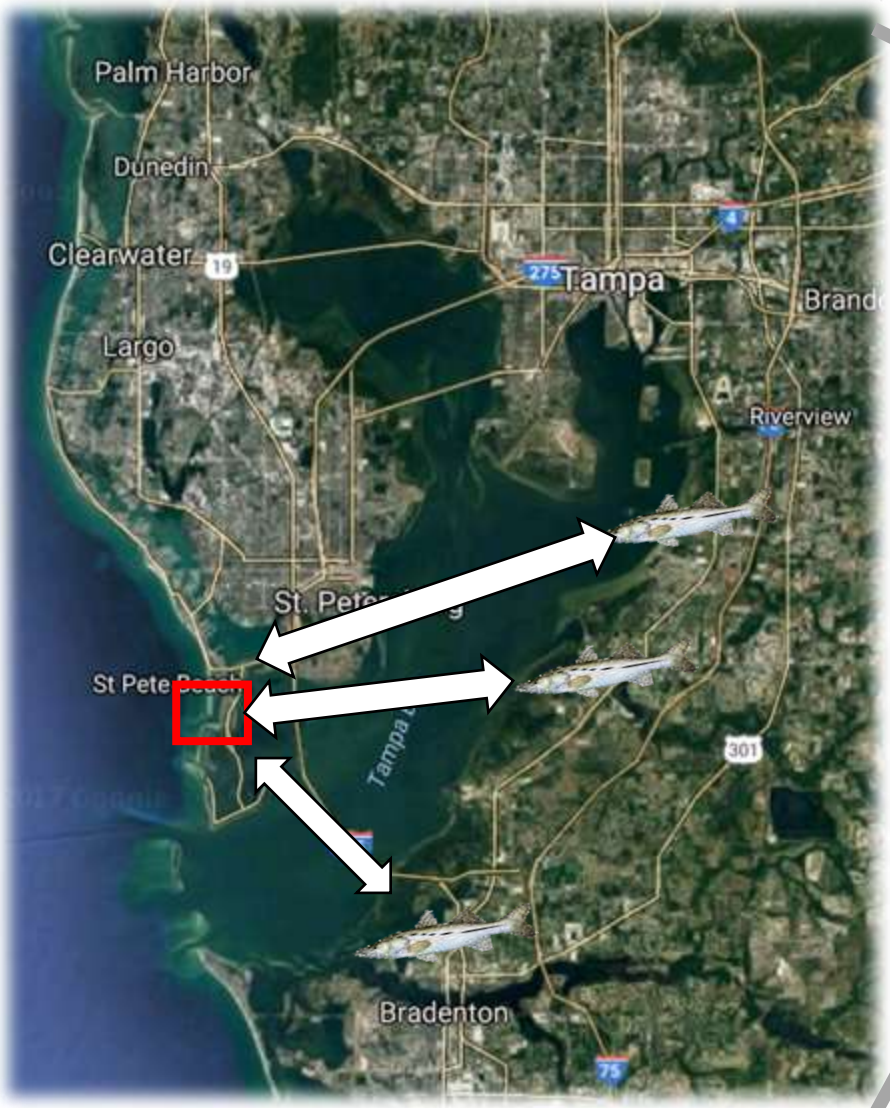
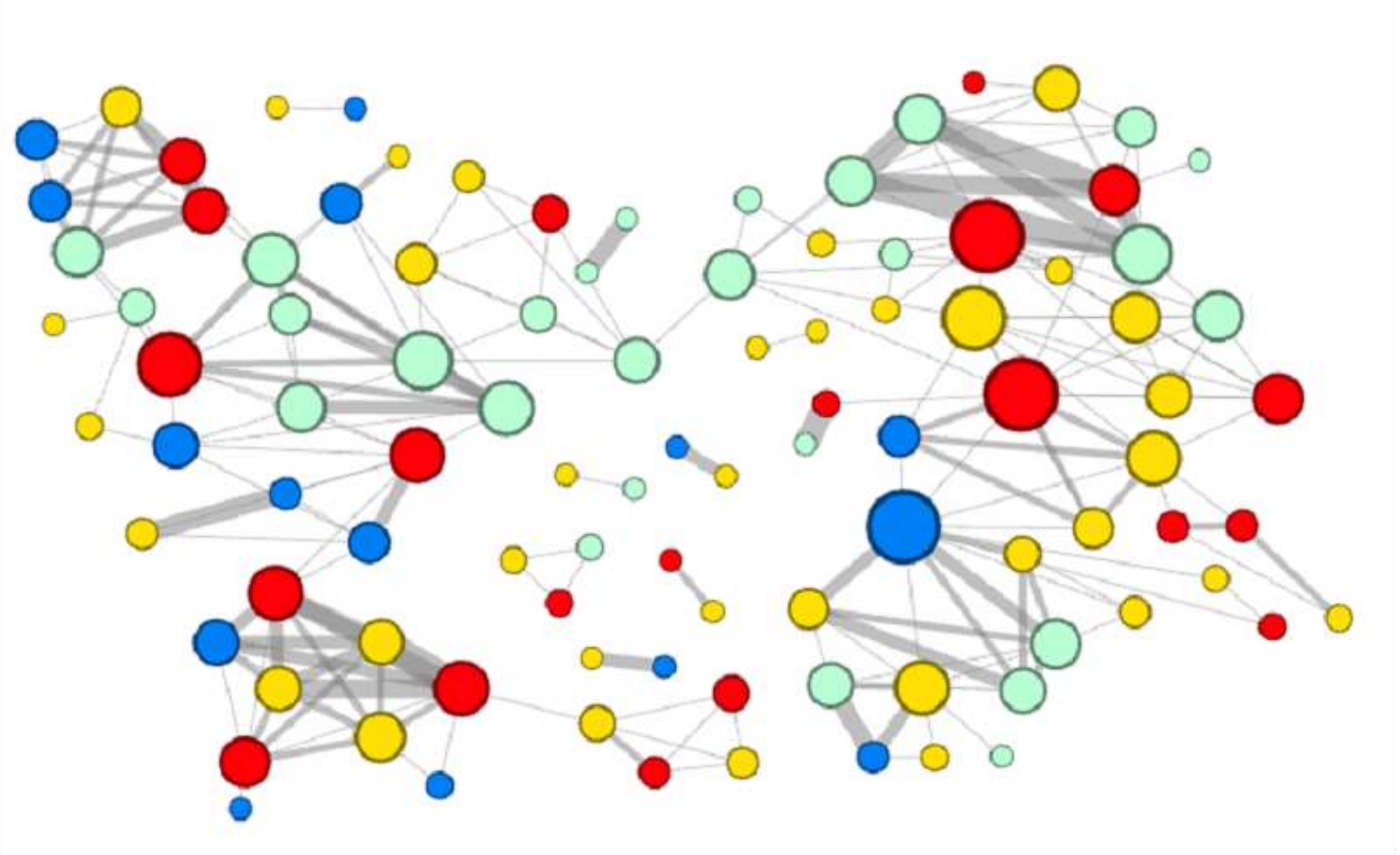


We are just tracking snook at the spawning site



Quantified space use between using network analysis



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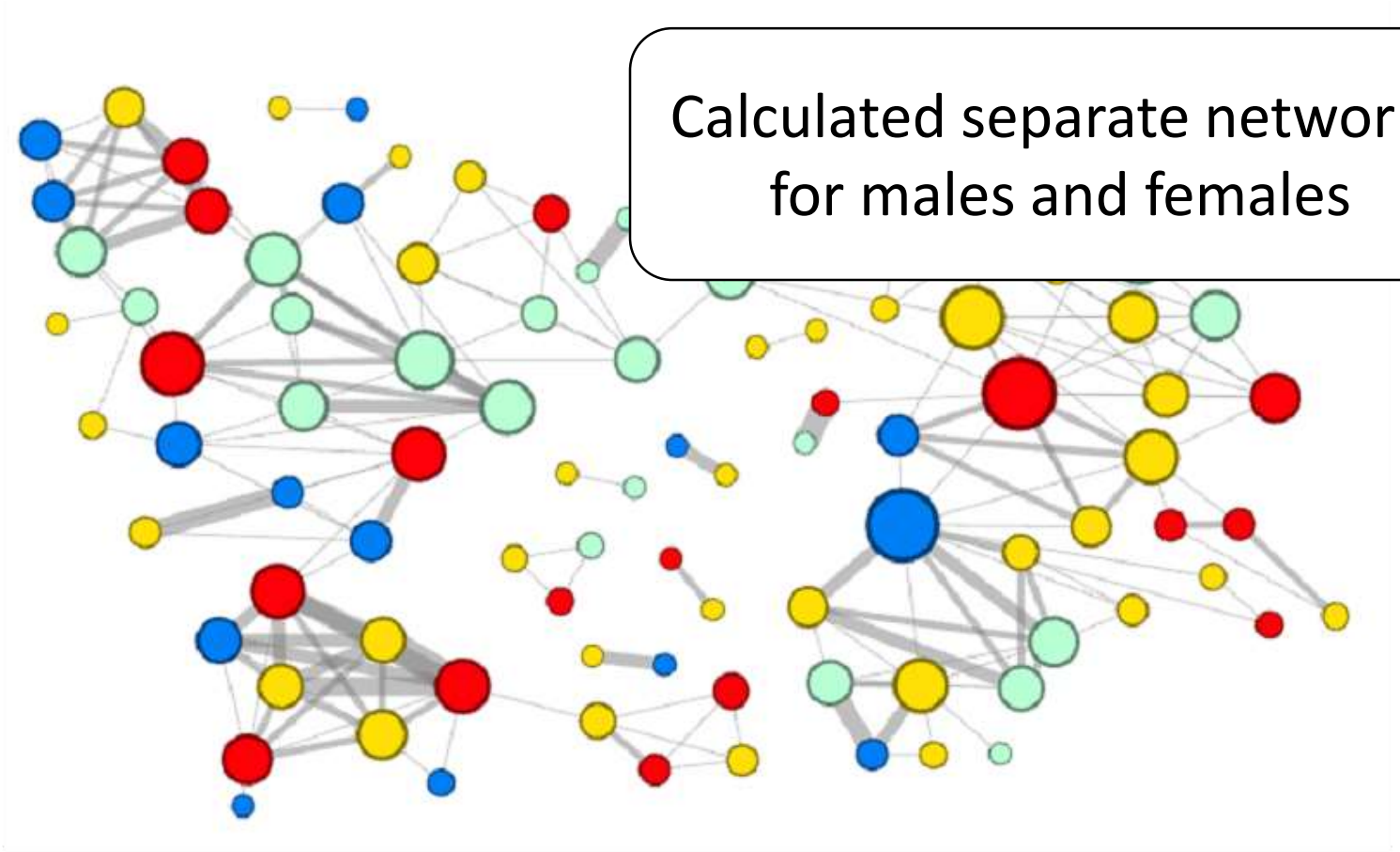
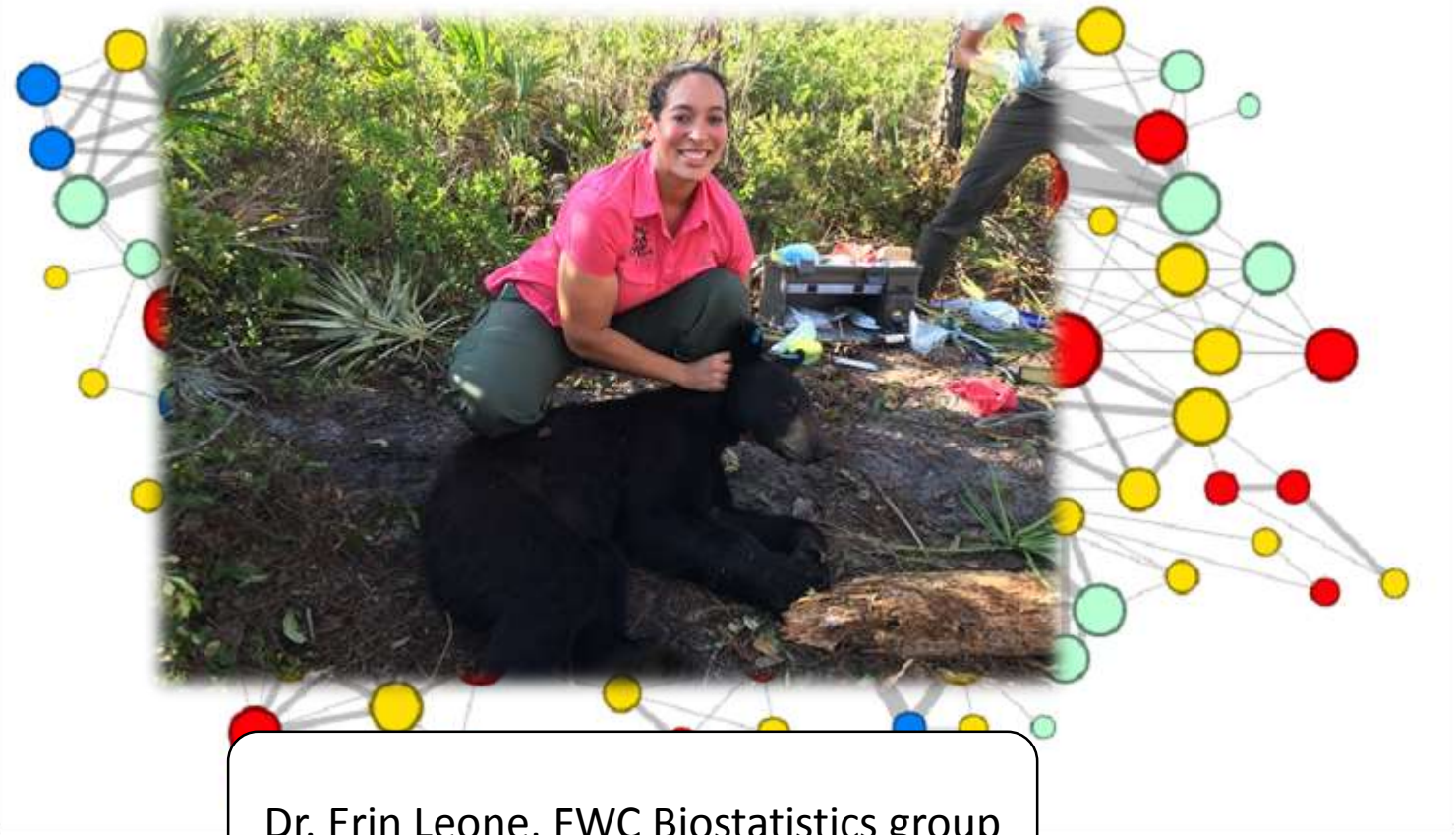


Calculated separate networks for males and females

Quantified space use between using network analysis



Dr. Erin Leone, FWC Biostatistics group

Calculated mean proportion of day snook spend on seagrass versus. spawning site

Index integrates both the number of fish at a site, and time individuals spend at site

Not a measure of how long individuals spend at spawning sites

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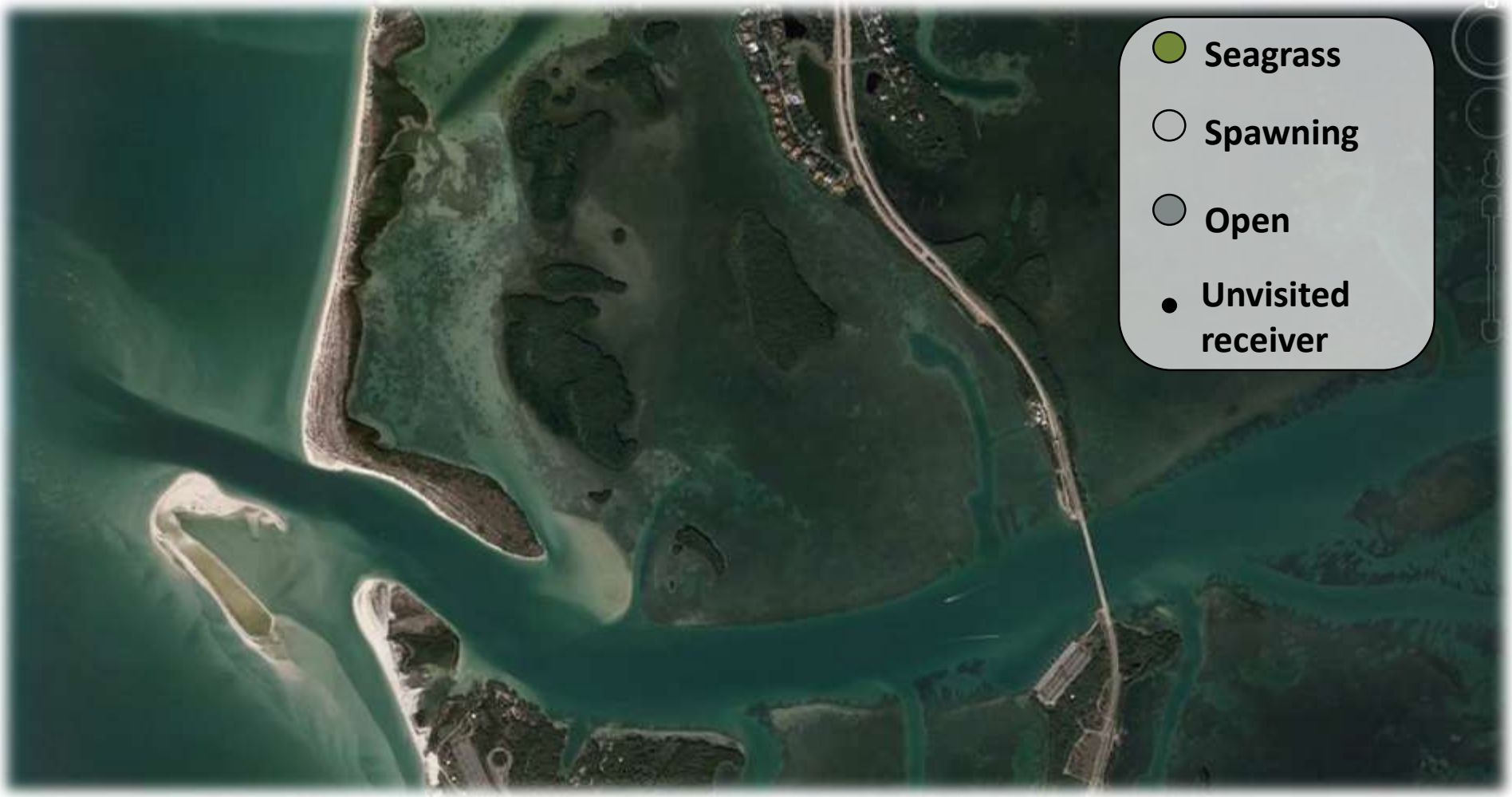

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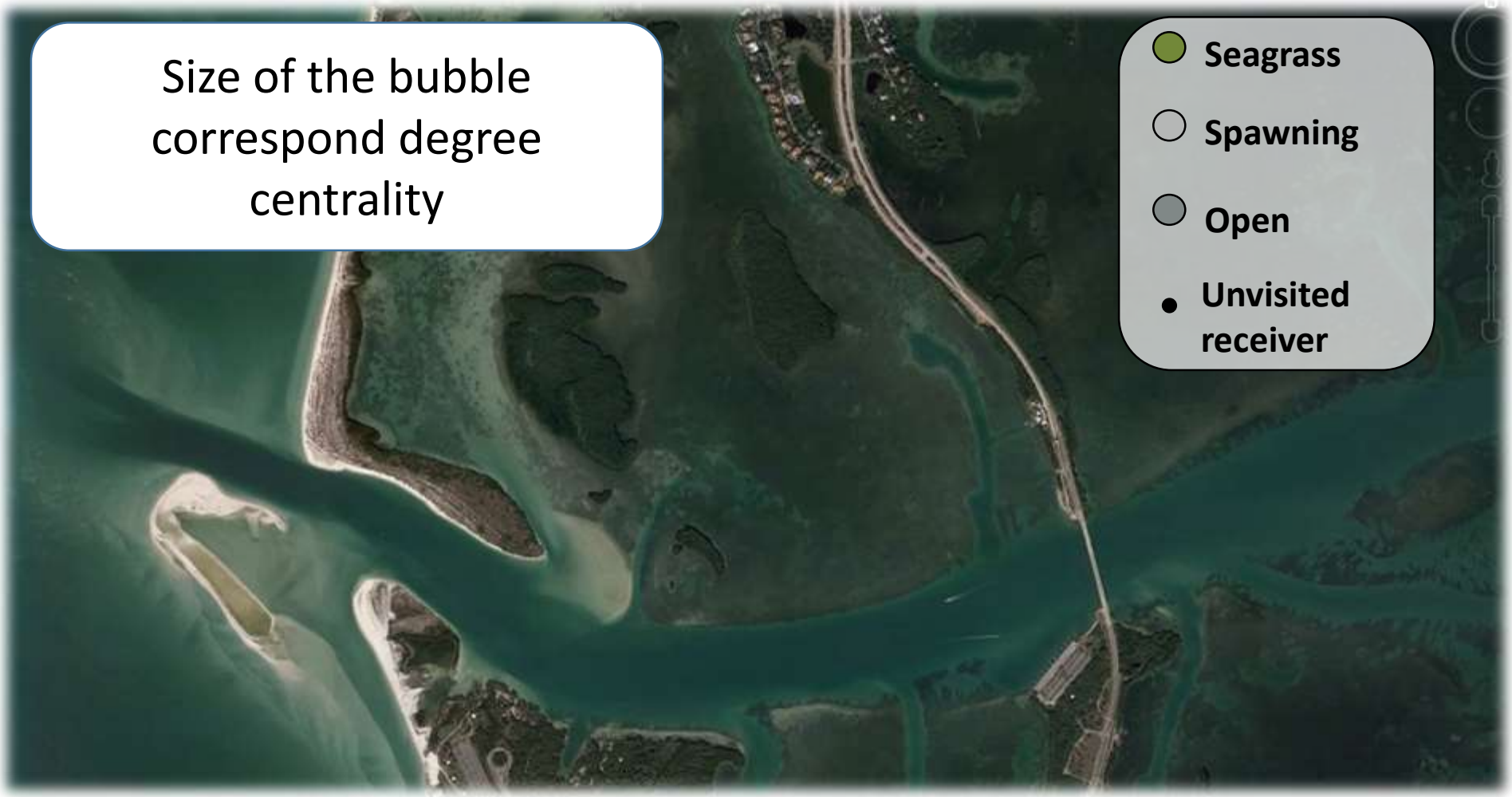

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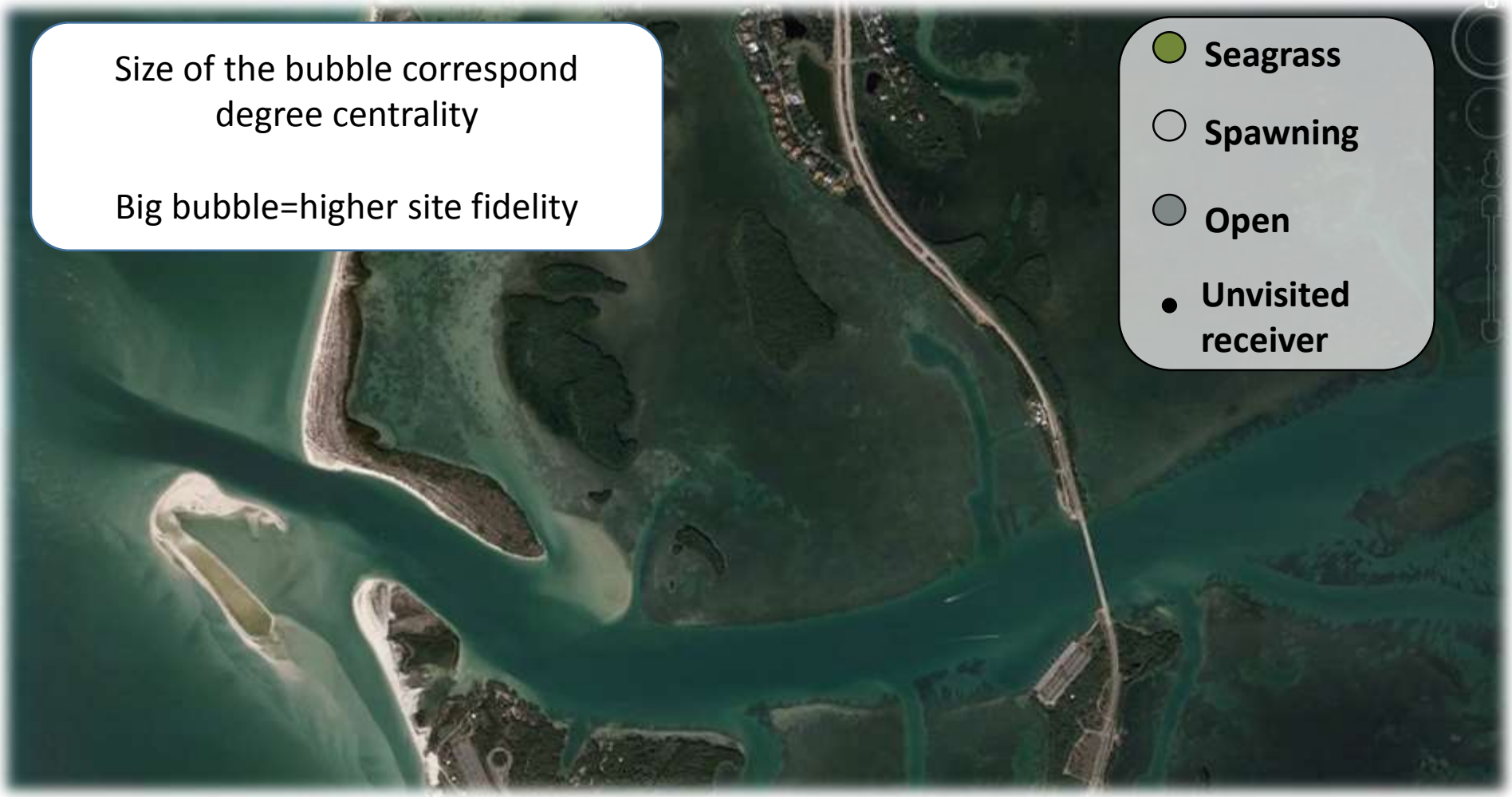
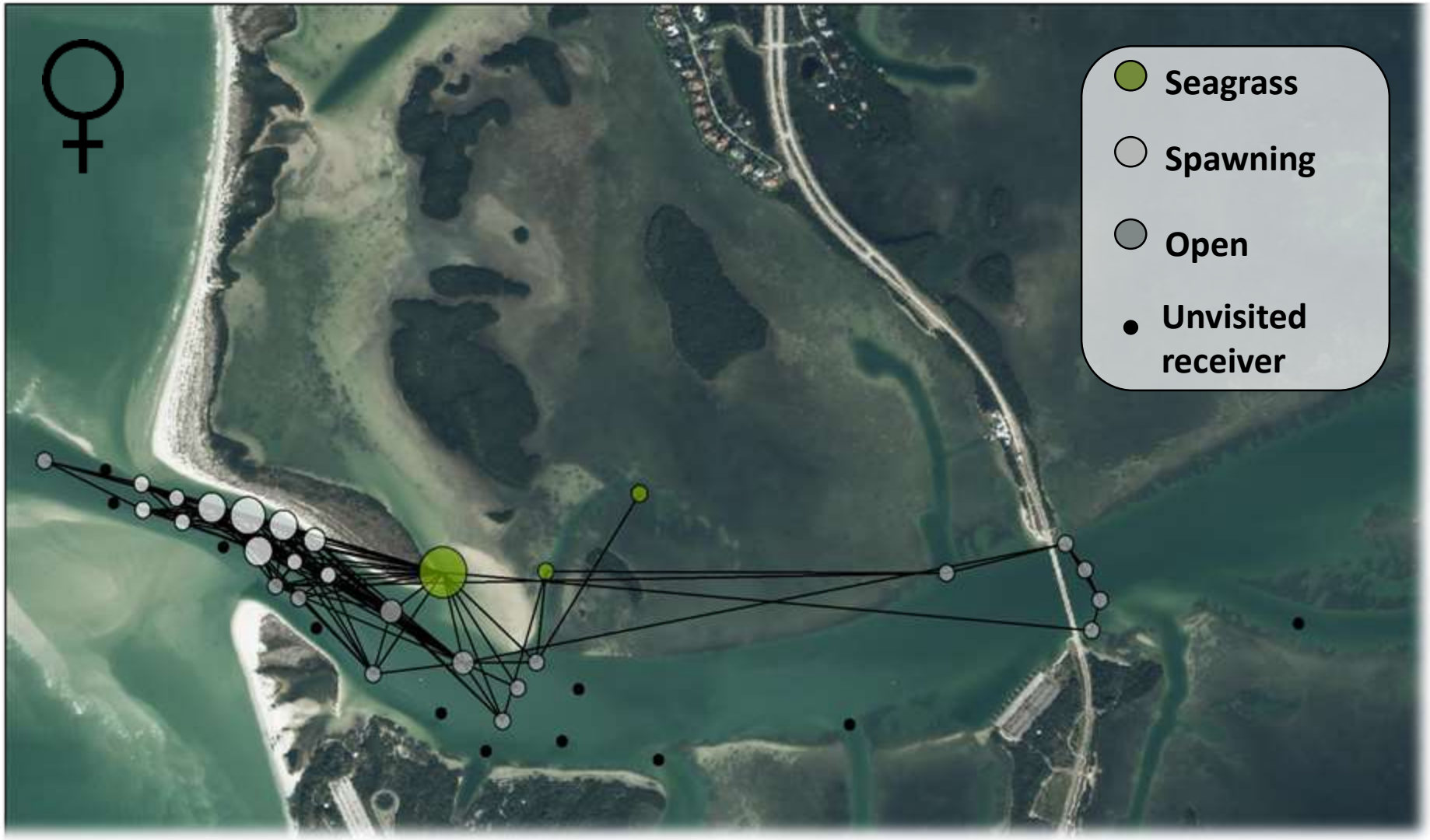


Females: important nodes within the seagrass habitat



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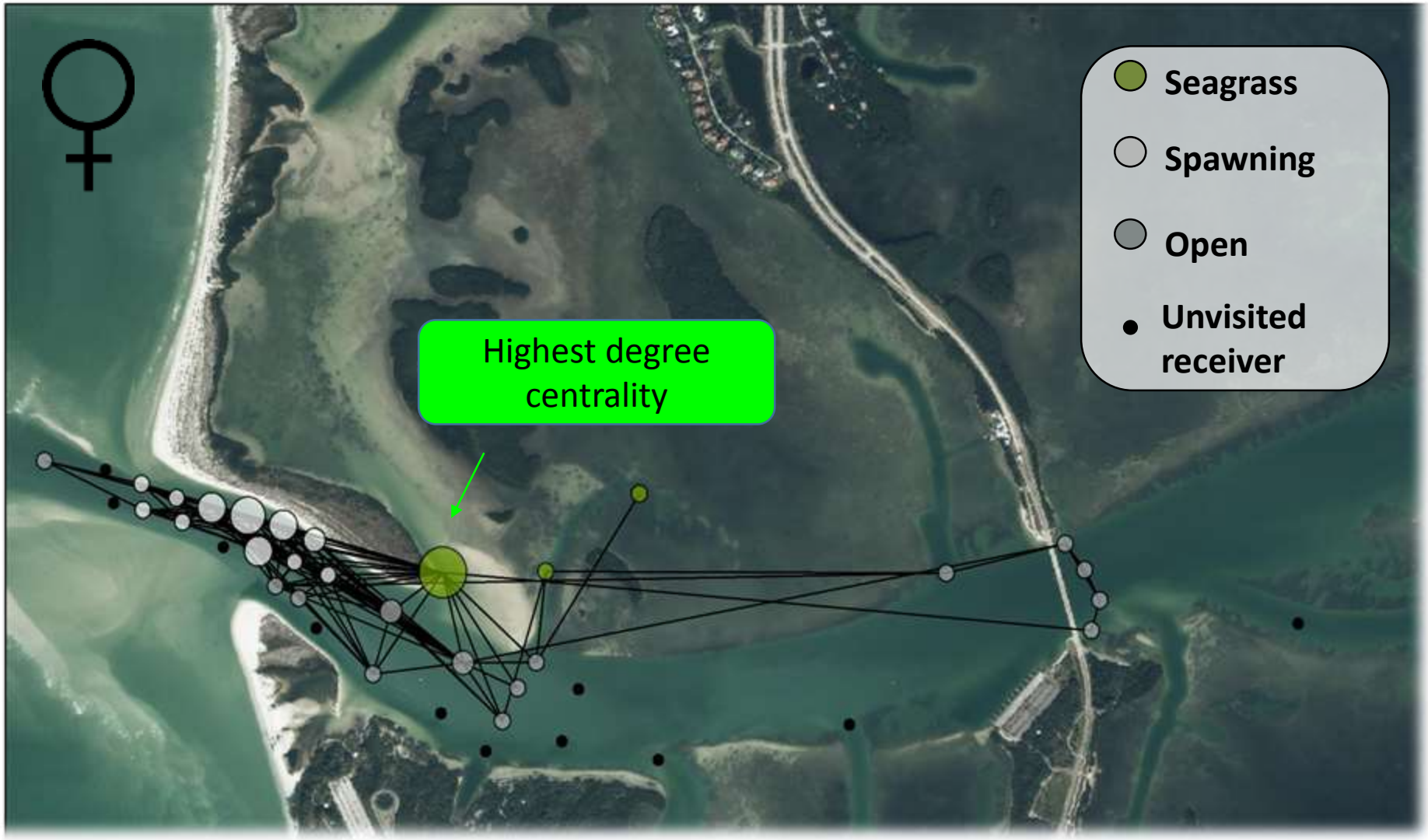

Males: important nodes within the seagrass habitat

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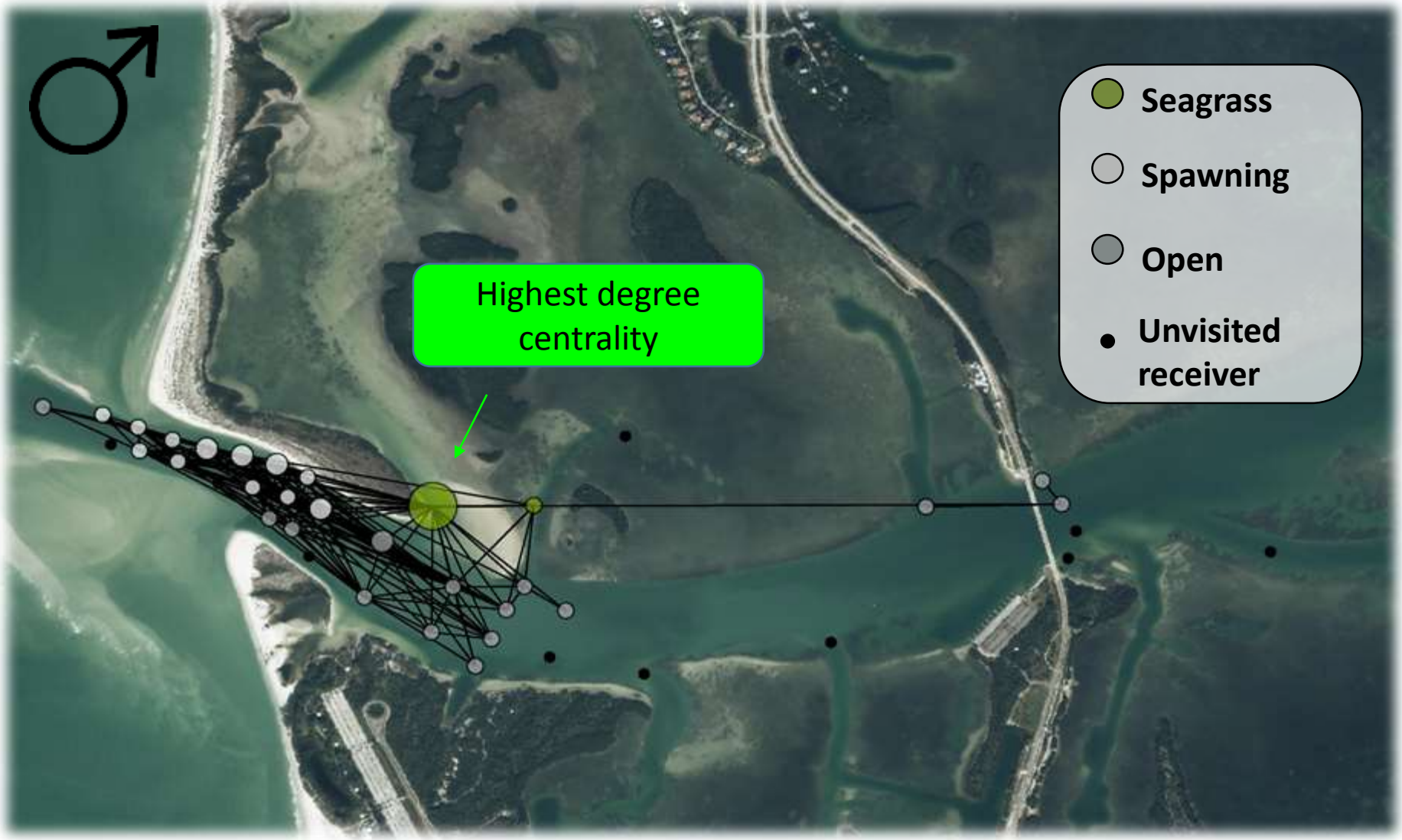

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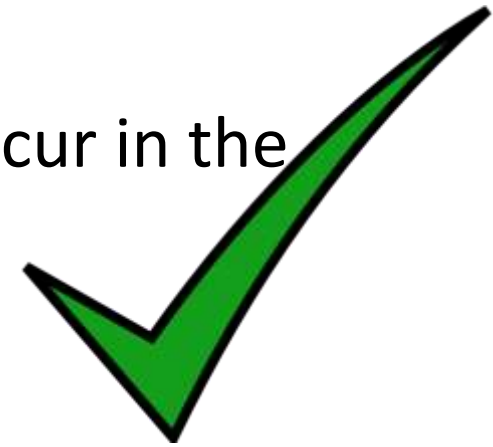

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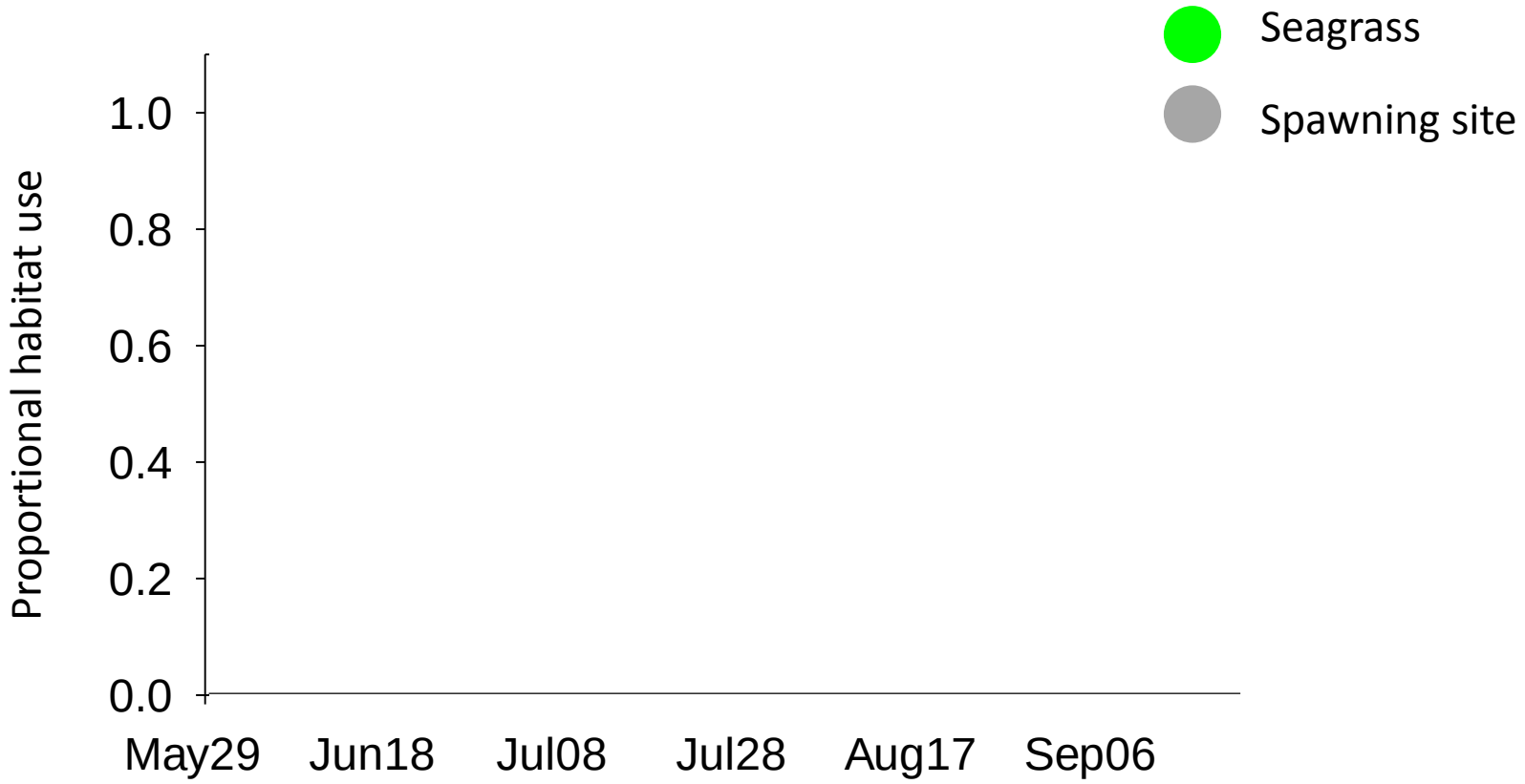

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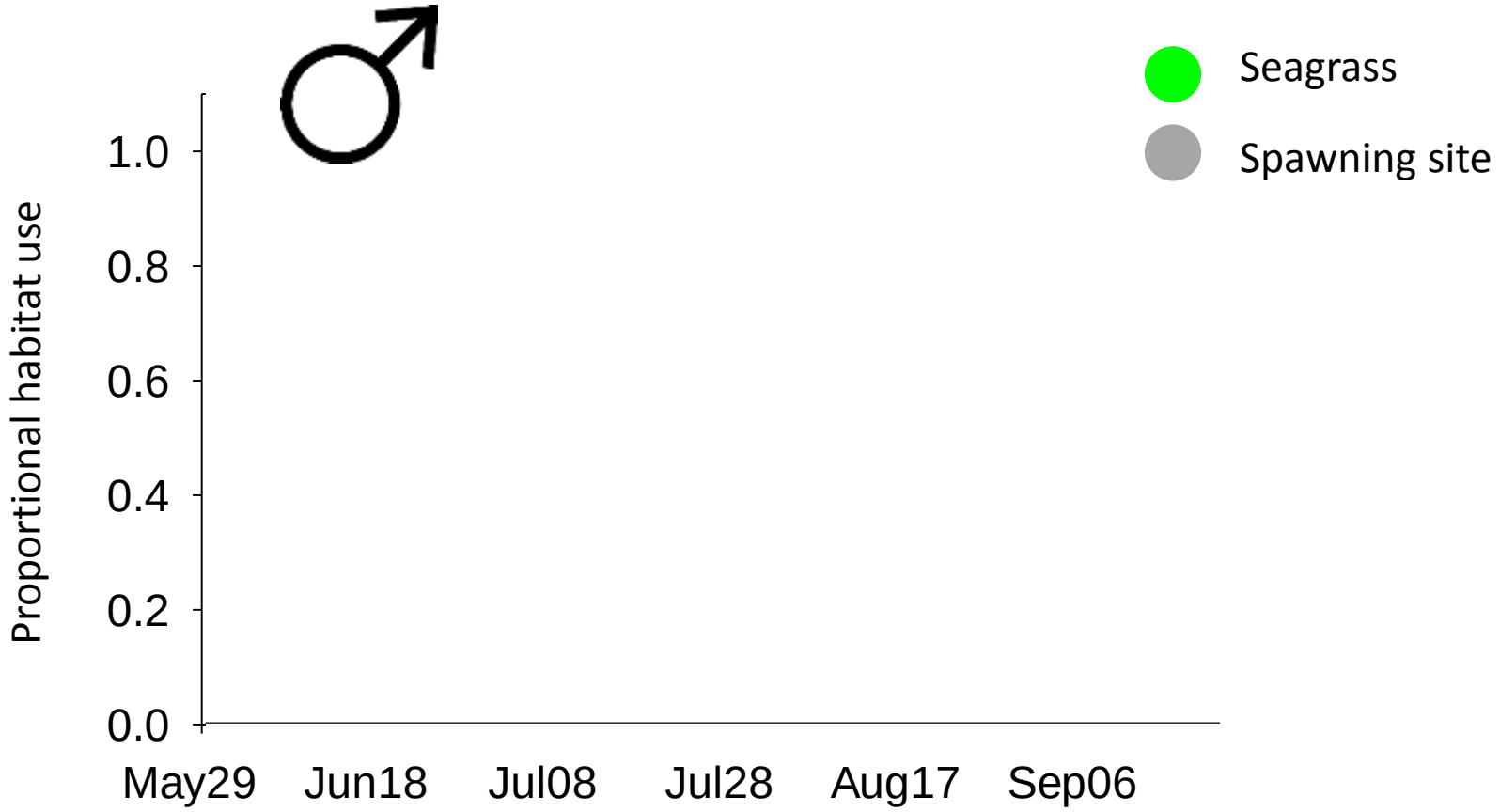

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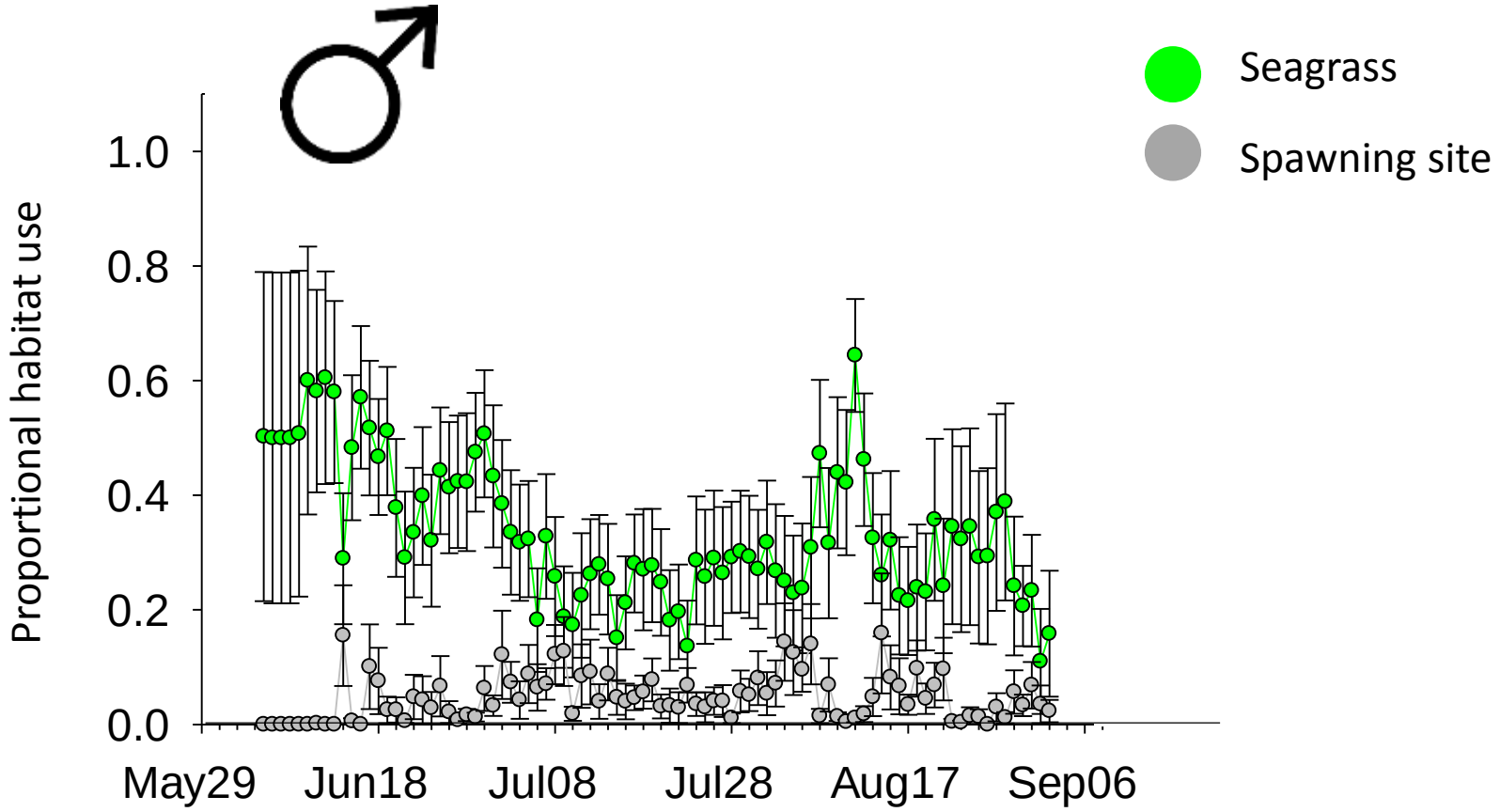

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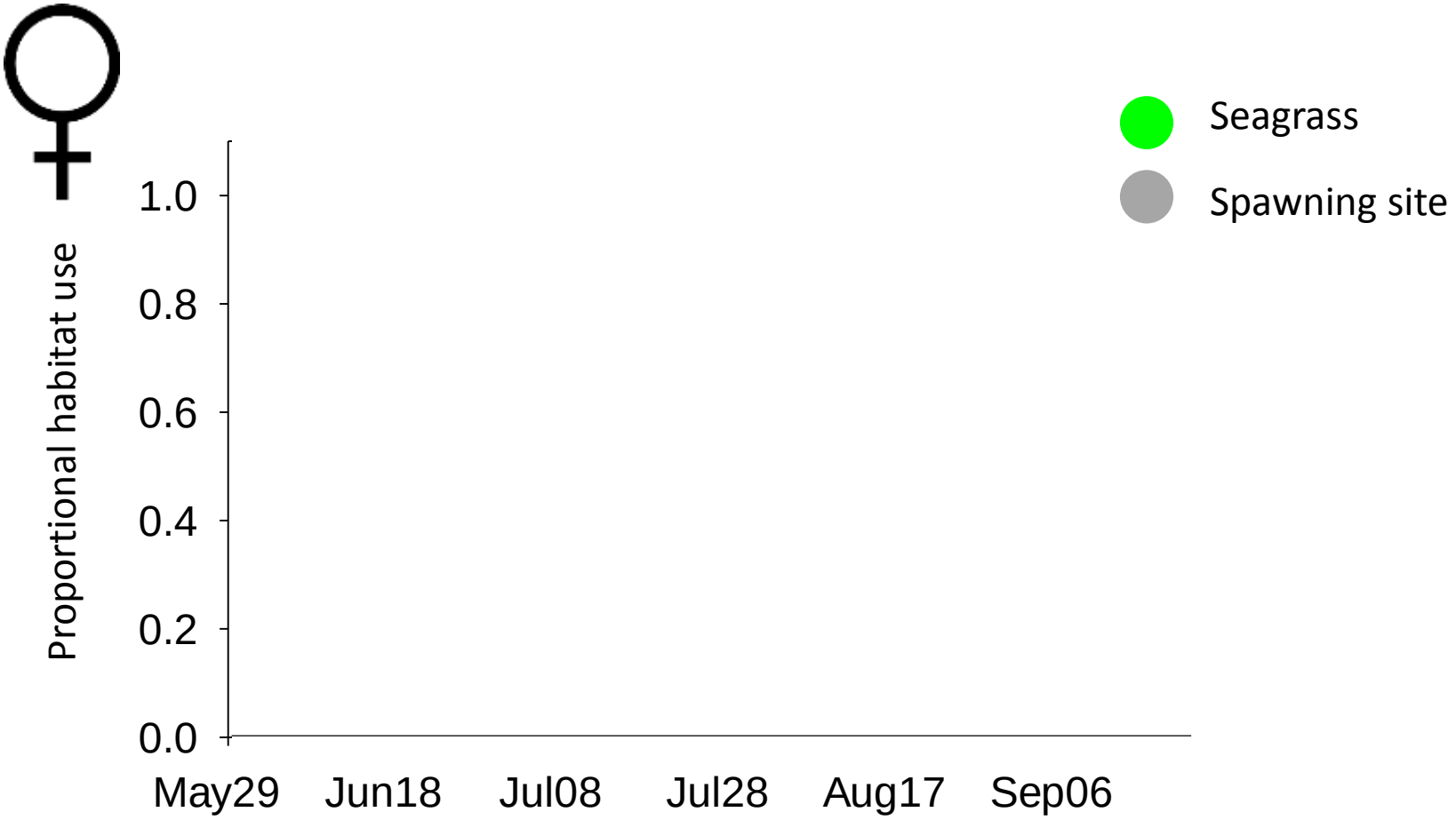

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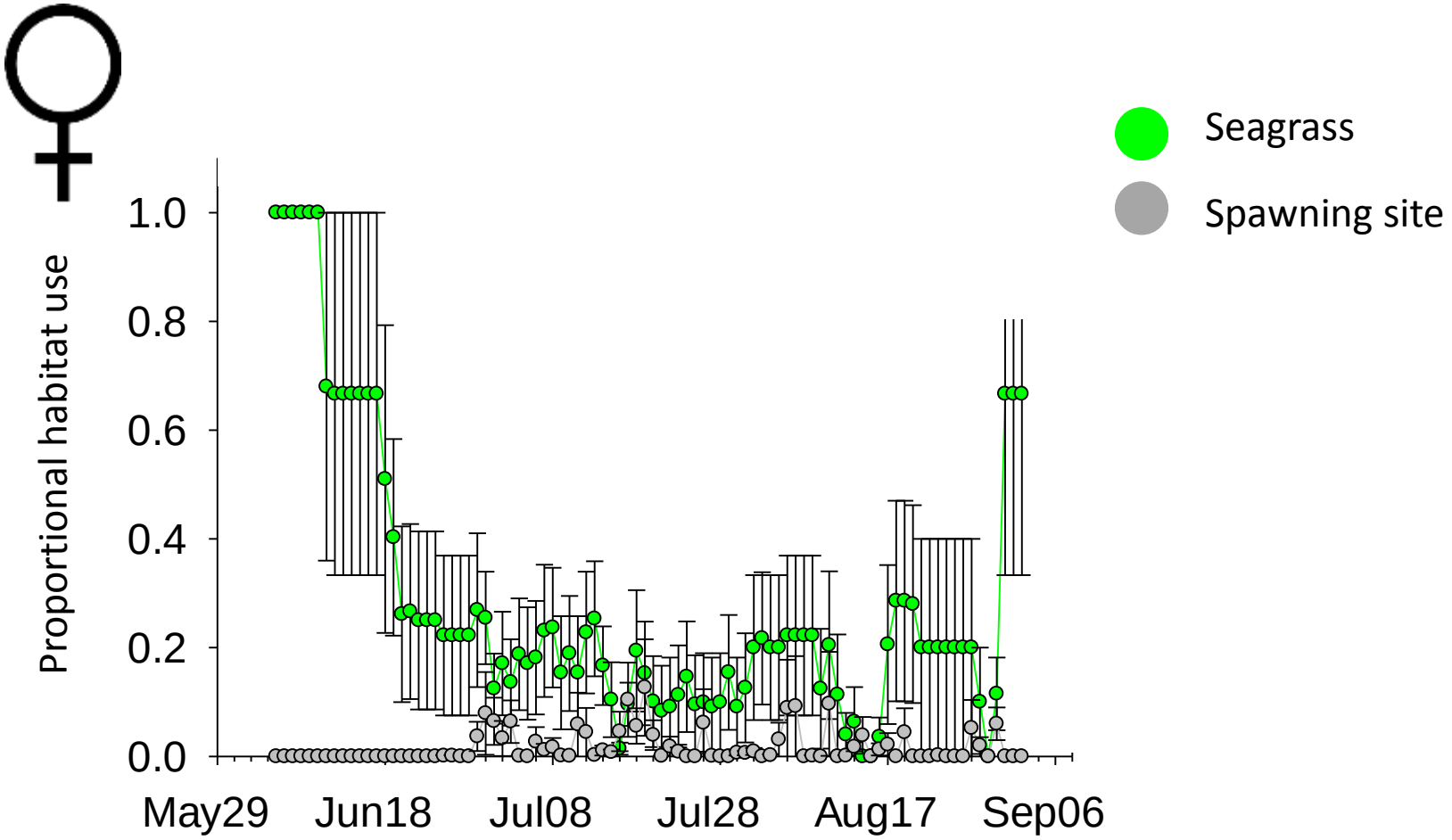

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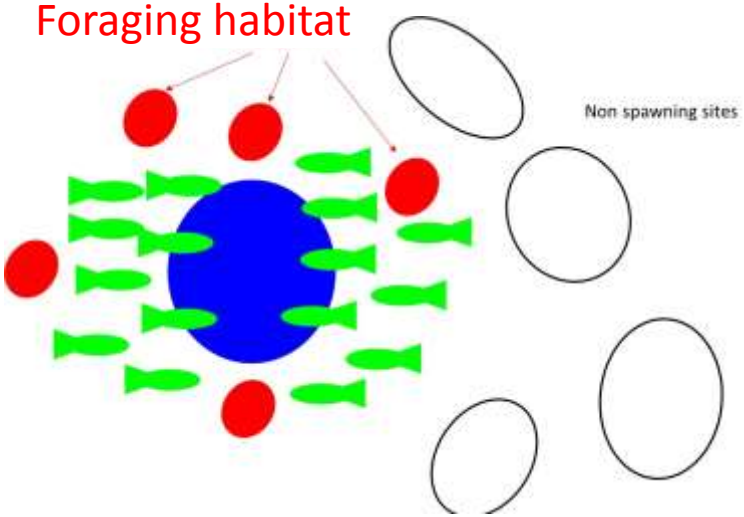
Future work

What is driving space use on seagrass habitat?

How does reducing the productivity of foraging habitat at aggregations affect spawning?

High resource availability

Foraging habitat



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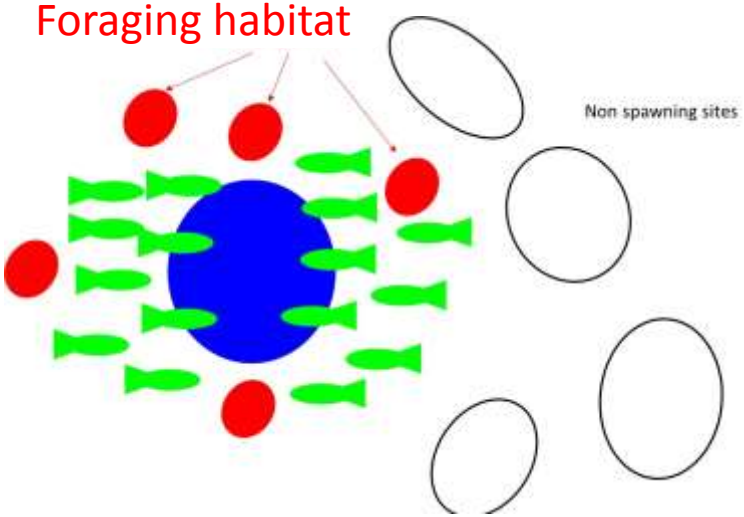
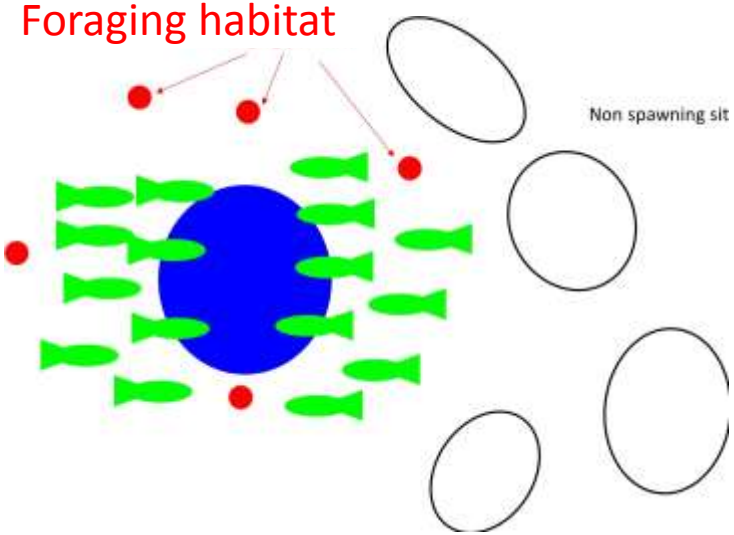
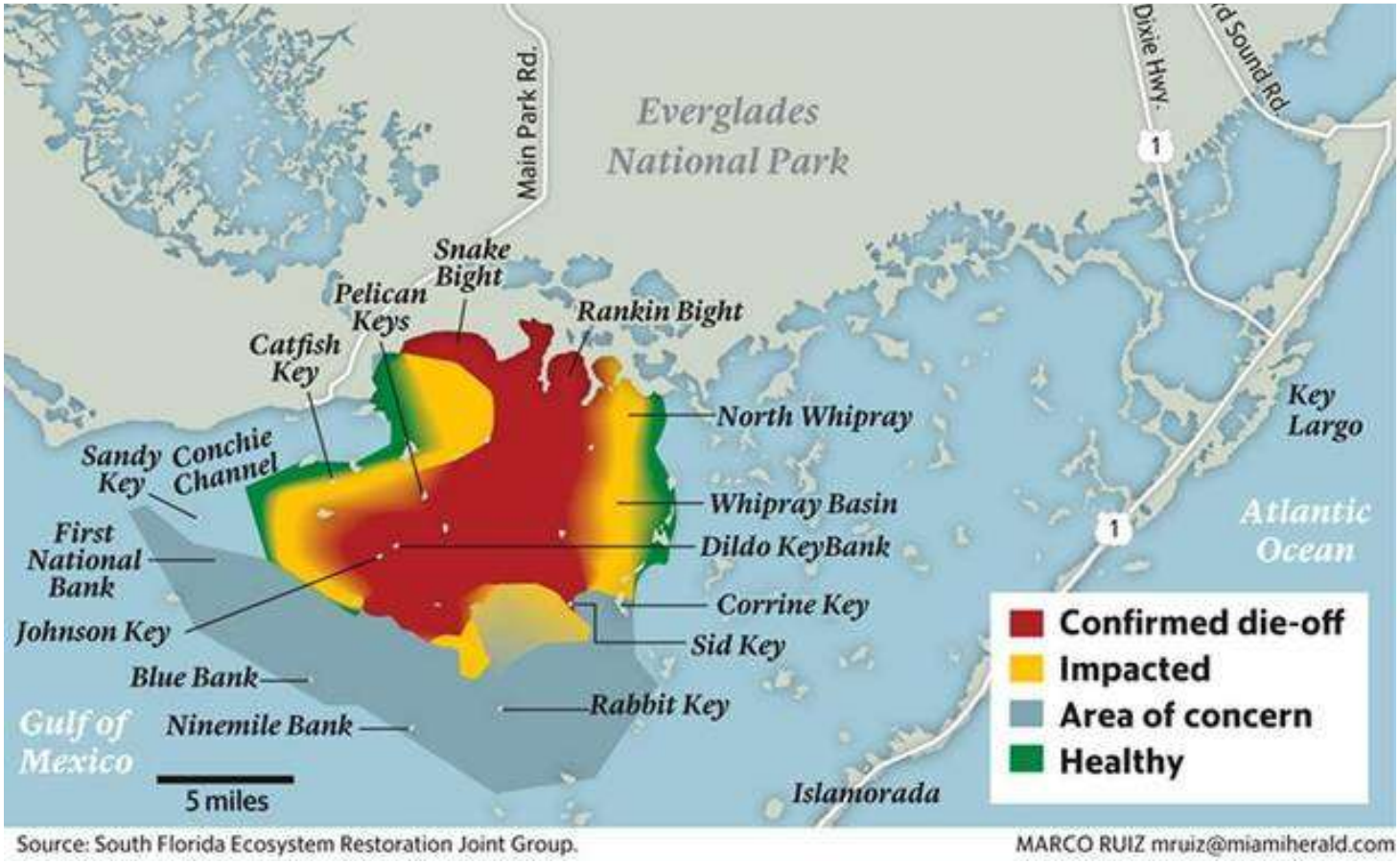


Low resource availability

Foraging habitat



Linking spawning Seagrass die-offs



Source: South Florida Ecosystem Restoration Joint Group.

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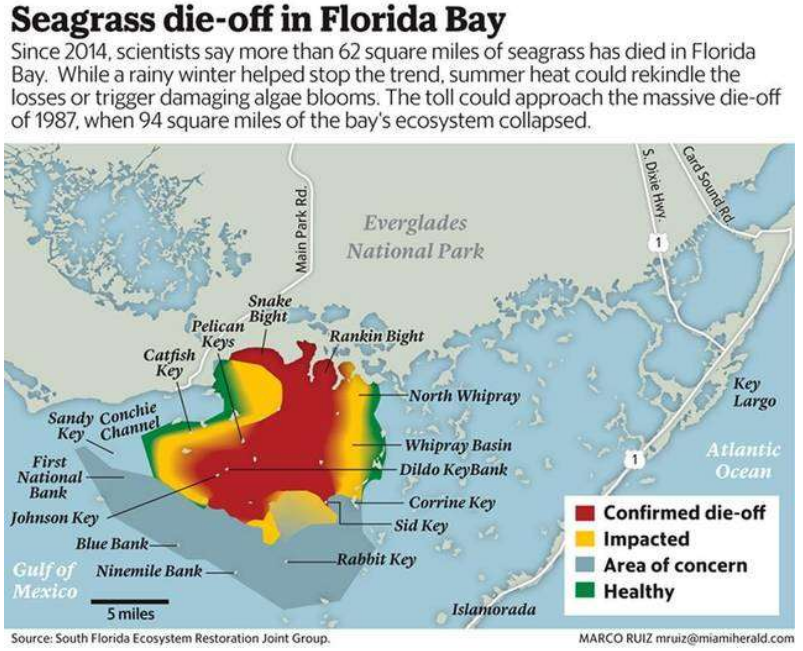
Use wading bird nesting models to understand how foraging at fish spawning aggregations affects reproductive success



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- FWC division of Fish Biology
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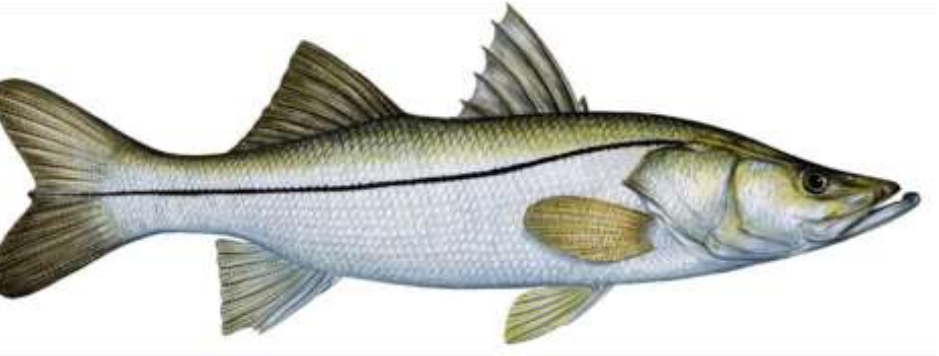
Questions?



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