

Foraging variation drives social organization in bottlenose dolphins



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- Bottlenose dolphins (*Tursiops truncatus*):
 - Generalist feeder (wide range of preys)
 - Social (fission-fusion dynamics)
 - Opportunistic (interact with human activities)
- Galicia (North-West Spain):
 - Resident bottlenose dolphins ¹
 - Shellfish farming: concentration of wild fish
 - Dolphins forage within shellfish farms ²

Do bottlenose dolphins vary in the frequency with which they use shellfish farms as foraging grounds?

Is this foraging variation linked to social organization?

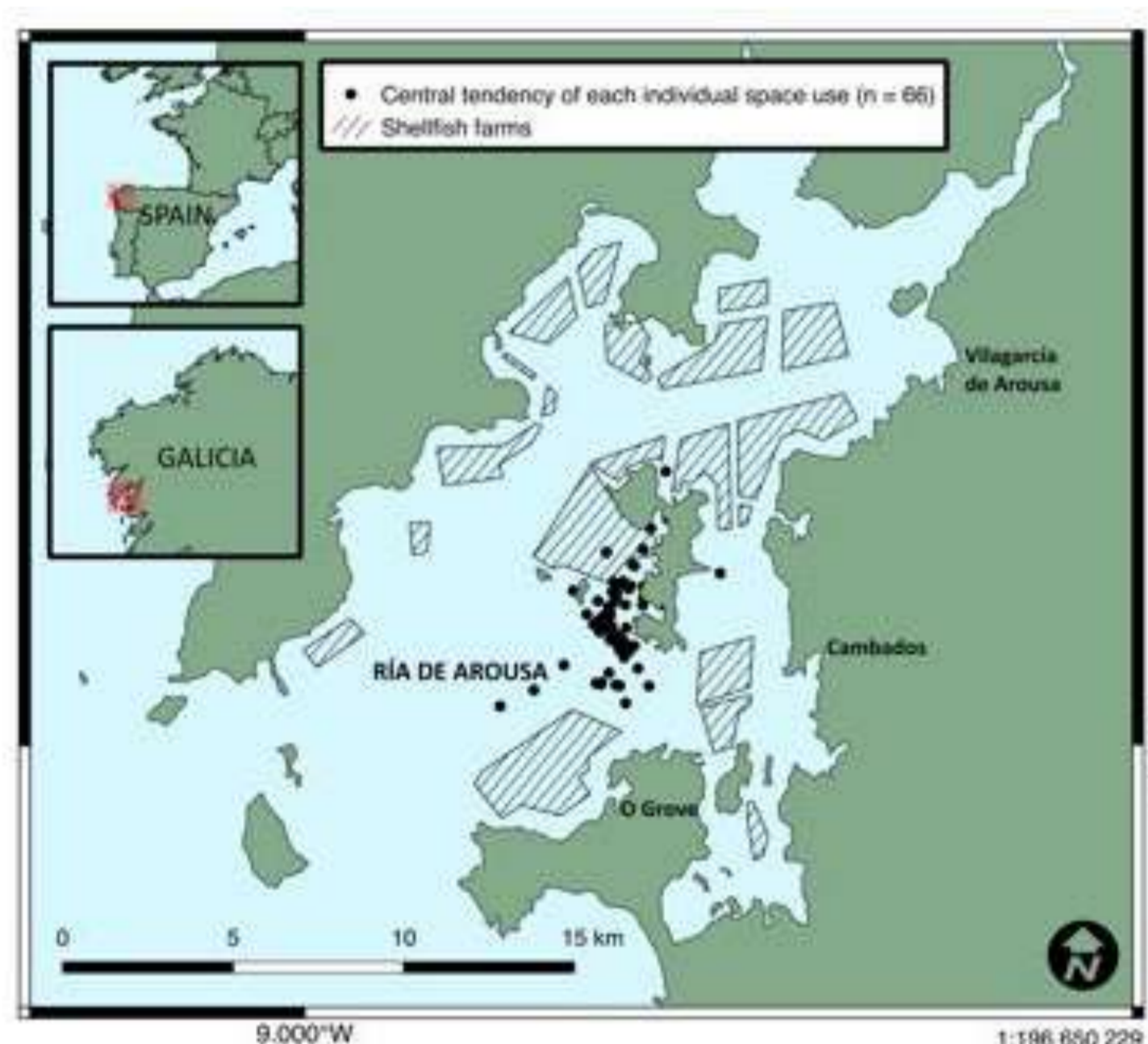
Dedicated boat-based surveys: Galicia, 2014-2017

Photo-identification analysis

Generalized affiliation indices GAI ³:

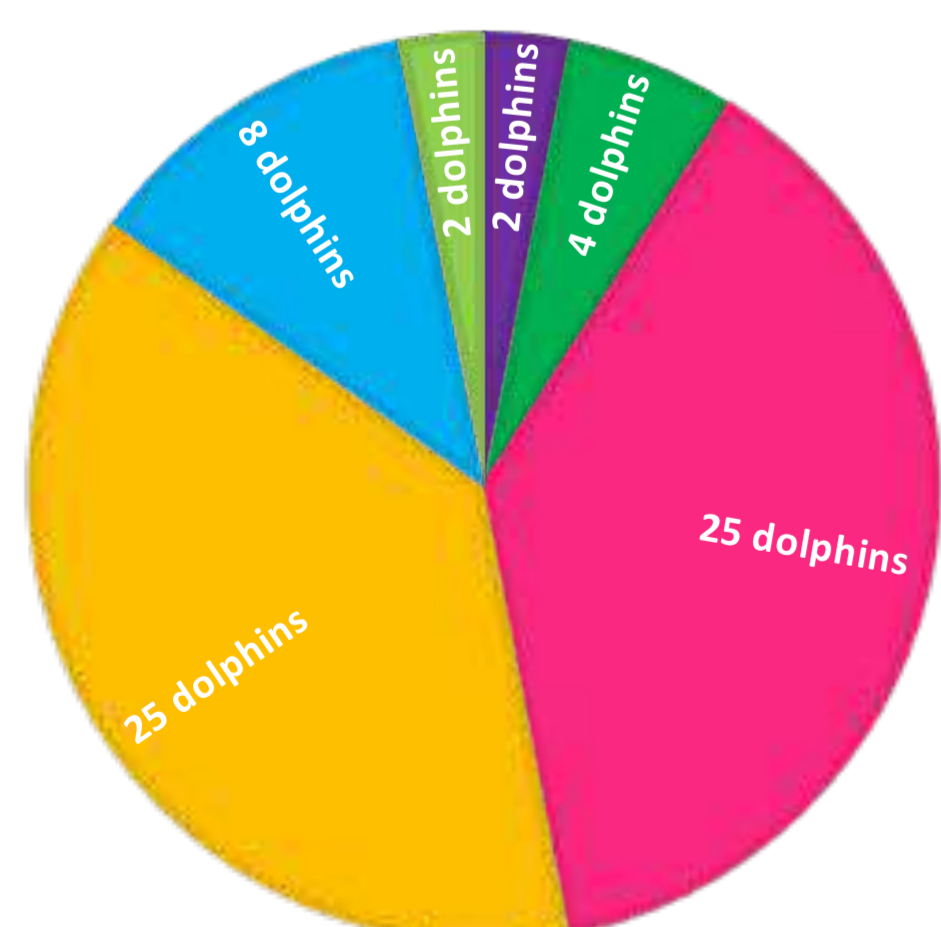
sex similarity, space-use overlap, gregariousness, cumulative number of sightings per pair of individuals

Social network analysis ⁴



The Ría de Arousa (Galicia)

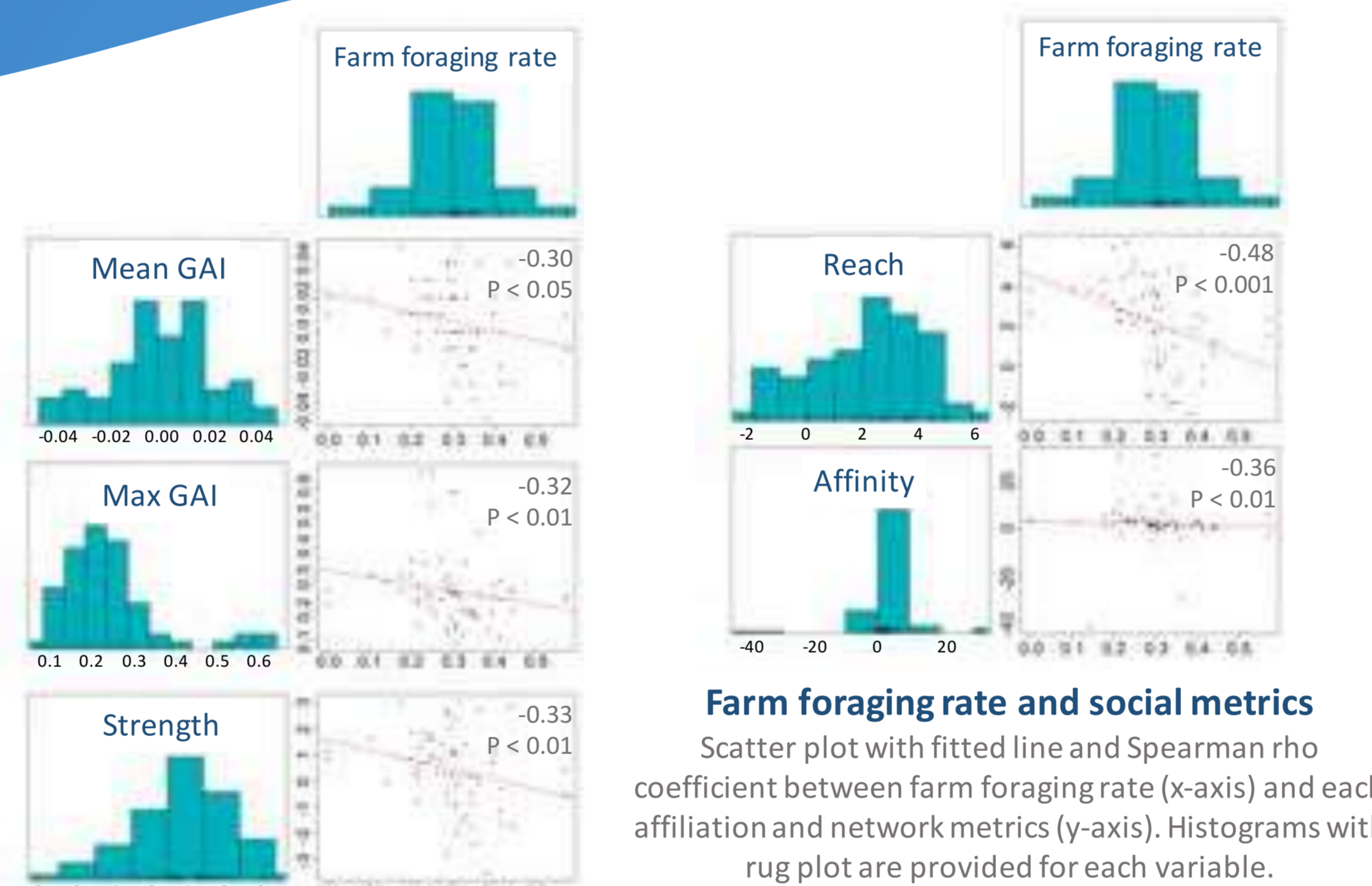
Individual space-use is represented by the centroid of the minimum convex polygon of all sightings of each individual.



■ 0 ■ <20% ■ 20-29% ■ 30-39% ■ 40-49% ■ >50%

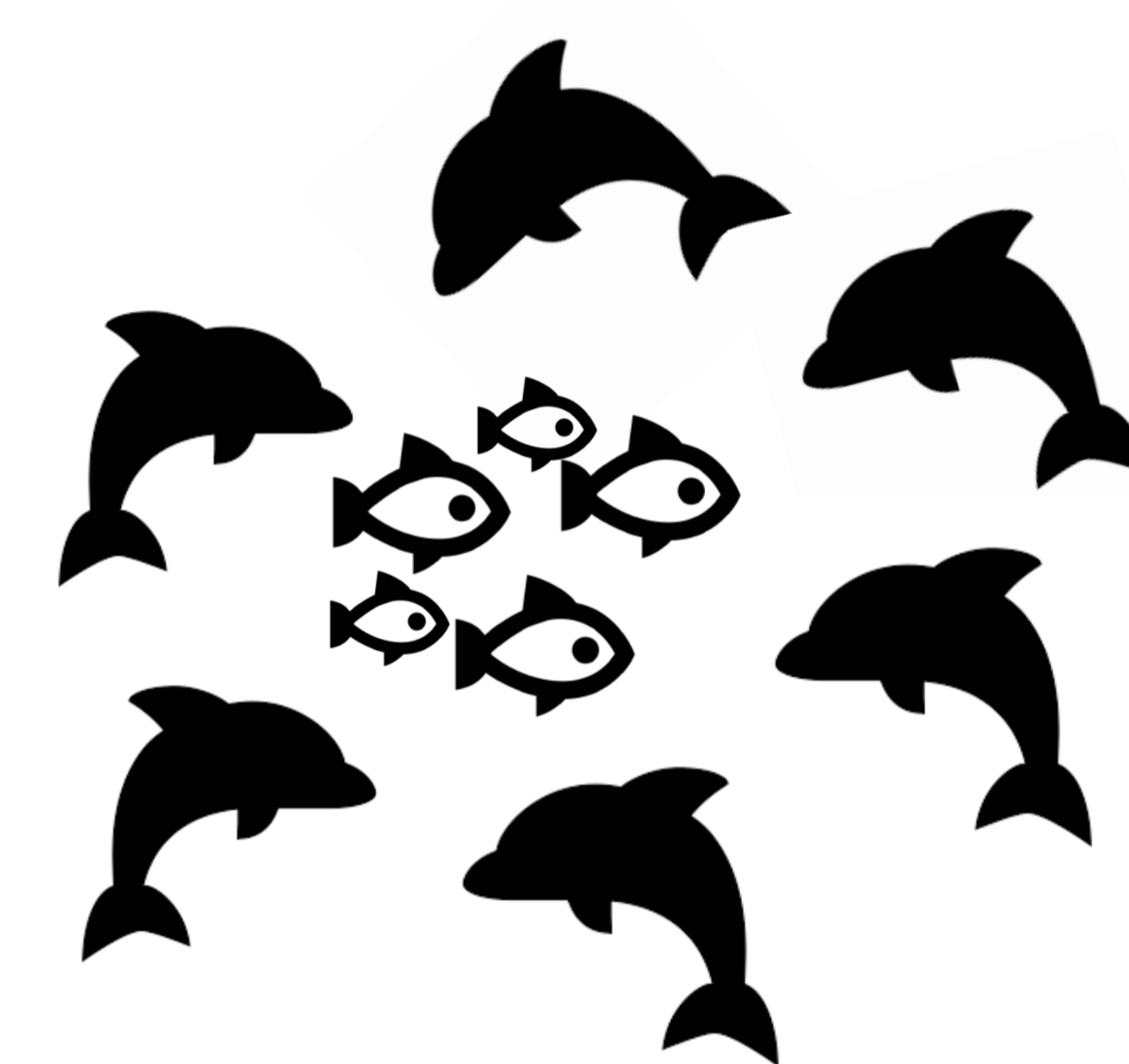
Shellfish farm foraging rate

Number of times an identified individual was observed foraging in the shellfish farm areas as a proportion of the total number of times the same individual was observed foraging.



Farm foraging rate and social metrics

Scatter plot with fitted line and Spearman rho coefficient between farm foraging rate (x-axis) and each affiliation and network metrics (y-axis). Histograms with rug plot are provided for each variable.

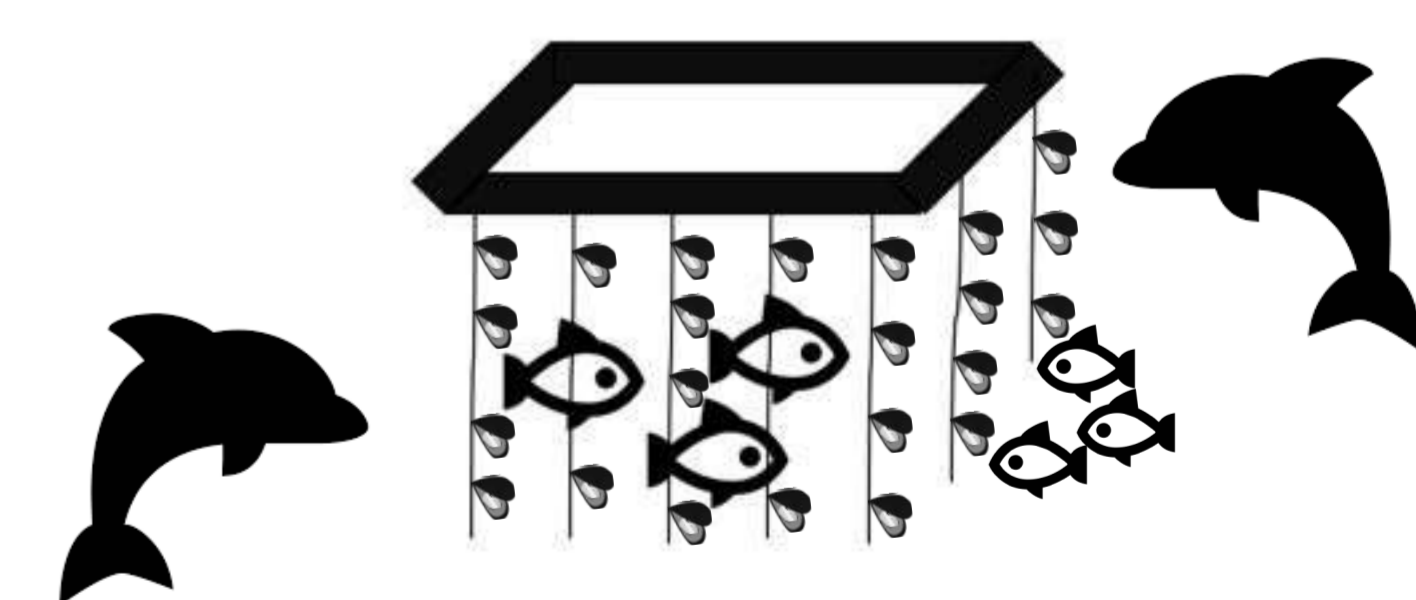


Foraging out of shellfish farms

Patchy, irregular distribution of prey

➤ Cooperative behavior

➤➤ Stronger associations

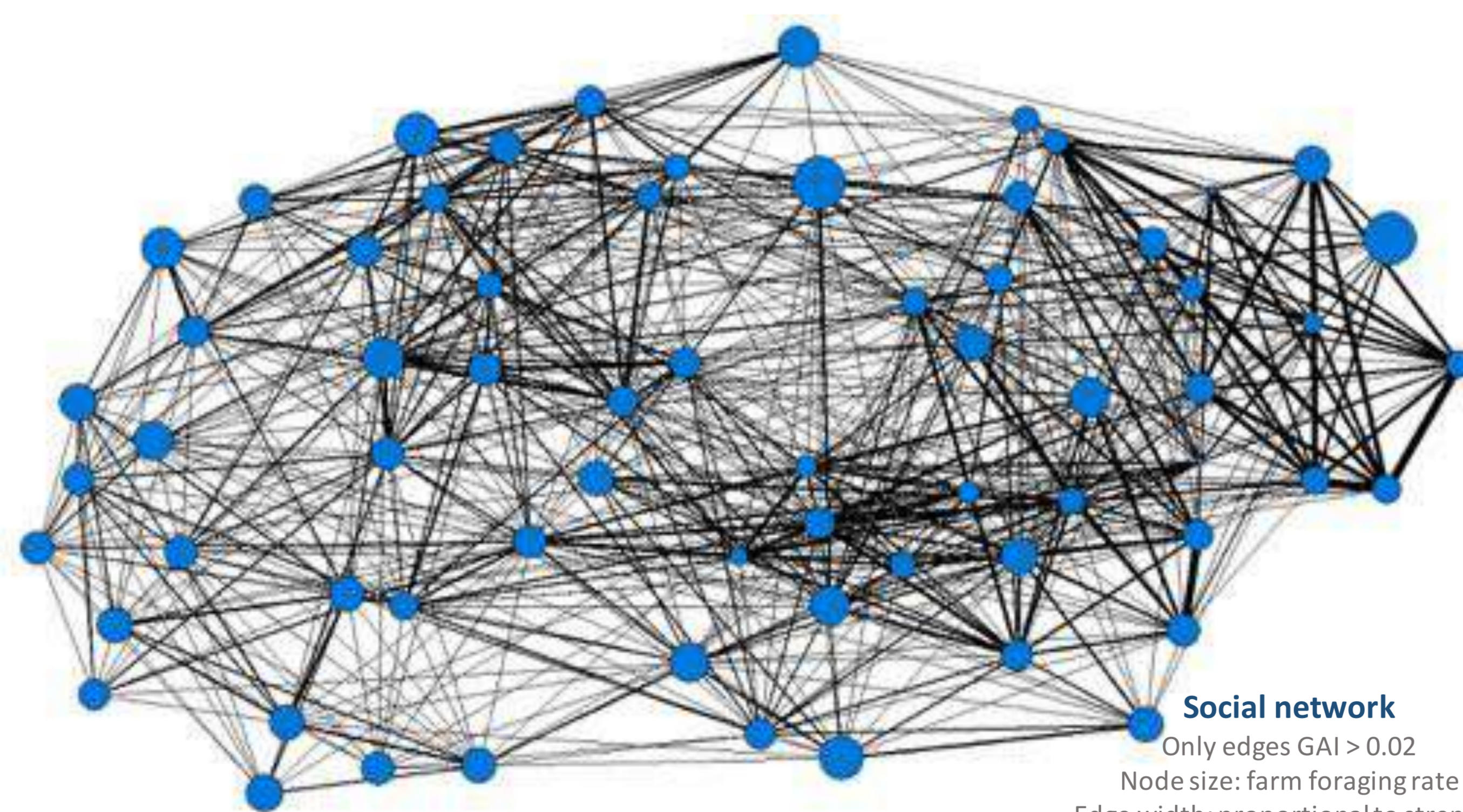


Foraging around shellfish farms

Reliable, easily located prey

➤ Non-cooperative behavior

➤➤ Weaker associations



Social network

Only edges GAI > 0.02

Node size: farm foraging rate

Edge width: proportional to strength

Methion S, Díaz López B. 2019. Individual foraging variation drives social organization in bottlenose dolphins. Behavioral Ecology 10.1093/beheco/arz160

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2. Methion S, Díaz López B. 2019. Natural and anthropogenic drivers of foraging behaviour in bottlenose dolphins: influence of shellfish aquaculture. Aquat Conserv. 29(6):927-937.
3. Whitehead H, James R. 2015. Generalized affiliation indices extract affiliations from social network data. Methods Ecol Evol. 6:836-844.
4. Whitehead H. 2008. Analyzing animal societies: quantitative methods for vertebrate social analysis. University of Chicago Press.

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