

Masterproject in ecological modelling:

How do larval tuna survive in the oligotrophic waters they are born into?

Supervisors: Øyvind Fiksen (oyvind.fiksen@uib.no) and Sergey Budaev (sergey.budaev@uib.no)

The Atlantic Bluefin tuna migrates across the Atlantic to feed on pelagic prey – they even come to the Norwegian Sea to eat mackerel and herring in the summer. But as autumn comes they seem to move south and forage on less profitable deep water fish and squids – and when it comes to spawning, they go to ocean deserts in the Mediterranean Sea (Muhling et al. 2017). The eggs and larvae are found in the Mediterranean Sea around mid-summer – and the exact timing of spawning may be adapted to match the annual food and temperature cycles (Reglero et al. 2018) – but do the larvae find enough food in these poor, oligotrophic areas? Why do they spawn here?

To answer these questions, we have developed a model for feeding and growth of tuna larvae (Fiksen and Reglero, ms). Eggs and larvae are eaten by jellies, other fish, invertebrates, and these predators have different killing power depending on larval size, environmental conditions, and behaviour (Fouzai et al. 2019) – and in this master project we will improve this model and simulate growth and survival of larvae under different combinations of food supply and predator abundance.

The thesis is theoretical and require an interest in working with models and numerical computation. Even if you have little prior experience with modelling, this is a skill that you can learn during your master.

- Fouzai N, Opdal AF, Jørgensen C, Fiksen Ø (2019) Dying from the lesser of three evils: facilitation and non-consumptive effects emerge in a model with multiple predators. *Oikos* 128:1307–1317
- Muhling BA, Lamkin JT, Alemany F, García A, Farley J, Ingram GW, . . . Carrion RL (2017) Reproduction and larval biology in tunas, and the importance of restricted area spawning grounds. *Rev Fish Biol Fisher* 27:697-732
- Reglero P, Ortega A, Balbin R, Abascal FJ, Medina A, Blanco E, . . . Fiksen Ø (2018) Atlantic bluefin tuna spawn at suboptimal temperatures for their offspring. *P Roy Soc B-Biol Sci* 285:20171405