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# Danish seine - Ecosystem effects of fishing

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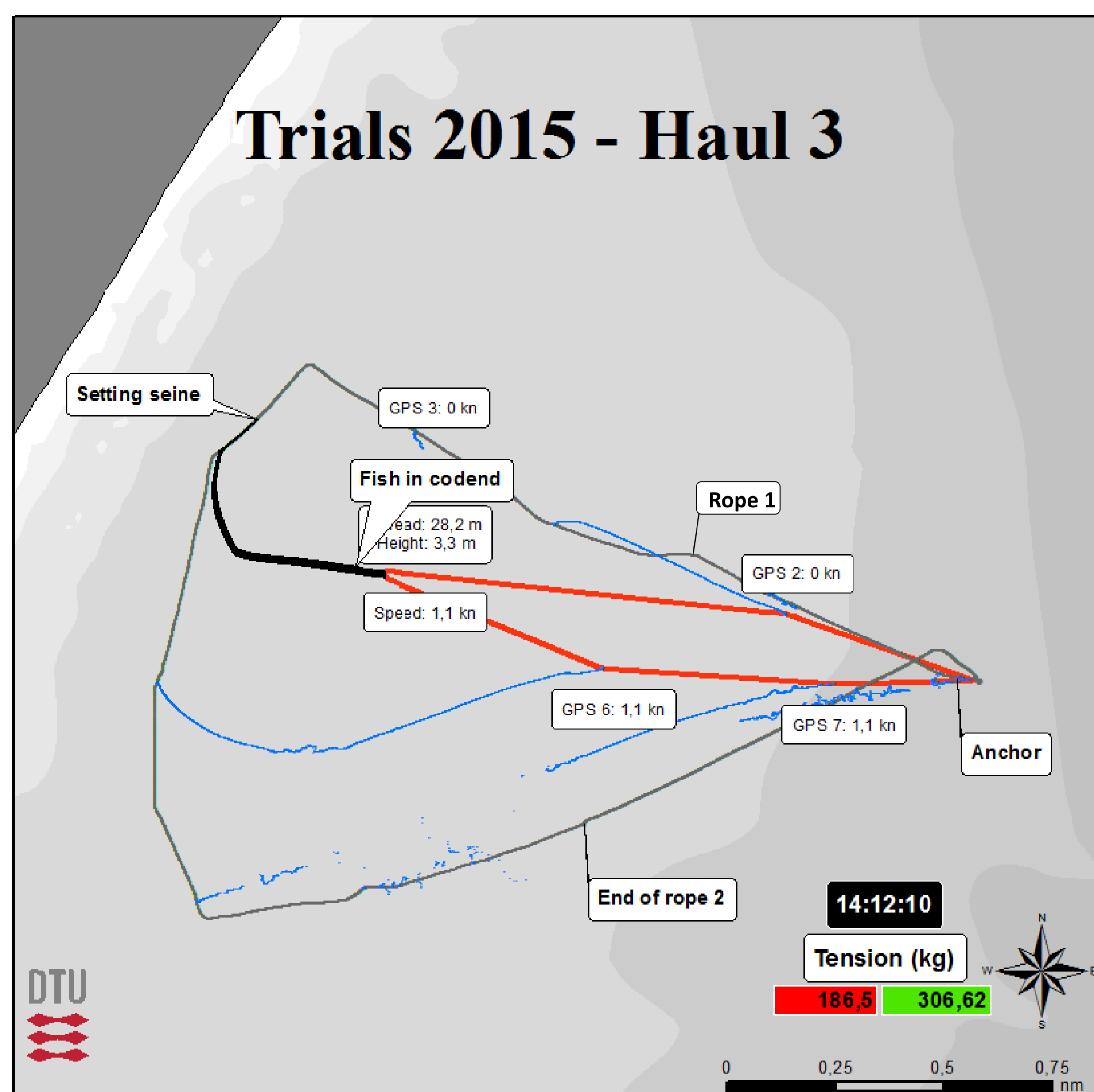
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## ? Background and aim

Danish seining is an efficient fishing technique<sup>1</sup> with low emissions of CO<sub>2</sub> and its negative impacts on the environment are considered to be gentle<sup>2,3</sup>. In order to expand the limited knowledge on general the gear and impacts it has on the environment, we carried out two sea trials on board a commercial Danish seiner in order to:

- describe the fishing process in a scientific way,
- investigate fish behaviour during the process and
- estimate the interaction of the gear with the sea bed.

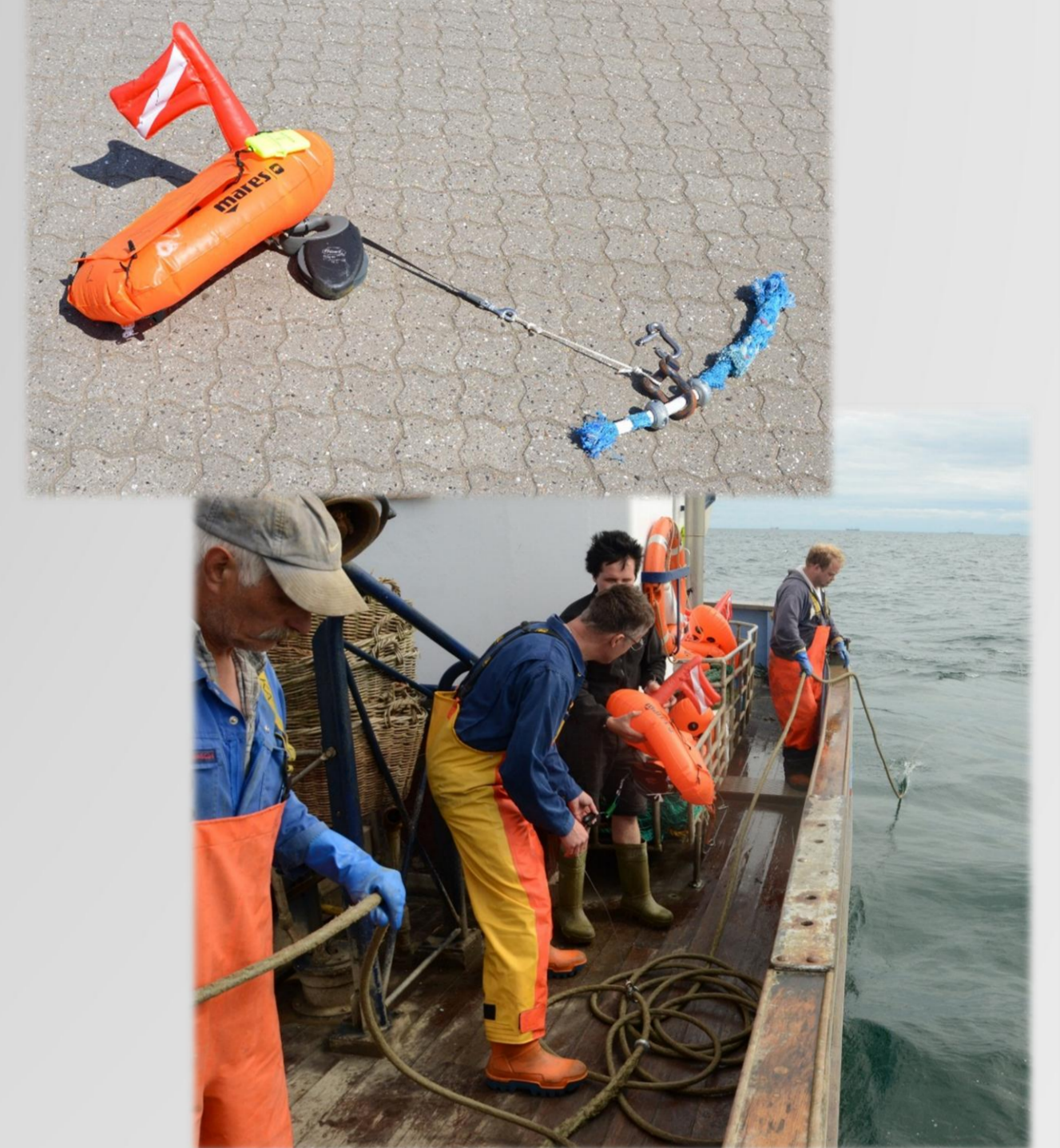
## || Observations and Results



Still image of haul animation including information about time, net behavior, net spread, net height, net velocity, occurrence of fish and forces between net and seine ropes (Video available by asking presenter)

## 🔧 Tools

We put 8 GPS-loggers in waterproof boxes which were placed in small rubber boats (see right). By help of a dog leash, they have been connected to 6 positions of the seine ropes and to both wing tips of the seine net. This allowed us to estimate the location of these points during the fishing process. Additionally, we used depth loggers and tension sensors to measure net height and forces acting between net and rope, respectively.



In order to examine behavior of fish in the seine net, we attached 7 cameras to several positions of the gear. Furthermore, we mounted cameras on specific anchors (see left) to investigate the reactions of fish towards the moving seine rope and to assess the level of negative impacts the gear has on the sea bed.

### Gear description:

Our results allowed us to create animations including various information about the fishing process for seven hauls (see left figure for standstill). The net did not move through the middle of the encircled area. Maximum net spread was reached quickly after setting the net and decreased continuously. Net height started with relatively high values (~8 m), shrank to ~2 m in the middle of the process and increased back to values around 8 m at the end of the process. Forces between seine net and rope 2 were higher than between net and rope 1 in the beginning of the hauling, but equalized during retrieval by reaching higher, but similar values.

### Fish behavior:

Often fish appeared in front of the gear early in the fishing process, but in any case the majority did not enter the codend before 75% of the fishing process were completed. Fish have been observed being herded by the seine ropes by distances of several meters.

### Impacts on the sea bed:

Although a quantification of impacts has not been possible, no remarkable differences of sea bed structures between before and after fishing could be detected from the video recordings and resuspended sediment settled down again within less than two minutes.

## ⚙️ Outcomes

- We were able to establish haul animations including information of the gear's performance for any point of the fishing procedure. This allowed, e.g., to determine where the seine net is moving through the fishing area, when the net is actually opened, when it is fishing, and to see that forces between net and ropes are asymmetric in the beginning but equalize with time.
- The majority of fish entered the codend very late in the fishing process although the herding started soon after the gear had been set out.
- Fish got herded several meters before the rope approached them, which might be explained by the created dust cloud and the reactions of other fish.
- Interactions of seine ropes and sea bed seem to be minor, at least on the sandy bottoms where these trials were conducted.

## 📍 References

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