



Oil and gas platforms in the North Sea

Do they benefit commercial fish species and biodiversity?

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OIL AND GAS PLATFORMS IN THE NORTH SEA:

DO THEY BENEFIT COMMERCIAL
FISH SPECIES AND BIODIVERSITY?

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The impact of offshore oil and gas platforms on the marine ecosystem remains a topic of concern in the North Sea. This study investigated the effect of these platforms on fish abundance using underwater video recordings.”

ABSTRACT

The impact of offshore oil and gas platforms on the marine ecosystem remains a topic of concern in the North Sea. This study investigated the effect of these platforms on fish abundance using underwater video recordings. By analysing a large database of fish species around a platform, we discovered a consistent increase in fish abundance near the platform. Recordings indicated a positive effect of offshore platforms on fish biodiversity and abundance. Results suggest that platforms may act as artificial reefs. Platforms are likely

providing marine habitat and shelter for various fish species. It is possible that the presence of platforms enhances local biodiversity and may support fish communities. This would be in agreement with the variety of species and numbers of fish observed by our underwater cameras. Understanding and promoting the positive influence of offshore platforms on fish abundance may support future marine conservation efforts. Ultimately, this may help guiding the implementation of UN sustainable development practices.

OFFSHORE PLATFORMS IN THE NORTH SEA

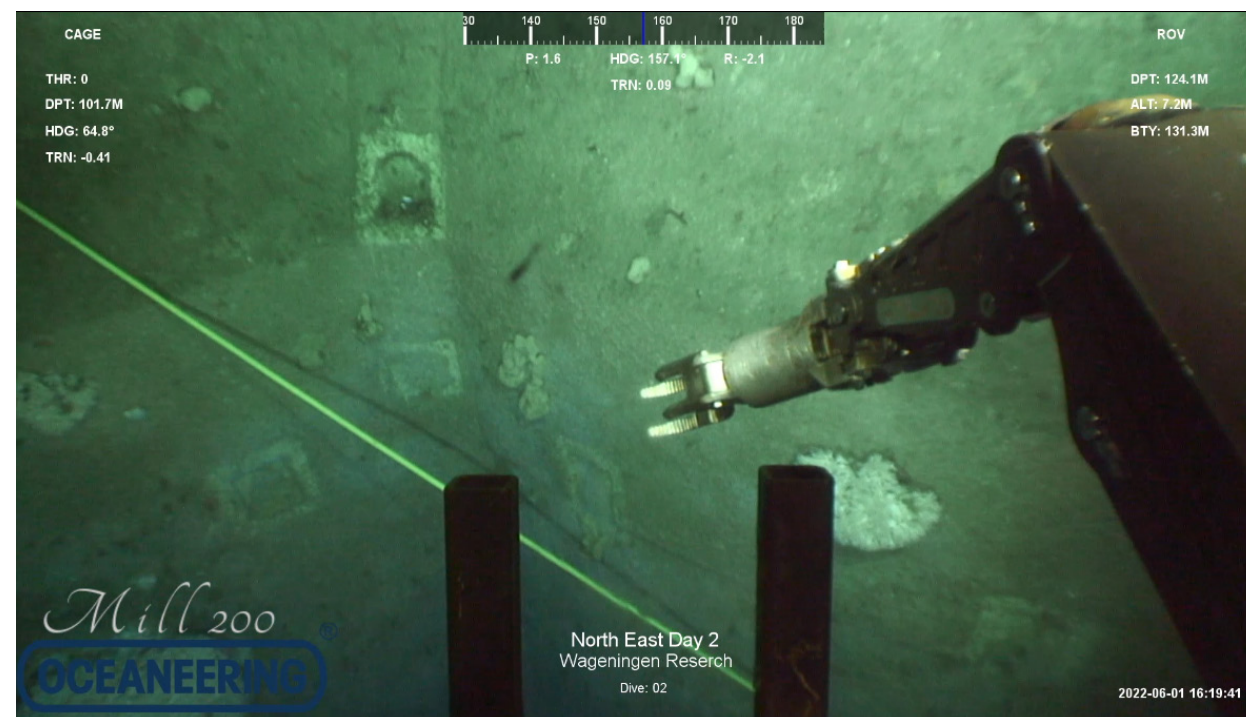
The North Sea, covering a vast area and bordering multiple countries, has been utilised for centuries. Being a part of the larger Atlantic Ocean, the North Sea is relatively shallow with 94 metres of average depth. Denmark has 55 offshore platforms on 19 oil and gas fields in the Danish part of the North Sea. In addition, there are more than 500 offshore platforms from Norway and the United Kingdom combined in the North Sea. Moreover, with further demands for oil and gas, fields like Rosebank, Cambo, Penguins, and Jackdaw may increase oil and gas production in the region. Therefore, it is crucial to understand the effects of platforms on the marine environment including fish abundance. Unfortunately, the ecological effects of platforms in the North Sea remain poorly understood. Researchers are actively investigating how these platforms influence the marine environment. Offshore platforms have the capacity to modify the environment in various ways. The impacts of platforms on marine life

become evident especially as a platform is reaching the end of its operational life. The relationship between offshore platforms and marine life is a complex phenomenon and remains debated.

Here, we provide insight into methods for marine life investigation and offshore platform effects on fish abundance in the North Sea. Our target offshore platform is situated in the northeast of Shetland near the Norwegian border. Remote underwater video recording vehicles (ROVs) were deployed around the platform to investigate fish abundance and biodiversity. ROVs recorded a radius of 0 - 100m away from the platform to determine the trends in fish abundance.

REMOTE UNDERWATER VEHICLES DEPLOYED AROUND THE OFFSHORE PLATFORM

The ROVs used in this study (Millennium 200 and Millennium 215) were selected for this task due to their metal arms and front camera as well as relatively strong current resistance and mobility.



ROV Millennium 200 during underwater camera setting operation. Metal arm manages the wire on foundations of the platform.

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To investigate fish abundance and biodiversity, remotely operated vehicles (ROVs) were deployed around the offshore platform.”

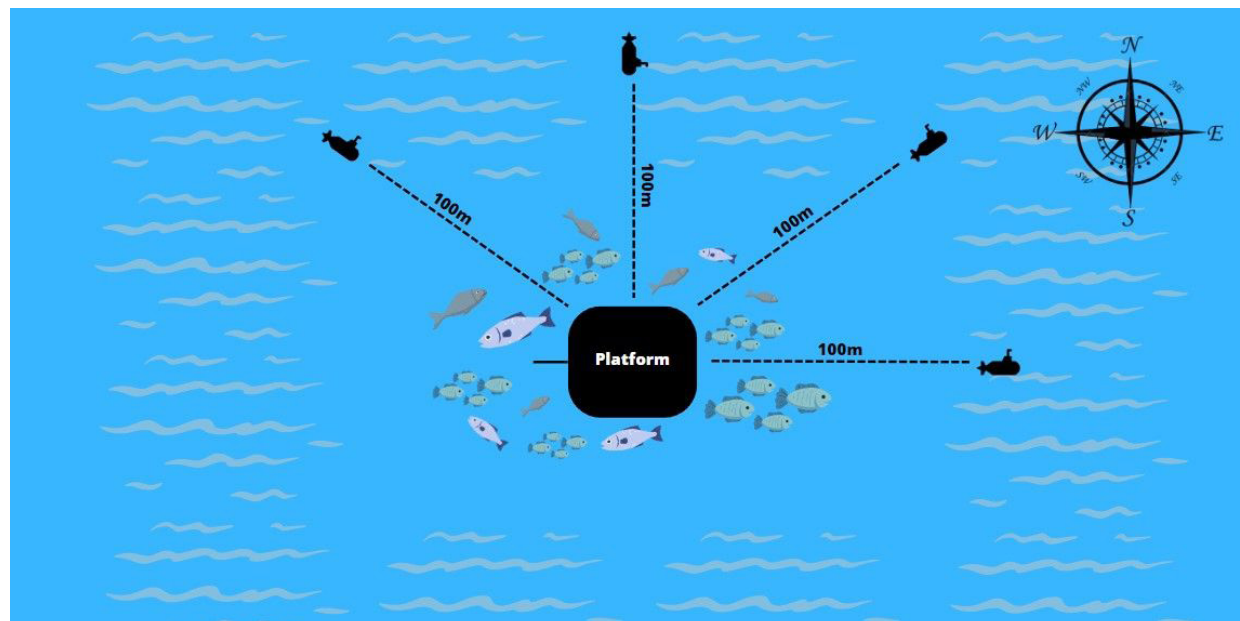
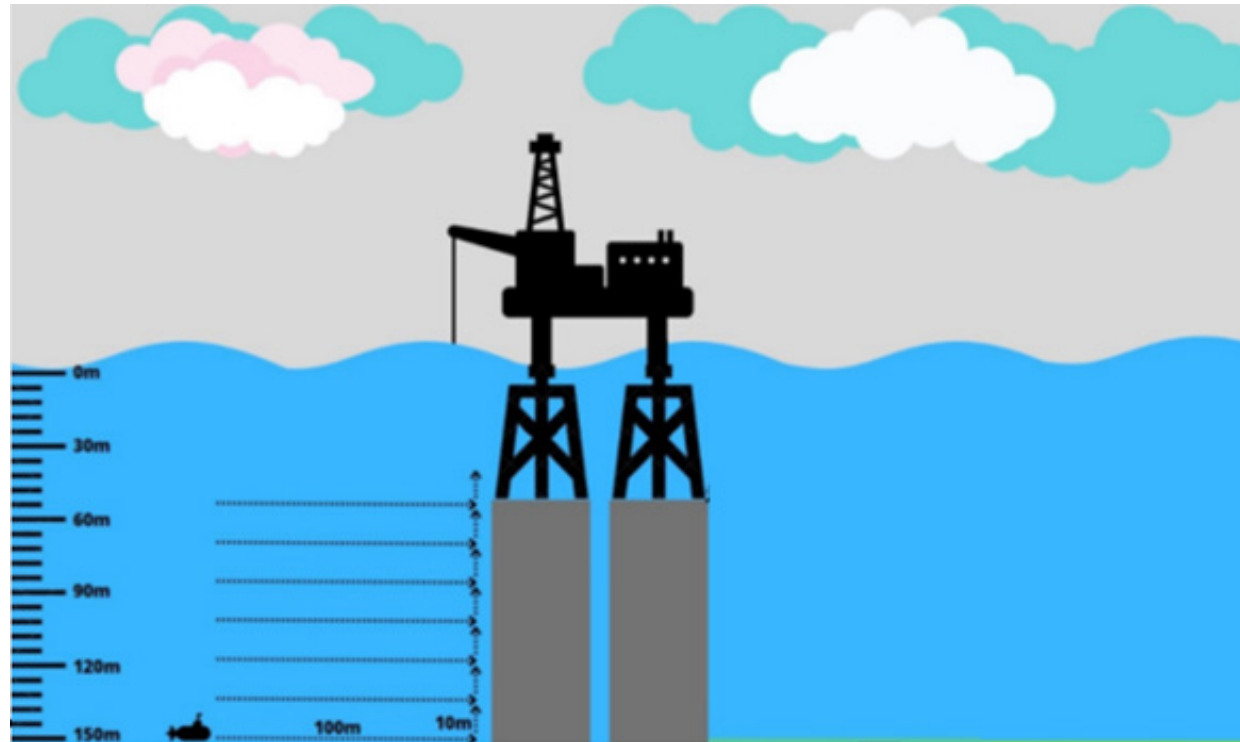


↑ Camera image of a seabed at 150 metres depth.

↓ One of many fish images captured by the underwater camera. In this case, the fish posted is a specimen of tusk (Brosme brosme).

”

...we discovered a consistent increase in fish abundance near the platform.”



- ↑ Visualisation of ROV investigation view from the side..
- ↓ Visualisation of ROV investigation view from the top. Underwater recordings revealed elevated fish abundance near the platform (i.e. within 25 m from the platform).

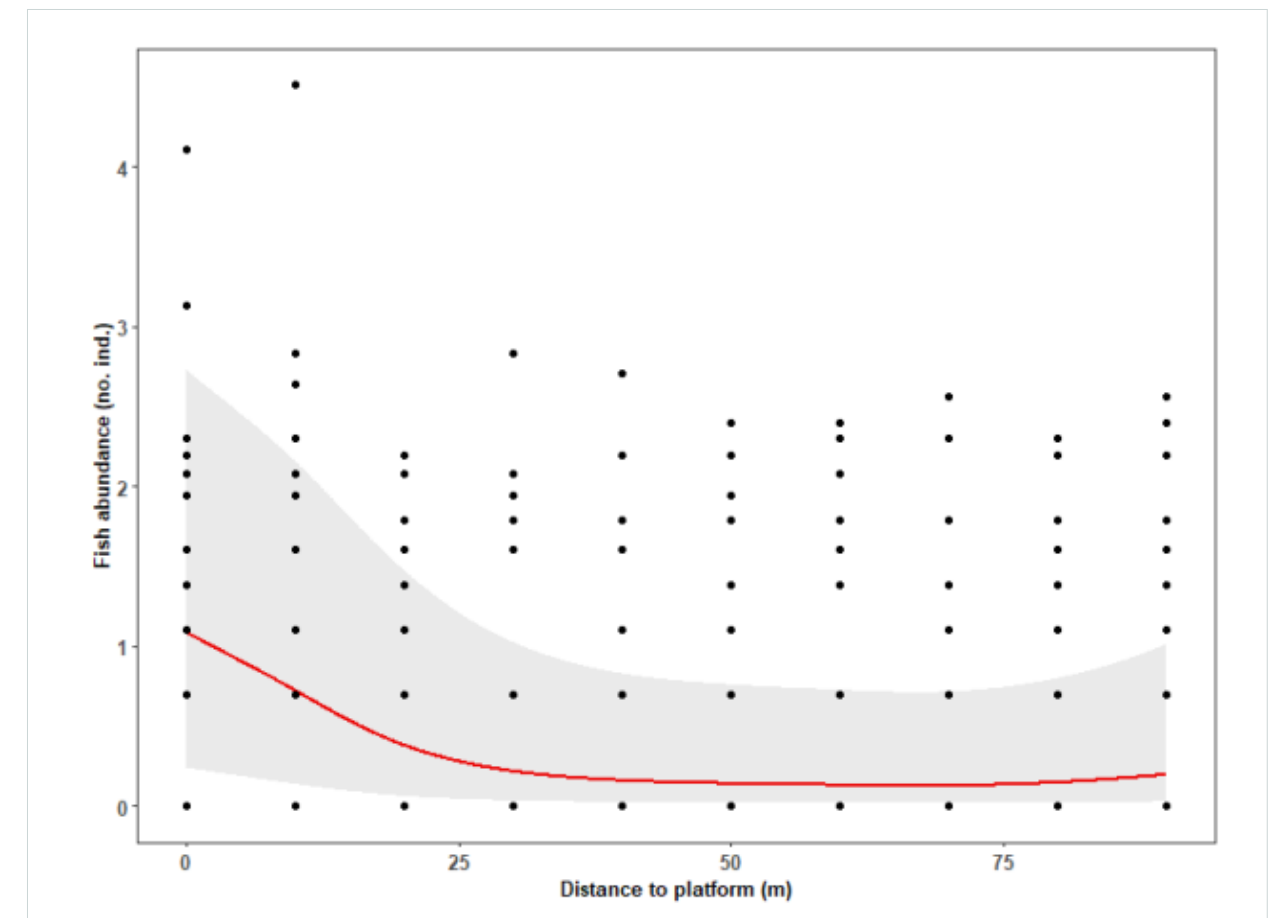
The ROV deployment started at a depth of 150 metres and moved toward the platform in a straight line. This method enabled us to detect the trend of fish abundance and biodiversity in relation to the distance from the platform. After completing the line movement, the ROV ascended 10 metres vertically and started the next line at a depth 10 metres shallower. The procedure was applied to find the relationship between distance to platform, water depth, biodiversity, and the abundance of fish.

The northwest side started at a depth of 150 metres and finished at 40 metres. The ROV moved along the line, gradually getting closer to the water surface (10 m steps). The second deployment was on the north side, where starting depth was 150 metres and finished at 50 metres. The northeast side was recorded three times with three deployments to further develop a database on fish abundance.

The last deployment of ROV around the platform was done on the east side. In summary, the ROV was deployed six times around the platform, and during each deployment, it followed a specific path to document fish and their platform distance.

DATA ANALYSES UNCOVER FISH ABUNDANCE NEAR THE OFFSHORE PLATFORM

To provide an understanding of fish abundance, a comprehensive database was created, documenting factors such as the number of fish, distance to the platform, depth, time of day, and direction from the platform. Statistical analyses were conducted using the R studio program. Models were developed and refined by systematically removing specific variables, ensuring the reliability of the analysis. The absence of collinearity among variables further strengthened the validity of the results.



- ↑ Fish abundance versus distance to platform. The black dots are real (field) observations, the red line represent expected values and the grey shade the 95% confidence intervals. Each dot may include more than one observation.

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Offshore platforms in the North Sea may have a positive influence on fish abundance, acting as artificial reefs that provide additional habitats and shelter. “

HIGH FISH ABUNDANCE NEAR THE OFFSHORE PLATFORM

Our analyses revealed a decline in fish abundance beyond 25 metres from the platform. Fish exhibited a preference for the proximity of the platform, possibly for hunting, breeding, and social interactions. Offshore platform foundations at around 120 metres depth appeared to be particularly attractive to fish. The fish activity, which was just fish detection, was highest during the night, with minimal detection in the morning. However, broad confidence intervals introduced some uncertainty. These findings highlight the nonlinear impact of various factors on fish abundance, including proximity to the platform, water depth, and time of day.

EXPLORING THE NORTH SEA’S BIODIVERSITY

The North Sea is home to a diverse range of marine species. The use of ROVs has provided valuable insights into this important ecosystem. For example, specimens of tusk (*Brosme brosme*) and ling (*Molva molva*) were detected, showcasing the presence of such species

in the region. Moreover, specimens of whiting (*Merlangius merlangus*), as well as coalfish-saithe (*Pollachius virens*), were spotted. However, the challenging conditions of the North Sea, including deep waters and limited visibility, can affect video footage quality and species detection. Despite these challenges, scientific efforts successfully documented the occurrence of these fish species, contributing to our understanding of the North Sea’s biological richness.

CONCLUSION

Offshore platforms in the North Sea may have a positive influence on fish abundance, acting as artificial reefs that provide additional habitats and shelter. Understanding this impact could be crucial for marine conservation and sustainable development. Using ROVs and meticulous data analysis, we uncovered the relationship between offshore platforms and fish abundance in the North Sea. These findings demonstrate how advanced technologies and methodologies are used to explore and monitor the diverse marine life in this ecologically significant area.

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