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eDNA-based assessment of species diversity and composition in a Dutch offshore wind farm

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The growing need for sustainable energy has led to an expansion of offshore wind farms (OWFs) in Europe, including in the North Sea. While the construction negatively impacts marine life, OWFs could create opportunities once operational. The scour protection, rocks and boulders placed around turbine foundations, creates hard substrate on otherwise sandy seabeds, attracting species and enhancing biodiversity. Monitoring these artificial reefs is essential to assess opportunities for marine life. Traditional monitoring methods, including scrape samples and photo/video imaging, are costly and often overlook cryptic species and those hidden in rock crevices. An effective alternative is species identification through environmental DNA (eDNA). Our study uses eDNA to monitor species diversity and composition on the scour protection of a new OWF in the Dutch North Sea. Shortly after commissioning, eDNA was collected from three turbine scour protections and three reference sites: one within, one near and one far from the OWF, respectively. Invertebrates are identified with the COI gene, while vertebrates are identified using two mitochondrial amplicons. Additionally, eDNA is sequenced directly using metagenomics, providing better insight in absolute species abundance. Within three months of commissioning, over 55 marine species were detected in the OWF, including reef-associated species like rock gunnel (*Pholis gunnellus*). While biodiversity indices did not differ inside or outside the OWF, species composition and food web structures varied between scour protection sites and sandy seabeds. The upcoming long-term eDNA collection will provide more insight in spatial patterns, succession stages and key indicator species in the OWF.