Data file for JAPPL-2022-00173

GENERAL INFORMATION

Title of dataset: Data from: Soundscape enrichment enhances recruitment and habitat building on new oyster reef restorations

Journal of publication: Journal of Applied Ecology

Corresponding author: Dominic McAfee, The University of Adelaide (dominic.mcafee@adelaide.edu.au)

Date of data collection: November 2020 – May 2021

Location of data collection: Gulf St. Vincent, South Australia

Funding source supporting data collection: Australian Research Council (ARC LP200201000)

DATA AND FILE OVERVIEW

Description of dataset:

This data relates to patterns in recruitment and habitat growth by the Australian flat oyster, *Ostrea angasi*, on reef restorations constructed in South Australia. To influence the rate of recruitment and habitat formation, healthy marine soundscapes, which consisted of acoustic recordings of a nearby healthy rocky reef, were broadcast at half of our study sites using underwater speakers.

Description of excel tab ‘Settlement panel data’:

The data consists of oyster larvae recruitment to settlement panels:

* Month-long deployments of settlement panels at two restoration sites and at three times. Two settlement panels were secured to a crate, with recruitment averaged between these two panels to provide a single value per replicate crate (*n* = 6 crates).
* Raw data consists of the number of oyster larvae that recruited to our settlement panels, which was then calculated per m2 , and per replicate crate (columns G, H, and I, respectively).

Description of excel tab ‘Boulder data’:

Data relates to the habitat characteristics formed by oysters on boulders from a new reef restoration:

* Five month-long deployment at one new restoration site. Three boulders were extracted for processing per crate, with oyster habitat values averaged among the 3 boulders to provide a single value per replicate crate (n = 6 crates).
* Data consists of the surface area of the upper (exposed) portion of each reef boulder; the percentage of that surface area covered by oyster habitat (‘Habitat cover’); the number of oysters >25 mm in height that comprised the habitat cover (‘Large recruits’); the percentage of the habitat cover that grew >5 mm above the boulder surface (‘3D habitat’); and the highest growth point above the boulder surface (‘Highest 3D growth’, which was only recorded for habitat exceeding 5 mm above the boulder surface).

OVERVIEW OF METHODS

This study was conducted across two large oyster reef restorations in Gulf St. Vincent, South Australia: Windara Reef (34°30.604″ S, 137°53.949″ E), a 20-hectare reef constructed in 2017–2018, and Glenelg Reef (34°58.314″ S, 138°29.787″ E), a 3-hectare reef constructed in 2020. These two restoration sites, which are approximately 80 km apart on opposite sides of Gulf St. Vincent, are each located ~1 km offshore in 7–10 m of water.

To locally enrich marine soundscapes at multiple sites across each restoration, we deployed underwater speakers at two sites across each of Windara Reef and Glenelg Reef. Speaker treatments enriched soundscapes by continuously playing a looped recording of a healthy reef soundscape recorded from a rocky reef habitat located 20 km south of Glenelg Reef (Port Noarlunga Reef). This rocky reef was selected because no flat oyster reefs remain in mainland Australia, and because previous soundscape monitoring throughout Gulf St. Vincent showed this site to be among the most bio-acoustically active.

To test the impact of soundscape enrichment on oyster settlement and habitat formation, we assessed oyster recruitment to settlement panels and oyster habitat formation on limestone boulders in the presence and absence of speaker playback. At each site, six plastic crates (40 × 40 × 40 cm) were positioned 2 m apart and 2 m from a speaker (or dummy control) such that they encircled the speaker. These crates provided attachment points for vertical settlement panels and to house limestone boulders. To assess oyster recruitment in space and time, we deployed standardised settlement panels (15 × 15 cm fibreboard) at each site for 1 month to avoid over-saturation by recruits (observed during longer deployments), and repeated these deployments three times throughout the recruitment season. For each time period, divers attached two vertical settlement panels to the outside of each crate, securing them 30 cm above the seafloor using cable ties. After 1 month, settlement panels were removed, and the number of recruited oysters counted from the central 7 × 7 cm area (an area shown to be representative of the entire panel) of the outer surface of the settlement panel under dissection microscope. The number of larvae per tile was calculated per m2 and averaged between the two tiles per crate to provide n = 6 replicate crates per treatment, per site, for each time. At Windara Reef, storms prevented the exchange of speakers to maintain our sound treatments through March, and therefore these data were excluded from the analysis.

To assess how soundscape enrichment influences habitat formation on new boulder reefs, we quantified attributes of the habitat formed by oysters on boulders 5 months after the construction of Glenelg Reef. This component was only run at Glenelg Reef for logistical reasons (see manuscript for details). Within a week of reef construction, we placed eight boulders (diameter: 15–30 cm) inside each of the n = 6 crates per site to form independent replicate reefs that reached 30 cm above the seafloor. After 5 months of continual exposure to either speaker or non-speaker control treatments, the top three boulders were removed per crate for analysis in the laboratory. On the exposed upper surface of each boulder, we measured the (1) percentage cover of oyster habitat on each boulder, (2) the number of oysters that were >25 mm in height (the largest size class) as an indication of the earliest recruits to reef boulders and (3) the percentage of early three-dimensional habitat growth (hereafter ‘habitat building’) that was >5 mm above the boulder surface (a height above which no solitary oyster grew, but represented habitat formed by the converging growth of multiple oysters). Boulder surface area and percentage cover was measured in ImageJ from photos taken in the plane of boulder's upper surface. Three-dimensional habitat over >5 mm was manually measured (using a measuring probe) and marked on the boulder surface, after which the percentage cover was measured. Data were averaged across the three boulders per crate (n = 6 per treatment, per site).