Noosa's *Huon Mundy Reefs* – performance update

Summer 2023

Monitoring of the ecological and physical performance of Noosa's *Huon Mundy Reefs* is undertaken by independent consultants, Ecological Service Professionals (ESP), in accordance with the government-approved Monitoring, Evaluation and Learning (MEL) Pian for the project.

The monitoring uses a scientifically rigorous Before After, Control and Impact (BACI) methodology. Core performance metrics include measuring the abundance of rock oysters, presence/absence of invertebrates and fish, recolonisation or colonisation of marine plants to and around the reefs, and changes in the condition of the shoreline adjacent to and 50 metres up and down stream of the 4 restoration areas.

ESP undertook baseline site assessments prior to the laying of the reef patches. In March 2023, ESP undertook the second monitoring event. The results of that monitoring are reported in: *Noosa's Huon Mundy Reefs – performance update – Winter 2023.* This document summarises the key findings from September 2023 monitoring event, 12 months after reef construction.

Monitoring log

- Baseline monitoring – prior to reef construction in September 2022
- Post construction monitoring event 1 - March 2023, 6 months after reef construction
- **Post construction monitoring event 2 – September 2023, 12 months after reef construction**

Oyster colonisation

Since the rocky reef patches were laid in September 2022, wild rock oysters have recruited consistently to all 30 reef patches in all four restoration areas. After initially high recruitment of oysters to the reefs (recorded in March 2023), the density of oysters has continued to steadily increase at all areas (Table 1).

Table 1: Average oyster density across all reef patches at each restoration site between the first and second post construction monitoring events.

Restoration site	Oysters per metre square March 2023	Oysters per metre square September 2023
Goat Island	833	917
Tewantin	492	668
Noosa Sound East	471	648
Noosa Sound West	385	600

Figure 1 presents the relative densities of oysters on the inner reef faces (adjacent to the shoreline which have relatively high lengths of exposure in each tidal cycle), the outer reef faces (lowest in the tidal range facing the river channel), and the reef tops (upper areas that are exposed to heat and desiccation the longest in a tidal cycle). A comparison of oyster recruitment between March and September 2023 is also given.

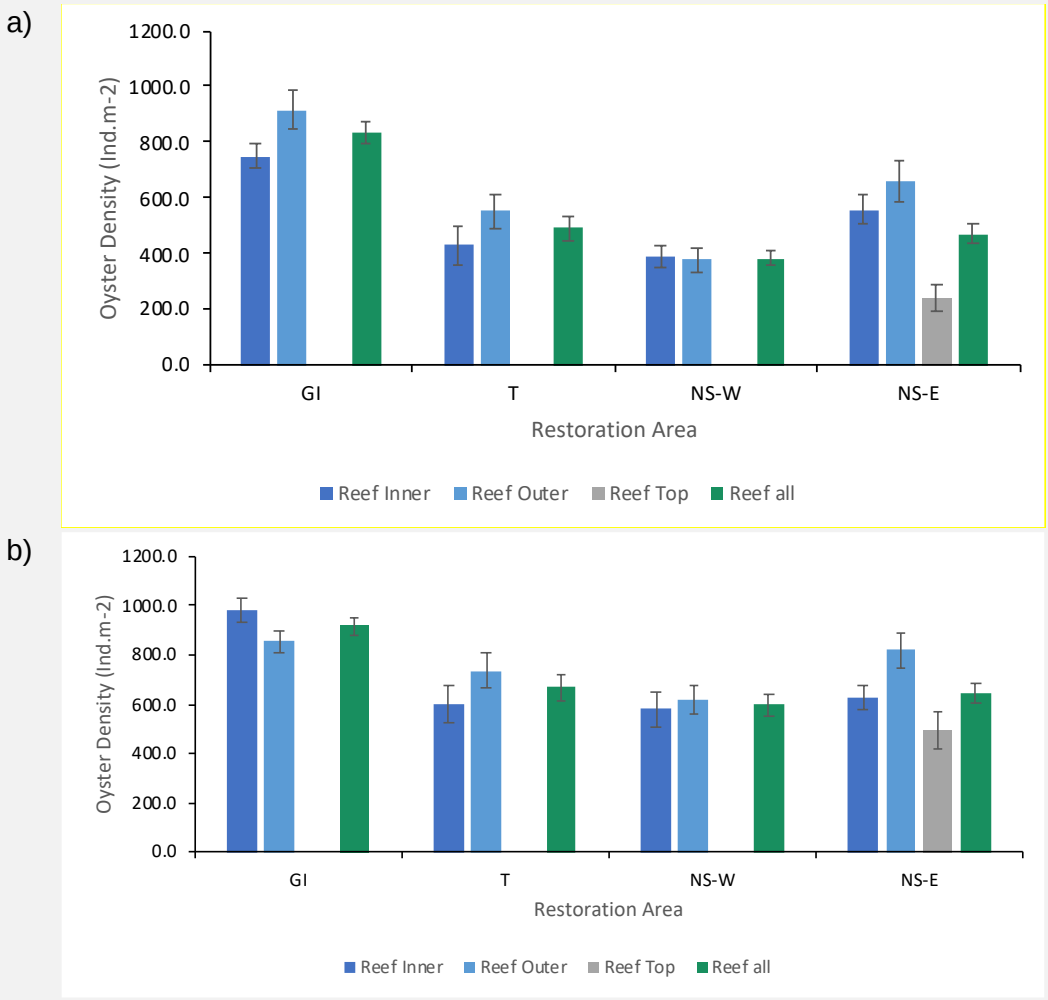

Figure 1: Average (± SE) oyster density at different positions on reef patches among the restoration areas in (a) March, and (b) September 2023

Oysters continue to grow primarily on the underside of the rocks (Figures 2,3) and, in some places, up the sides of the rocks.

Figures 2 and 3: Oyster density at Goat Island and at Noosa Sound East (Photos by S.Walker/ESP)

Oyster size

In September 2023, the rock oysters recruiting to the reef structures ranged in size from 2 to 53 mm, which was similar to the size range recorded in March 2023 and on remnant habitats surveyed prior to reef deployment. On average, the oysters in each of the restoration areas have continued to grow larger with 49% of oysters measured less than 20 mm in size, compared with more than 63% of oysters measured less than 20 mm in size in March 2023.

The maximum size of oysters on the reefs was like that found in the remnant rubble control locations at Tewantin, although the size distribution was skewed towards the smaller size classes due to ongoing recruitment on the reefs.

Invertebrates and Fish

Neither invertebrate nor fish assemblages were surveyed in September 2023 monitoring event. These will be surveyed and assessed in 2024.

Seagrass

The greatest change in benthic habitat between March and September 2023, was the substantial increase in the extent of seagrass growing around the reef patches. This was particularly prevalent at the Noosa Sound East and Noosa Sound West restoration areas, where seagrass covered 409.3 m2 and 554.5 m2 of sandy riverbed respectively (Figures 4, 5).

Figure 4: Seagrass (*Halophila ovalis*) growing between reef patches at Noosa Sound East (as seen at low tide), September 2023 (Photo by S.Walker/ESP)

Figure 5: Seagrass (*Halophila ovalis*) growing between reef patches at Noosa Sound West (as seen at mid tide), September 2023 (Photo by S.Walker/ESP)

Mangroves

Mangroves occurred along the shoreline at all restoration areas and saltmarsh was present along the shore at Noosa Sound East, Noosa Sound West, and Goat Island. In September 2023, there was no substantial change in the distribution of mangroves surrounding the restoration areas.

Several mangrove propagules (predominantly red mangroves *Rhizophora stylosa*) however have established on reef patches at each of these restoration site (Figure 6). There was also recruitment of mangrove propagules onto sand banks along the inner section of the reefs at Goat Island.

Figure 6: Mangrove propagule establishing on a reef patch at Goat Island (Photo by S.Walker/ESP)

Saltmarsh and Coastal Swamp Oak

Subtropical and temperate coastal saltmarsh is listed as 'vulnerable' under Australia's Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). Coastal swamp oak (*Casuarina glauca*) forest of New South Wales and South East Queensland is listed as 'endangered' under the EPBC Act 1999. Both these communities occur near restoration areas. In September 2023, relative to previous surveys there was no change in the distribution of coastal swamp oak or saltmarsh adjacent to or near the restoration areas.

Macro algae

In March 2023, there was a high coverage of macroalgae (*Padina australis* and *Hinksia sp*.) and turf forming algae on the reef patches at all restoration areas. The macroalgae covered up to 95% of the surface area within a narrow band (up to 1 to 1.5 m width) low on the shore, extending into the subtidal zone on each reef patch.

In September 2023, the coverage of the foliose macroalgae (*Padina australis*) was less dense in all restoration areas, but still covered most low intertidal and subtidal rocky surfaces in the restoration areas.

Shoreline change

In September 2023, sand had continued to accumulate on the shoreward side of reef patches at Goat Island restoration area (Figures 7,8). However, between several reef patches, and along the shore outside of the restoration area, there was continued undercutting of the bank vegetation where wave energy was not attenuated (reduced) by the reef patches.

There was no substantial change in the coastline erosion detected at all other restoration areas, although the wave attenuation of the reef structures was obvious when boats passed by, which will be of benefit to the coastline adjacent to each reef.

Figures 7 and 8: Sand accumulation shoreward of reef patches at the Goat Island restoration area (Photo by S.Walker/ESP)

Oyster gardening

Oyster gardening is continuing its success around the river under the dedicated project management of the Noosa Integrated Catchment Association (NICA) (Figure 9). executed

NICA, in partnership with TNC, deployed the first cycle of seeded oyster gardens to each of 20 registered gardeners around the Noosa River in November 2022. Each site was assessed, and each gardener was registered and inducted prior to deployment of the oyster gardens. From November 2022 onwards gardeners, supported by volunteers and contractors from NICA, were responsible for the monitoring and maintenance of the gardens.

Pleasingly all gardeners were retained in the program and a further "waiting list" of prospective oyster gardeners has developed through word-of-mouth. The *Oyster Gardening Technical Workshop* and *Oyster Gardening Masterclass,* conducted in April 2023, found that juvenile oysters within the oyster gardens were performing well across key growth, mortality, and associate species recruitment indicators.

The first oyster gardening cycle was concluded in October 2023 with all oyster gardens retrieved from registered gardeners and brought to the *Oyster Gardening Audit Workshop* at Tewantin. NICA volunteers and contractors, guided by TNC opened, inspected, weighed, and processed all gardens. Fully grown adult oysters from the gardens were subsequently deployed onto the *Huon Mundy reefs* to help kick start ecosystem recovery, whilst the remaining sub-adult oysters were retained in baskets, under the care of NICA, to grow out further.

In November 2023, all gardeners were invited to view their efforts via two on-river *Oyster Experiences* hosted by NICA. Gardeners visited the *Huon Mundy Reefs* to highlight the contribution of the oyster gardening program towards reef restoration. NICA is now preparing to deploy a second cycle of oyster gardens to gardeners throughout the Noosa River using only clean recycled shell not seeded with baby oysters (oyster spat).

Figure 9: Team of NICA volunteers, guided by TNC, taking a break from auditing oyster gardens brought in from oyster gardeners around the Noosa River. Note tub of adult oysters ready for deployment on the Huon Mundy reefs pictured in foreground. (Photo by J Bloomfield)

NICA has also continued to collaborate with multiple partners to ensure the delivery of aligned aspects of the program including Griffith University (research), Noosa Environment Education Hub (STEM curriculum), Noosa Community Biosphere Association (STEM curriculum) and Tourism Noosa (community and visitor awareness).

Figure 10: Aggregation of rock oysters extracted from an oyster garden, October 2023 (Photo by J Bloomfield)

Figure 11: NICA's vessel operator and oyster gardening assistant coordinator Sam. (Photo by J Bloomfield)

Noosa River Sediment Accumulation Study

In 2022-2023, the Noosa Parks Association and Ecological Service Professionals (ESP), with support from NICA and the Noosa Men's Shed, delivered a baseline assessment of sediment distribution and rates of accumulation throughout the Noosa River and lakes system.

The purpose of the study was to determine hotspots of sediment accumulation throughout the Noosa River using local citizen scientists alongside professionals in environmental assessment. The team used collected riverbed sediment samples at 28 sites throughout the river using a sediment crab tool and delivered these for laboratory analysis. The rate of sediment accumulation was measured using a Sediment Accumulation Devises (SADs), which were designed by ESP and constructed by ESP, NPA and the Noosa Mens Shed. GIS mapping and mathematical data analyses then enabled statistical validation and geographical representation of the results. The work involved 20 volunteers, 514 people hours of work and in-kind support from ESP.

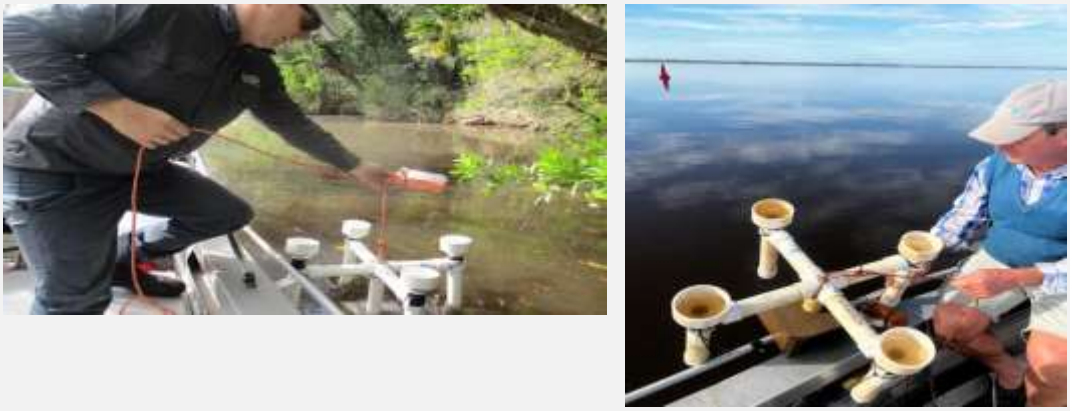

Figure 12: Sediment Accumulation Devises (Photo by Ecological Service Professionals)

This valuable project delivered river sediment and sediment accumulation analyses, silt and fine sand sediment distribution and sediment accumulation rate heat maps (figure 13). It also offers river researcher and managers pointers to future studies and potential sediment management trials. The technical report is available on request: office@noosasparks.org.

The project was funded by TNC, The Thomas Foundation, Australian Government and Noosa Council.

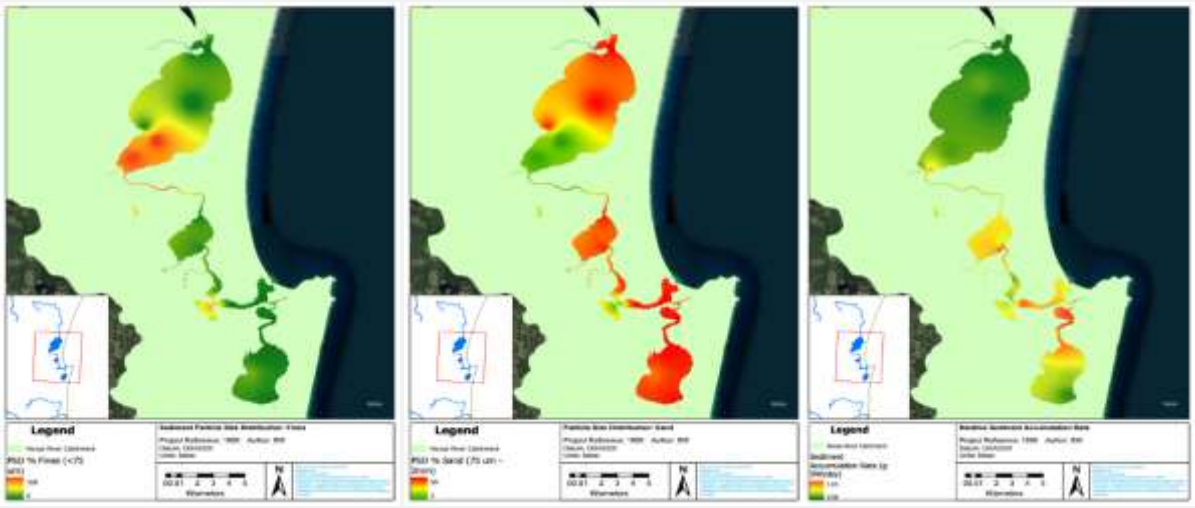

Figure 13: Heat maps of sediment accumulation and sediment accumulation rates