HUDSON RIVER PK

Tide Deck Report 2021

HUDSON RIVER PK

Purpose

In 2020, the newly designed Pier 26 opened in Hudson River Park. One of the main features of this pier is its representation of the riparian ecosystems that characterized New York prior to colonialization. A tiered series of habitat plantings run from east to west, starting with woodland forest, followed by coastal grassland, maritime scrub, rocky intertidal marsh, and ending with the river itself. For the purposes of this report, we are concerned with the last two ecological zones which collectively comprise the Tide Deck.

The Pier 26 Tide Deck rests under the raised end of Pier 26 and is made up of tide pools carved into granite, native marsh plantings, and submerged oyster enhancement structures. In 2021, Hudson River Park staff began a survey of the ecological conditions of the Tide Deck over time. With only a single year of data and analysis still very much under-way, this report will focus on establishing the baseline conditions of the Tide Deck, which can be referred to in coming years as the monitoring continues.

Tide pools are shallow pools that fill with water when the tide rising (Fig. 1), and hold on to this water when the tide recedes. This exchange of water also carries organisms, from microscopic plankton and algae to shellfish, crustaceans and other organisms. During high tide, the Pier 26 Tide Deck becomes completely submerged by the Hudson River, refreshing the water in the tide pools and allowing sessile species on the Tide Deck to feed on plankton suspended in the river. At low tide, the pools and rocks of the tide deck become accessible to mallards, seagulls, sparrows and other bird species who feed on the algae, insects and marine organisms present here. The Hudson River experiences two high tides and two low tides every day, meaning that the water

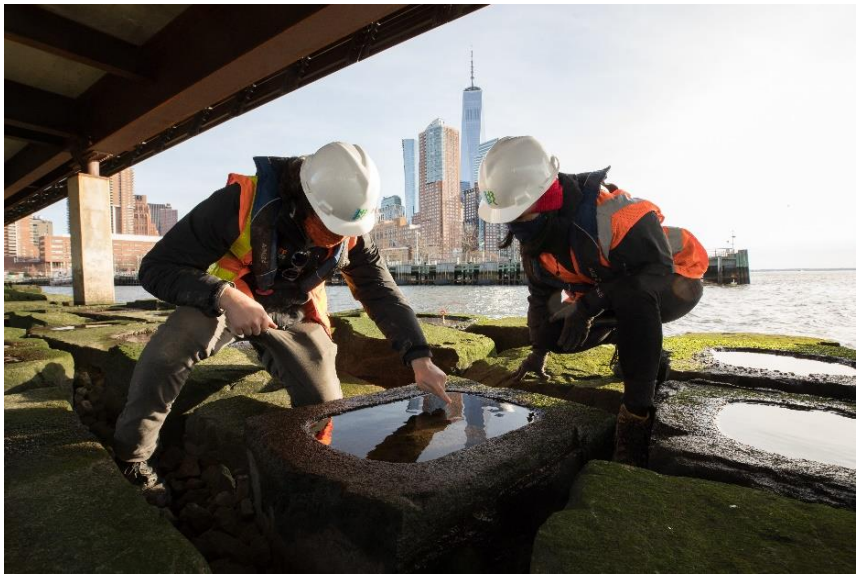
Fig.1 | One of the 108 tide pools on the Pier 26 Tide Deck, Summer 2021.

in the tide pools is constantly changing. This tide cycle creates ample opportunity for organisms to enter and leave the Pier 26 tide pools. While tide pools are a naturally occurring formation along rocky shorelines, the tide pools on Pier 26 are man-made. Regardless, they will impact the park by increasing the biodiversity, abundance, and succession of the organisms throughout Pier 26's five ecological communities, and by extension the Park as a whole.

In addition to tide pools, the Pier 26 Tide deck also features native marsh plantings. The majority of these plantings are *Spartina alterniflora*, a perennial rhizomatous grass native to the east coast of North America. At the onset of this project, juvenile spartina grasses were planted in a plastic material on the Tide Deck. These plantings will be monitored annually during the peak growth season in order to assess growth and propagation success of the spartina.

Fig. 2 | A wild oyster (*Crassostrea virginica*) growing on one of the tide pools

Fig. 3 | River Project staff inspecting tide pools on the south side of the tide deck.



Key Questions

- How does water temperature within artificial tide pools vary compared to the Hudson?
- What is the incidence and abundance of settling organisms such as barnacles, anemones, and bivalves, within the tidepools?
- What is the growth rate and survivability of *Spartina sp.* on PET mats

HUDSON RIVER PK

Methods

Tide pool monitoring

- Will be performed monthly during full field season (May-October); with August-October in 2021.
- Ten pools out of the total 108 were randomly selected for monitoring and marked with bolts.
- Water temperature of pools measured using HOBO tidbit MX2201s, collecting every 15 mins.
- Water temperature of river is continuously monitored by nearby (>100m) YSI EXO-2 sonde for comparison.
- Photos of pools were taken using both GOPRO black series 7, and iphone using a 0.0025m^2 PVC quadrat, lined up to bolts.

Spartina monitoring

- Performed annually in peak growth season.
- Two transects of 5 plots each per PET planting area are assessed using a nested 1m/0.25m^2 PVC quadrat, with each plot 3m apart (Fig 5).
- Within each 0.25m^2 area, the number of stems, the heights of 5 random stems, and the number flowering plants are recorded.
- Within each 1m^2 area the range of percent cover of vegetation is recorded via consensus.
    - Ranges: 0%, <1%, 1 - 5%, 6 - 25%, 26 - 50%, 51 - 75%, 76 - 100%

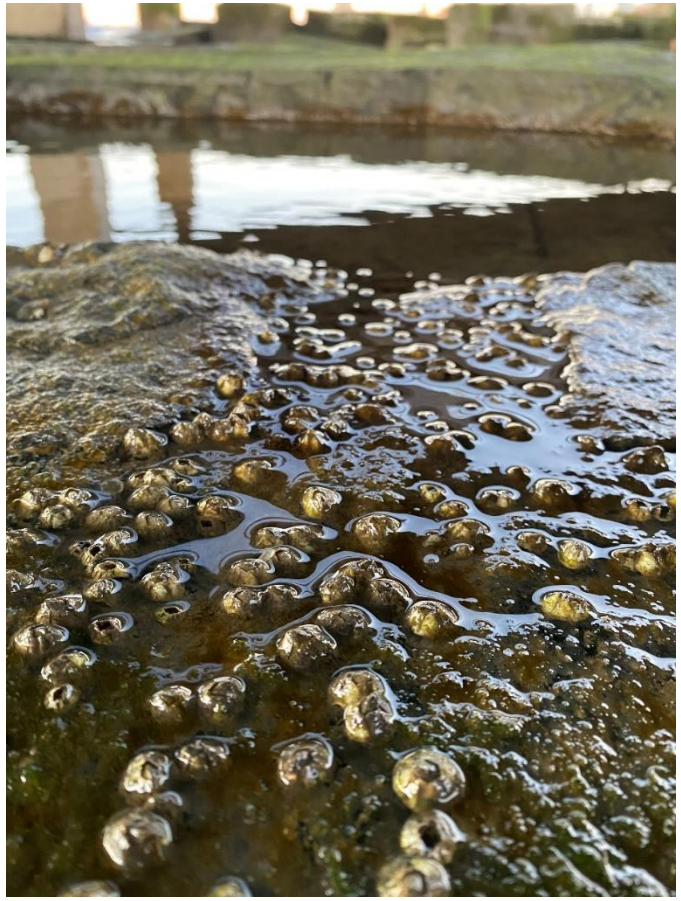


Fig. 4 | Barnacles in the intertidal portion of a tide pool

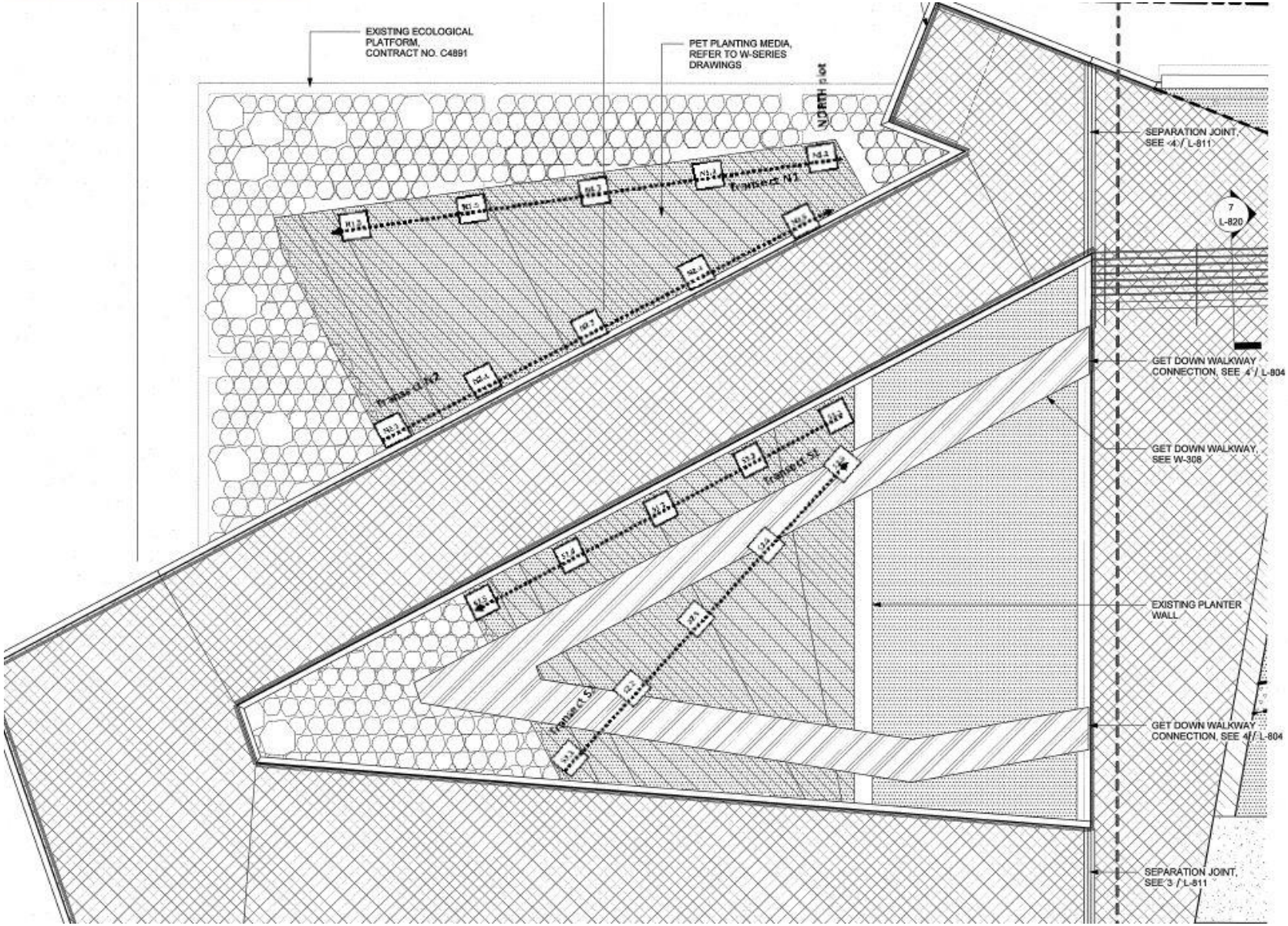


Fig. 5 | Transects for Spartina sp. monitoring on the Pier 26 Tide Deck.

HUDSON RIVER PK

Preliminary Findings

Photos of tidepool subsections were taken using several iterations of quadrat until a final 0.25m^2 design was settled on, using bolts to align the midpoints and ensure that the same area was being photographed each time (Fig. 6). A variety of sessile organisms were observed in the pools during the season, including barnacles, anemones, tubifex polychaetes, and oysters, as well as some mobile invertebrates including amphipods, isopods, swimming polychaetes, and jellies.

Tide pool and river temperatures from March to September were significantly different (p=0.02). Tide pools exhibited much more drastic temperature ranges (Fig. 7). This was expected due to the pools' shallowness and small volumes compared to the river, which enjoys significantly larger temperature mitigation due to sheer volume as well as currents and mixing.

Spartina plantings were variably effective, with shading and exposure to wave action possibly impacting survival. With only a baseline, however, subsequent years of data will be necessary to draw conclusions.

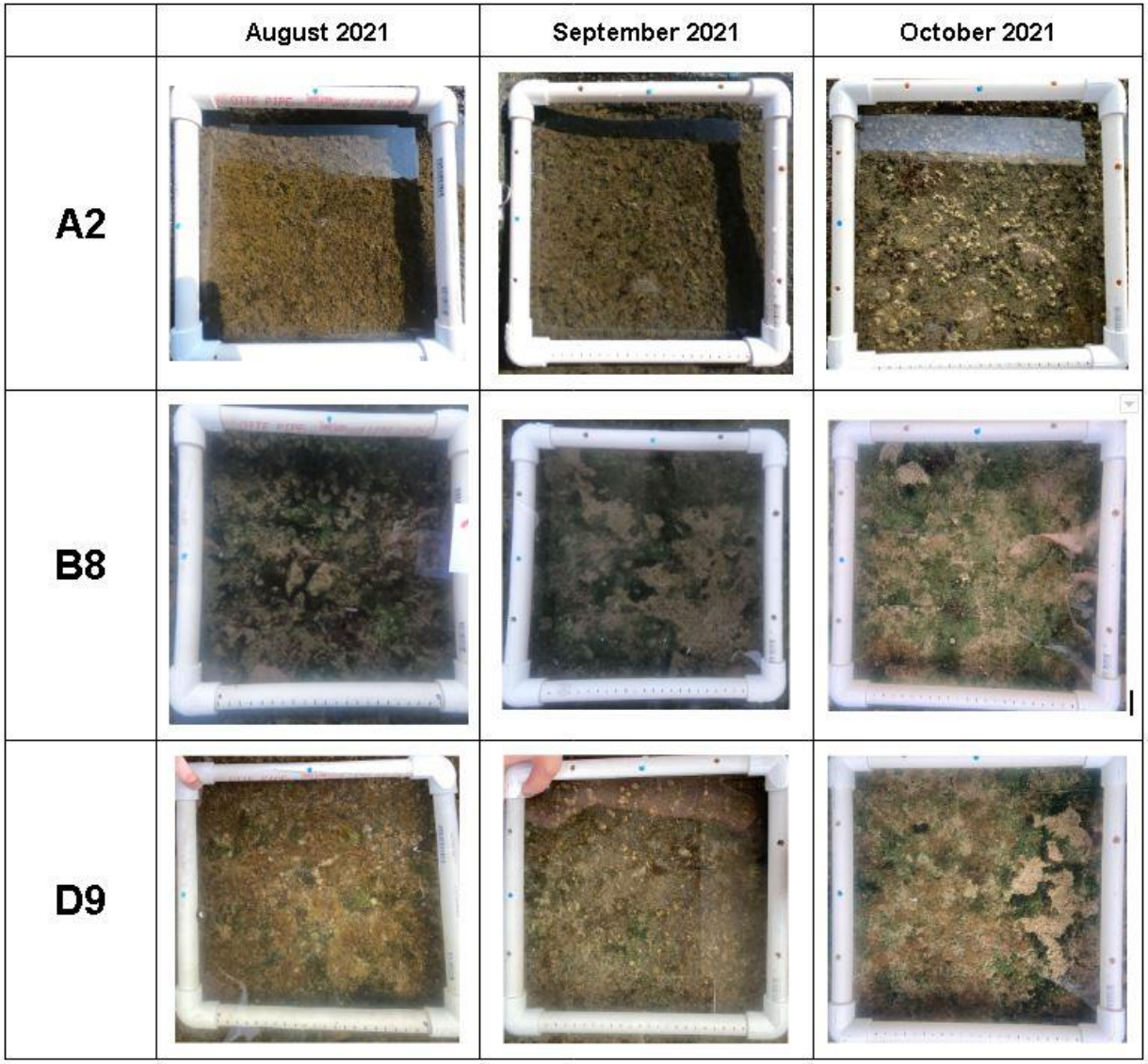


Fig. 6 | Three tidepools from August to October, 2021.

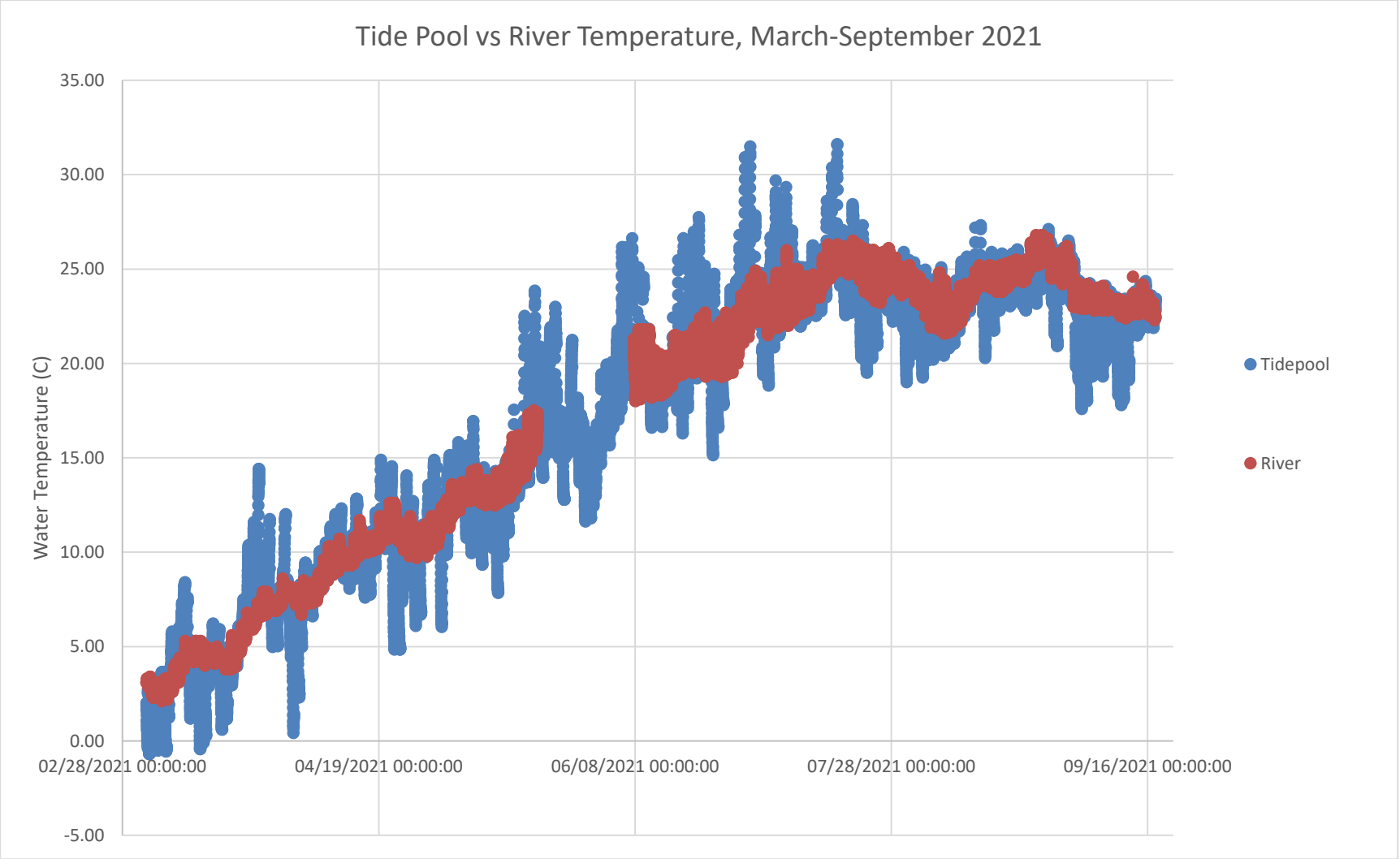


Fig. 7 | Tide pool temperature was measured using HOBO tidbits MX2201, river temperature with YSI EXO-2 datasondes. Both devices took measurements every fifteen minutes with the exception of a gap in the sonde data due to telemetry errors from 5/20-6/07.

Future Directions

Temperature monitoring will continue and expand to compare pools at various locations on the tide deck – there are over 100 individual pools of variable size and shading. Tidbit temperature loggers will be re-deployed in a manner that mitigates the likelihood of the devices being stranded outside the pools after the tide recedes.

Tide Pool imaging will begin in May 2022 so as to align with the Park's other monitoring efforts – the "field season" for most surveys runs from May-October: the warmer months of the year when organisms are much more active. Monitoring will occur monthly and take place as late in the afternoon as possible so as to reduce impacts of glare on the clarity of photos. Tide pool images will be assessed using free software to calculate % cover of sessiles, and to potentially count specific organisms such as barnacles. All organisms within the pools will continue to be noted qualitatively during sampling.

Spartina will be monitored during the peak of the growth season (August/September) each year. These data will help to answer the question of viability of the plants perennially within the PET mats and determine average growth rates, which can then be compared to other local data.

References

National Park Service, U.S. Department of the Interior (2015). Northeast Temperate Network Long-Term Rocky Intertidal Monitoring Protocol. https://irma.nps.gov/DataStore/DownloadFile/518982