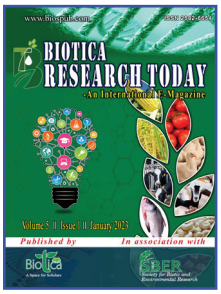
Article: RT1192



Biotica Research Today Vol 5:1 2023

10
12

How to cite this article?
Kumar *et al.*, 2023. Construction of Seawall - Useful or Harmful for Biodiversity Conservation. Biotica Research Today 5(1):10-12.

Construction of Seawall - Useful or Harmful for Biodiversity Conservation

Jeetendra Kumar[1*], Absar Alam[1] and Simanku Borah[2]

[1]ICAR-Central Inland Fisheries Research Institute, 24, Panna Lal Road, Prayagraj, Uttar Pradesh (211 002), India
[2]ICAR-Central Inland Fisheries Research Institute, HOUSEFEED Complex, Dispur, Guwahati, Assam (781 006), India

Open Access

Corresponding Author
Jeetendra Kumar
e-mail: jeetendrak142@gmail.com

Keywords
Beach, Biodiversity, Restoration, Seawall

Abstract

A seawall is useful to protect coastal infrastructure and lives from the wave action of the ocean. There are various forms of seawall present and it is made up based on the requirement and nature of wave action of the ocean. The seawall is not only useful in modern days but they are harmful to the coastal biodiversity. Coastal species have disappeared after seawall formation because many species sustained high wave action and periodic inundation of seawater. Moreover, the loss of beaches has also been reported in many studies.

Introduction

A seawall is a structure made of concrete, masonry or sheet piles, built parallel to the shore at the transition between the beach and the mainland or dune, to protect the inland area against wave action and prevent coastal erosion. Seawalls are usually massive structures designed to resist storm surges. The crest of the wall often extends into a stone-covered part that may be used for a road, promenade or parking area. Seawalls are often found in the case of narrow or steep beaches, where a typical breakwater is either too large or not economical.

History of Seawall Formation

The first seawalls are commonly attributed to the Roman Emperor Constantine I, also known as Constantine the Great, who ordered their construction in 448 A.D. The original marine barricades were built as part of a larger defence system designed to safeguard the city of Constantinople (present-day Istanbul, Turkey) from attackers by land or sea. They were erected along the mainland wall that bordered the city's Propontis side (on the Sea of Marmara) and Khrysoun Keras (on the gulf of the Golden Horn).

Types of Seawall

Based on Style

There are three types of seawalls based on the style of formation.

• **Vertical seawalls**: These walls are built vertically to prevent wave energy from eroding the shoreline where the waves are greater than two meters.

• **Curved seawalls**: Curved seawalls are one of the most popular, their structure resembling the shape of a wave. This type of seawall is curved along the shoreline to mimic the uneven way waves hit the coastline. This is an effective building method to deflect the water and reduce soil erosion at the bottom of the seawall.

Article History
Received on: 25th December 2022
Revised on: 02nd January 2023
Accepted on: 03rd January 2023

E-mail: *bioticapublications@gmail.com*

• **Mound seawalls**: This is one of the most common types of seawall which is made of concrete blocks and stones. It is less expensive than the vertical and curved seawall. It is usually built on mounds formed by rubble and rocks.

Based on Building Materials

Four common types of seawalls are concrete, cobble or boulder seawalls, sheet piles, and riprap seawalls.

• **Concrete Seawalls:** Concrete seawalls are used in areas where frequent and heavy waves often impact the shoreline. These are constructed using large blocks of concrete that are poured into place. Concrete seawall repair starts with building walls that are typically anchored deep into the soil either via digging a deep foundation or using piles that are sunk into the soil until they reach the bedrock.

• **Large Cobbles/ Boulder Seawalls:** They are built using large rocks and boulders (very large rocks) that are held together with mortar. Large cobble and boulder seawalls are great for properties that see light to moderate wave action.

• **Riprap Seawalls:** Riprap seawalls are a combination of large and small boulders and chunks of concrete. Riprap can also be used to reinforce the bases of older seawalls. These seawalls are great for preventing soil erosion in areas that see light to moderate wave action during storms.

• **Sheet Pile Seawalls:** These seawalls are anchored deep in the soil and set against the bank for added support. These seawalls can be further reinforced with large rocks at the base and rocks behind the steel sheets. These seawalls are great for areas that see moderate wave action and soil erosion due to severe storms.

Impact of Seawall

Seawalls supported 23% lower biodiversity and 45% fewer organisms than natural shorelines. Beach erosion may not seem like a big issue, but it can have an important economic and ecological impact on the surrounding areas.

Economic Impact

Loss of summer tourism- Beach tourism is very popular in coastal states; however, due to the loss of beaches, the economy of the city will be hampered. A once-popular beach in Cape May, N.J. that has all but disappeared since seawall construction began.

Ecological Impact

• **Narrowing of beaches**: This narrowing can reduce the diversity of species as well as the abundance of any one species, an effect especially pronounced in the upper intertidal zone.

• **Loss of dry sand**: Dry sand is very important for the nesting of sea turtles and laying their eggs. Therefore, the loss of dry sand due to the construction of seawalls may adversely impact the life cycle of sea turtles.

• **Loss of intertidal species**: The loss of intertidal species can affect the populations of other coastal species such as coastal bird populations.

A report on the impact of the seawall on biodiversity (Gittman *et al*., 2016), was observed to be significantly 23% lower along shorelines with seawalls when compared with that natural shorelines. The biodiversity was lower for flora (66%), benthic infauna (20%), birds (52%) and nekton (24%). Similarly, the organism abundance was also observed to be 45% lowered along shorelines with seawalls when compared with those along natural shorelines. The abundance of benthic infauna, birds and nekton was 66%, 71% and 56% lower along shorelines with seawalls when compared with natural shorelines.

Restoration of Biodiversity along the Seawalls

The biodiversity is drastically declining along the intertidal zone due to the formation of seawalls. However, we can restore biodiversity along the seawall through the formation or modification of the structure of seawalls. There are the following structures suitable for providing natural habitat and biodiversity can be restored (Browne and Chapman, 2014).

Artificial Rock Pools

One of the major differences along seawalls was the absence of mobile organisms - such as limpets, starfish and crabs. Researchers found that attaching artificial rock pools to the structures created habitats suitable for mobile creatures, such as starfish or crabs. Slight modifications to sea defences - at little or no extra cost - can boost the level of biodiversity found in intertidal zones.

Organisms found within the artificial rock pools are Limpets, polychaetes and algae, *Penaeus merguiensis* and green algae with *Nerita* sp. egg capsules on the fronds, *Nerita chamaeleon*, polychaete, *Anthopleura nigrescens* and *Saccostrea cucullata*.

Half Flower Pots

Flowerpots can be used along the seawall for the enhancement of biodiversity. These flower pots are attached at high and mid-shore positions.

Living Sea Walls

Sydney Institute of Marine Sciences & The University of New South Wales develops a living sea wall project that increases biodiversity. It is concrete panels that increase biodiversity by 30-40% compared to traditional sea walls. They are also improving water quality.

Conclusion

The seawall is made to protect the coastal area from erosion by wave action. However, it is also detrimental to coastal biodiversity. Many small structures are

incorporated into seawalls to protect, restore and revive the biodiversity along seawalls. There is still more scope to study the seawall to revive and protect biodiversity with a small change in the structure of the seawall.

References

Browne, M.A., Chapman, M.G., 2014. Mitigation against the loss of species by adding artificial intertidal pools to existing seawalls. *Marine Ecology Progress Series* 497, 119-129. DOI: 10.3354/meps10596.

Gittman, R.K., Scyphers, S.B., Smith, C.S., Neylan, I.P., Grabowski, J.H., 2016. Ecological consequences of shoreline hardening: A meta-analysis. *BioScience* 66(9), 763–773. DOI: https://doi.org/10.1093/biosci/biw091.