Chapter 7

Schoenoplectiella juncoides (Roxb.) Lye: morphological and ecological account of a wetland sedge

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Abstract: Wetlands are highly productive ecosystems in which sedges (Cyperaceae) play a key role in maintaining ecological structure and function. *Schoenoplectiella juncoides* (rock bulrush) is a widely distributed wetland sedge adapted to flooded and waterlogged conditions through its slender culms, reduced leaves, fibrous root system and prolific seed production. It commonly inhabits marshes, shallow water bodies, riverbanks and flooded agricultural fields, where it stabilizes soils, reduces erosion, regulates hydrology and contributes to primary productivity and nutrient cycling. As an early successional species, it facilitates wetland development and provides habitat and food resources for wetland fauna. Although often considered a weed in rice agroecosystems, *S. juncoides* has significant ecological value in natural wetlands. The study emphasizes the need for greater research attention to wetland sedges to better understand their ecological roles and support effective wetland conservation and management.

Keywords: Cyperaceae, hydrological regulation, soil stabilization, wetland conservation

Introduction

Wetlands are among the most productive and ecologically valuable ecosystems on Earth, providing a wide range of ecosystem services that support biodiversity, water regulation and human livelihoods (Moreno-Mateos et al., 2012). Within these systems, members of the family Cyperaceae (sedges) play a pivotal role in maintaining wetland structure, stability and ecological functioning (Wong, 2004; Barrett, 2013). Sedges commonly dominate marshes, swamps, floodplains, shallow lakes, rice fields and other seasonally or permanently inundated landscapes, where few plant groups can survive under prolonged waterlogged conditions (Prasad et al., 2019). Their well-developed, fibrous and rhizomatous root systems form dense underground networks that firmly anchor plants in saturated soils,

effectively stabilizing substrates, reducing shoreline and surface erosion and minimizing sediment loss during flooding events (Gautam and Gautam, 2021). In addition to their structural role, Cyperaceae strongly influence wetland hydrology by slowing water movement, enhancing water retention and regulating surface runoff. Their erect culms and dense stands reduce flow velocity, allowing suspended sediments to settle and preventing downstream siltation (Gaberščik and Zelnik, 2021). The substantial above-ground biomass produced by sedges contributes significantly to primary productivity and organic matter accumulation, forming the base of wetland food webs. Through litter deposition and decomposition, sedges enrich soils with organic carbon and nutrients, thereby supporting microbial activity and sustaining nutrient cycling processes (Hossain et al., 2025). *Schoenoplectiella juncoides*, commonly known as rock bulrush, is a characteristic wetland sedge widely distributed in tropical and subtropical regions, particularly in lowland wetland ecosystems. Morphologically, it is a grass-like herb with erect, slender, triangular culms arising from fibrous roots. Leaves are usually reduced, with bladeless sheaths at the base, giving the plant a rush-like appearance. The inflorescence consists of compact clusters of small spikelets borne near the culm apex and the fruit is a small, dry achene (Saxena and Brahmam, 1996). These structural features enable the species to tolerate prolonged flooding and anaerobic soil conditions. The species produces a large number of viable seeds, ensuring rapid colonization and persistence in disturbed or seasonally inundated habitats. Although perennial in natural wetlands, it may behave as an annual in cultivated fields such as rice paddies, completing its life cycle within a single growing season (Umkhulzum et al., 2018). The present study discusses the morphological, ecological distributional and other aspects of *S. juncoides*.

Morphology

Schoenoplectiella juncoides (Figure 1) is a slender, erect and tufted sedge, attaining up to 45 cm in height. Stems are terete to subterete or slightly angular, ribbed and smooth. Leaves reduced to membranous sheaths, obliquely truncate at the apex and often bearing a very small, rudimentary blade. Inflorescence pseudolateral, capitate, comprising 1-7 spikelets. Involucral bract erect, 1.4-15 cm long, shorter than the stem, with a groove on the inner surface. Spikelets sessile, many-flowered, oblong-ovoid, stramineous to brownish at maturity. Glumes tightly appressed, slightly keeled near the apex, 2.5-4 mm long, obtuse, shortly mucronulate, with a prominent midrib and faintly many-nerved sides; margins minutely ciliolate near the apex. Bristles 5-6, unequal in length. Stamens 2-3; style 2-3-fid. Nut unequally biconvex, broadly obovoid, black and shortly apiculate (Saxena and Brahmam, 1996).

Ecology

It typically inhabits marshes, shallow ponds, riverbanks, ditches and flooded agricultural fields, where it thrives in permanently or seasonally waterlogged, puddled and nutrient-rich soils. The species exhibits a high degree of tolerance to fluctuating water levels and periodic inundation, enabling it to persist in dynamic wetland environments. It plays a vital role in binding and stabilizing saturated soils through its dense root and rhizome systems, effectively reducing erosion along wetland margins and channel banks (Umkhulzum and Ameena, 2019). As an early successional colonizer, the species facilitates wetland development by modifying microhabitat conditions such as improving substrate stability, retaining moisture and moderating temperature, thereby creating favourable niches for the establishment of other hydrophytic and semi-aquatic plant species. Its dense above-ground growth further helps maintain local moisture regimes and hydrological balance, supporting wetland structure, productivity and ecological functioning (Das et al., 2018). It plays an important supportive role in wetland conservation and grassland development. Although it is not considered a major economic species, it contributes indirectly to ecosystem services by improving soil structure, enhancing sediment retention and aiding in the regulation of water quality through nutrient uptake and filtration (Roy and Devi, 2025). It is grazed opportunistically by livestock at certain growth stages and in seasonally inundated grasslands. It can function as a supplementary fodder resource when preferred forage species are scarce. It also provides shelter, breeding sites and refuge for a wide range of wetland organisms, including aquatic insects, amphibians and small vertebrates. Its seeds and vegetative parts form part of the diet of waterfowl and other wetland-dependent fauna, thereby contributing to local food webs and supporting biodiversity (Mitra, 2021).

Distribution

It is widely distributed across tropical and subtropical regions of Asia and the Indo-Pacific, extending to parts of Africa and Central Asia. The species occurs in South, East and Southeast Asia, including the Himalaya, China, Japan, Korea, India, Pakistan, Sri Lanka, Southeast Asia and the Pacific Islands. In India, it is distributed in Odisha, Punjab, Assam, Tamil Nadu, Karnataka, Kerela, West Bengal, Manipur, Punjab and Himachal Pradesh (POWO, 2025; Saxena and Brahmam, 1996; Rawat and Adhikari, 2015).

Threats

Despite its ecological significance, *S. juncoides* is perceived differently across habitats. In natural wetlands, it represents a valuable structural and



Figure 1: *Schoenoplectiella juncoides* in its habitat

functional component of the ecosystem, contributing to stability, succession and biological diversity. In contrast, within rice agroecosystems, it is often regarded as a problematic weed due to its strong competitive ability, rapid growth under flooded conditions and prolific seed production, which can reduce crop yields (Umkhulzum et al., 2019).

Conclusion

Wetland sedges, including *S. juncoides*, are often overlooked despite their considerable ecological significance and functional importance within wetland ecosystems. These species contribute to soil stabilization, nutrient cycling, hydrological regulation and habitat provision for a wide range of aquatic and semi-aquatic organisms. However, their roles remain inadequately documented. Comprehensive research is therefore needed to better understand the ecology, functional traits and ecosystem services of such sedges across natural and managed wetlands. Focused studies on their role in wetland succession, resilience to hydrological fluctuations, interactions with other plant species and responses to anthropogenic pressures would help to improve ecological knowledge and inform wetland conservation, restoration and sustainable management strategies.

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