Value of Sandy Beaches to fish—

Distributed to OPAC members at the request of Fran Recht.

This from Oregon Conservation Strategy:

BIOLOGICAL CHARACTERISTICS

The movement of sand by water and wind energy makes sandy beaches largely unsuitable for rooted and attached organisms. However, between the grains of sand in the intertidal zone is a vast multitude of life too small to see with the naked eye, including diatoms, harpacticoid copepods, amphipods, and algae, among others. Larger invertebrates can be found here as well, including crustaceans, mollusks, and diverse worm taxa. Many of the resident invertebrates burrow in the sand during periods of exposure for protection from desiccation and/or predation, and emerge to forage as tides permit.

Biological communities of the upper intertidal and supratidal zones of sandy beaches are often based on the resources provided by the incoming tides and deposited at the high tide line. Once in the intertidal zone, the detritus is broken down by the mechanical force of waves pounding against the shore and the industry of the many organisms that live and forage there. Organisms of the mid and lower intertidal, particularly the small invertebrates, provide food resources for numerous larger invertebrate, fish, and bird species. Some marine mammals intentionally use this zone to rest, hauling themselves out of the ocean to lay on the sand.

Strategy, Watch List, and commonly associated species that are associated with general sandy beach habitats, or specific to distinct sandy beach types, are listed in **Table 6.3**, Appendix **E** and **F**), respectively. Surf smelt use particular beaches to lay their eggs in the intertidal zone. Native littleneck and razor clams burrow below the sand and feed on plankton when the ocean water covers them. Western snowy plover nest either in the supratidal zone or above and feed in the intertidal sandy areas. Sanderlings gather in loose flocks in the winter months to feed on the rich array of invertebrates under the sand as the waves recede. Harbor seals rest on sandy beaches and northern elephant seals come ashore to molt, usually in the supratidal zone.

ADDITIONAL INFORMATION and CITATIONS:

A significant body of scientific literature confirms the importance of sandy beaches for fish, particularly at high tide when the intertidal zone is submerged. Research details the beaches' function as essential foraging grounds, nursery habitats, and migration corridors for various species.

Key literature on fish use of sandy beaches

- **Defeo, O. et al. (2009). "The ecophysiology of sandy beaches and the impacts of human activities: A review."** This comprehensive review article discusses the ecosystem services provided by sandy beaches. It highlights their role as crucial nursery areas for juvenile fish and as foraging sites for adults.

- **McLachlan, A. & Brown, A.C. (2006). "The ecology of sandy shores."** A foundational text, this book provides a detailed look at the physical and biological characteristics of sandy beaches and the organisms, including fish, that inhabit them.
- **Barreiros, J. P. et al. (2004). "Fish assemblages in the surf zone of sandy beaches in the Azores."** This study, along with other similar regional studies, investigates the composition of fish communities in sandy beach surf zones. It describes how factors like wave energy and beach morphology influence species abundance and distribution.
- **Olds, A. D. et al. (2018). "Seascape connectivity and spatial subsidies link coastal ecosystems: Implications for conservation and management."** This paper emphasizes the role of sandy beach surf zones as corridors that connect other important nursery habitats (e.g., coral reefs, seagrass beds) and facilitate the movement of fish for feeding, spawning, and dispersal.
- **Research on forage fish spawning:** Studies, particularly those in the Puget Sound region, have detailed the use of sandy beaches by forage fish like surf smelt and sand lance for spawning. This research has demonstrated the vulnerability of these habitats to human impacts and rising sea levels.
- **Specific regional studies on juvenile fish:** A study published on ResearchGate confirmed the presence and use of sandy beach surf zones by juvenile Chinook salmon in Oregon, suggesting these areas provide an abundant food supply and shelter from predators.

Importance of high tide for fish foraging

- **TakeMeFishing.org and Flop Industries (commercial sources with research context):** These resources describe the tidal influence on fish behavior, noting that a rising tide pushes baitfish and crustaceans into the shallows, attracting larger predatory fish. They point to areas like estuaries and shallow bays as productive spots during this time.
- **Washington Department of Fish and Wildlife (WDFW) (government resource):** WDFW explains that foraging for sand crabs (a key food source) is best at high tide during "slack water," when currents are calmer and crabs move around more. This confirms the link between high tide conditions and feeding activity.

- **Monterey Bay Aquarium (research-based education):** The aquarium's resources on sand crabs highlight that they are a primary food source for many fish, with some fish diets being 90% sand crabs. Fish predators of sand crabs therefore must time their foraging with the tides.

AI SUMMARY

During high tide, sandy beaches serve as important feeding grounds and nursery habitats for fish. The incoming tide pushes nutrient-rich waters and prey species into the intertidal zone, attracting larger fish that move in to feed. This provides a vital and temporary boost to the food web.

Expanded foraging grounds

- **Access to prey:** Rising tides push food sources, such as burrowed sand crabs, mole crabs, worms, and small baitfish, closer to shore where fish can access them.
- **Predator advantage:** Larger game fish, including striped bass, use the deeper water and wave action at high tide to their advantage. They hunt smaller baitfish by using the underwater structure created by sandbars, troughs, and rip currents to ambush their prey.
- **Stirred-up nutrients:** The churning of the waves and currents during an incoming tide aerates the water and stirs up nutrients, which stimulates feeding activity in many fish species.

Nursery and settlement habitat

- **Juvenile fish habitat:** For some species, the flooded, shallower areas of sandy beaches at high tide provide a crucial nursery habitat. These areas offer a refuge from larger predators found in deeper offshore waters.
- **Recruitment process:** Some juvenile fish settle in the nearshore waters of sandy beaches during the "recruitment" phase, after having spent their larval stage in the open ocean. This is where they find food and shelter before moving to deeper water as adults.

- **Refuge for foraging fish:** Forage fish like sand lance and surf smelt lay their eggs in the intertidal zone. At high tide, the eggs are submerged, providing a safe incubation period.

Ecological importance

- **Connecting food webs:** By connecting the offshore waters with the intertidal zone, high tide on sandy beaches provides a critical link in the coastal food web. This allows for the temporary movement of energy and nutrients between these different ecosystems.
- **Sustaining fish populations:** By serving as foraging grounds and nursery areas, sandy beaches at high tide contribute to the health and abundance of fish populations. This has a direct impact on the larger fish, marine mammals, and seabirds that prey on them.