

QUEEN'S BEACH AQUATIC LIFE ZONES

Synopsis of Ecological Units and Biota

1. Fresh Water Zone:

Current Status: The extent of this zone is small and variable; it depends on seasonal rainfall and runoff from adjacent golf course irrigation. Contamination by fertilizers, herbicides, and pesticides from the golf course is possible and occasionally may be severe.

Flora and Fauna: Uncertain; probably visited by a few marine species able to tolerate fresh water.

Future Value to Park: Potentially significant, for example if there were successful restoration of prominent native life forms such as fishes called o'opu-wai (*Chonophorus*, *Eleotris*) which probably once occupied this habitat locally. Also this tiny watershed serves the richer ecological zones (see below); contaminants from the golf course may have deleterious effects all the way to the ocean, and remedies may be needed to assure high quality for the Park's natural waters

2. Estuarine Zone:

Current Status: Shallow inlets and backwaters occur in two main areas extending over a total of several acres. This area is shrinking largely due to encroachment by alien mangrove trees.

Flora and Fauna:

Algae (Limu): Numerous species, some of them incompletely classified, can be found in this zone. The richness or diversity of the algal flora increases as one approaches the sea. Green algae such as *Enteromorpha* and *Ulva* are widespread from backwaters to ocean inlets. Brown algae such as *Dictyopteris* and *Padina* often dominate in the seaward portions of

this zone.

Invertebrates: Many kinds of these immensely diverse animals are present, but they are inconspicuous. Most are small and live attached to or underneath rocks on the bottom or else burrowed into the sediment. They include sponges, anemones, hydroids, bryozoans, snails, clams, echinoderms, tunicates, and a large variety of worms and arthropods.

Fishes: Those that currently live in or regularly visit this zone in the Queen's Beach inlets include ~~mullet~~ (*Neomyxys chaptalli* and *Mugil cephalus*) and the Hawaiian silver perch, called aholehole (*Kuhlia sandvicensis*). Both of those kinds of fishes were raised by prehistoric Hawaiian aquaculturalists. Other marine fishes that may stay in this zone for indefinite periods include small jacks = papio (family Carangidae). Toward the ocean, an increasingly diverse fish fauna is found. It grades into the typical shallow-water suite of fishes found along rocky Hawaiian shorelines (see next section). Introduced species such as mosquitofish (*Gambusia*) and Tilapia *sp.* may be established in these shallow brackish waters.

Other Wildlife: Birds that currently use this zone for feeding include the native night heron, *Nycticorax nycticorax* and the migrant wandering tattler, *Heteroscelus incanus*. The low marshy habitat of these backwaters might be suitable for the endangered Hawaiian Stilt, Koloa and Laysan Duck and others if the birds could be protected.

Future Value to Park: This zone would be of great importance to the Park if its naturalness could be preserved and interpreted for visitors. Hawaiian waterbirds noted above could be major assets of the Park. They were even compatible with Hawaiian fish farming in prehistoric times and could be part of a living tableau if an authentic Hawaiian fishpond, featuring the cultivation of mullet, etc., were to be part of the Park's educational program.

3. Marine Zone:

A. Intertidal and Rockpool Area:

Current Status: This area is relatively undisturbed and still exceptionally rich in marine life. It is readily accessible, although often turbulent enough to preclude clear views of features and life under more than a few inches of water. Footing is slippery and the turbulence may sweep waders off their feet. Injuries would be caused by contact with sharp-edged rocks. Adventurous children might be especially susceptible to such injuries.

Flora and Fauna:

Algae: Numerous species of Green, Brown, and Red Algae (Chlorophyta, Phaeophyta, and Rhodophyta respectively), together with Blue-Green Algae (Cyanobacteria) are found in this zone. Many of these limu are edible and have been consumed by seafood fanciers in Hawaii since prehistoric times. Red algae in particular become abundant and diverse in the lower intertidal zone, especially on open rock ledges washed by the surf. They include forms that are hardly recognizable as living plants. These are the thin calcareous crusts typified by the genus *Lithothamnion* that grow as a pink to purple coating over the rocks, even in holes and caves where the light intensity is often too low for other kinds of algae.

The algal community on the intertidal rocks at Queen's Beach is densest near the level of mean low water where it is called a turf, a term which fits the stature of the plants. The largest plants in these algal turfs are often species of the phaeophyte genus *Sargassum* which reach a few inches high. Conspicuous Green Algae, such as *Ulva* (sea lettuce) and delicate forms such as *Caulerpa* which often features tiny fernlike fronds are typically found in the deeper or more sheltered rockpools.

Invertebrates: Many kinds of these animals occur in this zone at Queen's Beach.

They represent virtually every phylum. Most are small and shelter in nooks and crannies of the rocky terrain, within the algal turf, or in pockets of sediment trapped in troughs and pools. Common examples include sponges, cnidarians (corals, hydrozoans, etc.), a variety of worms (including paper thin flatworms in day-glo colors); molluscs (including cowries, drupes, turban shells, etc.); also numerous arthropods, echinoderms, and tunicates. A few types are easily observed: big sea cucumbers (*Holothuria*) in the pools, spiky sea urchins (*Echinometra*) and the peculiar, blunt-spined *Colobocentrotus*, which shares rocks exposed to the strongest surf with the similiarly-shaped opihi limpet (*Cellana*). Although heavily fished here, opihi can still be found in a number of places on the Queen's Beach and adjoining Makapu'u coast.

Fishes: Rockpools harbor a variety of fishes, although far fewer kinds than are found just offshore. In the pools, sluices, and channels among the rocks are many juvenile fishes that shelter here before moving to different habitats as they mature. These juveniles include estuarine types such as mullets and aholehole as well as species that have seaward affinities. Fishes that remain in the intertidal area include several damsels, most commonly the kupipi, *Abudefduf sordidus*; also gobies (*Bathygobius* and *Kellogella*), and the rock-hopping blennies (*Istiblennius*).

The artificially-formed inlet at the eastern end of the Queen's Beach tract, adjoining the Makapu'u cliff section is visited by fishes from the offshore zone. The outer portion of the inlet can provide a rewarding experience for novice snorkelers when conditions are not too rough.

Future Value to Park:

The intertidal zone along this coast offers excellent opportunities for family exploring at the edge of the sea. School groups on marine biology field trips would find many

organisms and ecological principles worth studying here. Fishermen also use this area; some enforcement of existing regulations might be needed to help bring back species such as opihi. The rocky intertidal habitat is better represented here than in any nearby park or reserve. Hanauma Bay has very little development of this habitat. The Waimanalo coast near Sea Life Park has a less extensive and highly disturbed zone of rockpools. Turbulence is a drawback to the educational and recreational activities noted above. Perhaps in one or two places, protection from ocean waves could be engineered by strategic placement of a few extrinsic boulders (perhaps put in place by barge from offshore)

B. Offshore Area:

These waters are typically turbulent. The bottom just offshore is rugged and chaotic with numerous boulders and rock ledges interspersed with sand patches. There is no fringing reef. The bottom slopes fairly gently offshore for several hundred meters to about 60-80 feet deep before descending more steeply into Kaiwi Channel.

Algae are less densely distributed and probably less diverse than in the intertidal zone. Invertebrates are generally inconspicuous, although abundant and diverse in protected situations. Large spectacular forms such as spiny lobsters (*Panulirus*), slipper lobsters (*Scyllarides*), and octopus are not uncommon here. Fishes are abundant, diverse, and conspicuous. Species such as the yellow tang, *Zebrasoma flavescens*, rarely seen off windward shores, put in an appearance here. The marine life of this area is further enriched by a variety of oceanic birds, occasional sea turtles, and, during the winter season, humpback whales which come surprisingly close to shore here. Adjacent Makapu'u Head is an ideal vantage for observing these dramatic forms of marine wildlife. Recently, white-tailed tropic birds, *Phaeton lepturus*, even seem to have been attempting to nest on the south side of

Makapu'u Head near Queen's Beach.

While the turbulence and longshore currents off Queen's Beach may be dangerous for novice swimmers and those unfamiliar with the area, locally experienced surfers, snorkelers, and scuba divers frequently make their way here and find the oceanic ambience highly rewarding. Recently the region has begun to be used for organized rough-water swimming races which start at Makapu'u Beach and end at Sandy Beach. Offshore canoeists and kayakers also have found the area to their liking.

Future Value to the Park:

The offshore zone is not as seriously or imminently threatened as the intertidal and shoreward habitats. If fisheries are conserved (for example by outlawing gill nets) and the shooting of seabirds (as is occasionally reported) is stopped, this zone will hold its natural values indefinitely. They can be interpreted for visitors on shore. One doesn't have to actually surf, snorkel or scuba dive offshore here to benefit from their presence.