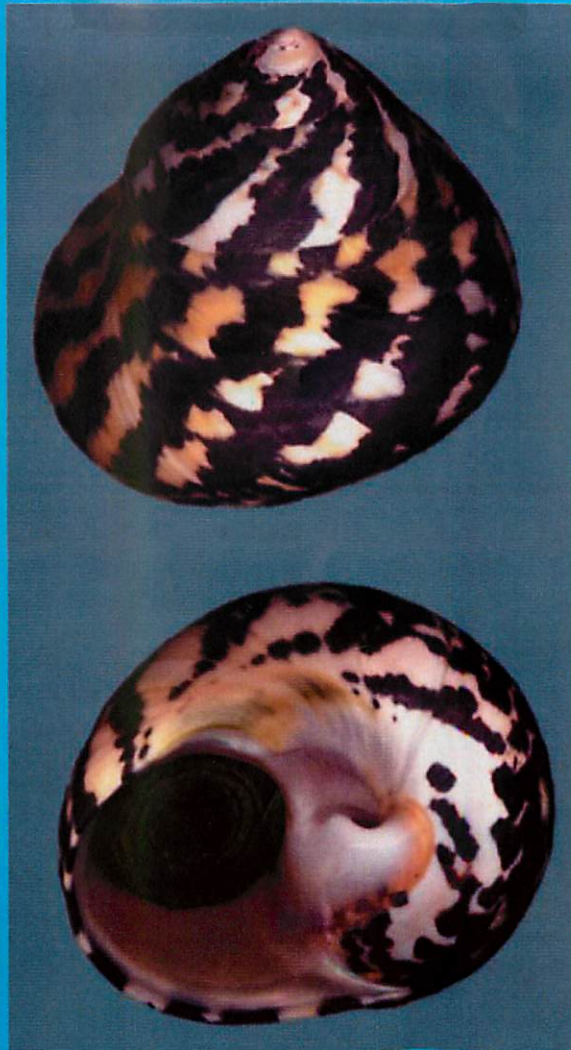


Whelk (*Cittarium pica*)

US Virgin Islands
Caribbean Southeast Area Monitoring and
Assessment Program
(SEAMAP-C)

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Introduction

The West Indian topshell, *Cittarium pica*, (also known locally as whelk) is a marine gastropod that inhabits rocky shorelines exposed to wave action. It is found in the intertidal and shallow subtidal areas of the yellow and pink zones; living mostly in cracks, fissures and under rocks in the intertidal surf zone during daylight and feeding at night on a variety of algae. *C. pica* presents a size zonation between larger and smaller individuals. Adults attain a relatively large size of about 10 to 12 cm, with reported maximum length of 13.6 cm.

Owing to its edible qualities, *C. pica* is among one of the most valuable Caribbean marine gastropods used as food throughout its range. Near human population centers, larger individuals are rare. Overexploitation has become a real concern throughout much of its natural distribution, even though fishing regulation limits the minimum shell size to 62 mm.

Objectives

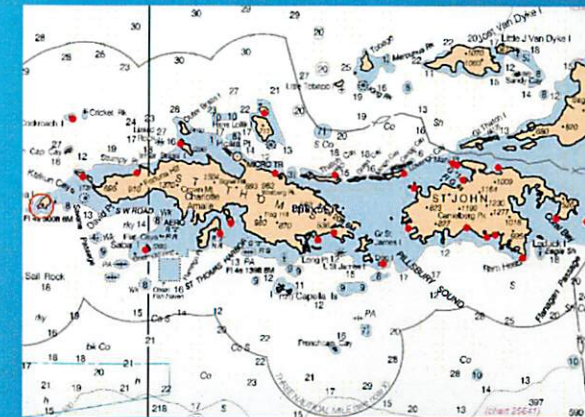
- Collect information to create a baseline on *C. pica* populations in the USVI.
- Quantify the abundance and size distribution of *C. pica* across a large spatial scale and compare populations between island groups.
- Evaluate the results in light of existing information, and identify significant data needs.

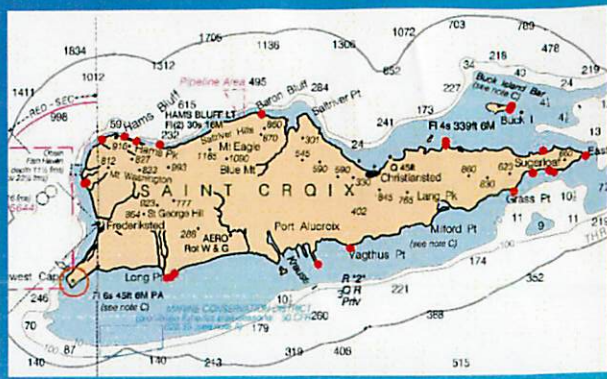
Methodology

This study was conducted in the US Virgin Islands (USVI), where 41 areas were surveyed between June 2003 and May 2004.

Fishermen Interviews and Site Selection

The staff of the Division of Fish and Wildlife (DFW) sought advisement from USVI commercial fishers to focus their sampling efforts in a suitable whelk habitat. Between March and July of 2003, a query was made to those fishers who harvest whelk, as identified through a review of reported commercial landings from 1998 to 2003 (DFW commercial catch report database). Each fisherman was asked to identify substantial whelk populations by marking areas on a map. There were 10, 18 and 3 respondents on St. Croix, St. Thomas, and St. John, respectively. Typically, fishers identified large stretches of rocky coastline, headlands or offshore cays as whelk habitats.





Body Size Measurements

To standardize our data, we measured the whelks shell width as the maximum diameter measured across the base of the shell. Because minimum harvest size in the USVI is 2-7/16ths inches or 62 mm shell size, values of > 62 mm shell width were classified as harvest-size in our samples.



Field Sampling Methods

The quadrant method was selected for sampling, and a 100 m tape or rope transect (marked at 1 meter intervals) served as a reference line running parallel to shore. The reference line was secured at intermediate tie-down points to resist wave action. At pre-selected random distances, a 1.0 m² PVC quadrant was placed over appropriate *C. pica* habitats. All whelks within the quadrant were collected and shell widths were measured to the nearest mm. The area within each quadrant was searched visually (with the aid of a mask for subtidal portions) and by probing crevices and running hands through macroalgae until no more whelks were encountered.

Harvest-size *C. pica* occur in very low densities in the USVI. To adequately sample this rare, but economically important part of the population, a belt transect method was employed. Duplicate belt transects (50 m²) were conducted parallel to the shoreline. Two divers surveyed 0.5 m on either side of a reference line (a 1.0 m-wide swath) for 50 m, collecting all individuals estimated at > 62 mm shell width.



Findings

A comparison to limited historic USVI data on *C. pica* indicates a decline in the relative abundance of large individuals. The relation between whelk size and exposure along habitat gradients showed that: sheltered bays had high densities of almost exclusively small whelk, while at the other extreme, some exposed cays or points had remarkable stands of large adult whelks. An increased exposure to wave energy was positively related to whelk body size.

High seas limit access by fishermen, thereby creating harvest refugia which enable *C. pica* to reach a larger average size. Large individuals are a particularly rare fraction of the total population at most sites.



In comparison to exposed coastlines, juveniles of *C. pica* were relatively abundant on leeward protected shorelines; which suggests that local patterns of whelk recruitment may be influenced by nearshore oceanographic processes. Alternatively, whelk may suffer lower mortality rates during their early post-settlement period at such sites.

Marine Protected Areas (MPAs) are a possibility for management of *C. pica* populations. Three of our sites were within MPAs and densities of large *C. pica* were comparatively high in those areas. The highest densities of large whelk, however, were observed outside formal MPAs; in areas where harvesting is restricted or reduced by exposure to high wave energy.

Harvesting is a major influence on the *C. pica* population structure for larger size classes. The data suggests that fishing mortality extends to individuals that are considerably smaller than the legal minimum harvest size.

Size-frequency distributions showed a truncation in body size at approximately 35-40 mm shell width suggesting that, at many sites, whelk mortality increases sharply at their third year. Natural mortality (due to predation) seems an unlikely explanation as it was only infrequently observed and was apparently directed towards smaller size classes of whelk.

A peak in young-of-the-year (YOY) density was observed in spring. Two factors seem applicable to the persistence of whelk populations despite the yet unquantified level of harvesting.



First: *C. pica* appears to attain reproductive maturity at a young age and a small size (end of its second year), where meat yield is low until about their third year.

Second: harvest refugia may have maintained pockets of large whelk at high density, ensuring successful spawning and recruitment despite localized depletions of larger whelk from more accessible areas.

Recommendations

- *Cittarium pica* might best be managed as a mosaic of partially isolated groups.
- The dates for season closure should be re-evaluated after collecting data on spawning activities; in particular, timing of annual spawning activity.
- Further studies should be conducted, including minimum size and age at reproductive maturity, the relation between reproductive output and age/size, spawning behavior and fertilization success in relation to population density.
- There is need for more information from commercial and recreational sectors (fishery dependent data), about the harvest of whelk, to estimate their relative contribution in the USVI.
- The degree of compliance with existing regulations should be evaluated and action should be taken to inform and educate groups that are prone to non-sustainable whelk harvesting practices.
- There is a need to understand the USVI whelk fishery in a wider geographical context.
- Usefulness of monitoring data will depend critically upon prior quantification of whelk exploitation (known fishing effort, harvest patterns, size preferences, etc.) and parallel advances in our knowledge of whelk biology.

