Title:

NCRMP Atlantic/Caribbean Stratified Random Reef Fish Survey Metadata

Abstract:

The National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Conservation Program's (CRCP) National Coral Reef Monitoring Program (NCRMP) supports reef fish sampling on hard-bottom (coral) habitats from 0 to 30 m of depth. This multi-agency, collaborative effort is heavily reliant on the participation of key federal, state, regional, and local partners for scientific divers, vessels, and operational assistance. The survey employs a stratified random approach using a reef visual census (RVC) stationary point count (SPC) methodology. The survey is conducted biennially and is designed to provide status and trends of reef fish populations and communities using standard population metrics such as density, occurrence, and biomass. These RVC-SPC data inform stock spatial distribution, community composition, effects of exploitation and fish population changes inside versus outside of management zones (e.g., national and territorial monuments and parks, and marine reserves).

Sampling Methods:

Fish surveys use a Reef Visual Census Stationary Point Count (RVC-SPC) method adapted from Bohnsack and Bannerot 1986 to collect fish abundance and size data (for detailed protocol see CRCP 2022, https://doi.org/10.25923/1baa-5g44). Briefly, two SCUBA divers each simultaneously survey reef fish from the seafloor to sea surface while centered within adjacent, non-overlapping, imaginary 15-m diameter cylinders (i.e., 177 m^2 area). For the first five minutes, divers record all observed fishes to species level, and in the following five minutes, all individuals for each species are enumerated and fork length recorded to the nearest cm. If additional species are encountered they are similarly identified, enumerated, measured, and added to the correct time period (5–10 minutes or 10–15 minutes). For ecological species (i.e., typically fishery non-target species), fork lengths are recorded in three categories: minimum, maximum, and mode. For economically important species (i.e., fishery target species) including groupers, snappers, hogfish, and triggerfish, fork length (cm) is recorded for the first 10 individuals and then additional lengths (i.e., >11 individuals) are recorded in the same three categories: minimum, maximum, and mode. Basic habitat data, such as survey depth, reef topography (e.g., maximum vertical relief), reef morphology (e.g habitat type) are also collected.

Data Aggregation Methods:

A hierarchical approach is used to calculate population metrics and standard errors at varying spatial resolutions within a jurisdiction.

Florida example
Jurisdiction (Dry Tortugas + Florida Keys + S.E Florida)
       ---- Sub-jurisdiction (Florida Keys)
             ---- Sector (Special Protected Areas, Open Areas)
                  ---- Strata (Individual stratum)

Specific population metrics (i.e, density, occurrence and biomass) are calculated using standard stratified random survey design techniques and take into account the different weights assigned to each

stratum due to their proportional differences in the sampling frame (varies depending on hierarchy level).

In general, the steps to calculate a population level mean from a stratified random survey is as follows:

1. Calculate the mean and variance of population metric for each stratum.
2. Calculate weighting factor for each stratum
3. Calculate weighted mean and variance of metric by multiplying stratum mean by stratum weight.
4. Sum the weighted mean and variance across all strata.

References:

Bohnsack JA, Bannerot SP. 1986. A stationary visual census technique for quantitatively assessing community structure of coral reef fishes. NOAA Technical Report NMFS 41:1–15.

CRCP. 2022. National Coral Reef Monitoring Program (NCRMP) Reef Visual Census (RVC) Fish Survey Protocols U.S. Atlantic: Florida, Flower Garden Banks, Puerto Rico, and U.S. Virgin Islands. 2022. NOAA Coral Reef Conservation Program. p. 21. https://doi.org/10.25923/1baa-5g44