

Objectives

- To document the presence/absence and species composition of intertidal infauna
- To provide semi-quantitative estimates of abundance or density of infaunal organisms
- To collect infaunal bivalve samples for tissue analysis
- To obtain preliminary information to help validate model inputs or evaluate the need for more comprehensive studies

Sampling parameters

- Infauna presence/absence & composition
- Infaunal abundance or density

Equipment

- site markers (appropriate for substrate type)
- surveying flags and tape
- GPS
- 30 m fiberglass tape measure, marked in cm
- compass
- quadrats (0.25 m<sup>2</sup> & 1.0 m<sup>2</sup>)
- shovel
- hand counter
- box screen with 5 mm mesh
- sieve with 0.5 mm mesh
- large tub or bucket
- hand coring device (cylindrical, 0.01 m<sup>2</sup> or similar size)
- rubber stopper for coring device
- identification field guides/charts
- field notebook (water-proof paper)
- pencils, waterproof pens, markers
- shoreline oil terminology code list
- digital, 35 mm cameras, video camera
- slide and print film, video tapes
- photo scales, photo log forms
- aluminum foil
- sample bags/jars
- large cooler and ice
- 10% buffered formalin
- waterproof labels
- chain of custody forms
- 8 oz. precleaned glass sample jars (for sediment samples)

Methods

- Conduct an overflight of the entire affected area within two hours of low tide (before or after), to observe the extent of visible contamination. Use USGS 7.5 minute topographic quadrangles, vertical aerial photographs, or other detailed maps to record observations. Observations should include:
  - the locations and approximate lengths of oiled shoreline segments
  - the approximate degree of oiling along different segments of shoreline
  - the shoreline and intertidal habitat types present
  - locations of access points, major landmarks, and potential ground-truth and reference stations
  - all photographs taken
- Conduct a preliminary shoreline survey. Divide the impact area into distinct shoreline segments using an initial classification system based on habitat type, degree of exposure, and degree of oiling. Develop a segment numbering system.
- For each shoreline segment, focus initially on identifying the intertidal habitat type, documenting oiling conditions, and determining potential locations for infauna sampling. Record the locations of potential study sites and other information on a basemap and with a GPS. Photodocument each shoreline segment examined and provide field sketches. If possible, use a GPS photo tracking program that links GPS data (by time) with photographs (available programs include Garmin MapSource and GPS Photo-Link). Field observations and descriptions for each shoreline segment should include the:

- shoreline segment number, date, time, weather conditions, tide level, and initials of observers
  - physical setting (shoreline orientation, exposure to wave energy and tidal currents, etc.)
  - shoreline and intertidal habitat types (especially note beaches, tidal flats, etc.)
  - sediment type and grain-size (e.g. mud, sand, mixed sand and gravel, etc.)
  - dominant species or types of biota present (including signs of infaunal organisms such as burrows, worm tubes, fecal mounds, etc.)
  - extent and degree of shoreline oiling (use shoreline oil terminology codes and % cover charts)
  - type or degree of shoreline cleanup performed (particularly note sediment disturbance or removal, flushing of oil and/or sediments into down-slope areas, etc.)
  - shoreline services or uses associated with the site (wildlife use, shellfish harvest, etc.)
- If appropriate habitat types (for infauna) are present, signs of abundant infaunal organisms are observed, or if key infaunal species are expected to occur (harvested species, ecologically important prey species, etc.), sampling can be conducted to document the presence, composition, and general abundance of infaunal organisms. If it is thought that highly quantitative density estimates are needed, or detailed comparisons of oiled vs un-oiled sites, an experienced intertidal ecologist and statistician should be consulted to plan more detailed studies. For semi-quantitative surveys of selected shoreline segments or habitat areas:
    - collect samples within the mid to lower intertidal zone(s) along each shoreline segment to be sampled
    - for species presence/absence, composition, or rough density estimates, take at least three to five samples per tidal elevation at each shoreline segment being examined
    - if unsure about which tidal elevation(s) to sample, make collections at several sites spanning the mid to lower intertidal zones, spaced 1-3 meters apart
    - photodocument the sampling locations, sample collection methods, the organisms observed, any obvious oil impacts, etc.
- Macroinfauna consist of a wide variety of invertebrate organisms that can be retained on a 0.5 mm screen. To sample macroinfauna, use a hand coring device, typically a cylinder with an open cross-sectional area of 0.01 m<sup>2</sup> and a small hole in the top:
    - insert the corer into the sediment (in a vertical position) to a depth of 15 cm (if sediments are that deep)
    - mark the outside of the corer so the depth of the core sample can be recorded, and so that cores do not exceed 15 cm in depth
    - place a finger or thumb over the small hole (or insert a rubber stopper) to create a vacuum, and extract the core
    - in coarse-grained sediments, cores often cannot be extracted whole, and a metal plate or other similar object must be slid under and across the bottom of the core before it is removed
    - empty the contents of the core into a labeled container, such as a large plastic bag
    - core samples can be initially sieved in the field (using a 0.5 mm screen) or preserved whole in buffered formalin
    - when sieving, it is best to force water up through the bottom of the sieve, by bobbing the sieve up and down in a large bucket or tub of water, this prevents forcing animals into or through the bottom of the sieve
    - after sieving, place samples in a sample bag or jar and preserve with 10% buffered formalin
    - place a waterproof label with the station location, sample number, and date inside the sample container
- To sample larger macroinfaunal target species, such as bivalves harvested for commercial or recreational purposes:
    - place a 0.25 m<sup>2</sup> or 1.0 m<sup>2</sup> quadrat on the sediment surface
    - use a shovel to excavate the sediments within the quadrat to the appropriate depth, commonly 20 cm, sometimes greater for some species
    - sieve the excavated sediments using a 5 mm screen (or larger, depending on the size range of the target species)
    - identify, count, weigh, and/or size the captured organisms in the field, and release them live,
    - or, place samples in plastic bags or jars and freeze or preserve in 10% buffered formalin
    - place a waterproof label with the station location, sample number, and date inside the sample container

- If tissue analyses (e.g. hydrocarbons) are planned for larger infauna, such as bivalves:
  - wrap each specimen (or batch of small specimens for a single analysis) in aluminum foil, place in labeled ziplock bag, and then inside a second ziplock (to prevent rubbing the label off as condensation forms), optionally add a more legible paper label, and freeze the sample as soon as possible
  - take care to avoid cross contamination during sampling and handling; clean sampling equipment, such as shovels, between collections
  - consider taking sediment samples for analysis, also. See the field sampling protocols for intertidal sediments for guidelines
  - ship bivalve and sediment samples on ice overnight to the laboratory conducting the analyses (see specific shipping information for this incident)
- Ship any samples preserved in formalin or other chemicals as dangerous goods.

#### Key References

Eleftheriou, A. and N.A. Holme, 1984, Macrofauna techniques. Chapter 6, Pages 140-216, In: N.A. Holme and A.D. McIntyre (eds.), *Methods for the Study of Marine Benthos*, IBP Handbook 16, Blackwell Scientific Publications, Oxford, UK.

NOAA Damage Assessment Center, 1997, Field forms and codes. Appendix 6, In: *Natural Resource Damage Assessment Emergency Guidance Manual*, Version 3.1. NOAA Damage Assessment Center, Silver Spring, MD.

Wolff, W.J., 1987, Flora and macrofauna of intertidal sediments. Chapter 4, Pages 81-105, In: J.M. Baker and W.J. Wolff (eds.), *Biological Surveys of Estuaries and Coasts*, Estuarine and Brackish Water Sciences Association Handbook, University of Cambridge Press, Cambridge, UK.

Edited 30 Apr 2010, wbd/jrp