



Narragansett Bay

Research Reserve

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Ongoing Nekton Monitoring Within the NERRS

Kenneth B. Raposa, Ph.D.; NBNERR

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As part of its effort to implement biological monitoring at a coordinated national scale, the National Estuarine Research Reserve (NERR) System is currently developing a nekton-monitoring program. Towards this end, a survey of all 27 NERR sites was recently conducted to assess ongoing nekton monitoring programs within or near NERR sites in order to better guide the development of any additional protocols. In September 2006 an email survey was sent out by Kenny Raposa, research coordinator at the Narragansett Bay NERR. The survey included six sets of questions that ranged from determining what sites are already monitoring nekton, to identifying what gears are being used, to quantifying the spatial and temporal extents of each program. The entire survey is illustrated in Figure 1.

Email or verbal responses were obtained from 22 of the 27 reserves by late October 2006. Of the 22 responding sites, five (23%) are currently not doing any type of nekton monitoring. These sites included Elkhorn Slough (CA), Padilla Bay (WA), Old Woman Creek (OH), Jobos Bay (PR), and Mission-Aransas (TX) (Table 1). Thus, 77% of the reserves in the system (17 sites) are already conducting some sort of nekton monitoring program within or near their reserve boundaries.

At these 17 sites, a total of 22 individual nekton monitoring programs are being conducted (although there are probably more than 22 – some reserves have monitoring programs that appear to really be a combination of multiple smaller programs) (Table 1). Of the 22 monitoring programs, eight (36%) are being conducted by reserve staff; 16 (73%) are being conducted by outside researchers or agencies (some of the programs are being jointly conducted by a NERR and another agency).

Sixteen different sampling gears are currently being used to monitor nekton throughout the NERRS, and in a variety of different habitats including open water, channels, marsh surface, marsh pools and creeks, and beaches, among others (Table 1). Fish trawls are easily the most common sampling gear being used; trawl monitoring is being conducted at Appalachicola, Chesapeake Bay VA, Delaware, GTM, Kachemak Bay, Narragansett Bay, North Carolina, Rookery Bay, Sapelo Island, San Francisco, and Wells. Seines deployed using various methods are also common; eight sites are currently monitoring nekton using seines.

This survey clearly demonstrates that nekton monitoring is currently occurring throughout much of the NERR system. However it also shows that, taken as a whole, this far from constitutes what could be considered a coordinated, national program. Predictably, a diverse variety of sampling gears are being used, and numerous habitats are being sampled. Some of the sampling gears are highly quantitative, sample the exact same area each time, and have generally high capture efficiencies. Others are passive gears that are not area adjusted, and have unknown sampling efficiencies. While trends can be discerned within a site regardless of sampling gear used, as long as it is used repeatedly, the issues raised above make it problematic to make comparisons among sites with regard to both absolute and trend data (the exception may be with trawls; enough sites are already monitoring with trawls that it may be worth exploring the possibility of making this into a NERR nekton monitoring program).

The results of this survey illustrate the need for developing and implementing a system-wide nekton-monitoring program that fits the unique needs of the NERR system. Ideally, this program will be standardized to some degree to facilitate comparisons of data over space and time, but it will also be flexible in recognition of the myriad habitats and issues among the diverse NERR sites. It may also be useful to comprehensively examine the wealth of nekton data that are already available throughout the NERRS. In particular, a synthesis could explore long-term trends among a subset of NERR sites that are already monitoring with the same sampling gear (i.e., trawls). It could also explore patterns of salt marsh use over space and time (e.g., although a variety of gears are being used, many sites are currently monitoring nekton in salt marsh habitats) and potentially relate the findings to results from the NERR emergent biomonitoring effort. Thus, in addition to initiating its own coordinated nekton monitoring program, the system might also explore funding a synthesis of the sizeable amount of nekton monitoring data that already exists.

Figure 1. The original nekton monitoring survey

2006 NERR nekton monitoring survey

1. General
 - a. Who is conducting the monitoring program (e.g., NERR, university, state agency, etc...)?
 - b. What is the target group or species of the monitoring program (e.g., juveniles, ichthyoplankton, sportfish, etc.)?
 - c. For each nekton monitoring program, list its goal or purpose, including those that address regional or national nekton issues?
2. Spatial
 - a. Where is the monitoring occurring in general (e.g., in your reserve; in your estuary, but outside your reserve; both)?
 - b. What habitats are being sampled?
1. What water depths are sampled (e.g., < 1m, 1-5m, etc...)?
 - d. During what tide stage (or tide height) does sampling occur?
3. Temporal
 - a. How long has monitoring been occurring (i.e., in what year did it begin)?
 - b. What is the annual frequency (e.g., annually, biannually, every 5 years, etc...)?
 - c. In what months does sampling occur (e.g., Jan-Dec; Jun-Oct, etc...)
 - d. What is the within-year frequency (e.g., monthly, biweekly)?
 - e. How much longer will this program continue?
4. Sampling design
 - a. What gear(s) are being used (e.g., trawl, seine, throw trap, etc...)
 - b. Provide specifications on each gear type (e.g., net length, mesh size, etc...)
 - c. Provide specifics about the number of stations, number of replicates/station, etc...
5. Data
 - a. What kind of data are collected (e.g., presence/absence; abundance; biomass; length, etc...)?
 - b. Would data be available for use within the NERRS?
6. Reports and Publications
 - a. List any resulting from the survey or monitoring program.

Table 1. Selected results from the NERR nekton monitoring survey

NERR site	Monitoring nekton?	Sample gear used	Habitats sampled	Conducted by?	Frequency	Year initiated
ACE Basin	yes	electrofishing	subtidal freshwater habitats	SCDNR	annually; monthly Jan-Dec	2001
Appalachicola	yes	trawl	veg. and unveg. bottom	NERR	annually; monthly Jan-Dec	2000
Chesapeake MD	yes	seine	nearshore	Maryland DNR	annually	1999
Chesapeake VA ¹	yes	trawl	littoral and channels	VIMS	annually; monthly Apr-Nov	1955
		seine	nearshore	VIMS	annually; biweekly Jul-Sep	1967; 1980
Delaware	yes	trawl	unspecified; presumably channels	NERR	annually; biweekly Jun-Oct	2005
GTM ²	yes	seine; trawl	nearshore (e.g., fringe marsh)	St. John's River WMD; USGS	annually; monthly Jan-Dec	2001
Hudson River	yes	seine; gill net; drift net; electroshocker	tributaries; marsh	Simons Rock College of Bard	annually; biweekly May-Aug	2001
Kachemak Bay	yes	trawl; fish pots	deep subtidal	Alaska DFG	annually (with gaps); monthly Apr-Aug	1975
Narragansett Bay	yes	trawl	unveg. bottom	RIDEM	annually; monthly Jan-Dec; seasonally	1979
		seine	nearshore	RIDEM	annually; monthly Jun-Sep	1990
		throw trap	unveg. marsh	NERR	intermittently; Jul and	2000

North Inlet	yes	block net	habitats vegetated marsh surface	Univ. of SC	Sep annually; biweekly to monthly Jan-Dec	1983
		epibenthic sled	tidal creek	Univ. of SC	annually; biweekly Jan-Dec	1981
North Carolina ³	yes	trawl larval dip net	unknown unknown	NC DMF NOAA	annually annually; monthly Jan-Dec	unknown > 50 yrs ago
Rookery Bay	yes	trawl	estuarine (<2m)	NERR	annually; monthly Jan-Dec	1998
Sapelo Island	yes	trawl; benthic trays; moored collectors	intertidal and water column	NERR; University	annually; monthly and biweekly Jun-Oct	2000
San Francisco	yes	seine; beam trawl	shallow beach; channels	UC Davis	annually; monthly Jan-Dec	1983
South Slough	yes	seine; minnow traps; fyke net	tidal channels	NERR; Oregon DFW; EPA	intermittent; variable as needed	1987
Tijuana	yes	seine with block net	marsh channels	NERR	annually; summer and winter	1986
Wells ⁴	yes	fyke net; lift net; beam trawl, ichthyoplankton net	salt marsh (multiple habitats)	NERR	annually; monthly Jun-Sep	1996
Elkhorn Slough	no					
Jobos Bay	no					
Mission-Aransas ⁵	no					
Old Woman Creek	no					
Padilla Bay	no					

Grand Bay	n/a
Great Bay	n/a
Jacques Cousteau	n/a
Waquoit	n/a
Weeks Bay	n/a

¹ Chesapeake Bay VA's seine program targets only striped bass

² GTM's monitoring program is not long term. It ran from 2001-2005.

³ North Carolina's nekton monitoring occurs near the reserve, but not in it.

⁴ Nekton monitoring at Wells occurs each year, but it is a combination of a variety of salt marsh restoration monitoring efforts at various sites

⁵ Nekton monitoring is occurring near the Mission-Aransas NERR but more information is needed