To: EPA, Superfund
From: Robert B. Davis
Date: October 16, 1989

Re: Comments on EPA Alternative for the Upper Estuary of the Acushnet River

The EPA proposal calls for the dredging of contaminants from the "Hot Spot Area" of the river, their incineration, and subsequent burial in a nearby landed area on the New Bedford side of the river. Considerable mention was made of the reduction of toxics since about 90% of the volume of PCBs lie in the Hot Spot Area.

In order to evaluate the EPA proposal it would seem the matter should be put in the context of the whole harbor. From sources of water north and south of the upper estuary. To the north, the Acushnet reservoir; to the south, the balance of the inner harbor & Buzzards Bay.

A remediation judgment of the upper estuary should be done with some anticipation of a resolution for the rest of the harbor.

Unlike the balance of the inner harbor, the upper estuary is an ecosystem, with a long term status such to require a resolution consistent with and supportive of the status. The standard of remediation would thus seem to differ from the rest of the inner harbor.

This is apparent in the use of the lower estuary, and the classificatory recognition of this in the CZM designation for this section of the inner harbor. It is designated as an industrial harbor, as opposed to the upper estuary. The PCB levels are notably lower in the lower harbor, though this is not the case for the heavy metals.

While the segments of the river differ, the surface area of the lower estuary is much larger, by approximately an order of magnitude. PCB transport occurs from the surface area of the underlying sediments. Since it is the lower estuary that faces the Hurricane Barrier, it is a primary source of depositions into the outer harbor. It is the ingestion of edible fish in the outer harbor that are consequential to health effects.

Noone has calculated the relative influences of the high level but remote & localized PCBs (Hot Spot Area) vs the low level but distributed PCBs immediately facing the outer harbor. Whatever the judgment, each is influential. Levels of PCBs in sediments relative to marine uptake is relative. The relatively low levels in the outer harbor, aside from some localized areas, are sufficent for marine uptake to

4 PAGES, INCLUDING ATTACHMENTS.

meet the FAL action level for select (edible) species.

The fear of the author is that the rationale to clean up the hot spot area (over 90% of the PCBs) signaled a question on the part of the agency to the rest of the harbor. The alternative was expressed without giving any indication of a plan for the balance of the harbor.

Further, no recognition was given to the adjacent waters of the upper estuary to the north. The estuary to the north of the hot spot area, and the head waters that are a source into the river. At first sight the waters to the north may appear to be remote and not causally significant, but yet they not only feed into the lower waters, but attract & receive marine species from the lower waters as long as the natural conditions for the flow of waters is not impeded.

The decline of the shore fisheries, to a large extent, can be attributed to the decline of the inland spawning grounds of the anadromous species; and the consequent decline of the predaceous finfish that follow the anadromous species in their migration. At one time, even cod would frequent coastal waters into the estuaries.

The significance of the cause was recognized by Spencer Baird in the mid 19th century, and in the 1920's:

> "The harmful effect of this decline upon the shore fisheries has already been explained, and few more convincing arguments can be advanced in favor of replenishing all possible alewife streams than its influence upon the future welfare of the shore fhisheries of Massachusetts." (D. Belding, "The Alewife Fisheries of Ma", Ma Div of Fisheries,1912-1920, p46, 52; hereafter, all references are to the Bibliography in the Attachment,"Historical Profile:Buzzards Bay")

The significance of the upper estuary is not as an isolated system, but as a part of a larger whole, if it is such a part. And indeed it is. And the connection is not to be limited to the gravitational movement of waters. Just as that does not stop the lowly herring in its travels, so neither should a specific task (clean up the river) limit this consideration in the solution to the problem.

It would seem that if damages to the natural resources are an issue, then restoration of the resources is an equal issue. And there should be no limit in the means of redress, if the means are proportioned to the causes of the decline. Without prioritizing specific causes, it is near unanimous that access to the inland spawning grounds by anadromous species is a major cause of the decline.

A quick review of the nearby inland surface waters affords a surprising but meaningful connection to the upper estuary and Buzzards Bay. The connected Freetown/Lakeville ponds are the largest natural body of water in the state, and serve as a municipal source of water under the (limited) authority of the City, and also under the authority of the state. Only one of the ponds (Long Pond) permits recreational use.

The distance of the southernmost ponds (Long Pond; Little Quitticas) to the Acushnet reservoir is not considerable. It is unclear if there exists any streams that connect with the Acushnet body of water. In the early years, that could have been the case. But what does seem apparent, is the bodies serve as groundwater sources in a southerly direction, and hence from the ponds into the lower basins, one of which is the Acushnet Reservoir, another of which is Buzzards Bay. An adjacent pond, the Snipatuit, serves as the Headwaters to the Mattapoisett River, one of the best herring rivers in the Commonwealth (Belding, 1912-1920). A channel connecting the pond to the river was established in 1755.

The early historic records speak of the Ponds as an active habitat of the migratory herring, and mention the frenzy of the perch (white perch is also an anadromous species) in the presence of the herring. With an abundance of surface fish come a variety of attendant species, say the osprey, the eagle (Buzzards Bay, 1989).

A simple proposal. While the Ponds enter the northerly river (Nemasket River into the Taunton River, eventually into Narragansett Bay), it would seem undeniable there is a connection to Buzzards Bay via groundwater means. There already exists a water supply connection. The proposal is to simply formalize the connection.

It would seem there is no incompatibility to manage a body of water to serve 2 purposes: as a source of water & as a spawning ground of marine life. Quite fortunately, and it is to the credit of the City, the ponds are nearly in pristine condition, other than the one pond and the impedence to the flow of the migratory fish. The latter would appear to be in need of correction. Given the periods of excess runoff and surplus water for various seasons, the ponds role as headwaters to a nearby coastal bay (Buzzards Bay), and a remote bay (Narragansett Bay) appear within the scope of management. It would appear then that an evaluation is in order.* It should be noted that the end is to restore a body of water to its natural condition. Mechanical means can alter in this direction. In terms of a cost-benefit analysis, the yield can be great at small cost. Consequently, I recommend that not only the Lakeville Ponds be reviewed, but the headwaters & tributaries that feed into Buzzards Bay be evaluated, since it is the latter body that

*See ATTACHMENT, PRE-PROPOSAL TO SEAGRANT, "HISTORY OF FISHERIES OF BUZZARDS BAY," 198

is the natural resource at issue. Credits & trade-offs appear to be within the scope of settlements, as long as the "ad quem" is Buzzards Bay.

There are a variety of points the author would like to make. One of which is the role of the locality in matters of this sort. It would seem to me that participation is desirable. But it would seem that unless some authority is given to the local level, participation will be limited. It would seem that the role assigned to the local level is to implement policies from above. It is an old deductive model, if you will, whereby the policies and standards follow from the federal & state level, while the locals province is to implement them. Consequently, the most that can be expected is a passive role at the local level. As much as the current local administration has moved in favor of environmental considerations, it has resulted in only one fulltime person for the task. This is singular for municipalities. But it is meager relative to the staff of the state & federal offices that the local 'person' must face.

There is a pathetic irony in this. For the local level is criticized for causing the problem, and the higher levels of government are now going to provide the standards that are wanting. But if this be the case, then it is for want of standards and direction in the early periods that caused the problem, and hence the higher levels of governments were as negligent. If not more so. Culpability is proportioned to capability. What office at the local level could contemplate the toxic effects of PCBs. At best, it would be speculation.

While a city official involved in the issue, I spoke of a 'triumvirate relationship' between the 3 levels of government: federal, state & local. It would seem to me that if genuine participation is in order, the relationship has to be well defined, to assure a degree of critical authority at the local level..

In order to provide materials with detail on a variety of topics that pertain to PCBs in the waters of New Bedford, I refer the reader to a detailed evaluation of the state document on the topic. The evaluation was written as a city official. It is a finished document.

Since time limits the review of the EPA proposal, the following comments will be perfunctory.

In the event of the execution of the EPA alternative, there is no need to incinerate the PCBs. Based on the affinity of PCBs to sediments, and their low-water solubility, the PCBs would be relatively encased. With a liner, the containments would be assured. And this would exclude the possible mobilization of the heavy metals. Gidley, an authority on this topic, advocates same. The incineration cost is

approximately $5 million, and thus the savings would be approximately one third. The only drawback would be the volume reduction lost through incineration. But this is small (circa 10%), and also excludes any need to remove ash depositions.

It would seem, given the large area to be dredged for the lower estuary, for the area of the upper estuary outside the hot spot area , that any dredging alternative is prohibitive (from one to 3 feet PCBs taper off to negligible levels: at 3 feet, the whole inner harbor contains circa 400,000 cubic yards). Consequently, the only solution for the balance of the harbor is capping. The precise method, materials, etc. is unclear. The PRP alternative would appear to provide a means to test the effectiveness of this means. In one fell swoop it contains all contaminants, if it works. My question is the effectiveness of the fabric to burrowing marine life, and thus a breaching of the layer. I am also concerned about the role of the lower layers of soil from bedrock to the upper layers. It would seem there is some connection , a nutrient flow, to the upper layers. Unfortunately, I received only the 'interim report' of the consultants, and much of the supporting data was in the Attachments*. But even if there is a limitation, in view of no other alternatives, then those limitations may have to be sufferable risks.

For it is transparent, it seems, that the balance of the upper estuary is not part of the EPA proposal because of the cost and want of disposal sites for the dredged material.

Indeed the EPA is justified in their concern to remove the high levels in the hot spot areas. It would seem, with the exclusion of incineration, that the cost can be used to integrate both methodologies, such that the total cost may be marginallty different. The author has not had time to even begin a cursory comparison, but it would seem that with large scale apparatus in place, with means used to enter/exit the estuary, that a cap could be put in place concurrent with the hot spot removal.

As the consultant noted, the upper estuary, for that matter, the whole inner harbor, lends itself to a series of controls. Unlike many bodies of waters, the quiescent Acushnet River lends itself to a varied physical operation. It would seem, that with the savings of incineration, a dredging & capping operation can be combined at a cost not too far removed from the present estimate. Assuredly, the cost is no more than $25 million, a total under other alternatives. And it entails the whole upper estuary. If the EPA were to then follow up the hot spot area and do the rest of the upper estuary, would they believe the cost to be less than $10 million.

* NO ATTACHMENTS WERE INCLUDED. MUCH OF SECTION # 5 WAS ALSO MISSING.

It would seem if the EPA is committed to clean up the whole upper estuary, then the PRPs provide an alternative so same can be done.

Attachments are enclosed in support of the above. The document, "Historical Profile: Buzzards Bay" by the author, is still in draft form, though essentially complete. It is hoped the final copy can be submitted and included.

A last point mentioned in my oral testimony, is to test for the presence of PCDFs in marine biota, in view of their presence in the sediments. Further, some speicifc testing of marine species should be tested for the upper estuary, in particular shellfish and crustaceans, so a time series can be established. This should be easy to do by means of cages.

ATTACHMENT #1: "HISTORICAL PROFILE: BUZZARDS BAY", 1989

#2: "PRE-PROPOSAL, SEAGRANT: "HISTORY OF THE FISHERIES OF BUZZARDS BAY."

ATTACHMENTS

to

TESTIMONY of ROBERT B. DAVIS

#1. "HISTORICAL PROFILE: BUZZARDS BAY"

#2. PRE-PROPOSAL, SEAGRANT: "HISTORY OF THE FISHERIES of BUZZARDS BAY."

Historical Profile: Buzzards Bay

Buzzards Bay

&

New Bedford Waters

Submitted to Camp, Dresser & McKee

by

Robert B. Davis

towards fulfillment of a contract

in respect to

Services Provided to the City of New Bedford

for

the

Treatment Plant

August 1989

Historical Profile: Buzzards Bay

Buzzards Bay is a semi-enclosed body of coastal water fed by a number of rivers, brooks & tributaries. It is enclosed by a series of islands on the southside of the bay, extending westward from Woods Hole, the southwesterly tip of Cape Cod. Buzzards Bay is the upper limit of a warm water regime and host to southern migratory finfish. It is located at what the (early) literature calls "the great divide" (Goode, 1887; Nichols, 1927), as evident in the temperature differentials (2.5 degrees C) south & north of Cape Cod (Fisheries Atlas, 1980)..

Both Cape Cod & the (Elizabeth) Islands were named by Bartholomew Gosnold in 1602, the discoverer of New England.

After leaving Newfoundland, upon following the (New England) coast in a southerly direction, the vessel of Gosnold (the Concord) approached the great headland, Cape Cod.

And

> "...the schools of Mackerell, Herrings, Cod & other fish that we daily saw as we went & came from the shore were wonderful...",

and closer to shore than in Newfoundland (Gookin, 1963). Gosnold spoke of the superior fishing about New England, and later travellers spoke in the same way,

> "...the fish being so much greater, better fed (1605)".(Wood, 1629-1634; McFarland, 1911).

Continuing their journey, the vessel rounded the Cape, passed the Vineyard, and sought a passageway into the bay.

Upon entry into Buzzards Bay the waters were described as

> "...one of the stateliest Sounds that ever I was in."

The island of Cuttyhunk served as a staging point for Gosnold's explorations of the area about Buzzards Bay (Gookin, 1963).

Gosnold spoke of the beauty of the land & 2 main rivers that feed the Bay:

> " This Maineland is the goodliest Continent that ever we saw...and beautified with 2 maine Rivers."

The 2 rivers are generally accepted as the Acushnet & Agawam (Wareham) rivers. Within a few days an Indian Chief (Sachem) visited the explorers and returned with 50 members of the tribe. The voyagers invited them to dinner, and they ate <u>codfish</u>. The Indians prolonged the feast by roasting crabs, red herring, ground-nuts and so on.

Later, in the time of the Pilgrims (June,1676), the Sogkonate Indians, a subtribe of the Wamponoags who visited Gosnold, were observed on the shores of Buzzards Bay near Agawom (Wareham) by a Captain Church:

> "Proceeding in their march, they crossed a river and opened a great bay, (Buzzards Bay) where they might see many miles along shore...and saw a vast company of Indians...some catching eels and flatfish in the water; some clamming, etc...."

Captain Church supped with the Indians that evening, led by the Squaw Sachem (Chieftess) Awashonks, and supper consisted of 3 dishes:

> "...a curious young bass in 1 dish; eels & flat-fish in a second; & shell fish in a third."

<u>Origin of Name</u>

The <u>Sound</u> was called "Gosnold's Hope" in anticipation of finding the inlet from the sea (Narragansett Bay or the Hudson river) mentioned by a prior explorer (Verrazano) (Scribner's, 1881). A tradition names the waters as the "Bay of Currents" from reported Norsemen who explored the area. Apparently the waters are named after the fish-hawk (osprey).(Strother, 1860; Endicott, 1883; Kimball, 1892; Standard Times, 1959).

The osprey feeds exclusively on fish (Albert, 1258-1262; Fornbush, 1927), and nests near the shore along Buzzards Bay (e.g. nests are evident today on the shores of the Westport River). The colonial period spoke of the diverse hawks in the area (Smith, 1615). Early works of natural history used the term Buzzardet (little Buzzard) to identify the fish-hawk (sometimes erroneously called the 'sea-eagle').(Kimball, 1892). The osprey was once a common breeding bird along the whole coast of New England, and locally in its interior (Fornbush, 1927). A US naval steamer that provided services to the

area was named after the bird (Baird, 1886; R.I. Inland Reports, 1899).

The osprey, & also the (emblematic) bald eagle, followed the alewives up the rivers. Thirty bald eagles at one time followed the alewives up the Agawam river to its headwaters at Halfway Pond (Fornbush, 1927). The eagle would not infrequently secure the catch of the osprey (Fornbush, 1927).

Spawning Ground

In colonial days the tributaries during the spawning season were crowded with shad, salmon, striped bass and alewives, while schools of mackerel, bluefish, sea bass, butterfish, scup and menhaden were found within its boundaries (Buzzards Bay, 1916).

Buzzards Bay is a part of a large spawning ground embracing Vineyard Sound, the South side of Cape Cod and Long Island Sound. (Buzzards Bay, 1916; Nichols, 1927). Species definitely known to have spawned in Buzzards Bay are : Butterfish, Sea bass, Shad, Alewife & Tautog.

Species at different stages of development in Buzzards Bay are: glut herring, menhaden, cunner, swellfish, flounder, and numerous small bait fish (Buzzards Bay, 1916).

Buzzards Bay is a spawning ground for lobsters, and apparently a larval source for Massachusetts Bay. There exists a net larval flow from Buzzards Bay through the Cape Cod Canal. (Collings et al, 1974-1979; Comments of George Kelly, NMFS Official, Woods Hole Conference, c.1980). The percentage of egg-bearing (ovigerous) lobsters in Buzzards Bay is notably higher than regions North of the Cape. The average for the state in 1987 was 9.2% of females ovigerous for all American lobsters sampled during a commercial lobster trap catch survey: for the regions, 4.5% for Cape Ann; 1.8%, Beverly-Salem; 1.7%, Boston Harbor; 3.9%, Cape Cod Bay; 16.9%, Outer Cape Cod; and

31.0%

for Buzzards Bay. (Estrella & McKiernan, 1987,1989). The trend appears to be historical. The egg-bearing count of lobsters in the late 19th-early 20th century favored locations south of the Cape. (Ma Inland Fishery Report, 1896, 1911). The incidence is similar to R.I. (R.I. Inland Fishery Reports, 1903-1904, 1929-1935).

Buzzards Bay is especially adapted for spawning by reason of its shallow water, warmth, abundance of food (A mush of food in the

water column: Baird, 1873), numerous estuaries and small rivers entering its headwaters. In fact, there are few if any places so naturally adapted for such a purpose as Buzzards Bay (Buzzards Bay, 1916). According to Vinal Edwards, a respected official of the U.S.Bureau of Fisheries and long-time observer of Buzzards Bay, it is probably the best arm of the sea for the spawning of fish along the New England coast,'apparently more favorable than Narragansett Bay.' (Buzzards Bay, 1916).

Notwithstanding the comparative merits, Buzzards Bay and its tributaries is a marine habitat that is a nursery area for a number of species. (Fisheries Atlas, 1980; Fiske et al, 1968; Howe, 1980).

Shellfish

Shellfish beds in Buzzards Bay favor the Bay Scallop and the hard-shell clam, not to exclude an indigenous oyster.. The soft-shell clam, however, is of less significance (Belding, 1931). The productive areas for the latter species lie north of the Cape (Goode, 1887).The soft-shell clam is present in volume in Chesapeake Bay (Fisheries Atlas, 1980).

Nonetheless, an extremely dense 18 inch band of soft-shell clams was noted in the inner harbor of New Bedford, approximately 8-10 feet below the surface at the rivers edge at the North Terminal (corner of Herman Melville Blvd & Herve Tichon Ave). In 1969 the North terminal was built and entailed the filling in of land from the shoreline to the bulkhead line. The land at the edge of the water was cleared to become the roadway parallel to the terminal. The soil was described as a fine silt (muck). The bed extended in an indefinite radius about the point (Donald Taber, August, 1989). A similar discovery was made by the DMF in respect to the Taunton River. Quantities of relic soft-shell clam (& oyster) were found on the West side of the river across from the Fall River Country Club near Pierce's beach in Somerset (Hickey, 1980-1981). However, the hard-shell clam is commonly abundant in Buzzards Bay, in particular at Clarks Cove. The yield in Clarks Cove ranks with the best (Hickey, 1989). Comments on the oyster will follow below.

The Bay Scallop

In the past, the South shore of Cape Cod and Buzzards Bay was recognized as 'famous for the abundance of scallops.'(Gutsell, 1930). West Falmouth harbor and adjacent ponds have historically been an area of high Bay Scallop production. (Capuzzo et al, 1980-1981; also, Curley et al, c.1968)

Every form of sea life has its range, and Cape Cod may be considered as the northern barrier in the distribution of the scallop:

> "As the common scallop is found only in a 'rare & local' way north of Cape Cod, we must look to the southward of that great dividing point for any commercial fishery of them." (Goode (Ingersoll), 1887, underlines added).

The headwaters at the head of Buzzards Bay are the most protected and perhaps most favorably situated of the scallop localitites in respect to natural conditions. The large bay scallop is found in this section (Belding, 1931). The larger scallop was identified in an offshore set at Cleveland Ledge, in contrast to a nearshore set at Wings Cove (Capuzzo et al, 1981-1982; Capuzzo edit., 1984). The Bay Scallop is distinct from the Queen & Calico Scallop, not to mention the Deep Sea scallop. The upper limit of the range of the Calico Scallop is North Carolina (Fisheries Atlas, 1980). Three subspecies of the Bay Scallop are generally recognized, intergrading in distribution from Cape cod to New Jersey ("the most common shell along the shores of N.J.":Gould, 1841), and the 2 other subspecies ranging to Laguna Madre, Texas. Morphologically the Ma & Beaufort (N.C.) Scallops are held to belong to one species, but the time of spawning differs markedly between scallops at the 2 locations (Gutsell, 1930).

The scallop fishery did not become of commercial importance in Ma until 1872. In the Acushnet River, and all along the western shore of Buzzards Bay, the Bay Scallop abounds and the catch is important to the locality (Goode (Ingersoll), 1887).

In Buzzards Bay, the fishery first started at New Bedford in 1870. The scallop area comprised approximately 400 acres, principally in the Acushnet river and Clarks Cove. From this locality the fishery spread rapidly in 1879 among the shore towns on the north side of the Bay (Belding, 1931).

The abundance of the Bay Scallop is highly variable. In 1901, R.I. authorities cited the scallop fishery as in "imminent peril" (R.I.Inland Fishery Reports, 1901), and commissioned a study of the species to address the problem (Risser, 1901).

The short life of the scallop with only one spawning season means the species population is variable. The fishery is hindered by the unpredictable abundance of natural set and the apparent instability of local populations (Capuzzo et al, 1980-1981; Lee, 1980).

Rhode Island commercial landings peaked in 1892 from a low in 1887, with a better but comparable high in 1945, with a decline thereafter, till a low in the 1960's, from which lancings have been

negligible into the seventies (Olsen & Stevenson, 1975).

The Acushnet River & Clarks Cove scallop fishery has not provided quantities of commercial value in recent years. The New Bedford harbor has very high levels of the heavy metal, Copper. The levels are very high in the inner harbor. The uptake of copper by the scallop is linear over time. However, histopathological examinations indicated the scallops to be in a good health condition. Possibly the scallops were stressed. According to the literature, juvenile scallops in other waters evidenced a 43% reduction in growth after exposure to copper (Sindermann,1979). In the outer harbor at Clarks Cove, the Shellfish Warden has successfully raised scallops in cages (Brad Bourque, 1989). It is hoped this success can be made practical.

However, it is the hardier hard-shell clam that has survived and done well in the harbor about the City.

The Quahaug

Like the scallop, the territory of the hard-shell clam can be divided into the same areas. The quahaug is essentially a southern or warm water mollusk, and Ma principally marks the northern range of the fishery, although quahaugs are taken in the Gulf of St Lawrence. Cape Cod is the northern limit of the hard-shell clam's range (Belding, 1919, 1931).

Buzzards Bay is extremely well situated for the growth and propogation of the quahaug. The Acushnet River has large beds of seed stock. The stock has been transferred at various times. In recent times, as well as in the early 1900's, when the beds were considered to be contaminated. Good beds of "Little Necks" existed in the Acushnet River and Clarks Cove in 1912. (Belding, 1919, 1931).

In view of the pollution question of the New Bedford waters, in 1980-1981 the Division of Marine Fisheries in cooperation with other agencies, surveyed and assessed the quantity and sanitary quality of the quahaug resource in New Bedford harbor. All stations tested were within allowable limits for mercury and PCBs (Hickey, 1983). The low levels of chemical contaminants caused a redraft of the closure areas. However, total coliform median values were in excess of allowable limits for depuration at 2 stations. The stations were at the CSO outlet in the northern section of Clarks Cove, and about the sewerage outfall off Fort Rodman. The resource was also compared with contaminated waters off Mt Hope Bay and the Taunton River, as well as a comparison through the literature with Narragansett Bay.

Very few quahaugs were found in the inner harbor (inside the hurricane barrier) except at stations on the Fairhaven side west

of the area about Fairhaven Marine (the outer part of the inner harbor). This area is near the outfall of the Fairhaven treatment plant. Average adjusted density ranged from 0.24/sq ft to 1.15/sq ft over an estimated 111 acres. The outer harbor had levels over the inner harbor by a factor of two. Highest densities were between Butler Flats Lighthouse and Fort Rodman; south of the Hurricane Barrier; and on the east side of the harbor.

Lowest densities were noted at the mouth of the harbor on either side of the entrance channel from the closure line northerly for a distance of about a mile.

Population density and size distribution were thus found to be quite variable, but nonethelesss greater than the inner harbor where quahaugs were observed (near Fairhaven Marine & the outfall of the Fairhaven Treatment plant), by a factor of two. The average density adjusted for dredge efficiency ranged from 0.23/sq ft to 2.98/sq ft in an area of 2,380 acres.

Clarks Cove. The data indicate a dense population through most of the Cove. Maximum densities were found along the east side of the Cove off Hazelwood Park, and the sewage disposal plant (the locus of this plant may be in error; in Clarks Cove it is not a treatment plant, but a former non-discharging screening station). Similar high densities exist outside this area off Fort Rodman, adjacent to the Municipal sewerage outfall. Average adjusted densities ranged from 0.24/sq ft to 2.69/sq ft over an estimated 1,243 acres.

The resource in Mt. Hope Bay and the Taunton river were comparable to the lower half of the density range of the inner New Bedford harbor. The adjusted density for Mt Hope Bay ranged from 0.05/sqft to 0.58/sq ft. The Lee River stations gave an average density of 0.68/sq ft over 130 acres. The total productive area in Mt Hope Bay was 1,933 acres.

For the Taunton River, total productive areas were about 1,078 acres. Density was very low throughout the river at an average of 0.19/sq ft. Discounting stations in the dredged channel, the range was from 0.57/sq ft to 0.76/sq ft. There were 4 high density beds of small acreage. The east bank of the river bordering the Fall River Country Club (74 acres) had an average density of 1.13/sq ft. The mean density south of the Montaup Electric plant in Somerset (55 acres) was 0.85/sq ft.

Based upon a median estimate of fishery biologists for polluted waters of Narragansett Bay, the average yield was 106.66 bushels/acre. This is more than double that of the Taunton River and Mt Hope Bay areas, but less than that of the New Bedford outer harbor and Clarks Cove areas (144.43 bu/acre). Less by a factor of one half.

What seems apparent is the high productivity of the Acushnet River. Higher than areas of Narragansett Bay, by a factor of one half; and higher by a factor of four over the Taunton River and sections of Mt Hope Bay.

Despite pollution, minimal management and periodic heavy utilization, legal and otherwise, the hard-clam resource has sustained itself over the years (Hickey, 1983). The Acushnet River and Clarks Cove are high producing areas (Hickey, Personal Communication, 1989). It is difficult to assess yield without the contribution of the effluent from the treatment plant. The area about the outfall off Fort Rodman is a high density area.

It should be noted that the Fall River treatment plant discharges in the area studied at Mt Hope Bay. The east side of the channel in Mt Hope Bay is a locus near the treatment plant. The site gave the highest average densities in the area (0.73/sq ft). The range was from 0.32/sq ft to 1.15/sq ft, respectively, from south to north along and parallel to the Fall River shore in the direction of the treatment plant (Hickey, 1983). What this seems to indicate is an influence of the effluent, but at a value decidedly less than in New Bedford harbor. The primary contribution to the productivity of the resource would then appear to be due to natural conditions. A review of 1879 landings for the quahaug indicated a value higher than other districts (5,000 bushels) (Goode, 1887).

The Oyster

There is some question whether oysters were indigenous north of the Cape (Gould, 1841), including Wellfleet on Cape Cod. But there is no doubt that they have always grown so on the south shore (Gould, 1841; Fisheries Atlas, 1980). The eastern shore of Buzzards Bay, and far up the Wareham (Agawam) river, support oyster stock. Southwest of Wareham, there were several oyster localities: the Weeweantit River, Wing's Cove, and a cove in Sippican harbor of Marion, as well as a bed off Ram's Island.

However, attempts to stock the oyster in New Bedford were not commercially successful (Goode (Ingersoll), 1887). But oyster shells are evident on the shore of Palmer Island, and presently oyster beds have formed in Palmer's Cove along the spillway that borders the inner side of the hurricane barrier (Bourque, 1988). Apparently the concrete substrate of the spillway provides an optimal surface for the attachment of the oyster seed (spat).

Natural beds have existed in the Westport River. Beyond this there is a gap in oyster growth until the mouth of the Taunton River is reached (Goode, 1887). For 12 miles the Taunton River produces natural oysters (called 'Somersets'). Oysters occur in Narragansett Bay, and at one time the whole upper half of the Providence River

was full of them, even to the City of Providence near the present rail station (Goode, 1887).

When the oyster stock declined in Wellfleet, seed was initially solicited from Buzzards Bay (Goode, 1887).

In general, Buzzards Bay is a remarkable habitat for a variety of shellfish. Other shellfish flourish. Quite evidently, the Bay serves as a spawning area for the shellfish. Coupled with favorable conditions for lobster larvae, it would seem that the conditions that favor this also favor the spawn and young of other species, namely the finfish. It would seem that with a move in the direction of natural conditions, the base exists to realize a ready-made potential of the ecosystem. A variety of marine life with a degree of abundance.

Finfish

To what extent the state fish, the codfish, frequented Buzzards Bay is not clear. But it seems that on a seasonal basis, following the habits of cod, Buzzards Bay was host to the cod similar to comparable waters.

The Cod

Cod occur in Vineyard Sound & Buzzards Bay in the winter season. It seems to remain on the off-shore banks and comes into the shallows in winter, and Southeastern New England appears to offer a favorable temperature to the locus of the species (Goode, 1887).

As abundant as cod were in colonial times, they apparently followed the same seasonal pattern:

> "In March, April, May & halfe June here
> is Cod in abundance; in May, June, July,
> & August, Mullet & Sturgion...In the end
> of August, September, October & Nouember,
> you have Cod againe...." (Smith, 1616).

Similar & current observations are made in Rhode Island. Cod is found in inshore R.I. waters in the late fall, winter, and early spring. In the summer, cod move out to offshore cooler waters. The R.I. Cod fishery is most intensive during the winter months when sizeable catches are made by the trawlers off the sandy beaches & shoal areas. During 1955 cod were present in the area of the Point Judith breakwater until May 30. A 40 inch 17 lb cod was taken in the traps at this time. The cod is one of the most important species in the R.I. winter fishery. In 1957, 558,903 lbs of cod were landed at R.I. ports (Gordon, 1960).

Historic R.I. records document the move of cod to coastal areas. In 1896,

> "...this year's run of codfish is the largest that they (fishermen) ever saw."

and is the first time in memory of the oldest fishermen that a seine full of codfish was hauled ashore on the beach (Block Island). This fish is usually found further from the shore, but this season can be caught like blackfish (tautog), right up to the rocks along the coast. Captain Church of N.Y. says anyone that wants a fresh codfish in this vicinity today can get it by going down on the coast with a rake, or hook & line, something I have never known before (RI Inland Reports, 1896).

In 1901,

> "The cod-fishery in the (Narragansett) bay & adjacent waters has been almost phenomenal."

The fish were abundant on the mussel-beds in the West Passage when the traps were set in the spring, & in the fall had returned in considerable numbers (RI Inland Reports, 1901). The above verifies the seasonal feeding habits of the cod.

In the winter it has appeared as far south as the mouth of the Chesapeake Bay. The southern limit of the species appears to be at Cape Hatteras (Goode, 1887). Cod used to frequent in abundance the mouths of our rivers (Baird, 1883) in pursuit of the shad, salmon & alewives. Cod have been recorded in fresh water upon occasion. Many recorded observations of cod up to the brackish waters of Maine; small cod in the rivers where the surface water is quite fresh; & a 6 lb cod was taken on February 6, 1877 in the Hudson River above Peekskill (Goode, 1887).

Scope of Finfish

Buzzards Bay supports a variety of fish. In 1916, the State Division of Marine Fisheries identified 68 species of fish that regularly inhabit Buzzards Bay. Of these, 32 are used for food, 9 are predaceous to the valuable species (Buzzards Bay, 1916).

Commercially valuable fish for food are: sea bass, butterfish, flounder (winter, summer, 4-spotted), mackerel, scup, squeteague and tautog. For bait: menhaden, alewife, sea herring and squid (Buzzards Bay, 1916).

Fish formerly important but now absent or taken in small quantities are: bluefish, bonito, striped bass, cod, hake, pollock, shad, salmon, smelt and spanish mackerel (Buzzards Bay, 1916, 1917).

The following source lists all recorded species, whether of commercial significance or not.

A review of historic records by researchers from SMU identified 190 species of finfish in Buzzards Bay for the period before 1920. For want of scientific data collections between 1920 & 1960, data was compiled for the post-1960 period. 100 species were identified. Combined, both periods indicate at least 203 species have been recorded in Buzzards Bay (Moss & Hoff, 1989). A similar number ("215 distinct species indigenous to local waters") was reported for R.I. coastal waters (Gordon, 1960). It is noteworthy that two of the 4 species reported by Gordon as not having been reported from New England waters in any previous book were identified by Moss & Hoff in Buzzards Bay. The Yellow Jack were recorded in 3 pre-1920 records, & the Seaboard Goby were identified in 9 post-1960 records (Moss & Hoff, 1989).

The apparent differences in the species composition between the historical and recent collections probably reflect selectivities of the different collecting gear used then and now (Moss & Hoff, 1989), as well as the record-keeping ways of each period. Current data, unlike in the early period, was not based on trap catches. The latter gear were common fishery apparatus in the early period.

But in general, many of the species abundant in one period are abundant in the other. However, discrepancies are good indicators of environmental changes. For example, shad was abundant in the early period. It is not today.

The present finfish of Buzzards Bay includes a resident year-round population of the winter flounder, Atlantic Silverside, mummichog, & fourspine stickleback. Transient but regular species in the summer and fall are the bluefish, butterfish, striped bass, black sea bass and scup (Moss & Hoff, 1989).

Butterfish, sea bass and scup use Buzzards Bay as a nursery ground, and their young-of-the-year numerically dominate the fauna. Prior to 1920, the records indicate the commercial catch to be dominated by the Atlantic mackerel, butterfish, silver hake, alewife, blueback herring, and other species. (Moss & Hoff, 1989).

"Buzzards Bay abounds in a variety of fish..." (Goode, 1887): First catch is a valuable statistic, and can serve as a lead to profile the scope of finfish in Buzzards Bay. An experienced fisherman (Mr Deane) of the local waters recorded the catch in New Bedford for the year 1880. The catch was by means of a weir. The trap was taken out at the end of June and returned in late August. The list will be supplemented by catches in local waters for other years in the same period, and any other obervations about fish caught in the waters of Buzzards Bay at the same time.

Buzzards Bay
1880
First Catch of Finfish in New Bedford Waters

1	Menhaden.....March 24	14	Dogfish.....April 24
2	Alewife.....	15	Mackerel.....
3	Smelt.....	16	Rock Bass...April 26
4	Tomcod.....	17	Sea Robin...April 27
5	Flatfish.....	18	Squid.....April 28
6	Tautog.....April 1	19	Butterfish....May 8
7	Skate.....	20	Kingfish.....
8	Perch.....	21	Squeteague....May 11
9	Sea-Herring...April 6	22	Flounder.....May 13
10	Eel.....	23	Bluefish.....May 13
11	Shad.....April 14	24	Stinging Ray..June 8
12	Striped Bass.April 15	25	Sand shark....June 7
13	Scup.....April 17	26	Shark.....June 10
27	Bonito.....June 25	28	Seres.....August 26

The first Seres was taken on August 26. This is a gold-colored fish about the size of scup: "a very palatable fish". It is quite common some seasons during August and September (Goode, 1887). The species is not listed in the official landing data. An Ichthylogical faculty member at the Harvard Museum of Natural History was unable to definitively identify the species. It appears to be related to the coastal fishes of the genus seriola. The juveniles behave like pilot-fishes & follow ships or coastal sharks.

The Rudderfish (seriola zonata) appears to be the species, since it is listed elsewhere. It is common from July to October. They are banded in color, but lose the bands as adults, & begin to navigate independently. What is not clear is the color & the edibility. (however, the Rudderfish recently observed in Narragansett Bay appears to be too dissimilar to be the species: 'white with black vertical stripes'; but 'warm-water exotic fishes enter Narragansett Bay...colorful strays from tropical waters', offers a source of varieties, one of which may be a type similar to the description of the seres (Narragansett Bay Watch, 1989)). An alternate candidate is the small amber-jack (seriola dumerili). It has been recorded as far as Woods Hole, but the records are open to question (Nichols, 1927). Its common occurrence is as far north as Fla, with a size of 2 feet. Moss & Hoff identify both the greater amberjack & the banded rudderfish as present in the pre-1920 species (2 & 4 records, respectively).

To complete the list:

29 Spanish Mackerel...August 30
30 Razor-Fish.....Septembre 6
31 Goosefish.....
.....
32 Striped Mullett.....
33 Salmon.....
34 Cunner.....
35 Sheepshead.....
36 Cod.....
37 Hake.....

The fisherman noted that striped mullet are quite abundant some years, but none this season. Nor have there been any salmon this year. In 1879 5 small ones were caught (If caught they are returned to the waters. A small number were caught in Dartmouth for the same year). Cunners have been plenty, but hake & cod scarce. A dozen sheepshead have been taken during the season. To complete the identification of varieties 'in the waters of New Bedford' a listing for 1858 of salt-water species not cited in 1880 follows, We shall identify but not count as distinct species with multiple names: Chogset for Cunner; Frost-Fish for Tom Cod. However, we shall let stand Seres and Rudderfish as independent, until further determination.

38 Lump-sucker
39 Whiting
40 Pollock
41 Skipjack
42 Haddock
43 Toad-Grunter
44 Sculpin
45 Bellows-Fish
46 Rudderfish
47 Swellfish

A review of the fish caught in the waters of Buzzards Bay for the year 1880 in the localities of the district, concludes to no other species absent from the above list than the following (Goode, 1887):

48 Swordfish
49 Sturgeon

It is unclear if the sturgeon was caught in the waters of Buzzards Bay. But there was a period when the species was present. It was very abundant in the Sakonnet River in R.I. in colonial times, and it was a favorite fish of the Indians. Indian lore indicate its presence in the Weweantic River in Wareham (See infra). For 1880, 1,500 pounds of fresh sturgeon were landed in the port of New Bedford, & 342,800 pounds of swordfish for the same year. A 1,000 pounds of sturgeon were landed in the Edgartown District for the same year. According to Professor Hartell, Ichthyology, Harvard University, it was not uncommon to catch sturgeon in local waters. He recently caught one in the Cape Cod canal.

In a description of the near home fishery out of New Bedford, the fish are caught 'chiefly in Buzzards Bay', and in season many swordfish are caught (Goode, 1887).

In order to illustrate the continuity of fish common to Buzzards Bay over a period of time, we shall list the other fish found in the waters of New Bedford for 1858 which are also present in 1880 (these are not landings):

> Smelt, Tom-Cod, Herring, Shad, Menhaden, Flat-fish, Bass, Tautog (Blackfish), Scup (Scuppang, Pogies), Cod, Mackerel, Bluefish, Rock Bass, Sheepshead, Flounder, Perch, Eel, Scate, Stingray, Squetteague (sic), Squid, Shark, Dogfish.

For Shellfish: Oysters, Quahaugs, Clams, Lobsters, Scallops, Winkles, Razors, Mussels, Starfish (five fingers) and Barnickles.

Buzzards Bay was recognized for its variety of fish. This was well known. According to a description of New Bedford waters in 1792 by the Massachusetts Historical Society (Vol IV, 1st series, page 233), the City's river provided good fishing for 'the smaller kind' and not far distant from the mouth of the river 'they catch the larger sort'. From the same source,

> "But few markets in any of our sea-ports are equally supplied with variety of fish, and such as are very excellent."

Fresh water fish are listed for the waters of New Bedford. Since anadromous fish are critical to the fecundity of an ecosystem, and non-anadromous fresh water fish are affected by their presence, we provide a complete list:

> Trout, Perch (White, Red, Yellow), Pickerel, Chub, Carp, Silverfish, Minnow, Hornpout, Eel & Clam.

The fresh water sources were not identified. Undoubtedly, they are local. A listing, however, was given for Assawamsett Pond, the surface water source of municipal water for the city of New Bedford. In the southerly part of the pond are large quantities of fish: pickerel, whitefish, perch, roaches, chubs, hornfish, and vast quantities of sea or white perch, which are taken in the fall of the year when the young alewives can be had for bait. In 1880 510,819 pounds of fresh Alewives were landed in the port of New Bedford. The catch was 2nd to menhaden in volume.

To conclude the survey of finfish, we cite an historic example of resources present in a local estuary. In the early years of the Bay the Weweantic River was a tributary rich in marine resources. The river begins in the lowlands of Carver and flows south to Buzzards Bay. It is a slow-moving and brackish stream. In the springtime white perch, herring and smelt spawn in the Wareham part of the river. During this time lamprey eels are observed moving upstream; and the endangered turtle, the Diamond-back terrapins, are also observed. There are abundant conch shell deposits in the area, a staple of the Indians in colonial times. There is also other evidence in the area of species no longer present in the river, namely the remains of the sturgeon and Atlantic salmon. The bones are present among the conch shells. The river is still host to the striped bass and tautog. Tautog are usually associated with rocky areas, but large tautog are present on the mud flats to feed on the blue crabs as they leave the mud. An Indian named Connett frequented the area in colonial times. The site of the depositional materials is named after him, called "Connett Hill." (Metcalf, 1989). The general area is where the Sachem Awashonks hosted Captain Church on seafood from Buzzards Bay (see supra).

Lobsters

The abundance of lobsters in the historic period is decidedly higher than today. The catch per 3 day set of today is 0.8 lobsters (Estrella, Pers Communication, 1989; Estrella & McKiernan, 1987; 1989), whereas in 1841 it was 1 lobster per day per pot, with an average weight of 3 lbs per lobster for Ma Bay (Gould, 1841); and an average of 1 marketable lobster per pot per day off the Elizabeth Islands (Goode, 1887). On a good day, a daily haul of the pot yielded 15 lobsters in the area of Cuttyhunk (Goode, 1887). The lobster industry on the South shore originated in the Elizabeth Isles, in particular at Cuttyhunk in 1807. There was only poor lobster fishing off the Vineyard at the time. It was not till after 1850 that there wa a directed and intense fishery for the lobster. The fishery off the Vineyard was west of Meneshema Bight at Lobsterville, and off of No Man's Land. From 200,000 to 260,000 lobsters were caught in the good years at Lobsterville. No Man's Land yielded smaller catches. At Cuttyhunk in 1880, about 240,000 lobsters were caught. The yield of marketable lobsters was, as noted above, about 1 lobster per pot per day, with an average lobster weighing 2 1/2 lbs (Goode, 1887).

The lobstermen at the time spoke of 2 type lobsters: the rock or ledge lobster that was a resident lobster which found its niche in the crevices of the rocks; and the school lobster, apparently, a migratory lobster that comes from offshore. Unlike the rock lobster, it is catchable on sandy bottoms (Goode, 1887).Apparently, the lobstermen of today that fish the area speak of the 2 types (Estrella, Personal Communication, 1989). (It should be noted that

not long ago it was said the 2 lobster-types did not intermix, i.e. the offshore lobster's range was not coastal. Recent research of the NMFS on the 2 type lobsters & their migratory habits, indicates continuity between the types (Estrella, 1989)).

Limited migratory research was undertaken at the turn of the century. In 1898 adult lobsters released and tagged near Woods Hole tend to travel toward the south & west. Nonetheless, some migrated in a WNW direction. Two liberated in Buzzards Bay at Woods Hole were found near West Island (migrated 4 miles). The longest distance traveled of a lobster recaptured, was 16 miles in 27 days. Many traveled near that distance, with a time of 2 weeks. The researcher concluded to a strong migratory impulse on the part of the lobster:

> "Attention has already been called to the strong migratory impulse which controlled the movements of the animals set at liberty...." (Bumpus,1898,underlines added).

The researcher also expressed concern about the fate of the species & the 'merciless persecution of the lobster', since within 3 months, 20 to 30% of the liberated lobsters were recaptured. It would seem, on that basis, at the rate of fishing effort, most lobsters would eventually be captured (Bumpus, 1898).

Most of the fishermen from the New Bedford District placed their traps near Cuttyhunk. In 1880 the catch was:

> New Bedford.....50,526 lbs
> Fairhaven.....45,000 lbs
> Mattapoisett.....3,000 lbs
> Dartmouth.....75,000 lbs
> Westport Point.....12,000 lbs

The totals were 35 fishermen, 1,088 pots, with 174,726 lbs of lobster caught, for a 4 month season. The yield is 175 lbs of lobsters per pot per day, & over a 4 month season this averages to over or under one lobster per pot. Under if the average weight is 2 1/2 lbs per lobster caught, and more if the average lobster weighs less.

This is in marked contrast to the 0.8 lobster per catch over a 3 day period for today. Still, the per unit catch in Buzzards Bay is on the high side compared to the north shore fishing areas (Estrella, 1989, 1987; Pers Communication, 1989). Notwithstanding the decrease in the yield, it is apparent that Buzzards Bay is a productive lobster area, capable of high per unit yields. It would seem that coupled with a notably distinctive reproductive propensity, a directed lobster fishery has a potential that remains to be realized.

The Upper Estuary

It should be noted that in the middle of the 19th century serious concern was elicited in respect to the decline of the fishery. Within memory, the change in the fishery was too apparent.And this led to a complete review of the fishery, and entailed a commission that subpoenaed those knowlegeable of the problem. A set of interrogatories (a series of questions) were to be answered before a commission (Baird, 1873). The exact causes were never ascertained, but overfishing and the damming of the inland waterways were considered to be critical (the voracious & wasteful appetite of the bluefish was also cited by Baird as a possible cause of the decimation of select fisheries). Pollution was consdidered to be a minor cause, and if so, in a localized manner.

Today, we ask if it is a primary cause. The 2 causes identified by Baird are germane. But given the very high levels in the upper estuary, there is a question if the levels are outside the limits of tolerance. And what effect, whether mitigated or not, will it have on the outer estuary and on Buzzards Bay.

What seems to be the result is that the wetlands in the upper estuary have survived, though not without some damage.

Despite very heavy levels of contaminants as well as evidence of bioaccumulation, the project area wetlands continue to function as effective systems and have high values. The wetlands continue to support and produce biota representative of estuaries in Southeastern New England. Plant biomass, benthic and fish community composition and structure, and avian and mammal use are all typical of estuarine wetlands of the region, although elements of the benthic community indicated the influence of pollutants (IEP, June,1988).

The benthic community at a wetland station has a high number of opportunistic species. The wetland is the most northerly, is located on the Acushnet side and appears to be opposite of a former (chemical) discharging plant. Though a wetland of good size, it does not provide a good feeding habitat for species feeding on benthic marine invertebrates (IEP,1989).

Even with the high sediment levels of PCBs in the estuary, a viable population of infaunal organisms still remains in the harbor. (Bellmer, 1989).

In respect to marine fisheries, a number of fish species, including winter flounder, mackerel, bluefish, and pollock feed in the upper Acushnet estuary. Numerous bait fish were observed in the spring

and late summer within salt marsh tidal creeks. (SES, rev 1988).

Demersal fish were observed: American eel, winter flounder, scup, summer flounder, windowpane flounder, and tautog. Killfish, & silversides would be among the pelagic species expected to utilize the wetlands. (SES, rev 1988).

Also, numerous juvenile fish were observed at the waters edge amongst blades of salt marsh cordgrass within the proposed temporary containment site on the western shore of the estuary.

Alewives and blue-back herring also migrate through the upper Acushnet River estuary to spawn in the Acushnet River (SES, rev 1988).

The Acushnet River estuary, due to its location amidst abundant development, is a haven which provides food, shelter, and nesting sites for migratory waterfowl, wading birds, and year round resident wildlife species. (SES, rev 1988). The overall effect of the PCB and metal contamination and bioaccumulation on the biological systems in the estuary is not readily apparent. (IEP, 1989).

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SOUTHEASTERN MASSACHUSETTS UNIVERSITY
CENTER FOR MARINE SCIENCE AND TECHNOLOGY

September 27, 1989

Mr. C. Chryssostomidis
Director
MIT SeaGrant
College Program Office
292 Main Street
Building E38-300
Cambridge, Massachusetts 02139

RE: Pre-Proposal
History of Fisheries of Buzzards Bay

Dear Mr. Chryssostomidis:

Enclosed is our Pre-Proposal for a two-year grant pertaining to the History of Fisheries of Buzzards Bay.

We look forward to a working ~~relationship~~ with your Office and if there are any questions, please do not hesitate to call me at (508) 999-8474.

Sincerely,

Thomas J. Curry

Thomas J. Curry, Ph.D.
Director

TJC/gml

Pre-proposal Cover Page

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Check one: ☒ Research ☐ Education ☐ Advisory

PRINCIPAL INVESTIGATOR(S) Robert B. Davis Title Adjunct Professor

Campus Address Center for Marine Science & Technology/Dept. of Philosphy/Southeastern Massachusetts University Office phone 999-8474/999-8490

PROJECT TITLE History of the Fisheries of Buzzards Bay

The National Sea Grant Act requires one-third of all expended funds to be from non-federal sources.

First year request from Sea Grant: $ 44,000 Anticipated non-federal contribution: $ 22,000

Second year request from Sea Grant: $ 55,734 Anticipated non-federal contribution: $ 27,866

Project start date: July 2, 1990 Estimated completion date: July 2, 1992

Please provide the names, addresses and telephone numbers of two persons not employed at your institution who are qualified to review a formal proposal in this area for its scientific merit.

1. Division of Marine Fisheries (DMF)
Bruce Estrella
Fisheries Biologist
Sandwich, MA
Telephone: ( ) 508-888-1155

2. John Farrington, Director
Environmental Science Program
University of Massachusetts - Boston/Harbor Campus
Boston, MA
Telephone: ( ) 617-929-8255

Signature [signature] Date 9/29/89

Project Description

History of the Fisheries of Buzzards Bay

What is the marine-related problem, issue, hypothesis or need requiring this work?

Buzzards Bay is a distinct body of water with well-defined boundaries. It is an ecosystem. It has a history of observed and recorded use from colonial times to the present. An urban port (New Bedford) was and is the central port of the Bay.

There exists no unified chronology nor comprehensive understanding of the variety and abundance of marine life in Buzzards Bay. There does exist a variety of scattered records in the literature depositories of the area. The New Bedford Public Library was one of the first, if not the first, public libraries in the United States, and hosts a relatively complete collection of early town histories in its genealogy room.

The decline of the fisheries in the contemporary period relative to the period pre-1920 is evident. The priority of the causes are not. In the mid-19th century a similar view of a fishery decline was held. The difference between current and prior catches was too evident for memory to miss. An extensive investigation of the problem was made. By the U.S.Commission of Fisheries, lead by the Head Commissioner, Spencer Baird. The investigation entailed a review of existing knowledge, with the subpoena of fishermen before a Board of Fishery officials. A list of 40 plus interrogatories were submitted to the fishermen prior to their appearance before the Board. The Board queried the witnesses in terms of the interrogatories.

While a number of causes were recognized, the major cause cited was the damming of the inland waterways, and the attendant prevention of anadromous species from entering the inland bodies of water. With the decline of the anadromous species, there followed a decline of the predators in pursuit of the anadromous fish.

The consequence was a series of legislative measures to remedy the situation. There exists a complete documentary history of state legislation to protect the fisheries, from colonial times to circa 1870. Notable efforts were made to protect the fisheries.

One consequence was the designation of Buzzards Bay as a conservation area that excluded commercial catches of finfish. This

status is historically unique for a coastal body of water. The designation is still in effect.

What will be your approach, including theoretical studies, laboratory analyses and/or field work and what approximate time schedule will each require?

The project is over a 2 year time period. The first year will consist in a review of historical fishery records, local historical documents, and interviews of old timers knowledgeable of the early fisheries. Also, there may exist select measures of primary productivity. At one time NMFS may have made such measures in the Bay. To the extent the data is available, it will be evaluated relative to similar measures for other coastal waters. The principal investigator already has an extensive compilation of primary productivity and chlorophyl a data for coastal & offshore waters.

The second year will be to order the research material and submit a draft document for publication.

Who will use & benefit from your research? How will results be made available to the user?

The study will result in a publication of the history of the fishery of the Bay. The anticipated length is over 300 pages.

The document will be made available to local officials, special interests, fishery officials & researchers, and the general public interested in the topic.

The document will be of direct value to the Center for Marine Research* at SMU, as a baseline study of the coastal waters within the bounds of the Center's research interests.

How is this project relevant to the MIT Sea Grant College Program theme areas?

The project is relevant to the criteria, Ocean & Coastal Processes. The history is a documentation of the impacts of human actions on the coastal environment. The record exhibits the interconnection of coastal & more distant ecosystems. Buzzards Bay is an upper limit of warm waters, and separated from colder waters by what the early literature calls the Great Divide, Cape Cod. The niche of Buzzards Bay within at-large ecosystems will be evaluated. Adjacent bodies of waters will be assessed, namely Cape Cod Bay/Ma Bay & Narragansett Bay.

And consideration will be given to the role of the Lakeville Surface Water Ponds as an inland basin of anadromous species, and their relationship to Buzzards Bay.

*Center for Marine Science and Technology

The interconnected ponds are ranked as the largest natural body of surface water in the state of Ma. They have been managed as a municipal source (Tri-City agreement: New Bedford, Taunton, Fall River) of water since the late 19th century. Recreational activity is limited on all but one of the Ponds. Their role as a habitat of anadromous species has never been evaluated, nor has there ever been an attempt to manage the ponds to serve both purposes: as sources of

water supply & a spawning ground of marine species.

This dual role will be evaluated.

Further, a review of the history of legislation to protect the coastal fisheries will be examined. Many legislative measures were filed in support of the fisheries in the 19th century.

An evaluation of the effect of the legislation will be made. A query will be made of the relationship between statutory (positive) law and natural law, and whether a system of well-defined specific statutes introduces limits on the functioning of more generic law.

What industry, government or community cooperation or support do

you expect as sources of non-federal matching funds?

The vessel of the school as well as one of the City's Harbor Development Commission (HDC) will provide trips to the various ports in the Bay, as well as transit up the estuaries in the direction of the headwaters.

The costs of the project are primarily for salary and publication of the history.

In-kind services and partial salary costs will be assumed by the host institution and others. Some private sector corporations and localities may contribute to the costs.

Note

An Historical Profile of Buzzards Bay is attached, as well as a detailed resume of the principal investigator.

Resume Form

Name: Robert B. Davis

Social Security number: 013-26-9953

Work address: Center for Marine Science & Technology/Dept. of Philosophy
Southeastern Massachusetts

Work telephone: 508-999-8474/999-8490

Education:
A.B., Boston College
M.A., Thesis, St. John's University

Present position: Adjunct Professor

Department: Department of Philosophy

Previous positions:
Visiting Lecturer, University of Rhode Island
Jefferson Community College, Watertown, New York
Wadhams Hall Seminary College, Ogdensberg, New York
Mater Dei College, Ogdensberg, New York

Professional societies:
American Philosophical Association
American Catholic Association

Honors and awards:
Magna Cum Laude, Boston College
Friary Medal, Highest Average in Philosophy, Boston College
International Biography, Cambridge, England, 1976
National Association of Regional Councils, Service Recognition Award, 1983

(continued on back)

Principal publications related to this proposal:

Buzzards Bay: Historical Profile.

NOTE: A copy is attached separately, as well as a detailed resume (attached) for related works.