INVESTIGATION OF POSSIBLE EFFECTS OF DREDGING AND FILLING ELLIOTT AND OLD RHODES KEYS

Report to
Florida State Board of Conservation
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1 Rickenbacker Causeway
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[Restored and transferred to electronic form by A. Y. Cantillo (NOAA) in 1999. Original stored at the Library, Rosenstiel School of Marine and Atmospheric Science, University of Miami. Minor editorial changes were made.]

The Marine Laboratory of the University of Miami, at the request of the Florida State Board Conservation, has investigated the site of a proposed bulkhead line of Elliott and Old Rhodes Keys, Biscayne Bay, Florida (Figure 1).

Observations were conducted to determine the probable effects of 1) bulkheading and filling behind the bulkhead, and 2) the probable biological consequences of obtaining fill from the Caesar Creek delta.

The study covered the areas most likely to be affected by the creation of the bulkhead line proposed by F. Gerritsen of the Coastal Engineering Laboratory in his report to Mr. William C. Martin.

The investigation was limited to the above two factors and did not include observations upon the possible changes in erosive forces created by deepening and straightening the shoreline. The investigation also did not consider partial bulkheading of the area.

This report assumes that the bulkhead line is filled in as shown on the chart. In a discussion with Mr. William Martin the possibility was mentioned that some individual property owners might do bulkheading and filling opposite their property while other owners made no alterations. Specifically, Mr. Martin mentioned that he might be the only one to bulkhead and fill while the other owners might not. Such action would reduce the biological damage because of the smaller area involved. However, as stated above, this study was conducted considering the maximum bulkheading and filling as proposed.

It was also suggested by Mr. Martin that additional fill would be piled on the Keys themselves rather than only behind the bulkhead to the edge of the mangroves. This would require considerably more fill and would take a great deal more from the delta of Caesar Creek. The plans given us do not indicate this and for this study only the area indicated was considered.

Two trips were made to the study area. Five scientists from the Marine Laboratory were directly involved in the investigation and others consulted in their particular fields of interest.

Sixteen stations were occupied (Figure 1) at which observations of salinities, temperature, flora and fauna were made (Tables 1, 2, and 3j.

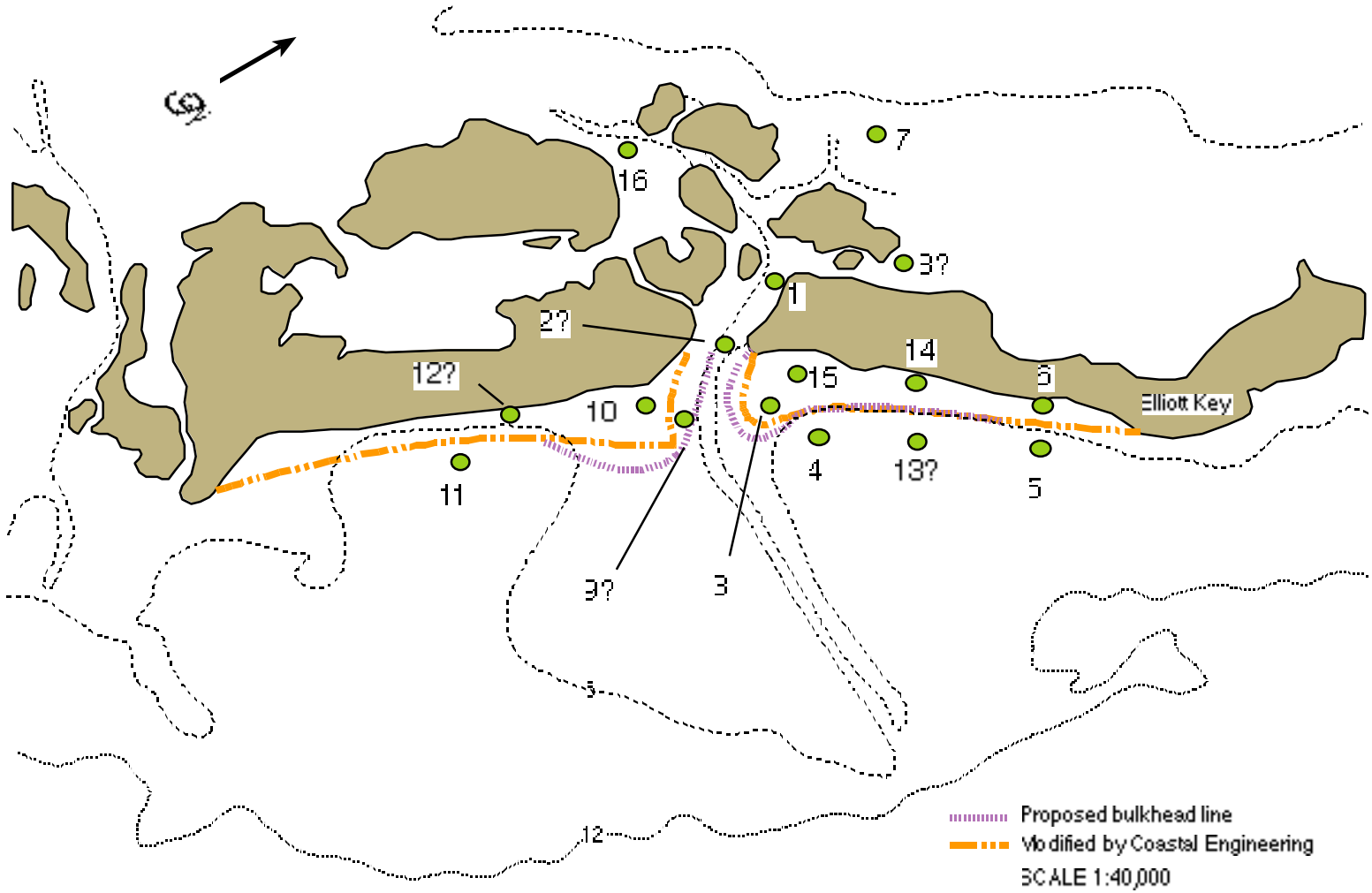

Figure 1. Map of area studied and stations occupied during Elliott and Old Rhodes investugation. Scale 1:40,000. Depth contours are 6 and 12 feet. [SEVERAL STATION NUMBER DESIGNATIONS ARE QUESTIONABLE DUE TO ILLEGIBILITY OF ORIGINAL DOCUMENT.]

Table 1. List of plant life found during the investigation of Elliott and Old Rhodes Keys bulkhead site.

	Name	Depth in Feet	Abundance	Station No.
Spermatophyte	*Thalassia testudinum*	1 - 10	Dominant	3, 4, 5, 6, 7, 8, 9, 10, 14, 15
Algae	*Penicillus capitatus*	1 - 10	Scattered	3, 4, 5, 6, 13, 14, 15, 9, 10
	Halimeda opuntia	1 - 6	Scattered	4, 5, 6
	Halimeda scabra	1 - 6	Scattered	4, 5, 6, 7
	Udotea flabellum	1 – 6	Scattered	4, 5, 6
	Gracillaria confervoides	6 – 10	Common in loose clumps	3, 4, 5, 6, 9, 10
	Laurencia intricate	6 – 20	Abundant, 2nd to *Thalassia*	13
	Laurencia papillosa	6 – 10	Scattered	13
	Ircinia campana	1 - 10	Scattered	13
	Ircinia fasciculata	1 - 10	Scattered	13, 15
	Amphiroa rigida	1 - 3	Scattered	5, 6
	Dasycladus vermicularis	1 - 6	Scattered	5, 6
	Valonia ocollala	1 - 6	Scattered	5,6
	Dictyosphaeria cavernosa	1 – 6	Scattered	4, 5, 6
	Anadyomene stellata	1 – 10	Scattered	5
	Caulerpa laruginosa	2 – 6	Scattered	5
	Acetabularia crenulata	1 – 6	Scattered	4, 5, 6

Table 2. List of animals found during the Elliott and Old Rhodes investigation.

Type	Scientific name	Common name	Station No.	Depth
Coral	*Porites porites*	Finger coral	5, 14, 15, 3, 4, 9, 10, 7	1 – 6
	Siderastrea radians	Starlet coral	8, 7, 3, 4, 12, 5, 9, 10, 11	3 – 10
Gorgonians	*Speciospongia* sp.		11, 13	8 – 12
	Plexurella flexuosa	Whip gorgonian	11, 13	8 – 12
Sponge	*Speciospongia* sp.		11, 13	8 – 12
Molluscs	*Columbella mercatoria*	Dove shell	5, 6	
	Cerithium eburneum	Cerith	5, 6	
	Cerithium sp.		5, 6	
	Modulus modulus	Modulus	3, 4, 14, 15, 13, 5, 6, 9, 10	1 – 5
	Vermicularia spirata	Worm shell	5	2
	Turbo casteneus	Turban	5	2
	Laevicardium laevigatum	Cockle	7, 8	5
	Pecten gibbus	Scallop	3	3
Fish	*Lutjanus griseus*	Mangrove snapper	2, 5, 6, 11	20
	S*phyraena barracuda*	Barracuda	4, 11	20
	Lachnolaimus maximus	Hogsnapper	2	20
	Haemulon sciurus	Bluestripe grunt	5, 6, 11	2 - 5
	Eucinostomus gula	Mojarra	6	3
	lagatis bipinnulatus	Blue runner	5	8
	Lactophrys tricornis	Cowfish	3, 6	2 - 6
	Opisthonema oglinum	Pilchards	4	6
	Dasyatis say	Stingray	6	2
	Chaetodipterus faber	Spadefish	11	10
	Pomacanthus arcuatus	Angelfish	11	10

Table 3. Salinity observations recorded during the survey of Elliott and Old Rhodes Keys.

Date	Sta. No.	Corrected Salinity	Tide	Depth In feet	Water temp.
7/24/58	1	Surface 38.0 ppt	Falling	18	31°C
		Bottom 37.6 ppt	"		31
	2	Surface 38.0 ppt	Falling	6	31
		Bottom 37.8 ppt	"		31.8
	4	Surface 37.8 ppt	Falling	6	32
		Bottom 37.8 ppt	"		31
	6	Surface 37.6 ppt	Low	7	32
		Bottom 37.4 ppt	"		31.4
8/12/58	8	Surface 39 ppt	Low	5	29.5 °C
	16	Surface 38 ppt	Flood	7	29.9
	11	Surface 38 ppt	Low	10	30.0
	14	Surface 38 ppt	Early flood	5	30.0

The main tidal drainage in the area is through Caesar Creek. This channel has a maximum chart depth of 22 feet. Judging from salinity observations made in the course of this survey circulation through this channel from bay to ocean is apparently adequate to allow maintenance of similar salinities both inside and outside the bay (Table 3).

The bottom material, both to the east and to the west of Elliott and Old Rhodes Keys is largely marl, with some shelly material. Some organic material is found in quiet shallows.

The flora consists primarily of the marine grass *Thalassia testudinum*. The algae flora is rather limited and consisted of 16 species (Table 1) .

The "grass flats" observed were covered by from 1 to 5 feet of water at low tide.

At the time of this study temperatures in the shallows ranged between 29 °C and 32 °C.

Observations made with push net and by the aid of mask and fine in water over the flats showed few fish present (Table 2). It is probable that during certain seasons the grassy shallows are frequented by many other species of fish.

Observations made in the deep water of Caesar Creek showed that at the time of the study large numbers of mangrove snapper, grunts and hog snapper were present that were not seen in the shallows.

The area included within the proposed bulkheading. is generally very shallow and apparently little utilized by marine invertebrates or fishes.

The deeper water (4-8 feet) beyond the bulkhead line is same what more abundantly inhabited and certainly supports more algae, finger coral and sponge growth. It is from this intermediate zone that a great deal of the spoil must come in filling operations.

The conclusions resulting from this survey are as follows:

1. The shallow, grassy bottoms included in the proposed bulkhead line are probably not vitally important to the biological welfare of the area.

2. The present revised bulkhead line will probably allow continued circulation of bay and ocean water under normal conditions.

3. The offshore bottoms beyond the bulkhead line are somewhat more productive but can probably be used for fill without causing long term biological harm to the bay as a whole.

4. The silt created by dredging will be carried both in and off shore through Caesar Creek and will kill many marine organism, particularly plant life and sessile marine "animals. This is likely to be a short term effect, however, since re-colonization can probably be expected. It is not known how long this will take.

   There is no evidence that the proposed dredging and filling will harm the local shrimp population since salinities are too high to suggest that the area is a desirable "nursery" ground for small shrimp. It may well support populations of larger shrimp that could be evaluated only with fishing at all seasons of the year.

5. deepening of the area now known as Caesar Creek Bank may do more good than harm in the long run since most o! the area now is so shallow that it is nearly exposed at low tide. The most productive areas now present are those with depth of six or more feet to the north and south of Caesar Creek Bank.

A word of warning should be sounded at this point. The total shallow "grassy" environment in Florida is limited and is very important to life in the area since these areas produce the basic pasturage and organic material upon which all our desirable food and game fish and shrimp depend.

The proposed dredging and filling at Elliott and Old Rhodes Keys is only a small area when considering the extent of filling that has been done in the past and what is proposed to be done in the near future. The effect upon marine life of this alteration when considering individual areas is not always of great importance yet the total effect of all areas is. The biologist is asked to make a judgment of the productivity of an individual area and does not have the opportunity to study its importance in the overall environment. A rather serious error can be committed; individually an area can be relatively unimportant but in the total complex it can be very important. A complete study of the entire area would strengthen the evaluation of this single area.