



**IMPORTANT**  
PAGE 70 WAS ADDED  
IT IS NOT A PAGE IN THE REPORT  
IT SHOWS DETAIL FROM  
ORIGINAL DOCUMENT  
MISSING FROM THE SCAN  
OF PAGE 69

U. S. COAST AND GEODETIC SURVEY.

*J. M. Thorn* Superintendent.

State: *Florida*

**DESCRIPTIVE REPORT. "A"**

*Hydrographic* Sheets Nos. *1925,*  
*1926, 1927, 1928, 1929.*

LOCALITY:

*West Coast of Florida,*  
*from Cape Romano*  
*Southward.*

1888-9.

CHIEF OF PARTY:

*L. J. F. Moser, U.S.N.*

**NOTE**  
PAGES 66 AND 67  
SHOW CONTINUOUS  
SURVEY COVERAGE

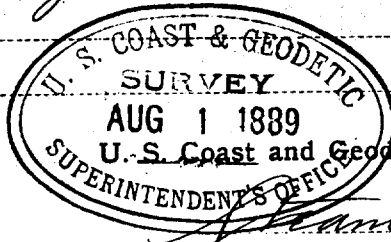
Write me at:

Edgartown, M. V., Mass.

264.

Telegraph me at:

My Express Office is:



Report "A"

James A. D. Bache

July 28<sup>th</sup>, 1889.

2-547

Prof. J. B. Mendenhall

Superintendent U.S. & G. Survey

Washington, D.C.

Sir:

In obedience to "Instructions and Memoranda for Descriptive Reports" I beg leave to submit the following Report "A":—

The work performed during the season consisted of a continuation of the hydrography of the preceding winter season, from Cape Romano southward to a connection with the finished work on the reefs, or to points where the water connections were of no more service to commerce or defence, and to connect the finished work on the three fathom curve with the ten fathom curve from Cedar Keys to Light House Point.

This latter was considered of the first importance. I am glad to say that



we finished this and all of the important work on the Florida Reefs, besides making a survey of St. W. Channel Bar, Key West.

The details of the work I have already referred to in Report "B".

The work as plotted on the sheets I think will be found correct. In the unimportant passages tangents to topographical features were at times used, but they all seemed to work very well on the sheets. The system of blocks adopted has already been referred to.

The channels as far as I was able to observe are permanent, and, as before stated, I believe that the changes are not very great in a generation.

The only harbor improvements in the vicinity of any of the work that is contemplated is on St. W. Channel Bar where preliminary preparations are being made. I am told that a system of jetties will be adopted at a large expense.

The flood tide from the Reefs sets in a northerly direction through the Keys, and the ebb sets to the southward; it must



11/8/89



be remembered however that as the rise and fall of tide on the Gulf side is much greater than on the Reefs side, and the tides from three to four hours later, the currents here do not follow the turn of the tides. In fact every few miles has different tidal phenomena, and a limited period of observations can give us accurate information concerning these varying currents.

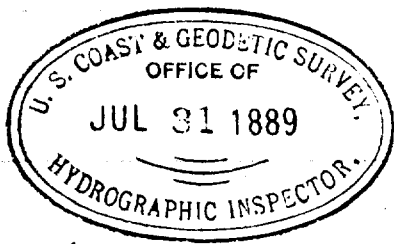
The bottom is rocky, generally covered by a light coat of sand and silt.

For further information I beg leave to refer to my Report "B".

The titles and statistics for the sheets will be found appended.

Very respectfully  
J. F. Moser.

Lieut. U.S.N., Asst. C. of U.S.N.  
Chief of Party



Forwarded  
Chas. M. Thomas, Lt. Comd'r., U. S. N.  
Hydrographic Inspector C. & G. Survey

Soundings:— Proj. No. 4; Big Spanish & Knights  
Key Channels & Approaches, Florida Reefs

Date	Letter	Number of —				Name of Vessel	Observers
		Soundings book	Miles Naut.	Soundings	Angles		
1889							
Jan'y 23	a	1	20.00	1472	224	Stm Launch	Ensigns F. Swift & S.M. Strite
" 24	b	2	39.20	1900	230	"	" " " "
" 25	c	143	35.50	1736	212	"	" " " "
" 26	d	244	35.60	1733	194	"	" " " "
" 30	e	3	32.20	1651	200	"	" " " "
" 31	f	445	32.40	1649	202	"	" " " "
Feb'y 1	g	6	34.70	1679	208	"	" " " "
" 2	h	5	17.30	912	108	"	" " " "
" 8	i	7	4.00	256	38	"	Ensign S.M. Strite & Sea. E. Veith
" 12	k	648	29.60	1726	210	"	& Pay. Yeo. J. I. Dunn
" 13	l	7	27.30	1467	234	"	" " " "
" 14	m	8	22.90	1401	228	"	" " " "
" 16	n	749	35.20	1854	243	"	" " " "
" 20	o	10	13.30	667	100	"	" " " "
" 21	p	911	31.70	1611	212	"	" " " "
" 25	q	10	22.90	1272	205	"	" " " "
" 26	r	11	8.50	519	61	"	" " " "
" 28	s	10	1.70	113	22	"	" " " "
March 8	t	11	26.00	1056	172	"	R. D. Tisdale &
" 9	u	11	15.00	658	107	"	" " " "
			485.00	25,332	3,410		
Jan'y 16	a	1	7.50	682	88	Whale boat	Ensign S.M. Strite & Pay. Yeo. J. I. Dunn
" 17	b	2	1.50	126	25	"	Ensigns R. D. Tisdale & S.M. Strite
" 18	c	1	5.10	387	71	"	" " " "
" 19	d	2	12.50	865	164	"	" " " "
" 23	e	1	12.00	749	148	"	Ensign R. D. Tisdale & Pay. Yeo. J. I. Dunn
" 24	f	2	18.50	1056	214	"	" " " "
" 25	g	3	15.00	851	147	"	" " " "
" 26	h	4	12.30	897	154	"	" " " "
" 28	i	5	2.90	235	40	"	" " " "
" 30	k	3	10.00	821	140	"	" " " "
" 31	l	4	10.20	1317	108	"	" " " "
Feb'y 1	m	5	12.50	1047	116	"	" " " "
" 2	n	5	12.60	928	132	"	" " " "
" 6	o	6	10.00	552	78	"	" " " "
" 7	p	7	7.00	543	110	"	" " " "
" 8	q	6	6.50	818	93	"	" " " "
" 14	r	7	16.50	836	112	"	& Sea. E. Veith
" 15	s	8	16.00	662	112	"	" " " "
" 16	t	7	17.00	637	104	"	" " " "
" 20	u	8	6.00	332	58	"	" " " "
" 21	v	9	10.00	461	64	"	" " " "
March 9	w	9	8.50	862	102	"	H. A. Bispham &
" 11	x	649	10.00	1236	142	"	" " " "
" 14	y	10	5.50	935	80	"	" " " "
			245.60	17,835	2,602		

(over)  
Report of Lieut. J. F. Moser, U.S.N.  
Comdg. Str. A.D. Baiche  
Winter 1888-89



Soundings: - Proj. No. 4 (Cont'd)

Date	Letter	Number of -				Name of Vessel	Observers
		Soundy Book	Miles Naut.	Soundings	Anglos		
1889							
Jan'y 30		1	13.00	1,195	82	Gig	Lieut. J. F. Moser
" 31		2	15.50	1,224	142	"	" " & Ens. H. A. Bispham
Feb'y 1		1	11.25	1,046	54	"	" "
" 2		2	6.90	439	44	"	" " & Ens. H. A. Bispham
" 6		243	11.30	1,082	140	"	Ensign S. M. Strite & Sea. E. Veith
" 14		3	4.60	341	42	"	Lieut. J. F. Moser & Ens. H. A. Bispham
May 13		3	8.50	1,005	32	"	Ensign R. D. Tisdale & Pay. Yea. J. L. Dunn
			71.05	6,332	536		

Recapitulation				
	485.00	25,332	3,410	Stm. Launch
	245.60	17,835	2,602	Whale boat
	71.05	6,332	536	Gig
Total on Sheet.	801.65	49,499	6,548	

Report of Lieut. J. F. Moser, U.S.N.  
 Comdg. Str. Lt. D. Boake  
 Winter 1888-89

# Soundings: - Proj. No 2. - Florida Bay

Date	Letter	Number of —				Name of Vessel.	Observers
		Soundg. book	Sound- ing	Sound- ings	Angles		
<i>1889</i>							
March 8	a	1	20.50	1075	104	"Spy"	Ensigns F. Swift & S. M. Strite
" 9	b	1	21.40	978	146	"	" " " "
" 11	c	2	14.00	390	40	"	" " " "
" 14	d	142	21.80	637	100	"	" " " "
" 15	e	3	6.00	275	38	"	" " " "
" 16	f	2	15.50	550	98	"	" " " "
" 22	g	3	31.80	829	126	"	" " " "
" 23	h	2	27.70	615	112	"	" " " "
" 27	i	3	10.60	367	48	"	" " " "
" 28	k	3	22.25	713	126	"	" " " "
April 4	l	4	10.25	316	40	"	" " " "
" 5	m	4	7.00	226	36	"	" " " "
" 6	n	4	31.75	1075	144	"	" " " "
" 8	o	445	50.00	1508	172	"	" " " "
" 9	p	5	40.00	1223	134	"	" " " "
" 10	q	546	27.25	1317	180	"	" " " "
" 11	r	6	40.25	1421	180	"	" " " "
" 16	s	6	3.50	118	18	"	" " " "
" 19	t	6	5.00	174	22	"	" " " "
" 20	u	647	28.10	1224	130	"	" " " "
" 22	v	7	34.60	1515	238	"	" " " "
" 23	w	748	6.40	435	42	"	" " " "
" 24	x	8	25.20	943	134	"	" " " "
May 3	y	9	18.60	667	64	"	" " " "
" 4	z	9	33.25	1125	94	"	" " " "
" 6	a'	9	3.75	163	14	"	" " " "
" 7	b'	9	18.20	593	46	"	" " " "
" 8	c'	9410	20.00	787	92	"	" " " "
" 9	d'	10	35.00	1353	130	"	" " " "
" 10	e'	10411	16.40	799	74	"	" " " "
			646.05	23411	2922		
<hr/>							
March 9	a	1	7.10	270	43	Stm. launch	Ensign R. D. Tisdale & Pas. Yeo. J. L. Duane
" 11	b	2	10.00	408	60	"	" " " "
" 13	c	1	10.50	418	64	"	" " " "
" 14	d	2	11.00	530	69	"	" " " "
" 15	e	1	15.60	695	87	"	" " " "
" 16	f	2	30.00	1210	167	"	" " " "
" 21	g	1	8.00	385	36	"	" " " "
" 23	h	243	33.10	1425	163	"	" " " "
" 26	i	144	28.10	1255	117	"	" " " "
" 27	k	3	1.25	155	26	"	" " " "
May 9	l	4	30.00	1261	154	"	" " " "
" 10	m	3	25.50	1207	128	"	" " " "
			210.15	9219	1,114		

(over)

Report of Lieut. J. F. Moser, USN.  
Comdg. Stn. Ad. Bache  
Winter 1888-89.



Soundings: — Proj. No. 2 (Contd.)

Date	Letter	Number of —				Name of Vessel	Observers
		Soundings Book	Miles Naut.	Soundings	Angles		
1889							
Feb'y 26	a	1	5.00	130	24	Whale boat	Ensign R.D. Tisdale & Sea. E. Veith
March 22	b	1	7.00	454	63	"	" & Pay. Yeo. J.I. Drown
" 26	c	1	14.50	1712	126	"	" H.A. Bispham & Sea. E. Veith
" 27	d	2	14.80	1287	99	"	" " " "
May 6	e	3	3.50	297	18	"	Ensigns P. Swift & S.M. Stride
			44.80	3880	330		
May 11.		1	16.10	2,139	141	Gig	Ensign R.D. Tisdale & Pay. Yeo. J.I. Drown

Recapitulation				
	646.05	23411	2922	Spy
	210.15	9219	1114	Stem launch
	44.80	3880	330	Whale boat
	16.10	2139	141	Gig
Total on Sheet.	917.10	38,649	4,507.	

Report of Lieut. J. T. Moore, USN  
 Comdg. U.S. A.D. Beache  
 Winter 1888-89

Soundings: - Proj's A & B, Cedar Keys to  
Light House Pt., West coast of Florida

Date	Letter	Number of —				Name of Vessel	Observers
		Soundg. Book	Miles Naut.	Soundings	Angles		
1889							
April 3	A	1	79.20	755	4	Ship	Lieut. Moser & Ensigns Bispham & Tisdale
" 4	B	1	58.72	588	1	"	" " " " " "
" 5	C	1	90.20	880	4	"	" " " " " "
" 6	D	2	58.66	625	—	"	" " " " " "
" 9&10	E	2	73.18	758	3	"	" " " " " "
" 11	F	2	71.77	623	4	"	" " " " " "
" 12	G	3	124.77	1092	4	"	" " " " " "
" 17	H	3	103.17	914	4	"	" " " " " "
" 18	I	4	93.10	826	5	"	" " " " " "
" 19	J	4	62.47	695	12	"	" " " " " "
" 20	K	4&5	70.81	773	—	"	" " " " " "
" 22	L	5	64.02	845	8	"	" " " " " "
Total on Sheet			950.07	9374	49		

Report of  
Lieut. J. Moser, USN  
Sounding Station - Cedar Keys  
Winter 1888-89



Soundings: - Proj. No. 1; Sombroso Key Lh. to N.W. Passage Lh., Florida Reefs

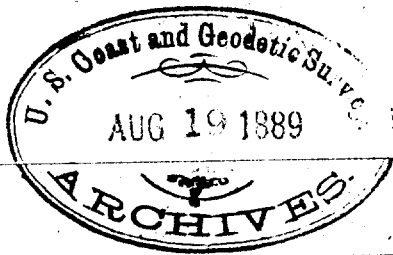
Date	Tide	Number of —				Name of Vessel	Observers
		Sounding book	Miles Hunt.	Soundings	Angles		
1889							
May 13	a	1	13.00	960	36	Whale boat	Ensigns E. Swift & S.M. Strite
" 14	b	1	2.00	221	16	"	" " " "
Total on Sheet.			15.00	1,181	52		

Report of Lieut. J. H. Moore, USN  
 Comdg. Str. C. D. Bache  
 Winter 1888-89

Soundings:— N. W. Channel Bar, Key West Harbor, Fla.

Date	Letter	Number of —			Name of Vessel	Observers
		Soundings Book	Miles Saut.	Soundings		
1889						
May 2	a	1	.50	61	8	Stm. launch Ensign R. D. Tisdale & Pay. Yeo. J. L. Dunn
" 3	b	1	22.50	1995	248	" " " " "
" 7	c	2	22.25	1843	232	" " " " "
Total on Sheet.			45.25	3899	488	

Report of Lieut. J. F. Moser, USN  
 Comdg. Str. USDT Bache  
 Winter 1888-89



U. S. COAST AND GEODETIC SURVEY.

*F. M. Thorn*, Superintendent.

State: *Florida.*

DESCRIPTIVE REPORT. "B"

*Hydrographic Sheets Nos 1925,  
1926, 1927, 1928, 1929.*

LOCALITY:

*Florida Bay and  
Reefs.*

*1889.*

CHIEF OF PARTY:

*Lt. J. F. Moser, U.S.N.*

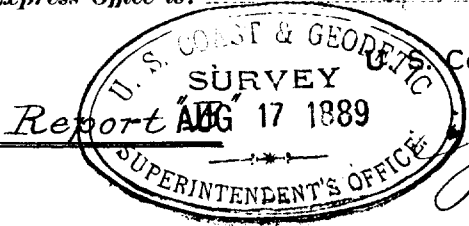
275

Write me at: Edgartown, M. V., Mass.

Telegraph me at: \_\_\_\_\_

My Express Office is: \_\_\_\_\_

T. L. M.



Coast and Geodetic Survey,

Report AUG 17 1889

Steamer A. D. Bache

July 28<sup>th</sup>, 1889.

2-547

Prof. T. C. Mendenhall  
 Superintendent U. S. C. & G. S. Survey  
 Washington, D. C.

Sir:

In obedience to Paragraph 26, Laws and Regulations, Coast and Geodetic Survey, 1884, I beg leave to submit the following report of the operations of the hydrographic party on board this vessel under my charge during the winter of 1888-'89.

After closing work on the coast of Massachusetts, as mentioned in my previous report, the party went to Baltimore, Md., to outfit for the winter's work.

Agreeably to your instructions we sailed December 29<sup>th</sup>, 1888, arriving at Key West January 8<sup>th</sup>, 1889. We stopped at St. Augustine, Fla., en route, to convoy the "Spy," but that vessel failing to appear we proceeded

after waiting a reasonable time.

After coaling at Key West and taking on board the necessary stores and signal accessories, the "Pache" proceeded to Bahia Honda and commenced work January 11<sup>th</sup>.

During the preceding winter this party closed work on the West Coast of Florida from the northward, to a line from Cape Sable to Sandy Key to East Bahia Honda Key.

The work for the present season consisted in the continuation of the hydrography through Florida Bay and James Sound to the Reef Keys, and between the Keys wherever passages exist, connecting with the work previously executed, including the Knights Key Channel and Spanish Key Channel. The development of the ten fathom curve off shore from the three fathom curve from Cedar Keys to Light House Point near Appalachee Bay, and the resurvey of St. W. Channel Bar, Key West, were also assigned this party. The sketches herewith appended will show the area covered.



The Knights Key Channel and Spanish Key Channel are the only two recognized channels east of Key West in which six to seven feet of water can be carried from the reefs to the Gulf; the former extending from the western side of Knights Key between banks and shoals in a northerly direction, and the latter running from Bahia Honda harbor and east of No Name, Mayo's, Annette and Harbor Keys, and west of Little Pine, Grassy, Crawl, Little Spanish and Big Spanish Keys.

These channels and the adjoining waters, as far as a line N. W. from Stirrup Key, were developed by a system of lines, N. W. and S. E., 4 to the mile, and crossed by a series of lines, N. E. and S. W., 3 to the mile. The remainder of the work in this locality was developed by a single series of lines, five to two miles, in a N. W. and S. E. direction, excepting where passages occurred and then special developments were made.

Taking a line from Sandy Key to East Bahia Honda Key the water deepens gradually towards the middle of the line from

both ends, to a depth of about twelve feet; now bend this line to a curve in the direction of Channel Key and the water will shoal gradually as the line is bent until the banks are met. From East Bahia Honda Key to Knight's Key a system of banks with wide channels between are encountered; this same condition prevails north of Key Vacas, where a few scattering banks are found. These increase in number and extent to the eastward, until on a line from Long Key to Sandy Key the Bay is mostly obstructed; east of this the general features are banks and ponds with narrow connecting channels between the ponds. In this portion of the work the channels were simply traversed and the banks outlined. Although signals were erected and located over this area the existing conditions did not warrant a minute development; sufficient however was done to chart the channels and banks.

These waters are not traversed or used by commerce. In the more open waters included between Cape Sable, Sandy Key, the Eastern

Bay Keys, and the banks and shoals to the northward of the reef Keys, a very superior sponge is found, called the Florida Bay sponge, and during the winter until about April 1<sup>st</sup> a large number of small craft, drawing not more than  $3\frac{1}{2}$  feet of water, are engaged in this industry. As you pass to the eastward, and as the water is broken into banks and ponds, sponges are also found but frequently have a reddish color and are less valuable.

These latter waters are also hunted over for turtle by small boats.

The Knight's Key Channel and the Spanish Key <sup>5 1/2 feet</sup> Channel, already referred to, are only used by the small craft in the vicinity, but both are good for (seven feet) at low water and about nine feet at high water. The Knight's Key Channel being an open water channel is wide and preferred. The Spanish Key Channel is very narrow and tortuous near the Bay entrance, and has a strong current setting through it.

The constituents of the bottom vary from rock to mud, but as I have mentioned in

my previous reports on this coast, I believe, and all my observations have confirmed this belief, that when the rock is not actually exposed it is covered by only a thin coating of mud or sand. We have in no instance along this coast, except on top of the mud banks, been able to fix a single stick signal in the bottom. We have tried pumping heavy scuttling down with steam pumps, we have fastened iron wedges to the bottom of the scuttlings and tried to drive them with heavy sledges, but invariably they encountered rock from six to twelve inches below the surface of the bottom. On the mud banks where we have had occasion to place signals the timber would go through four to five feet of mud and sand and then encounter rock.

There is no doubt in my mind that the foundation for all these mud banks is rock. It is along the edges of these banks that some of the best sponges are found, and they generally cling to a rocky base.

I notice in "Three Cruises of the Blake" the statement from Hunt: - "the whole triangular

space between the Rebecca Shoal and Cape Sable being filled up with silt". I do not believe that this is the case. We have carried the work from Cape Romano to the Reef Keys and to the ten fathom curve, and all my evidence is that the bottom is rock over this area, even including the shoal making off to the southward of Cape Romano. We have tried to drive water signals at every point and always failed on account of the rocky bottoms. Last winter I was in consultation with the Cable authorities at Key West in regard to laying a new cable from that place to Punta Rassa and I recommended them to lay the cable in no less than ten fathoms of water, even though it were not the shortest distance, in order to avoid the agitation caused by the sea and the resulting chafing of the cable on the rocky bottom; a difficulty so frequently encountered in the old cable causing much expense, delay, and interruption.

All the evidence in dredging showed large areas of rocky bottom. I mentioned in my report last year that I believed that this



rocky condition extended to the hundred (100) fathom curve, and I still believe it does. No doubt if the waters could be drawn off and the rocky bed fully exposed we would find many holes and wells, the same as we find not only in the shallower waters but also on the Keys, such as Big Pine, Vacas and others, where deep breaks may be noticed which in some instances serve as wells or receivers holding excellent potable water from which vessels water, as those on Key Vacas.

The evidence we have had in working along these reefs and Keys does not confirm the theory that the changes are great or rapid. Wherever we have joined the hydrographic work with that executed thirty and more years ago on the exact line of the Keys we have found little or no change. Further than this the screw piles placed on the mud banks in 1858-'59, on Echooner Bank, Crescent Shoal, Horsneck W., and Middle Bank to mark those  $\Delta^{\text{ms}}$ , are standing in position to-day, and appear as if placed in position but a year or two ago. These banks are all

out in the Bay and in positions where rapid changes would affect them very much. I may state further that in traversing unimportant passages between the Keys that did not warrant a separate system of signals were frequently angled for positions on topographical features, such as tangents to distant Keys, and the work plotted to an unusual exactness. I venture to say that if the original topographic survey had been made with the exactness usually adopted in more important localities, and a similar survey were made to-day, that it would be remarkable to see how slight the changes, if any, would be found.

I admit that any trained observer in visiting this locality from the first of November to the first of May, and seeing the waters whitishly discolored as though holding in suspension a large quantity of inorganic matter, would form the theory that the changes must be rapid and great. Though not a trained observer I noticed that during the winter months the water is always murky, the bottom can never ~~be~~ seen, the tidal currents are strong and

one naturally comes to the conclusion that on certain planes where the Gulf and Reef tides meet and the current of the waters disappear that then the particles held in suspension must drop and form banks and shoals, but such does not appear to be the case. During the latter part of April the waters commence to clear, and we have traversed these reefs repeatedly after April with the water so clear that it only served to heighten the brilliancy of the bottom which stood up like a moving panorama. I have seen just as smooth water and as clear weather in winter as I have in early summer, yet in the one case it would be milky and murky, and in the other clear as crystal. What the cause is I do not know, but I believe - without any material evidence - that the discoloration is not entirely due, or even in great part, to inorganic matter, such as detritus and particles broken from the outer reefs and disseminated by agitation. We all know that these waters teem with organic life, and may it not be in winter that new colonies of the majority are formed

Everyone who has dredged in this locality knows the masses of unrecognizable shapes and forms that are brought to the surface; masses and masses of gelatinous and semi-gelatinous material, probably the matrix, in which the ova is deposited and upon which the young of different organic forms subsist, may not the refuse from this material be one of the great causes of the discoloration of the water.

I have never hauled the dredge in these waters, that I did not have more or less of this substance, sometimes forming coatings from one-half to an inch thick, on a sponge or some inorganic substance, and frequently occurring in lumps as large as a large bucket. I mention this as one of the many substances that may cause the discoloration of the water and that would not add materially in the formation of banks or shoals. The embryos of many marine objects, some microscopically small, would add another large factor.

It may not be out of place here to say that the gelatinous substances referred to are of many forms and colors, from white to black.

Two years ago when my attention was first called to it I selected a specimen about the size of a deck bucket; it looked like a mass of pure rubber and was translucent and elastic. After a long examination I discovered with the microscope that it was penetrated by canals, terminating in points on the surface, and that these canals contained myriads of young amphipods in an undeveloped stage.

In the "Three Cruises of the Blake", page 61, I notice the statement: - "There is practically no evidence that the Florida Reef or any part of the southern peninsula of Florida which has been formed by corals owes its existence to the effect of elevation", and on page 55, "Nowhere else along the reef or the line of keys do we find indications that the highest elevation of the land is due to any causes except those now acting in the formation of the keys &c."

It would be an assumption on my part were I to write in a manner that would even seem to contravert so high an authority as the author of that work, for whose labor and learning I have the most profound regard, but



from my observations on the Keys I cannot help but think that there has been at least an upheaval, and that the forces now in operation cannot entirely account for the formation of the Keys. On the Summerland, Bahia Honda, Pigeon and Rachael Keys, and no doubt on many others that I have not visited, there are old coral reefs with their surface above high water. These reefs were never formed at their present level, of this I feel positive; they may be washed over at extraordinarily high spring tides or during heavy gales, but they could never have attained the proportions that they have even at a much less elevation.

These old corals are massive, such as are usually found on the outer reefs well below the surface of the water and where the conditions are favorable for a vigorous life. In these old reefs I have seen no indications of the shallow water corals. Those I refer to are in situ; they are not uprooted nor do they consist of masses of coral broken from the outer reefs and carried by the action of the sea to their present position there to be formed into a

conglomerate. Wherever I have seen them they seem to stand erect in their beds as originally formed by the polyp, and the interstices filled in with sand and shells forming solid beds. I may be mistaken in my observations as I am not a trained observer but a simple layman, but the evidence to me is very strong that we must seek other forces than those now in effect to explain the formation of these keys. On many of the keys the rock exposed to view is all coral sandstone or oolite, but even on these I believe that other forces must be called to our aid. Take for example the best known key, that of Key West. I do not believe that a piece of ancient coral has been found on this key; it is very rocky, in many cases exposed on the surface, and a large part oolitic; much of the surface rock is coated with what appears to be crystalline lime stone, which is also found in the veins through the rock, and where the rock has been exposed to the action of the sea and the softer parts decomposed and washed out it assumes a rough, porous and jagged appearance,

which if struck with a hammer has a ringing sound like clink stone. On detaching a jagged edge so that the grain is exposed the thin hard veins can be seen, they forming in great part the skeleton of the honeycombed mass.

I do not know the highest elevation of Key West, but there is a central ridge, running in a general east and west direction, which I should judge was about sixteen (16) feet above mean tides. A walk around the island shows the fact that this rock everywhere dips from this central ridge. We all know where a shoal is exposed to the action of the sea that the wave, as it rolls on the shoal rolls around it and encircles it, arranging the particles on the inclinations produced; may not this Key have been formed in this way and gradually elevated. I do not believe that in the history of man that the waters have been over this island at its present height, a sea certainly cannot break over it. In very violent hurricanes the waters, with the wind at S.W., have backed into the lower part of the town, but

this is not frequent. It is true that the wind frequently blows strong and that the sand, from an island once above the waters, may by this agency, under certain conditions, be very much enlarged but I do not think that Key West was formed in that way.

It may be interesting to state that for some time a company has been boring an artesian well, when I left they had reached a depth of over nine hundred (900) feet and they claimed a small stream of brackish water. A few specimens from below nine hundred (900) feet were submitted to me for examination, as the manager thought they had reached chalk and flint. I subjected the specimens to a microscopical and chemical test with such means as I had at hand and found neither chalk nor flint. The supposed flint was a crystalline lime stone coating such as is found on the surface, already referred to, and the supposed chalk was a whitish, friable carbonate of lime without the chalk structure; in fact the successive formations that the well passes through consists of rock

similar to that found on the surface and interspersed beds of sand, from fine to coarse

Pardon this long digression from what may not seem pertinent to a hydrographic survey, but the exposed land bears such an important relation to the water covered surface that it is only by a study of the one that we can make any inference as to the other.

I have already stated that Florida Bay and the adjoining waters produces a large number of sponges which give employment to many men. These people come mostly from the Bahamas and are known locally as "Conchs". The industry is carried on in small schooners and sloops, each craft having from six to eight small boats, called dinghys, from which the sponge is fished, as it is called. In this locality the sponge glass is very rarely used, work is carried on in smooth weather, and at times a few drops of oil are scattered on the water to calm it. The sponge is very readily seen by the man who stands in the bow with a long pole to the end of which is secured, in a socket, a bent two-pronged hook



with which the operator detaches the sponge and flings it into the boat; he also uses the pole as a means of propelling the boat. After a sufficient number of sponges are taken they are carried to some key where they are "killed" by laying them in the sun for about two days, after which they are put in "crawls" - small enclosures built with stakes in the water - and after remaining in the water from four to five days they are beaten and put on strings five feet, two inches long and are ready for market. The cured sponges are carried to Key West and sold at auction.

The most desirable sponge, and the one principally taken, is the wool sponge, though the "hard head" and "grass sponges" are also cured but do not find a ready sale. Many other varieties, such as the loggerhead, glove and others grow in these waters but they are not merchantable.

In my report last year I referred to the turtle catching and it therefore is not necessary to repeat it here.

In many parts of these waters, particularly

around the Keys, different varieties of the shallow water corals are found. I collected three species of *Meandrina*, six species of *Astraea*, one *Oculina*, two varieties of *Porites* and two varieties of *Millepora*, the latter however is a hydroid and not a true polyp. I obtained at the Buoy Depot at Key West a very large specimen of *Madrepore palmata* which had possibly been attached to some of the iron work of a buoy-sinker. In the vicinity of Indian Key, in shallow water, I saw some very large *Meandrina*s, as large as a tub. They are locally called "heads", in fact the natives call all the large masses, heads; it is only the branching varieties that are called corals by them.

The greatest difficulty we had to contend with in our hydrographic work was the complex nature of the tides, and I fear that with all our efforts we have not thrown very much light on this all important subject.

We commenced work in Spanish Key Channel and I selected a point on the eastern side of the same Key as affording a good

position for a permanent gauge, not only for this channel but for a portion of the waters extending to the eastward. It was not until this portion of the work was nearly finished that I discovered that the gauge gave very poor results for the Bay and Reef sides. We however overcame this by means of comparison gauges, and for the continuation of the work to the eastward observed tides on a permanent gauge at Tambor Key with comparisons on such sections as were deemed necessary.

We found it necessary for the correct reduction of the data to divide the work into blocks, and from our observations and predicted tides from former observations, to construct reductions and grade one block to the other. The great difference in time and range of high and low waters made this necessary. For a further correct study of the tides I caused the curves of all the observations to be plotted and compared; these curves were forwarded with the original records of this party.

The following is the report of Ens. Diapham, who under my direction had charge of everything

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pertaining to tides and the reductions. Mr. Bispham has faithfully and ably performed this duty.

In this report will be found the details of the systems adopted and their references.

"Tidal Memoranda":

"Florida Reefs and Bays"

"N. W. Channel."

"West coast of Fla., North of Cedar Key"

From Jan. 14<sup>th</sup> to May 10<sup>th</sup>, 1889

"During the season's work among the Florida Reefs and in Florida Bay, tide stations were occupied as follows:—

(1) *to Crane Key*, Jan. 14<sup>th</sup> to Feb. 13<sup>th</sup>, 1889, inclusive

(2) *Big Spanish Key*; Feb. 6<sup>th</sup> to Feb. 8<sup>th</sup> " "

(3) *Bahia Honda*, Feb. 8<sup>th</sup> to Feb. 10<sup>th</sup> " "

(4) *Bamboe Key*, Feb. 11<sup>th</sup> to May 10<sup>th</sup> " "

(5) *Little Hog Key*, Mch. 13<sup>th</sup> to Mch. 15<sup>th</sup> " "

(6) *Man of War Bush*; Apl. 24<sup>th</sup> to Apl. 25<sup>th</sup> " "

(2) and (3) were comparison gauges in connection with (1)

(5) and (6) were comparison gauges in connection with (4)

All gauges were plain staffs, numbers increasing with rise of tide. They were always secured to a "

"piece of scantling driven firmly in the bottom. A sight vane was always placed conveniently on the beach to see that the gauge did not settle and to enable the gauge to be replaced should it carry away.

On Camel Key gauge was placed about 500 meters to the northward of "Jack". It stood near a dilapidated house, owned by a Mr. Nicholas, about 40 meters from N.W.M.

On the S.E. pile of this house is the P.M.

The P.M. is the middle nail of three copper nails driven in a horizontal line about 2" apart; above and below the middle nail a galvanized iron nail is driven. The letters "C.S." are made in copper tacks above the copper nails.

38 H.W.'s and 44 L.W.'s were observed

Mean of 38 H.W.'s	1.854 ft.
" " 44 L.W.'s	.993 "
" Rise and Fall	.861 "

P.M. above mark "3" of gauge	1.360 "
" " " M.L.W.	3.367 "

"The comparison gauge at Big Spanish Key was near O'ced". A comparison of 4 H. W.'s and 3 L. W.'s show the tides to be 1 hour, 30 minutes later, and 1.4 feet greater rise and fall than at Co Stame Key gauge. The curve shows a marked difference in character from the curve of the Co Stame Key gauge, but a close resemblance to the curve of Content Key gauge (results predicted from last year's observations). This comparison shows the tide at Big Spanish to be 1 hour, 30 minutes later, and the rise and fall .5 foot less than at Content. The latter comparison has been accepted.

The comparison gauge at Bahia Honda was on the North side of the key. A comparison of 2 H. W.'s and 2 L. W.'s showed the rise and fall of the tides to be the same as at Co Stame Key, but 2 hours earlier.

The Bamboo Key gauge was placed on the West side of Bamboo Key, about 30 meters off shore, fully exposed to all tidal influence. The two principal houses on the key - to the Northward of the lookout-pole and close together - face the gauge; near it on the beach is a coconut tree. "The"

" Lookout-pole above mentioned is "Pam".

Two P.M.'s have been established on Bamboo Key; the first is on the coconut tree; the second, on the lookout-pole. In each case the P.M. is the middle nail of three copper nails driven in a horizontal line about 3" apart; above the middle nail, and also below is driven a nail; the letters "C.S." "B.M." are cut above the P.M.'s.

173 H.W.'s and 173 L.W.'s were observed.

Mean of 173 H.W.'s	2.970 ft.
" " 173 L.W.'s	1.668 "
" Rise and Fall	1.302 "

P.M. (Tree) above mark "5" of gauge	3.264 ft.
" " (Lookout-pole) " " "5" "	6.757 "
" " (Tree) " M.L.W.	6.596 "
" " (Lookout-pole) " " " "	10.089 "

The gauges at Co Name Key and Bamboo Key were read together for two days, giving 4 H.W.'s and 4 L.W.'s as a comparison; the results were very unsatisfactory owing to the long stands at both stations, but show approximately that the tides at Co Name Key are 3 hours earlier and .5 foot less

rise and fall than at Bamboo Key.

The comparison gauges at Little Hog Key and at Man of War Bush show an inappreciable difference both in time and the rise and fall of the tide from the Bamboo Key gauge.

A tide book was constructed from the results of the comparison gauge at Bahia Honda with Utkame Key.

A tide book was constructed from the results of the comparison gauge at Big Spanish Key with Content Key.

The reduction of soundings on Projection No. 4 - Spanish Key and Knight's Key Channels and Approaches - Scale 1:20,000 - has been accomplished as follows: All the work to the Eastward of Little Pine Key to a line running  $S\ E\ \frac{1}{2}\ E$  (mag.) from Lemon Key, by the Bahia Honda gauge; the shore making out from the S. E. point of Little Pine Key makes the natural limit to the Southward. East of the line from Lemon Key, the Bamboo Key gauge is used.

The work in the vicinity of Big Spanish Key to a line running from the northern extremity of Big Pine Key, N. E. to Annette Key, and from Annette Key N. E. to Mayo's Key is reduced by the Big Spanish Key gauge. The remainder of the



"Crock, - which is in the vicinity of Oo Oame Key - is reduced by the Oo Oame Key gauge. The lines referred to are shown on projection in dotted red lines.

All the crock on Projection No 2, - Florida Bay, Scale 1:40,000 - is reduced by the Dambro Key gauge.

The two days crock on Projection No 1 - Florida Reefs, Scale 1:40,000 - is reduced by the same gauge as the crock in this vicinity last year: namely, Content Key gauge and N.W. Channel Lt. Hs. gauge (Block No. 8)

The crock on the North West Passage bar is reduced by means of a gauge established at the Light House by a party working in the vicinity under the Engineer Corps, U.S.A. The tidal data has been taken from the records of the above party, through the kindness of the officer in charge.

The crock on the West Coast of Florida, north of Cedar Keys, is reduced by a tide gauge on the Steinhatchee River, Deadman's Bay. A comparison gauge was placed at the mouth of the river, showing no difference in time, or in rise and fall of tides at the two places.

A comparison gauge was also established "

" at position I-1- in 5 fms water. Owing to unsuccessful working of the Patchelder Pressure gauge, the results were unreliable.

Tide curves for the entire series of tidal observations have been plotted; also the curves of the comparison gauges have been superposed on the corresponding curves at the main gauges. This work has been done by Eugene Veith, Seaman recorder, in a most satisfactory and most creditable manner."

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The difference in the time and range of tides on the Gulf side and the Reef side is so great that the current runs between the Keys with great velocity. In the deep water to the westward of Knight's Key, and between Long Key and Couch Key, the rips are very heavy and during Spring tides there are overfalls that might swamp a small boat.

To get a correct knowledge of the tides in this locality would require many permanent stations, and these are so difficult to maintain that a single party cannot accomplish it. Very few people live on these Keys so that

observing parties, of no less than two members, must be encamped and must be visited frequently in order to supply food, water and correct the time-pieces. Generally these places are inaccessible for a vessel, and small boats must traverse long distances to establish communication.

It is generally believed that the rise and fall of tide in the Gulf is very small and that there is but one tide a day; this on the west coast of Florida is not the case. There are two tides each day, and they are of the nature of the Pacific Coast tides in so much as they show an inequality each day in the rise and fall. I have not the exact figures to refer to, but approximately the tides on the Reef side rise and fall about 1.5 feet, on the Gulf side about 3.5 feet to 4 feet, and the difference in high and low water is from three to four hours, and all this is subject to great interference from wind and sea. You can thus imagine the great difficulty a single party is subject to in getting correct data when working on the dividing lines.

In my previous seasons reports I suggested

the necessity of having permanent gauges on this coast for correct data, and my experience since has in no wise lessened my idea of this necessity.

Very few of the  $\Delta^m$  marks on the keys remain in this section. We were very much surprised to find the screw piles marking the  $\Delta^m$ s on Crescent Shoal, Horseneck W., Schooner Bank and Middle Shoal in position, and apparently in excellent condition. Appended will be found a list of  $\Delta^m$ s found or of which some mark was discovered.

In my report two years ago of work executed south of Cedar Keys, where we recovered many of the same piles marking the shore  $\Delta^m$ s and standing over 30 years, I suggested that such piles should now be used on our work. My experience this year confirms the durability of these surface marks. I do not think that we fully recognize the importance of our surface marks, and too frequently mark the  $\Delta^m$ s with material that is soon destroyed. I have lately seen  $\Delta^m$ s marked on the Coast of Florida with terra-cotta pipe; in a very

few years these points will be wiped out of existence.

I would call attention to the fact that a rock or head somewhere between Rachael Key and Hog Island was not found. We could obtain no definite information concerning it; the limits in which we were told it was situated, from different statements, included about four square miles; not could we find anyone who could place us near it, or who knew anything definite about it. The Capt. of a sponger, who I was told was a very reliable man and would have positive information if any one had, said that he knew of no outlying rock or head in the locality. A search was made however and every boat had instructions to keep a careful lookout for any dangers, but none were discovered.

I was greatly assisted on this work by the Schn. "Spy" which the Office was kind enough to assign me; in fact I should have been unable to have prosecuted the work in the shoal water successfully without her, as this vessel could not get near the rock.

It was my original intention to make a reconnaissance through the keys from Key West to the Spanish Key Channel. The "Spy" made the passage but had hard work in getting through. One foot is about the greatest draught that can be carried at low water in this channel in an east and west direction. There are several channels from the Gulf to the Reefs between the Keys with about four feet at low water, but time did not permit me to make a full examination.

### Section III

The latter part of March I left the "Spy" and party to continue the Reef work, and with this vessel went to Cedar Keys to carry out the instructions of the Office in connecting the in-shore hydrography, or three fathom curve, with the ten fathom curve. (See sketch appended.)

The waters along this coast, from Anclote to Apalachee Bay, shoal very gradually, and the ten fathom curve is from thirty to forty miles off shore. The shore being very low is in most cases out of sight at the three fathom curve.

To signal this coast for the purpose of simply locating the inner ends of the lines would

have required a long time, not to speak of the difficulties in transporting the lumber over such long distances. As the manner of executing this work was left at my discretion I concluded to locate the lines by astronomical observations, particularly as there were no outlying dangers. I therefore adopted a system of lines two miles apart and, in order to give the greatest weight to Meridian Altitudes, laid them true East and west. The chronometers were also well rated by telegraph for longitudes.

We found, however, after commencing work that by standing well into the shore that we were able to recognize certain topographical features, such as points of land, woods, keys, and a few houses that were on our sheets.

By the usual methods we were therefore able to locate the inner ends of the lines quite accurately. When the conditions were very favorable we anchored barrel buoys on the inner ends of the lines, and in this manner obtained very good results. I may therefore say that the lines are located by angles on located shore objects, and astronomical positions.

The system of true East and West lines was frequently disturbed by wind and current, which however slight was sufficient to bend the lines from their true courses.

The tide gauge was erected in the Steinhatchee River and comparisons were made, outside of the mouth, in three fathoms of water in Deadman's Bay, and in six fathoms south of Ocklockonee Shoal. The comparison in the deep water though not entirely satisfactory gave sufficient results to warrant the use of the observations on the Steinhatchee gauge for all the work. The details of the gauge are set forth in Mr. Bispham's report, page 26.

The bottom, from Cedar Keys north, is quite regular as far as Deadman's Bay, but in the approaches to Apalachee Bay a change of depth of a fathom is not infrequent beyond the six fathom curve.

This portion of the coast, from Cedar Keys to Light House Point, is known to sponge fishermen as "The Bay", and here the larger schooner spongers assemble in fleets soon after the first of April. The water then is perfectly clear



and the bottom is plainly visible in seven fathoms of water. These sponges are taken in five and six fathoms of water by means of a pole forty feet long with hook attached. The water glass — a simple cedar bucket with a glass bottom — is here used, and two men are employed in each dinghy; one to propel the boat with a paddle and assist in turning the pole, and the other with a water glass who also detaches the sponge. These sponges are "killed" on the decks and in the holds of the vessels, and you can imagine the stench that arises from the decaying animal matter. These Bay sponges are a wool sponge and I am told are the best in the Florida market.

After finishing the work on this section, April 23<sup>rd</sup>, we returned to Key West April 29<sup>th</sup>, having been delayed by bad weather.

On our arrival at Key West, by direction of the Office we made a survey of U. W. Channel Bar. We found here a large party, under the U. S. Army Engineers, who are making tidal and current observations and making borings with a view to the improvement of the channel.

As they had established an elaborate set of signals, through the kindness of the officer in charge I received their location and then connected them with our own data. We were employed on this work about a week, in which time we also found and located a rock in the narrowest part of the Main Ship Channel, a report of which has already been made; after which we continued work with the "Spy" on the Reefs.

Referring to the anchorages, winds &c, I beg leave to say:—the seaward entrance to Spanish Key Channel, usually called Bahia Honda Harbor, is the only real harbor in this section where vessels drawing thirteen (13) or fourteen (14) feet of water can ride out any weather. A vessel can make a good anchorage on the reefs almost anywhere in ordinary weather, and from Alligator to Fowey Rocks it is all a pound with good anchorages in any weather, but from Alligator to Key West vessels anchoring on the reefs are very much exposed to winds from East to S.W. A few buoys at Bahia Honda would make it very accessible. The chart is the

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3/10.

best guide; in the absence of buoys the small rocky islet off the west end of Big Bahía Honda, Key is very useful. In entering the harbor with this vessel I would get the small islet well on the west point of Big Bahía Honda and run for it until close aboard, then shape course up the channel keeping the shoal off the Summerland Keys best aboard to avoid an eleven (11) foot spit that makes out from the eastern banks.

A fair anchorage may be made to the westward of Knight's Key, not good however for South and W.S.W. winds. Vessels of light draught, seven or eight feet, can make a better anchorage between Key West Bank and Knight's Key.

The Keys are mostly wooded with a scrub growth, and many of the reef keys have coconut plantations. These plantations have not been remunerative except where some northern man has been found, who has bought at a high figure.

Pilots for the Bay and Keys are found in Key West. Our charts, however, will convey to an intelligent navigator more information than the vast majority of men who call themselves

Pilots.

The prevailing winds in winter are Easterly, with "bothers" every five or six days, as described in previous reports.

The wrecks on the outer reefs are still very frequent. No doubt many are intentional to get the insurance, whilst others no doubt are caused by vessels with head wind standing off the reefs a certain number of hours and then standing on the same length of time, not knowing that whilst the current flows in the axis of the stream it also trends on the reefs.

I do not think it is generally known that the stream runs with considerable velocity close to the coast from Jupiter to Fovey Rocks, and as this part of the coast is not lighted the greatest vigilance is necessary. In fact coast-wise steamers, unless they have the wind strong from the N. West, steer from Hatteras direct for Matanilla and then hug the Eastern side of the channel to Gun Cay, and from there cross the stream to Carysfort. This course they have pursued I am told for several years. Some time ago a number of the captains of

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the Mallory and other lines petitioned the Governor of Nassau to have a light erected on Mata-cilla, but I am told it was refused.

In this connection I might call attention to a subject in the lighting of the reefs which might bear discussion, that is the placing of red sectors on the reef lights to cover the dangers. Making a passage to the southward one is desirous to hug the reefs close to avoid the stream; if the red sector is a success and the line of change of color is bright and sharp I know of no place where they could be placed to a better advantage than on these Reef lights.

On May 14<sup>th</sup>, having finished the work over the area signalled, and having continued the work until the waters disappeared in narrow boat channels and ponds, we closed work and returned to Key West and prepared to go to Sapelo, Ga., where we had been directed to stop and examine into the grounding of a lumber ship. On the eve of sailing we were however directed to proceed North without stopping.

After a very disagreeable passage we arrived at New Bedford, Mass., May 24<sup>th</sup>.

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In closing this report I desire to call the attention of the Office to the officers and men under my command who so cheerfully assisted in the execution of all the work.

I desire particularly to call attention to the services of Benign Swift, who was in charge of the "Egpy", and who has been detached from the Survey. When he is again available for this work I am sure the Survey will be benefited by his services. He is an able commander, a zealous and efficient worker, and always cheerful when others are dejected and miserable.

The statistics of the work are appended, and though we did not accomplish as many miles as in former seasons under my command, owing to the nature of the work, the party was fully and constantly employed.

Number of Miles of soundings run (Geog.)	3142.8
Number of Soundings	102,602
Number of Angles	11,644

The following is a list of the officers attached to this party during the past season: —

Ensign F. Swift, U.S.A.

Ensign H. A. Bispham, U.S.A.

Ensign R. D. Tisdale, U.S.A.

Ensign S. M. Strite, U.S.A.

P. A. Surgeon J. M. Steeler, U.S.A.

Asst Engineer T. H. Leonard, U.S.A.

Recorder Geo. R. Jones

Recorder J. L. Dunn

Recorder J. M<sup>o</sup>le Tiffany.

Very respectfully  
J. F. Moser.

Lieut U.S.A., Asst C. & G. Survey  
Chief of Party

Report of  $\Delta^{\text{ns}}$  visited, winter 1888-'89

$\Delta^{\text{ns}}$  Torch, Plover, Horseshoe, Driftwood, Johnson, Sandy Key 2, Cape Sable Astronomical: - These marks were found the same as described in the report of last year.

$\Delta^{\text{ns}}$  Content and Lemon were again searched for but not found.  $\odot$  Content 2 was found standing.

$\Delta$  Coconut: - An old sponger said he remembered the old signal and mark at "Coconut", but the point on which it stood had washed away; a careful search in the water revealed nothing.

$\Delta$  Little Pine '56: - A very careful search was made for this point. A tripod signal was erected on a spot that, though not marked, showed every evidence from natural surroundings to have been where the original signal stood.

The following  $\Delta^{\text{ns}}$  were looked for but not recovered: - Kilgard, No name - Rockwell, No name - Shell fish - Kettle - Bahia Honda - C end of base - Matasses Key - Duck Key, Knights Key - Paimbo - Osceola - Horseneck



J.C. Clark, 1857.

Willie.

Erected near the center of a small point running out from Pine Key and almost in line between Stirrup and Grassy signals.

A hole was out in the coral 20 ~~xxxxxx~~ inches in depth, a bottle buried at the center and an iron cone placed over it. A nail was driven in a large stump nearly due west 24 ft. 7 in. from center.

Stirrup

WSW

Stirrup

ENE

Horseneck West

N. 2 S.W.

Channel Key.

by J.C. Clark, 1857.

On Channel Key, a small island about 1-1/2 miles north from Duck Key, on the ~~xxxxxx~~ northwest side on an open place surrounded by trees about 75 yards from the beach. Marked by a stone monument and by 3 stakes, 2 ft. equidistant and projecting 1 ft. from the ground. By 1 granite stone, distant 5 ft. N. 18 E. from center, projecting 8 in. ~~xxxxxx~~

Grassy

S. 35 W.

Horseneck West

N. 65 W.

Willie

S. 53 W.

By 1 granite stone 5 ft. S. 8 W. from center, projecting 8 in. from the ground. These were added afterwards.

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Shoal East - Blue Bank - Oxfoot - Spoonbill -  
Dowlegg - Olive - Curlew and Rachael Key.

△ Pigeon Key: - The granite post was found but had been pulled up and the upper end turned over and put in the hole in the ground; it was placed in its proper position and secured, and I think is in the exact spot.

△ Howie's House, S. W. Gable (on Knight's Key): - The house is not standing, nor do any traces of the house remain; but a cistern, said to be at S. W. end of old house, is still intact.

△ Willie: - This point was on a small rocky islet, scarcely large enough for a large tripod; though no trace of the original mark remained, the smallness of the island precluded any appreciable error for using the center of the island for the △<sup>n</sup>.

△ Grassy Key: - One of the white stones described in the description furnished <sup>J. C. Clark, 1857.</sup> was recovered, the others had been removed; the stakes of the old signal were also recovered.

△ Channel Key: - Although no mark was recovered, a tripod was built on the only accessible point of the island to build a signal, and

where the description showed the old  $\Delta^m$  point to have been.

Long Key: - Not recovered, though no exhaustive search was made.

Jewfish: - Some traces of an old signal (iron bolt &c) were found in water near the shore line, but no definite mark (as described in description furnished) was recovered.

Lignum Vitae: - Not recovered; a very thorough search was made in the locality of  $\Delta^m$  point as furnished by original description, though not found here, the mark may probably be concealed under a very large pile of brush, in which it would be impossible to search without burning off. (A.H. Serrard, 1857.)

Horseneck W.: - Recovered; screw pile intact, and agreeing with description furnished. A tripod signal was erected over it. (J.C. Clark, 57.)

Middle Shoals: - Although no description of this  $\Delta^m$  point was furnished, it was recovered without trouble. An iron screw pile, about a foot above the bank (which is dry at low water) marks the  $\Delta^m$  point. A tripod signal was built over it. (J.C. Clark, 1857.)

A. H. Seward, 1858.

318.

Center Key:— This point was partially recovered; although none of the marks as described remained, a part of an (apparently) old tripod was found, and natural surroundings given with description.

Schooner Bank:—  $\Delta^m$  mark fully recovered; screw-pile set in brick masonry, dry at low water. Description given correct, and the same as original record. A. H. Seward, 1858.

Man of War Bush:— Mark partially recovered; only one of the granite monuments was recovered; locality answers description furnished. Seward J. F. Moore, 1859-90, 70 others last time. A. H. Seward, 1858.

Rabbit:— Three of the five granite monuments were found in place; no traces of the other two. Erected tripod signal.

Oyster Key:— One granite monument recovered, apparently marking the  $\Delta^m$  point. Over this was erected the tripod used. A few days later on visiting the locality a second post was found about thirty meters from first post, but lying on its side in the water, being entirely covered except at very low tide. A. H. S. 58.

Δ Crescent Shoal:— The screw-pile as described was found in position on the S. E. end of Crescent Shoal, about one foot under water and apparently in good condition. Erected tripod over it.

Δ Stirrup Key:— Found two pieces of corallitic stone, about 20 in. long and section 4" x 6", lying on the ground out of position, on the point described, and a short distance from there the shell of a very old stump but no evidence of a central mark. Erected a tripod over the supposed position, and after plotting its position found it to agree with the old  $\Delta^m$ . It must be remembered however that my work was done on a 1:40,000, where a few meters out of position would be inappreciable. I should not have accepted it on the  $\Delta^m$  if on trigonometrical work.

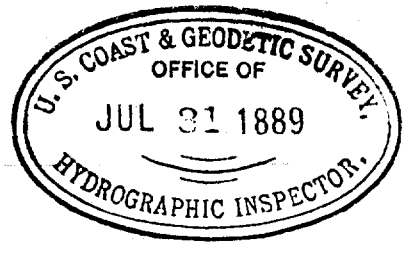
In the list of  $\Delta^m$ s given as "not found", I do not desire to say that they do not exist; in most cases a systematic search was not made, as a sufficient number of  $\Delta^m$ s were recovered for our work without expending a great amount of time in clearing the keys and erecting trial signals to aid the search.

11 | 8 | 89

It is probable, however, that the surface marks of nearly all those marked "not found" have disappeared.

The position of Sombroso Light as furnished on the Office sheet was not found to be correct. We located it by occupying the Light, and cuts from  $\Delta$ ms Pigeon Key and Crescent Shoal. See Anglebook.

Very respectfully  
D. F. Moser.  
Lieut. U.S.N., Asst. S. & G. S.  
Chief of Party



Forwarded  
Chas. M. Thomas, Lt. Comd'r., U. S. N.,  
Hydrographic Inspector C. & G. Survey.

Statistics of Field Work executed by *Lieut. J. F. Moser, U.S.A.*

Date of beginning field work ..... *Jan'y 11<sup>th</sup> 1889*  
Date of closing field work ..... *May 14<sup>th</sup> 1889*

RECONNAISSANCE:

Area of, in square statute miles .....  
Lines of intervisibility determined as per sketch submitted.....  
Number of points selected for scheme .....

BASE LINES:

Primary, length of.....  
Secondary, length of.....  
Beach measurements, length of.....  
Number of days employed in measurements of base.....  
Number of days employed in re-measurements.....

TRIANGULATION:

Area of, in square statute miles .....  
Signal poles erected, number of.....  
Observing tripods and scaffolds built, number of.....  
Observing tripods and scaffolds built, heights of.....  
Days occupied in opening and verifying lines of sight, number of.....  
Stations occupied for horizontal measures, number of.....  
Stations occupied for vertical measures, number of.....  
Geographical positions determined, number of.....  
Elevations determined trigonometrically, number of.....

GEODESIC LEVELING:

Elevations determined by spirit-leveling of precision, number of.....  
Lines of geodesic leveling, length of.....

LATITUDE, LONGITUDE, AND AZIMUTH WORK:

Latitude stations occupied, number of.....  
Pairs of stars observed for latitude, number of.....  
Average number of observations on a pair.....  
Longitude stations, telegraphic, number of.....  
Longitude stations, telegraphic, number of nights on which signals were exchanged.....  
Longitude stations, chronometric, etc., number of.....  
Azimuth stations, number of.....  
Number of nights of observations for azimuth.....  
Number of stars observed for azimuth.....

1889



GRAVITY DETERMINATIONS:

Number of pendulum stations occupied.....

MAGNETIC WORK:

Stations occupied for observations of the magnetic declination, number of.....

Stations occupied for observations of the magnetic dip, number of.....

Stations occupied for observations of the magnetic intensity, number of.....

TOPOGRAPHY:

Area surveyed in square statute miles.....

Length of general coast-line in statute miles.....

Length of shore-line of rivers in statute miles.....

Length of shore-line of creeks in statute miles.....

Length of shore-line of ponds in statute miles.....

Length of roads in statute miles.....

Topographic sheets finished, number of.....

Topographic sheets, scales of.....

Topographic sheets, limits and localities of:

HYDROGRAPHY:

Area sounded in square geographical miles.....

Number of miles (geographical) run while sounding.....

Number of angles measured.....

Number of soundings.....

Number of tidal stations established.....

Number of specimens of bottom preserved.....

Current stations, number of.....

Hydrographic sheets finished, <sup>unfinished</sup> number of.....

Hydrographic sheets, scales of.....

Hydrographic sheets, limits and localities of:

2500
3142.8
11644
102602
3
34
5
1:10,000 - 1:20,000 - 1:40,000 & 1:80,000

- 1-8000 Proj. A & B: - Cedar Keys to Light House Pt., West Coast of Florida
- 1-20000 Proj. No. 4: - Big Spanish & Knights Key Channels, Florida Reefs
- 1-40000 Proj. No. 2: - Florida Bay
- 1-40000 Proj. No. 1: - Sombra Key Lh. to U.S. Passage Lh., Florida Reefs
- 1-10000 Exam.: - U.S. Channel Bar, Key West Harbor, Fla.



323.

N.W.

Portion of Chart N<sup>o</sup>. 1

Report of Lieut. Moser, Comdg. Str.

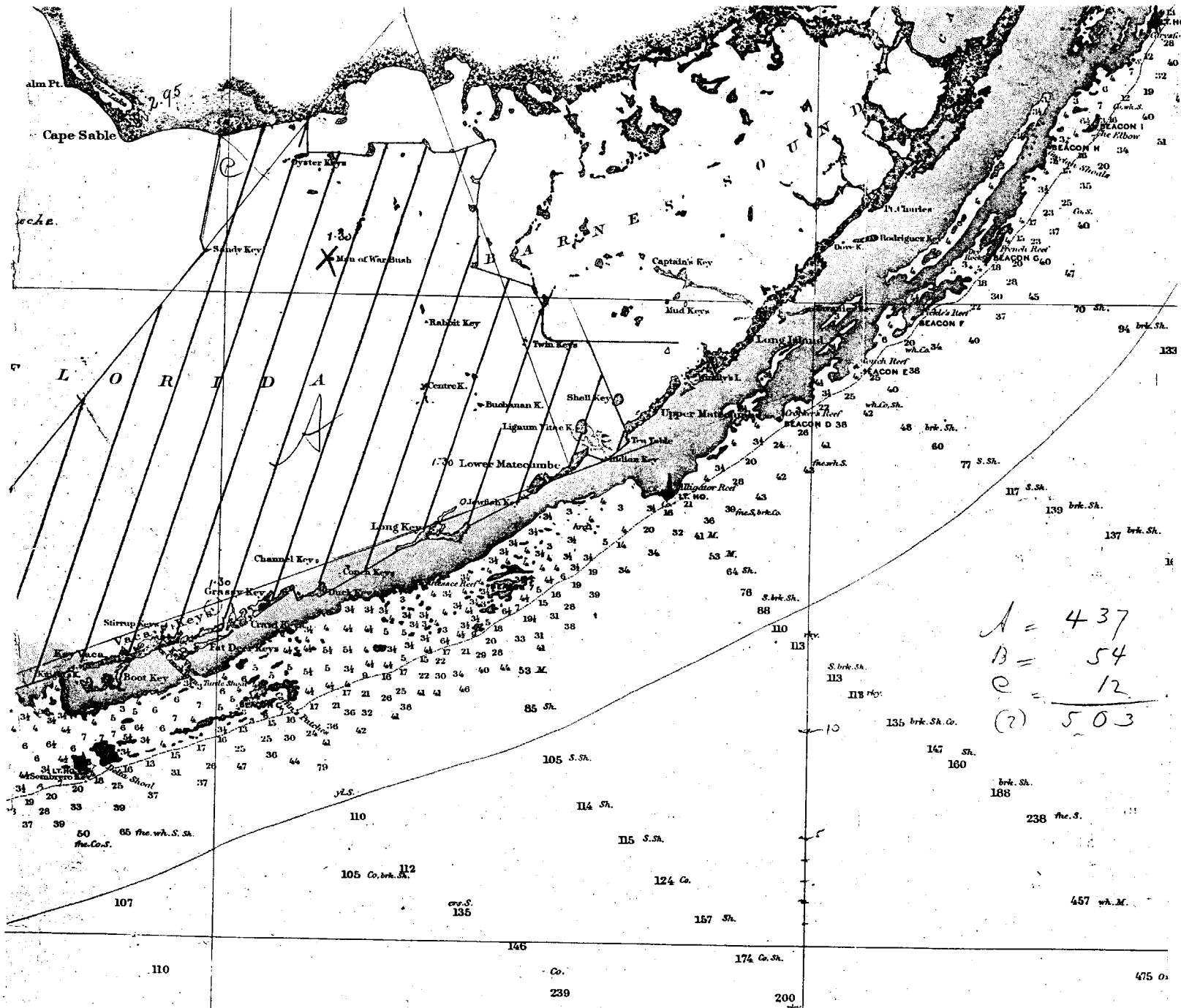
Limits of Work

FLORIDA BAY AND REEFS

A  
Str. BACHE

Winter 1888-89





$$\begin{array}{r}
 A = 437 \\
 B = 54 \\
 C = 12 \\
 \hline
 (?) \quad 503
 \end{array}$$

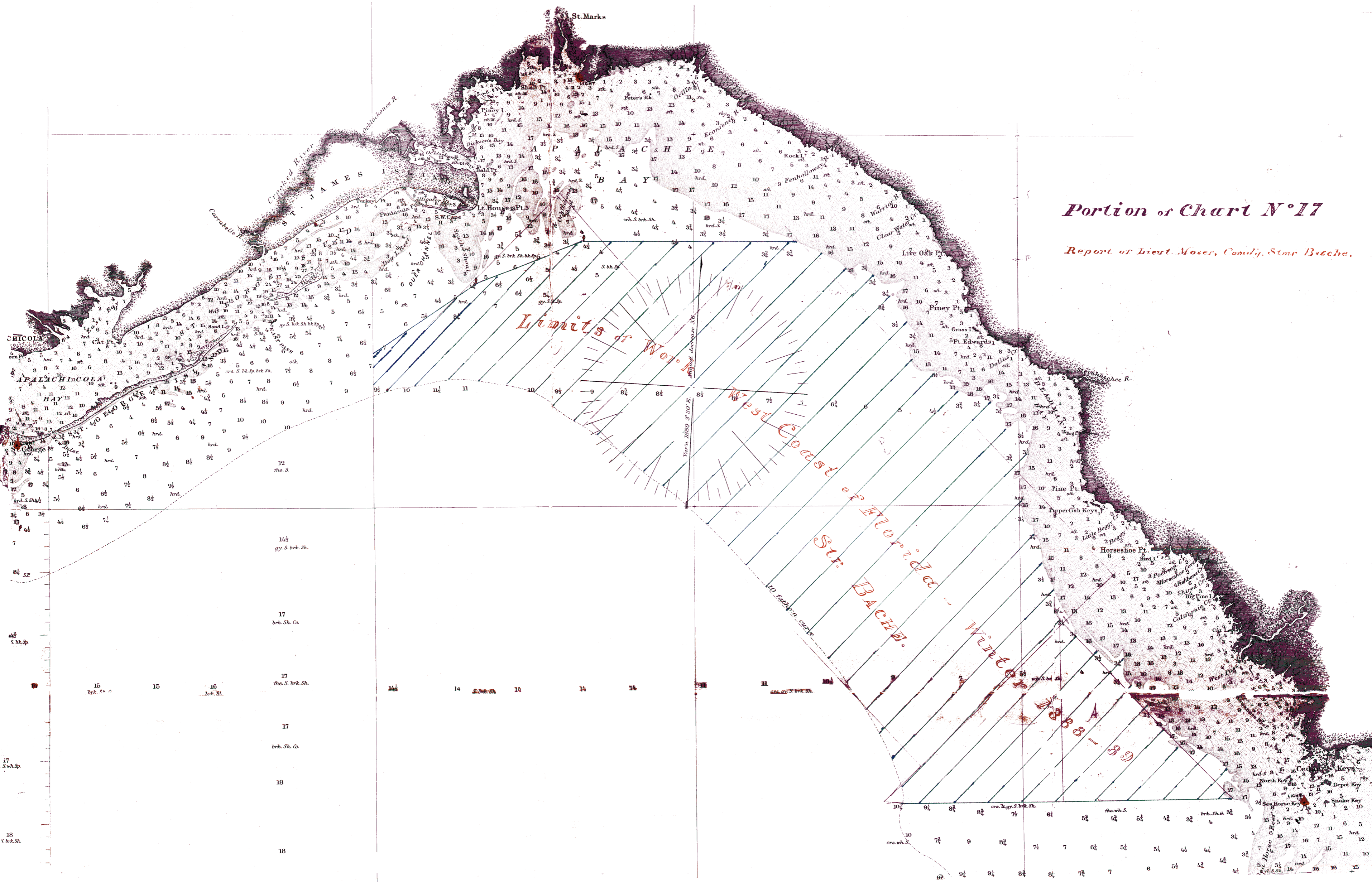
324.



St. Marks

# Portion of Chart N°17

Report of Lieut. Moser, Comdg. Steer Bache.



Limits of West Coast of Florida

West Coast of Florida  
Steer BACHE

1881-89



Portion of Chart N°17

Report of Lieut. Moser, Comdg. Steer Bache.

ON ORIGINAL DOCUMENT  
NOT ON SCAN OF PAGE 69

A = 203  
B = 258  
C = 224  
(1) 1285  
(2) 503  
3  
2  
1793



Soundings: - Proj. No. 4; Big Spanish & Knights  
Key Channels & Approaches, Florida Reefs

Date	Letter	Number of -			Name of Vessel	Observers		
		Sound'g book	Miles Naut.	Soundings			Angles	
1889								
Jan'y	23	a	1	20.00	1472	224	Stm. launch	Ensigns F. Swift & S.M. Strite
"	24	b	2	39.20	1900	230	"	" " "
"	25	c	173	35.50	1736	212	"	" " "
"	26	d	274	35.60	1733	194	"	" " "
"	30	e	3	32.20	1651	200	"	" " "
"	31	f	475	32.40	1649	202	"	" " "
Feb'y	1	g	6	34.70	1679	208	"	" " "
"	2	h	5	17.30	912	108	"	" " "
"	5	i	7	4.00	256	38	"	Ensign S.M. Strite & Sea. E. Veith
"	12	k	678	29.60	1726	210	"	& Pay. Yeo. J. L. Dunn
"	13	l	7	27.30	1467	234	"	" " "
"	14	m	8	22.90	1401	228	"	" " "
"	16	n	779	35.20	1854	243	"	" " "
"	20	o	10	13.30	667	100	"	" " "
"	21	p	9811	31.70	1611	212	"	" " "
"	25	q	10	22.90	1272	205	"	" " "
"	26	r	11	8.50	519	61	"	" " "
"	28	s	10	1.70	113	22	"	" " "
March	8	t	11	26.00	1056	172	"	R. D. Tisdale & "
"	9	u	11	15.00	658	107	"	" " "
			485.00	25,332	3,410			
Jan'y	16	a	1	5.50	682	88	Whale boat	Ensign S.M. Strite & Pay. Yeo. J. L. Dunn
"	17	b	2	7.50	126	25	"	Ensigns R. D. Tisdale & S.M. Strite
"	18	c	1	5.10	387	71	"	" " "
"	19	d	2	12.50	865	164	"	" " "
"	23	e	1	12.00	749	148	"	Ensign R. D. Tisdale & Pay. Yeo. J. L. Dunn
"	24	f	2	18.50	1056	214	"	" " "
"	25	g	3	15.00	851	147	"	" " "
"	26	h	4	12.30	897	154	"	" " "
"	28	i	5	2.90	235	40	"	" " "
"	30	k	3	10.00	821	140	"	" " "
"	31	l	4	10.20	1317	108	"	" " "
Feb'y	1	m	5	12.50	1047	116	"	" " "
"	2	n	5	12.60	928	132	"	" " "
"	6	o	6	10.00	552	78	"	" " "
"	7	p	7	7.00	543	110	"	" " "
"	8	q	6	6.50	818	93	"	" " "
"	14	r	7	16.50	836	112	"	& Sea. E. Veith
"	15	s	8	16.00	662	112	"	" " "
"	16	t	7	17.00	637	104	"	" " "
"	20	u	8	6.00	332	58	"	" " "
"	21	v	9	10.00	461	64	"	" " "
March	9	w	9	8.50	862	102	"	H. A. Bishop & "
"	11	x	679	10.00	1236	142	"	" " "
"	14	y	10	5.50	935	80	"	" " "
			245.60	17,835	2,602			

Report of Lieut. J. F. Moser, U.S.N.  
Comdg. Str. U.S. Fish Com.  
Winter 1888-89 (over)

Soundings:— Proj No. 4 (Contd)

Date	Letter	Number of			Name of Vessel	Observers	
		Soundg book	Miles Naut.	Soundings			Angles
1889							
Jan'y 30	a	1	13.00	1195	82	Gig	Lieut. J. F. Moser
" 31	b	2	15.50	1224	142	"	" " & Ens. H. A. Bispham
Feb'y 1	c	1	11.25	1046	54	"	" " & Ens. H. A. Bispham
" 2	d	2	6.90	439	44	"	" " & Ens. H. A. Bispham
" 6	e	243	11.30	1082	140	"	Ensign S. M. Strite & Sea. E. Veith
" 11	f	3	4.60	341	42	"	Lieut. J. F. Moser & Ens. H. A. Bispham
May 13	g	3	8.50	1005	32	"	Ensign R. T. Tisdale & Pay. Yeat. J. J. Dunn
			71.05	6332	536		

Recapitulation				
	485.00	25332	3410	Stm launch
	245.60	17835	2602	Whaleboat
	71.05	6332	536	Gig
Total on Sheet	801.65	49499	6548	

Report of Lieut. J. F. Moser, USN  
 Comd'g USF. Cr. S. Bache  
 Master 1888-89

Soundings: - Proj. No. 2, Florida Bay

Date	Letter	Number of -				Name of Vessel	Observers	
		Soundings Book	Miles Naut.	Soundings	Angles			
1889								
March	8	a	1	20.50	1075	104	Spy	Ensigns F. Swift & S.M. Strite
	9	b	1	21.40	978	146	"	" " " "
	11	e	2	14.00	390	40	"	" " " "
	14	d	142	21.80	637	100	"	" " " "
	15	e	3	6.00	275	38	"	" " " "
	16	f	2	15.50	550	98	"	" " " "
	22	g	3	31.80	829	126	"	" " " "
	23	h	2	27.70	615	112	"	" " " "
	27	i	3	10.60	367	48	"	" " " "
	28	k	3	22.25	713	126	"	" " " "
April	4	l	4	10.25	316	40	"	" " " "
	5	m	4	7.00	226	36	"	" " " "
	6	n	4	31.75	1075	144	"	" " " "
	8	o	445	50.00	1508	172	"	" " " "
	9	p	5	40.00	1223	134	"	" " " "
	10	q	546	27.25	1317	180	"	" " " "
	11	r	6	40.25	1421	180	"	" " " "
	16	s	6	3.50	118	18	"	" " " "
	19	t	6	5.00	174	22	"	" " " "
	20	u	647	28.10	1224	130	"	" " " "
	22	v	7	34.60	1515	238	"	" " " "
	23	w	748	6.40	435	42	"	" " " "
	24	x	8	25.20	943	134	"	" " " "
May	3	y	9	18.60	667	64	"	" " " "
	4	z	9	33.25	1125	94	"	" " " "
	6	a'	9	3.75	163	14	"	" " " "
	7	b'	9	18.20	593	46	"	" " " "
	8	c'	9+10	20.00	787	92	"	" " " "
	9	d'	10	35.00	1353	130	"	" " " "
	10	e'	10+11	16.40	799	74	"	" " " "
			30	646.05	23,411	2,922		
1889								
March	9	a	1	7.10	270	43	Stm. launch	Ensign R.D. Pisdale & Pay. Yoo. J. L. Dumas
	11	b	2	10.00	408	60	"	" " " "
	13	c	1	10.50	418	64	"	" " " "
	14	d	2	11.00	530	69	"	" " " "
	15	e	1	15.50	695	87	"	" " " "
	16	f	2	30.00	1210	167	"	" " " "
	21	g	1	8.00	385	36	"	" " " "
	23	h	243	33.10	1425	163	"	" " " "
	26	i	144	28.10	1255	117	"	" " " "
	27	k	3	1.25	155	26	"	" " " "
May	9	l	4	30.00	1261	154	"	" " " "
	10	m	3	25.50	1207	128	"	" " " "
			30	210.15	9,219	1,114		

Report of Lieut. J. F. Mann, U.S.N.  
Comd'g St. A. B. Boats  
Winter 1888-89 (over)

32

Soundings: — Proj. No. 2, (Cont'd)

Date	Letter	Number of —			Name of Vessel	Observers
		Soundy book	Miles Naut.	Soundings		
1889						
Feb'y 26	a	1	5.00	130	24	Whale boat
March 22	b	1	7.00	454	63	"
26	c	1	14.50	1712	126	"
27	d	2	14.80	1287	99	"
May 6	e	3	3.50	297	18	"
	"		44.80	3880	330	
May 11	d	1	16.10	2,139	141	Gig
	"					

Recapitulation				
	646.05	23411	2922	Spy
	210.15	9219	1114	Stm. Launch
	44.80	3880	330	Whale boat
	16.10	2139	141	Gig
Total on Sheet	917.10	38649	4,507	

Report of Lieut. J. J. Mason, U.S.N.  
 Comdg. U.S.S. Albatross  
 Winter 1888-89

Soundings:— Proj. No. 1; Sombroso Key Lt. to  
N.W. Passage Lt., Florida Reefs

Date	Letter	Number of —				Name of Vessel	Observers
		Soundy Book	Miles Haut.	Soundings	Angles		
1889							
May 13	a	1	13.00	960	36	Whale boat	Ensigns F. Swift & S.M. Strite
" 14	b	1	2.00	221	16	"	" " "
Total on Sheet			15.00	1,181	52		

Report of Lieut. J. F. Moser, U.S.N.  
Comdg. St. F. C. A. S. Boche  
Winter, 1888-89

Soundings:— N. W. Channel Bar, Key West Harbor, Fla.

Date	Tide	Number of —				Name of Vessel	Observers
		Soundg Book	Miles Naut.	Soundings	Angles		
1889							
May 2	a	1	.50	61	8	Stm. launch	Ensign R. D. Pisdale & Pay. Geo. J. L. Dunn
" 3	b	1	22.50	1995	248	"	" " " "
" 7	c	2	22.25	1843	232	"	" " " "
Total on Sheet.			45.25	3,899	488		

Report of Lieut. J. F. Moser, U.S.N.  
 Comdg. U.S. Asst. Buoy  
 Winter 1888-89

307

Soundings:— *Projects A & B., Cedar Key to  
Light House Pt., West coast of Florida*

Date	Letter	Number of —				Name of Vessel.	Observers
		Soundg book	Miles Naut.	Sound- ings	Angles		
1889							
April 3	A	1	79.20	755	4	Ship	Lieut. Moser & Enrs. Bispham & Tisdale
" 4	B	1	58.72	588	1	"	" " " " " "
" 5	C	1	90.20	880	4	"	" " " " " "
" 6	D	2	58.66	625	—	"	" " " " " "
" 9&10	E	2	73.18	758	3	"	" " " " " "
" 11	F	2	71.77	623	4	"	" " " " " "
" 12	G	3	124.77	1092	4	"	" " " " " "
" 17	H	3	103.17	914	4	"	" " " " " "
" 18	I	3	93.10	826	5	"	" " " " " "
" 19	J	4	62.47	695	12	"	" " " " " "
" 20	K	4&5	70.81	773	—	"	" " " " " "
" 22	L	5	64.02	845	8	"	" " " " " "
<i>Total on Sheet</i>			950.07	9374	49		

*Report of  
Lieut. J. F. Moser, U.S. Ft  
Sounding Station  
Winter 1888-89*

# Soundings — Grand Recapitulation

Name of Vessel	Number of		
	Miles (Naut.)	Soundings	Angles
Ship	950.07	9374	49
Spy	646.05	23411	2922
Steam launch	740.40	38450	5012
Whale boat	305.40	22896	2984
Gig	87.15	8471	677
Grand aggregate	2729.07	102,602	11,644

Report of  
 Lieut. J. J. Moser, U.S.N.  
 Comdg. U.S.S. Albatross  
 Winter 1858-59



# Signals

<i>Erected</i>	<i>Occupied</i>	<i>Determined</i>
69	80	64

Report of  
Lieut J. M. Moore, U.S.A.  
Comdy Ar. U.S. Route  
Winter 1888-89

Number of days on Station and how  
Employed.

No. of days on Station	127
" " " " which hydrographic work was done	67
" " " prevented from " " by bad weather	15
" " " " " " " " other causes	18
" " " on which signals were built &c	8
" " Sundays	19

Report of  
Lieut. J. H. Moser, U.S.N.  
Comdg. Stn. U.S.S. Beache  
Winter 1888-89

Number of Officers and Men attached to Party

Lieutenant	1
Ensigns	4
P. A. Surgeon	1
Assistant Engineer	1
Master-at-Arms	1
Paymaster's Yeomen	2
Machinists	4
Ship's Writer	1
Boatswain's Mate	1
Carpenter's mates	2
Quartermasters	4
Cabin Steward	1
Cabin Cooks	2
Ship's Cook	1
Second Class Firemen	4
Scamen	22
Landmen	3

Report of  
Lieut. J. F. Moser, U.S.N.  
Comdg. Str. U.S.S. Beak  
Winter 1888-89

# 1927

Diag. Cht. No. 1251-1

Form 504

U. S. COAST AND GEODETIC SURVEY

DEPARTMENT OF COMMERCE

## DESCRIPTIVE REPORT

Type of Survey .....

Field No. .... Office No. ....

### LOCALITY

State .....

General locality .....

Locality .....

194 .....

CHIEF OF PARTY

LIBRARY & ARCHIVES

DATE .....

1927  
2261

H-1927  
Statistics

Date, 1889.	Letter.	Number of				Vessel.
		Vol.	Angles	Soundgs	Miles	
March... 8.	a	1	104.	1075	20.5	Spy
" 9.	b	1	146	978	21.4	"
" 11.	c	2	40	390	14.0	"
" 14.	d	1&2	100	637	21.8	"
" 15.	e	3	38	275	6.0	"
" 16.	f	2	98	550	15.5	"
" 22.	g	3	126	829	31.8	"
" 23.	h	2	112	615	27.7	"
" 27.	i	3	48	367	10.6	"
" 28.	k	3	126	713	22.2	"
April... 4.	l	4	40	316	10.3	"
" 5.	m	4	36	226	7.0	"
" 6.	n	4	144	1076	31.7	"
" 8.	o	4&5	172	1508	50.0	"
" 9.	p	5	134	1223	40.0	"
" 10.	q	5&6	180	1317	27.3	"
" 11.	r	6	180	1421	40.2	"
" 16.	s	6	18	118	3.5	"
" 19.	t	6	22	174	5.0	"
" 20.	u	6&7	130	1224	28.1	"
" 22.	v	7	238	1515	34.6	"
" 23.	w	7&8	42	435	6.4	"
" 24.	x	8	134	943	25.2	"
May... 3.	y	9	64	667	18.6	"
" 4.	z	9	94	1125	33.3	"
" 6.	a'	9	14	163	3.7	"
" 7.	b'	9	46	593	18.2	"
" 8.	c'	9&10	92	787	20.0	"
" 9.	d'	10	130	1353	35.0	"
" 10.	e'	10&11	74	799	16.4	"
March 8.	a	1	43	270	7.1	Steam Launch
" 11.	b	2	60	408	10.0	"
" 13.	c	1	64	418	10.5	"
" 14.	d	2	69	530	17.0	"
" 15.	e	1	87	695	15.5	"
" 16.	f	2	167	1210	30.0	"
" 21.	g	1	36	385	8.0	"
" 23.	h	2&3	163	1425	33.1	"
" 26.	i	1&4	117	1255	28.1	"
" 27.	k	3	26	155	1.3	"
May... 9.	l	4	154	1261	30.0	"
" 10.	m	3	128	1207	25.5	"
Feb'y... 26.	a	1	24	130	5.0	Whaleboat
March 22.	b	1	63	454	7.0	"
" 26.	c	1	126	1712	14.5	"
" 27.	d	2	99	1287	14.8	"
May... 6	e	3	18	297	3.5	"
" 11	a	1	141	2139	16.1	Gig
Total	48	19	4,507	38,649	917.1	

L261-H