Bayou Lafourche Barrier System

The Bayou Lafourche barrier system lies about 75 km west of the mouth of the Mississippi River and about 80 km south of New Orleans. The system encompasses Timbalier and East Timbalier islands, Caminada-Moreau Headland, and Grand Isle (fig. 1). The shoreline is approximately 65 km long and extends east from Cat Island Pass to Barataria Pass (chapter 1, fig. 11). Timbalier and East Timbalier islands, and Grand Isle are downdrift flanking barrier islands located to the west and east. respectively, of the Caminada-Moreau erosional headland. These islands range from 0.2 to 1.2 km wide. Cat Island Pass, Little Pass Timbalier, Raccoon Pass, Belle Pass, Caminada Pass, and Barataria Pass connect the Gulf of Mexico to Terrebonne, Timbalier, Caminada, and Barataria bays. Belle Pass represents the distal end of the abandoned Bayou Lafourche distributary system. The Bayou Lafourche barrier system is dominated by landward and lateral movement. Inadequate sediment supply, subsidence, and storm and human impacts are the major factors causing shoreline change in this region (Mossa and others, 1985; Penland and others, 1986; Ritchie and Penland, 1988; McBride, 1989b).

The Bayou Lafourche shoreline is divided into two sections: the Timbalier Islands and the Caminada-Moreau Headland and Grand Isle. The Timbalier Islands extend east from Cat Island Pass to Belle Pass and consist of Timbalier and East Timbalier islands (Peyronnin, 1962; Kwon, 1969; Isacks, 1989). The Caminada-Moreau Headland and Grand Isle extend from Raccoon Pass to Barataria Pass (Kwon, 1969; Conaster, 1971; Harper, 1977; Gerdes, 1982; Shamban, 1982; Jeffrey, 1984; Combe and Soileau, 1987; Ritchie and Penland, 1990a, b). Maps presented show shoreline change for both sections in the years 1887, 1934, 1956, 1978, and 1988. From these maps, magnitude of shoreline movement, width, and island area measurements were obtained, and rates of change were calculated to determine the extent and rapidity of change to the barrier system.

Timbalier Islands-1887 to 1988

Morphology

The Timbalier Islands have experienced more lateral morphological change than any other island in Louisiana. In 1887, the barrier shoreline included Caillou, Timbalier, and East Timbalier islands (1887 map). At that time, Caillou Pass separated Caillou and Timbalier islands. In 1934, Caillou Pass was partially blocked by the westward lateral migration of Timbalier Island; Little Pass Timbalier was much wider; and Raccoon Pass consisted of a series of breaches (1934 map). By 1956, Timbalier Island completely shielded Caillou Pass, and Caillou Pass evolved into a back-barrier channel (1956 map). Timbalier Island continued to migrate west while other areas only experienced land loss because of mangrove die-offs during the hard freezes of 1983 and 1985 (1978 and 1988 maps).

Shoreline Movement

Comparisons of shoreline position are made for the periods 1887 vs. 1934, 1934 **vs.** 1956, 1956 **vs.** 1978, 1978 **vs.** 1988, and 1887 vs. 1988. Shoreline position and barrier width were monitored at 164 shore-normal transects along the gulf and bay shorelines (transects map; tables 9, 10, 11, 12, and 13).

Timbalier and East Timbalier islands were examined separately to provide a more accurate representation of barrier shoreline response to dominant coastal processes. Both islands formed as a result of lateral spit accretion and breaching; however, once formed, the mechanisms by which they migrated differed. Washover processes caused East Timbalier Island to rapidly migrate landward. In contrast, Timbalier Island continued migrating west in response to local processes (wind and waves). Therefore, the western end of the island grows laterally at the expense of erosion on the eastern end. Moreover, the dominance of lateral migration was enhanced by the width and elevation of the west-central portion of Timbalier Island, which inhibited washover processes from transporting sediment across the island to the bay shoreline.

Timbalier Island

Along its gulf side, Timbalier Island generally exhibits a lower average rate of change because erosion on the east and accretion on the west cancel each other. More importantly, Timbalier Island is rapidly migrating west while its length slowly decreases (table 14). The average rate of change for Timbalier Island between 1887 and 1934 along the gulf shoreline was only -1.4 m/yr; the average bayside rate of change was -2.9 m/yr. (tables 11 and 13). This average gulfside rate of change decreased slightly to -1.2 m/yr, while the average bayside rate of seaward-directed movement decreased slightly to -2.1 m/yr. Between 1956 and 1978, the gulf shoreline migrated landward at an increased average rate of -3.1 m/yr and then increased over twofold to -7.0 m/yr between 1978 and 1988 (fig. 11). For the period 1956 to 1978, the average bayside rate further decreased to -1.3 m/yr; however, between 1978 and 1988, the average rate escalated over tenfold to -14.1 m/yr (fig. 12). The rate of change along the bay indicates a net seaward movement, causing the gulf and bay sides to converge slowly.

East Timbalier Island

Rates of gulf and bayside movement are much higher along East Timbalier Island than Timbalier Island and, in fact, are the highest in the United States. The average gulfside rate of change for East Timbalier Island was -44.4 m/yr between 1887 and 1934 but decreased by about eightfold to -5.5 m/yr between 1934 and 1956 (table 13). Since 1956, the average rate of shoreline retreat has increased steadily to -16.2 m/yr and -21.2 m/yr for the periods 1956 vs. 1978 and 1978 vs. 1988, respectively (fig. 13).

Along the bay side, the average rate of change decreased continuously from 45.1 to 18.3, 15.8, and -1.2 m/yr for the periods 1887 vs. 1934, 1934 vs. 1956, 1956 vs. 1978, and 1978 vs. 1988, respectively (fig. 14, table 11). This suggests a slow reversal in the natural and human processes along the back-barrier shoreline. Washover processes probably swept sand across the island and caused the bay shoreline to migrate landward at a rate consistent with gulfside retreat. At some point, after the construction of seawalls on the island in the late 1950's, this natural process was terminated, and the bay shoreline experienced recession.

Timbalier Islands Summary

The average change rate along the gulf shoreline was -16.3 m/yr between 1887 and 1934, but decreased -3.8 m/yr between 1934 and 1956 (table 13). Migration increased steadily for the periods 1956 vs. 1978 and 1978 vs. 1988 (fig. 15). The rate of change along the bay shoreline was net progradational at 12.4 m/yr between 1887 and 1934 (table 11). This rate declined by half to 5.6 m/yr for the period 1934 vs. 1956 and raised slightly to 7.1 m/yr between 1956 and 1978. For the period 1978 to 1988, bayside change remained relatively constant at -7.8 m/yr; however. a reversal in direction resulted in extensive changes in back-barrier morphology (fig. 16).

The 1887 vs. 1988 map presents cumulative shoreline position changes for the Timbalier Islands shoreline. The gulf shoreline of the Timbalier Islands experienced landward movement. except for the western end of Timbalier Island which exhibited lateral accretion. Gulfside change rates were highest along East Timbalier Island and the eastern end of Timbalier Island.

The magnitude and direction of bay shoreline movement depends on island width and geomorphology, with low and narrow areas exhibiting the greatest change. The western end of Timbalier Island is undergoing lateral migration by spit-building processes at the expense of erosion along the eastern end. Between 1887 and 1988, the eastern and western ends of Timbalier Island migrated rapidly to the west (table 14).

Area and Width Change

Area change becomes more meaningful along the Timbalier Islands because of the dominance of lateral versus cross-shore sediment transport Extreme amounts of lateral migration characterize Timbalier Island: therefore, area and width measurements are probably better indicators of change than data derived from shore-normal transects.

Timbalier Island

In 1887, the average width of Timbalier Island was 1,341 m, and by 1934, the barrier island narrowed to 946 m (table 12). Between 1887 and 1934, the rate of area change was -8.8 ha/yr (table 15). The average width of Timbalier Island decreased to 916 m by 1956. Between 1956 and 1978, the island grew at a rate of 3.8 ha/yr; however, island width decreased to 850 m by 1978. This land gain indicates that, while narrowing, Timbalier Island increased its length by spit processes. For the period 1978 to 1988, Timbalier Island experienced rapid land loss (fig. 17). During this period. island widthdecreased by over 50 percent to result in an average width of 415 m. This trend will eventually lead to fragmentation because storms easily overwash and breach inlets across narrow islands.

The average width of Timbalier Island decreased 926 m between 1887 and 1988, an average island narrowing rate of 9.2 m/yr (fig. 18). During the period. the area of Timbalier Island decreased from 1,485 to 542 ha (fig. 19, table 15).

East Timbalier Island

East Timbalier has experienced extreme changes in island area and width. In 1887, its width ranged from 80 to 649 m, with an average width of 283 m (table 12). The rate of area change between 1887 and 1934 was -2.1 ha/yr (fig. 20, table 16). By 1934, the width ranged between 94 and 441 m, with an average width that narrowed to 248 m. The rate of area change increased to 14.5 ha/yr between 1934 and 1956 to result in land gain. By 1956, average island width dramatically increased to 506 m with a range between 118 and 1,240 m. Land gain continued between 1956 and 1978 but slowed to 3.7 ha/yr. This land gain was reflected in a continual increase to 547 m wide by 1978. Island area showed a sharp decline between 1978 and 1988 with a loss of 257 ha, a 52 percent decrease at an average rate of -25.7 ha/yr.

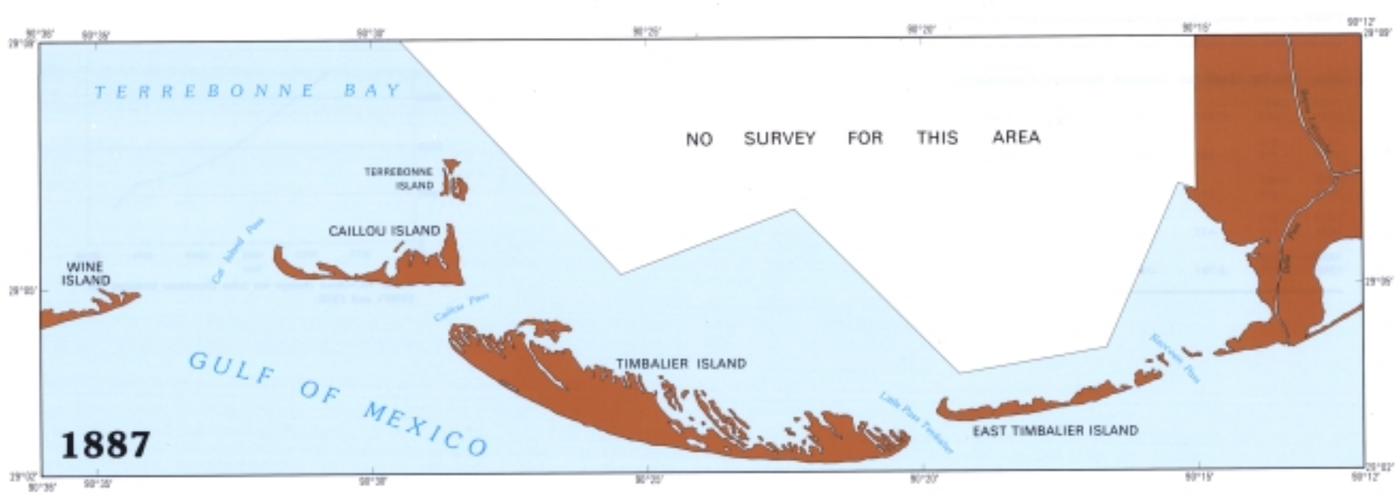
Average width along East Timbalier Island increased from 283 m in 1887 to 333 m in 1988 (fig. 21, table 12). This represents an average widening of 0.5 m/yr. Likewise, the island exhibited a slight area increase between 1887 and 1988, with major fluctuations (fig. 22). Overall. East Timbalier Island has conserved land area to show a slight land gain (table 16).

Timbalier Islands Summary

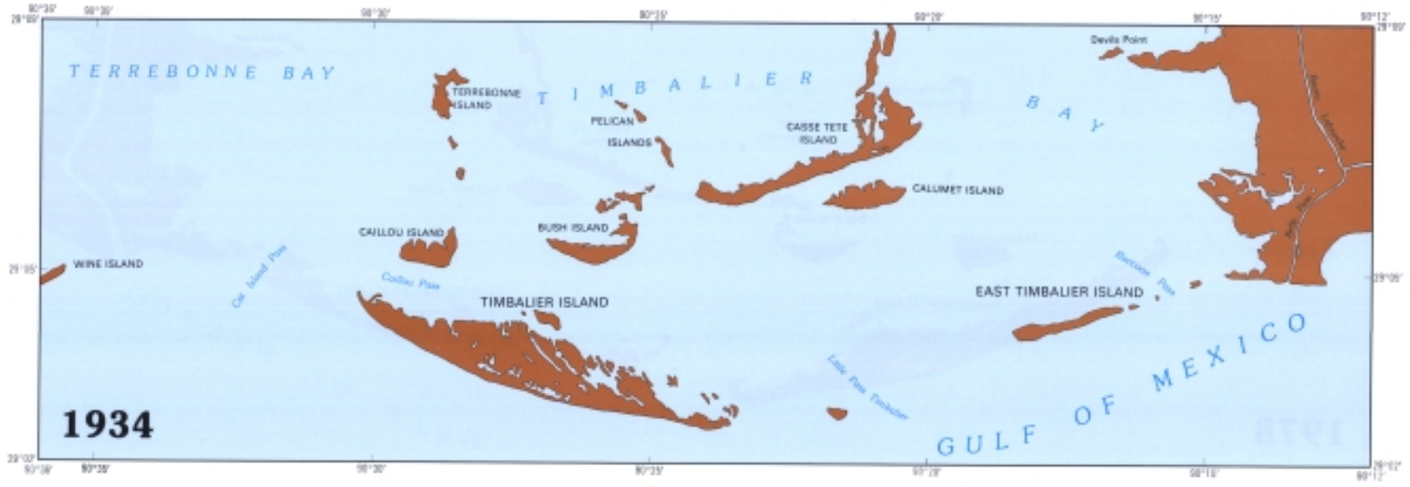
In 1887, island width along the Timbalier Islands ranged between 80 and 2,355m, with an average width of 945 m (table 12). By 1934, average width narrowed to between 94 and 1,906 m with an average width of 756 m. The average rate of area change for this period was -10.9 ha/yr (table 17). The average rate of area change reversed from land loss to land gain between 1934 and 1956 to 7.5 ha/yr, stabilized at 7.6 ha/yr between 1956 and 1978 but dramatically increased -71.5 ha/yr between 1978 and 1988 (fig. 23). The average width of the barrier islands decreased continuously from 1956 to 1988 (fig. 24). Although barrier width narrowed between 1934 and 1978, the islands experienced land gain because rapid lateral spit accretion is capable of depositing sediment faster than the narrowing process can remove it. High land loss rates occurred between 1978 and 1988 primarily because Hurricanes Danny and Juan struck the area in 1985 (Case. 1986). During this short time, 715 ha were lost.

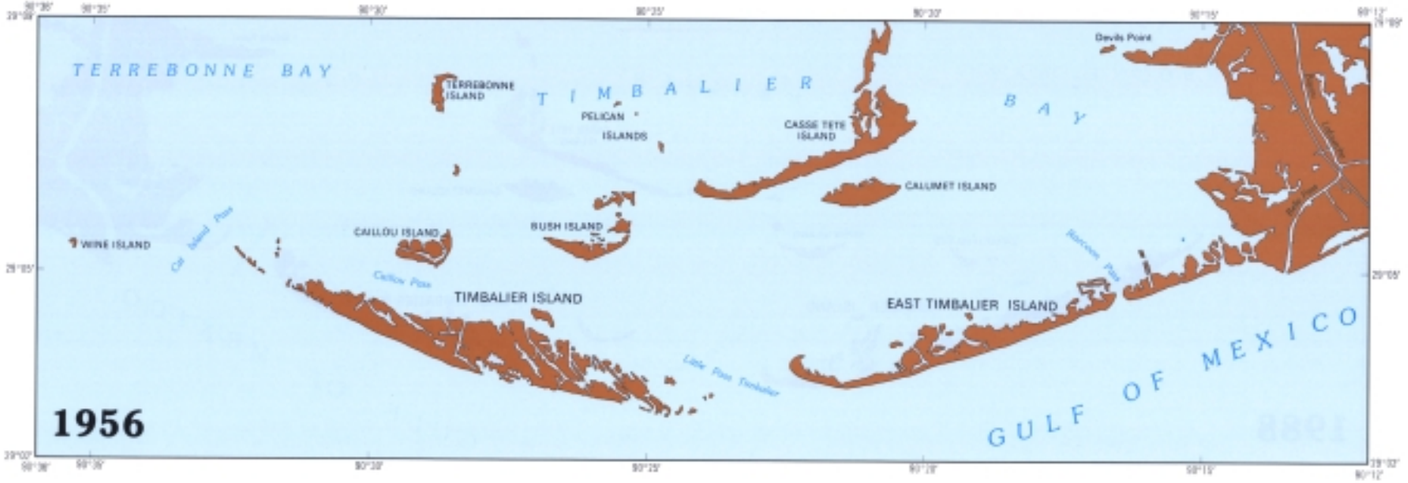
Combined area of the Timbalier Islands has decreased 897 ha from 1887 to 1988 (fig. 24, table 17). Shoreline changes between 1887 and 1988 along the gulf and bay shorelines caused the Timbalier Islands to narrow 5.6 m/yr (fig. 25, table 12). Barrier island widths for 1887 and 1988 are shown in figure 26.

• Historic Shorelines •

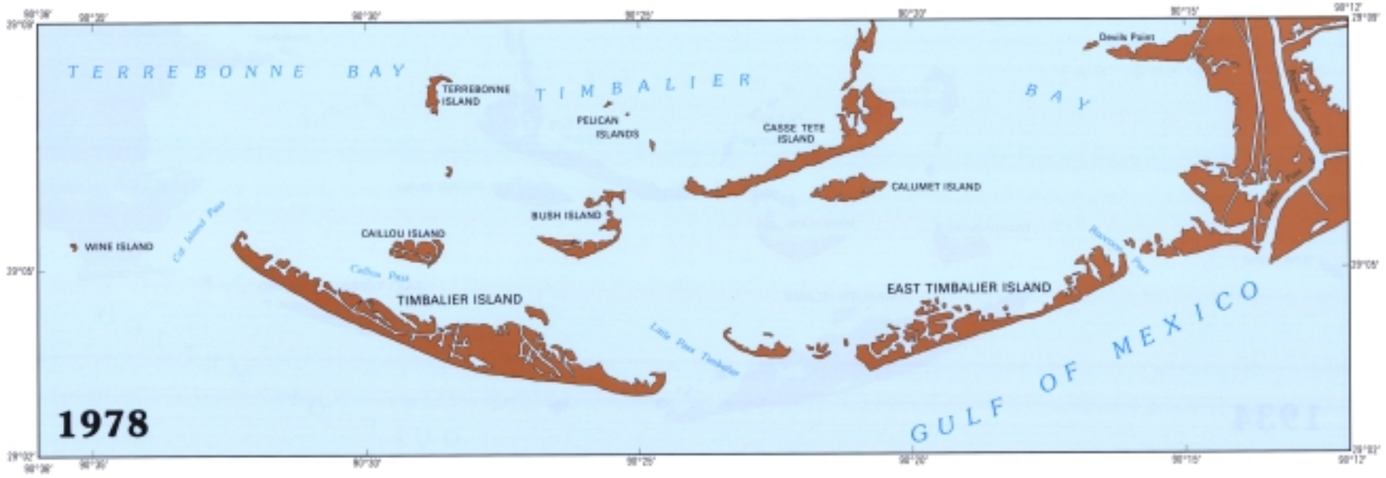


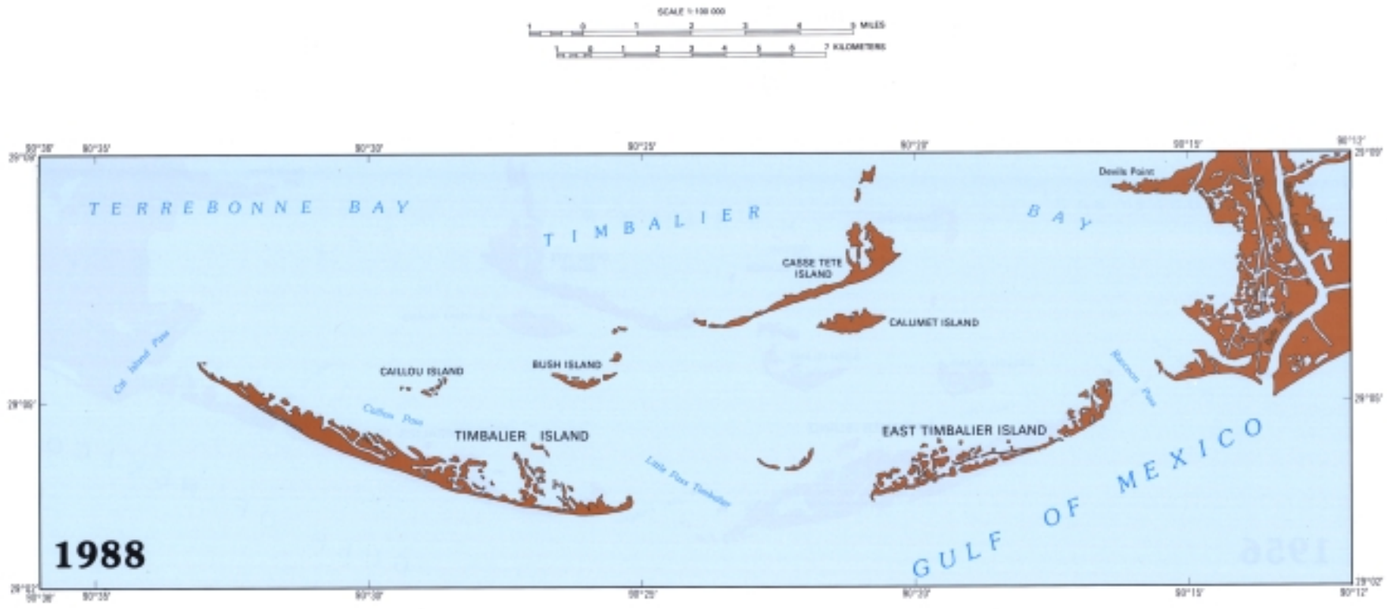
Timbalier Islands





Timbalier Islands





Timbalier Islands

FIGURE 11.—Average gulfside rate of change between 1887 and 1988 along Timbalier Island.

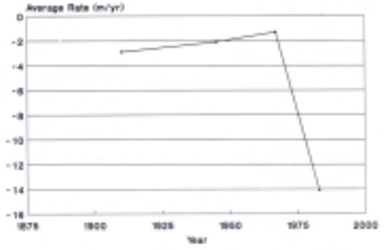


FIGURE 12.—Average bayside rate of change between 1887 and 1988 along Timbalier Island.

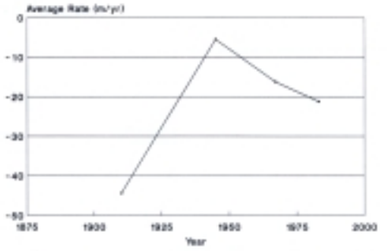


FIGURE 13.—Average gulfside rate of change between 1887 and 1988 along East Timbalier Island.

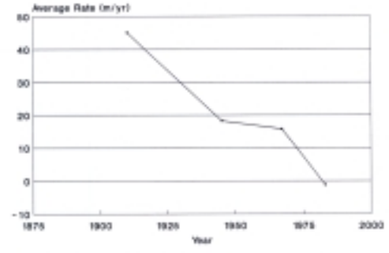


FIGURE 14.—Average bayside rate of change between 1887 and 1988 along East Timbalier Island.

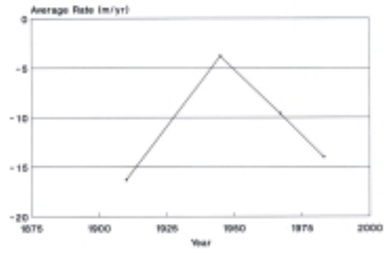


FIGURE 15.—Average gulfside rate of change between 1887 and 1988 along the Timbalier Islands shoreline.

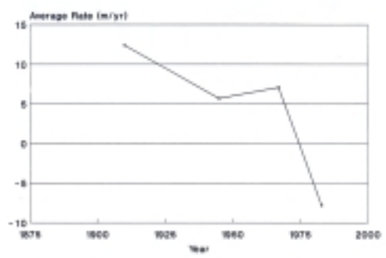


FIGURE 16.—Average bayside rate of change between 1887 and 1988 along the Timbalier islands shoreline.

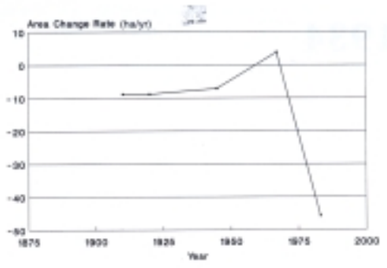


FIGURE 17.—Rate of area change between 1887 and 1988 of Timbalier Island.

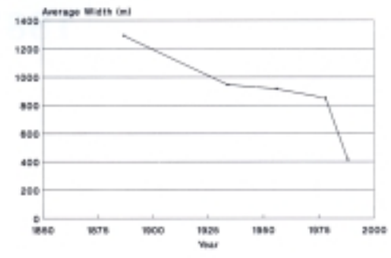


FIGURE 18.—Average barrier width between 1887 and 1988 of Timbalier Island.

FIGURE 19.—Area changes of Timbalier Island between 1887 and 1988.

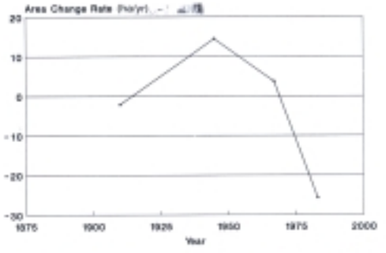


FIGURE 20.—Rate of area change between 1887 and 1988 for East Timbalier Island.

FIGURE 21.—Average barrier width between 1887 and 1988 for East Timbalier Island.

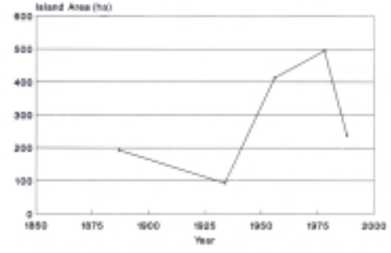
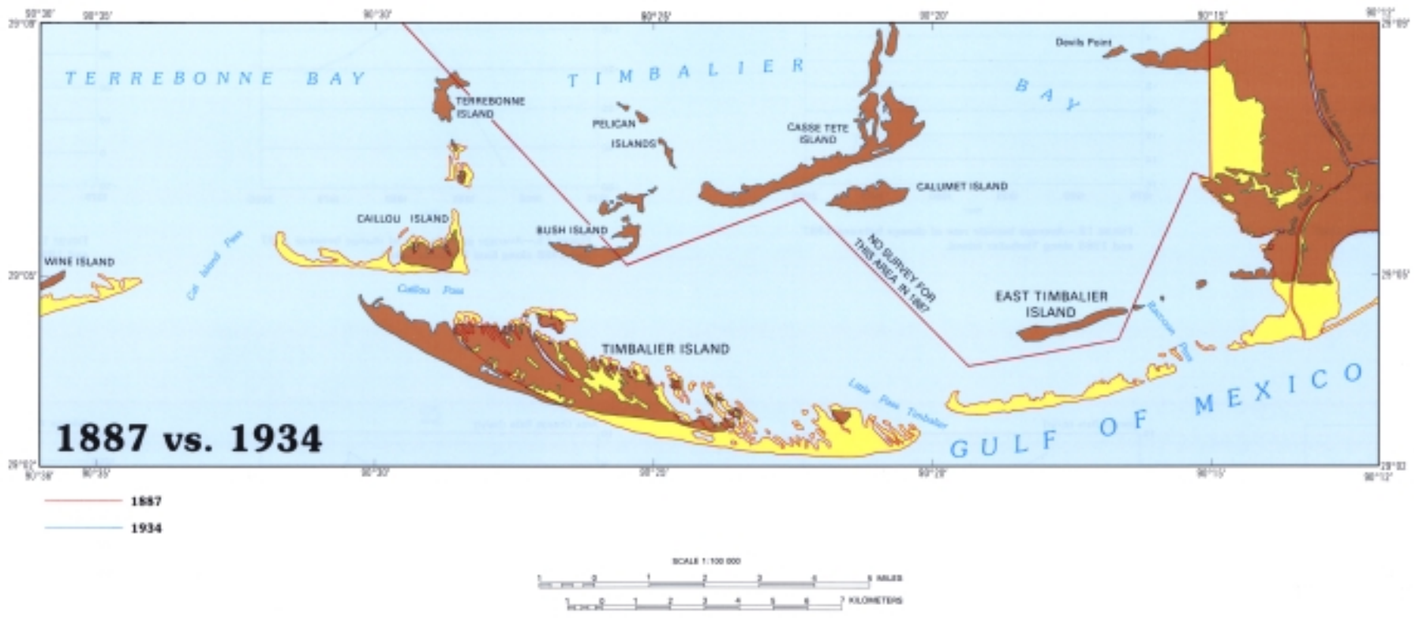
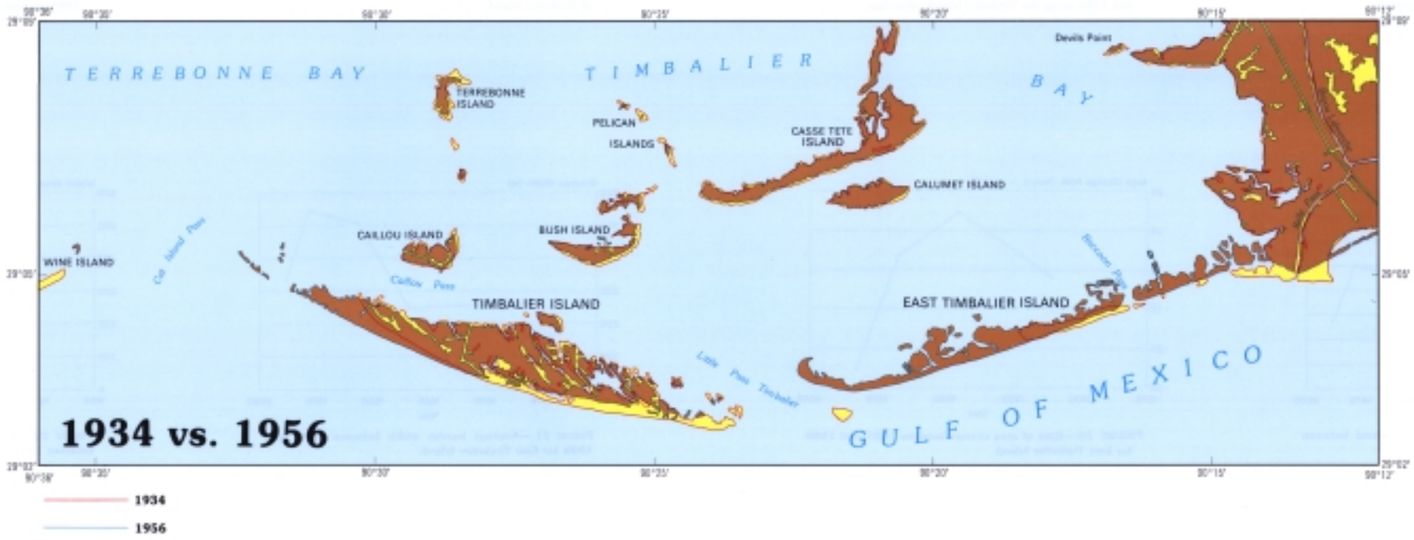


FIGURE 22.—Area changes of East Timbalier Island between 1887 and 1988.

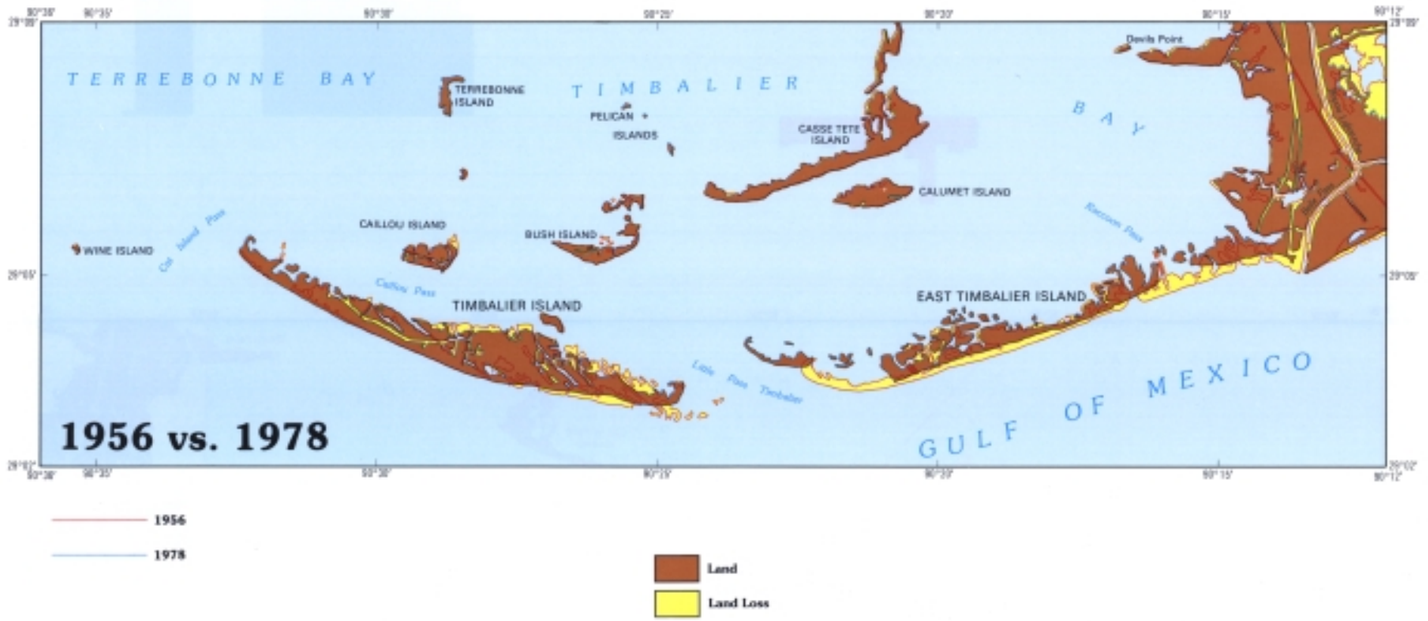
Timbalier Islands

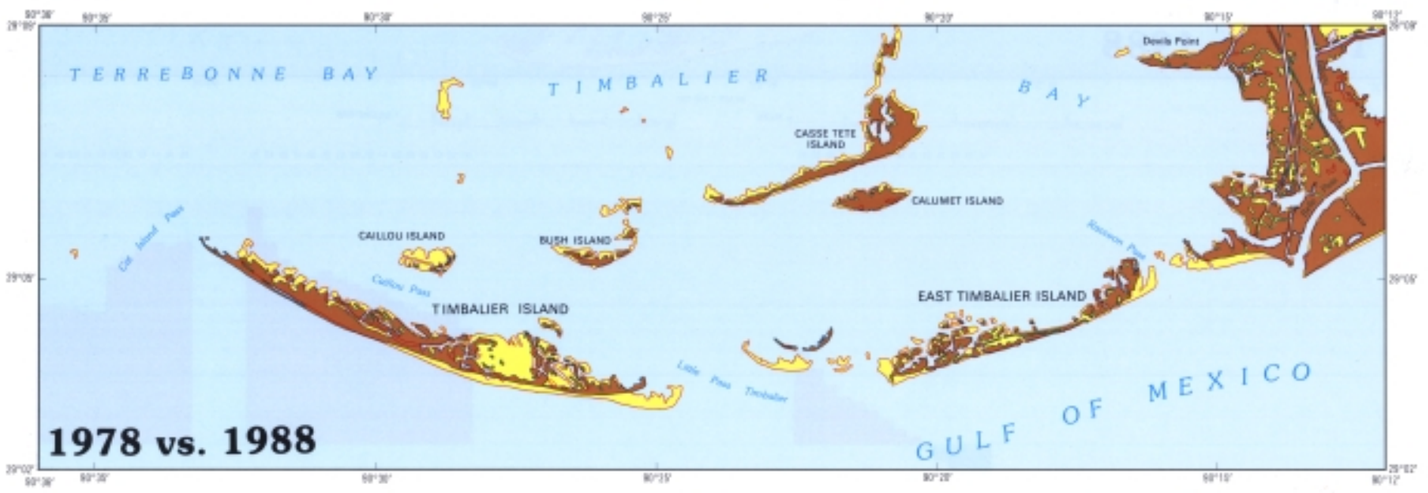
• Shoreline Change and Land Loss •



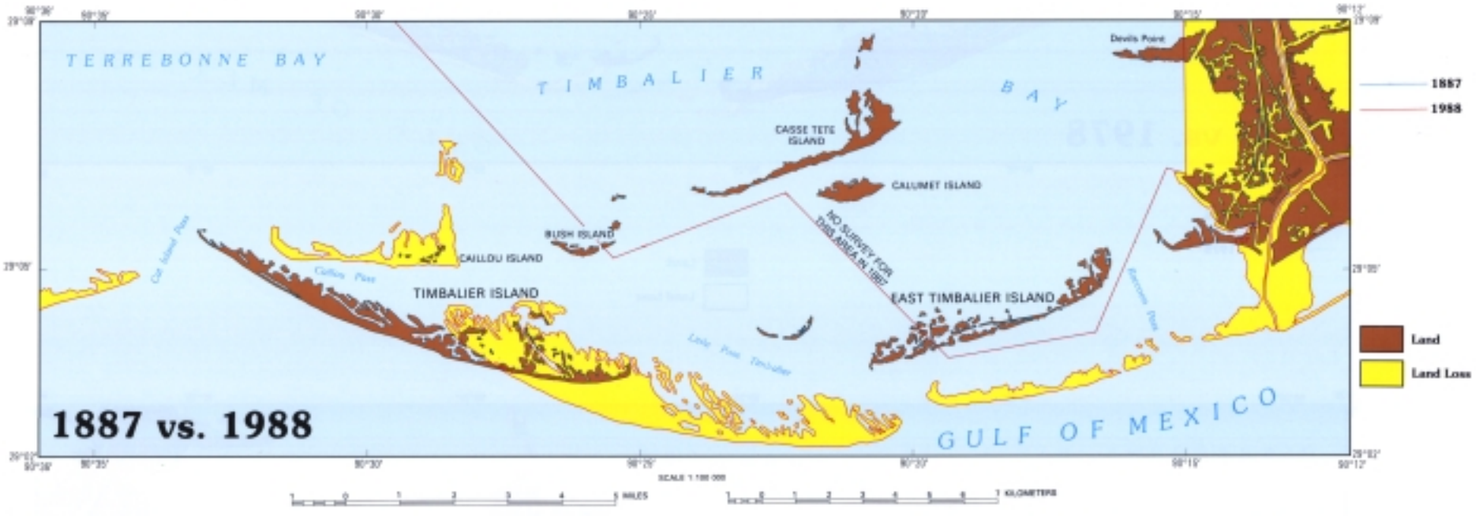


Timbalier Islands





Timbalier Islands



Timbalier Islands

TABLE 9.—*Timbalier Islands bayside magnitude of change (meters)*

Transect #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Transect coordinates		90° 33' 00"	45"	30"	15"	90° 32' 00"	45"	30"	15"	90° 31' 00"	45"	30"	15"	90° 30' 00"	45"	30"	15"	90° 29' 00"	45"	30"	15"	90° 28' 00"	45"	30"	15"
Y	1887 - 1934	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	−270	−328	−64	−31	−163	−108
α	1934 - 1956	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	−127	−134	−66	−93	−106	−66	−49	−14	−54	−73	−16	−58	−33	−17
β	1956 - 1978	n.a.	n.a.	162	320	586	n.a.	342	30	289	68	43	−4	12	6	−6	−4	−10	−6	−164	−11	−208	−175	−136	−102
r	1978 - 1988	n.a.	n.a.	−78	−118	−402	−220	−170	34	−475	−150	−146	−368	−63	−7	−20	−18	−28	−238	−9	−190	−158	−1227	−383	−81
δ	1887 - 1988	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	−527	−602	−468	−1479	−695	−368

Transect #		25	26	27	28	29	30	31	32	33	34	35	36	37	38	39*	40*	41*	42*	43*	44*	45*	46*	47*	48*
Transect coordinates		90° 27' 00"	45"	30"	15"	90° 26' 00"	45"	30"	15"	90° 25' 00"	45"	30"	15"	90° 24' 00"	45"	30"	15"	90° 23' 00"	45"	30"	15"	90° 22' 00"	45"	30"	15"
Y	1887 - 1934	−120	−100	−196	−46	24	−293	−52	−216	−10	−176	−169	−174	−136	−151	−204	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
α	1934 - 1956	−10	12	64	−1	−23	−6	−7	−248	6	−4	n.a.	32	−780	−80	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
β	1956 - 1978	−12	−13	−221	−13	−567	−165	−401	−547	78	102	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	72	671	444	760	868
r	1978 - 1988	−2	−39	−116	−143	−6	15	27	522	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	411	298	263	n.a.	n.a.	n.a.	n.a.
δ	1887 - 1988	−144	−140	−581	−187	−814	−384	−432	−690	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Transect #		49*	50*	51*	52*	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
Transect coordinates		90° 21' 00"	45"	30"	15"	90° 20' 00"	45"	30"	15"	90° 19' 00"	45"	30"	15"	90° 18' 00"	45"	30"	15"	90° 17' 00"	45"	30"
Y	1887 - 1934	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	2132	2118	2068	2168	2028	1881	2019	2267
α	1934 - 1956	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	37	−41	11	170	381	454	760	760
β	1956 - 1978	n.a.	n.a.	n.a.	1012	745	311	−76	495	−9	166	−62	242	−9	17	−109	−12	4	−41	7
r	1978 - 1988	n.a.	n.a.	n.a.	n.a.	−122	−42	−86	−613	−65	−117	−16	−31	−15	−16	−36	−231	−37	−12	−16
δ	1887 - 1988	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1798	2238	2082	2210	1954	2400	2056	2181	2138	2164	2402	2749	3021

Transect #		68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
Transect coordinates		15"	90° 16' 00"	45"	30"	15"	90° 15' 00"	45"	30"	15"	90° 14' 00"	45"	30"	15"	90° 13' 00"	45"	30"	15"	90° 12' 00"
Y	1887 - 1934	2236	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1697	1470	−43	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
α	1934 - 1956	765	n.a.	n.a.	n.a.	n.a.	n.a.	671	n.a.	n.a.	969	1124	27	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
β	1956 - 1978	324	n.a.	452	426	716	498	118	710	332	172	344	67	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
r	1978 - 1988	−347	−3	n.a.	n.a.	n.a.	232	281	−28	−12	8	20	23	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
δ	1887 - 1988	2966	3302	n.a.	n.a.	n.a.	n.a.	n.a.	2908	2753	2806	3007	64	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Timbalier Island bayside summary

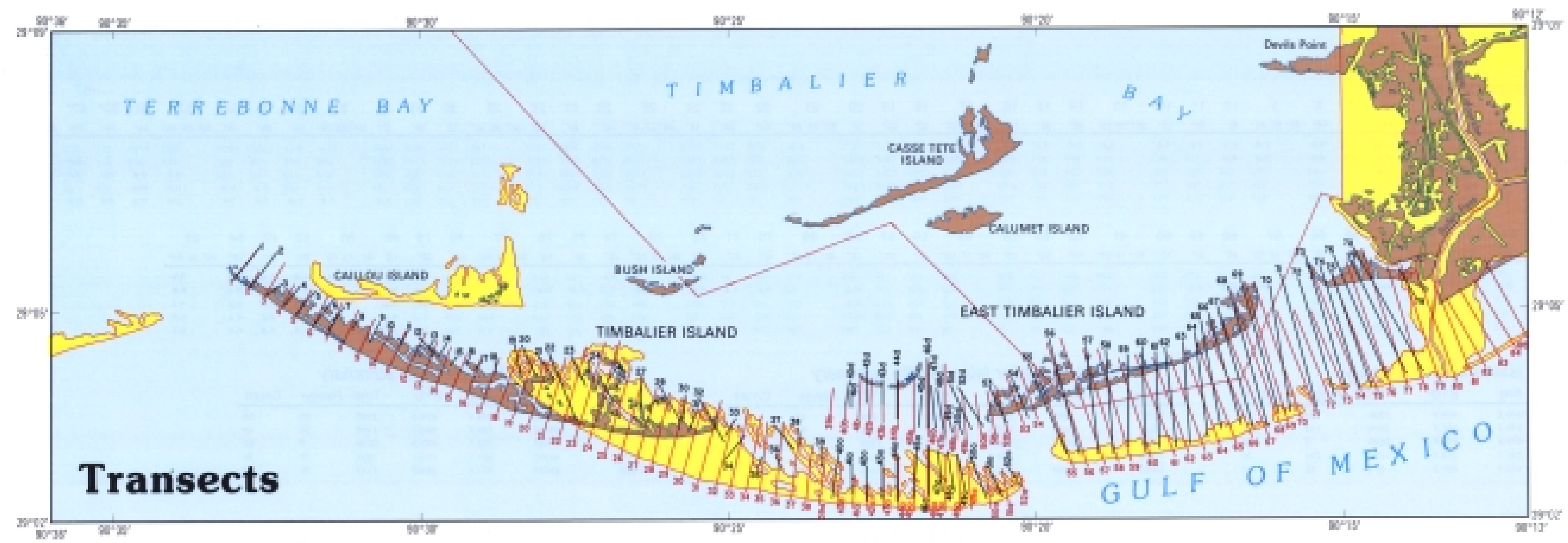
Years	Sum	Avg	STD	Total Range		Count
1887 - 1934	−2487	−138.0	88.7	24	−328	21
1934 - 1956	−1244	−46.1	86.5	62	−249	27
1956 - 1978	−894	−28.8	232.7	586	−547	31
1978 - 1988	−4216	−140.5	267.5	522	−1227	30
1887 - 1988	−7087	−506.8	216.7	−140	−1479	14

East Timbalier Island bayside summary

Years	Sum	Avg	STD	Total Range		Count
1887 - 1934	19057	2117.4	90.7	2267	1881	9
1934 - 1956	4034	403.4	318.3	765	−41	10
1956 - 1978	10084	347.6	358.9	1012	−109	29
1978 - 1988	−293	−12.2	214.2	411	−613	24
1887 - 1988	41247	2426.3	428.9	3302	1798	17

Timbalier Islands bayside summary

Years	Sum	Avg	STD	Total Range		Count
1887 - 1934	19289	964.5	1024.3	2267	−328	30
1934 - 1956	4910	122.8	332.6	1124	−248	40
1956 - 1978	9787	158.3	347.3	1012	−567	60
1978 - 1988	−4469	−78.2	247.7	522	−1227	57
1887 - 1988	40117	1179.9	1511.8	3302	−1479	34



Gulfside Transects

Bayside Transects

EXPLANATION
(Timbalier Islands only)

Description of shoreline change data

1439 Shoreline advance or island width as measured at points subject to the influence of entrances (e.g., tidal inlets, bayous, bays, etc.)

1100 Shoreline advance or island width as measured at points not subject to the influence of entrances

0 Black zeroes, italicized or non italicized, represent no shoreline movement

−245 Shoreline retreat as measured at points not subject to the influence of entrances

−842 Shoreline retreat as measured at points subject to the influence of entrances

* Portions of the same transect used to represent different islands as a result of rapid lateral island migration
a—1887 through 1934 gulfside and width measurements only
b—1956 through 1988 gulfside and width measurements only
c—1887 through 1934 bayside measurements only
d—1956 through 1988 bayside measurements only

Abbreviations in shoreline change data tables

n.a. No shoreline data exist because of entrance location

n.a. No bayside shoreline exists (e.g. headland area)

n.d. No survey exists or maps unavailable

TABLE 10.—*Timbalier Islands gulfside magnitude of change (meters)*

Transect #		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Transect coordinates		90° 33' 00"	45"	30"	15"	90° 32' 00"	45"	30"	15"	90° 31' 00"	45"	30"	15"	90° 30' 00"	45"	30"	15"	90° 29' 00"	45"	30"	15"	90° 28' 00"	45"	30"	15"
Y	1887 - 1934	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	653	665	615	517	561	284	192
α	1934 - 1956	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	758	421	322	286	218	138	105	107	69	−19	−64	−77	−84	−130
β	1956 - 1978	n.a.	n.a.	12	12	29	n.a.	18	78	73	76	58	40	6	8	12	8	6	14	7	14	18	−21	−77	−80
r	1978 - 1988	n.a.	n.a.	270	134	109	115	67	112	120	83	80	28	1	−63	−110	−120	−149	−166	−107	−209	−227	−227	−186	−159
δ	1887 - 1988	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	609	604	404	222	98	−75	−162

Transect #		25	26	27	28	29	30	31	32	33	34	35	36	37	38	39*	40*	41*	42*	43*	44*	45*	46*	47*	48*
Transect coordinates		90° 27' 00"	45"	30"	15"	90° 26' 00"	45"	30"	15"	90° 25' 00"	45"	30"	15"	90° 24' 00"	45"	30"	15"	90° 23' 00"	45"	30"	15"	90° 22' 00"	45"	30"	15"
Y	1887 - 1934	141	44	−71	−118	−252	−308	−385	−444	−484	−470	−426	−430	−389	−321	−698	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
α	1934 - 1956	−212	−250	−280	−268	−272	−283	−321	−196	−90	−30	−152	−278	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
β	1956 - 1978	−105	−131	−103	−184	−221	−173	−92	−237	−352	−696	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	−321	n.a.	−823	−828	n.a.
r	1978 - 1988	−140	−102	−72	−86	−129	−320	−540	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	−649	−660	−649	−497	n.a.	n.a.	n.a.	n.a.
δ	1887 - 1988	−316	−489	−676	−692	−921	−1287	−1208	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Transect #		49*	50*	51*	52*	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67
Transect coordinates		90° 21' 00"	45"	30"	15"	90° 20' 00"	45"	30"	15"	90° 19' 00"	45"	30"	15"	90° 18' 00"	45"	30"	15"	90° 17' 00"	45"	30"
Y	1887 - 1934	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	−2021	−1972	−2055	−2124	−2133	−2120	−2136
α	1934 - 1956	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	37	−47	−43	−79	−123	−193	−138
β	1956 - 1978	−1014	−531	−153	−196	−229	−206	−200	−232	−280	−283	−286	−232	−221	−203	−118	−107	−123	−84	−186
r	1978 - 1988	n.a.	n.a.	−272	−167	−96	−19	−69	−74	−1	25	34	46	26	15	−40	−44	−71	−17	38
δ	1887 - 1988	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	−1647	−1626	−1650	−1663	−1649	−2017	−2169	−2307	−2256	−2354	−2490	−2384	−2540

Transect #		68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
Transect coordinates		15"	90° 16' 00"	45"	30"	15"	90° 15' 00"	45"	30"	15"	90° 14' 00"	45"	30"	15"	90° 13' 00"	45"	30"	15"	90° 12' 00"
Y	1887 - 1934	−2119	−2165	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	−2311	−1928	−1993	−1606	−1956	−1437	−1206	−1842	−2150
α	1934 - 1956	−308	−242	n.a.	n.a.	n.a.	n.a.	−137	n.a.	n.a.	−366	−583	−446	−311	−291	−401	−616	159	362
β	1956 - 1978	−81	−197	−335	−462	−1148	−720	−613	−827	−283	−243	−107	−238	−223	−14	−35	−79	−125	−115
r	1978 - 1988	−106	−338	−768	n.a.	n.a.	n.a.	−849	−700	−279	−243	−157	−80	−76	−12	−38	−28	−41	−61
δ	1887 - 1988	−2621	−2679	−3368	n.a.	n.a.	n.a.	n.a.	−2976	−2626	−2965	−2798	−2660	−2316	−1983	−1810	−1829	−1800	−1964

Timbalier Island gulfside summary

Years	Sum	Avg	STD	Total Range		Count
1887 - 1934	−1432	−68.1	486.8	653	−698	22
1934 - 1956	−609	−25.3	256.8	758	−321	28
1956 - 1978	−2144	−69.2	170.2	78	−696	31
1978 - 1988	−2038	−70.3	165.2	270	−540	29
1887 - 1988	−3366	−240.4	480.8	609	−1208	14

East Timbalier Island gulfside summary

Years	Sum	Avg	STD	Total Range		Count
1887 - 1934	−19765	−2087.2	64.8	−1972	−2136	9
1934 - 1956	−1206	−120.6	87.8	37	−308	10
1956 - 1978	−11043	−286.2	268.8	−81	−1148	31
1978 - 1988	−5733	−212.3	297.5	46	−846	27
1887 - 1988	−41860	−2332.9	430.8	−1647	−3368	18

Timbalier Islands gulfside summary

Years	Sum	Avg	STD	Total Range		Count
1887 - 1934	−36150	−903.8	1062.8	653	−2150	40
1934 - 1956	−4073	−97.2	265.6	758	−616	43
1956 - 1978	−14452	−204.0	263.7	78	−1148	71
1978 - 1988	−8509	−130.8	227.8	270	−846	65
1887 - 1988	−65826	−1605.5	1099.7	609	−3368	41

Timbalier Islands

TABLE 11.—*Timbalier Islands bayside rate of change (meters per year)*

Transect #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38*	39*	40*	41*	42*	43*	44*	45*	46*	47*	48*
Transect coordinates	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887 - 1934	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1934 - 1956	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1956 - 1978	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1978 - 1988	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887 - 1988	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Transect #	49*	50*	51*	52*	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
Transect coordinates	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887 - 1934	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1934 - 1956	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1956 - 1978	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1978 - 1988	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887 - 1988	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Timbalier Island bayside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 - 1934	-65.8	-2.8	1.8	5.5	-7.0	21
1934 - 1956	-56.5	-2.1	3.0	2.8	-11.0	27
1956 - 1978	-40.6	-1.3	10.6	26.6	-24.9	31
1978 - 1988	-421.6	-14.1	26.7	82.2	-122.7	30
1887 - 1988	-69.4	-5.0	3.1	-1.4	-14.6	14

East Timbalier Island bayside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 - 1934	405.5	45.1	2.8	49.2	42.1	9
1934 - 1956	163.4	16.3	14.5	35.7	-1.8	10
1956 - 1978	467.6	16.6	16.3	46.6	-5.0	29
1978 - 1988	-29.3	-1.2	21.4	41.1	-61.3	24
1887 - 1988	409.4	24.0	4.3	32.7	17.5	17

Timbalier Islands bayside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 - 1934	410.4	12.4	21.6	49.2	-7.0	30
1934 - 1956	223.2	5.6	16.1	51.1	-11.3	40
1956 - 1978	444.8	7.1	19.8	48.0	-24.9	60
1978 - 1988	-440.8	-7.8	24.8	52.2	-122.7	57
1887 - 1988	367.2	11.7	15.0	32.7	-14.6	34

TABLE 12.—*Timbalier Islands width measurements (meters)*

Transect #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38*	39*	40*	41*	42*	43*	44*	45*	46*	47*	48*
Transect coordinates	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1934	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1956	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1978	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1988	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Transect #	49*	50*	51*	52*	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
Transect coordinates	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1934	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1956	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1978	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1988	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Timbalier Island width summary

Years	Sum	Avg	STD	Total	Range	Count
1887	40031	1340.9	496.8	2305	163	30
1934	29334	946.3	881.7	1900	119	31
1956	29009	915.9	555.6	2240	7	32
1978	27297	659.2	558.6	1565	384	32
1988	12668	416.1	261.3	811	60	31

East Timbalier Island width summary

Years	Sum	Avg	STD	Total	Range	Count
1887	5664	283.2	135.1	649	60	20
1934	2464	246.4	97.6	441	94	10
1956	19195	596.1	310.1	1240	115	32
1978	19669	546.8	385.7	1431	16	36
1988	9664	333.2	308.1	1114	20	29

Timbalier Islands width summary

Years	Sum	Avg	STD	Total	Range	Count
1887	54836	945.4	654.8	2355	60	58
1934	30242	795.5	590.8	1900	94	44
1956	47644	792.1	488.8	2248	7	67
1978	46364	681.2	485.1	1565	16	71
1988	22758	377.1	290.7	1114	20	60

TABLE 13.—*Timbalier Islands gulfside rate of change (meters per year)*

Transect #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38*	39*	40*	41*	42*	43*	44*	45*	46*	47*	48*
Transect coordinates	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887 - 1934	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1934 - 1956	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1956 - 1978	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1978 - 1988	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887 - 1988	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Transect #	49*	50*	51*	52*	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
Transect coordinates	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887 - 1934	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1934 - 1956	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1956 - 1978	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1978 - 1988	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887 - 1988	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Timbalier Island gulfside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 - 1934	-30.5	-1.4	9.7	19.1	-19.4	22
1934 - 1956	-30.0	-1.2	11.7	34.6	-14.6	26
1956 - 1978	-97.6	-3.1	7.8	3.6	-38.0	31
1978 - 1988	-203.6	-7.0	10.5	27.6	-54.6	29
1887 - 1988	-33.3	-2.4	5.8	9.0	-13.6	14

East Timbalier Island gulfside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 - 1934	-399.7	-44.4	1.2	-42.0	-45.5	9
1934 - 1956	-84.8	-8.8	4.4	2.6	-13.9	10
1956 - 1978	-503.0	-16.2	12.2	-4.1	-52.2	31
1978 - 1988	-573.3	-21.2	26.7	4.6	-84.6	27
1887 - 1988	-416.6	-23.1	4.4	-16.3	-33.3	18

Timbalier Islands gulfside summary

Years	Sum	Avg	STD	Total	Range	Count
1887 - 1934	-769.1	-16.3	21.7	19.1	-48.7	40
1934 - 1956	-198.6	-3.5	11.2	34.5	-28.0	45
1956 - 1978	-688.3	-9.8	11.9	3.5	-52.2	71
1978 - 1988	-935.5	-14.3	23.7	27.6	-84.6	65
1887 - 1988	-551.7	-16.2	11.6	9.0	-33.3	41

See page 55 for explanation of numbers.

Timbalier Islands

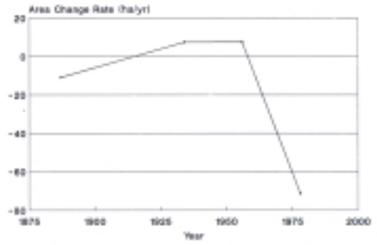


FIGURE 23.—Rate of area change between 1887 and 1988 for the Timbalier Islands.

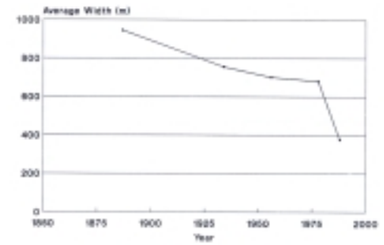


FIGURE 24.—Average barrier width between 1887 and 1988 for the Timbalier Islands shoreline.

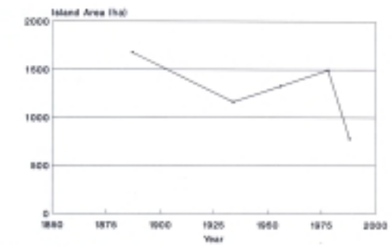


FIGURE 25.—Area changes between 1887 and 1988 for the Timbalier Islands.

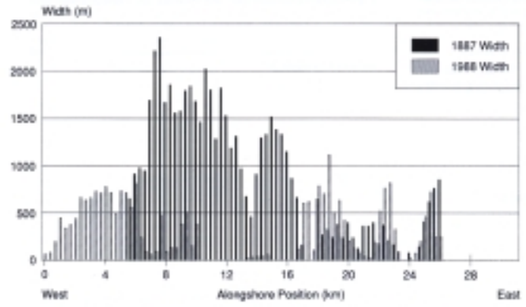


FIGURE 26.—Comparison of barrier widths between 1887 and 1988 for the Timbalier Islands shoreline.

TABLE 14.—*Lateral and length change of Timbalier Island*

Lateral Migration				
Dates (Number of Years)	West End(m)	Rate(m/yr)	East End(m)	Rate(m/yr)
1887-1934 (47)	2,843	60.5	5,207	110.8
1934-1956 (22)	3,715	168.9	743	33.8
1956-1978 (22)	83	3.8	1,232	56.0
1978-1988 (10)	1,164	116.4	1,063	106.3
1887-1988 (101)	7,786	77.2	8,245	81.6

Length of Island			
Date	Length(m)	Change(m)	Rate of Change(m/yr)
1887	13,952	N.A.	N.A.
1934	11,651	-2,301	-49.0
1956	14,646	2,995	136.1
1978	13,477	-1,169	-53.1
1988	13,569	-92	-9.2
1887-1988		-383	-3.8

TABLE 15.—*Area changes for Timbalier Island from 1887 to 1988*

Date	Area (ha)	Change (ha)	% Change	Rate (ha/yr)	Projected Date of Disappearance
1887	1,485				
1934	1,071	-414	-28%	-8.8	2058
1934	1,071				
1956	915	-156	-15%	-7.1	2085
1956	915				
1978	999	84	9%	3.8	N.A.
1978	999				
1988	542	-457	-46%	-45.7	2000
1887	1,485				
1988	542	-943	-64%	-8.3	2048

TABLE 16.—*Area changes for East Timbalier Island from 1887 to 1988*

Date	Area (ha)	Change (ha)	% Change	Rate (ha/yr)	Projected Date of Disappearance
1887	193				
1934	93	-100	-52%	-2.1	1978
1934	93				
1956	413	320	344%	14.5	N.A.
1956	413				
1978	495	82	20%	3.7	N.A.
1978	495				
1988	238	-257	-52%	-25.7	1997
1887	193				
1988	238	45	23%	0.4	N.A.

TABLE 17.—*Area changes for the Timbalier Islands from 1887 to 1988*

Date	Area (ha)	Change (ha)	% Change	Rate (ha/yr)	Projected Date of Disappearance
1887	1,677				
1934	1,164	-513	-31%	-10.9	2041
1934	1,164				
1956	1,328	16	14%	7.5	N.A.
1956	1,328				
1978	1,495	167	13%	7.6	N.A.
1978	1,495				
1988	780	-715	-48%	-71.5	1999
1887	1,677				
1988	780	-897	-53%	-8.9	2076