



Tampa Bay Estuary Program  
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Data Summary from the Tampa Bay Inter-  
agency Seagrass Monitoring Program  
Through Year 2004

FINAL REPORT

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Year 2004

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by  
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## **Introduction**

The state of Tampa Bay's seagrass meadows have become an important issue in the past three decades as scientists and environmental managers have worked to reverse the detrimental effects of eutrophication upon this important habitat within the estuarine ecosystem. Seagrass coverage in Tampa Bay declined from about 16,000ha in 1950 to near 8800ha in 1982. This decline was a result of anthropogenic impacts such as dredge and fill operations and excessive nutrient discharge to the bay. However, nutrient load reductions began to ameliorate eutrophic conditions during the 1980s and as water clarity improved, seagrass began to recolonize several areas of the bay.

The Tampa Bay National Estuary Program (now named Tampa Bay Estuary Program or TBEP) established restoration goals for Tampa Bay that were to be achieved through reduction and control of nutrients discharged to Tampa Bay. Seagrass was chosen as the "biological barometer" to gauge the effectiveness of the nutrient reduction strategy. It was postulated that improved water clarity resulting from reduced phytoplankton biomass would allow restoration of seagrass coverage. Using the nutrient reduction paradigm, the TBEP set a restoration goal of similar seagrass acreage to that found in 1950.

In 1997, the TBEP coordinated the creation of a bay-wide fixed transect seagrass monitoring program. The primary goal of the program is to document temporal and spatial changes in seagrass species composition, abundance, and distribution along a depth gradient. Several bay area agencies committed personnel and equipment to the program. Data collection from 60 transects began in 1998. Currently, 62 transects are monitored due to revisions in transect selection and location.

The City of Tampa and the Tampa Bay Estuary Program funded this project.

## **Program Overview**

In 1997, 30 fixed seagrass monitoring transects were selected from randomly selected Tampa Bay transects that had previously been used by the Southwest Florida Water Management District Surface Water Improvement and Management (SWIM) program to groundtruth aerial photography interpretation. An additional 27 fixed transects were placed in a nonrandom manner in other areas of interest within Tampa Bay. In 2000, two transects in Middle Tampa Bay and three transects in Lower Tampa Bay were added. Also, in 2000 and 2001, transect S4T1 in Lower Tampa Bay was not monitored due to the impending expansion at Port Manatee. However, data collections along this transect recurred in 2002.

Several transects that were being monitored in Old Tampa Bay did not appear to provide sufficient information to characterize seagrass distribution in several sections of this bay segment. Therefore, monitoring was terminated at five transects (S1T2, S1T7, S1T10, S1T11, and S1T12) after the 2000 monitoring effort. Transects S1T13, S1T14, S1T15, S1T16, and S1T17 were established in 2001 to provide data from areas of interest. Further, transect S4T12 was not sampled during 2003 due to safety concerns caused by

its close location to the Tampa Bay Pilots operation area. The location of this transect was moved in 2004. Finally, 2003 information collected for transects S3T1, S3T7, and S3T8 are not included herein due to quality assurance matters.

Data from 62 seagrass transects monitored in Tampa Bay during 2004 (Figure 1) are presented in this report. The agency responsible for monitoring each transect and the initial monitoring year for that transect is presented in Table 1. These agencies include Hillsborough County Environmental Protection Commission (HCEPC), City of Tampa, Bay Study Group (BSG), Pinellas County Department of Environmental Management (PC), Hillsborough County Cockroach Bay Aquatic Preserve (CB), Florida Fish & Wildlife Conservation Commission, Fish and Wildlife Research Institute (FWRI), Manatee County Environmental Management Department (MC), and Tampa Baywatch, Inc. (TBI).

## **Report Summary**

This report presents an overview of the Tampa Bay Interagency Seagrass Monitoring Program (TBISP) and seagrass distribution within Tampa Bay. Further, a summary of trends in coverage, abundance, and major changes in species composition observed during the course of the monitoring program are included. Water quality, sediment composition, and epiphyte information collected during transect monitoring are not discussed within this report. This information can be obtained through the TBEP.

Results regarding seagrass species abundance, distribution, and zonation over time are presented for the 1997-2004 period in Hillsborough Bay (HB, Figures 16-27) and the 1998-2004 period for Old Tampa Bay (OTB, Figures 3-14), Middle Tampa Bay (MTB, Figures 29-41), Lower Tampa Bay, including Terra Ceia Bay (LTB, Figures 43-57), and Boca Ciega Bay (BCB, Figures 59-69). For each transect, results are presented in a graphic format illustrating annual species composition, abundance, and distribution. Seagrass abundance is presented as percent coverage within a square meter using the Braun Blanquet coverage class system. The coverage classes are as follows: 1) solitary = one short shoot; 2) few = more than one short shoot, but less than 1% seagrass coverage within a meter square; 3) 1 = 1-5% seagrass coverage within a meter square; 4) 2 = 6-25% seagrass coverage within a meter square; 5) 3 = 26-50% seagrass coverage within a meter square; 6) 4 = 51-75% seagrass coverage within a meter square; 7) 5 = 76-100% seagrass coverage within a meter square; 8) 6 = reported seagrass coverage not occurring within a designated meter square placement. The “reported” category, though not a Braun Blanquet coverage class, is useful to follow recolonization patterns and to delineate areas of changing species composition.

Additional 2004 transect information, including length of each transect, the number of meter square placements (N) along each transect, and the percent of N in which each seagrass species was found, is presented in Figure 2 for OTB, Figure 15 for HB, Figure 28 for MTB, Figure 42 for LTB, and Figure 58 for BCB.

### Training of Participating Agency Personnel:

During the initial development of the seagrass transect monitoring program, concerns were raised about the need to collect comparable data between the participating agencies. To address this concern, a training class is scheduled several weeks prior to the start of each annual monitoring effort to train personnel and review field sampling procedures and protocols.

## Results and Discussion

### Old Tampa Bay:

Of the twelve transects monitored in Old Tampa Bay during 2004 (Figure 2), only S1T3, S1T5, S1T6, S1T8, and S1T9 encompass the seven-year data set generated from the onset of the program. Transects S1T1 and S1T4 were established in 1999, while monitoring of transects S1T13, S1T14, S1T15, S1T16, and S1T17 commenced in 2001. Braun Blanquet data from transects monitored during 2004 are presented in Figures 3-14.

All five seagrass species recorded from Tampa Bay have been found in Old Tampa Bay during the course of the monitoring program. Generally, *Halodule wrightii* has been the dominant species found on the transects. However, *Syringodium filiforme* and *Thalassia testudinum* have comprised a substantial portion of the seagrass composition along the eastern shoreline and the western shoreline south of Gandy Bridge. In addition, *Ruppia maritima* coverage increased substantially between 2002-2003. *Halophila engelmanni* was documented in northwest Old Tampa Bay between 1999 and 2002, however, this species was not observed along any transect during 2003-2004.

*H. wrightii* was found on all of the Old Tampa Bay transects during 2004. A positive gain for *H. wrightii* were seen on transects S1T9, S1T14, and S1T15 (Figures 9, 11, and 12) between 2003-2004. In contrast, losses were seen at transect S1T13, S1T16, and S1T17 (Figures 10, 13, and 14). Also, a decline in coverage was observed along S1T5, however, the seaward edge that had thinned and retreated between 2001-2003 appeared to have stabilized in 2004 (Figure 6). Little change was noted in *H. wrightii* coverage along the remaining transects between 2003 and 2004.

*S. filiforme* abundance increased along transect S1T6, S1T8, S1T9 and S1T15 between 2003-2004 (Figures 7, 8, 9, and 12). *S. filiforme* abundance along the remaining transects was relatively unchanged except at S1T17 where abundance dropped slightly (Figure 14). Further, the distribution of *S. filiforme* along each transect depth gradient did not change.

Generally, *T. testudinum* distribution and abundance remained stable among the Old Tampa Bay transects between 2003-2004 though abundance increased slightly along transects S1T14 and S1T15 (Figures 11 and 12).

Since 2002, *R. maritima* has proliferated along transects S1T5 and S1T16 (Figures 6 and 13). *R. maritima* was also observed along transect S1T17, generally between Big Island and the shoreline during 2004.

The attached alga, *Caulerpa prolifera*, has continued to be present along several transects in Old Tampa Bay during the course of the study. In 2003, *C. prolifera* was a major component of the SAV along transect S1T8, however, by 2004 the alga had disappeared (Figure 8). In contrast, *C. prolifera* abundance along transect S1T14 increased considerably between 2003-2004 (Figure 11). The alga was also observed on transects S1T9 and S1T16 during 2004 (Figure 9 and 13).

#### Hillsborough Bay:

Eleven transects have been monitored in Hillsborough Bay since 1997 (Figure 15). *H. wrightii* has been the dominant species where seagrass coverage was present. Also, *R. maritima* has persisted along the northeastern shoreline and has been observed periodically in most areas of Hillsborough Bay. Braun Blanquet data from the Hillsborough Bay transects are presented in Figures 17-27.

Annual estimates in *H. wrightii* areal coverage have been determined for Hillsborough Bay by the BSG since 1986 (Figure 16). Maximum coverage of 86ha was attained 2001, however, coverage decreased to about 54ha in 2003 and 48ha in 2004. Losses in coverage occurred at Gadsden Point in 2002 (transect S2T12, Figure 27) and Catfish Point during 2003-2004 (S2T112, Figure 26). Gains and losses in *H. wrightii* coverage have been noted in other areas of Hillsborough Bay since 1997. However, the recolonization and subsequent loss of shoal grass along the southeastern portion of Interbay peninsula have driven the major changes in Hillsborough Bay's seagrass coverage in recent years.

*R. maritima* has been to be a small constituent of Hillsborough Bay's seagrass coverage between 1997 and 2003, comprising less than 5% of the total bay seagrass coverage. In 2004, minor *R. maritima* coverage was noted along transect and S2T6 (Figure 21).

*C. prolifera* was noted along transect S2T12 (Figure 27) between 2002 and 2004. Further, sparse coverage was noted during 2004 along transect S2T112 at Catfish Point (Figure 26). *C. prolifera* was a major constituent of Hillsborough Bay's submerged aquatic vegetation (SAV) between 1986 and 1996 (City of Tampa, 2004).

#### Middle Tampa Bay:

Thirteen transects have been established in Middle Tampa Bay (Figure 28). Two transects, S3T12 and S3T13, have been monitored since 1997. Two additional transects, S3T10 and S3T11, were established in 2000. Braun Blanquet data from transects monitored during 2004 are presented in Figures 29-41.

Four seagrass species, *H. wrightii*, *R. maritima*, *S. filiforme*, and *T. testudinum* were found in Middle Tampa Bay during 2004. *H. wrightii* has been the dominant species in the northeast quadrant of Middle Tampa Bay. Typically, seagrass composition south of the Little Manatee River and along the western side of Middle Tampa Bay has been comprised of *H. wrightii*, *S. filiforme*, and *T. testudinum*. Seagrass coverage for Middle Tampa Bay has been generally stable, however, gains and/or losses were noted along several transects between 2003-2004. The following discussion illustrates these changes.

*H. wrightii* abundance increased along transects S3T10 and S3T13 as a result of expansion in coverage offshore towards the terminal end of the transect (Figures 38 and 41). An increase in abundance was also seen along the first 200m of transect S3T5 (Figure 33). A decrease of *H. wrightii* abundance occurred at transects S3T2, S3T4, and S3T12 (Figures 30, 32, and 40). Following a decrease of *H. wrightii* coverage along transect S3T9 between 2002-2003 (Figure 37), little change has been seen in this area near the mouth of the Little Manatee River. Data from transects S3T3, S3T6, and S3T11 also indicate little change in *H. wrightii* coverage (Figures 31, 34, and 39).

*S. filiforme* abundance increased somewhat along transect S3T11 just south of Coffeepot Bayou (Figure 39). Little change was seen for this species elsewhere in Middle Tampa Bay.

*T. testudinum* abundance decreased at transects S3T3 and S3T5 (Figures 31 and 33) which are located near Cockroach Bay. Little change was seen for this species elsewhere in Middle Tampa Bay.

The only *R. maritima* coverage documented in Middle Tampa Bay during 2004 was found along transect S3T13 (Figure 41), just south of Apollo Beach. The sparse coverage seen on transect S3T12 during 2003 was absent in 2004 (Figure 40).

Between 2003-2004, *C. prolifera* coverage increased along transect S3T12 (Figure 40) on the southern end of Interbay peninsula. A meadow of *C. prolifera* continues to persist at Lassing Park traversed by transect S3T8 (Figure 36). Finally, *C. prolifera* was noted for the first time at transect S3T7 at Coquina Key, transect S3T10 at Picnic Island, transect S3T11 near Coffeepot Bayou, and at transect S3T13, just south of Apollo Beach (Figures 35, 38, 39 and 41).

#### Lower Tampa Bay:

Fifteen transects were assessed for seagrass coverage in Lower Tampa Bay (including Terra Ceia Bay and the Manatee River) during 2004 (Figure 42). *H. wrightii*, *H. engelmanni*, *R. maritima*, *S. filiforme*, and *T. testudinum* were found in this bay segment during 2004. *H. engelmanni* was not reported for any Lower Tampa Bay transects during 2003, but has been documented along transects S4T7 and S4T8 in previous monitoring years. Braun Blanquet data from transects monitored during 2004 are presented in Figures 43-57.

Seagrass species composition in Lower Tampa Bay has been dominated by *T. testudinum*. *S. filiforme* has not been documented along transects within the Manatee River, however, this species is common in the proximity of Terra Ceia Bay and Egmont Key. *H. wrightii* has been present on all transects.

Generally, there was little change in *H. wrightii*, *S. filiforme*, and *T. testudinum* abundance and/or coverage in Lower Tampa Bay between 2003-2004. However, new *S. filiforme* and *T. testudinum* coverage was reported on the seaward end of transect S4T5 in Terra Ceia in 2004 (Figure 47). New *T. testudinum* coverage was also noted between the 190-

200m section of transect S4T11 at Perico Island (Figure 53). Finally, thin *T. testudinum* coverage noted on the seaward end of transect S4T10 during 2003 waned during 2004 (Figure 52).

The seaward edge of seagrass coverage along Transect S4T2, located just south of Bishop Harbor, has retreated since 1999 (Figure 44). Further, the species composition of the meadow's seaward edge shifted from *T. testudinum* to *H. wrightii* between 1999-2001 as the seaward *T. testudinum* coverage disappeared. The seaward edge of the *H. wrightii* coverage receded in 2003 and 2004.

*R. maritima* and *H. engelmanni* coverage has been sporadic in the Manatee river. Ephemeral *R. maritima* coverage has been noted along transect S4T8 with the last incidence occurring in 2003 (Figure 50). *R. maritima* was seen on transect S4T9 for the first time in 2004 (Figure 51). Similar to *R. maritima*, ephemeral *H. engelmanni* coverage has been seen along transect S4T8 during the course of the study.

#### Boca Ciega Bay:

Eleven transects were assessed for seagrass coverage in Boca Ciega Bay in 2004 (Figure 58). *H. wrightii*, *S. filiforme*, and *T. testudinum* were found within this bay segment. Braun Blanquet data from transects monitored during 2004 are presented in Figures 59-69.

Generally, *H. wrightii* has been the dominant species in the northern portion of Boca Ciega Bay. The species coverage transitions to a *T. testudinum* dominated community in the southern portion of Boca Ciega Bay. Only minor fluctuations have been noted within the Boca Ciega Bay seagrass community since the start of the monitoring program. However, an apparent shift from a *T. testudinum* dominated community to a *S. filiforme* dominated community occurred between 1999-2000 along transect S5T8 (Figure 66).

*H. wrightii* abundance increased along transects S5T1, S5T6, and S5T8 and decreased at transect S5T3 (Figures 59, 64, 66, and 61) between 2003-2004. *H. wrightii* coverage also expanded 50m seaward at transect S5T1. *H. wrightii* coverage was generally stable at the remaining transects

Between 2003-2004, *S. filiforme* and *T. testudinum* abundance coverage and abundance was generally stable at all transects except for transect S5T8 (Figure 66). *T. testudinum* coverage along this transect decreased along the first 50m of the transect.

#### Summary

We now have seven years or more of data from most of the Tampa Bay seagrass monitoring transects. This information suggests that most *S. filiforme* and *T. testudinum* communities in Tampa Bay have been relatively stable since 1998. The major changes detected have been the rapid development and subsequent declines of *H. wrightii*, *R. maritima*, and the alga, *C. prolifera*. Approximately 45ha of *H. wrightii* developed and subsequently disappeared along southeastern Interbay Peninsula in Hillsborough Bay between 1998 and 2003. In addition, *H. wrightii* coverage and abundance in northwest

Old Tampa Bay decreased during 2002 and 2004. *R. maritima* meadows have developed recently in Old Tampa Bay, however, this species appears to be waning in the northeast quadrant of this subsection. Finally, *C. prolifera* has periodically revegetated several areas of Tampa Bay only to have abundance wane or disappear all together.

Nitrogen management has been the keystone to the recovery of Tampa Bay to date. The need to reduce nitrogen to the bay was identified in the late 1960s and work began to control point source loading. As nitrogen sources were reduced in the late 1970s and early 1980s, there were soon improvements noted such as reductions in macroalgae and phytoplankton biomass. Following these improvements, minor seagrass recolonization began to occur in some areas of Tampa Bay. With the advent of the Tampa Bay National Estuary Program in the early 1990s, work began on establishing acceptable levels of phytoplankton biomass needed to maintain adequate water clarity to promote seagrass recolonization.

The discussed loss of *H. wrightii* at Interbay peninsula and northwest Old Tampa Bay may be due, in part to poor water clarity. Specifically, in Hillsborough Bay, elevated color values due to increased rainfall within the watershed during 2003 may have impacted the deeper *H. wrightii* growing along Interbay peninsula (City of Tampa 2004). Increased color may result in degraded water column light penetration thus reducing the light available to the seagrass. For additional discussion of water quality in Old Tampa Bay and its potential effect on seagrass coverage, please see: "Factors Influencing Seagrass Recovery in Feather Sound, Tampa Bay Florida", submitted to the Pinellas County Environmental Foundation in April 2004 (Tampa Bay Estuary Program 2004).

### **Acknowledgements**

This project has been made possible through the auspices of the Tampa Bay Estuary Program. Special thanks are extended to Holly Greening who has facilitated the coordination and implementation of the seagrass monitoring program. In addition, the Tampa Port Authority contributed partial funding for this project in 2004. Also, Dave Tomasko, Ray Kurz, and Tom Reis provided guidance in the initial design of the monitoring protocols. Field collections were conducted by personnel from Florida Fish & Wildlife Conservation Commission – Fish and Wildlife Research Institute, Hillsborough County Cockroach Bay Aquatic Preserve, Hillsborough County Environmental Protection Commission, Manatee County Environmental Management Department, Pinellas County Department of Environmental Management, Tampa BayWatch, Inc., and City of Tampa Bay Study Group. The generous contributions from these agencies and the hard work by their personnel have ensured the success of this project. Finally, Robin Lewis (Lewis Environmental Services, Inc.) is acknowledged for early on advocating the need to establish permanent seagrass transects in Tampa Bay and for his continued support of this program.

**References**

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Tampa Bay Estuary Program. 2004. Factors Influencing Seagrass Recovery in Feather Sound, Tampa Bay Florida. Prepared for the Pinellas County Environmental Foundation. 29p.

Table 1. Transect monitoring in Tampa Bay by agency and initial monitoring date.

	HCEPC	BSG	PC	CB	FWRI	MC	TBI	
<b>Old Tampa Bay</b>	S1T1	1999						
	S1T3	1998						
	S1T4	1999						
	S1T5	1998-03	2004					
	S1T6	1998						
	S1T8	1998						
	S1T9	1998						
	S1T13	2001						
	S1T14	2001						
	S1T15	2001						
	S1T16			2001				
	S1T17		2001					
	<b>Hillsborough Bay</b>	S2T2		1997				
		S2T3		1997				
		S2T4		1997				
		S2T5		1997				
		S2T6		1997				
S2T8			1997					
S2T9			1997					
S2T10			1997					
S2T111			1997					
S2T112			1997					
S2T12			1997					
<b>Middle Tampa Bay</b>		S3T1				1998		
	S3T2				1998			
	S3T3				1998			
	S3T4				1998			
	S3T5				1998			
	S3T6				1998			
	S3T7					1998		
	S3T8					1998		
	S3T9				1998			
	S3T10						2000	
	S3T11						2000	
	S3T12		1997					
	S3T13		1997					
<b>Lower Tampa Bay</b>	S4T1					1999		
	S4T2					1998		
	S4T3					1999		
	S4T4					1998		
	S4T5					1998		
	S4T6					1998		
	S4T7					1998		
	S4T8					1999		
	S4T9					1998		
	S4T10					1998		
	S4T11					1998		
	S4T12	2004	1998-02					
	S4T13						2000	
	S4T14						2000	
	S4T15						2000	
<b>Boca Ciega Bay</b>	S5T1		1998					
	S5T2		1999					
	S5T3		1998					
	S5T4		1998					
	S5T5		1998					
	S5T6		1998					
	S5T7		1998					
	S5T8		1998					
	S5T9		1998					
	S5T10		1998					
	S5T11		1998					

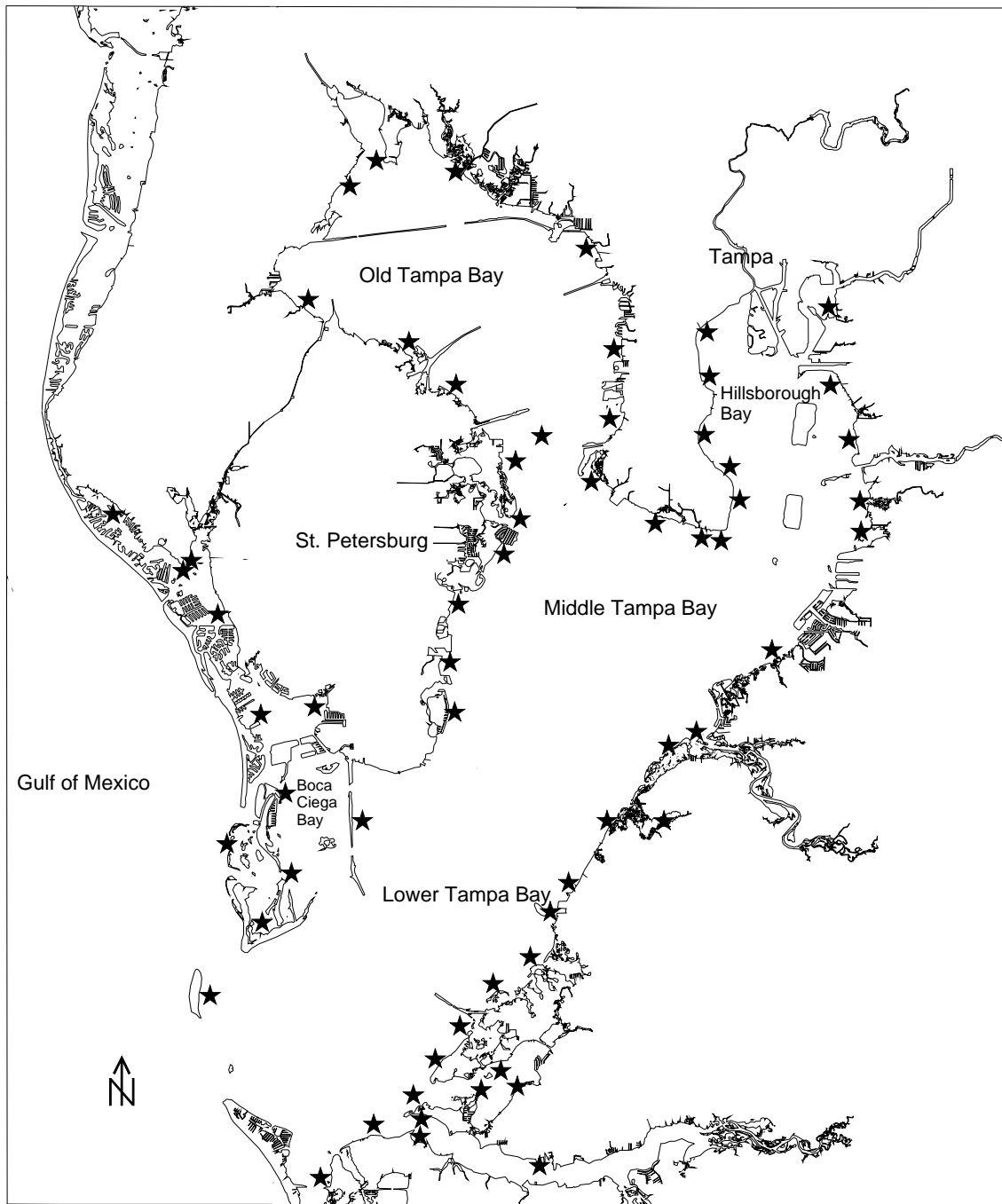


Figure 1. Location of the 62 current seagrass monitoring transects in Tampa Bay.

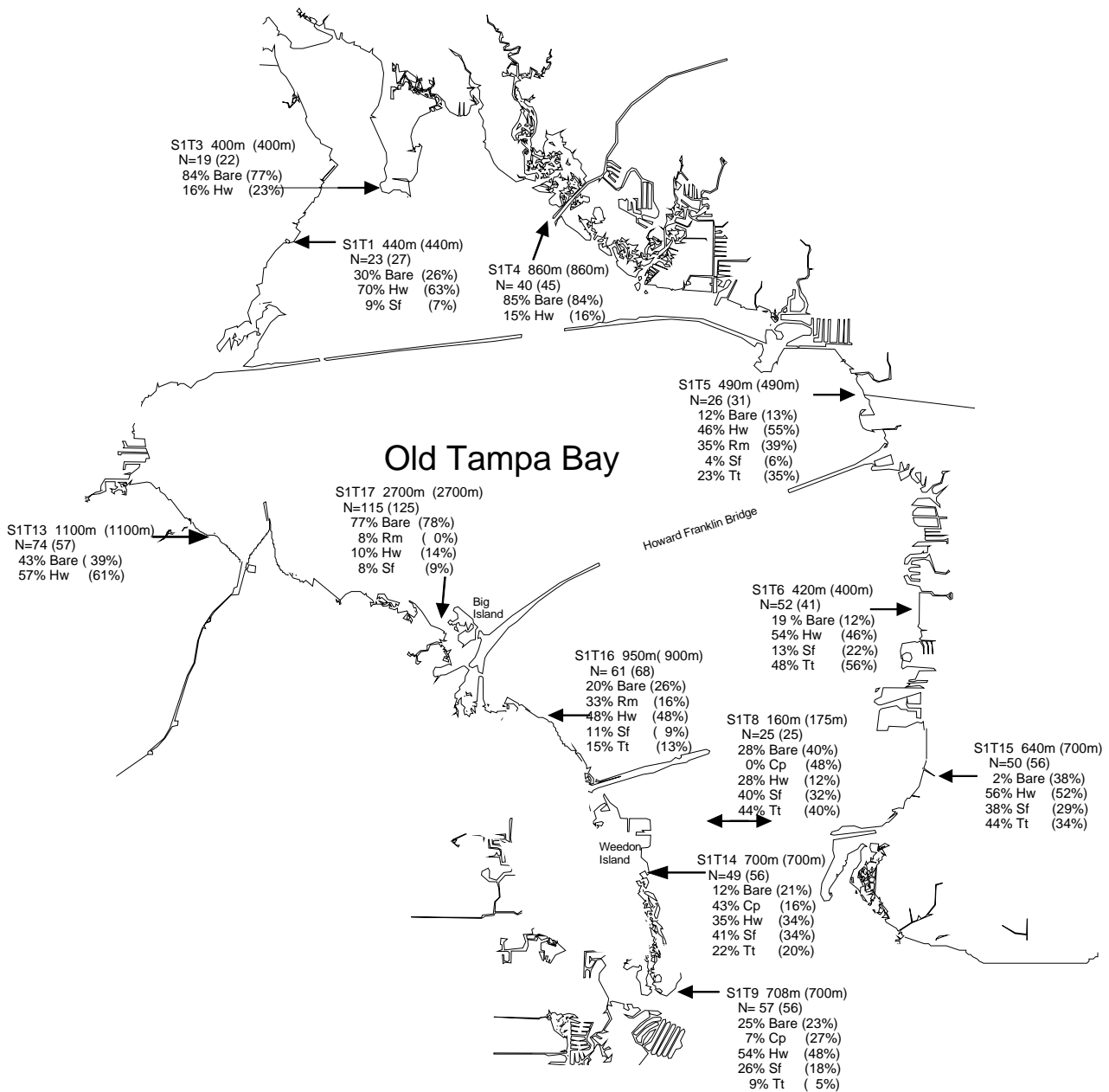


Figure 2. Name, location, length and percent of meter square placements containing each seagrass species and the alga, *Caulerpa prolifera*, along the 12 Old Tampa Bay seagrass monitoring transects in 2004. Results from 2003 in parentheses. N=number of meter square placements; Cp=*Caulerpa prolifera*; He=*Halophila engelmanni*; Hw=*Halodule wrightii*; Rm=*Ruppia maritima*; Sf=*Syringodium filiforme*; Tt=*Thalassia testudinum*; ND=No Data.

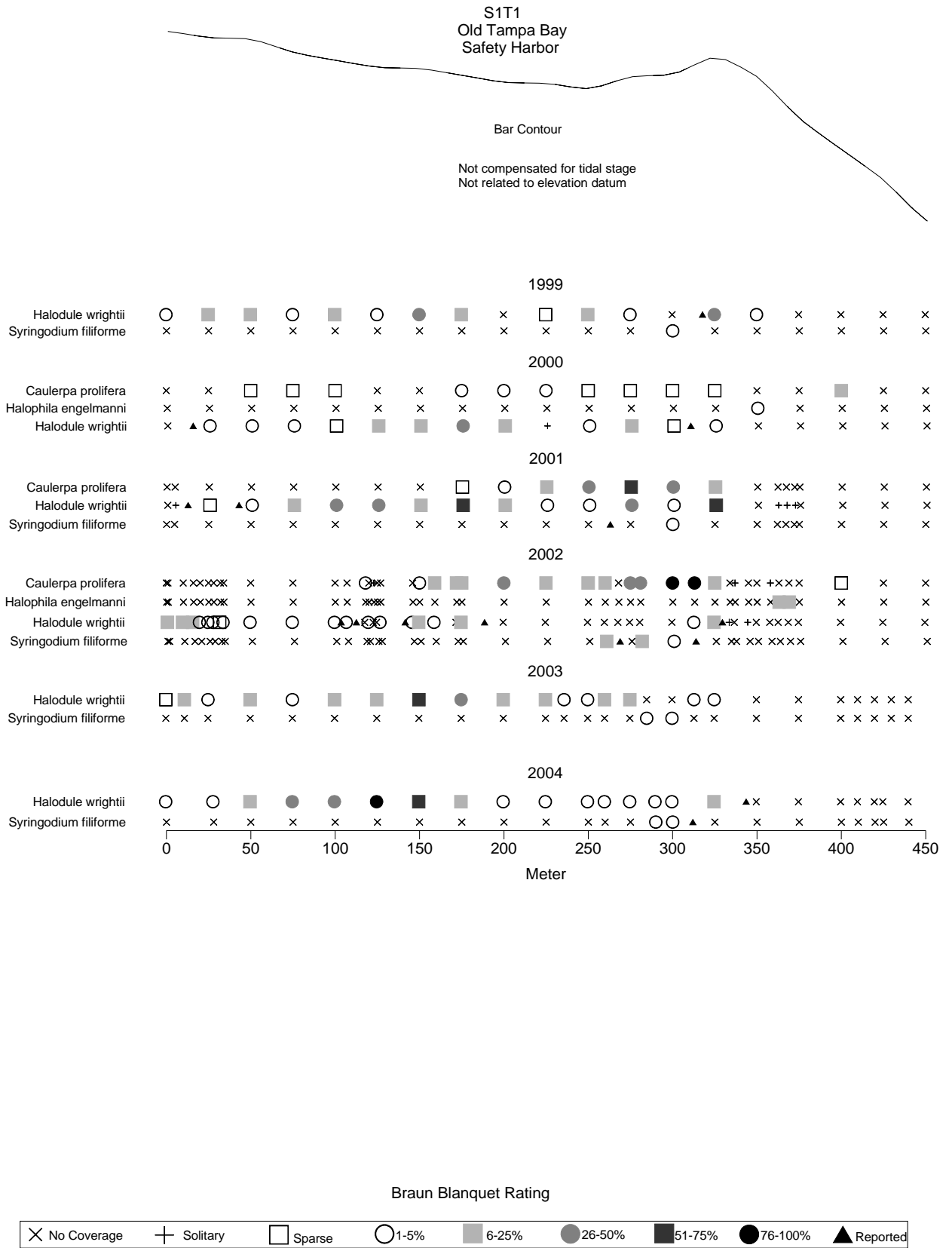


Figure 3. Seagrass species, abundance, and zonation at S1T1 from 1999-2004.

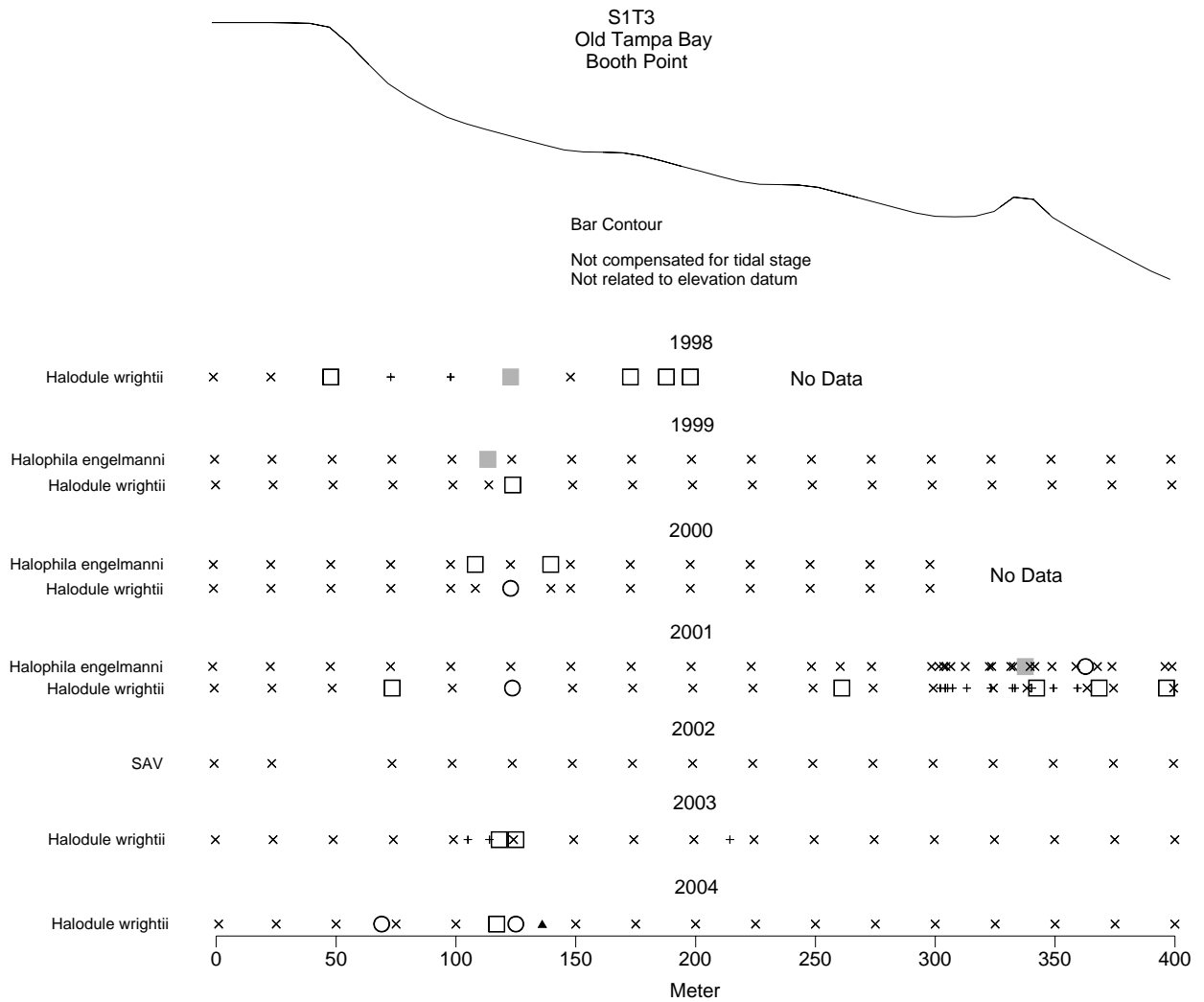
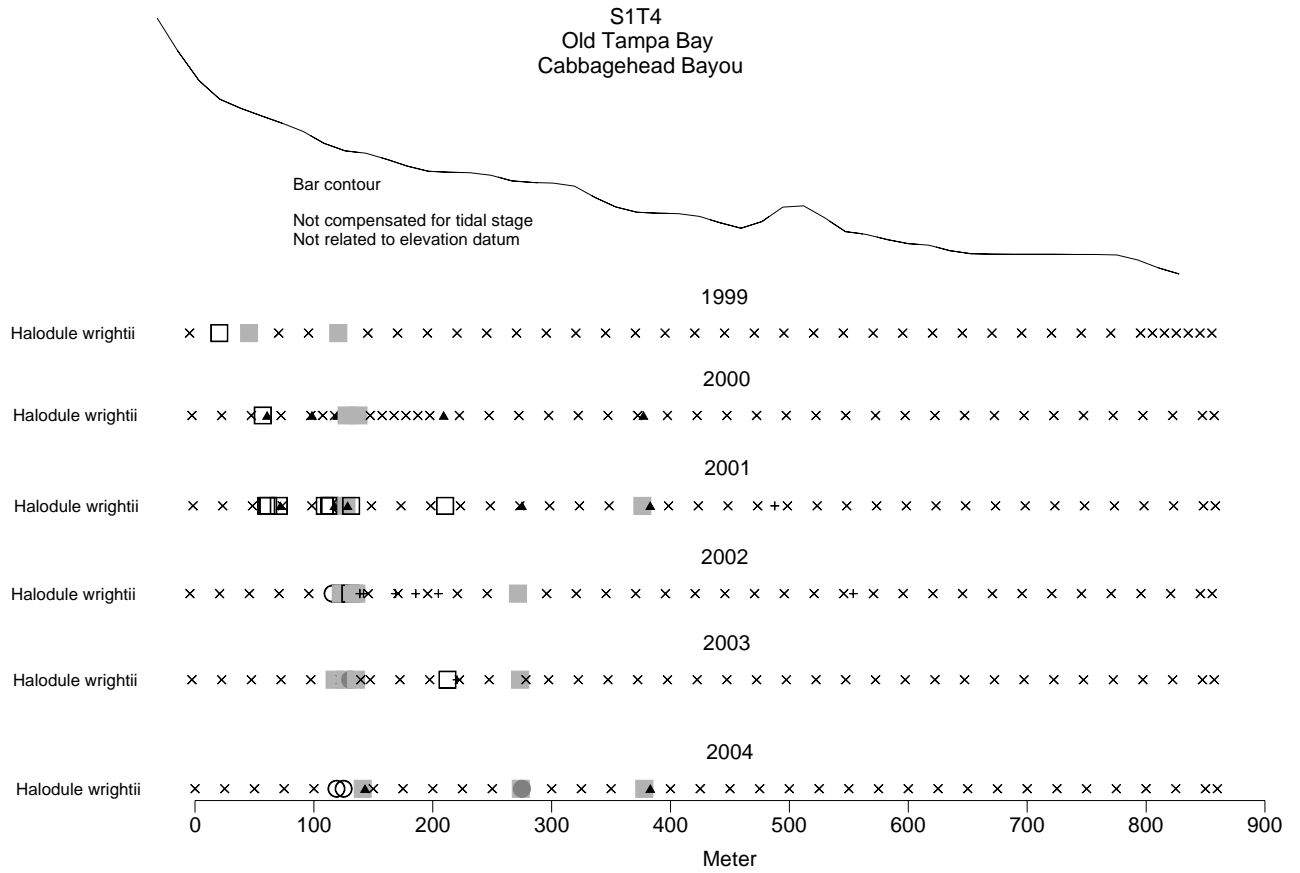


Figure 4. Seagrass species, abundance, and zonation at S1T3 from 1998-2004.



Braun Blanquet Rating

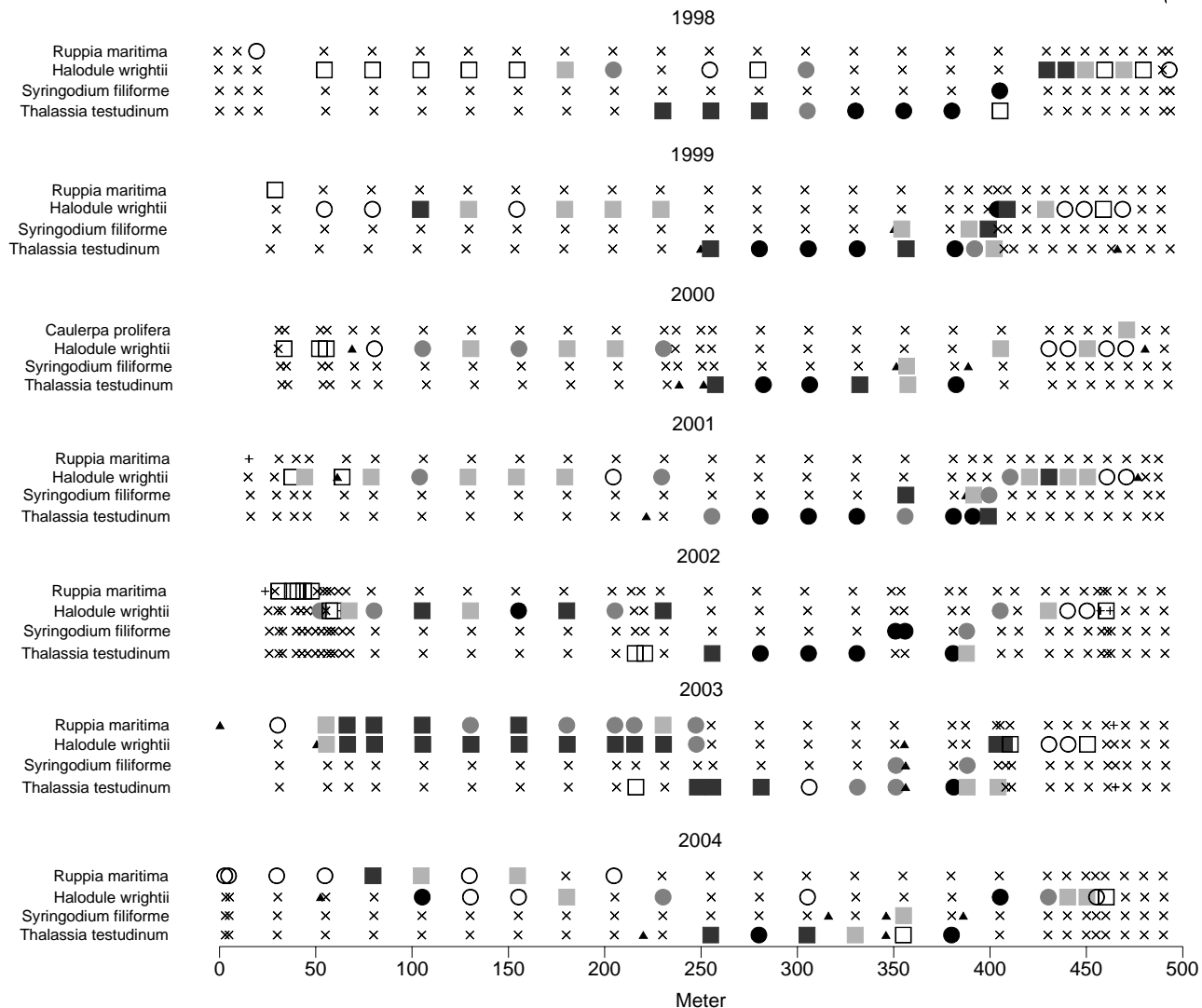


Figure 5. Seagrass species, abundance, and zonation at S1T4 from 1999-2004.

S1T5  
Old Tampa Bay  
Fish Creek

Bar Contour

Not compensated for tidal stage  
Not related to elevation datum



Braun Blanquet Rating

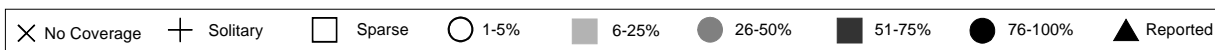


Figure 6. Seagrass species, abundance, and zonation at S1T5 from 1998-2004.

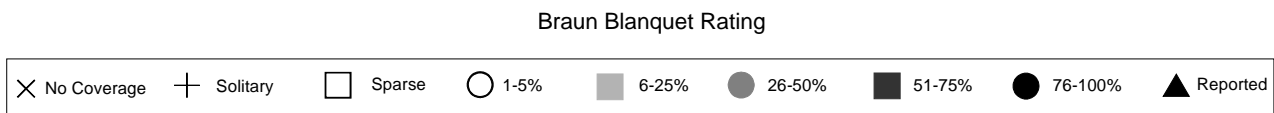
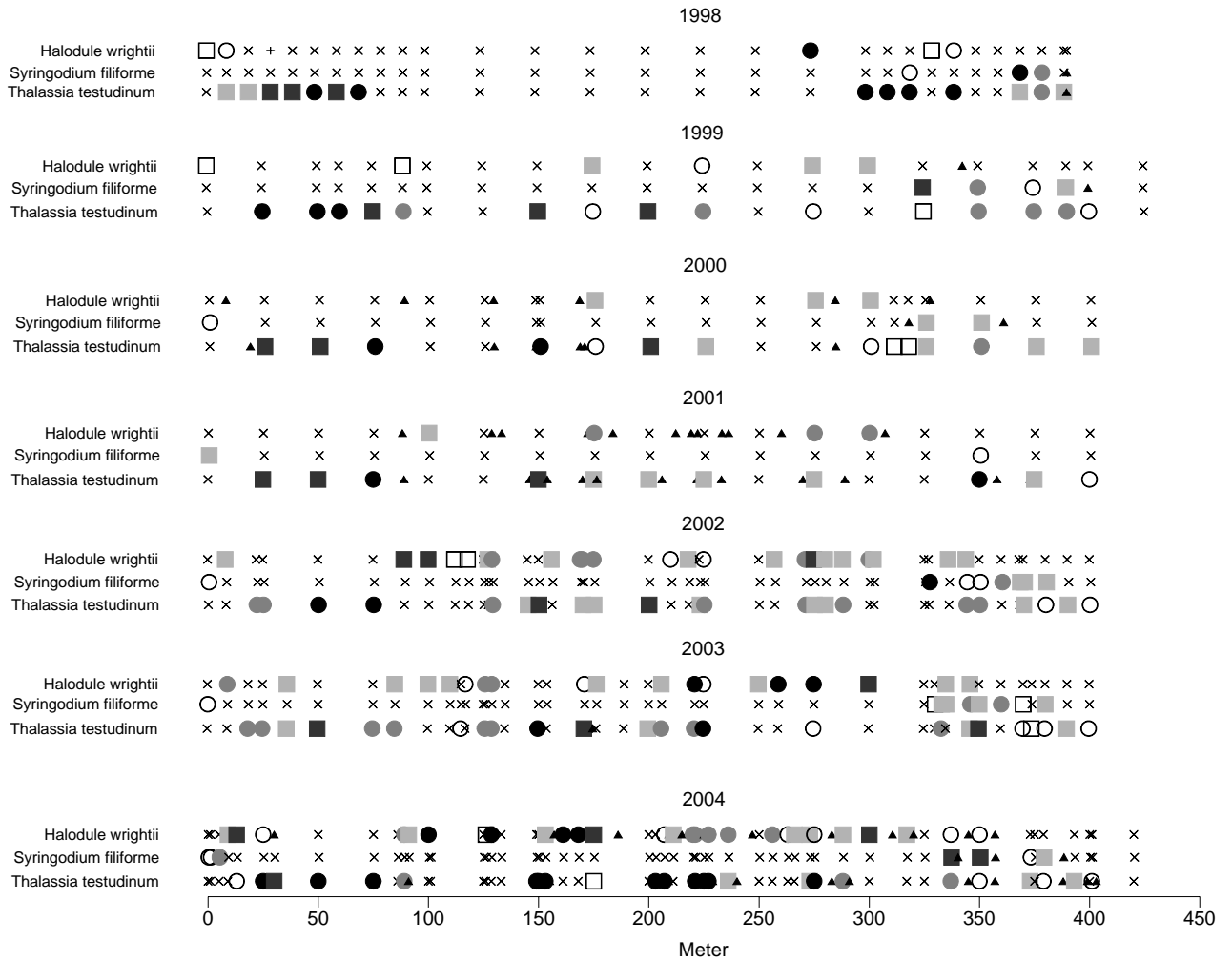
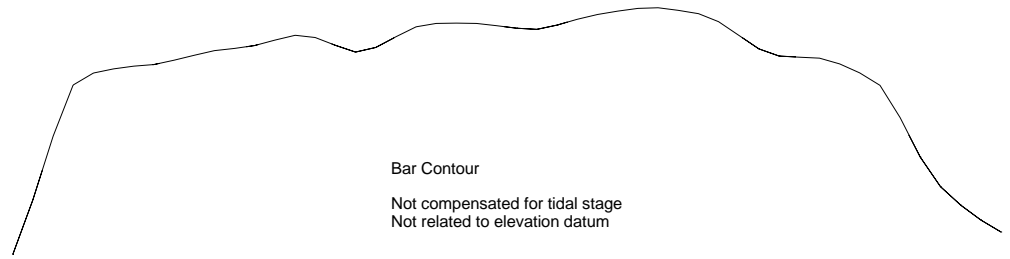


Figure 7. Seagrass species, abundance, and zonation at S1T6 from 1998-2004.

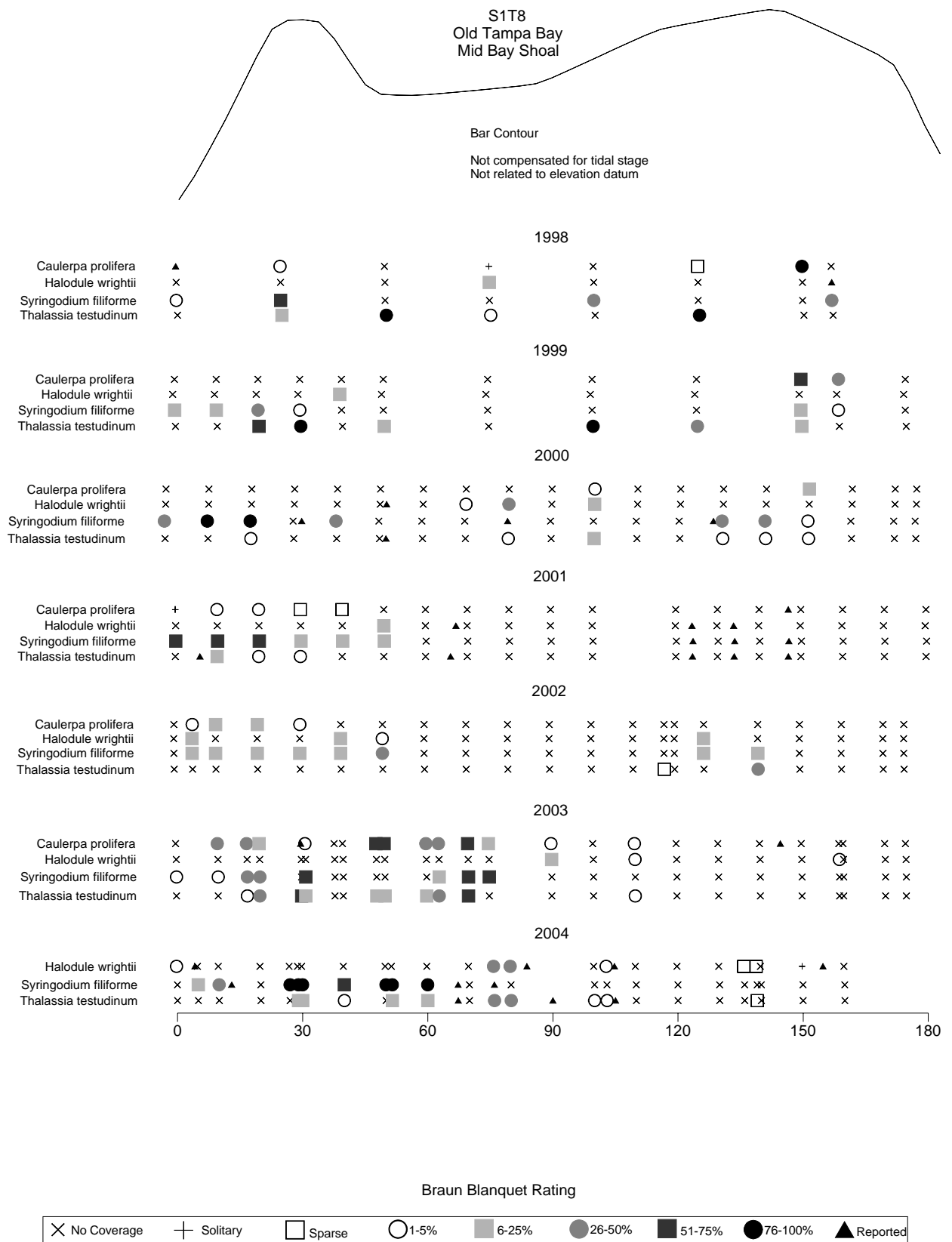


Figure 8. Seagrass species, abundance, and zonation at S1T8 from 1998-2004.

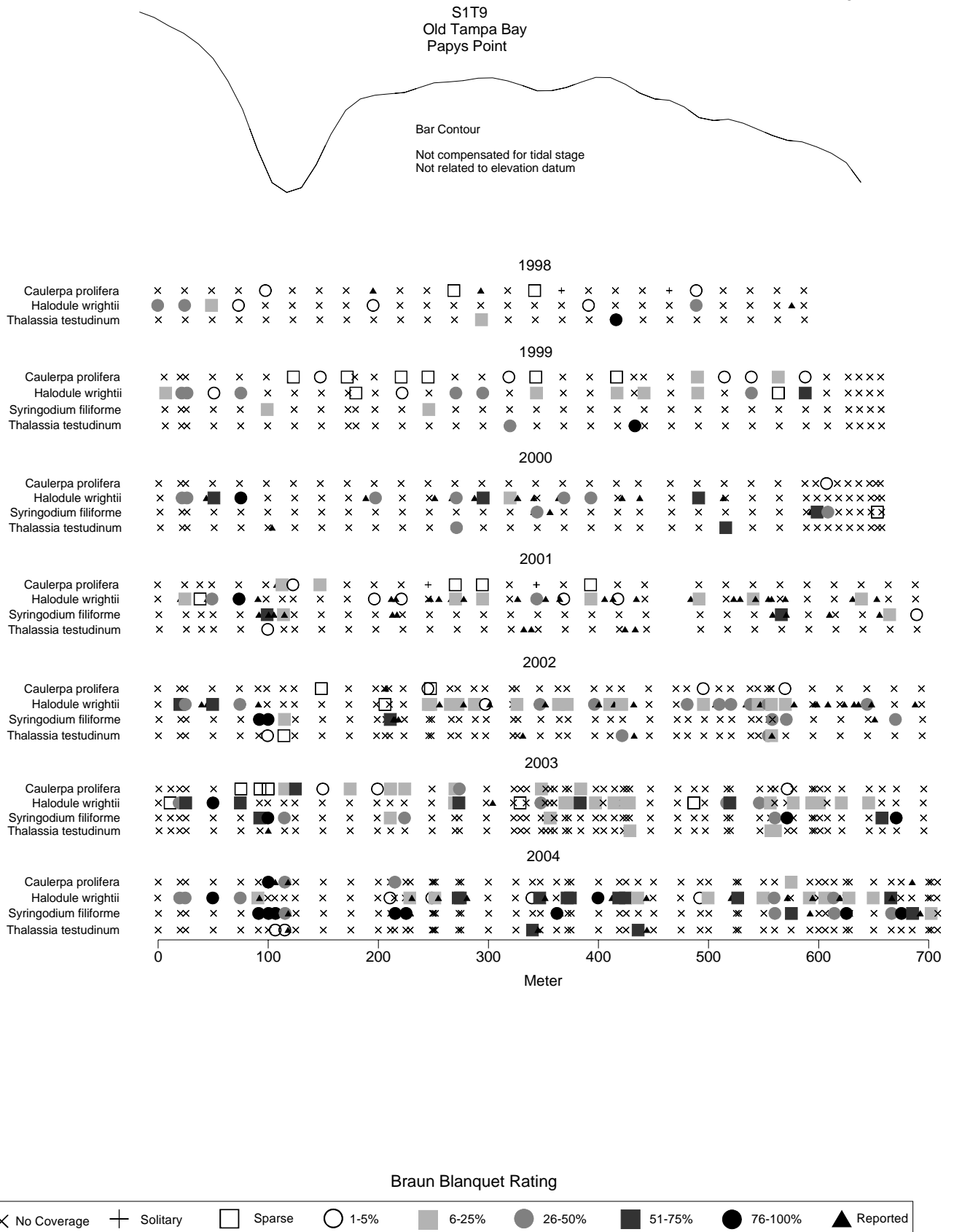


Figure 9. Seagrass species, abundance, and zonation at S1T9 from 1998-2004.

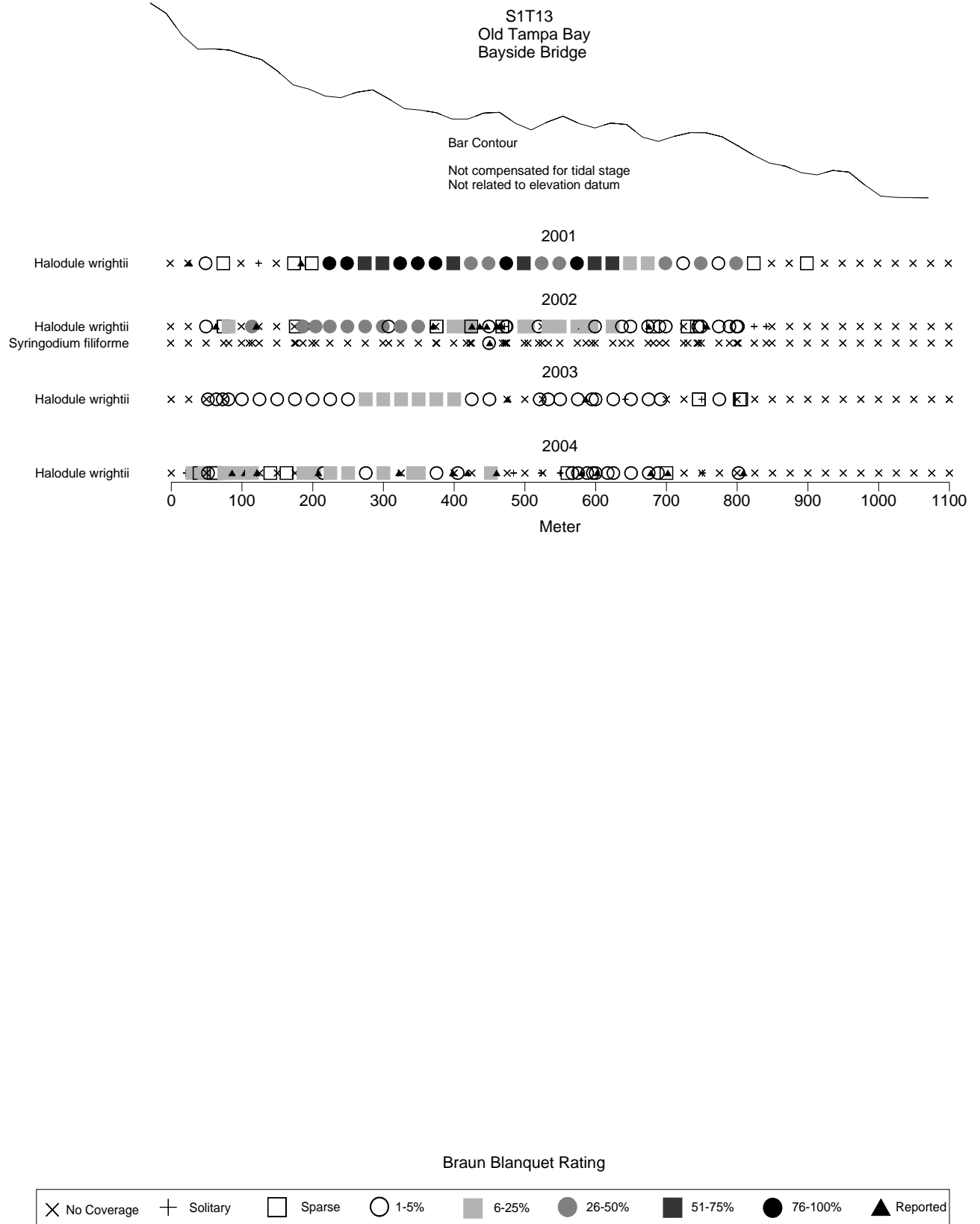


Figure 10. Seagrass species, abundance, and zonation at S1T13 from 2001-2004.

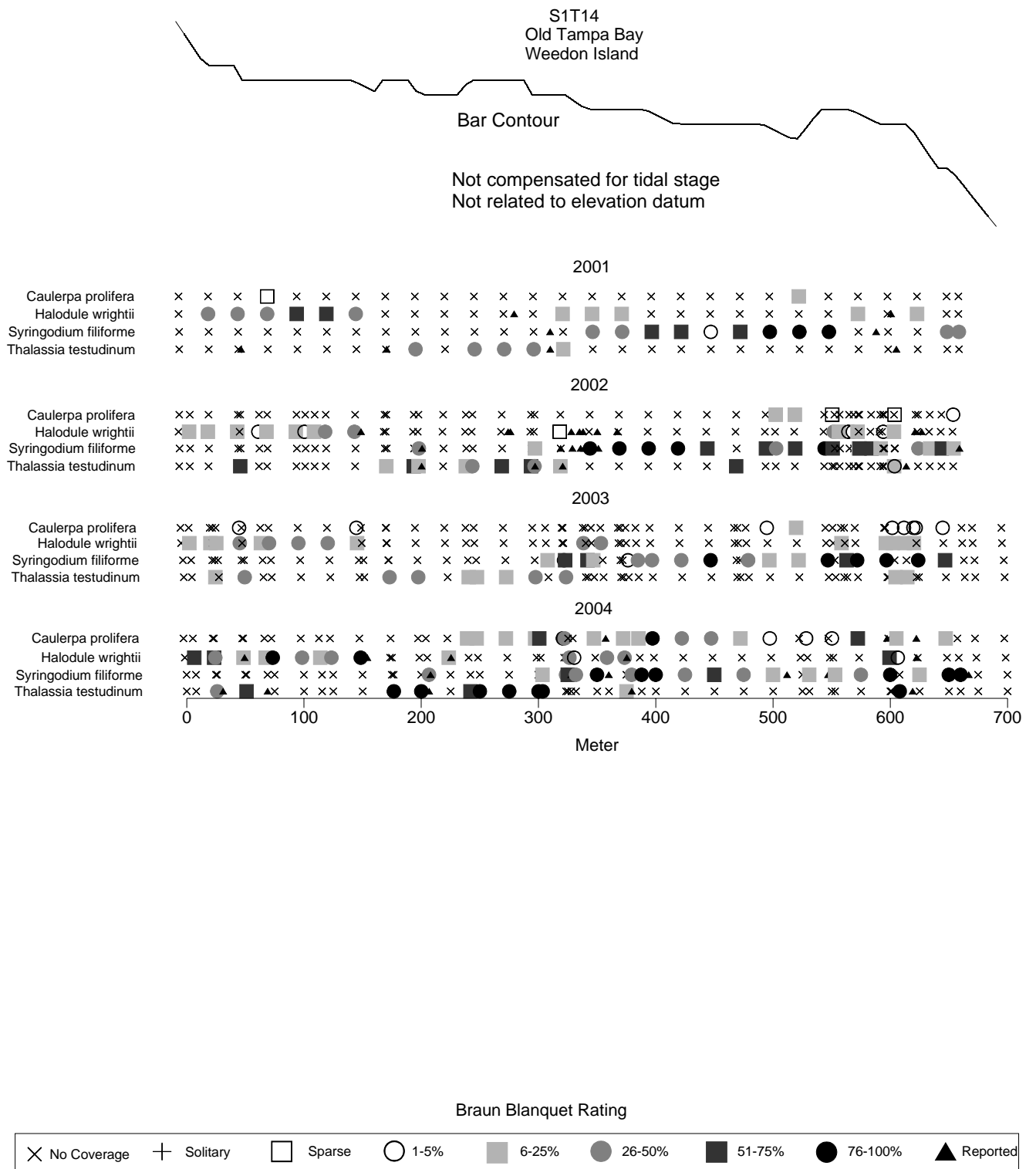


Figure 11. Seagrass species, abundance, and zonation at S1T14 from 2001-2004.

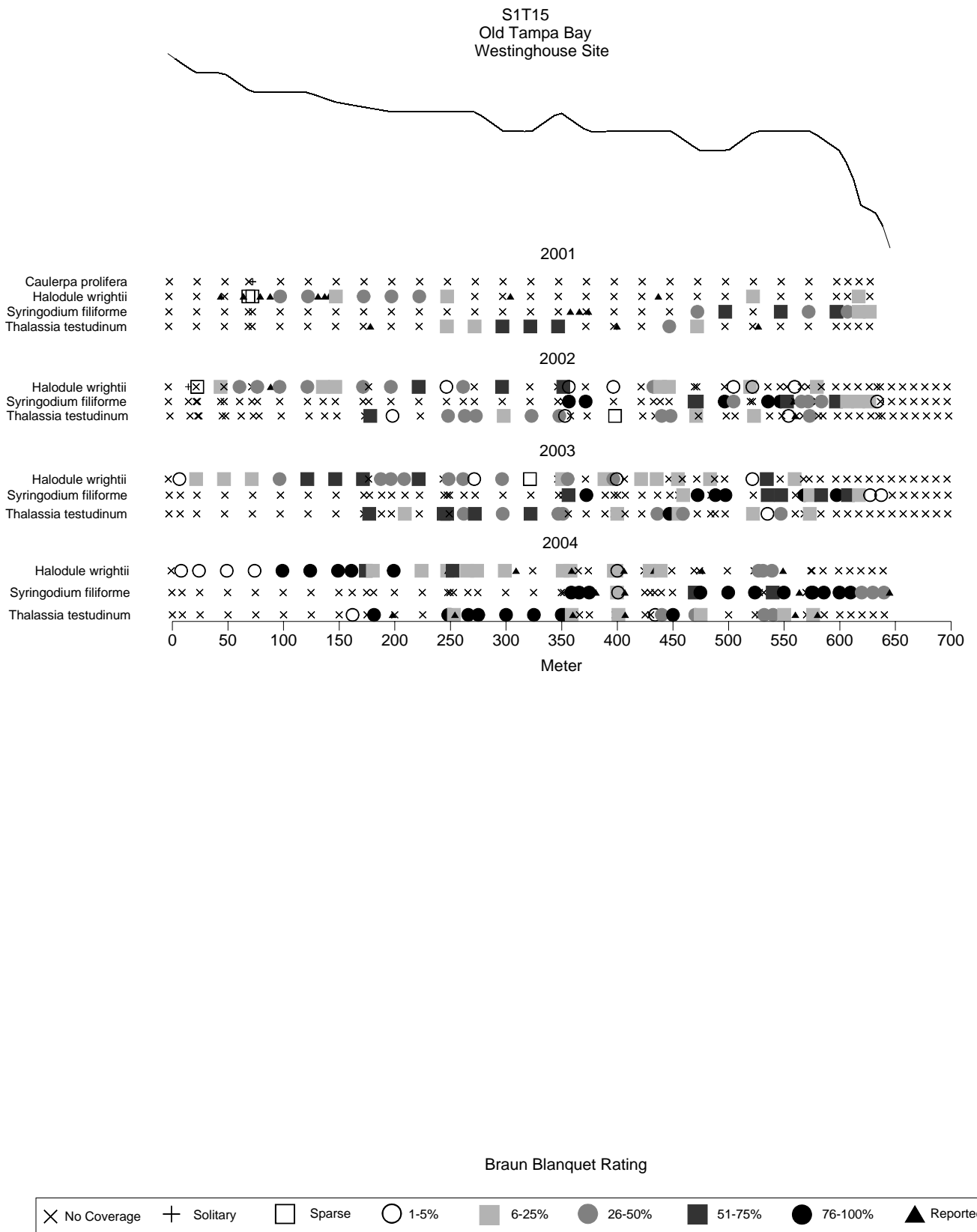


Figure 12. Seagrass species, abundance, and zonation at S1T15 from 2001-2004.

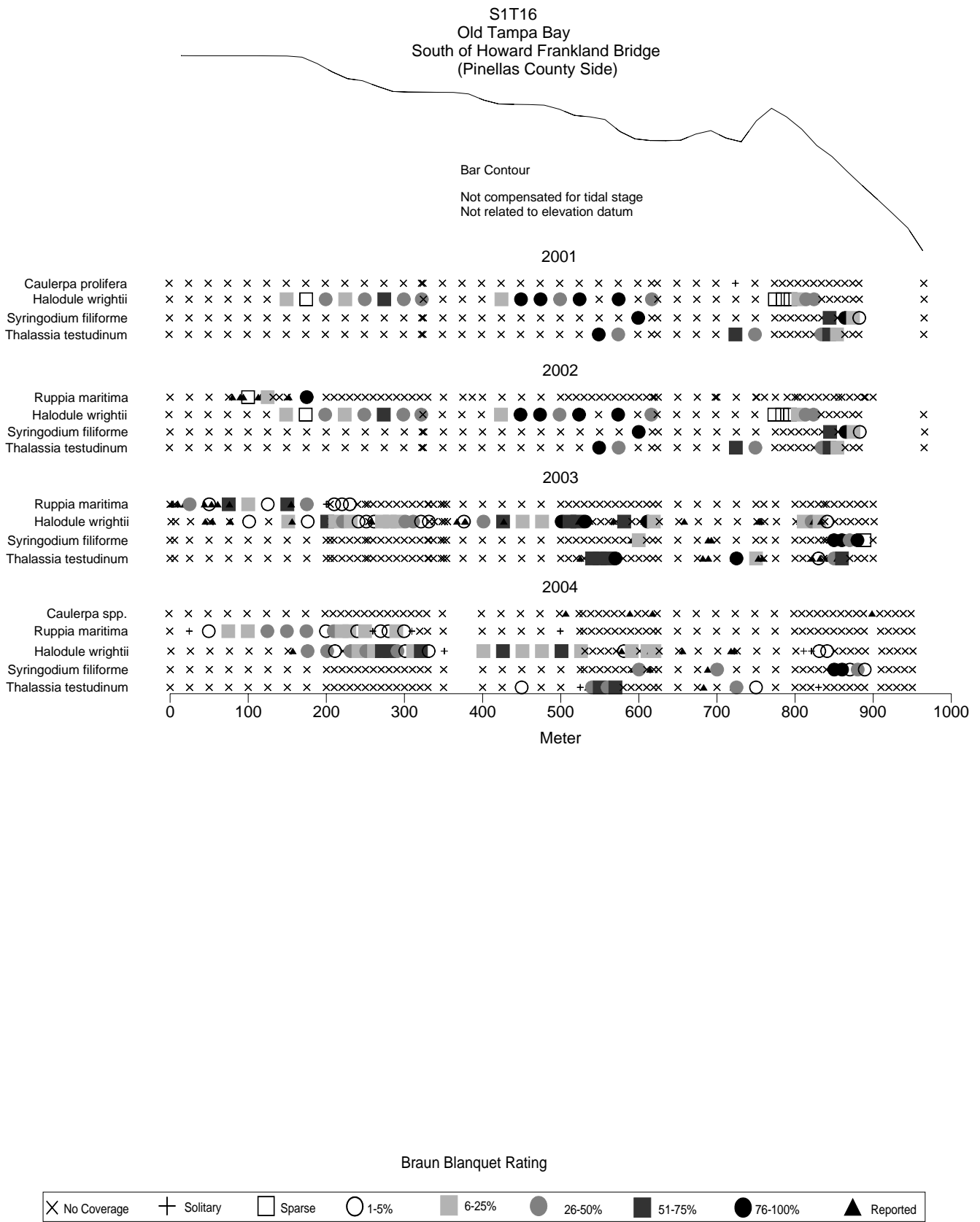


Figure 13. Seagrass species, abundance, and zonation at S1T16 from 2001-2004.

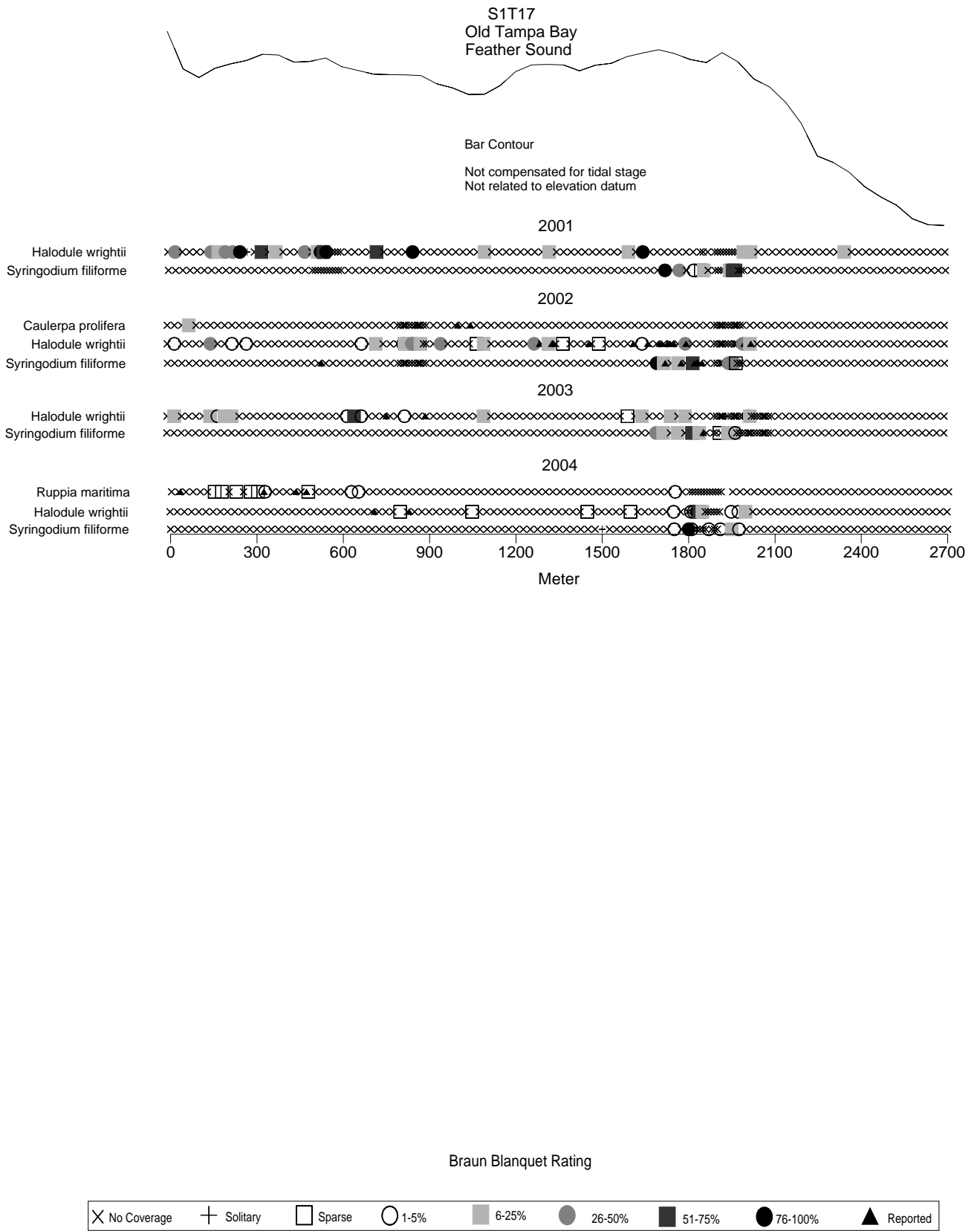


Figure 14. Seagrass species, abundance, and zonation at S1T17 from 2001-2004.

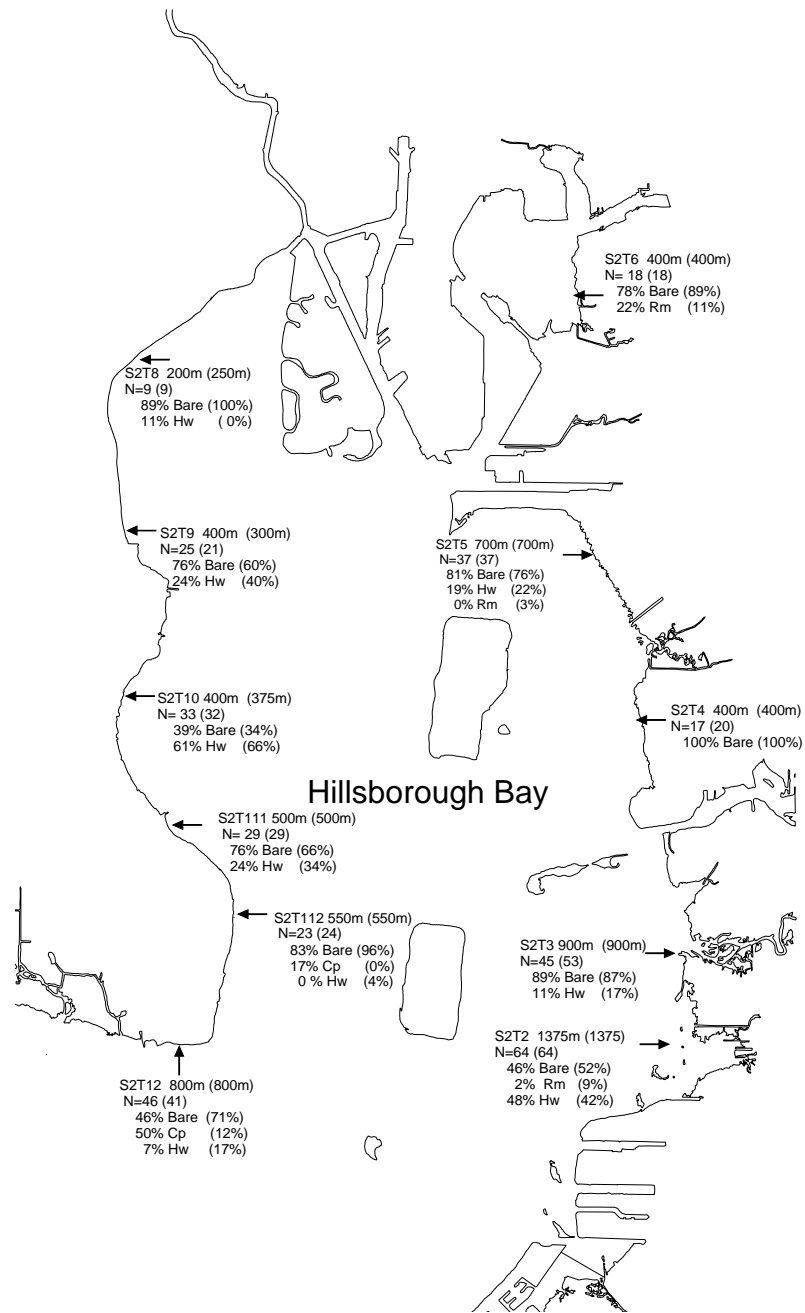


Figure 15. Name, location, length and percent of meter square placements containing each seagrass species and the alga, *Caulerpa prolifera*, along the 11 Hillsborough Bay seagrass monitoring transects in 2004. Results from 2003 in parentheses. N=number of meter square placements; Cp=*Caulerpa prolifera*; He=*Halophila engelmanni*; Hw=*Halodule wrightii*; Rm=*Ruppia maritima*; Sf=*Syringodium filiforme*; Tt=*Thalassia testudinum*, ND=No Data.

*Halodule wrightii* Coverage in Hillsborough Bay  
1986-2004

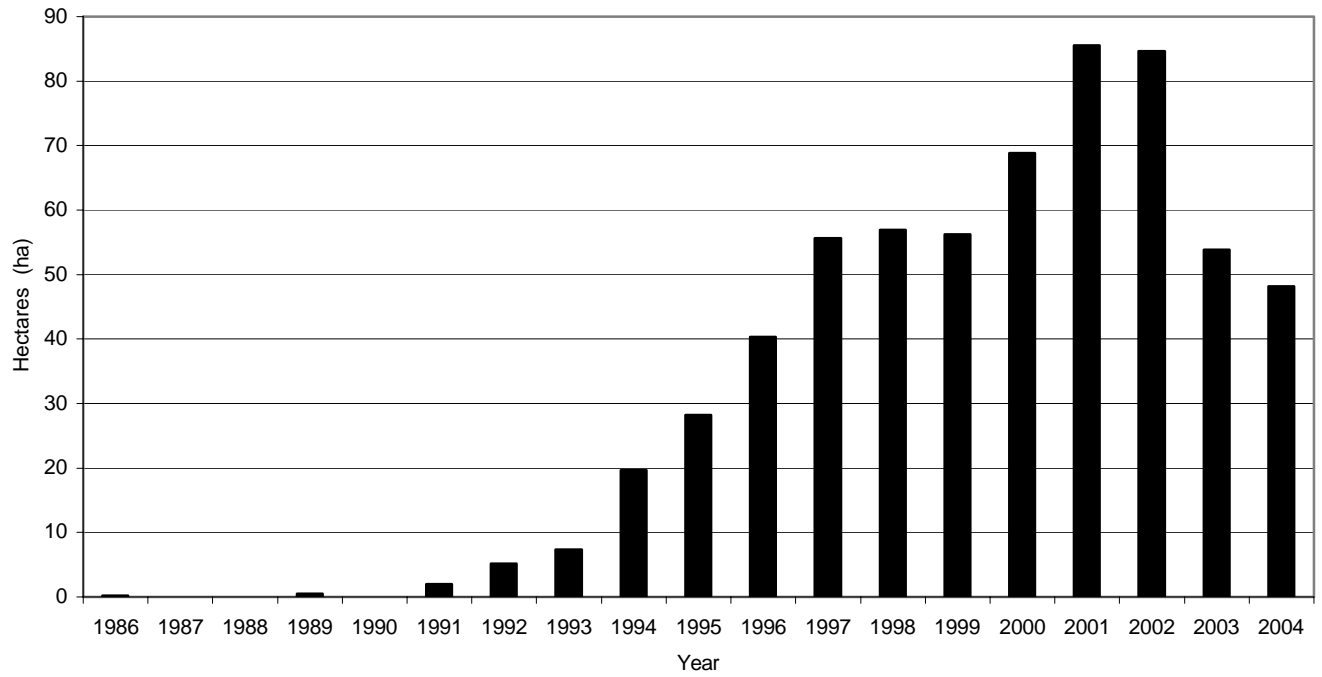


Figure 16. Annual determinations of *Halodule wrightii* coverage in Hillsborough Bay from 1986-2004 (City of Tampa, 2004).

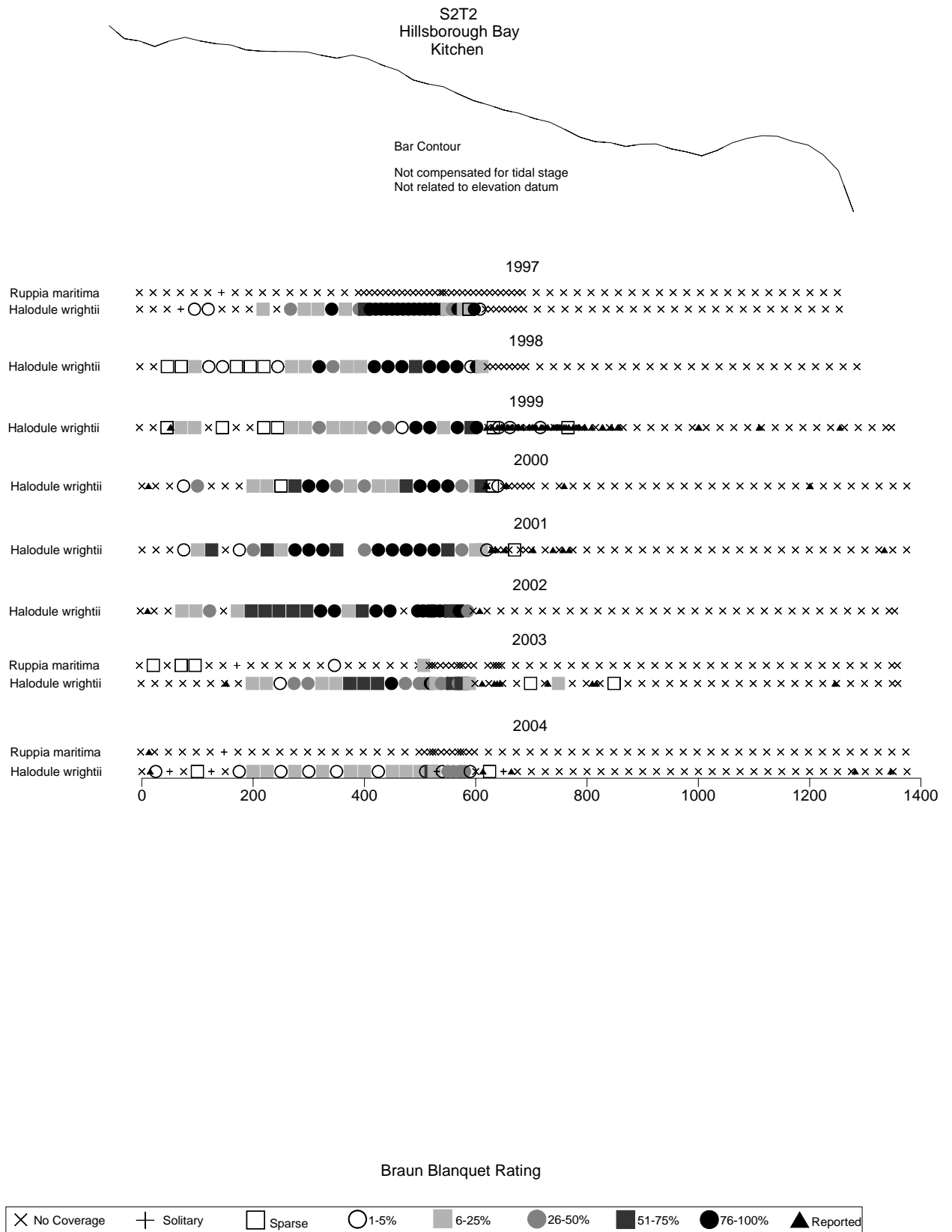


Figure 17. Seagrass species, abundance, and zonation at S2T2 from 1997-2004.

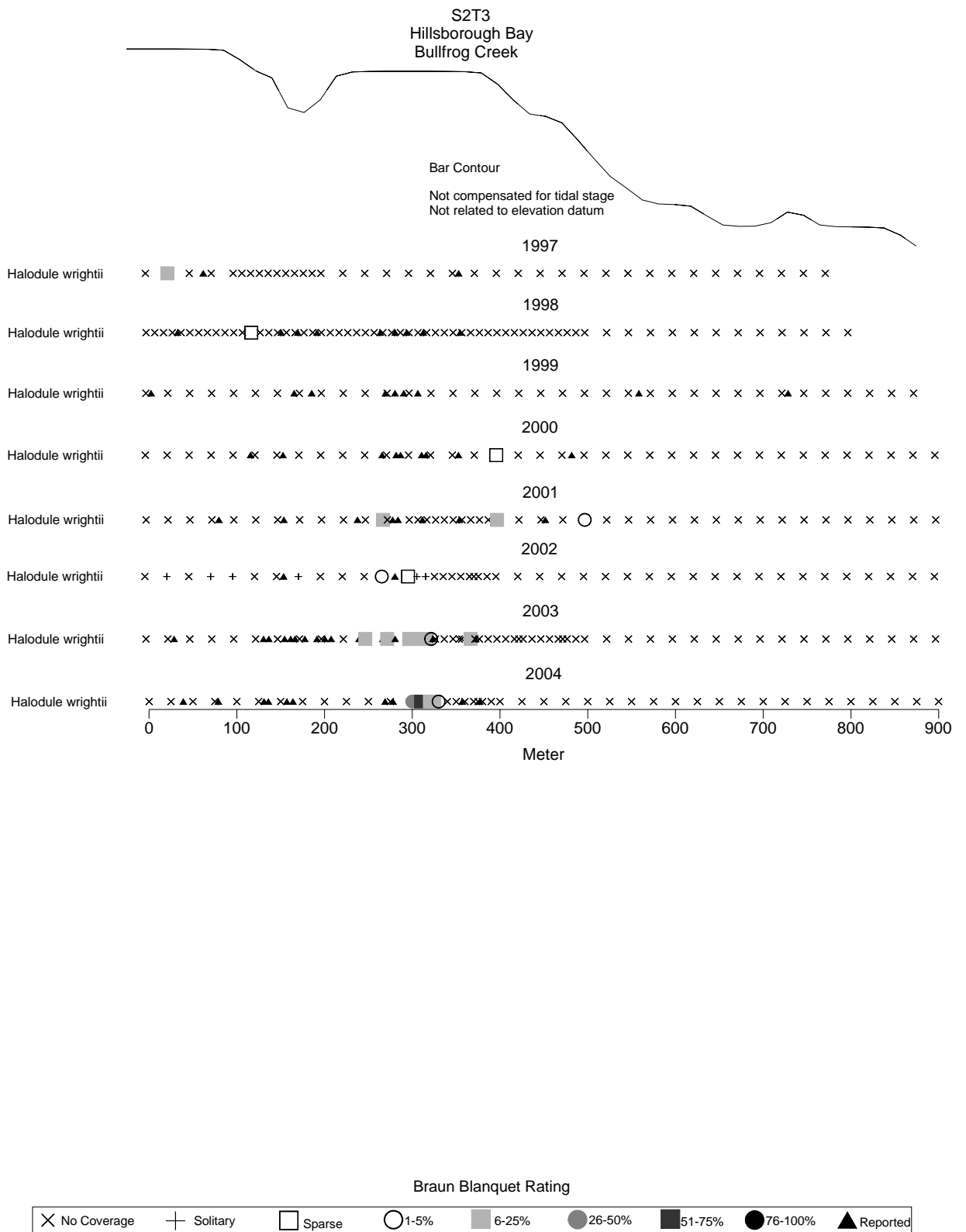
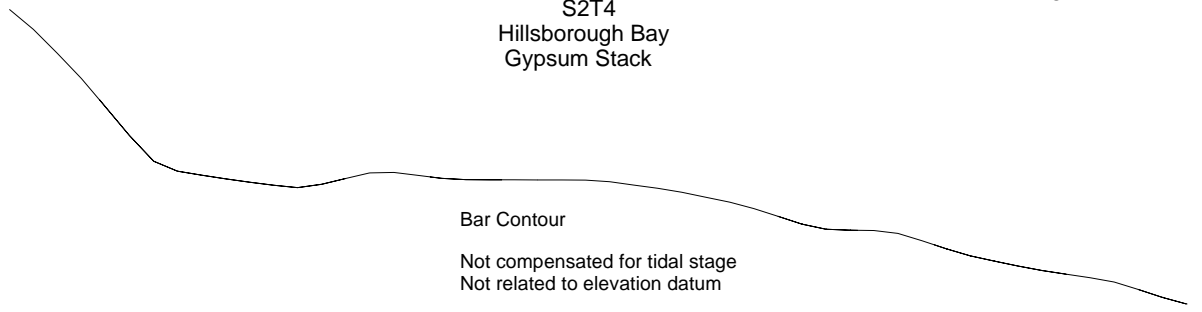
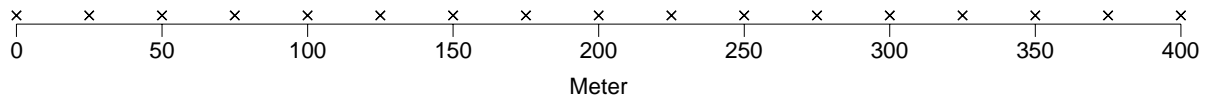


Figure 18. Seagrass species, abundance, and zonation at S2T3 from 1997-2004.

S2T4  
Hillsborough Bay  
Gypsum Stack



No SAV reported in 1997, 1998, 1999, 2000, 2001, 2002, 2003 or 2004.



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Figure 19. Seagrass species, abundance, and zonation at S2T4 from 1997-2004.

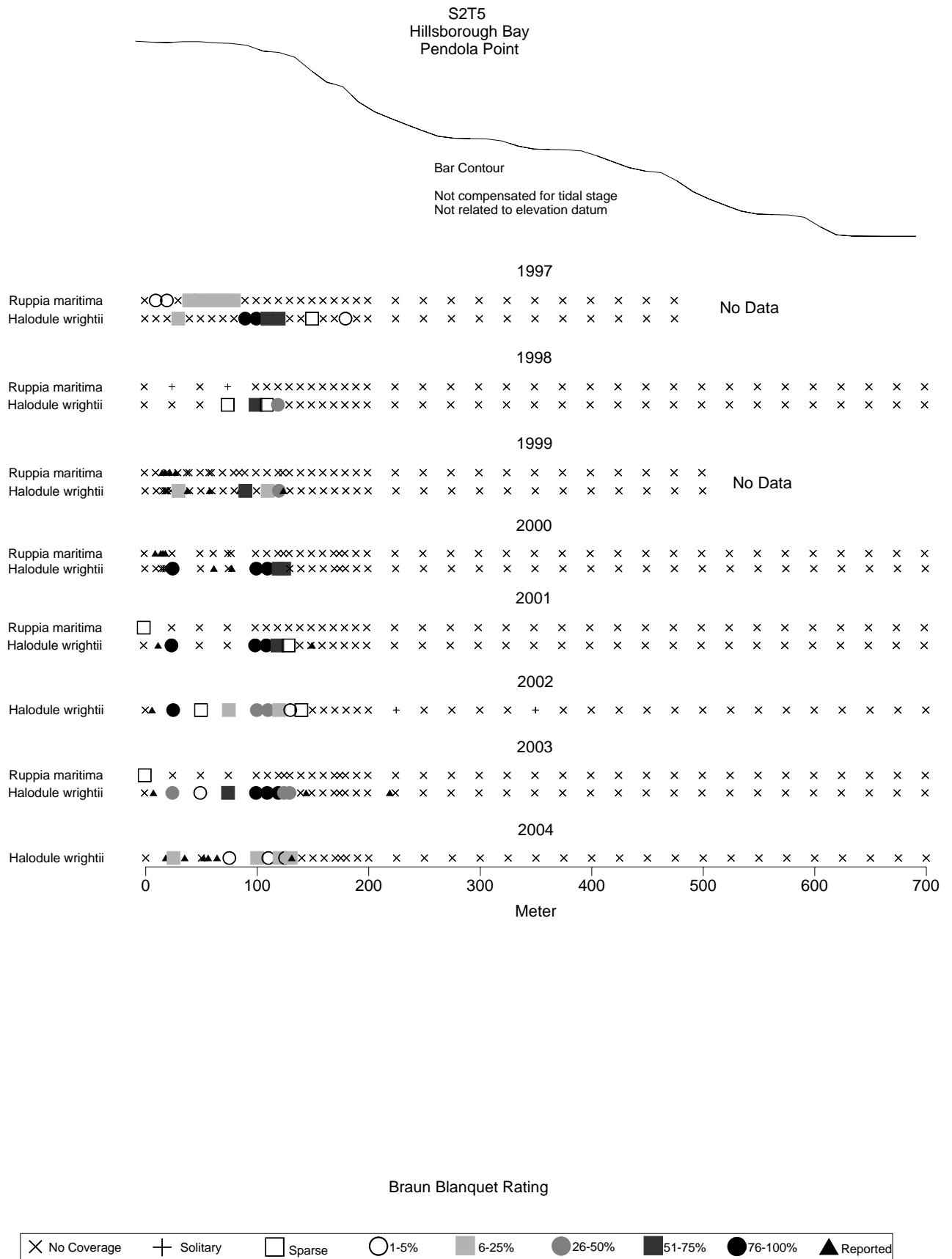
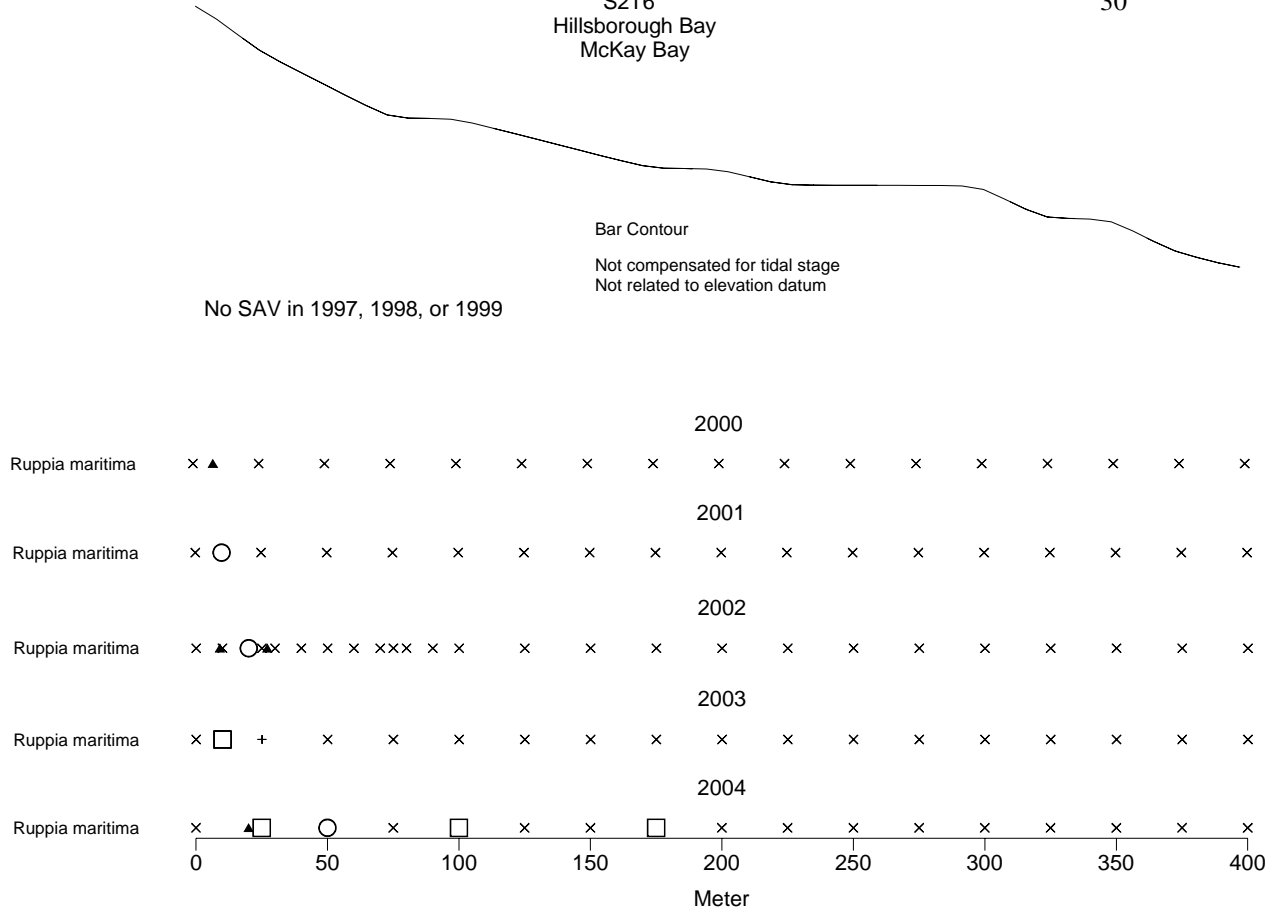


Figure 20. Seagrass species, abundance, and zonation at S2T5 from 1997-2004.

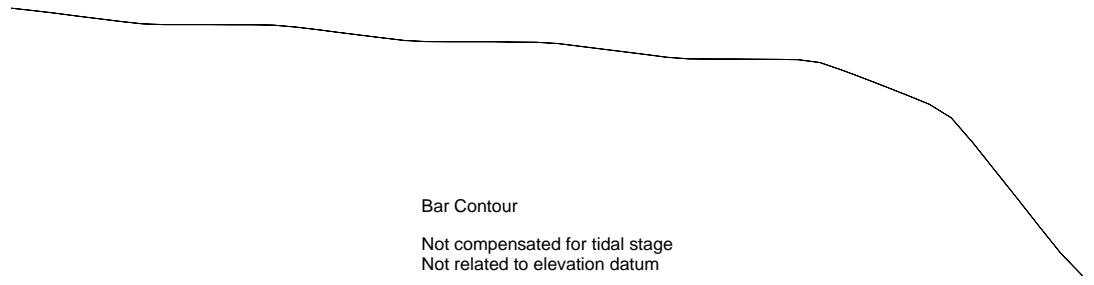


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Figure 21. Seagrass species, abundance, and zonation at S2T6 from 1997-2004.

S2T8  
Hillsborough Bay  
North Bayshore Blvd.



No SAV in 1997, 1998, 1999, 2001, 2002, or 2003.

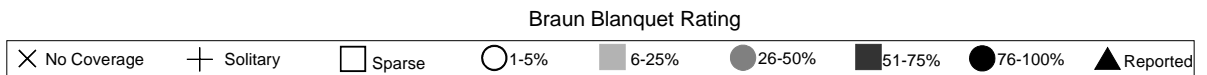
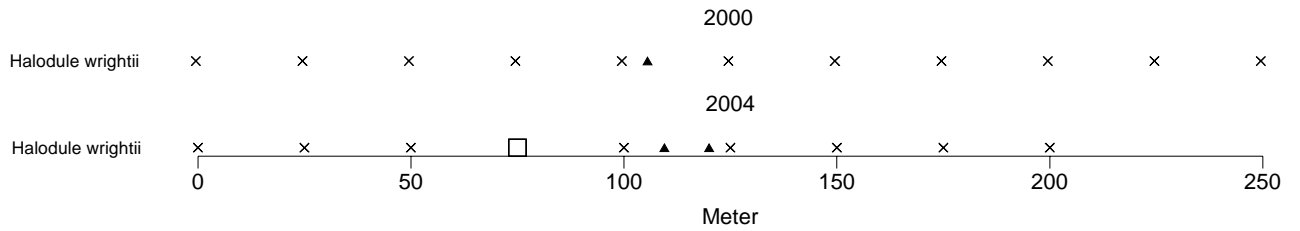


Figure 22. Seagrass species, abundance, and zonation at S2T8 from 1997-2004.

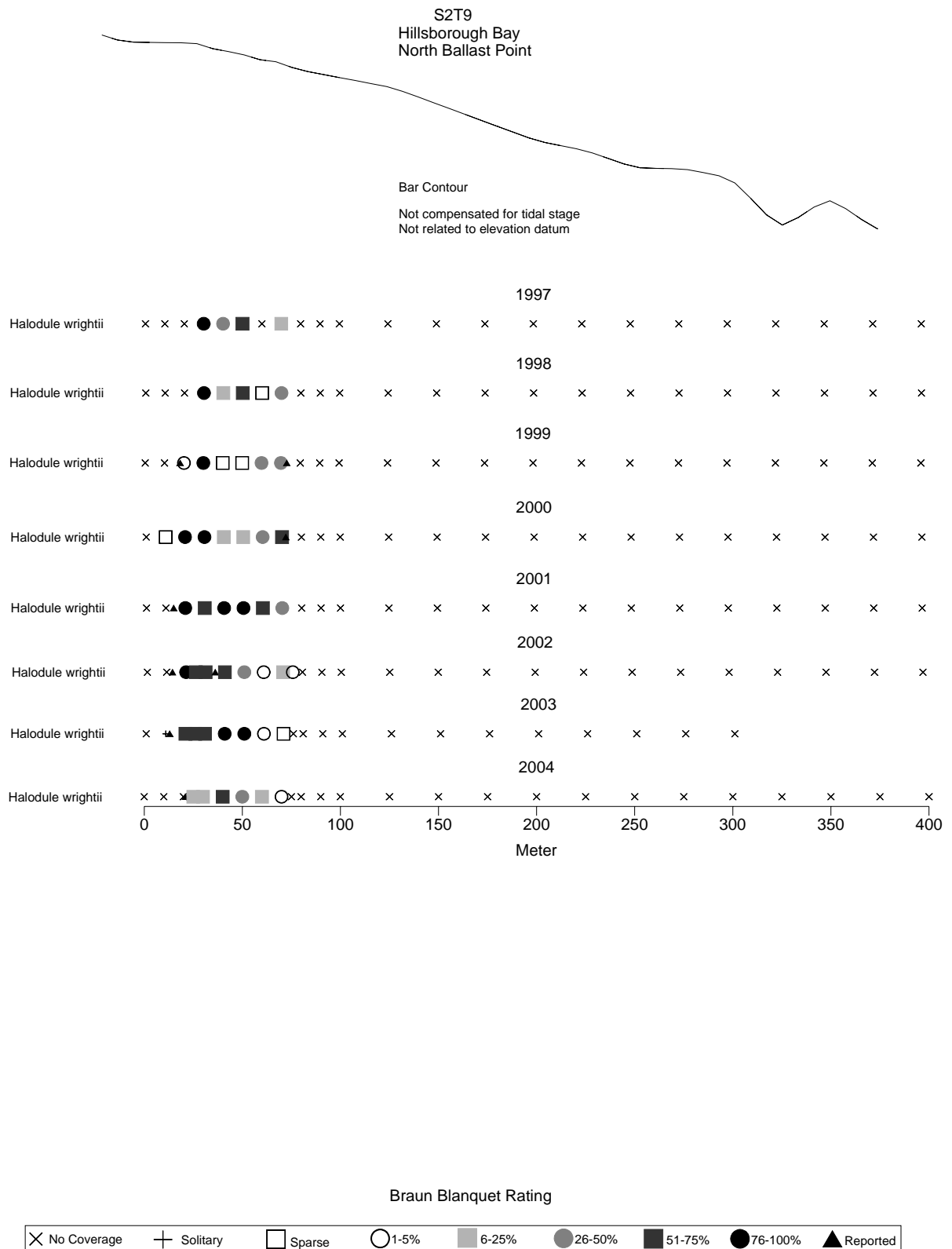


Figure 23. Seagrass species, abundance, and zonation at S2T9 from 1997-2004.





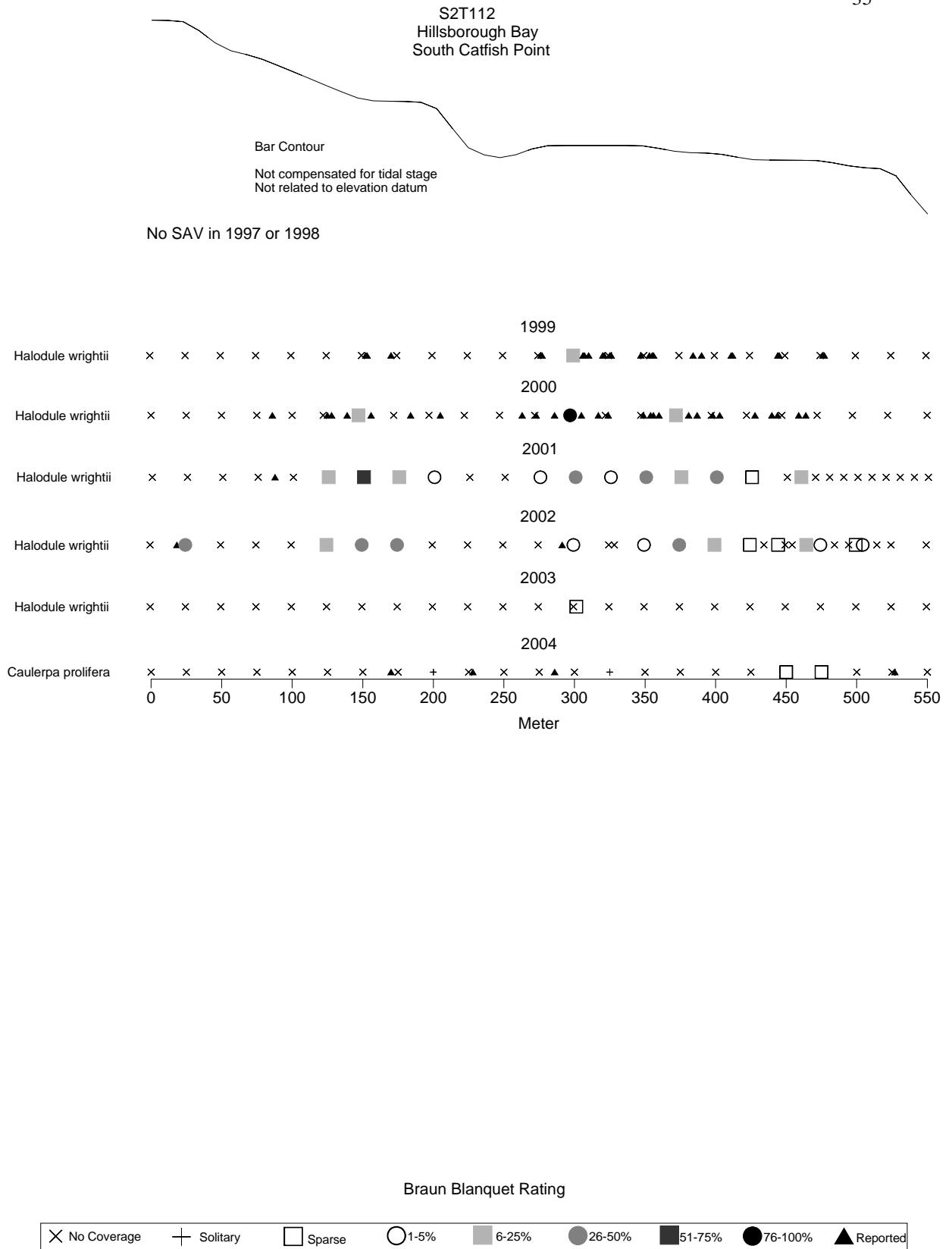


Figure 26. Seagrass species, abundance, and zonation at S2T112 from 1997-2004.

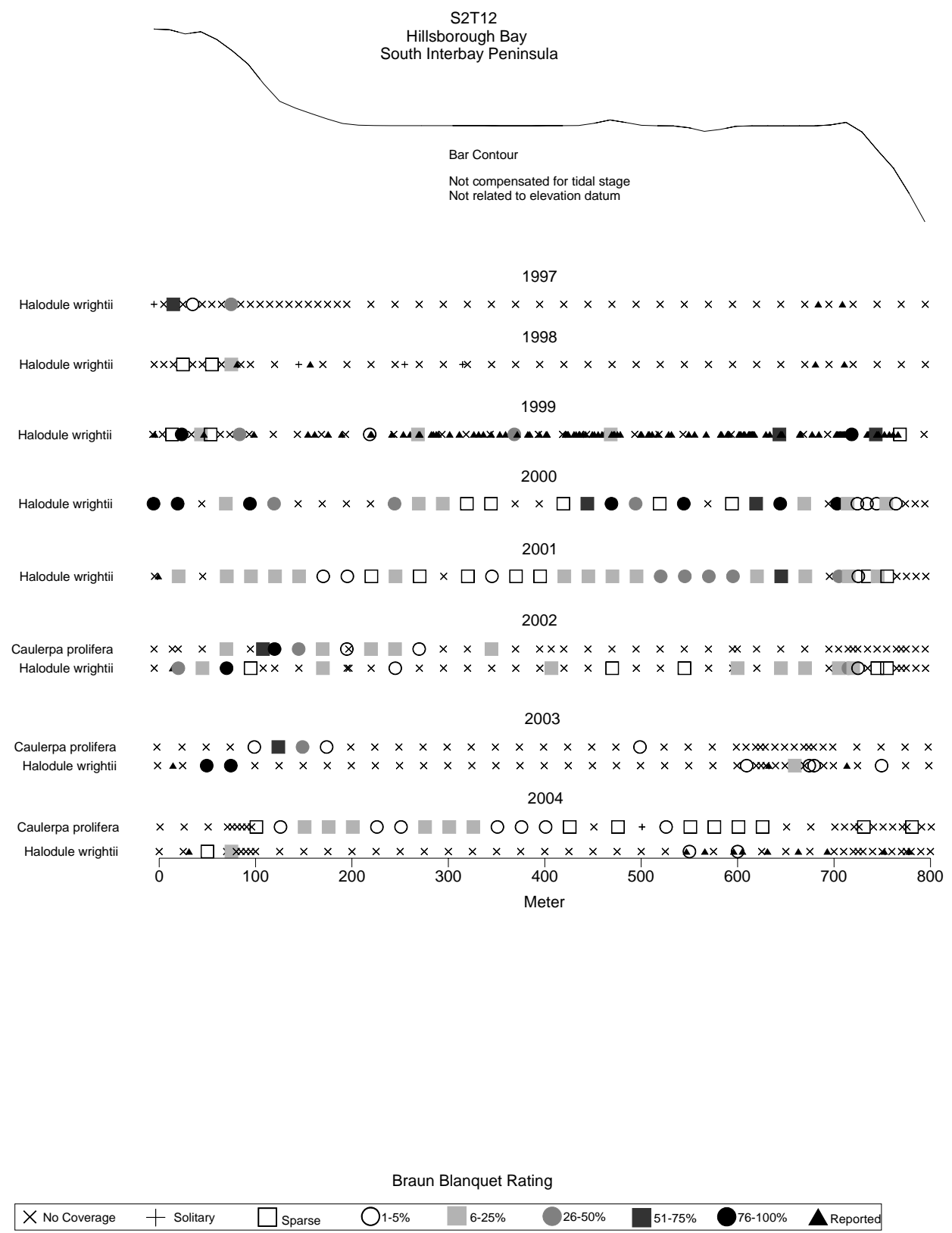


Figure 27. Seagrass species, abundance, and zonation at S2T12 from 1997-2004.

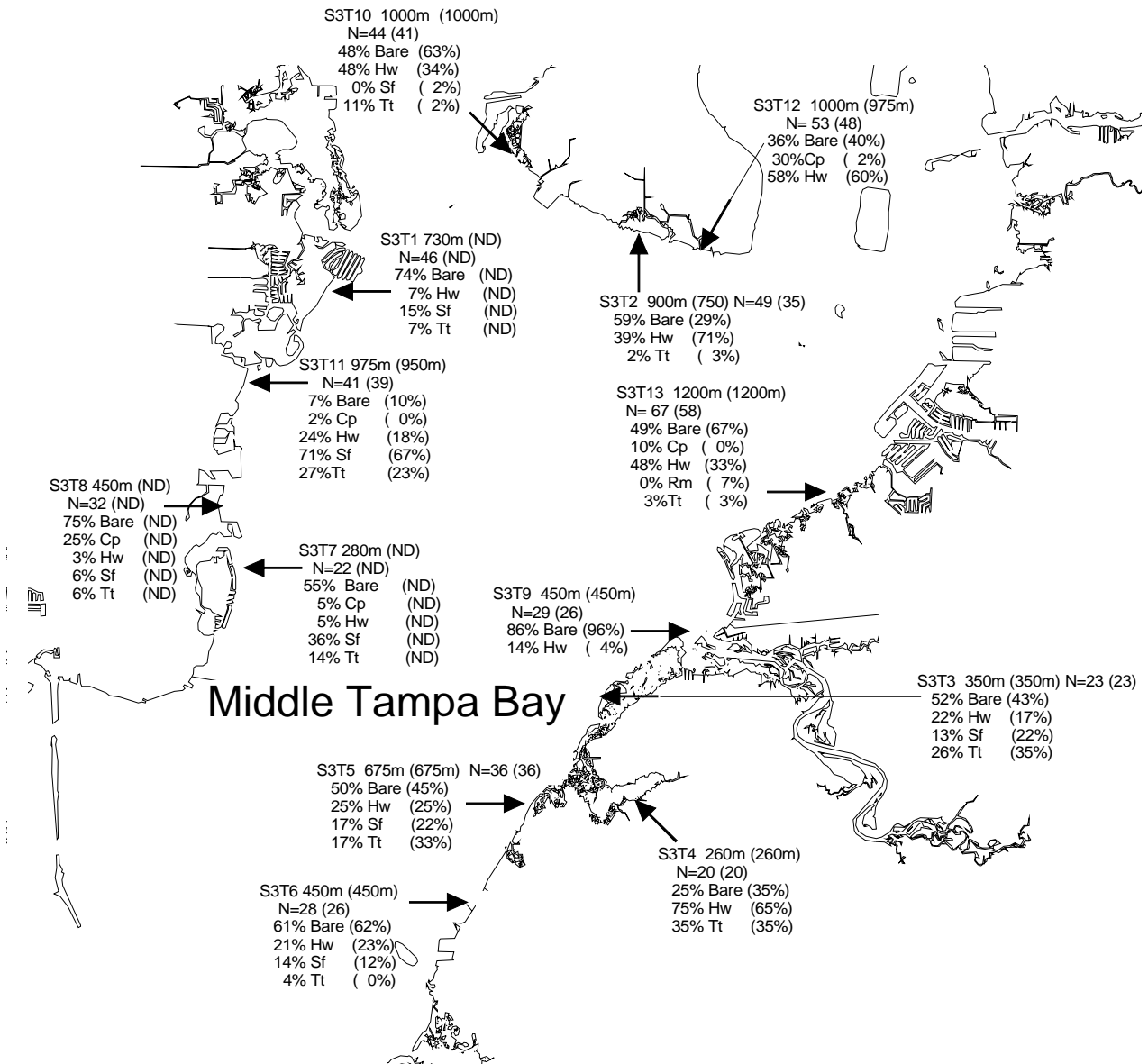


Figure 28. Name, location, length and percent of meter square placements containing each seagrass species and the alga, *Caulerpa prolifera*, along the 13 Middle Tampa Bay seagrass monitoring transects in 2004. Results from 2003 in parentheses. N=number of meter square placements; Cp=*Caulerpa prolifera*; He=*Halophila engelmanni*; Hw=*Halodule wrightii*; Rm=*Ruppia maritima*; Sf=*Syringodium filiforme*; Tt=*Thalassia testudinum*, ND=No Data.

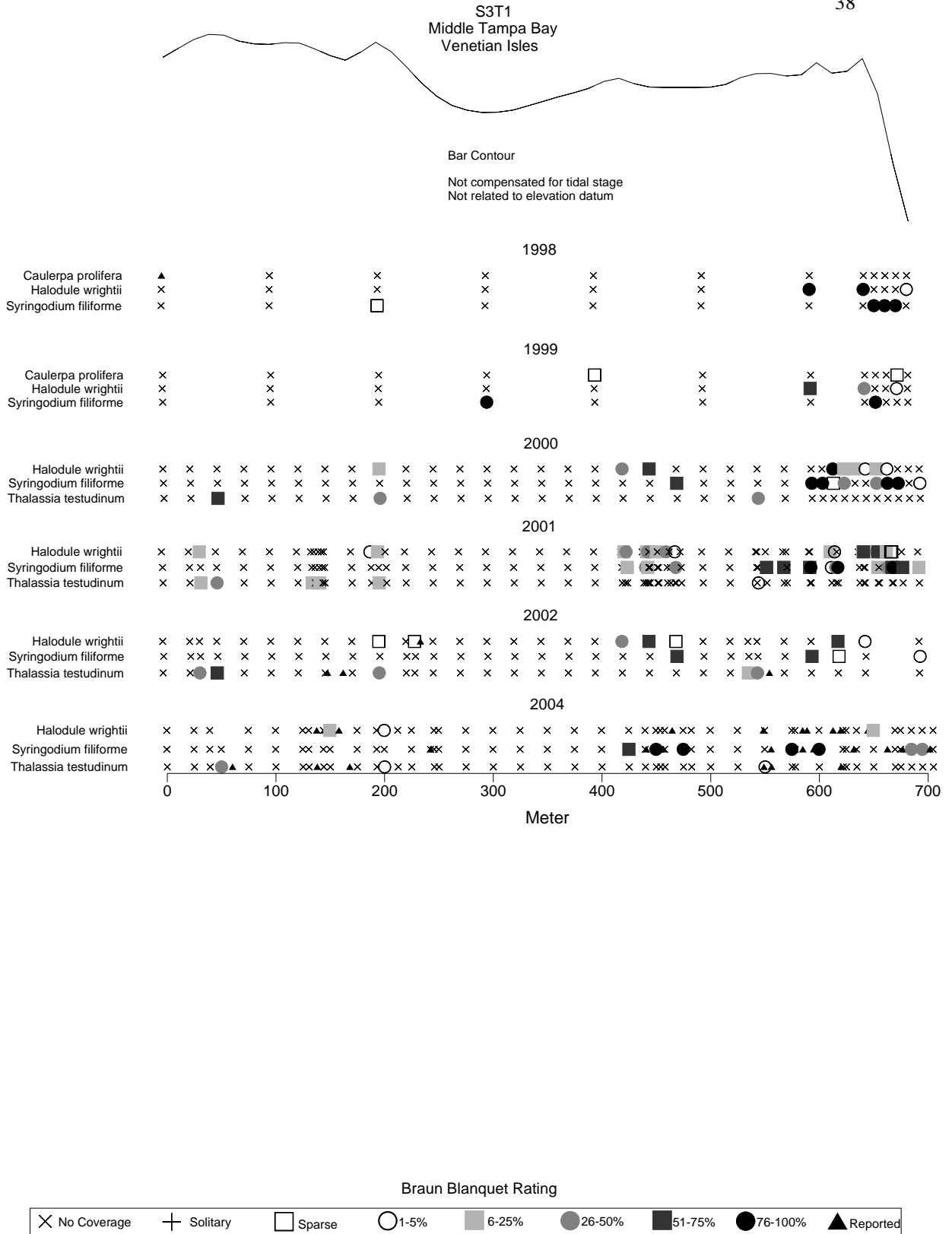
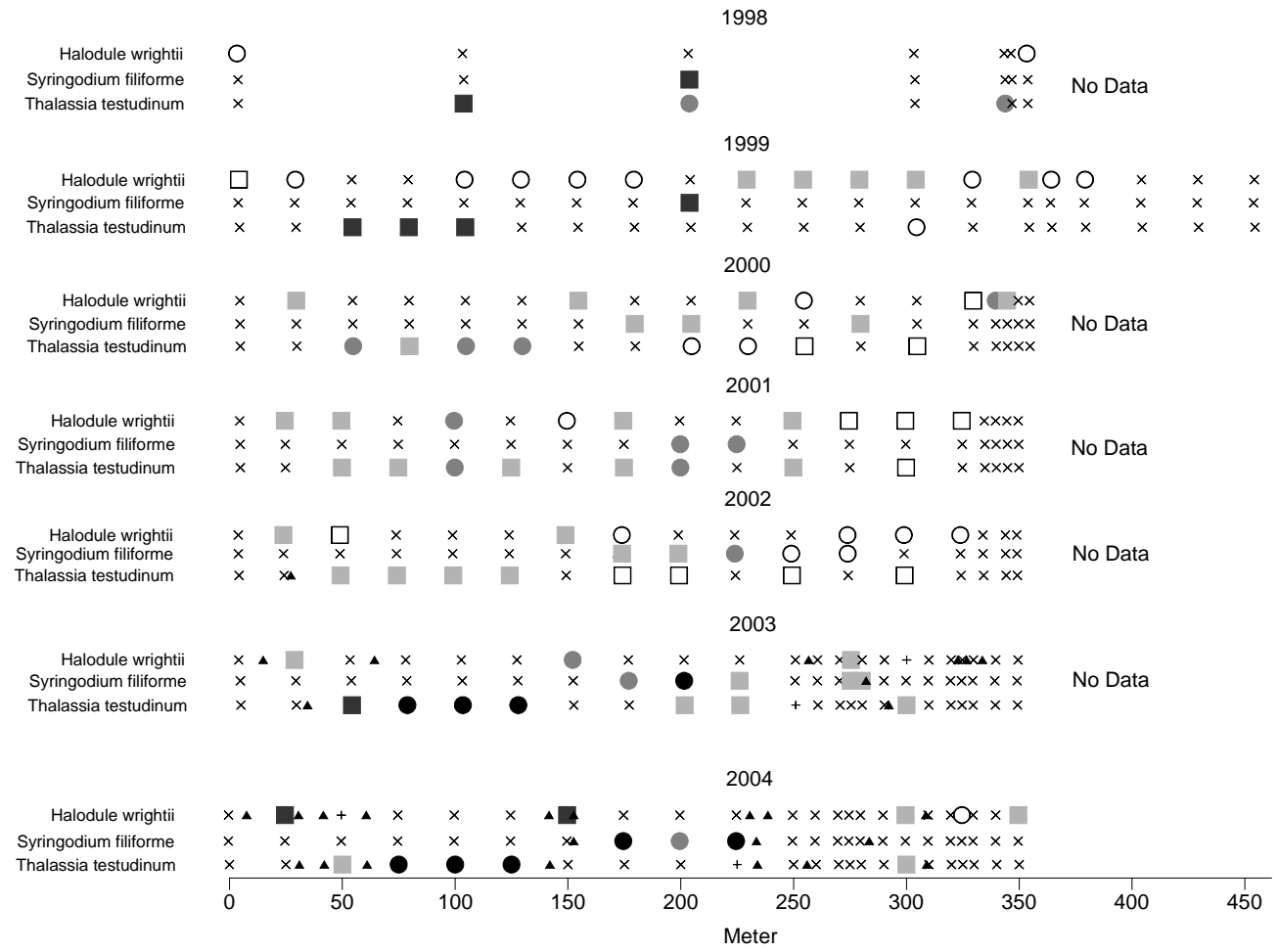


Figure 29. Seagrass species, abundance, and zonation at S3T1 from 1998-2004 (2003 data not reported).



S3T3  
Middle Tampa Bay  
Little Cockroach Bay

Bar Contour  
Not compensated for tidal stage  
Not related to elevation datum



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Figure 31. Seagrass species, abundance, and zonation at S3T3 from 1998-2004.

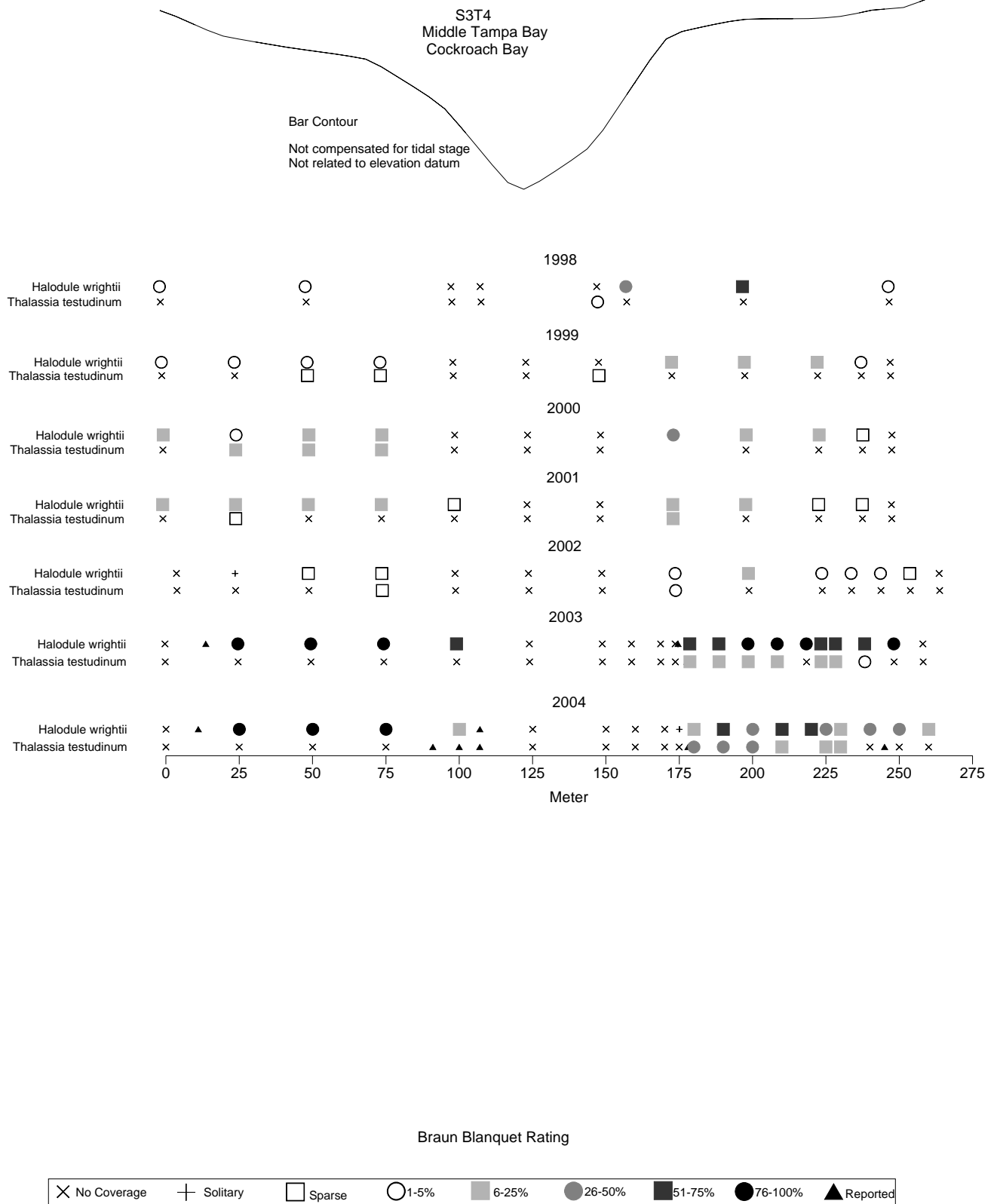


Figure 32. Seagrass species, abundance, and zonation at S3T4 from 1998-2004.

S3T5  
Middle Tampa Bay  
Beacon Key

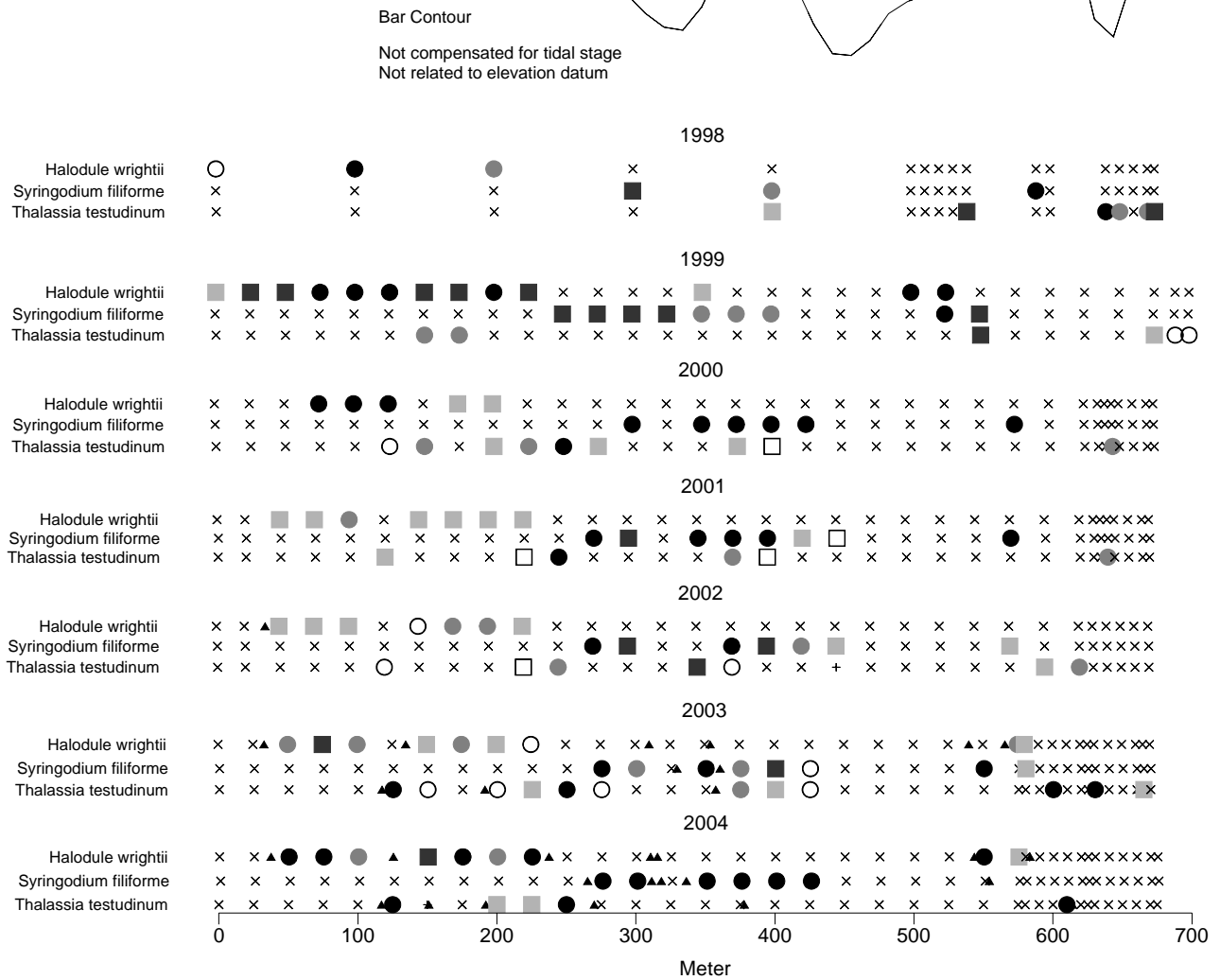


Figure 33. Seagrass species, abundance, and zonation at S3T5 from 1998-2004.

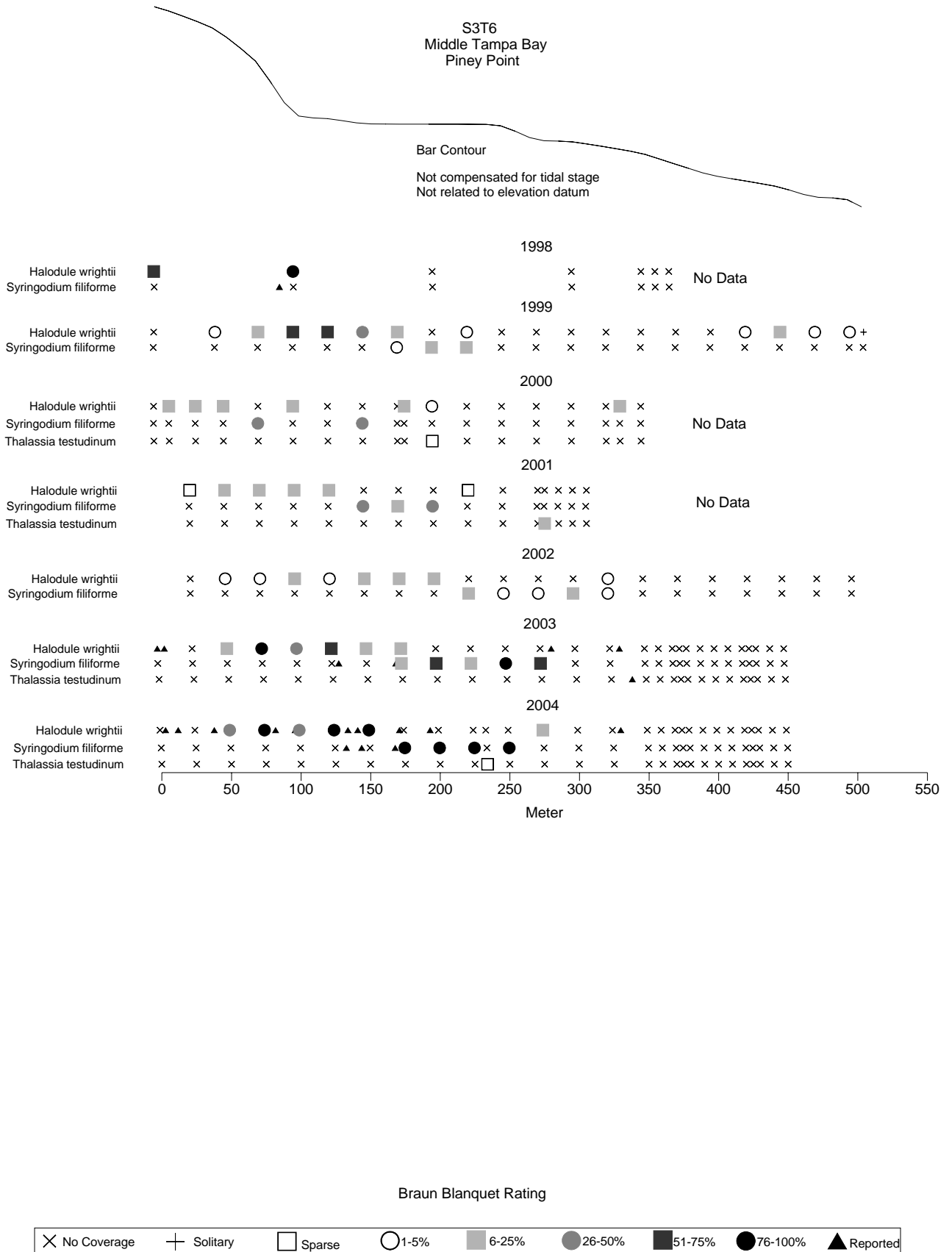


Figure 34. Seagrass species, abundance, and zonation at S3T6 from 1998-2004.

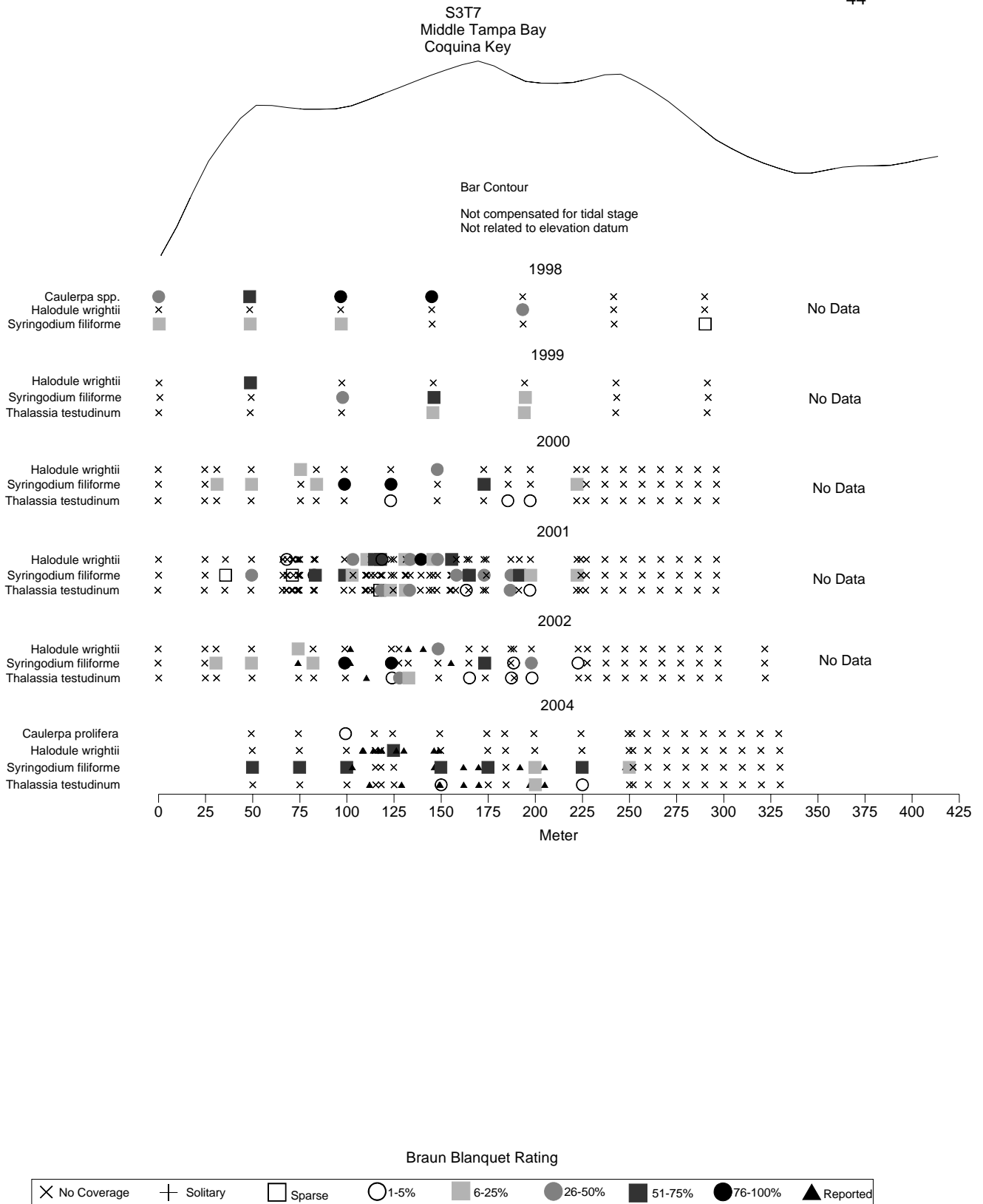


Figure 35. Seagrass species, abundance, and zonation at S3T7 from 1998-2004 (2003 data not reported).

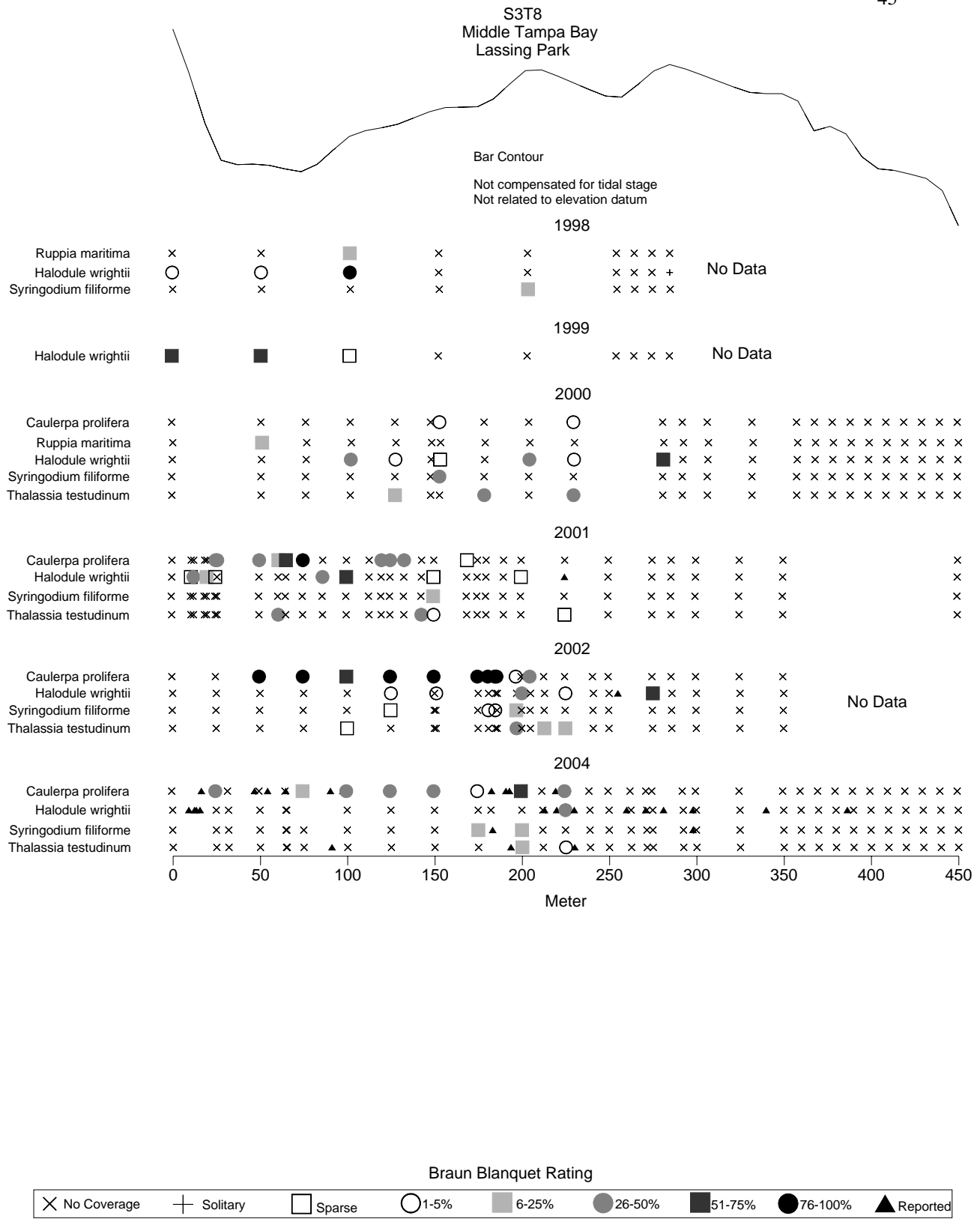


Figure 36. Seagrass species, abundance, and zonation at S3T8 from 1998-2004 (2003 data not reported).

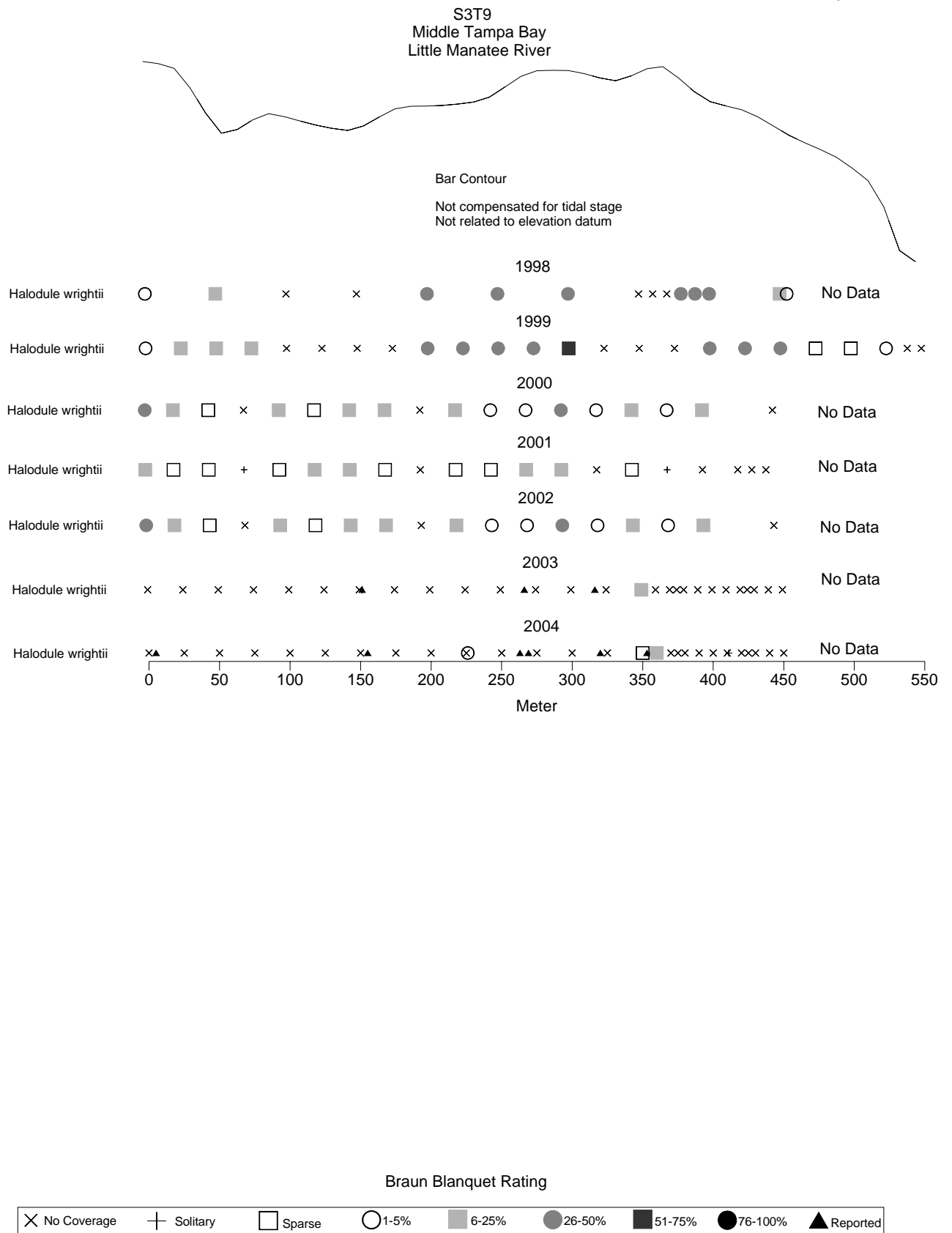


Figure 37. Seagrass species, abundance, and zonation at S3T9 from 1998-2004.

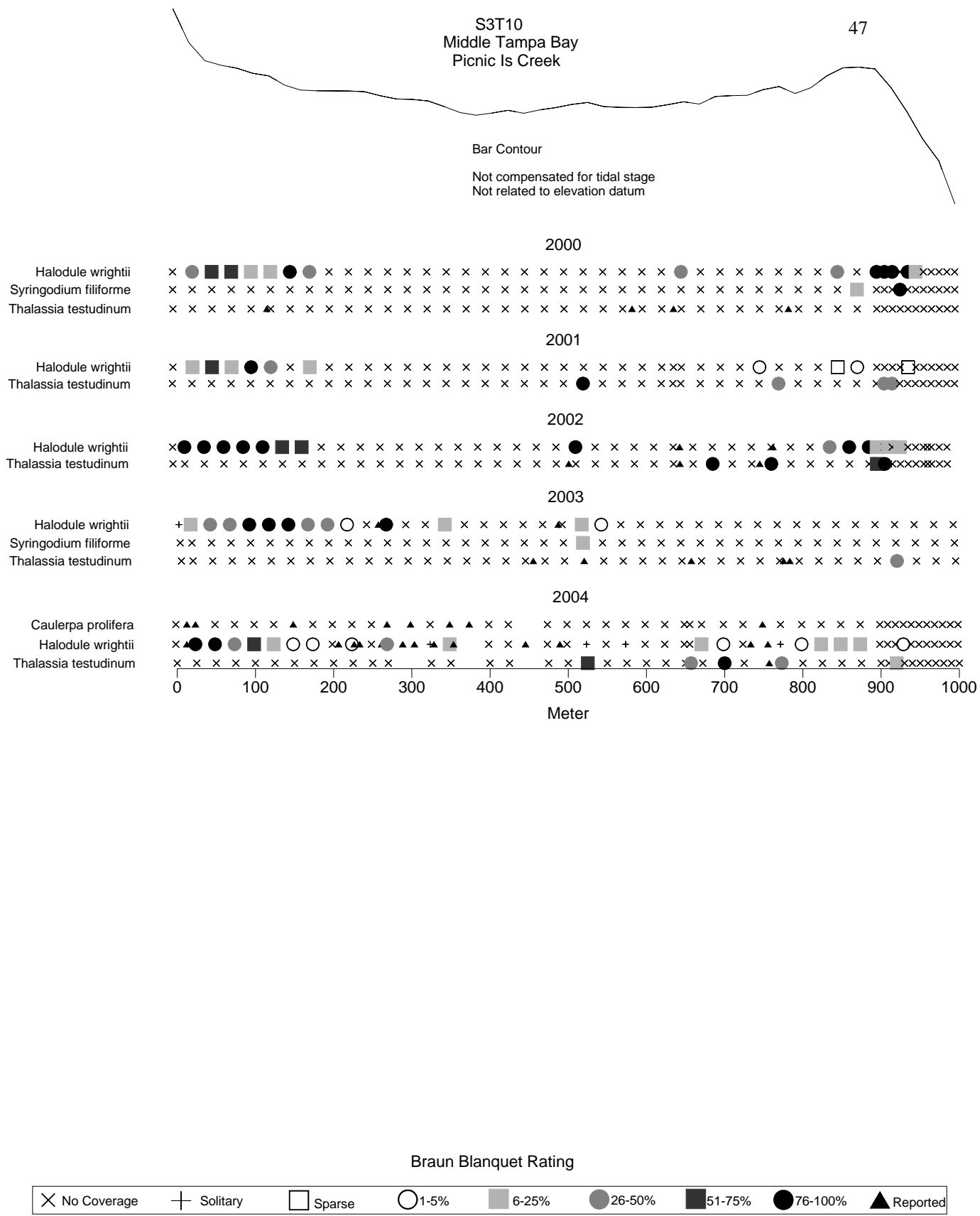
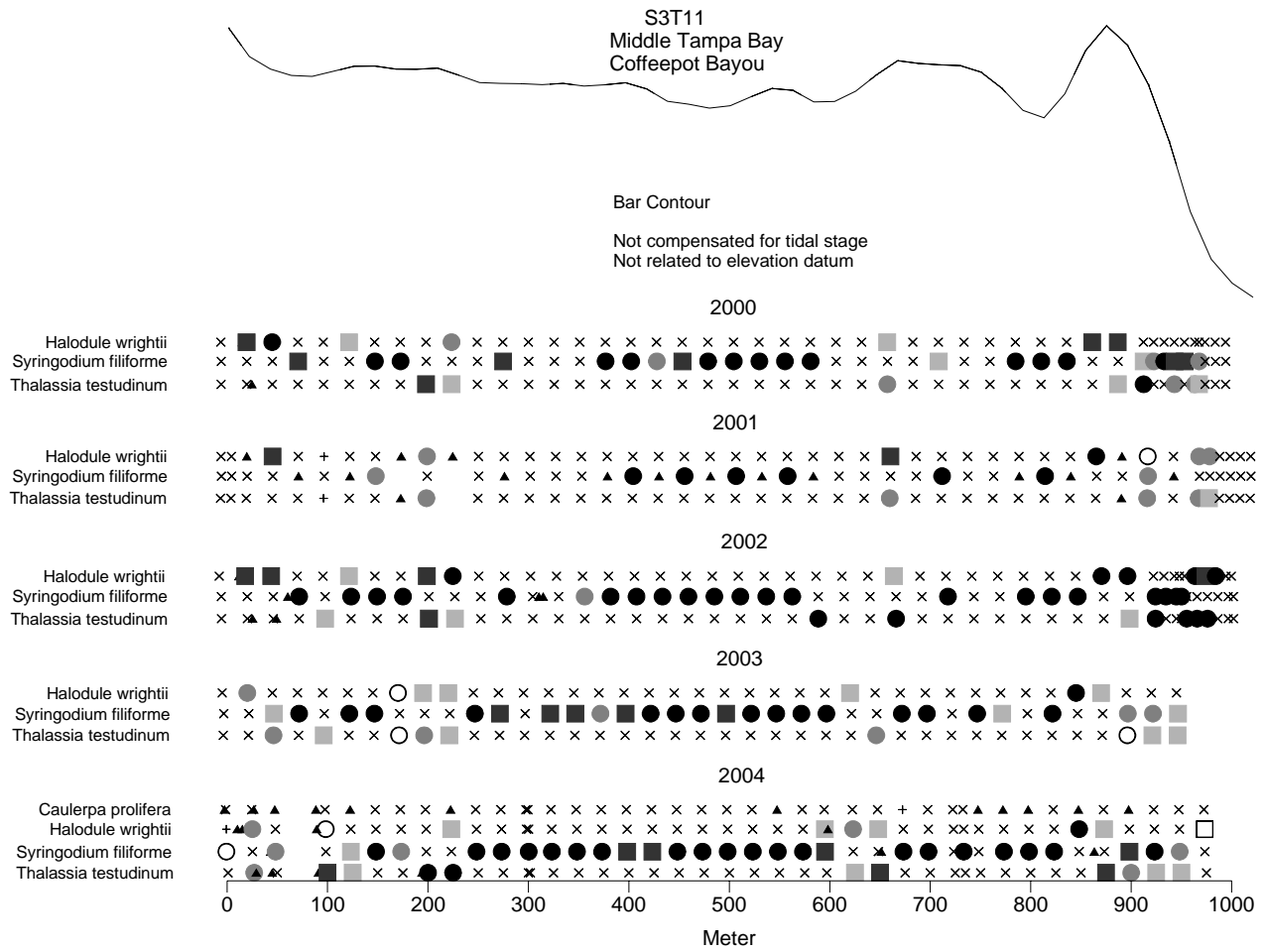


Figure 38. Seagrass species, abundance, and zonation at S3T10 from 2000-2004.



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Figure 39. Seagrass species, abundance, and zonation at S3T11 from 2000-2004.

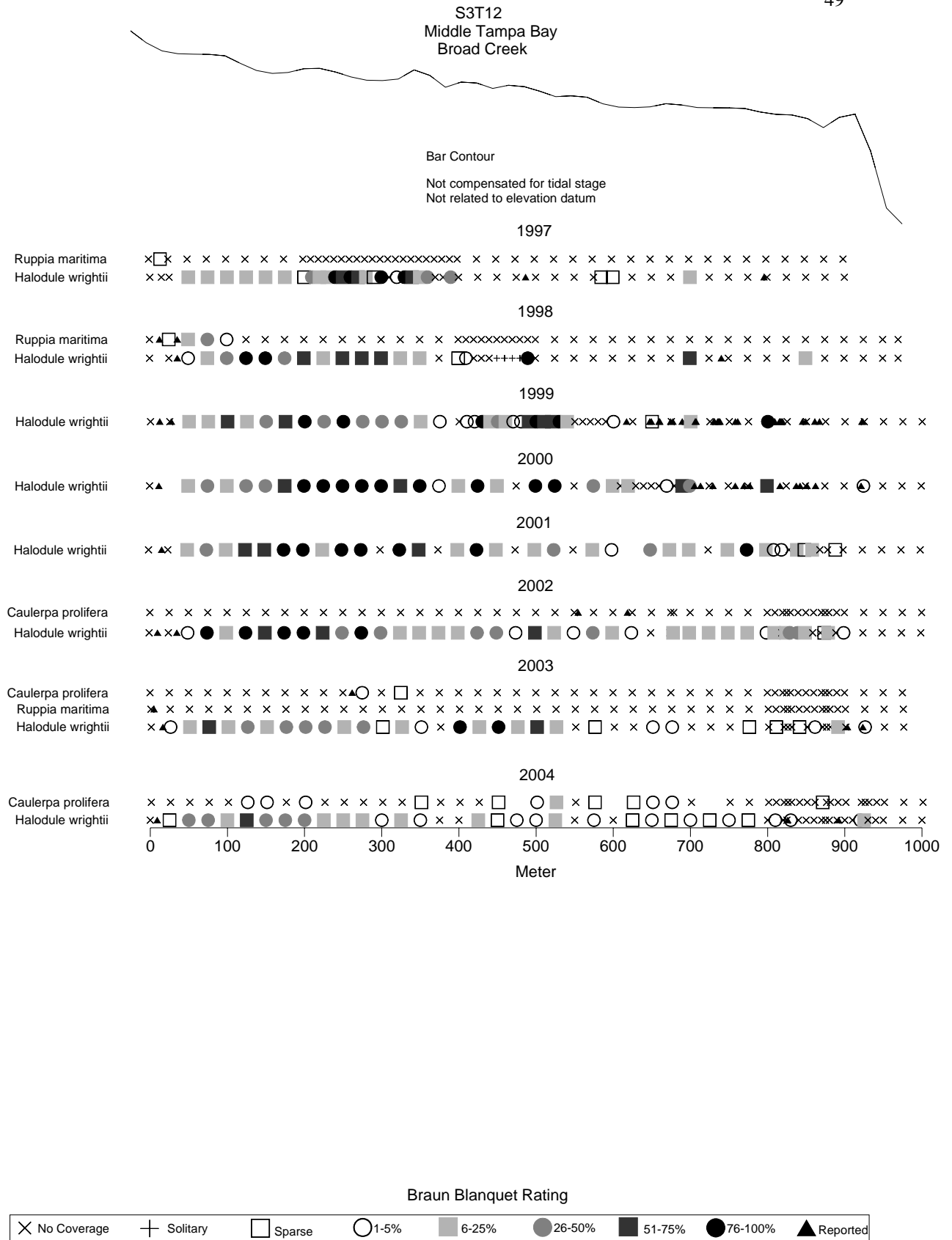


Figure 40. Seagrass species, abundance, and zonation at S3T12 from 1997-2004.

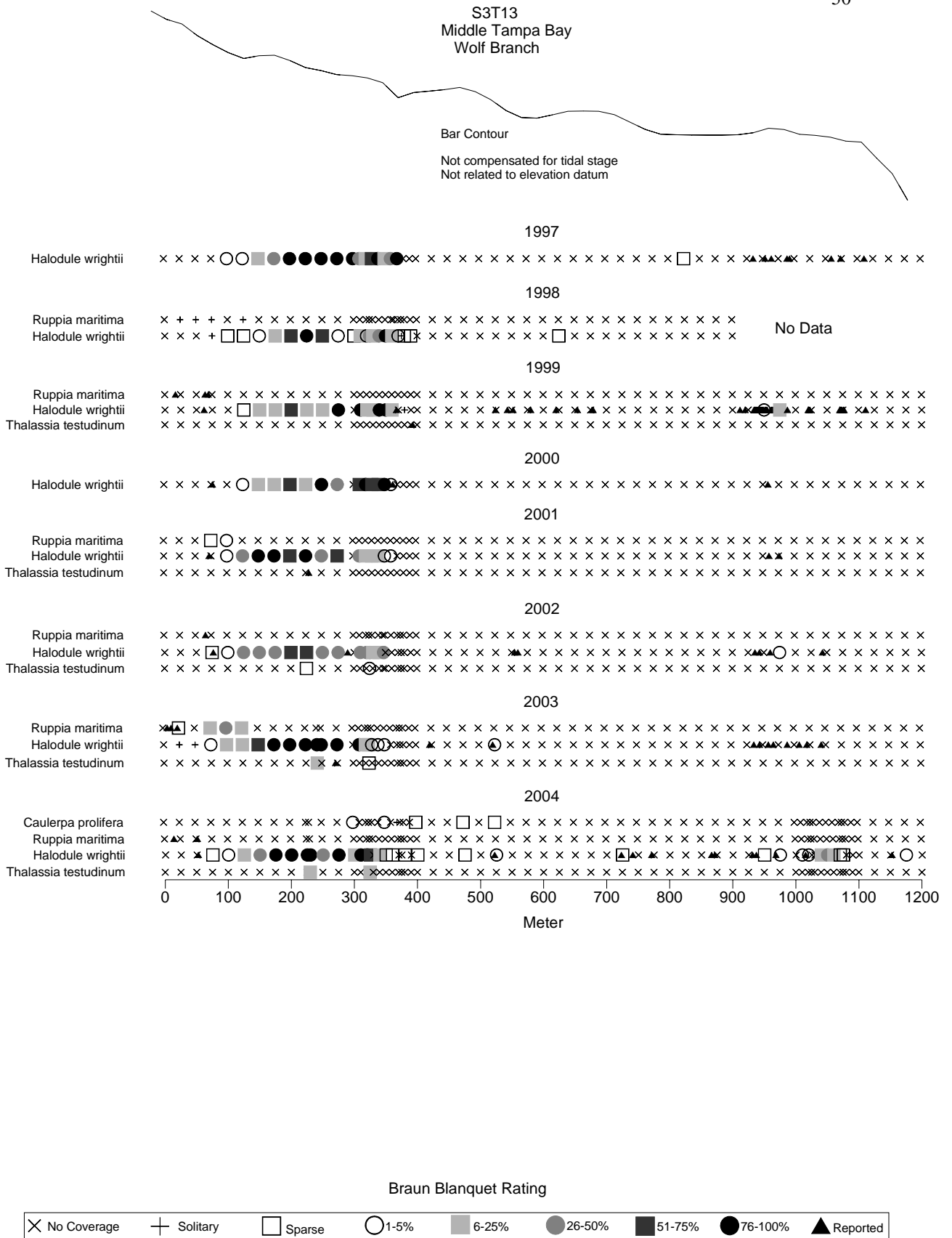


Figure 41. Seagrass species, abundance, and zonation at S3T13 from 1997-2004.

## Lower Tampa Bay

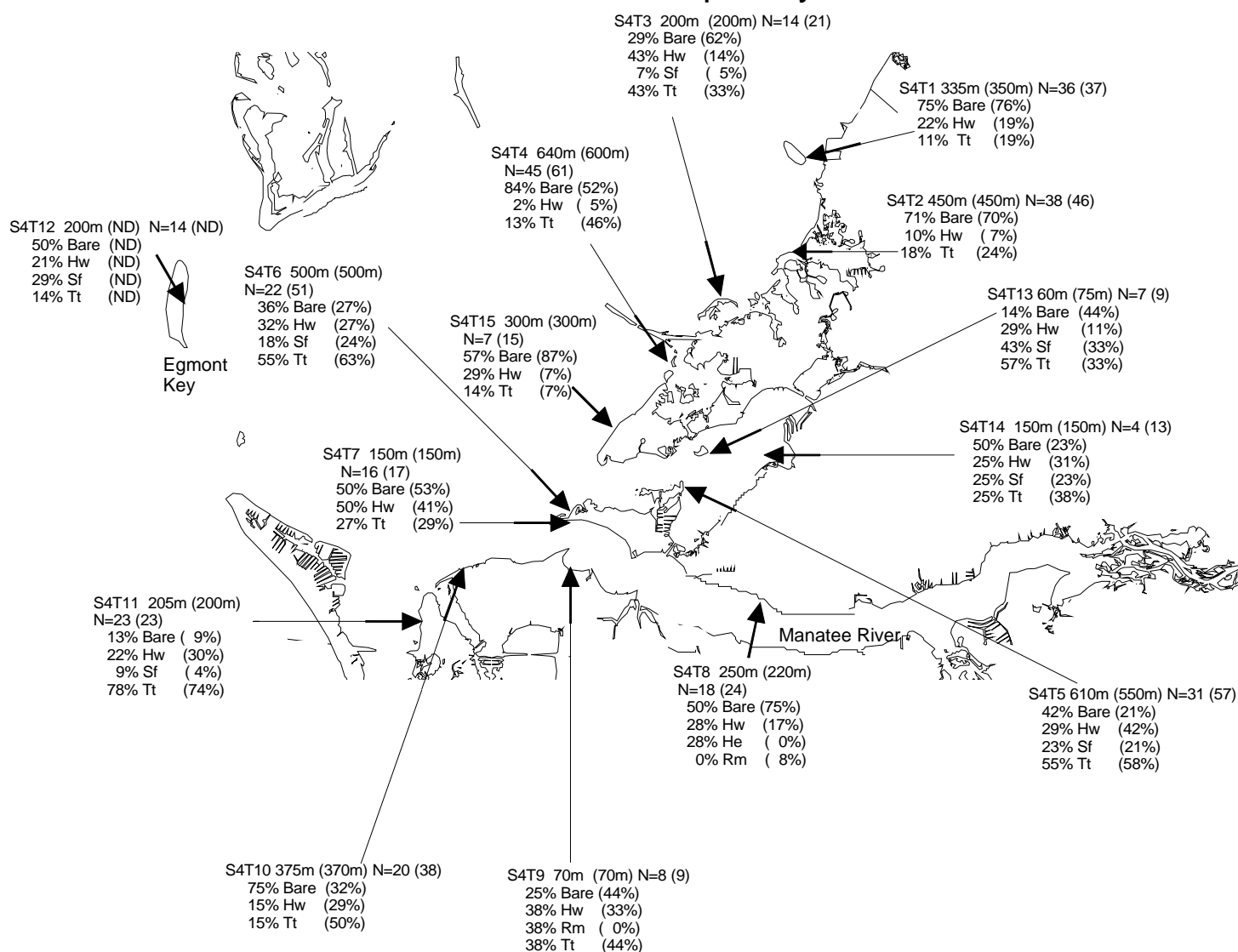
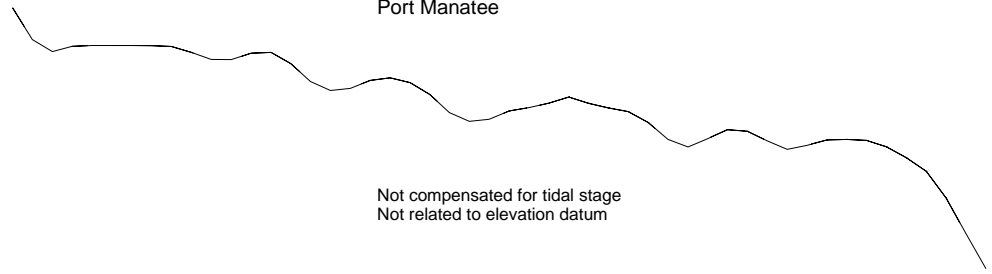
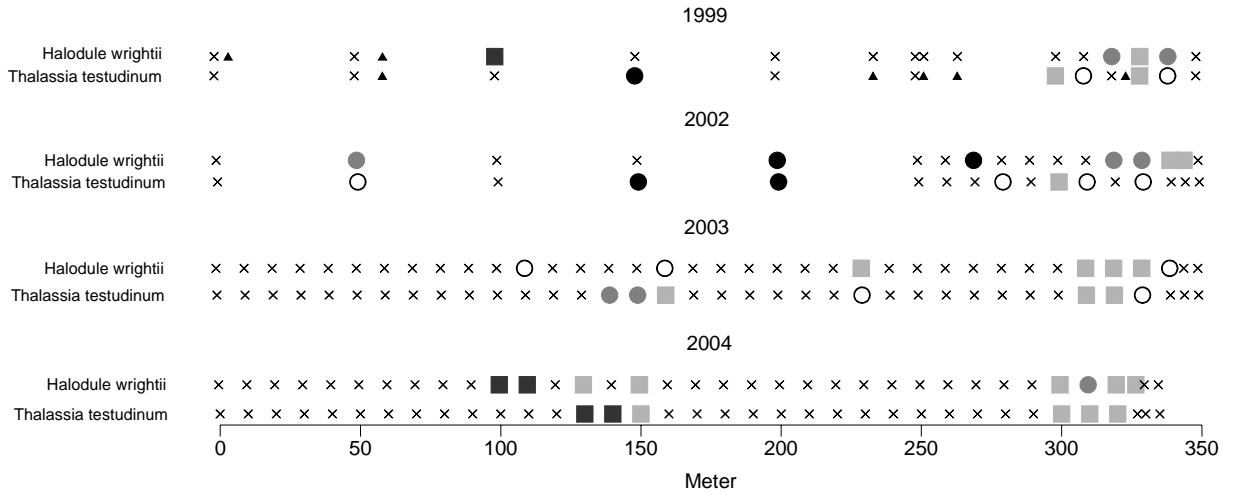


Figure 42. Name, location, length and percent of meter square placements containing each seagrass species and the alga, *Caulerpa prolifera*, along the 15 Lower Tampa Bay seagrass monitoring transects in 2004. Results from 2003 in parentheses. N=number of meter square placements; Cp=*Caulerpa prolifera*; He=*Halophila engelmanni*; Hw=*Halodule wrightii*; Rm=*Ruppia maritima*; Sf=*Syringodium filiforme*; Tt=*Thalassia testudinum*, ND=No Data.

S4T1  
Lower Tampa Bay  
Port Manatee



Note: Transect not sampled in 2000 or 2001 due to Port construction.



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Figure 43. Seagrass species, abundance, and zonation at S4T1 from 1999 and 2002-2004.



S4T3  
Lower Tampa Bay  
Joe Island

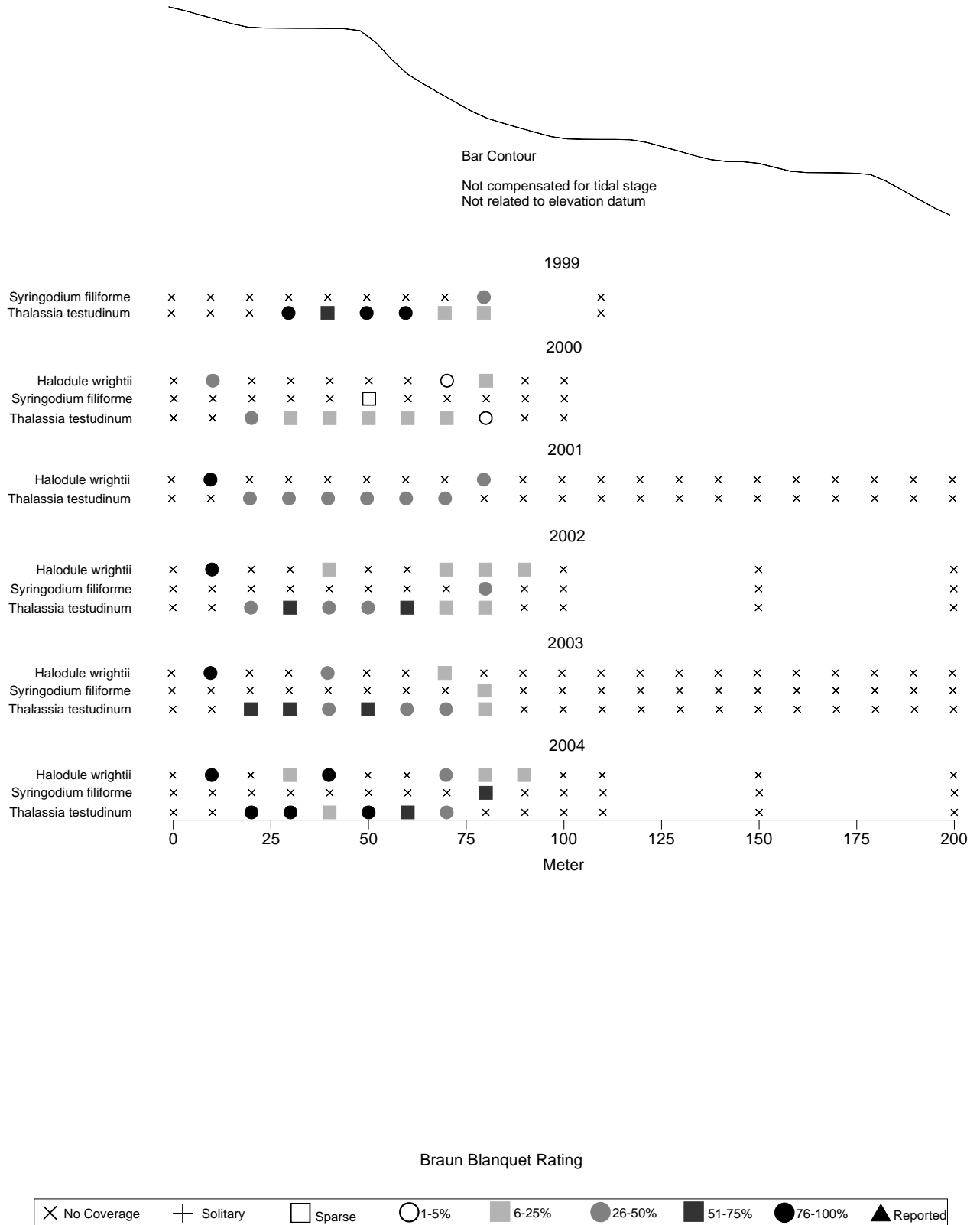


Figure 45. Seagrass species, abundance, and zonation at S4T3 from 1999-2004.

S4T4  
Lower Tampa Bay  
Miguel Bay

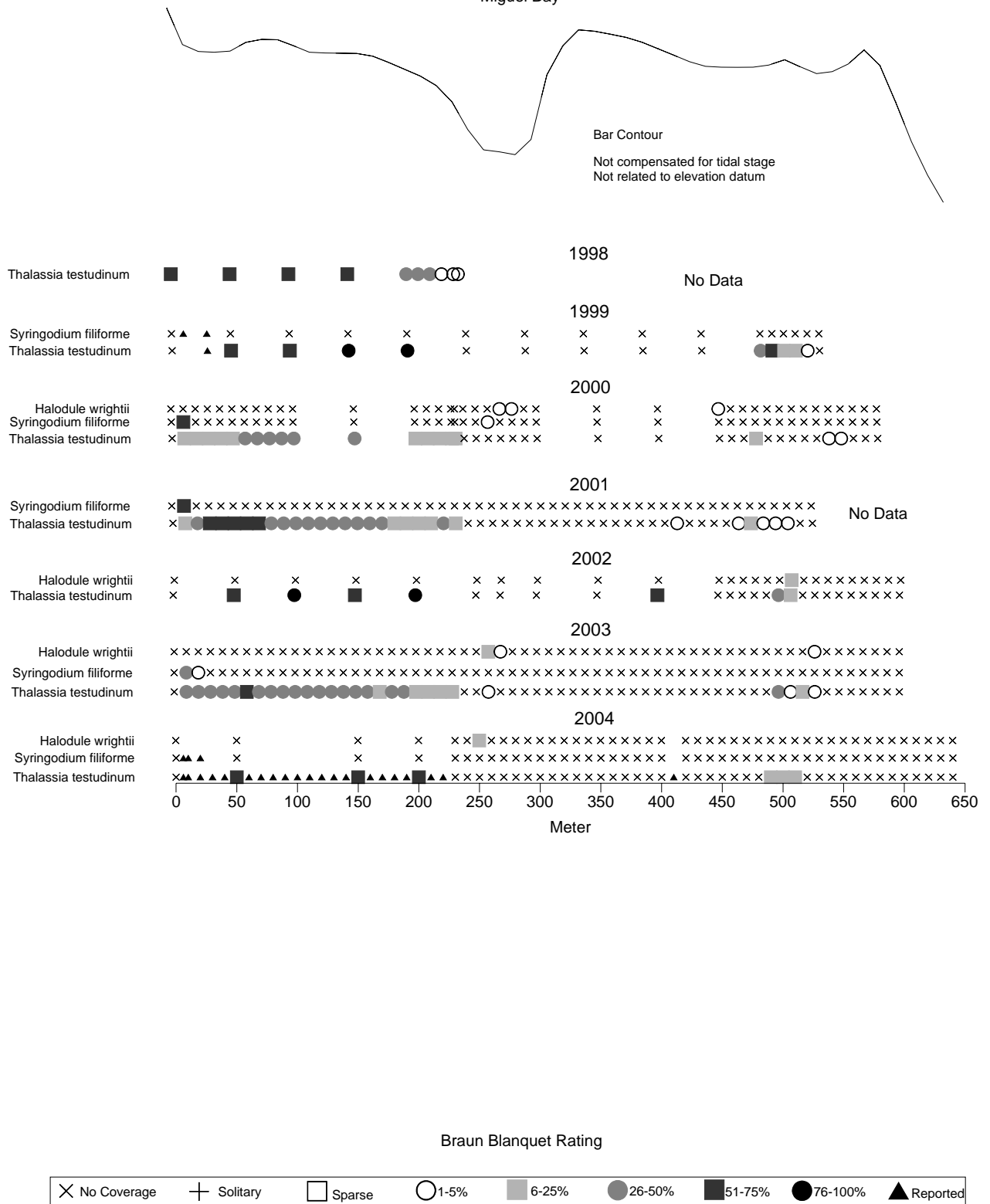
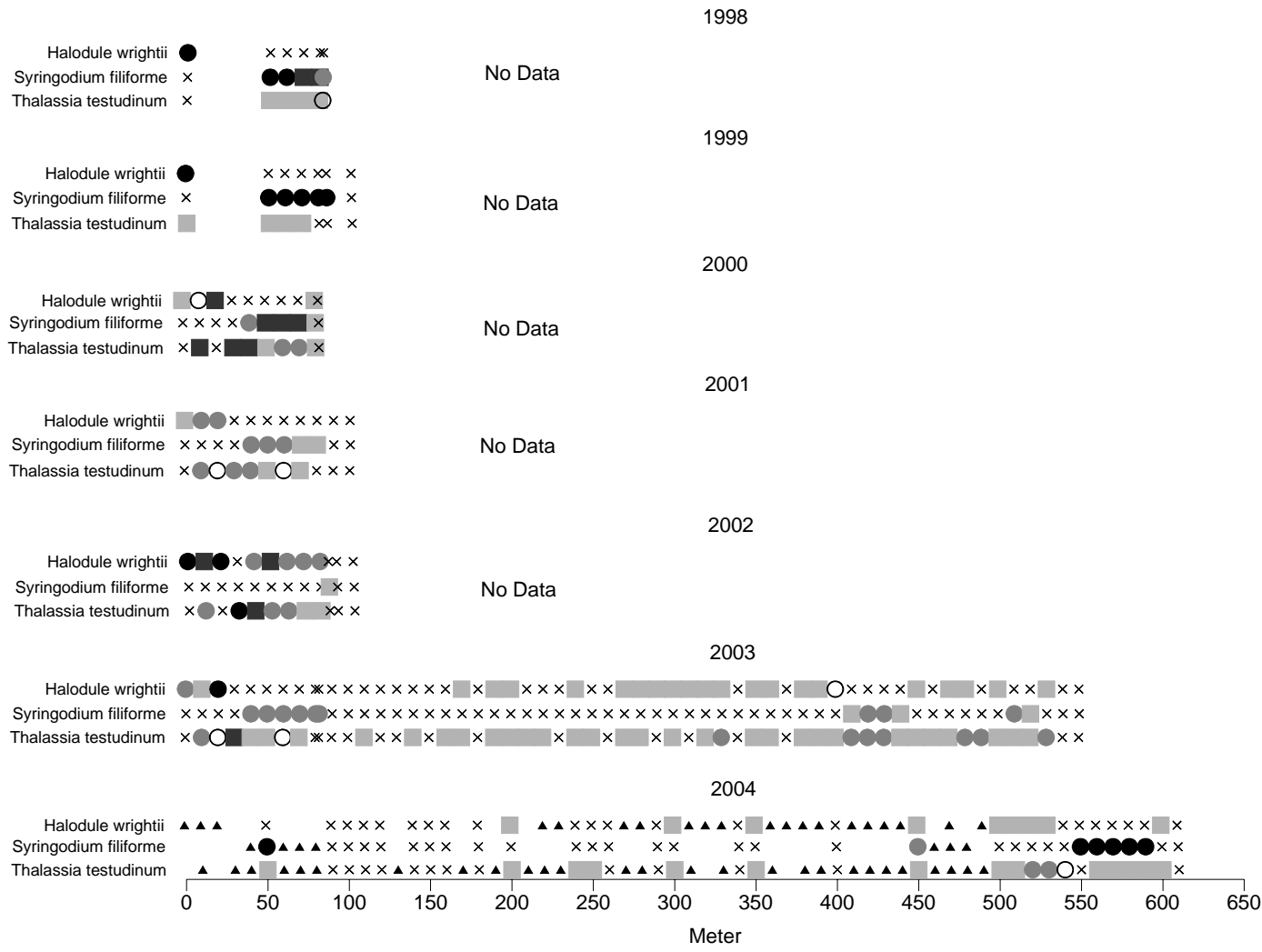
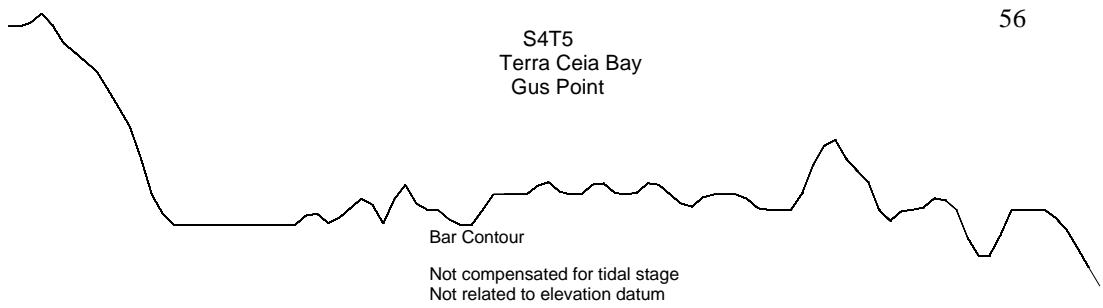


Figure 46. Seagrass species, abundance, and zonation at S4T4 from 1998-2004.

S4T5  
Terra Ceia Bay  
Gus Point



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Figure 47. Seagrass species, abundance, and zonation at S4T5 from 1998-2004.

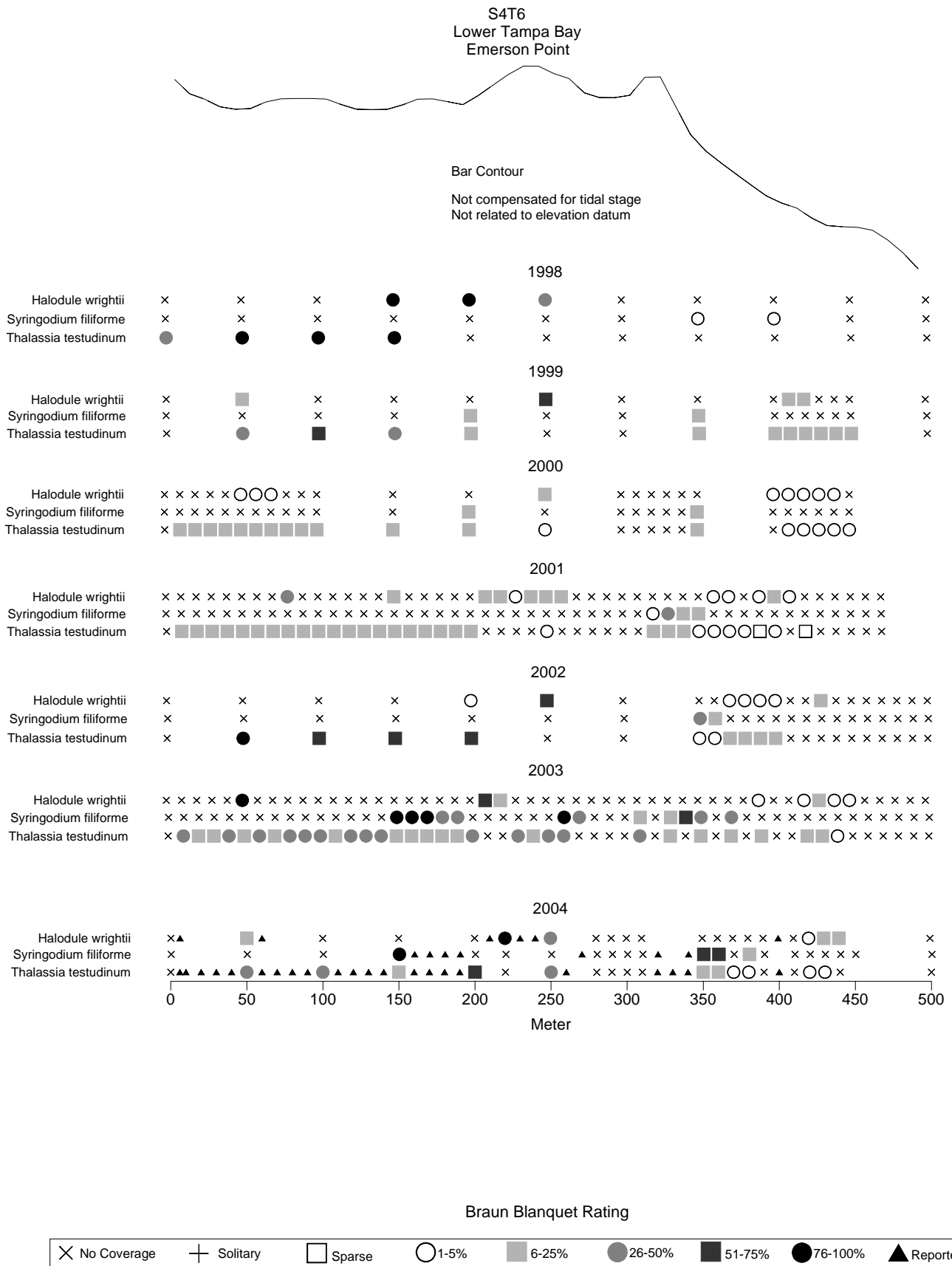


Figure 48. Seagrass species, abundance, and zonation at S4T6 from 1998-2004.

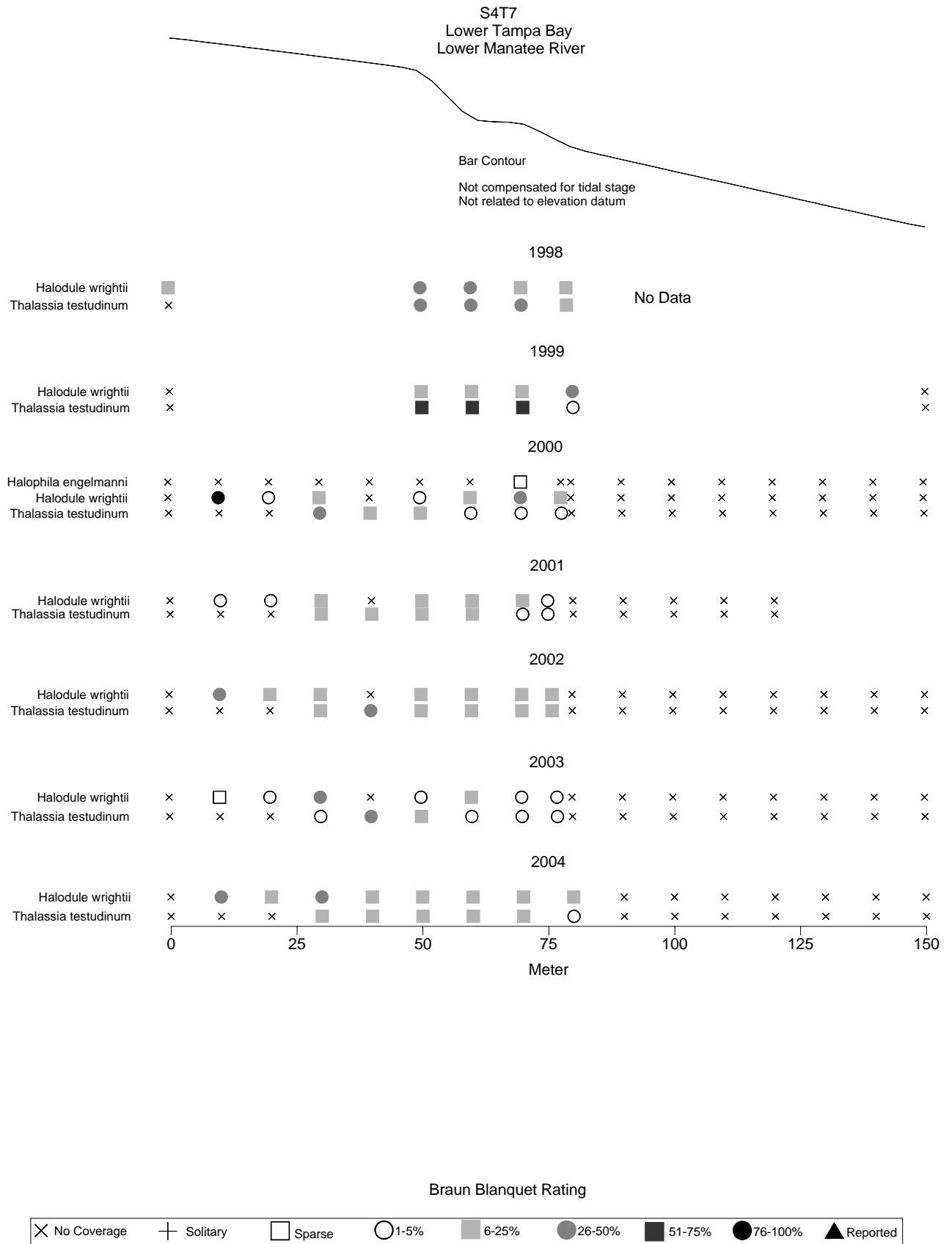


Figure 49. Seagrass species, abundance, and zonation at S4T7 from 1998-2004.

S4T8  
Lower Tampa Bay  
West of Riverside Marina

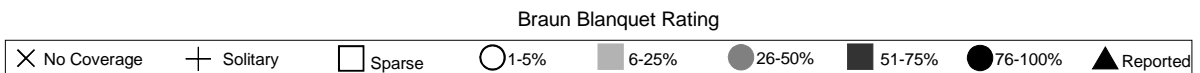
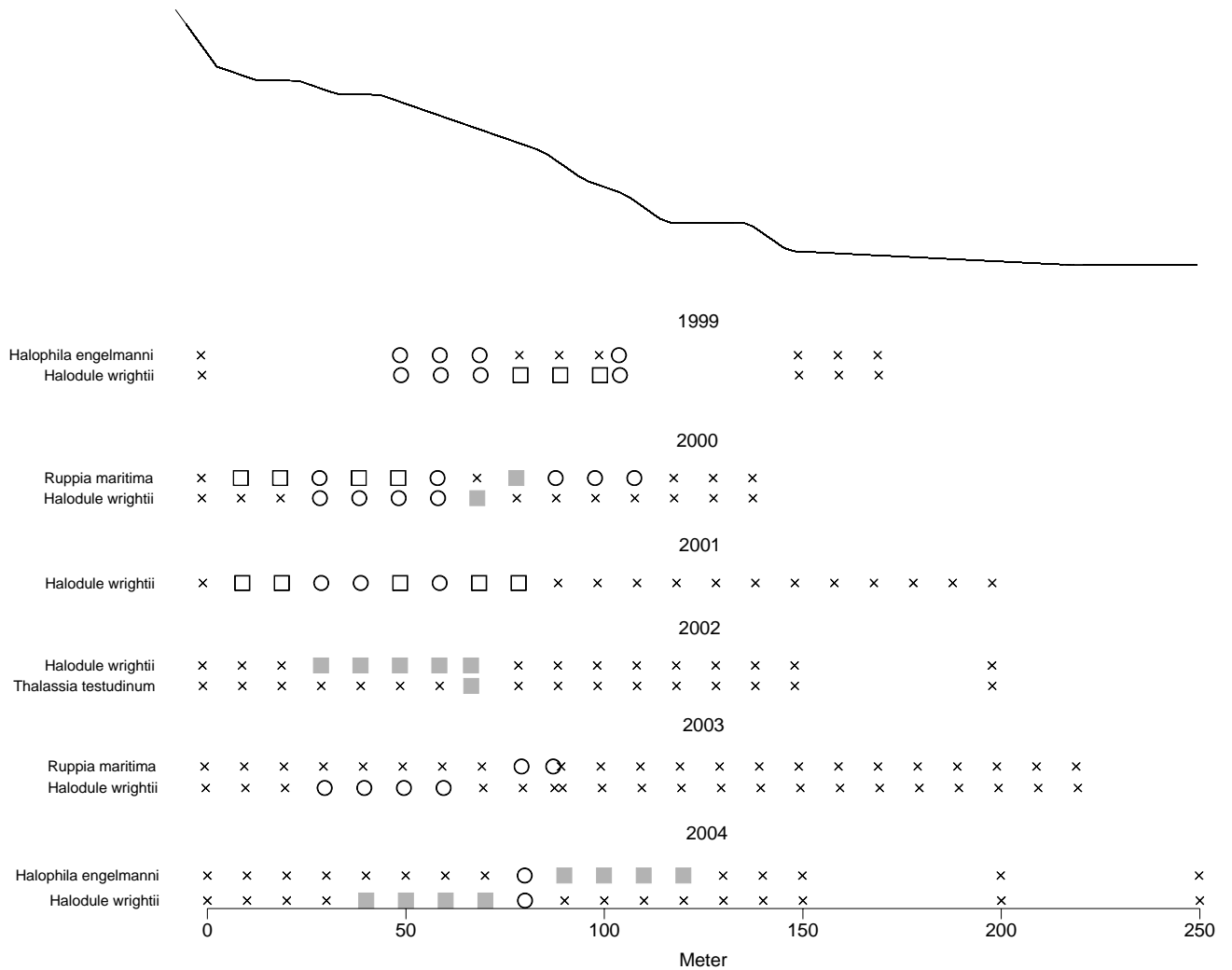


Figure 50. Seagrass species, abundance, and zonation at S4T8 from 1999-2004.

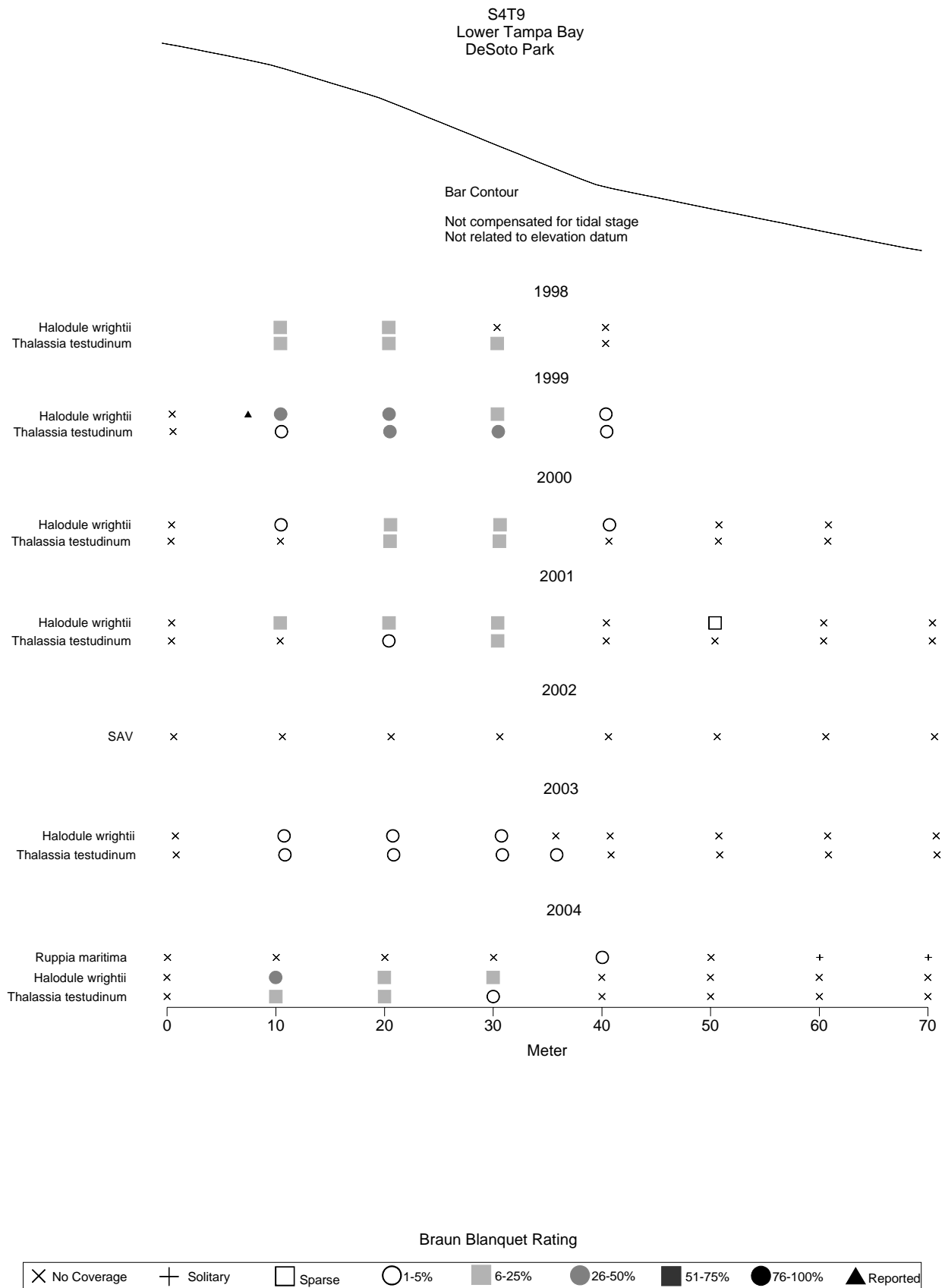


Figure 51. Seagrass species, abundance, and zonation at S4T9 from 1998-2004.

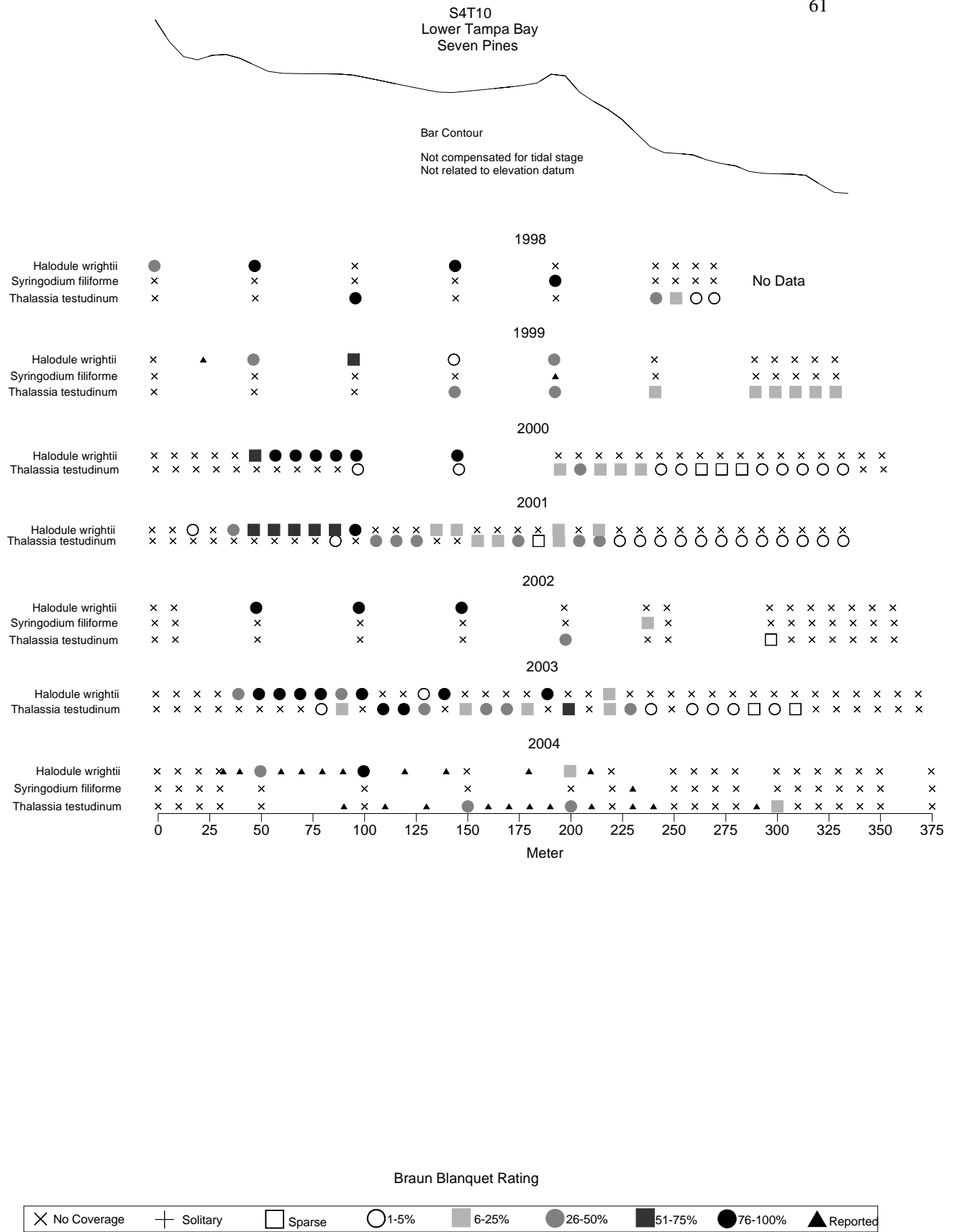


Figure 52. Seagrass species, abundance, and zonation at S4T10 from 1998-2004.

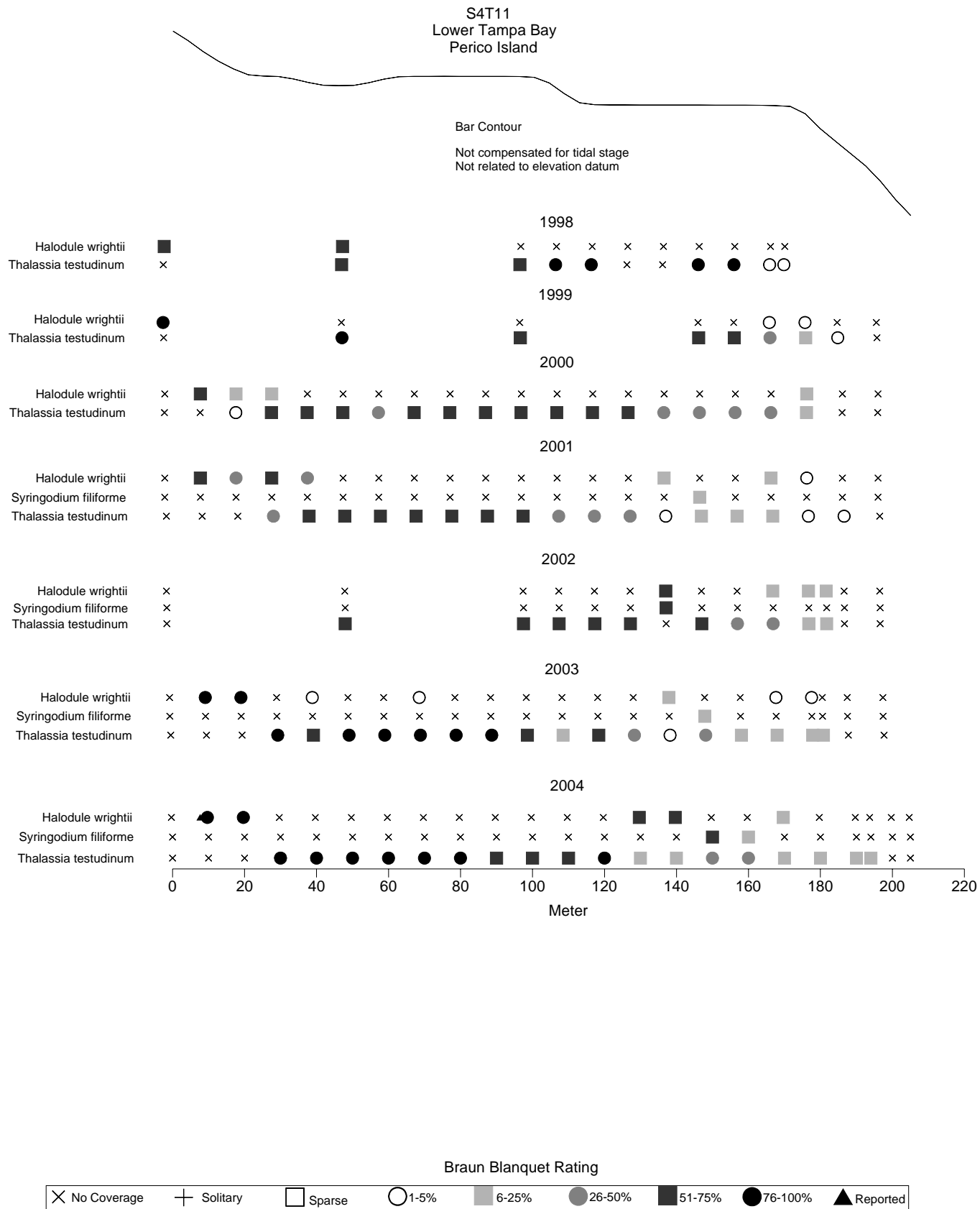
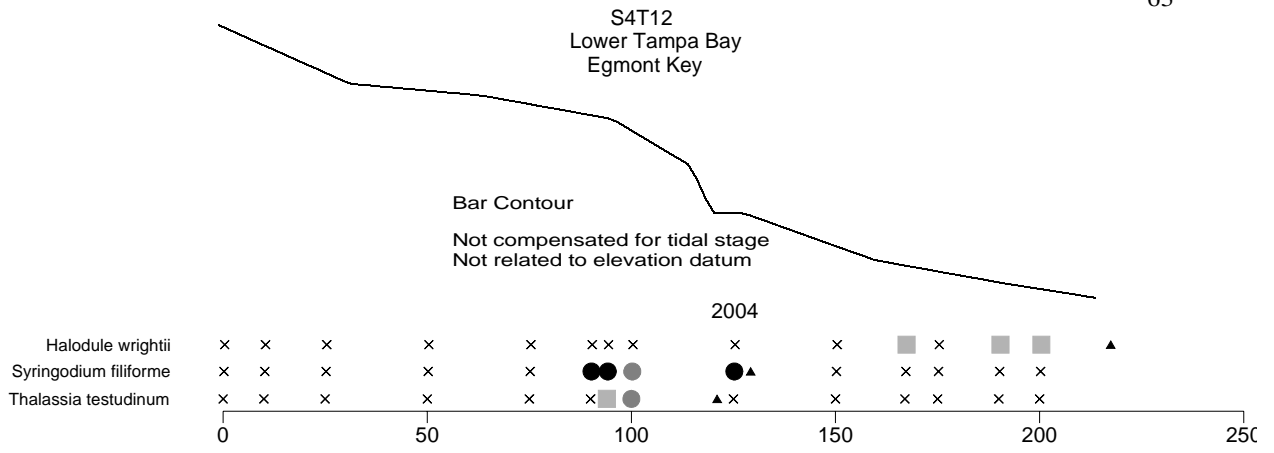


Figure 53. Seagrass species, abundance, and zonation at S4T11 from 1998-2004.



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Figure 54. Seagrass species, abundance, and zonation at S4T12 during 2004 (Transect relocated in 2004).

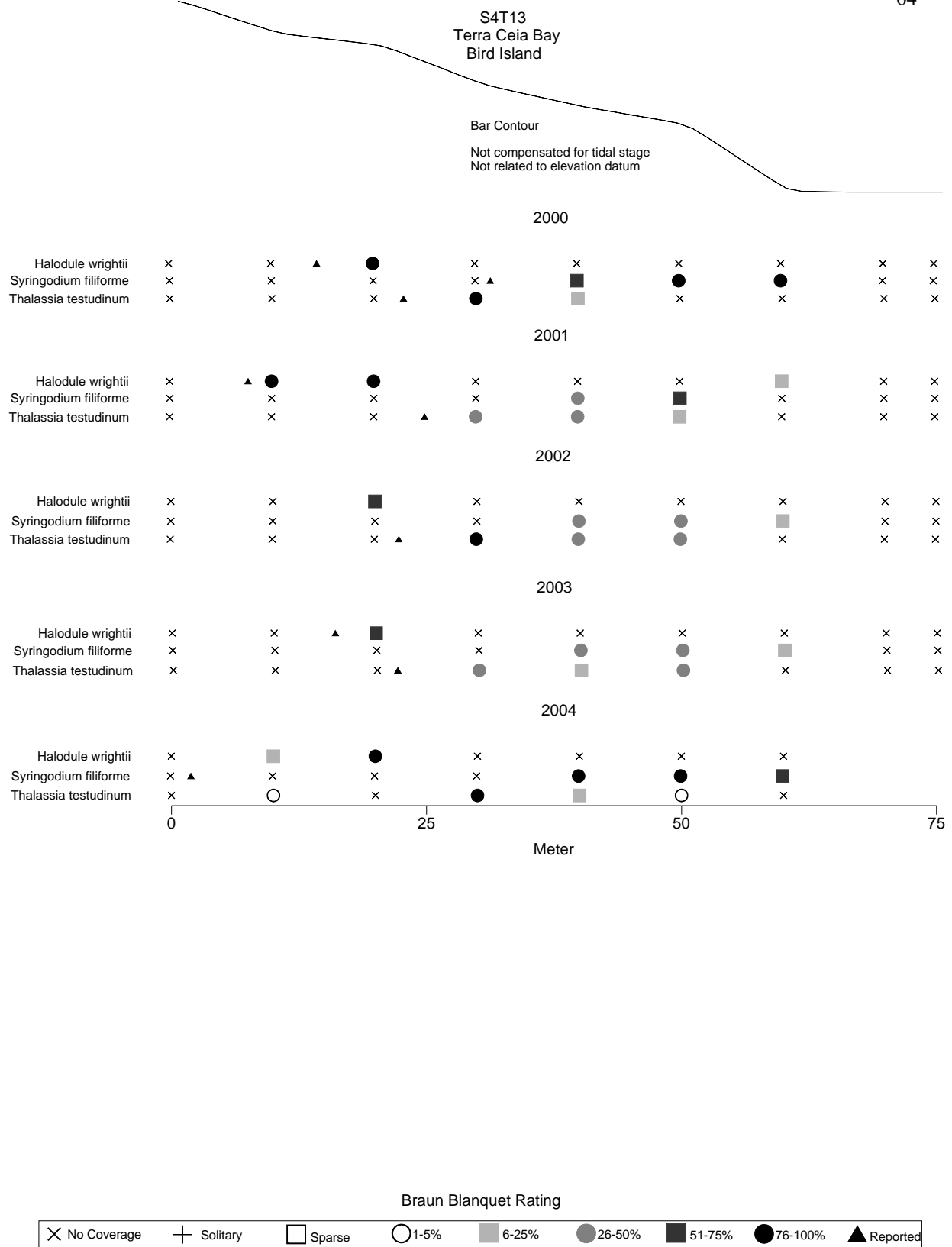


Figure 55. Seagrass species, abundance and zonation at S4T13 from 2000-2004.

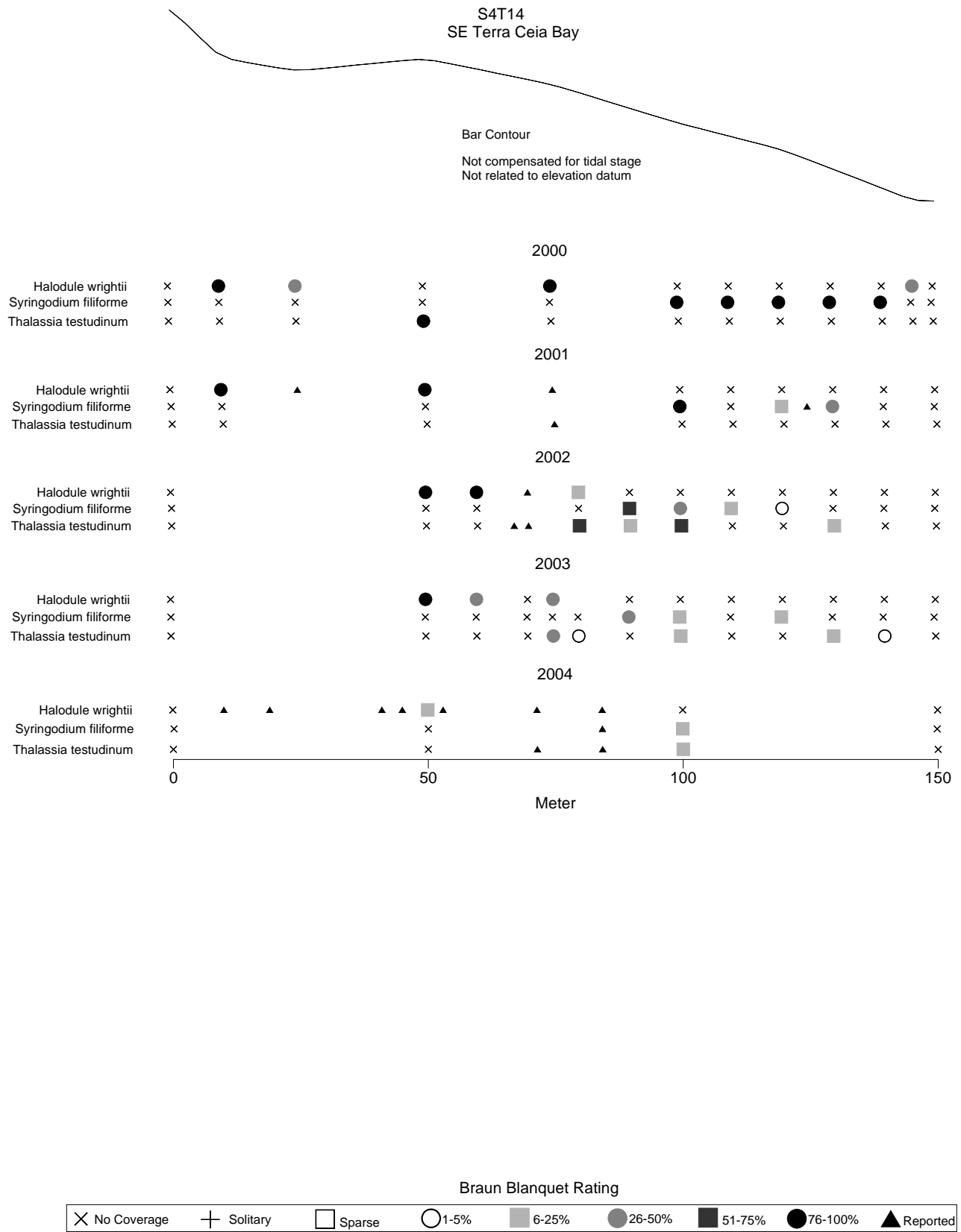


Figure 56. Seagrass species, abundance, and zonation at S4T14 from 2000-2004.



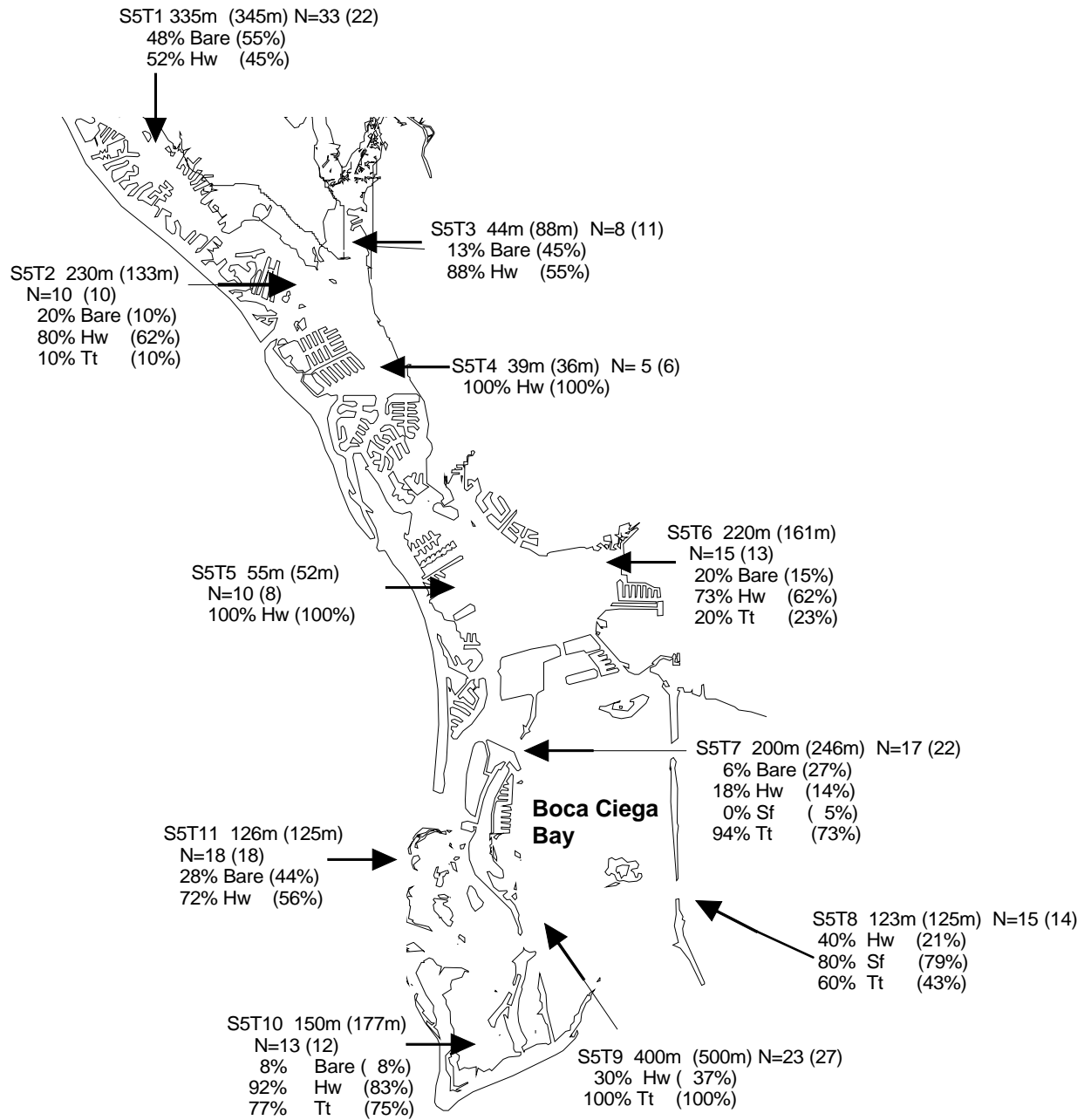
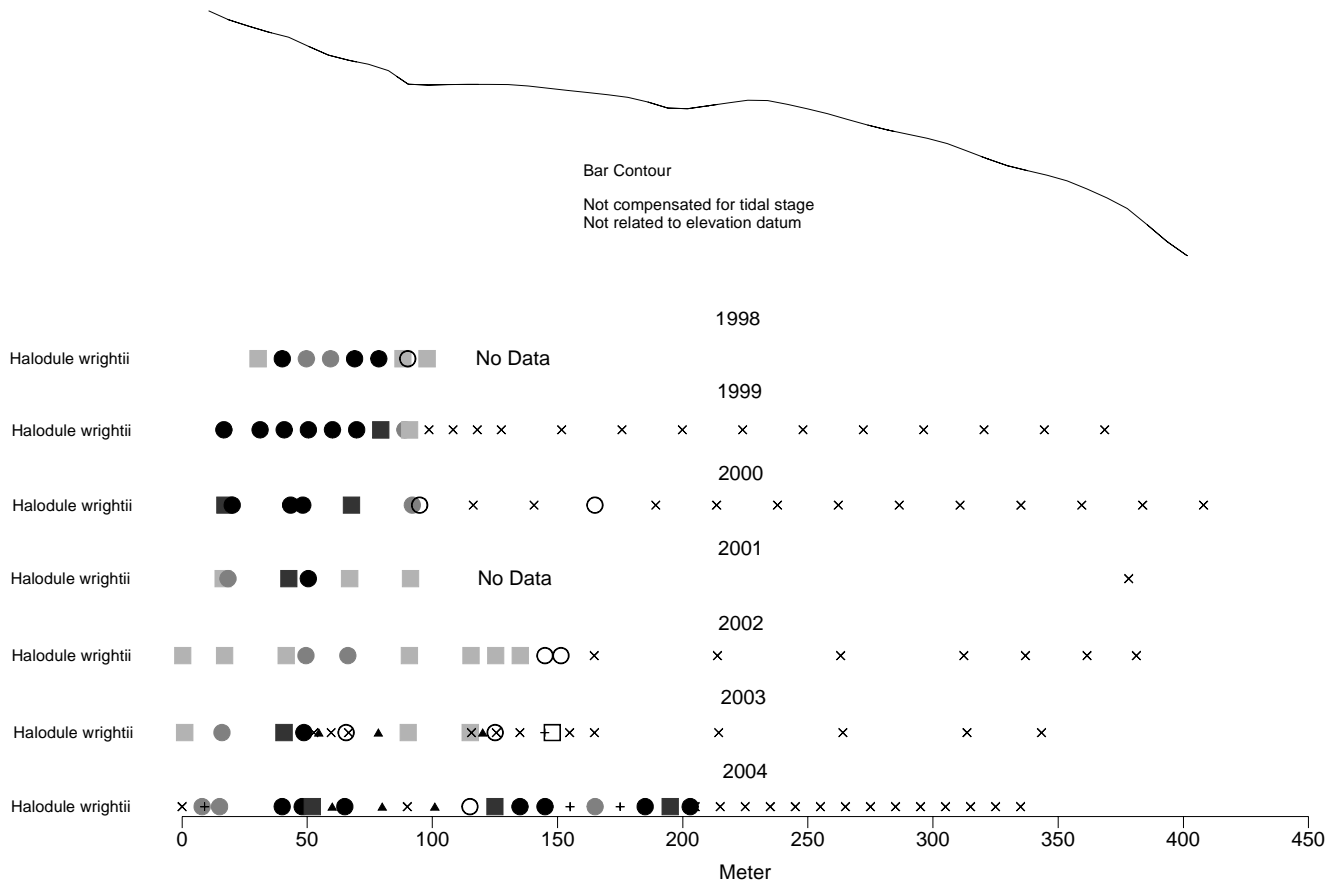


Figure 58. Name, location, length and percent of meter square placements containing each seagrass species and the alga, *Caulerpa prolifera*, along the 11 Boca Ciega Bay seagrass monitoring transects in 2004. Results from 2003 in parentheses. N=number of meter square placements; Cp= *Caulerpa prolifera*; He=*Halophila engelmanni*; Hw=*Halodule wrightii*; Rm=*Ruppia maritima*; Sf=*Syringodium filiforme*; Tt=*Thalassia testudinum*.



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Figure 59. Seagrass species, abundance, and zonation at S5T1 from 1998-2004.

S5T2  
Boca Ciega Bay  
Turtle Crawl Point

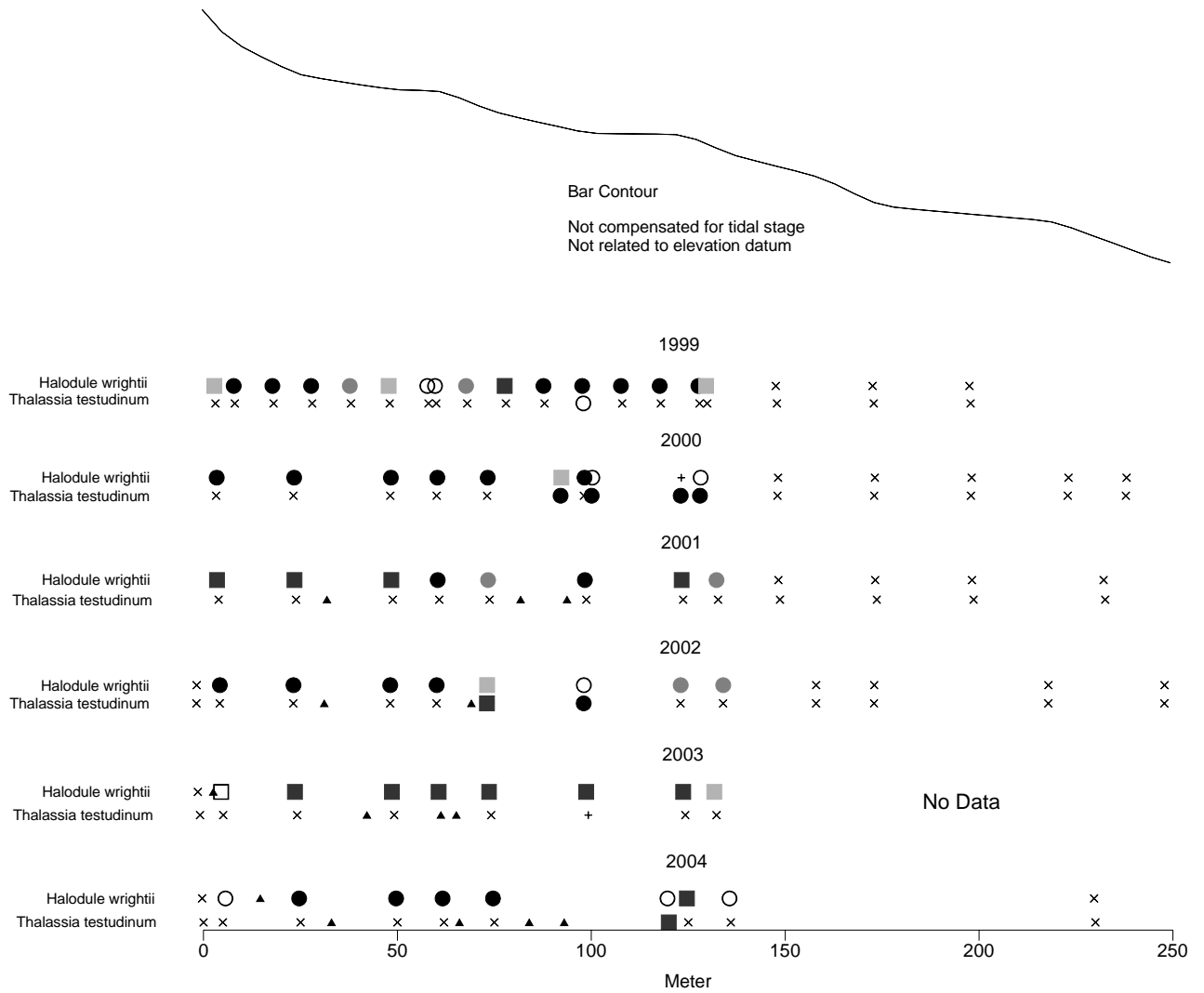
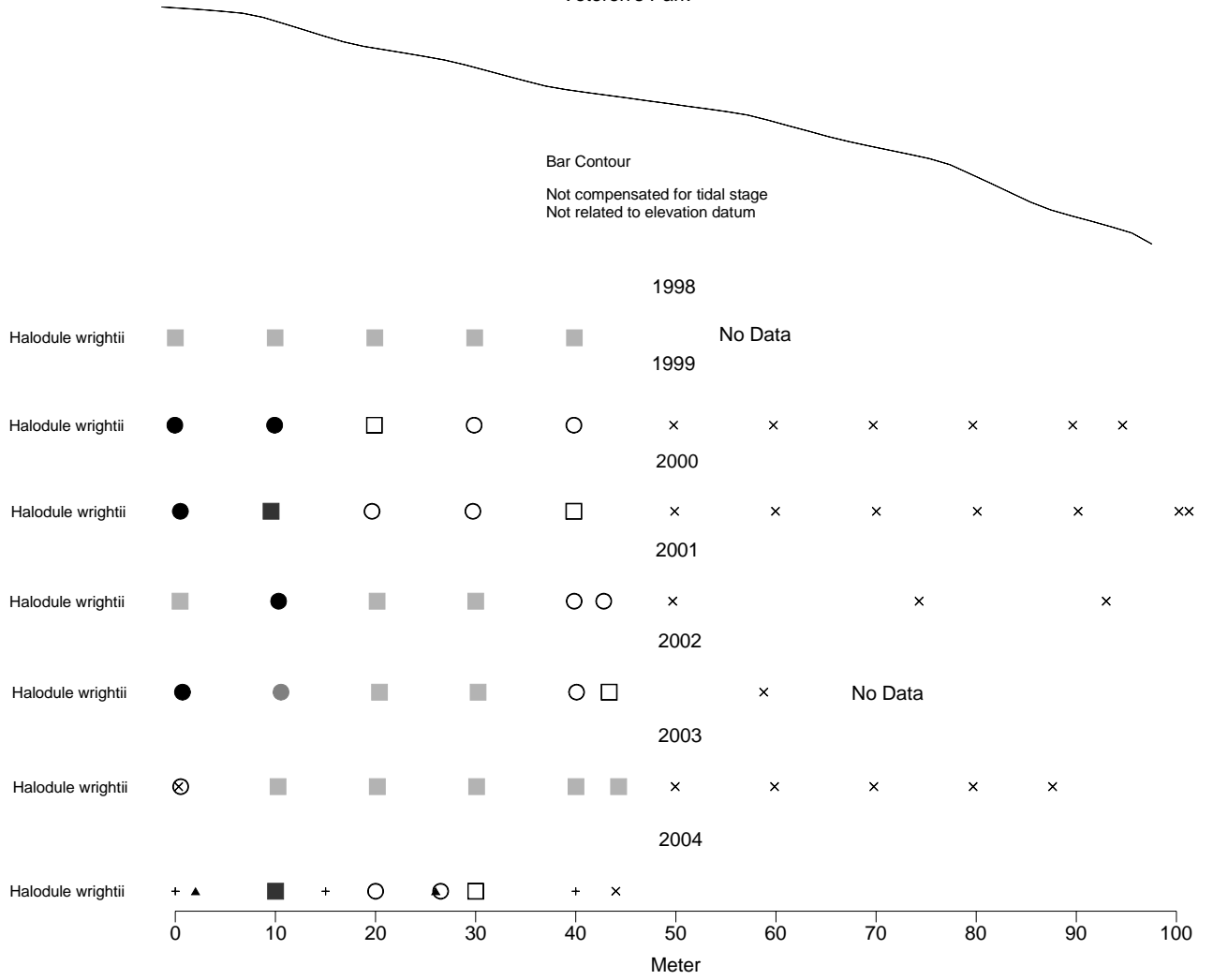


Figure 60. Seagrass species, abundance, and zonation at S5T2 from 1999-2004.

S5T3  
Boca Ciega Bay  
Veteren's Park



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Figure 61. Seagrass species, abundance, and zonation at S5T3 from 1998-2004.

S5T4  
Boca Ciega Bay  
Isle of Palms

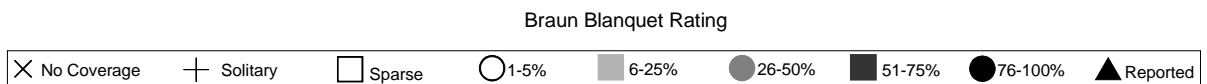
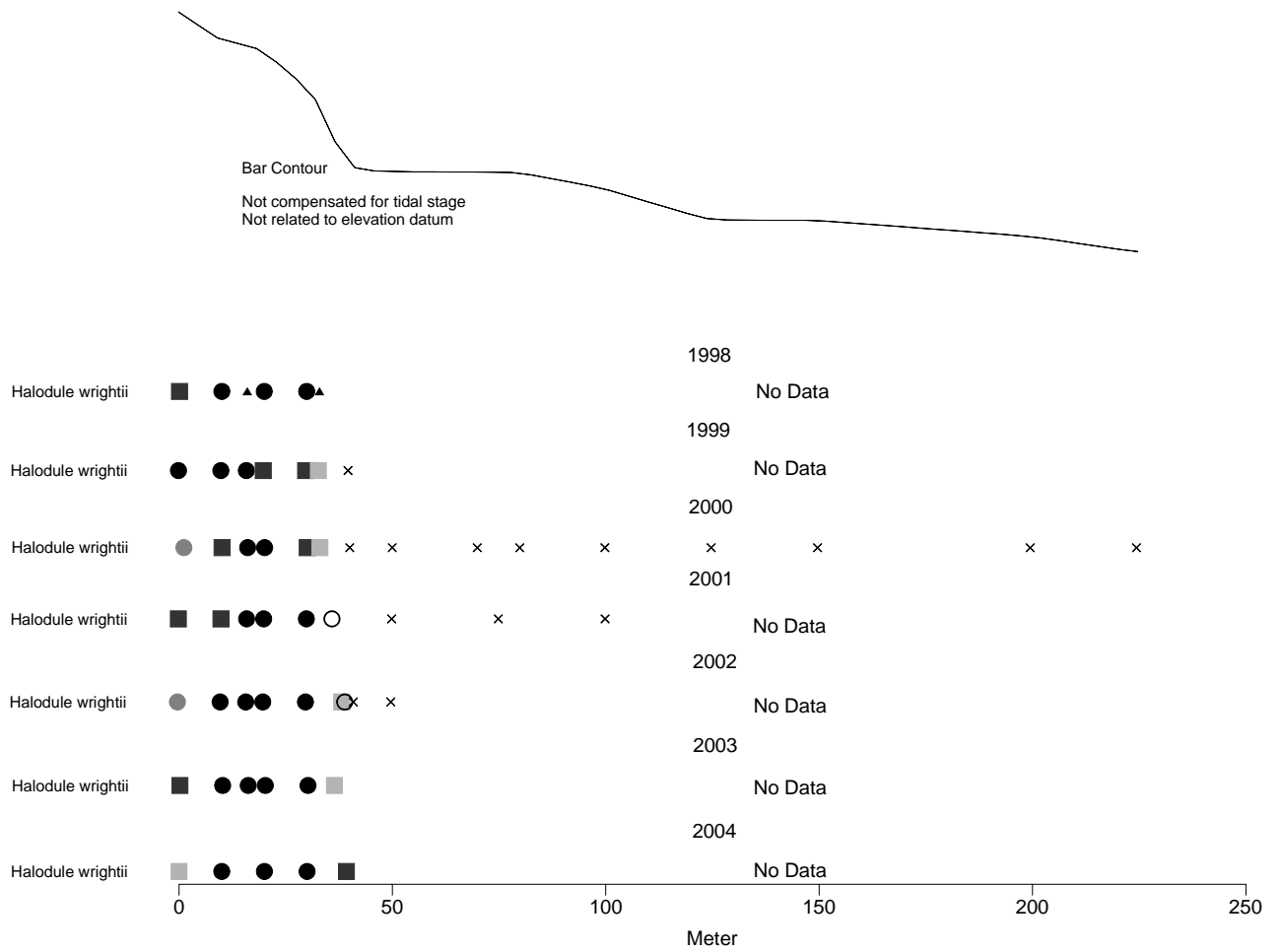
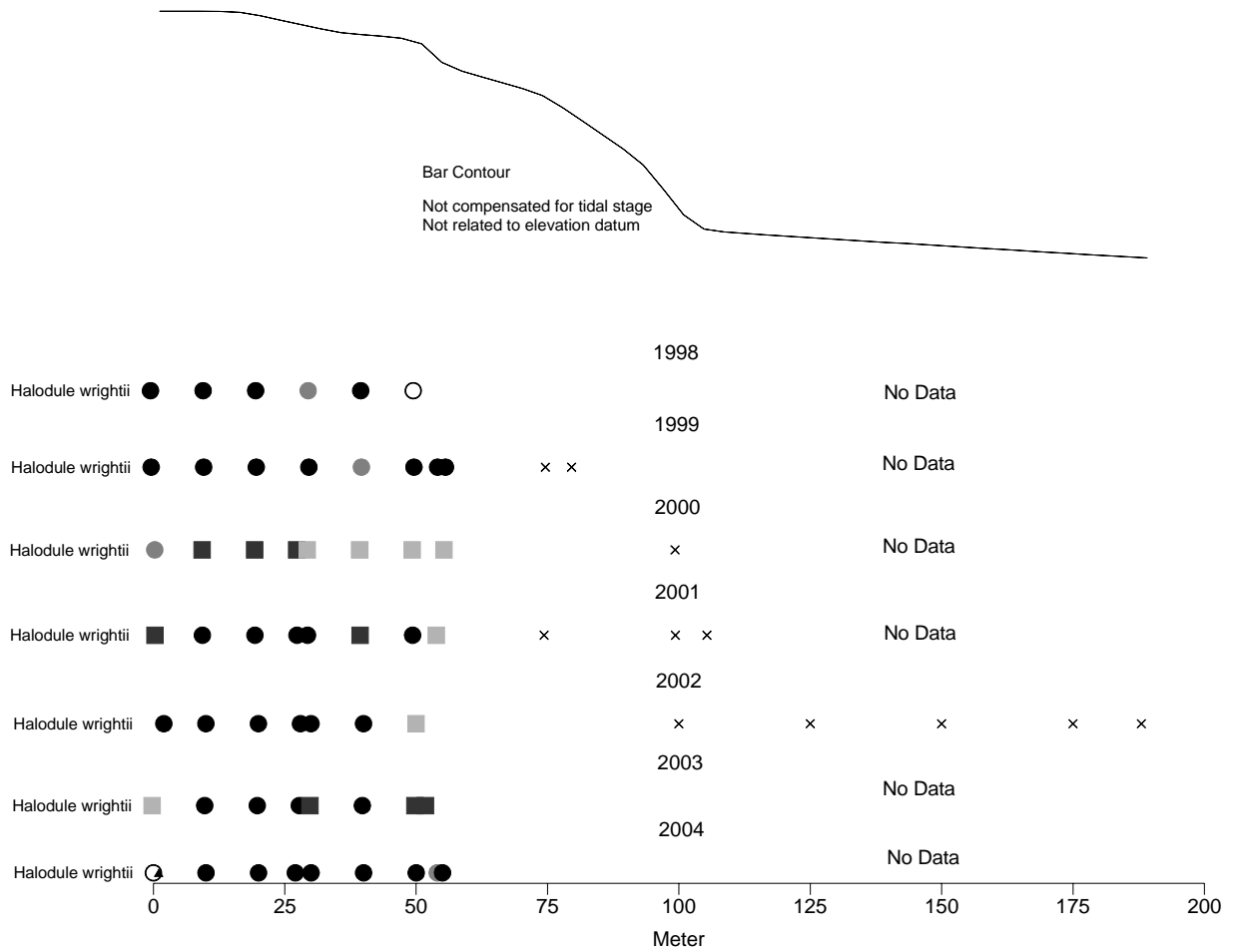


Figure 62. Seagrass species, abundance, and zonation at S5T4 from 1998-2004.

S5T5  
Boca Ciega Bay  
Long Key



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Figure 63. Seagrass species, abundance, and zonation at S5T5 from 1998-2004.

S5T6  
Boca Ciega Bay  
Hart Creek

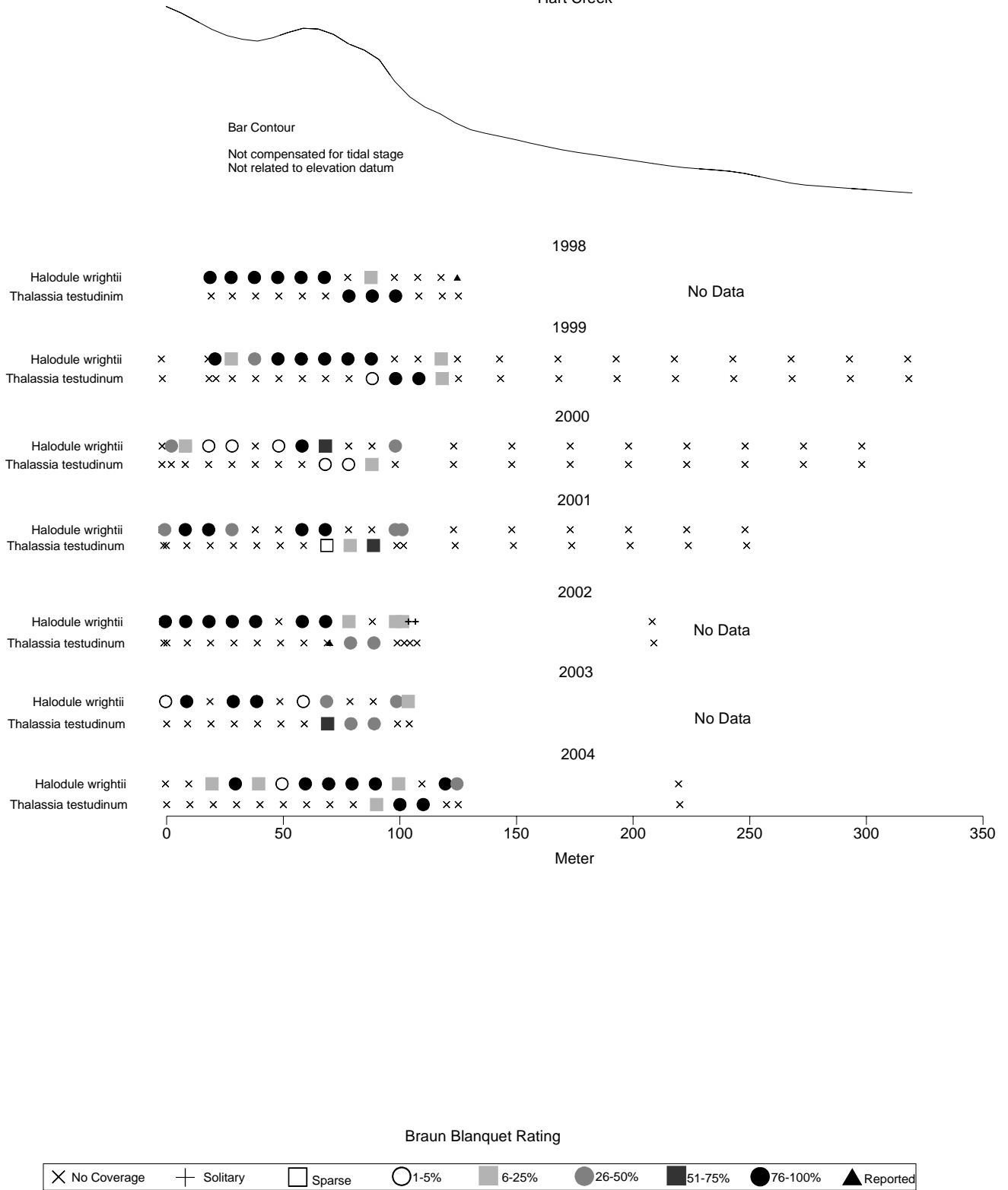


Figure 64. Seagrass species, abundance, and zonation at S5T6 from 1998-2004.

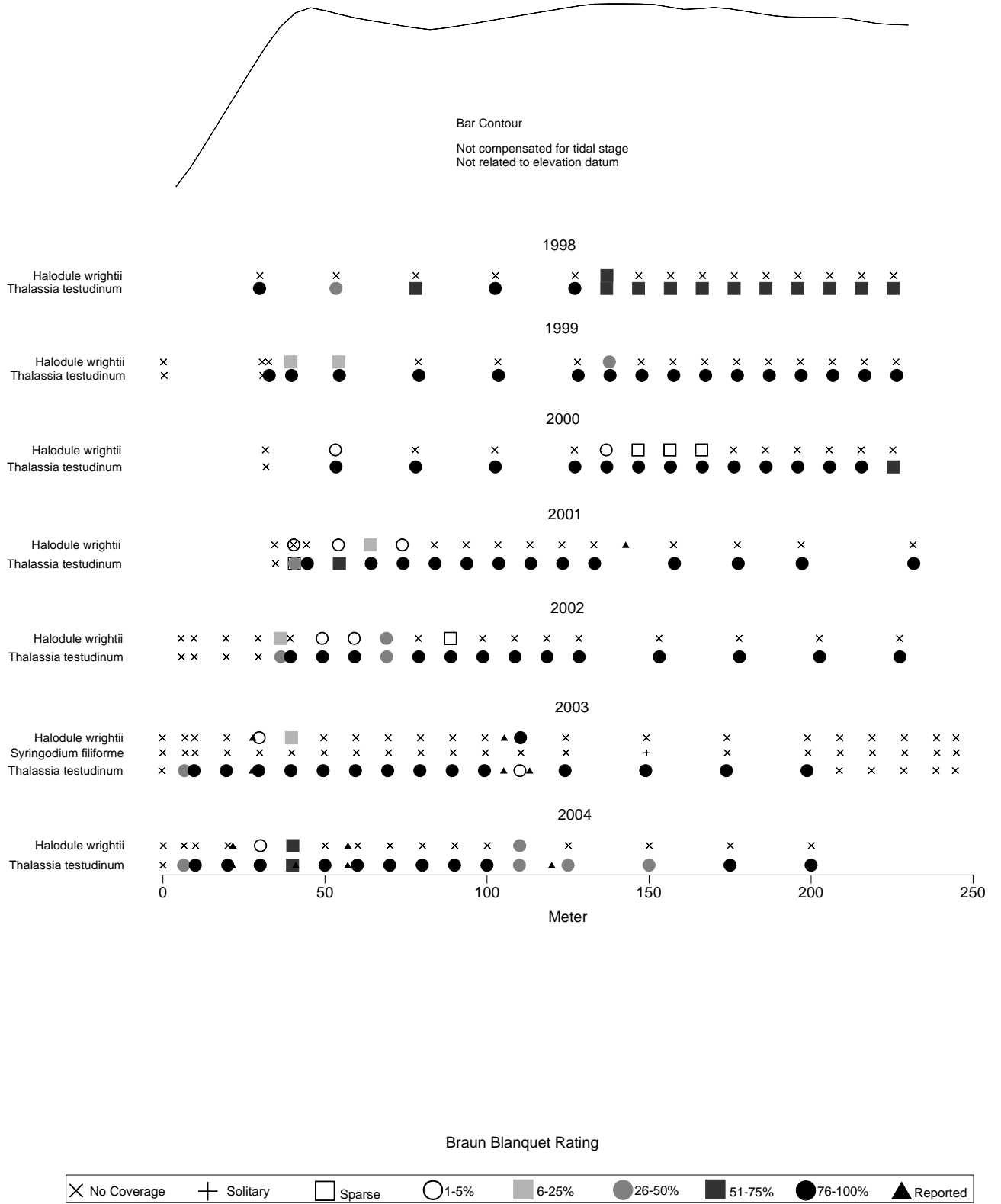


Figure 65. Seagrass species, abundance, and zonation at S5T7 from 1998-2004.

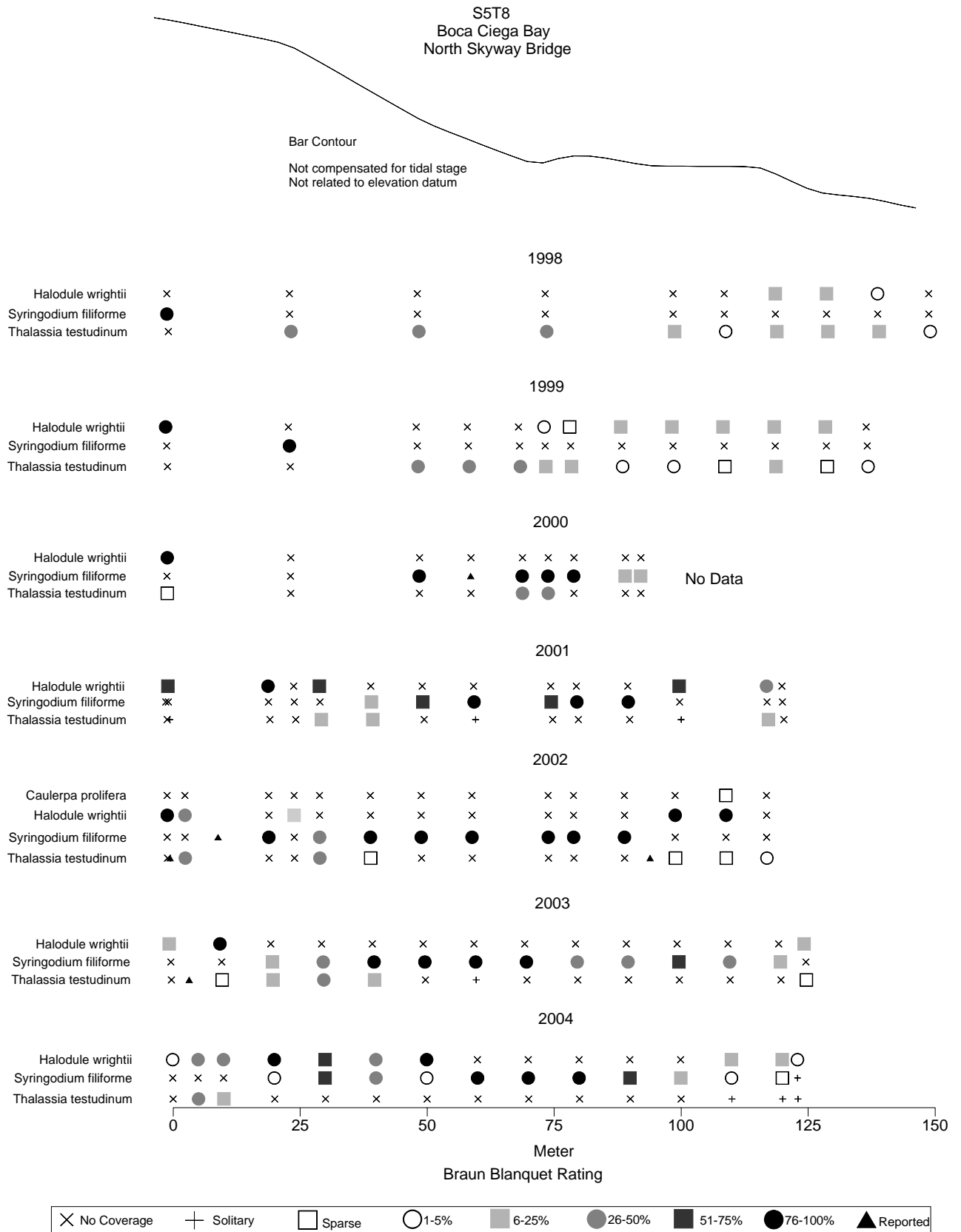


Figure 66. Seagrass species, abundance, and zonation at S5T8 from 1998-2004.

S5T9  
Boca Ciega Bay  
Bunces Pass

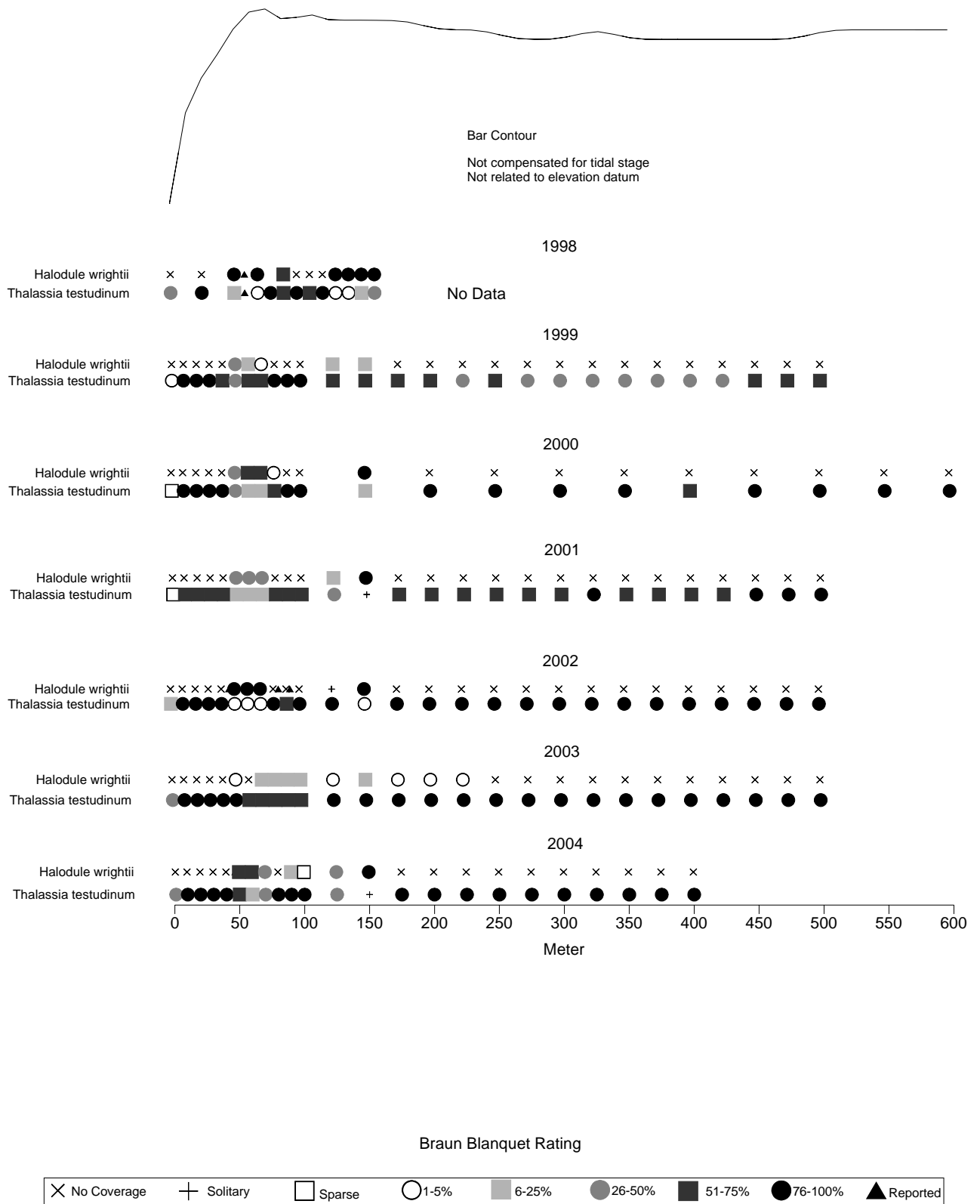


Figure 67. Seagrass species, abundance, and zonation at S5T9 from 1998-2004.

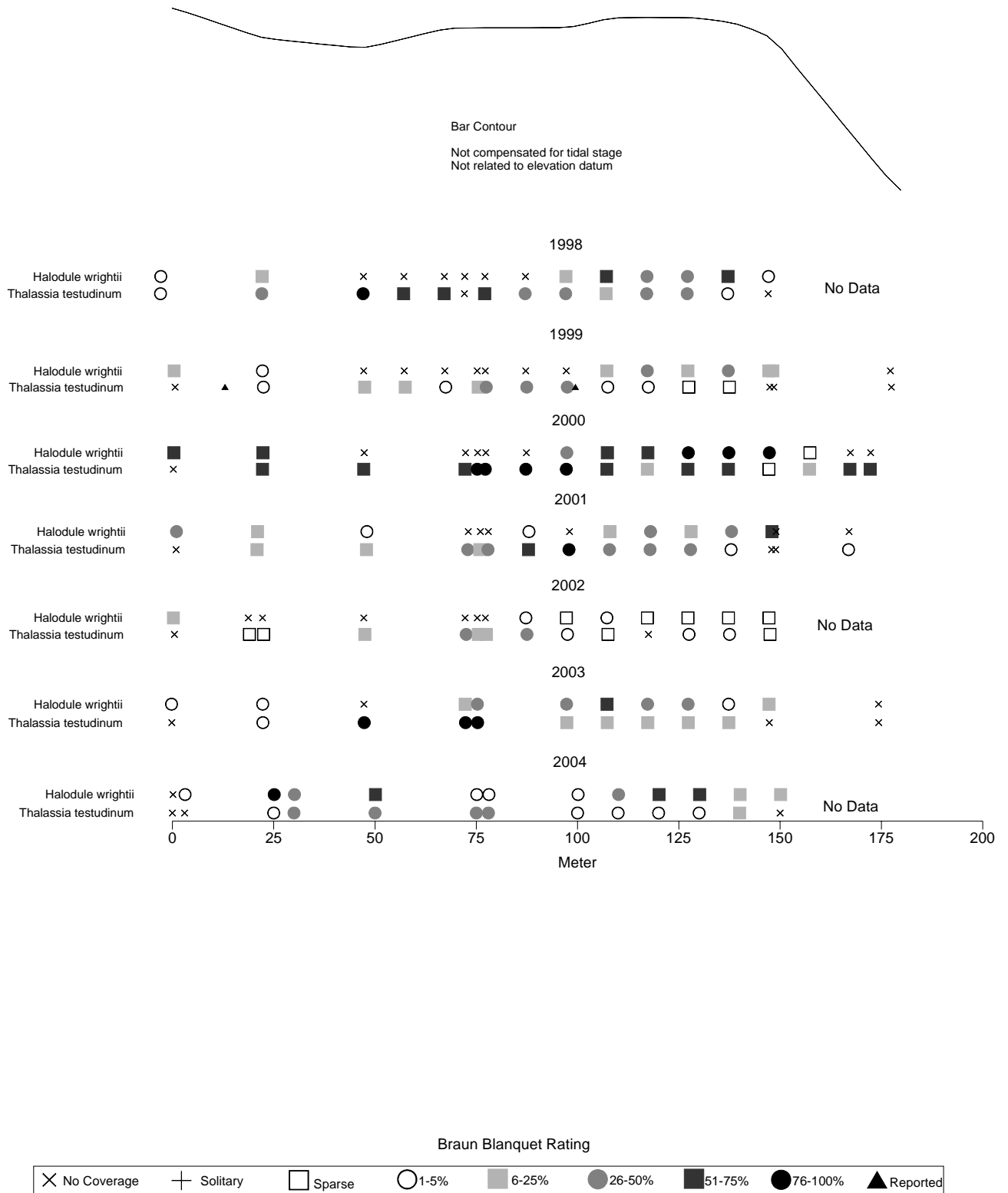


Figure 68. Seagrass species, abundance, and zonation at S5T10 from 1998-2004.

S5T11  
Boca Ciega Bay  
Shell Key

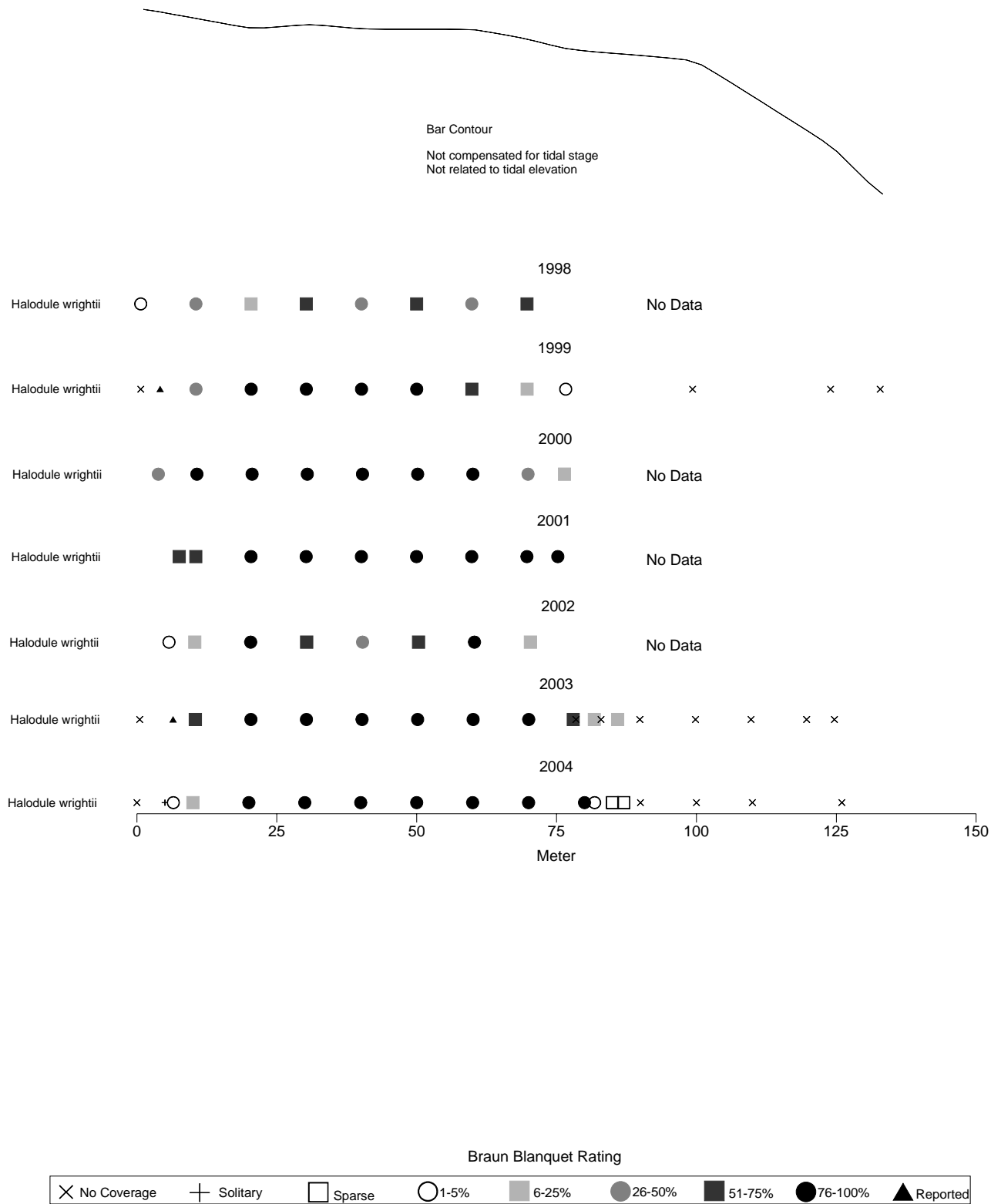


Figure 69. Seagrass species, abundance, and zonation at S5T11 from 1998-2004.