

# **The 2006 Delaware Bay Horseshoe Crab Spawning Survey**

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## **Abstract**

The moon phases dictated the 12 survey dates for 2006. Beaches surveyed included 11 in New Jersey and 13 in Delaware, comprising 288 possible p.m. beach surveys, of which, a total of 26 were cancelled for a variety of reasons. The top single day estimate was 503,435 on May 27, two days after the new moon and similar to last year's count of 527,250. The male to female sex ratios were considerably higher (4.53) and has been increasing since 2001 (3.38). Combined seasonal activity totaled 1,885,355, a substantial increase over 1,307,429 in 2005. Seasonal estimates of males and females have typically fluctuated over the years; however, males in 2006 were up 48% and females 27%. The unusually warm and calm spring may have contributed to the increased numbers of spawners.

## **Introduction**

Since its inception of a standardized methodology in 1999, the survey and the associated data is now considered to be the premier method of estimating the spawning adult horseshoe crabs. The survey is totally dependent on both individual volunteers and/or organizations that adopt a beach for collection of data. Volunteers are solicited through the web site and by organizations that sponsor a beach site. Other public agencies like New Jersey and Delaware Fish and Wildlife Departments and USGS assist with formal data analysis and interpretation for managerial and harvest implementation needs.

Specific training for survey volunteers is offered by several agencies and organizations in the early spring. These dates and locations are placed on the web several months prior to the survey. In all cases new volunteers are accompanied by an experienced volunteer. Typically, a survey may involve three individuals, one to count, and two to move the "line" and record the data. A few chose to pace the one kilometer as they have practiced and know their measured pace from experience. In all, a survey usually takes from 30 -45 minutes from start to end, a point to keep in mind as the tide stage is critical to the success of an accurate count.

## **Methods**

Horseshoe crabs were enumerated in the months of May and June 2006 along the shores of the Delaware Bay. The beaches represented in this year's count totaled 24 (13 along the state of Delaware's coast and 11 along the Delaware Bay coast of New Jersey). The Delaware beaches north to south were Woodland, Pickering, Kitts Hummock, Ted Harvey Wildlife Management Area (WMA), North Bowers, South Bowers, Bennetts Pier, Big Stone, Slaughter, Fowler, Primehook, Broadkill and Cape Henlopen. New Jersey beaches included Sea Breeze, Fortescue, Gandys, Reeds, Pierces Point, Highs, South Cape Shore Lab, Norburys Landing, Villas, North Cape May and Sunset Beach.

Counts were taken synchronically, based on tidal progression up the bay, on both sides on designated, representative beaches. All counts took place two days before, the day of and two days after the new or full moons of May and June for 12 nights total. All data was taken on forms that have been derived from years of experience and based in the data needs of wildlife managers. An annual meeting with managers and volunteer coordinators evaluate current data needs and the necessary form changes adopted on an annual basis.

## Results

Coverage by the volunteers accounted for 91% or 262 of the entire 288 scheduled counts. In New Jersey, 14 dates were missed, 7 of these dates due to volunteer no-shows, 4 were weather related, 1 due to flooding, and 2 for miscellaneous circumstances. The 7 cancellations due to lack of volunteers were scattered throughout the season, May 11th and June 27th at Sea Breeze, May 13th at North Cape May, May 15th and June 13th at Sunset Beach, June 9th at Pierces Point and June 13th at Gandys beach. Cancellations due to weather were June 23rd and June 27th at Sunset beach, June 25th at Sea Breeze and June 27th at Gandys. Other circumstances prevented the counting at Sea Breeze May 15th and May 23rd. Flooding prevented the May 11th count at Gandys. Table 1. A.

Last year, at New Jersey's Gandys Beach, a majority of the counts were canceled due to flooding. Based on the previous years' documentation, the sampling methodology was modified at Gandys in order to rectify that situation. Specifically, the beach length was shortened to include the area less prone to flooding and 100 quadrats was sampled within this smaller area.

Twelve cancellations occurred in Delaware during the 2006 spawning season. Of these, 8 were canceled due to weather, 2 for no access and 2 because of lack of volunteers. The weather cancellations were May 11th at Bennetts Pier and Woodland, June 25th at Fowler, Slaughter and Ted Harvey WMA and June 27th at Fowlers, Bennetts Pier and South Bowers. Flooding conditions prevented access to Kitts Hummock May 11th and Bennetts Pier May 13th. Lack of volunteers resulted in Bennetts Pier not being surveyed on June 9th and June 13th. Table 1. B.

This year's survey produced sizable spawning activity from the start. Horseshoe crabs were abundant along the shoreline during both the full moon and new moon dates in May. The peak of activity occurred May 27th, two days after the new moon, with 503,435 individuals estimated. Delaware spawners were calculated to be 280,782 on this date and New Jersey spawners 222, 653. Both of these counts were the highest estimate for a single night during the season.

Eighty percent of the seasonal spawning occurred during the month of May. In Delaware, spawning activity moderated during June 9th, 11th and 13th and lessened substantially during the last count in June. New Jersey's activity dropped off considerably in June with only 14% of the seasonal activity noted. Table 1. Figure 1.

Spawning along the New Jersey shoreline was greatest in May with 86% of the total seasonal spawning activity occurring. Spawning activity for the overall season was greatest at South Cape Shore Lab (127,666 individuals), followed by Norburys Landing (100,626) and Fortescue (94,042). The highest densities recorded were 18.07 crabs per meter at Norburys Landing and 17.22 crabs per meter on Highs Beach. These densities were achieved on May 27th. Table 1. A.

In Delaware, 78% of the estimated number of spawners were observed during the month of May. The highest seasonal activity occurred on Big Stone beach and was estimated to be 258,600. The other top estimates were 190,170 at Slaughter and 143,428 at South Bowers. The greatest densities occurred at Slaughter beach with 24.24 crabs per meter, at Pickering Beach with 22.36 crabs per meter and at Ted Harvey WMA with 22.14. Table 1. B.

The 2006 male to female ratio was 4.53 (4.76 in Delaware and 4.17 in New Jersey), dramatically higher than last year. The 2005 male to female ratio of 3.89 (4.13 in New Jersey and 3.71 in Delaware) was also higher than the previous 1999-2004 ratios of 3.72, 3.67, 3.38, 3.48, 3.61, 3.85 respectively. (Sex ratios are computed by averaging the total number of males and females counted throughout the entire season.) This ratio ranged from 1.83 male per female at Broadkill beach to a high seasonal ratio of 6.23 at South Bowers beach in Delaware. Other high ratios in Delaware included 5.97 at Cape Henlopen, 5.81 at Pickering, 5.36 at Ted Harvey WMA and 5.23 at North Bowers.

In New Jersey, the average seasonal ratio ranged from 1.17 at Sunset Beach comprised of 7 males and 6 females to 5.5 at Highs Beach. The counts at Pierces Point resulted in a sex ratio of 5.28 males per 1 female and at South Cape Shore Lab 4.91.

The male to female ratio was utilized to estimate the number of females and males spawning along the shores for the years 2000-2006. The number of female horseshoe crabs spawning has changed over the years with substantial increases and decreases each year. Following a decrease of 13% in the number of females in 2005, the 2006 figures increased by 27%. Comparably, the male spawners decreased 12% in 2005 and significantly increased 48% in 2006. Table 5 and Figure 5.

The seasonal estimate of 1,885,355 is a monumental increase over previous years' estimates. Spawning individuals increased 577,926 from the 2005 estimate of 1,307,429 (Table 4 and Figure 4). Utilizing the sex ratios, the increase resulted in 73,564 more females and 504,362 male spawners (Table 5 and Figure 5).

We employ four levels of spawning activity to categorize the densities for each count. No spawning activity = 0 crabs, low activity = less than 5 crabs per meter, moderate = 5-10 crabs per meter and high activity = greater than 10 crabs per meter). Data is analyzed in percentages since the number of dates and/or beaches may change yearly. As in previous years, the majority of the dates surveyed (54% in DE and 64% in NJ) showed horseshoe crab densities lower than five crabs per meter. In New Jersey, the percentage of densities greater than 10 crabs per meter was the higher than the years 2001-2005, 12% in New Jersey and 17% in Delaware. Table 3 and Figure 3.

Twenty dates (7%) with zero crabs noted were in New Jersey (7) and Delaware (13). No horseshoe crabs were observed during the counts taken May 11th, May 23rd, May 27th and June 11th at Sunset Beach. The remaining dates with zero counts were May 11th at North Cape May, June 9th at Sea Breeze and June 11th at Highs beach. In Delaware, the date of May 11th contributed to 7 of the total 13 dates with no horseshoe crabs sighted at Broadkill, Primehook, Slaughter, South Bowers, North Bowers, Ted Harvey WMA and Pickering. There were no spawners observed along the shores of Woodland, the most northern site during the last three counts in June (June 23rd, 25th and 27th). The remaining dates with zero crabs in Delaware were June 25th and June 27th at Pickering and June 27th at Big Stone Beach.

## **Discussion**

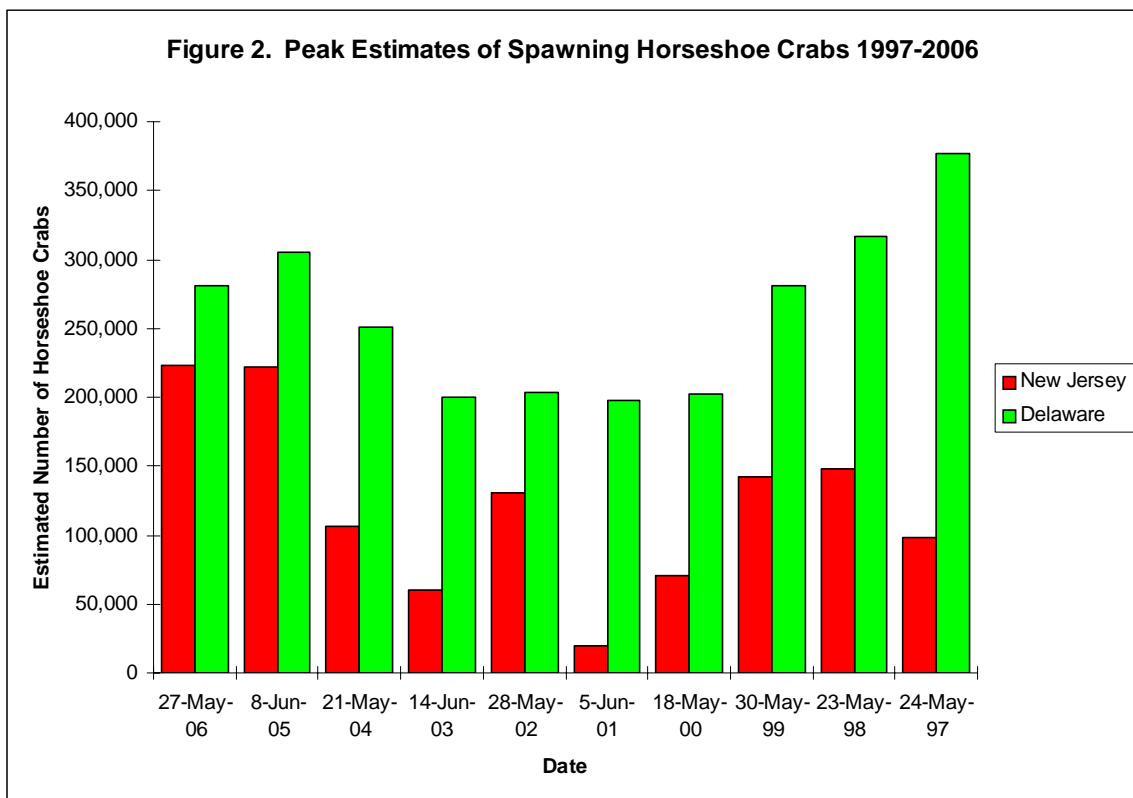
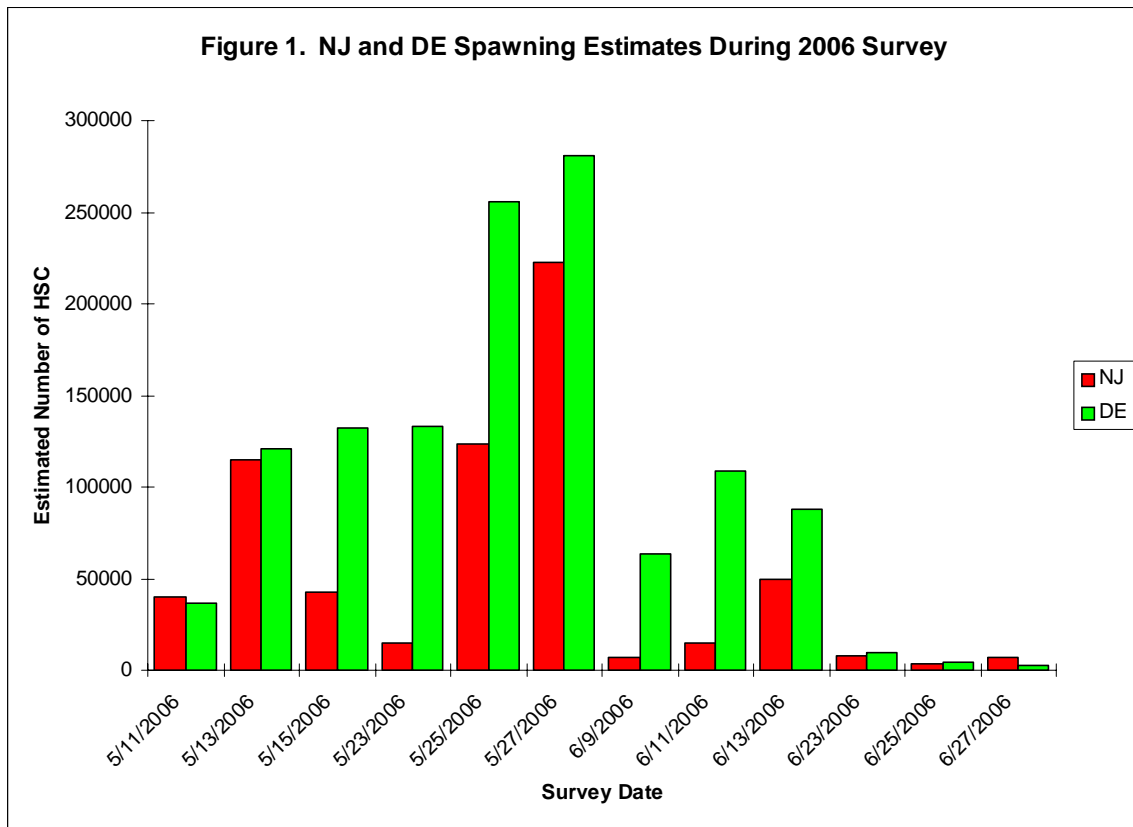
This year's weather appeared conducive to spawning: little severe weather conditions; reduced flooding; mild temperature; and little wind making for ideal spawning conditions.

The 2006 estimate for Delaware of 280,782 spawners is slightly less than last year and higher than the 2000-2004 years' estimates. In New Jersey the number of spawners was similar to last year's estimate and much greater than the estimates from the years 1997-2004. High crab per meter densities were observed this season with many counts over 10 crabs per meter (15%). Few dates contained zero or no crabs, just 7%.

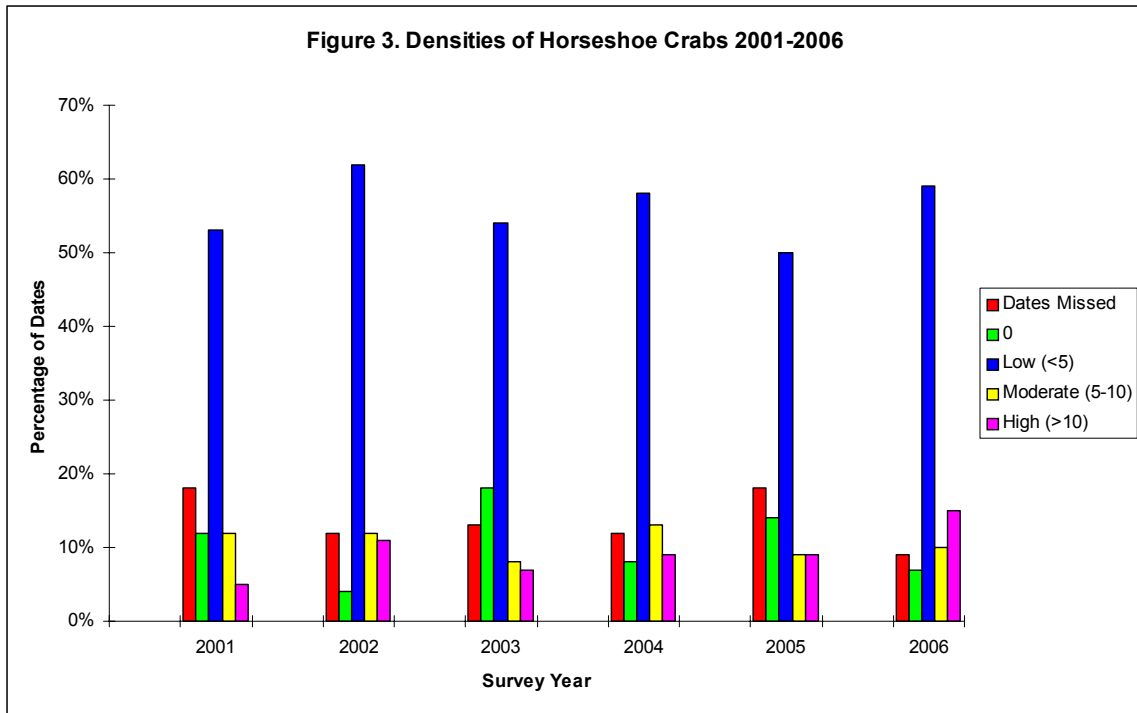
Finally, it should be noted that it is likely that the mild weather conditions appear to have supported the greatly increased numbers of male and female spawners overall. However, the increased male to female ratios should be of concern to fishery managers coast-wide as these ratios may reflect the negative impacts of the selective fishery on adult spawning females. The weather conditions in 2006 appear to have been optimum enabling spawners to access beaches in good numbers and may have given managers the best opportunity in recent years for adult spawning survey data on the condition and number of the adult spawning population.

## Acknowledgements

Our sincere thanks to all our volunteers who went out at all hours of the night. We thank USGS and Dave Smith for contributions to the current methodology. We applaud their tagging efforts and, again, our volunteers who reported 239 sighting of tagged horseshoe crabs. Both of these efforts continue to make contributions to our understanding of population dynamics.



**Figure 3. Densities of Horseshoe Crabs 2001-2006**



**Figure 4. Seasonal Estimates of Spawning Horseshoe Crabs**

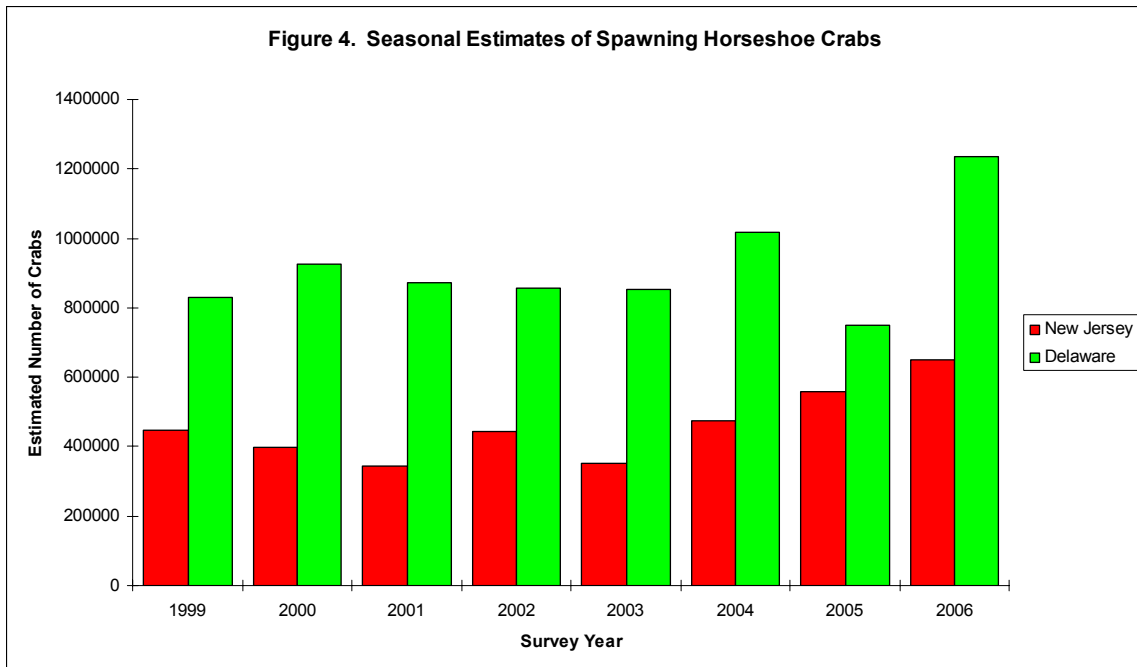
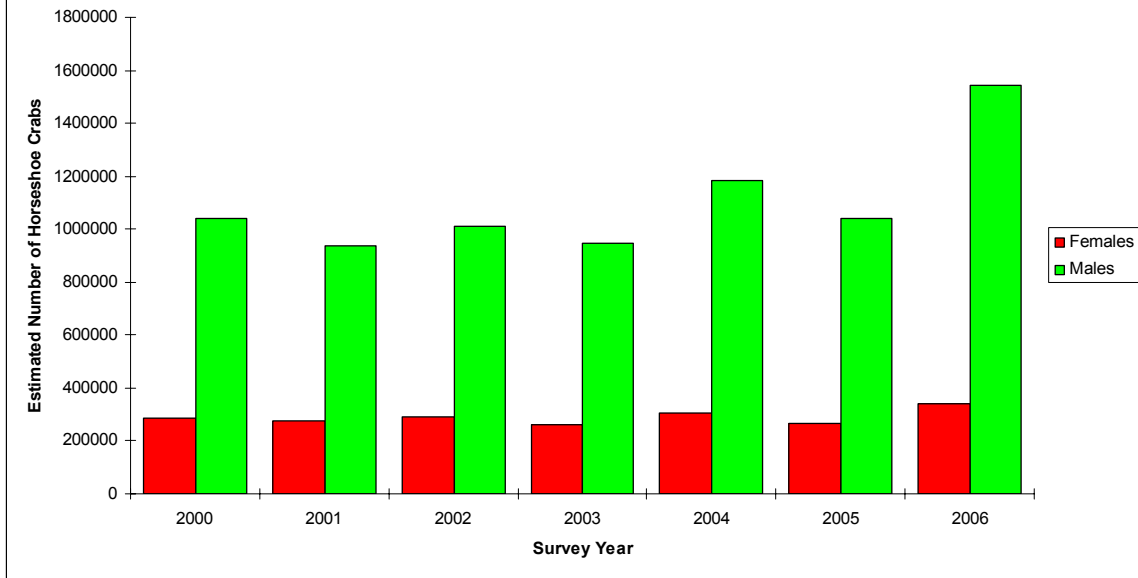


Figure 5. Seasonal Estimates of Male and Female Horseshoe Crabs



**Table 1. 2006 Survey Results - Densities and Estimates  
A. New Jersey Beaches (2 pages)**

Moon Phase	Full -2	Full	Full +2	New -2	New	New +2
Date	11-May	13-May	15-May	23-May	25-May	27-May
<b>Sunset Beach (2.02 km)</b>						
Density of HSC, Crabs/m	0.00	0.03	canceled	0.00	0.03	0.00
Estimated Number of HSC	0	61	no surveyors	0	61	0
<b>North Cape May* (3 km)</b>						
Density of HSC, Crabs/m	0.00	canceled	0.03	0.01	0.06	0.09
Estimated Number of HSC	0	no surveyors	90	30	180	270
<b>Villas (2.8 km)</b>						
Density of HSC, Crabs/m	1.20	0.92	0.90	0.76	6.68	13.19
Estimated Number of HSC	3,360	2,576	2,520	2,128	18,704	36,932
<b>Norburys Landing (2.43 km)</b>						
Density of HSC, Crabs/m	1.82	4.59	3.59	0.70	9.60	18.07
Estimated Number of HSC	4,423	11,154	8,724	1,701	23,328	43,910
<b>South CSL* (2.2 km)</b>						
Density of HSC, Crabs/m	5.89	12.88	5.11	0.66	10.05	12.86
Estimated Number of HSC	12,958	28,336	11,242	1,452	22,110	28,292
<b>Highs* (0.8 km)</b>						
Density of HSC, Crabs/m	10.15	10.69	2.34	1.13	10.33	17.22
Estimated Number of HSC	8,120	8,552	1,872	904	8,264	13,776
<b>Pierces Point (0.7 km)</b>						
Density of HSC, Crabs/m	10.99	10.80	2.50	0.34	12.80	15.88
Estimated Number of HSC	7,693	7,560	1,750	238	8,960	11,116
<b>Reeds* (1.53 km)</b>						
Density of HSC, Crabs/m	1.97	13.83	3.00	2.29	8.82	16.45
Estimated Number of HSC	3,014	21,160	4,590	3,504	13,495	25,169
<b>Gandys* (1.2 km)</b>						
Density of HSC, Crabs/m	canceled	9.65	4.56	1.08	4.92	8.78
Estimated Number of HSC	flooded	11,580	5,472	1,296	5,904	10,536
<b>Fortescue (2.6 km)</b>						
Density of HSC, Crabs/m	0.02	6.41	2.39	1.34	4.99	16.97
Estimated Number of HSC	52	16,666	6,214	3,484	12,974	44,122
<b>Sea Breeze* (1.65 km)</b>						
Density of HSC, Crabs/m	canceled	4.53	canceled	canceled	6.00	5.17
Estimated Number of HSC	no surveyors	7,475	other	other	9,900	8,531
<b>Totals</b>	<b>39,620</b>	<b>115,119</b>	<b>42,474</b>	<b>14,737</b>	<b>123,879</b>	<b>222,653</b>
Moon Phase	Full -2	Full	Full +2	New -2	New	New +2

\* Beaches Surveyed Every Year

**Table 1. 2006 Survey Results - Densities and Estimates  
A. New Jersey Beaches (2 pages)**

Moon Phase	Full -2	Full	Full +2	New -2	New	New +2	Totals
Date	9-Jun	11-Jun	13-Jun	23-Jun	25-Jun	27-Jun	
<b>Sunset Beach (2.02 km)</b>							
Density of HSC, Crabs/m	0.01	0.00	canceled	canceled	0.06	canceled	
Estimated Number of HSC	20	0	no surveyors	weather	121	weather	263
<b>North Cape May* (3 km)</b>							
Density of HSC, Crabs/m	0.04	0.02	0.08	0.16	0.06	0.11	
Estimated Number of HSC	120	60	240	480	180	330	1,980
<b>Villas (2.8 km)</b>							
Density of HSC, Crabs/m	0.59	0.09	1.39	0.46	0.49	0.45	
Estimated Number of HSC	1,652	252	3,892	1,288	1,372	1,260	75,936
<b>Norburys Landing (2.43 km)</b>							
Density of HSC, Crabs/m	0.25	0.16	1.98	0.18	0.23	0.24	
Estimated Number of HSC	608	389	4,811	437	559	583	100,626
<b>South CSL* (2.2 km)</b>							
Density of HSC, Crabs/m	0.40	0.42	8.40	0.13	0.17	1.06	
Estimated Number of HSC	880	924	18,480	286	374	2,332	127,666
<b>Highs* (0.8 km)</b>							
Density of HSC, Crabs/m	0.32	0.00	1.26	0.08	0.14	0.42	
Estimated Number of HSC	256	0	1,008	64	112	336	43,264
<b>Pierces Point (0.7 km)</b>							
Density of HSC, Crabs/m	canceled	0.36	0.83	0.07	0.18	0.13	
Estimated Number of HSC	no surveyors	252	581	49	126	91	38,416
<b>Reeds* (1.53 km)</b>							
Density of HSC, Crabs/m	0.31	1.43	4.57	1.46	0.04	1.06	
Estimated Number of HSC	474	2,188	6,992	2,234	61	1,622	84,502
<b>Gandys* (1.2 km)</b>							
Density of HSC, Crabs/m	1.63	3.57	canceled	1.34	0.01	canceled	
Estimated Number of HSC	1,956	4,284	no surveyors	1,608	12	weather	42,648
<b>Fortescue (2.6 km)</b>							
Density of HSC, Crabs/m	0.42	0.42	2.75	0.06	0.15	0.25	
Estimated Number of HSC	1,092	1,092	7,150	156	390	650	94,042
<b>Sea Breeze* (1.65 km)</b>							
Density of HSC, Crabs/m	0.00	3.14	4.10	0.93	canceled	canceled	
Estimated Number of HSC	0	5,181	6,765	1,535	weather	no surveyors	39,386
<b>Totals</b>	<b>7,058</b>	<b>14,622</b>	<b>49,920</b>	<b>8,137</b>	<b>3,307</b>	<b>7,204</b>	<b>648,728</b>
Moon Phase	Full -2	Full	Full +2	New -2	New	New +2	

\* Beaches Surveyed Every Year



**Table 1. 2006 Survey Results - Densities and Estimates**  
**B. Delaware Beaches (2 pages)** \* Beaches Surveyed Every year

Moon Phase	Full -2	Full	Full +2	New -2	New	New +2
Date	11-May	13-May	15-May	23-May	25-May	27-May
<b>Cape Henlopen (1.5 km)</b>						
Density of HSC, Crabs/m	0.08	0.67	1.15	0.05	1.01	2.78
Estimated Number of HSC	120	1,005	1,725	75	1,515	4,170
<b>Broadkill (1.5 km)</b>						
Density of HSC, Crabs/m	0.00	0.01	0.08	0.02	0.28	2.01
Estimated Number of HSC	0	15	120	30	420	3,015
<b>Primehook* (2.0 km)</b>						
Density of HSC, Crabs/m	0.00	2.22	2.74	1.59	10.63	11.41
Estimated Number of HSC	0	4,440	5,480	3,180	21,260	22,820
<b>Fowler* (3 km)</b>						
Density of HSC, Crabs/m	0.01	3.13	3.81	0.36	3.92	8.31
Estimated Number of HSC	30	9,390	11,430	1,080	11,760	24,930
<b>Slaughter (3 km)</b>						
Density of HSC, Crabs/m	0.00	5.19	4.66	8.50	13.90	24.24
Estimated Number of HSC	0	15,570	13,980	25,500	41,700	72,720
<b>Big Stone* (5.0 km)</b>						
Density of HSC, Crabs/m	7.31	6.93	1.07	11.47	11.25	1.67
Estimated Number of HSC	36,550	34,650	5,350	57,350	56,250	8,350
<b>Bennetts Pier (2.6 km)</b>						
Density of HSC, Crabs/m	canceled	canceled	4.75	2.05	5.58	13.21
Estimated Number of HSC	weather	no access	12,350	5,330	14,508	34,346
<b>South Bowers (2.3 km)</b>						
Density of HSC, Crabs/m	0.00	7.14	9.57	2.14	12.60	11.96
Estimated Number of HSC	0	16,422	22,011	4,922	28,980	27,508
<b>North Bowers* (1.3 km)</b>						
Density of HSC, Crabs/m	0.00	4.39	7.34	3.81	9.84	18.36
Estimated Number of HSC	0	5,707	9,542	4,953	12,792	23,868
<b>Ted Harvey WMA (1.0 km)</b>						
Density of HSC, Crabs/m	0.00	13.01	19.80	5.42	21.87	22.14
Estimated Number of HSC	0	13,010	19,800	5,420	21,870	22,140
<b>Kitts Hummock* (1.0 km)</b>						
Density of HSC, Crabs/m	canceled	12.74	13.23	10.80	22.13	15.19
Estimated Number of HSC	no access	12,740	13,230	10,800	22,130	15,190
<b>Pickering (1 km)</b>						
Density of HSC, Crabs/m	0.00	7.56	16.40	14.24	22.36	20.75
Estimated Number of HSC	0	7,560	16,400	14,240	22,360	20,750
<b>Woodland* (0.5 km)</b>						
Density of HSC, Crabs/m	canceled	0.83	1.52	0.02	0.97	1.95
Estimated Number of HSC	weather	415	760	10	485	975
<b>Totals</b>	<b>36,700</b>	<b>120,924</b>	<b>132,178</b>	<b>132,890</b>	<b>256,030</b>	<b>280,782</b>

**Table 1. 2006 Survey Results - Densities and Estimates**  
**B. Delaware Beaches (2 pages)** \* Beaches Surveyed Every year

Moon Phase	Full -2	Full	Full +2	New -2	New	New +2	Totals
Date	9-Jun	11-Jun	13-Jun	23-Jun	25-Jun	27-Jun	
<b>Cape Henlopen (1.5 km)</b>							
Density of HSC, Crabs/m	0.07	0.50	0.55	0.15	0.81	0.54	
Estimated Number of HSC	105	750	825	225	1,215	810	12,540
<b>Broadkill (1.5 km)</b>							
Density of HSC, Crabs/m	0.05	0.11	0.66	0.21	0.44	0.24	
Estimated Number of HSC	75	165	990	315	660	360	6,165
<b>Primehook* (2.0 km)</b>							
Density of HSC, Crabs/m	0.75	3.18	1.91	0.47	0.48	0.21	
Estimated Number of HSC	1,500	6,360	3,820	940	960	420	71,180
<b>Fowler* (3 km)</b>							
Density of HSC, Crabs/m	0.30	1.14	0.59	0.10	canceled	canceled	
Estimated Number of HSC	900	3,420	1,770	300	weather	weather	65,010
<b>Slaughter (3 km)</b>							
Density of HSC, Crabs/m	1.45	2.16	2.22	0.73	canceled	0.34	
Estimated Number of HSC	4,350	6,480	6,660	2,190	weather	1,020	190,170
<b>Big Stone* (5.0 km)</b>							
Density of HSC, Crabs/m	5.05	6.67	0.14	0.02	0.14	0.00	
Estimated Number of HSC	25,250	33,350	700	100	700	0	258,600
<b>Bennetts Pier (2.6 km)</b>							
Density of HSC, Crabs/m	canceled	2.40	canceled	0.69	0.15	canceled	
Estimated Number of HSC	no surveyors	6,240	no surveyors	1,794	390	weather	74,958
<b>South Bowers (2.3 km)</b>							
Density of HSC, Crabs/m	4.38	7.44	7.01	0.01	0.11	canceled	
Estimated Number of HSC	10,074	17,112	16,123	23	253	weather	143,428
<b>North Bowers* (1.3 km)</b>							
Density of HSC, Crabs/m	3.62	4.35	2.96	0.06	0.09	0.10	
Estimated Number of HSC	4,706	5,655	3,848	78	117	130	71,396
<b>Ted Harvey WMA (1.0 km)</b>							
Density of HSC, Crabs/m	3.34	8.21	16.76	0.38	canceled	0.06	
Estimated Number of HSC	3,340	8,210	16,760	380	weather	60	110,990
<b>Kitts Hummock* (1.0 km)</b>							
Density of HSC, Crabs/m	4.65	9.91	14.01	1.86	0.05	0.08	
Estimated Number of HSC	4,650	9,910	14,010	1,860	50	80	104,650
<b>Pickering (1 km)</b>							
Density of HSC, Crabs/m	8.39	10.67	20.44	1.27	0.00	0.00	
Estimated Number of HSC	8,390	10,670	20,440	1,270	0	0	122,080
<b>Woodland* (0.5 km)</b>							
Density of HSC, Crabs/m	0.11	1.03	4.49	0.00	0.00	0.00	
Estimated Number of HSC	55	515	2,245	0	0	0	5,460
<b>Totals</b>	<b>63,395</b>	<b>108,837</b>	<b>88,191</b>	<b>9,475</b>	<b>4,345</b>	<b>2,880</b>	<b>1,236,627</b>

**Table 2. Comparison of Data on Horseshoe Crabs Spawning on Delaware Bay Shores  
Years 1997-2006**

	27-May-06	8-Jun-05	21-May-04	14-Jun-03	28-May-02	5-Jun-01	18-May-00	30-May-99	23-May-98	24-May-97
<b>Estimated Number of HSC</b>	503,435	527,520	356,739	259,957	333,553	216,929	272,770	422,775	464,934	475,810
<b>Estimated Number of HSC-NJ</b>	222,653	222,168	105,973	60,272	130,164	19,726	70,293	141,720	148,444	98,487
<b>Estimated Number of HSC-DE</b>	280,782	305,352	250,766	199,685	203,389	197,203	202,477	281,055	316,490	377,323
<b>Beaches Surveyed in DE</b>	13	13	13	13	13	13	11	9	7	7
<b>Beaches Surveyed in NJ</b>	11	11	11	10	10	10	11	13	12	12
<b>Main Spawning Beaches in DE</b>	Big Stone	Big Stone	Slaughter	Slaughter	S. Bowers	Slaughter	Slaughter	Slaughter	Slaughter	Slaughter
	Slaughter	S. Bowers	Big Stone	Big Stone	Slaughter	Big Stone	Big Stone	Big Stone	Big Stone	Big Stone
	S. Bowers	Bennetts	Pickering	Pickering	Big Stone					
	Pickering	Slaughter		Ted Harvey	Pickering					
		Pickering								
<b>Main Spawning Beaches in NJ</b>	South CSL	South CSL	South CSL	South CSL	South CSL	South CSL	South CSL	Townbank	South CSL	Norburys
	Norburys	Norburys	Fortescue	Fortescue	Gandys			Norburys	Reeds	South CSL
	Foescue	Villas	Norburys	Norburys	Sea Breeze			South CSL	Cooks	

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**Table 3. Percentages of Horseshoe Crab Densities 2001-2006**

		<b>0</b>	<b>Low (&lt;5)</b>	<b>Percentages Moderate (5-10)</b>	<b>High (&gt;10)</b>	<b>Dates Missed</b>
<b>Survey Year</b>	<b>State</b>					
<b>2001</b>	<b>New Jersey</b>	10	63	5	5	17
	<b>Delaware</b>	13	46	11	6	19
<b>2002</b>	<b>New Jersey</b>	3	61	10	8	13
	<b>Delaware</b>	5	63	13	12	7
<b>2003</b>	<b>New Jersey</b>	17	60	7	3	13
	<b>Delaware</b>	18	50	8	10	13
<b>2004</b>	<b>New Jersey</b>	5	63	9	8	14
	<b>Delaware</b>	10	54	15	10	10
<b>2005</b>	<b>New Jersey</b>	14	48	6	10	21
	<b>Delaware</b>	14	51	11	8	16
<b>2006</b>	<b>New Jersey</b>	5	64	8	12	11
	<b>Delaware</b>	8	54	12	17	8

**Table 4. Seasonal Estimates Of Horseshoe Crabs 1999-2006**

<b>Year</b>	<b>New Jersey</b>	<b>Delaware</b>	<b>Total</b>
<b>1999</b>	447,128	830,405	1,277,533
<b>2000</b>	398,847	925,837	1,324,684
<b>2001</b>	343,351	871,375	1,214,726
<b>2002</b>	442,586	857,362	1,299,948
<b>2003</b>	352,800	853,721	1,206,521
<b>2004</b>	474,019	1,019,014	1,493,033
<b>2005</b>	557,956	749,473	1,307,429
<b>2006</b>	648,728	1,236,627	1,885,355

**Table 5. Seasonal Estimates Of Male and Female Horseshoe Crabs 2000-2006**

<b>Year</b>	<b>Females</b>	<b>Males</b>
<b>2000</b>	283,658	1,041,026
<b>2001</b>	277,335	937,391
<b>2002</b>	290,167	1,009,781
<b>2003</b>	261,718	944,803
<b>2004</b>	307,842	1,185,191
<b>2005</b>	267,368	1,040,061
<b>2006</b>	340,932	1,544,423