# INDICES OF ABUNDANCE FOR BLACKNOSE SHARK FROM THE SEAMAP TRAWL SURVEYS

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## *Introduction and Survey Design*

The Southeast Fisheries Science Center (SEFSC) Mississippi Laboratories has conducted standardized groundfish trawls under the Southeast Area Monitoring and Assessment Program (SEAMAP) in the Gulf of Mexico since 1987. The objective of this trawl survey is to provide fisheries independent data for stock assessment for as many species as possible. This survey, which is conducted semi-annually (summer and fall) in U.S. waters of the Gulf of Mexico (GOM), provides an important source of fisheries independent information on blacknose sharks (*Carcharhinus acronotus*). Details concerning methodologies and evolution of this survey have been covered in previous documents (most recently SEDAR22-DW-06) and will not be repeated in this document.

## *Uses of SEAMAP Groundfish Trawl Data*

For shark SEDAR 21, we used the entire time series of data to develop abundance indices for blacknose, sharks. A total of 9,026 stations were sampled from 1987- 2009 (Table 1). The locations of all stations and stations where blacknose sharks were caught were plotted by year and all years combined (Figures 1 – 24). Survey coverage area was consistent during the time series, with only minor areas (shrimp statistical zones 9 and 10) not being consistently covered year to year. Yearly nominal CPUE (sharks per trawl hour) indicates a steady trend from 1989 – 2007 with a high spike in 2008 and 2009 (Figure 25). Blacknose shark distribution by depth zone and shrimp statistical zone are presented in Figures 26 and 27, respectively.

Simple abundance indices are reported for two of the time series (i.e., Summer and Fall) (Figures 28 and 29). Scott Nichols summarized his methodologies in SEDAR13-DW-31. Those methods were not repeated herein.

A length frequency histogram was constructed for blacknose sharks (Figure 30). This indicated that a wide range of sizes of blacknose shark are captured in the trawl gear in the GOM.

## *Literature Cited*

Nichols, S. 2007. Indexes of abundance for small coastal sharks from the SEAMAP trawl surveys. SEDAR13-DW-31.

Pollack, A.G. and G. Walter Ingram Jr. 2010. Abundance indices of subadult yellowedge grouper, *Epinephelus flavolimbatus*, collected in summer and fall groundfish surveys in the northern Gulf of Mexico. SEDAR22-DW-06.

Table 1. Summary of the data used in these analyses collected by NOAA Fisheries during Summer and Fall SEAMAP groundfish surveys conducted between 1987 and 2009.

| Survey Year | Number of Stations | Number Collected | Number Measured | Minimum Total Length (mm) | Maximum Total Length (mm) | Mean Total Length (mm) | Standard Deviation |
|---|---|---|---|---|---|---|---|
| 1987 | 357 | 0 | | | | | |
| 1988 | 365 | 0 | | | | | |
| 1989 | 358 | 4 | | | | | |
| 1990 | 403 | 2 | 2 | 652 | 880 | 766 | 161 |
| 1991 | 396 | 6 | 5 | 667 | 800 | 715 | 51 |
| 1992 | 385 | 2 | 2 | 687 | 867 | 777 | 127 |
| 1993 | 413 | 4 | 3 | 539 | 723 | 654 | 100 |
| 1994 | 419 | 3 | 2 | 499 | 675 | 587 | 124 |
| 1995 | 382 | 6 | 6 | 647 | 872 | 718 | 84 |
| 1996 | 385 | 4 | 4 | 425 | 1015 | 629 | 273 |
| 1997 | 364 | 3 | 3 | 450 | 840 | 606 | 206 |
| 1998 | 369 | 4 | 4 | 680 | 741 | 719 | 27 |
| 1999 | 389 | 3 | 3 | 690 | 945 | 832 | 130 |
| 2000 | 383 | 4 | 6 | 638 | 950 | 807 | 153 |
| 2001 | 315 | 3 | 3 | 427 | 643 | 503 | 121 |
| 2002 | 396 | 3 | 3 | 483 | 709 | 622 | 122 |
| 2003 | 381 | 7 | 7 | 451 | 1041 | 755 | 226 |
| 2004 | 359 | 5 | 5 | 351 | 705 | 479 | 142 |
| 2005 | 385 | 8 | 8 | 663 | 967 | 806 | 100 |
| 2006 | 387 | 3 | 3 | 501 | 970 | 775 | 244 |
| 2007 | 340 | 4 | 4 | 499 | 978 | 763 | 220 |
| 2008 | 493 | 17 | 10 | 425 | 819 | 619 | 138 |
| 2009 | 602 | 27 | 23 | 368 | 1160 | 650 | 271 |

| Total Number of Years | Total Number of Stations | Total Number Collected | Total Number Measured | Overall Mean Total Length (mm) |
|---|---|---|---|---|
| 23 | 9026 | 122 | 106 | 686 |

Table 2. Breakdown of total number of SEAMAP stations sampled (n= 9026) during the Summer and Fall groundfish survey by shrimp statistical zone.

| | Shrimp Statistical Zone | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 9 | 10 | 11 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 1987 | | 20 | 31 | 21 | 34 | 35 | 42 | 35 | 31 | 40 | 46 | 22 |
| 1988 | | 15 | 24 | 12 | 26 | 20 | 37 | 50 | 33 | 46 | 59 | 43 |
| 1989 | | 9 | 28 | 12 | 22 | 35 | 47 | 27 | 32 | 42 | 54 | 50 |
| 1990 | | | 55 | 25 | 32 | 38 | 45 | 35 | 38 | 45 | 43 | 47 |
| 1991 | | | 35 | 18 | 45 | 27 | 43 | 47 | 48 | 37 | 48 | 48 |
| 1992 | | | 26 | 9 | 43 | 38 | 45 | 43 | 29 | 58 | 56 | 38 |
| 1993 | | | 58 | 20 | 38 | 34 | 50 | 37 | 30 | 54 | 52 | 40 |
| 1994 | | | 63 | 15 | 33 | 43 | 50 | 37 | 41 | 45 | 50 | 42 |
| 1995 | | | 29 | 20 | 33 | 36 | 46 | 42 | 27 | 53 | 56 | 40 |
| 1996 | | | 29 | 23 | 30 | 38 | 39 | 46 | 30 | 46 | 55 | 49 |
| 1997 | | | 22 | 10 | 29 | 36 | 48 | 42 | 28 | 51 | 48 | 50 |
| 1998 | | | 19 | 12 | 36 | 35 | 59 | 29 | 29 | 46 | 65 | 39 |
| 1999 | | | 28 | 16 | 37 | 37 | 49 | 41 | 25 | 53 | 61 | 42 |
| 2000 | | | 32 | 12 | 33 | 37 | 39 | 53 | 20 | 59 | 56 | 42 |
| 2001 | | | 15 | 17 | 35 | 37 | 39 | 23 | 24 | 36 | 45 | 44 |
| 2002 | | 1 | 31 | 21 | 27 | 43 | 49 | 42 | 29 | 51 | 59 | 43 |
| 2003 | | 1 | 60 | 18 | 26 | 29 | 26 | 39 | 40 | 45 | 51 | 46 |
| 2004 | | | 20 | 11 | 29 | 35 | 37 | 52 | 35 | 43 | 55 | 42 |
| 2005 | | | 50 | 21 | 29 | 27 | 49 | 39 | 19 | 51 | 46 | 54 |
| 2006 | | 1 | 34 | 18 | 43 | 26 | 38 | 51 | 30 | 46 | 63 | 37 |
| 2007 | | | 12 | 9 | 26 | 32 | 40 | 51 | 24 | 49 | 50 | 47 |
| 2008 | | 1 | 41 | 20 | 39 | 49 | 65 | 68 | 61 | 43 | 57 | 49 |
| 2009 | 6 | 10 | 55 | 18 | 30 | 45 | 69 | 95 | 100 | 64 | 65 | 45 |
| Total | 6 | 58 | 797 | 378 | 755 | 812 | 1051 | 1024 | 803 | 1103 | 1240 | 999 |

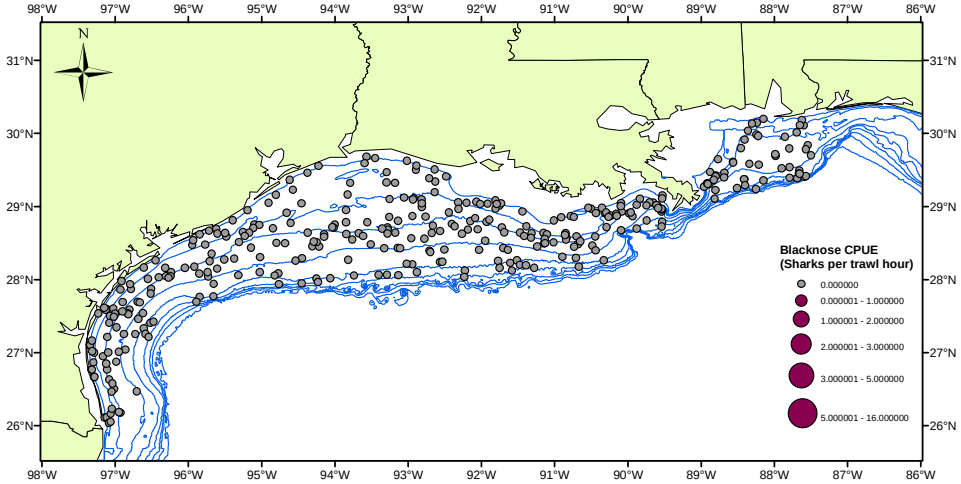



Figure 1. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1987.

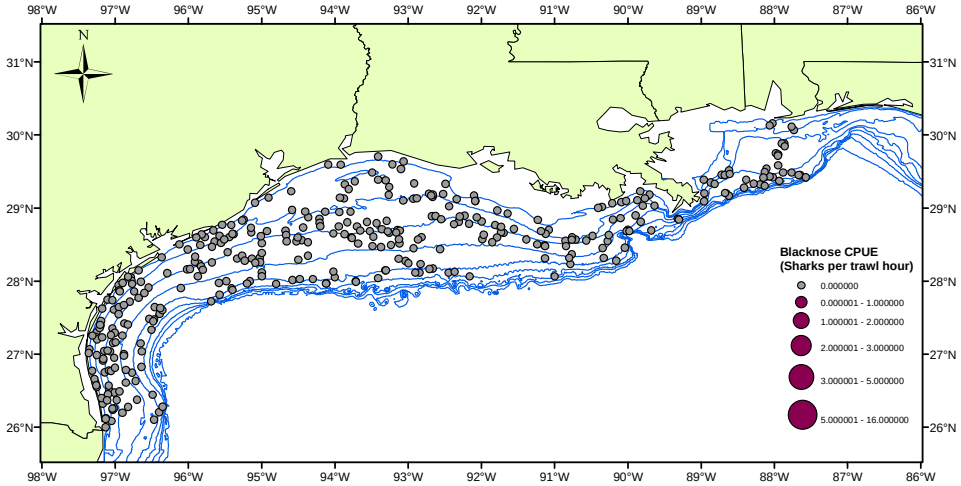



Figure 2. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1988.

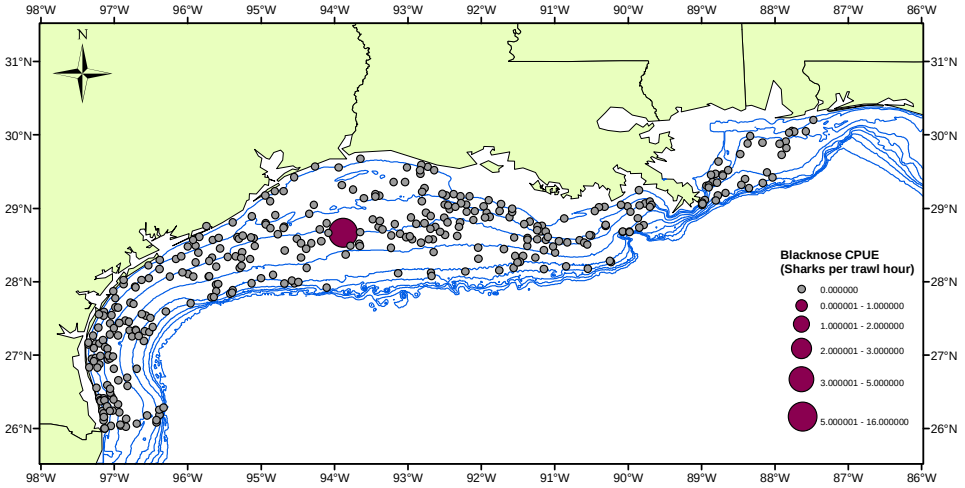



Figure 3. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1989.

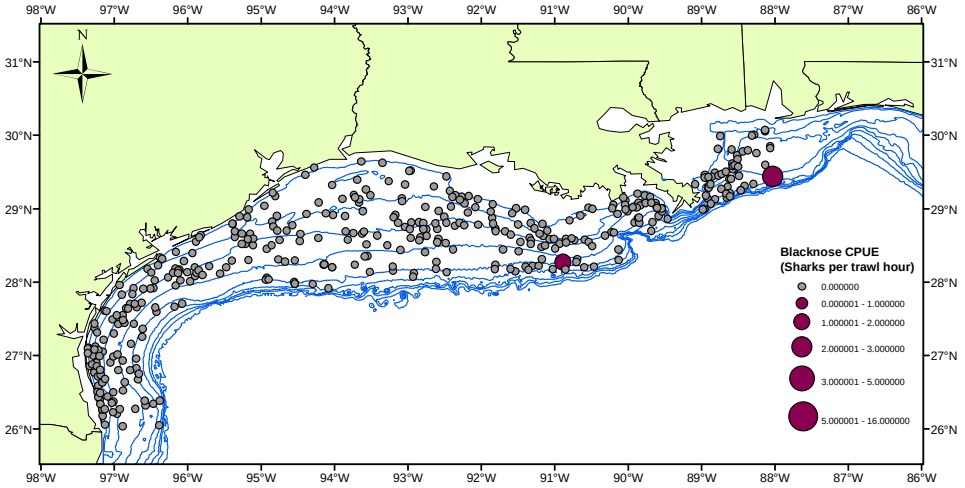



Figure 4. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1990.

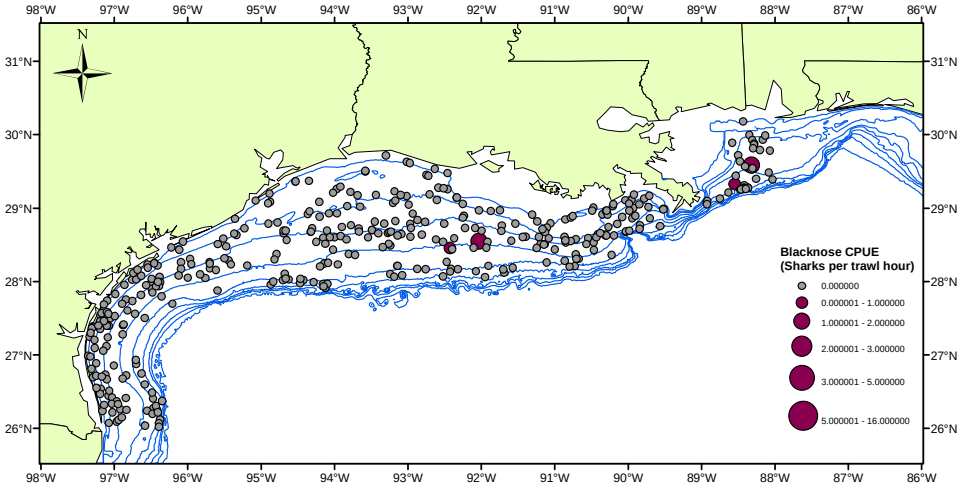



Figure 5. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1991.

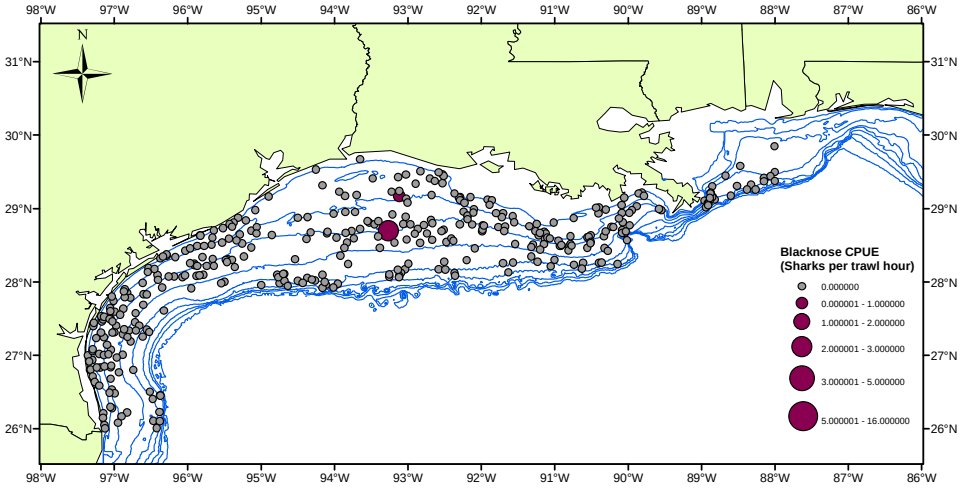


Figure 6. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1992.

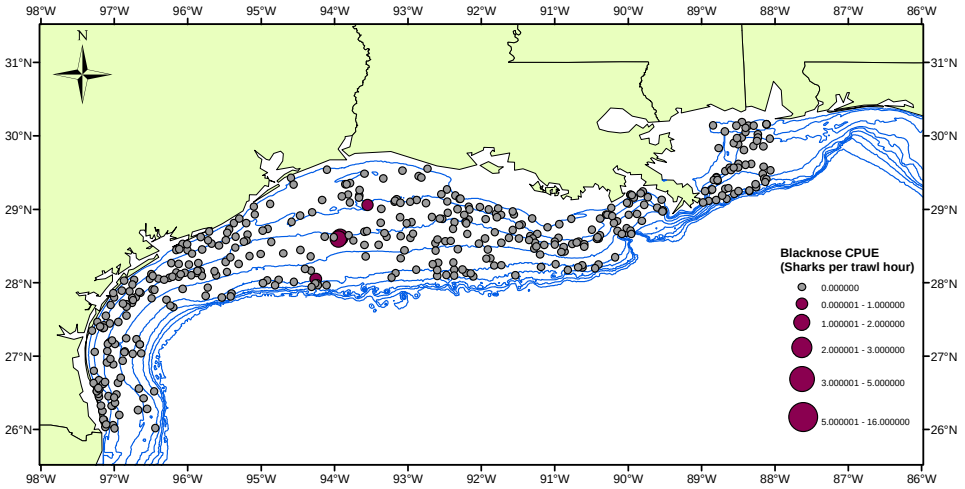



Figure 7. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1993.

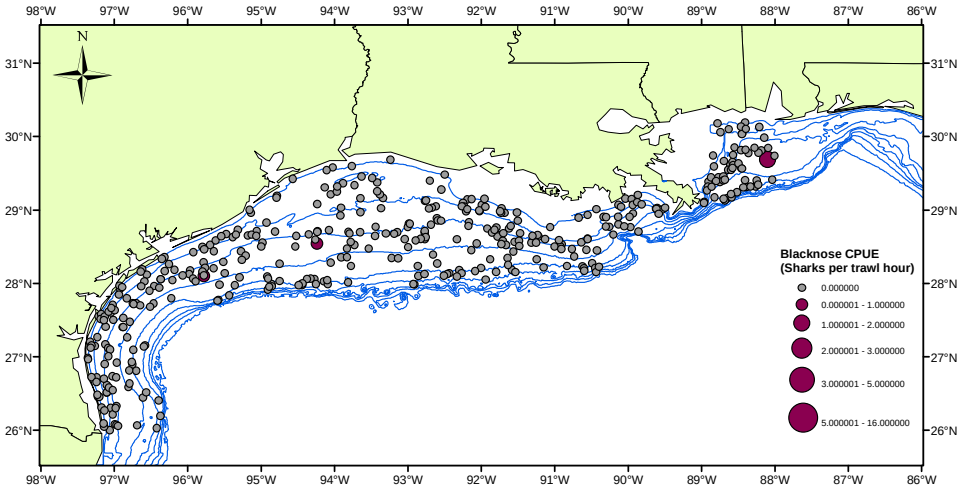



Figure 8. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1994.

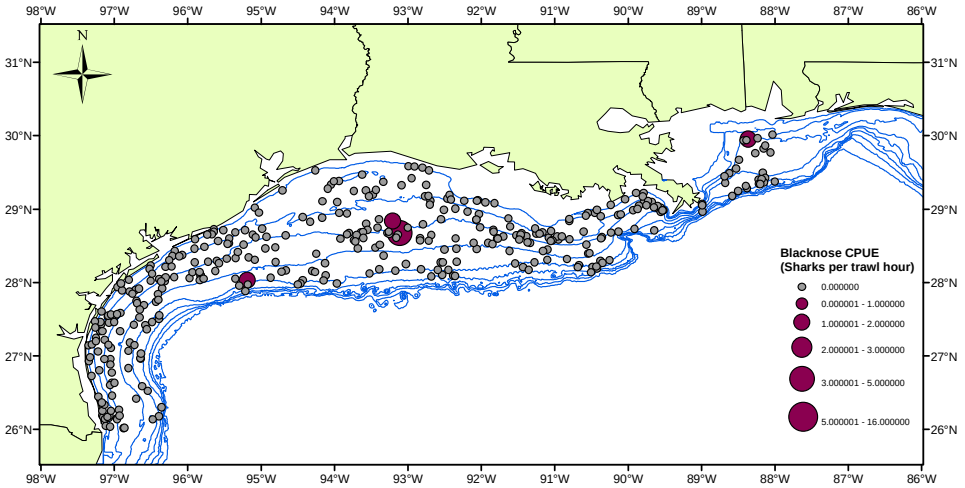



Figure 9. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1995.

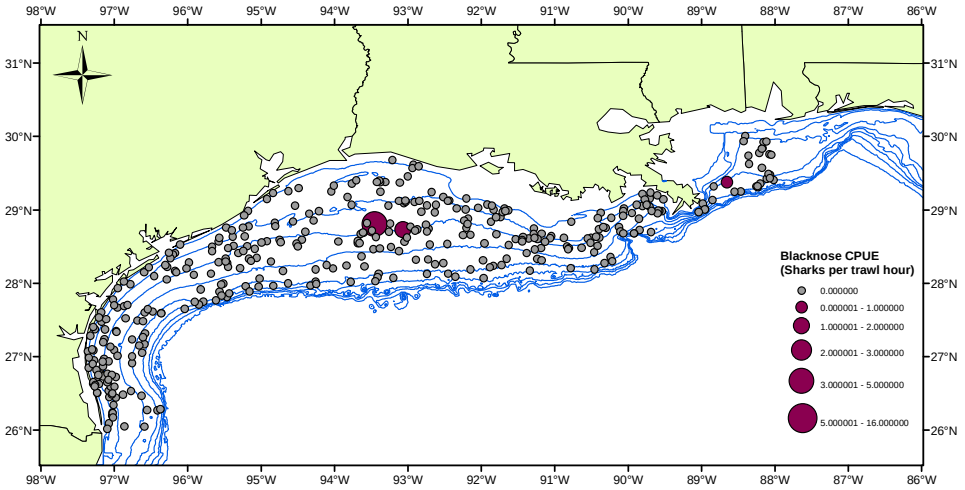



Figure 10. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1996.

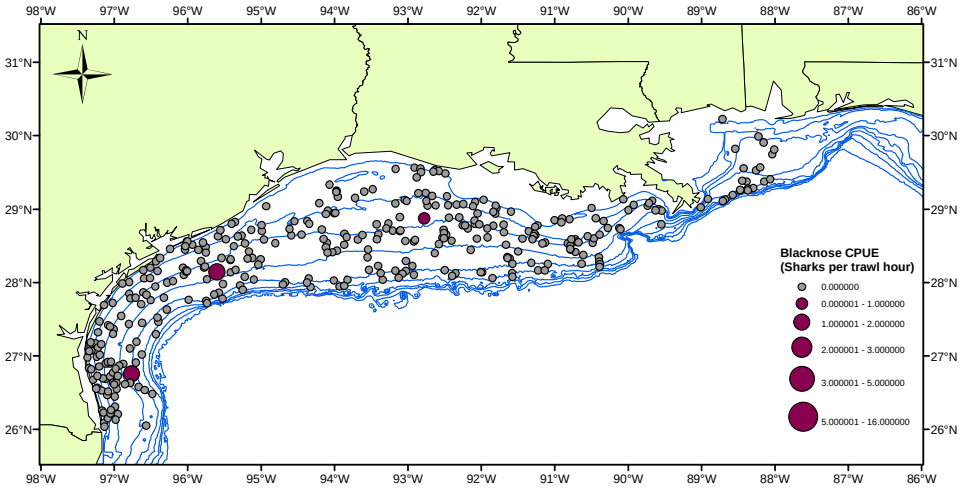



Figure 11. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1997.

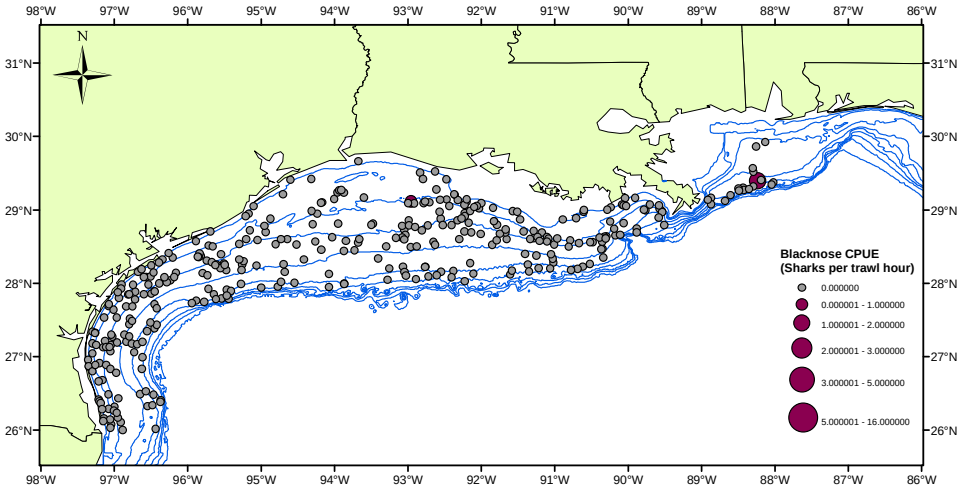



Figure 12. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1998.

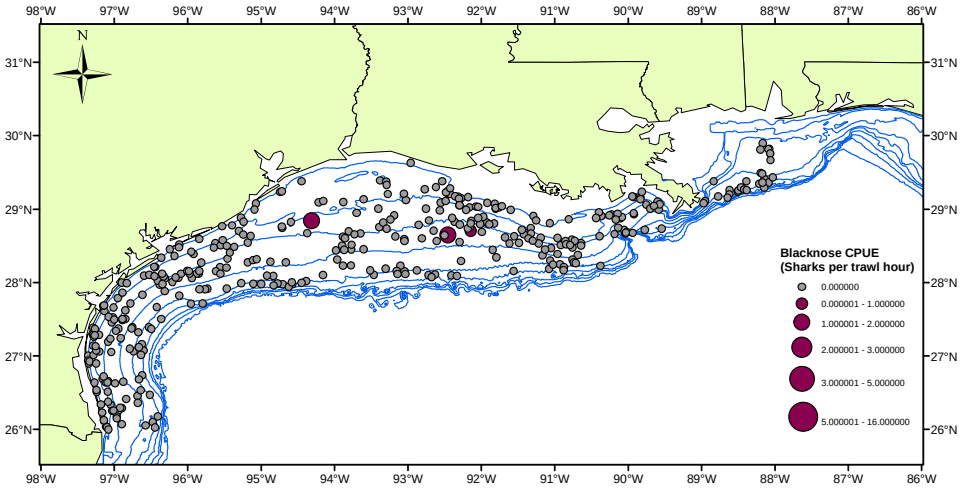



Figure 13. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1999.

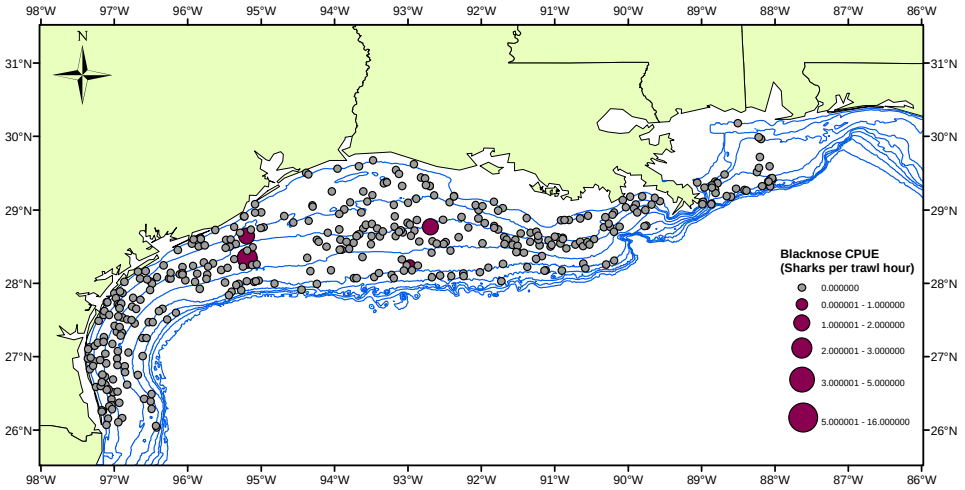



Figure 14. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 2000.

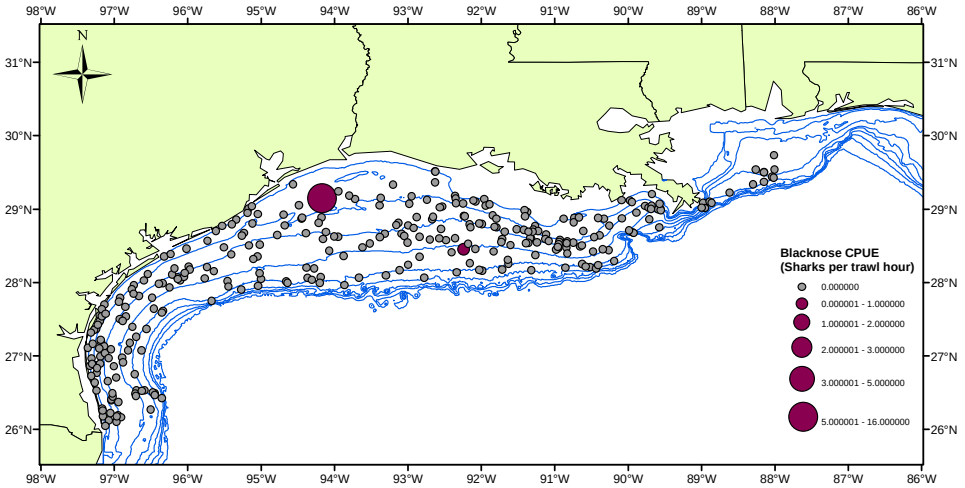



Figure 15. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 2001.

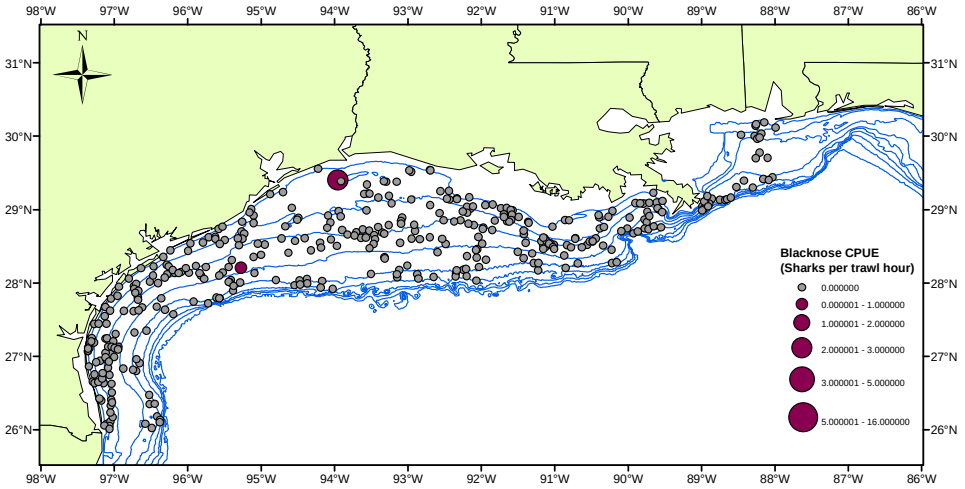



Figure 16. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 2002.

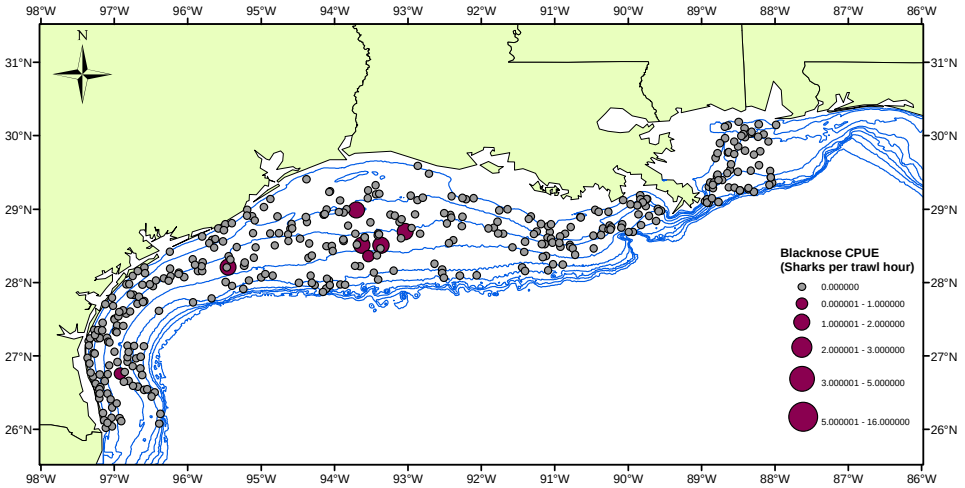



Figure 17. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 2003.

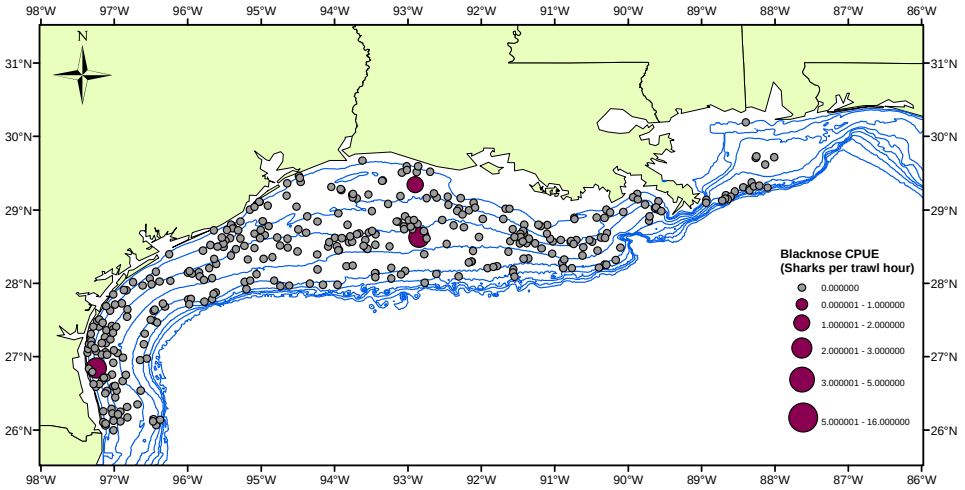



Figure 18. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 2004.

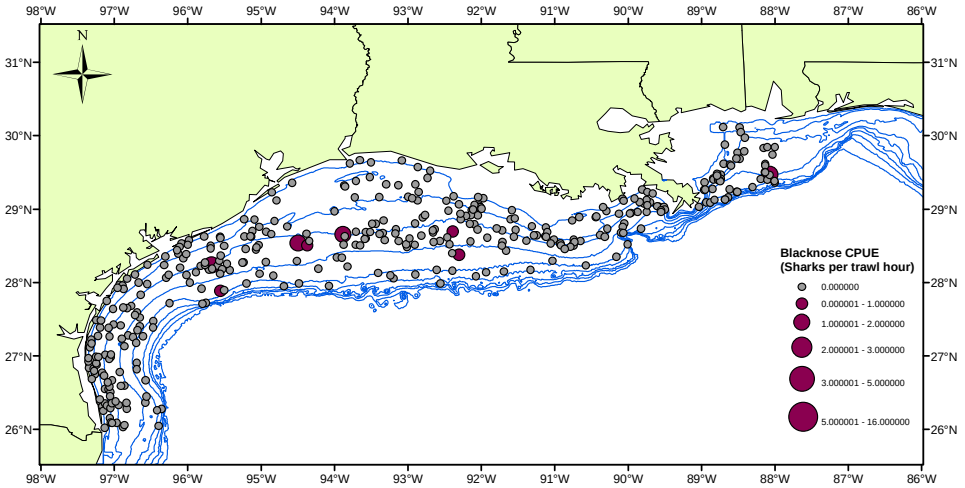



Figure 19. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 2005.

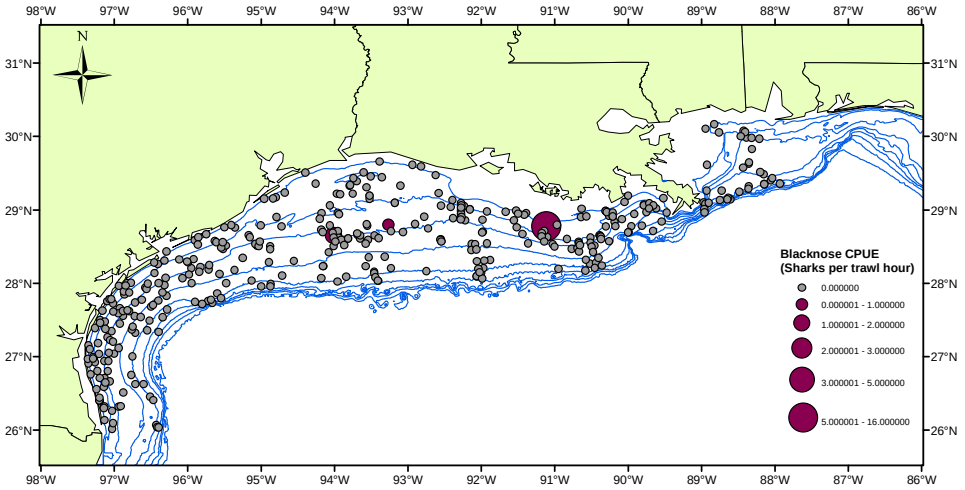



Figure 20. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 2006.

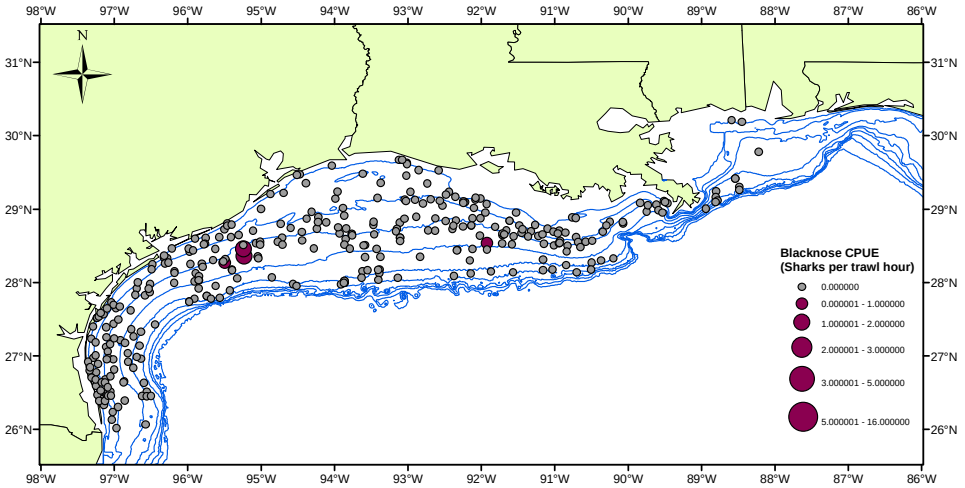



Figure 21. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 2007.

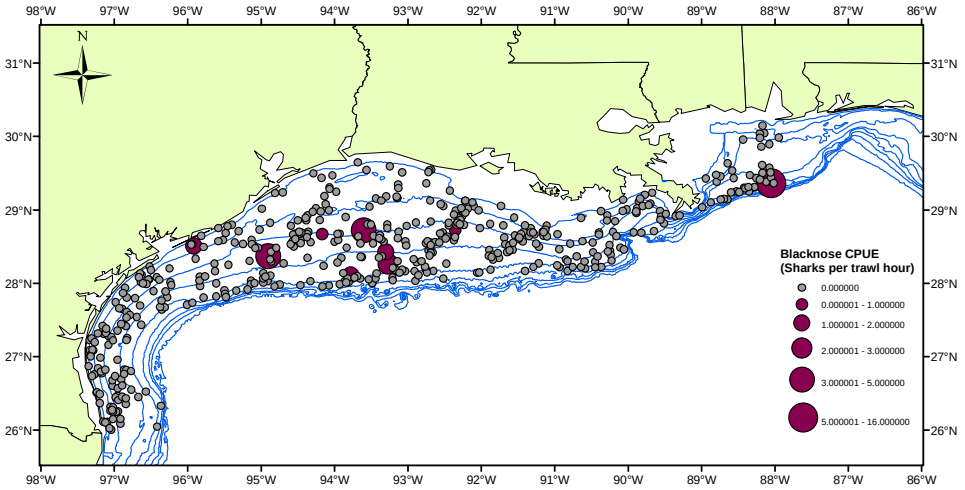



Figure 22. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 2008.

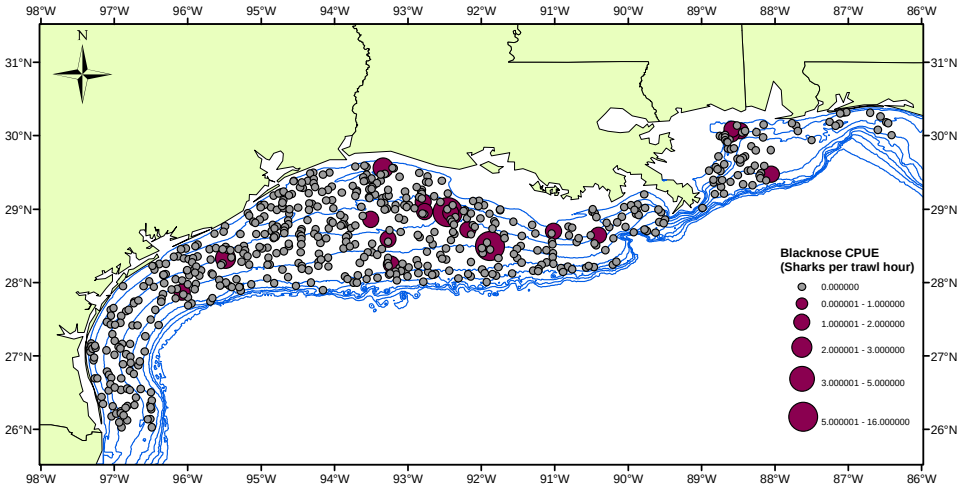



Figure 23. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 2009.

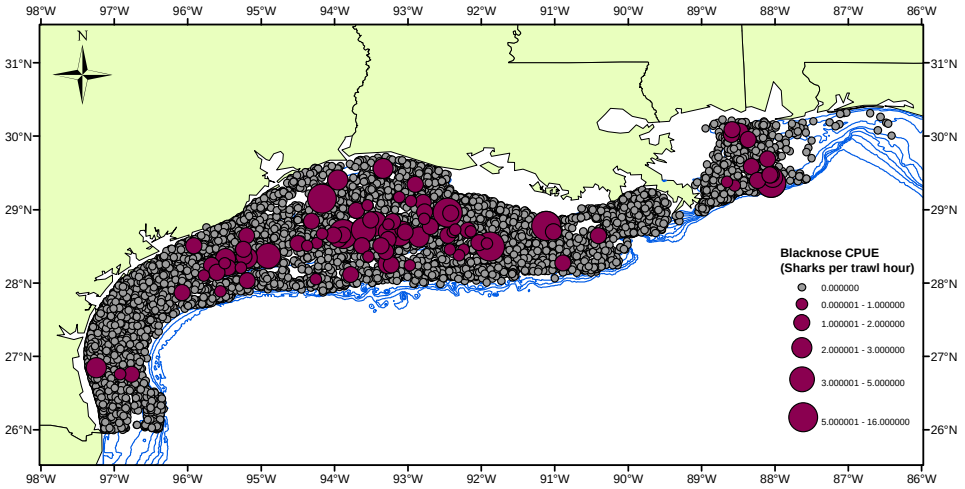



Figure 24. Survey effort and positive CPUE (range: 1 to 16 sharks per trawl hour) for blacknose sharks from 1987 - 2009.

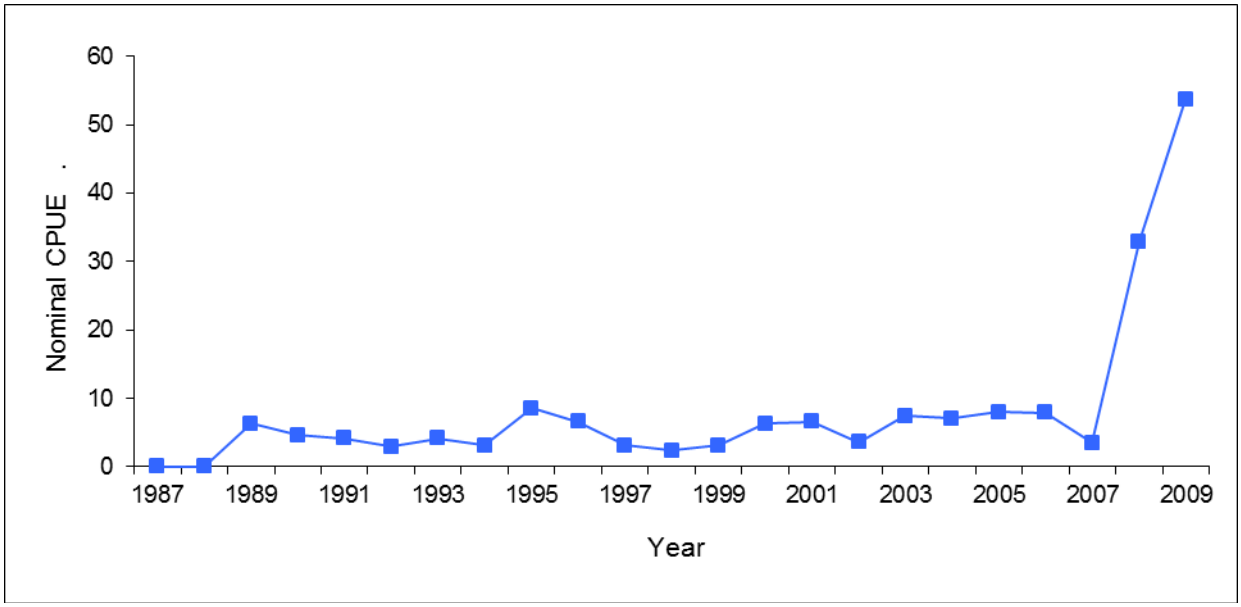



Figure 25. Nominal CPUE of blacknose sharks in groundfish trawls.

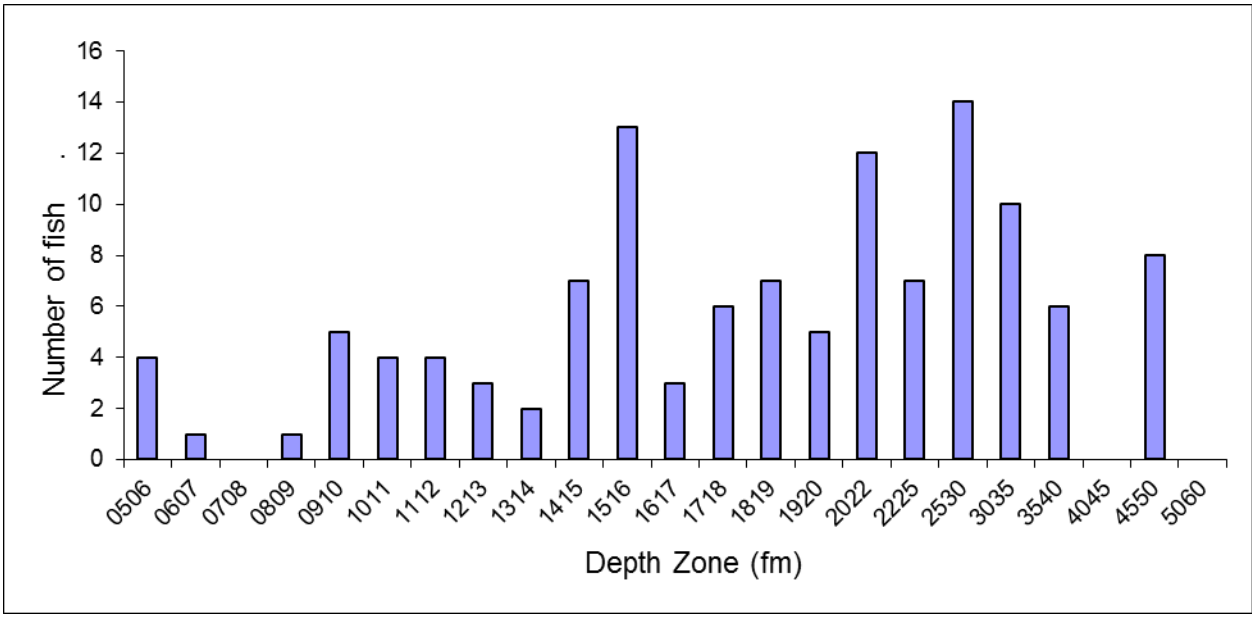



Figure 26. Distribution of blacknose sharks by depth zone collected in the Summer and Fall groundfish survey from 1987-2009.

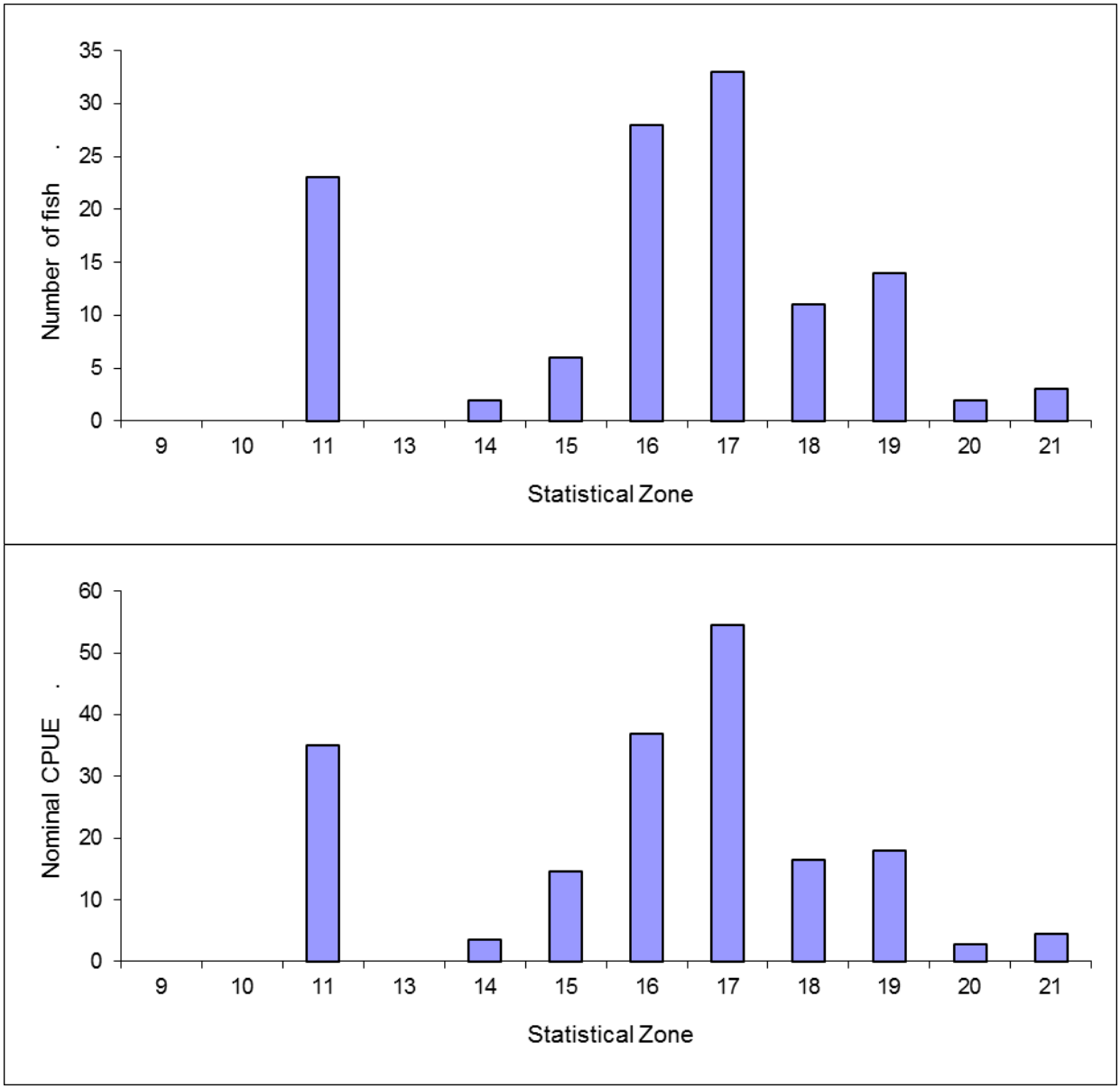
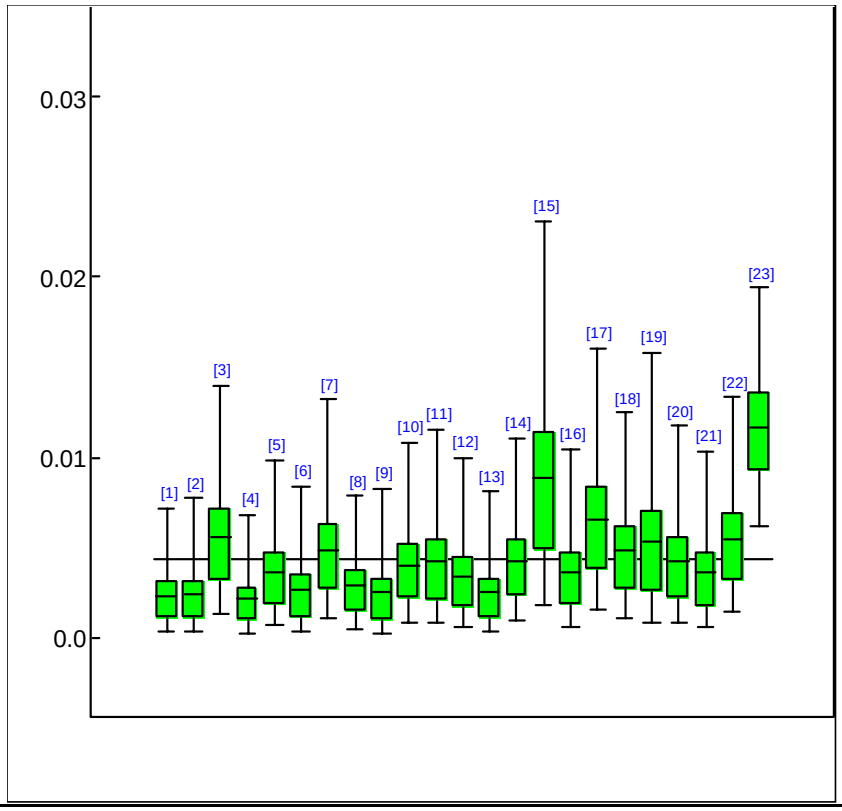


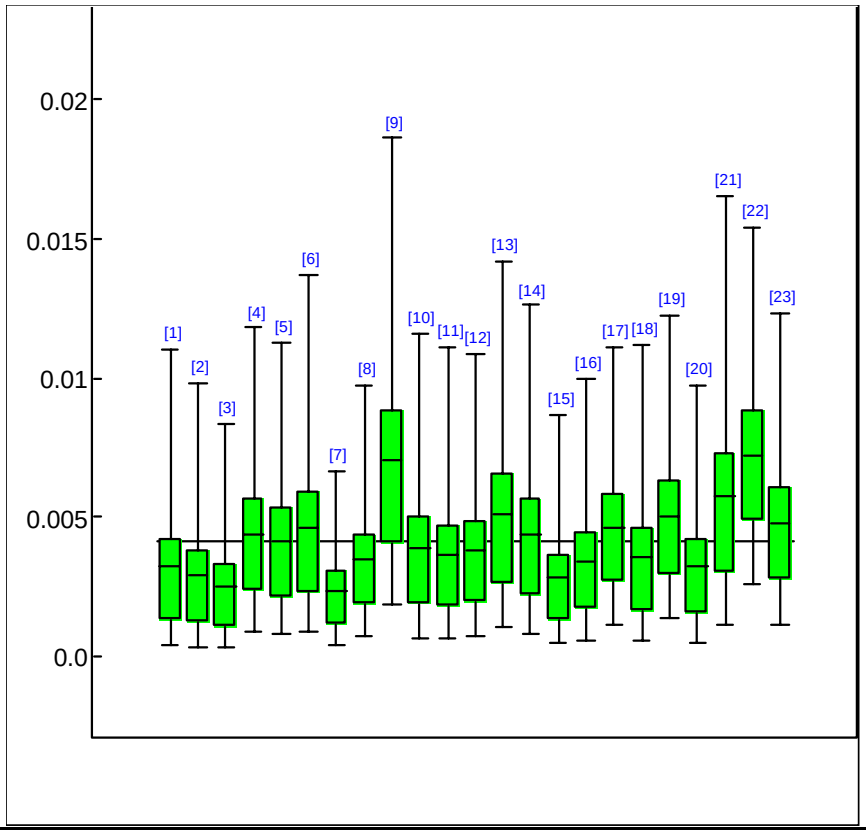

Figure 27. Distribution of blacknose sharks by shrimp statistical zone. Top figure shows the number of fish caught and the bottom shows the nominal CPUE.




**SUMMER**

| Year | Mean | STD | 2.50% | Median | 97.50% | CV |
|---|---|---|---|---|---|---|
| 1987 | 0.002331 | 0.001828 | 3.07E-04 | 0.001823 | 0.007145 | 0.784212784 |
| 1988 | 0.002418 | 0.002021 | 2.82E-04 | 0.001871 | 0.007727 | 0.835814723 |
| 1989 | 0.005522 | 0.003379 | 0.001291 | 0.004746 | 0.01401 | 0.611915972 |
| 1990 | 0.002122 | 0.001735 | 2.50E-04 | 0.001637 | 0.006778 | 0.817624882 |
| 1991 | 0.00359 | 0.002516 | 6.57E-04 | 0.002965 | 0.009802 | 0.700835655 |
| 1992 | 0.002635 | 0.002216 | 2.94E-04 | 0.002017 | 0.008363 | 0.840986717 |
| 1993 | 0.004889 | 0.003224 | 0.001072 | 0.004111 | 0.01319 | 0.659439558 |
| 1994 | 0.002853 | 0.001963 | 4.95E-04 | 0.002377 | 0.007842 | 0.688047669 |
| 1995 | 0.002482 | 0.00227 | 2.58E-04 | 0.001824 | 0.008247 | 0.914585012 |
| 1996 | 0.004021 | 0.002678 | 8.00E-04 | 0.003379 | 0.01083 | 0.666003482 |
| 1997 | 0.004177 | 0.003037 | 7.78E-04 | 0.003428 | 0.01153 | 0.727076849 |
| 1998 | 0.003396 | 0.002506 | 5.43E-04 | 0.002744 | 0.009984 | 0.737926973 |
| 1999 | 0.002502 | 0.00212 | 3.10E-04 | 0.001894 | 0.008091 | 0.847322142 |
| 2000 | 0.004224 | 0.002713 | 8.95E-04 | 0.003626 | 0.01106 | 0.642282197 |
| 2001 | 0.008831 | 0.005704 | 0.001758 | 0.007621 | 0.02307 | 0.645906466 |
| 2002 | 0.003607 | 0.002617 | 5.67E-04 | 0.002949 | 0.01041 | 0.725533685 |
| 2003 | 0.006501 | 0.003804 | 0.001563 | 0.005732 | 0.01606 | 0.585140748 |
| 2004 | 0.004821 | 0.003036 | 0.001124 | 0.004112 | 0.01245 | 0.629744866 |
| 2005 | 0.005295 | 0.003938 | 8.71E-04 | 0.004225 | 0.01581 | 0.743720491 |
| 2006 | 0.004284 | 0.002934 | 7.95E-04 | 0.003569 | 0.01173 | 0.68487395 |
| 2007 | 0.003567 | 0.002628 | 5.71E-04 | 0.002897 | 0.01031 | 0.736753574 |
| 2008 | 0.005391 | 0.003218 | 0.001437 | 0.004655 | 0.01331 | 0.596920794 |
| 2009 | 0.01164 | 0.003411 | 0.006176 | 0.01123 | 0.01939 | 0.293041237 |

Figure 28. Indices of annual abundance for blacknose sharks for Summer SEAMAP Groundfish Surveys (years are 1=1987, 23=2009).




**FALL**

| Year | Mean | STD | 2.50% | Median | 97.50% | CV |
|---|---|---|---|---|---|---|
| 1987 | 0.003216 | 0.002957 | 3.46E-04 | 0.002398 | 0.01102 | 0.919465174 |
| 1988 | 0.002896 | 0.002569 | 3.26E-04 | 0.002175 | 0.009785 | 0.887085635 |
| 1989 | 0.002526 | 0.00224 | 2.78E-04 | 0.001885 | 0.008363 | 0.886777514 |
| 1990 | 0.004368 | 0.00293 | 8.66E-04 | 0.003687 | 0.0118 | 0.670787546 |
| 1991 | 0.004096 | 0.002838 | 8.07E-04 | 0.003366 | 0.01128 | 0.692871094 |
| 1992 | 0.004641 | 0.003546 | 8.40E-04 | 0.003738 | 0.01372 | 0.76405947 |
| 1993 | 0.002307 | 0.00172 | 3.65E-04 | 0.001855 | 0.006675 | 0.745557 |
| 1994 | 0.003436 | 0.002386 | 6.75E-04 | 0.002829 | 0.009713 | 0.694412107 |
| 1995 | 0.007061 | 0.004381 | 0.001856 | 0.006015 | 0.01862 | 0.620450361 |
| 1996 | 0.003897 | 0.003005 | 6.68E-04 | 0.00313 | 0.01158 | 0.771105979 |
| 1997 | 0.003668 | 0.002897 | 6.16E-04 | 0.002931 | 0.0111 | 0.789803708 |
| 1998 | 0.003771 | 0.002738 | 7.32E-04 | 0.003066 | 0.01086 | 0.726067356 |
| 1999 | 0.005087 | 0.003499 | 9.96E-04 | 0.004267 | 0.01417 | 0.687831728 |
| 2000 | 0.004348 | 0.003183 | 7.80E-04 | 0.003556 | 0.01261 | 0.732060718 |
| 2001 | 0.002811 | 0.002262 | 4.29E-04 | 0.002202 | 0.008677 | 0.804695838 |
| 2002 | 0.003412 | 0.002545 | 5.80E-04 | 0.002769 | 0.009964 | 0.745896835 |
| 2003 | 0.00457 | 0.002632 | 0.001136 | 0.004038 | 0.01108 | 0.575929978 |
| 2004 | 0.003577 | 0.002882 | 5.11E-04 | 0.00279 | 0.0112 | 0.805703103 |
| 2005 | 0.004996 | 0.002861 | 0.001343 | 0.004397 | 0.01225 | 0.572658127 |
| 2006 | 0.003208 | 0.002476 | 5.01E-04 | 0.002555 | 0.009708 | 0.771820449 |
| 2007 | 0.005754 | 0.00426 | 0.001138 | 0.00472 | 0.01653 | 0.740354536 |
| 2008 | 0.007182 | 0.003342 | 0.002615 | 0.006562 | 0.01544 | 0.465329992 |
| 2009 | 0.004807 | 0.002997 | 0.001133 | 0.004147 | 0.01231 | 0.623465779 |

Figure 29. Indices of annual abundance for blacknose sharks for Fall SEAMAP Groundfish Surveys (years are 1=1987, 23=2009).

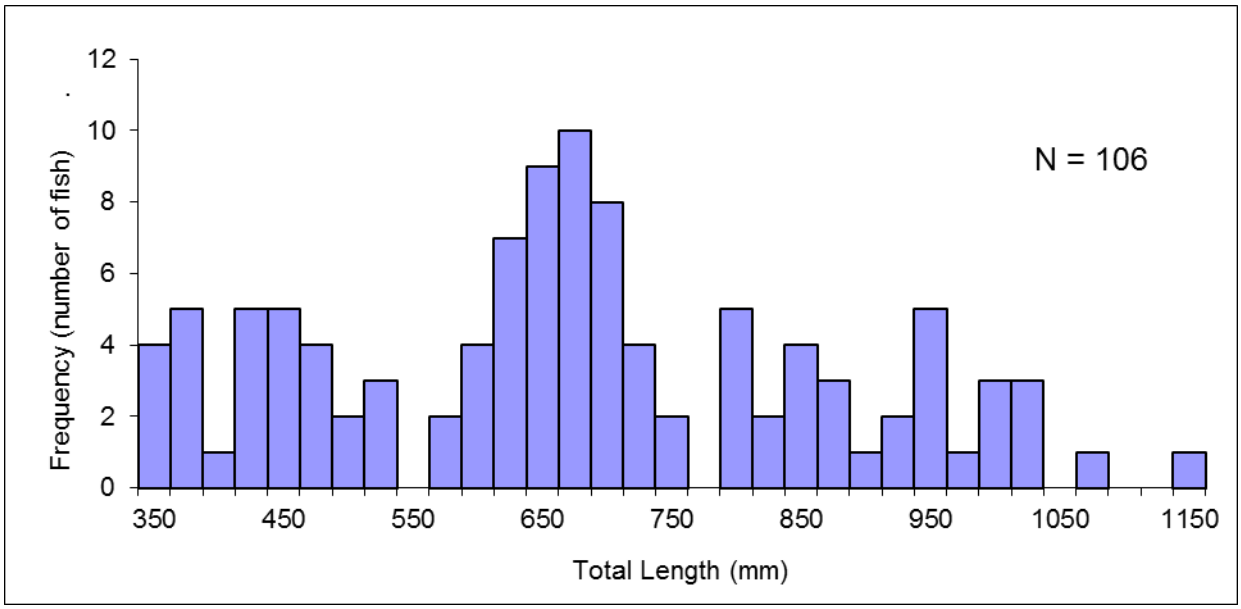



Figure 30. Length frequency histogram for blacknose sharks collected in NOAA Fisheries Summer and Fall SEAMAP Groundfish Surveys from 1987 – 2009