

# 2016 Life Jacket Wear Rate Observation Study

featuring

National Wear Rate Data from 1999 to 2016



*Produced under a grant from the Sport Fish Restoration and Boating Trust Fund, administered by the U.S. Coast Guard.*

# 2016 Life Jacket Wear Rate Observation Study

featuring

National Wear Rate Data from 1999 to 2016

Thomas W. Mangione

Mihaly Imre

Wendy Chow

Heather E. Lisinski

Elizabeth Heitz

Rebecca Millock

JSI Research & Training Institute, Inc.

Boston, Massachusetts

March 2017



JSI Research & Training Institute, Inc.

*Promoting and Improving Health*

# Table of Contents

<b>I. INTRODUCTION.....</b>	<b>4</b>
<b>II. NATIONAL CORE DATA RESULTS .....</b>	<b>5</b>
<b>Adult Life Jacket Wear Rates on Open Motorboats 2006 to 2016 .....</b>	<b>5</b>
Figure A – Adult Wear Rates on Open Motorboats 2006-2016 .....	6
<b>National Life Jacket Wear Rates for ALL Boaters 1999 to 2016.....</b>	<b>7</b>
Figure B – Life Jacket Wear Rates for ALL Boaters.....	8
<b>National Life Jacket Wear Rates for ADULTS (18 years or older) 1999 to 2016 .....</b>	<b>9</b>
Figure C – Life Jacket Wear Among Adult Boaters.....	9
<b>National Life Jacket Wear Rates for YOUTH (17 years or younger) 1999 to 2016 .....</b>	<b>10</b>
Figure D – Life Jacket Wear Among Youth Boaters.....	10
<b>Life Jacket Wear Rates by Age Categories 1999 to 2016.....</b>	<b>11</b>
Table 2.1 – Life Jacket Wear Rates by Age Excluding Boaters on PWCs .....	12
<b>Powerboats for Adults (18 years or older) .....</b>	<b>13</b>
Figure E – Adult Wear Rates for ALL Powerboats Except PWCs.....	13
Table 2.2 - Life Jacket Wear Rates by Powerboats for Adults .....	14
<b>Powerboats for Youth (17 years or younger) .....</b>	<b>15</b>
Figure F – Youth Wear Rates for ALL Powerboats Except PWCs .....	15
Table 2.3 – Life Jacket Wear Rates by Powerboats for Youth.....	16
<b>All Paddlecraft for Adults (18 years or older) .....</b>	<b>17</b>
Figure G – Adult Wear Rates for ALL Paddlecraft (excluding Paddleboards).....	17
Table 2.4 – Life Jacket Wear Rates by Paddlecraft for Adults .....	18
<b>All Paddlecraft for Youth (17 years or younger).....</b>	<b>19</b>
Figure H – Youth Wear Rates for ALL Paddlecraft.....	19
Table 2.5 – Life Jacket Wear Rates by Paddlecraft for Youth.....	20
<b>Sail Craft for Adults (18 years or older) .....</b>	<b>21</b>
Figure I – Adult Wear Rates for ALL Sail Craft.....	21
Table 2.6 – Life Jacket Wear Rates by Sail Craft for Adults .....	22
<b>Sail Craft for Youth (17 years or younger) .....</b>	<b>23</b>
Figure J – Youth Wear Rates for ALL Sail Craft.....	23
Table 2.7 – Life Jacket Wear Rates by Sail Craft for Youth .....	24
<b>Boat Type and Size for Adults (18 years or older).....</b>	<b>25</b>
Table 2.8 – Life Jacket Wear Rates by Boat Type and Size for Adults .....	26

<b>III. ENVIRONMENTAL AND SITUATIONAL INFLUENCES ON LIFE JACKET WEAR RATES .....</b>	<b>27</b>
Table 3.1 – Wear Rates by Wave Height 1999-2016 – Adult Only .....	27
Table 3.2 – Wear Rates Observed by Visibility 1999-2016 – Adult Only .....	28
Table 3.3 – Wear Rates Observed by Weather Conditions 1999-2016 – Adult Only .....	29
Table 3.4 – Wear Rates Observed by Water Temperature 1999-2016 – Adult Only .....	30
Table 3.5 – Wear Rates Observed by Air Temperature 1999-2016 – Adult Only .....	31
Table 3.6 – Wear Rates Observed by Wind Speed 1999-2016 – Adult Only.....	32
Table 3.7 – Wear Rates Observed on Skiffs and Runabouts by Activity 2007-2016 – Adult Only.....	33
<b>IV. CONCLUSIONS FOR LIFE JACKET WEAR RATES - NATIONAL TREND DATA 1999 TO 2016.....</b>	<b>34</b>
<b>V. APPENDIX: METHODS &amp; DESCRIPTIVE INFORMATION .....</b>	<b>36</b>
JSI Data Collection Form: 2016 Boat Form .....	38
JSI Data Collection Form: 2016 Site Form.....	39
<b>VI. INFORMATION ON BOATS &amp; PEOPLE OBSERVED.....</b>	<b>40</b>
Figure K – Number of Boats and People.....	41
Figure L – Types of Boats .....	42
Figure M – Length of Boats .....	43
Figure N – Length of Boats 2004-2016 Data Only .....	44
Figure O – Operation of Boats .....	45
Figure P1 – Activity of Boaters—ALL YEARS.....	46
Figure P2 – Activity of Boaters 2007-2016 Data.....	47
Figure P3 – Activity of Boaters 2002-2016 .....	48
Figure Q – Gender of Boaters .....	49
Figure R1 – Age of Boaters .....	50
Figure R2 – Age of Youth Boaters.....	51
Figure S – Water Temperature in which ALL Boaters were Observed.....	52
Figure T – Water Current in which ALL Boaters were Observed .....	53
Figure U – Wave Height in which ALL Boaters were Observed .....	54
Figure V – Visibility in which ALL Boaters were Observed .....	55
Figure W – Weather in which ALL Boaters were Observed.....	56
Figure X – Air Temperature in which ALL Boaters were Observed.....	56
Figure Y – Wind Speed in which ALL Boaters were Observed .....	58

## I. INTRODUCTION

This report provides data and analysis on the 2016 National Life Jacket Wear Rate Observation Study with comparison information from the previous seventeen years' of studies (1999-2015). Tracking changes in life jacket wear rates over time provides important statistics for those individuals and groups responsible for educating the public about boating safety, improving boating safety programs, and for legislative efforts targeting safety improvements for recreational boating. The 2015 Recreational Boating Statistics report, published by the United States Coast Guard (USCG), shows that among the 428 drowning deaths in 2015 where life jacket use or nonuse was known, 82% (352) of the individuals were reported as not wearing a life jacket. These statistics make it essential to not only track the national life jacket wear rate among recreational boaters, but also to understand the circumstances and patterns in which life jackets are worn.

Calendar year 2016 marked the eighteenth year of life jacket wear rate data collection efforts conducted by JSI Research & Training Institute. The cumulative years of data allow for a higher level of analysis (i.e., controlling for the impact of influencing factors like age, weather, and boat type) in order to unmask potential trends and indicators of increased or decreased life jacket wear among different groups of recreational boaters. This year we again included a section reporting the observed impact of site and boat characteristics on wear rates. These tables provide insights into the factors which influence wear rates. The tables show these relationships separately for powerboats, paddlecraft, and sailboats.

Most information in this report is presented separately for adults (18+ years old) and youth (0 to 17 years old) since wear rates are substantially different for these two groups. Over the eighteen years of the presented data, the general distribution of ages, gender, boat types, boat characteristics, and site characteristics have remained relatively stable. The appendix contains a detailed description of methods used and proportions of various boaters; boat and site characteristics are shown for the 1999-2016 period of data collection.

## II. NATIONAL CORE DATA RESULTS

### Adult Life Jacket Wear Rates on Open Motorboats 2006 to 2016

The National Boating Safety Advisory Council (NBSAC) recommended the creation of a strategic plan for the National Recreational Boating Safety Program in 2005. The goals, objectives, and strategies in this Plan can help all partners in boating safety work together to reduce the incidents of preventable deaths, injuries, and property damage. One of the objectives of the 2012-2016 Strategic Plan is to increase the observed life jacket wear rate of adults in open motorboats. For the purposes of this measurement, “open motorboats” are a combination of the Skiff/Utility (hereafter as “skiffs”) and Runabout/Speedboat (hereafter as “speedboats”) categories that are individually presented later in this report. This objective was put in place beginning in 2006.

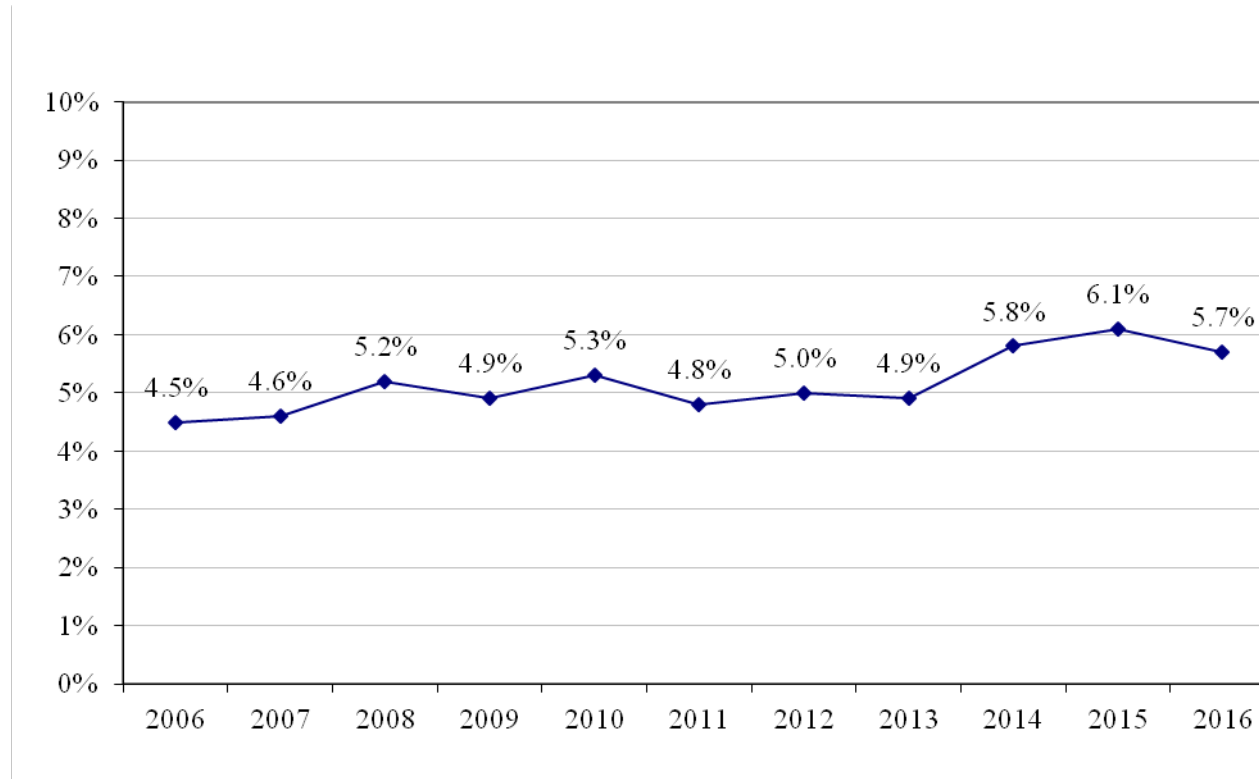
To ensure that comparisons to 2006 are valid, the proportion of skiffs to speedboats in each state for each subsequent year was set to mirror the proportions found in 2006 since the wear rates for skiffs are generally greater than those for speedboats. For example, in 2006 the national proportion across all states of the number of skiffs to the number of speedboats was 22% versus 78%, but in 2011 the proportions were 31% to 69%. If proportions of these boat categories were not adjusted, the 2011 combined wear rate would appear more positive simply because JSI observed more skiffs relative to speedboats this year than in 2006. Similarly, the proportions are likely to fluctuate each year in each state.

Weighting each state’s data to correspond to the 2006 state ratios, the adult wear rate for open motorboats in 2016 is 5.7% and represents a generally improving trend since 2011. (See Figure A for a chart showing these trends and also Table 2.2 on page 11.) However, this rate is a slight decrease from 6.1% in 2015 which was the highest rate observed by the study to date.



### Figure A – Adult Wear Rates on Open Motorboats\* 2006-2016

(Weighted to 2006 Skiff-Speedboat Proportions for Each State)



JSI Research & Training Institute, Inc.

2016 National Observational Life Jacket Wear Rate Study

\* The Open Motorboat category is created by grouping "Skiffs" and "Speedboat/Runabouts" together. Two factors are controlled for in this chart: Age (proportions of 18 to 64 and 65+ adults), and the proportion of Skiffs to Speedboat/Runabouts, which has been set each year within each state to reflect the proportions observed in 2006, the year in which the Strategic Plan goals were first measured. In addition, each state's contribution to the national average is weighted to reflect the 2006 proportions.

## National Life Jacket Wear Rates for ALL Boaters 1999 to 2016

Figure B shows trends for national life jacket wear rates, including all groups of recreational boaters together (youth and adults) for two groups of boats - “all boats” and “all boats except PWCs”. The two sets of data present a clear indication of the impact of PWCs (Personal Watercraft) on the overall average wear rates. In subsequent tables in this report we remove PWCs from the findings since this will provide a more valid representation of the trends in voluntary wear rates, because life jacket wear is mandated for operators and passengers of PWCs in almost all the states where observations occur (the exception is Alaska for adults).

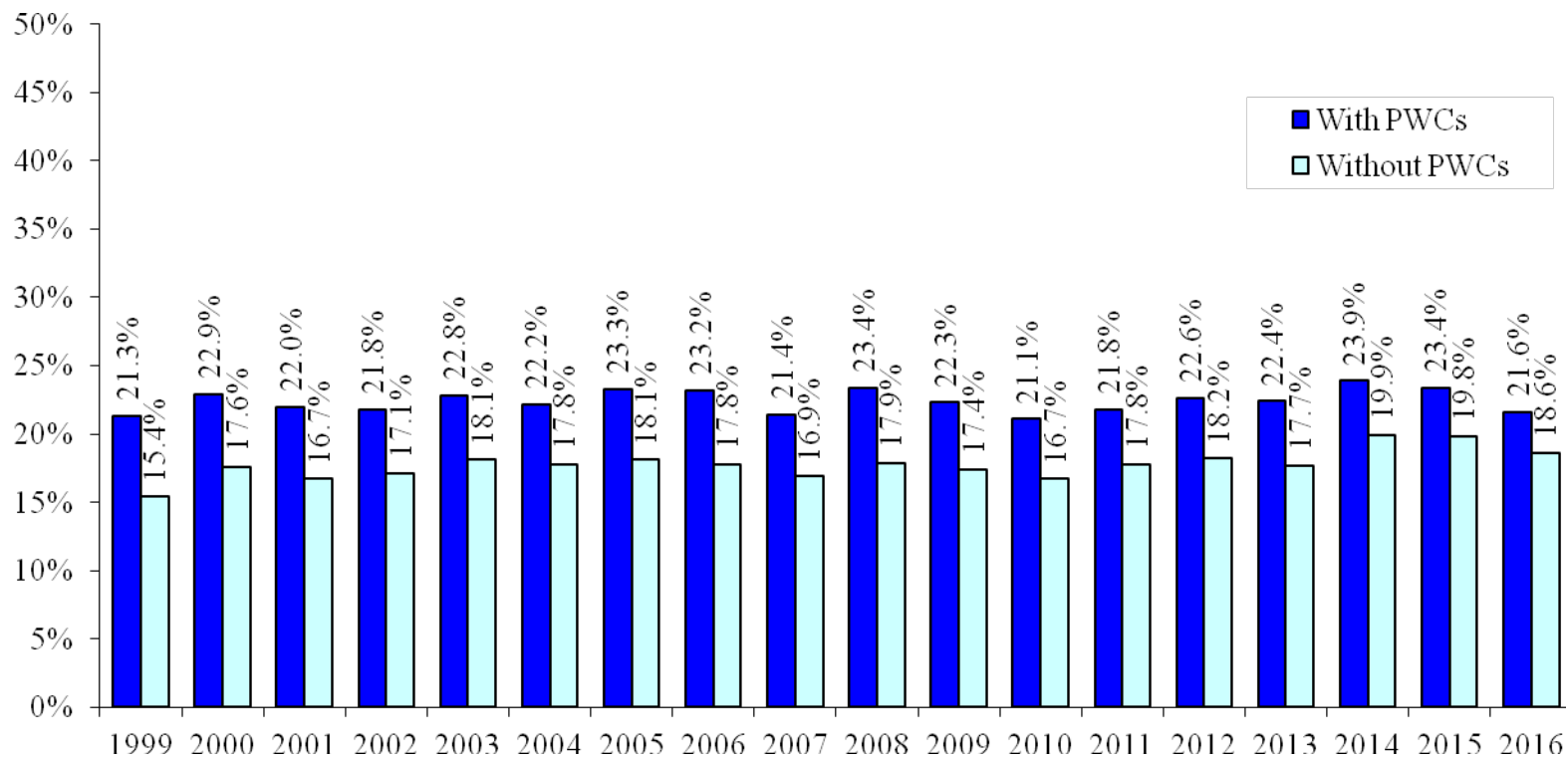
The average life jacket wear rate for all boats and boaters combined for 2016 is 21.6%. After a trend of increasing wear rates since 2010, this is a drop from the highest rates observed in 2014 and 2015.

The 2016 average wear rate excluding PWCs is 18.6%. This is down slightly from 2014 and 2015 rates.





**Figure B – Life Jacket Wear Rates for ALL Boaters**

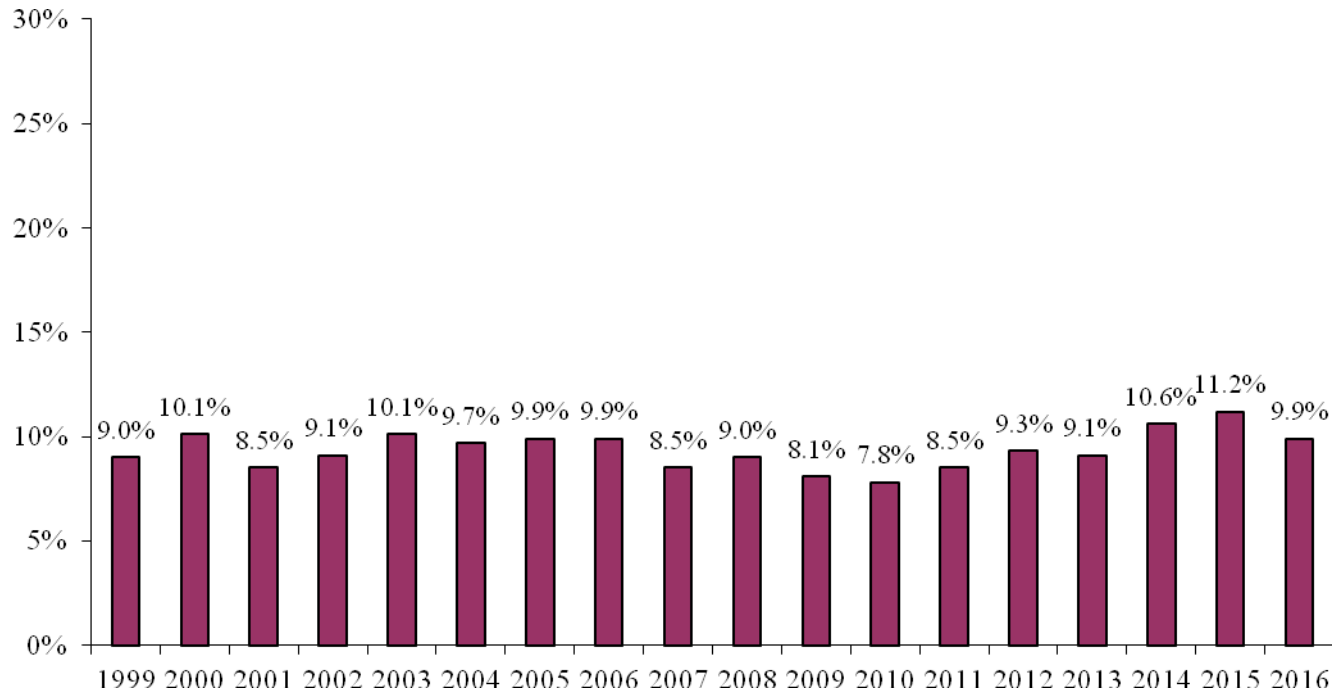


JSI Research & Training Institute, Inc.  
2016 National Observational Life Jacket Wear Rate Study  
\*Factors controlled for: Age & Boat Type.

## National Life Jacket Wear Rates for ADULTS (18 years or older) 1999 to 2016

Figure C and Table 2.1 show the national wear rate trend for all adults on all boats excluding PWCs. The national average wear rate for all adults in 2016 is 9.9% which is somewhat lower than the highest rates in 2014 and 2015.

**Figure C – Life Jacket Wear Among Adult Boaters\***  
(All boats except PWCs)

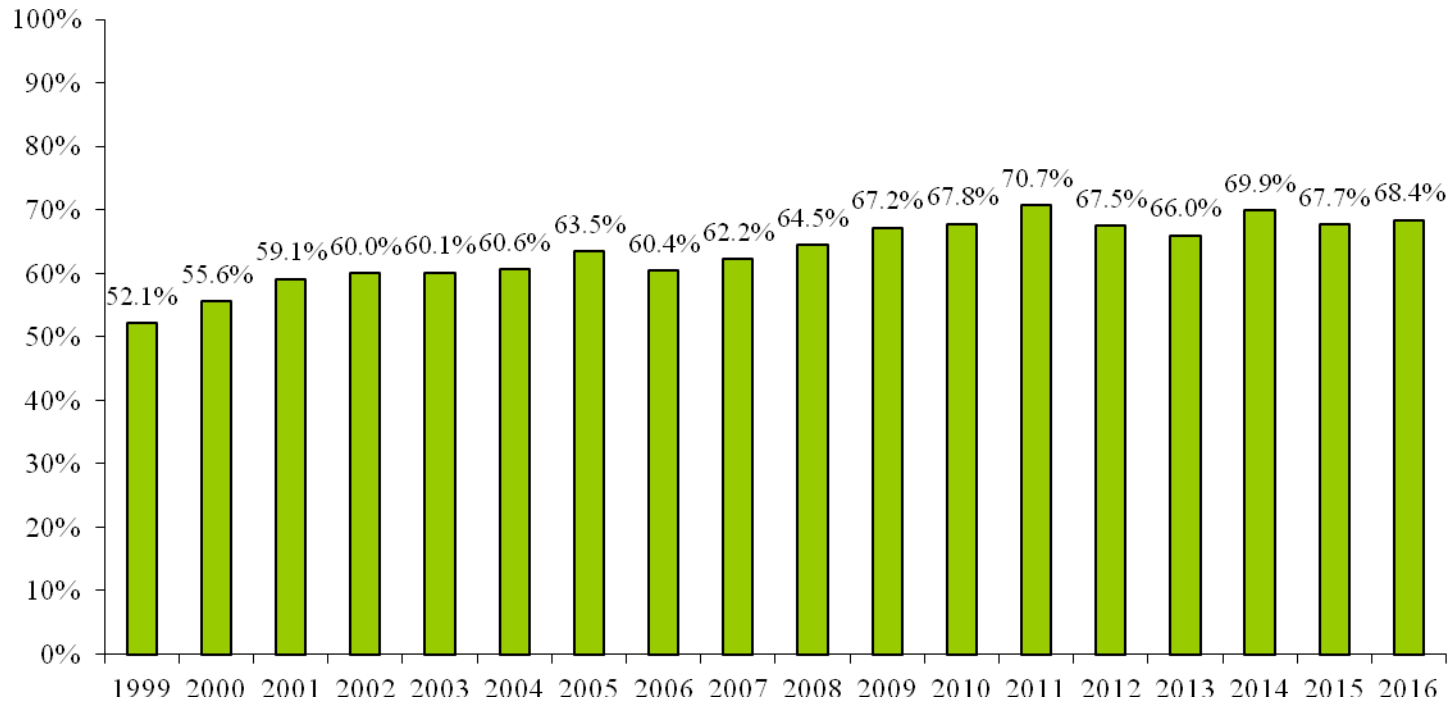


JSI Research & Training Institute, Inc.  
2016 National Observational Life Jacket Wear Rate Study  
\*Factors controlled for: Age & Boat Type.

## National Life Jacket Wear Rates for YOUTH (17 years or younger) 1999 to 2016

Figure D and Table 2.1 show the national wear rate trend for all youth (17 years or younger) on all boats excluding PWCs. These rates are relatively high across the eighteen years of data shown with a general upward trend that has leveled out over the past several years. The rate for 2016 is 68.4%.

**Figure D – Life Jacket Wear Among Youth Boaters\***  
(All boats except PWCs)



JSI Research & Training Institute, Inc.  
2016 National Observational Life Jacket Wear Rate Study  
\*Factors controlled for: Age & Boat Type.

## Life Jacket Wear Rates by Age Categories 1999 to 2016

Table 2.1 presents wear rates by the different age categories captured in the study.

The youth (0-17) wear rate for 2016 is 68.4%, up slightly from last year. For the under 6 year olds rates are 92.9% in 2016; for those between 6 and 12 years of age rates are 84.1%; and for teens (ages 13 to 17) rates are 41.5%. The rate for 6 to 12 year olds is down slightly from 2015 levels. The rates for under 6 years old and teens are higher than 2015.

For adults ages 18 to 64, the 2016 wear rate is 9.9%, a decrease from 2015 levels.

For adults 65 years of age and older, the 2016 data show a wear rate of 11.0%, which is also a decrease from 2015 rates.



**Table 2.1 – Life Jacket Wear Rates by Age Excluding Boaters on PWCs\***

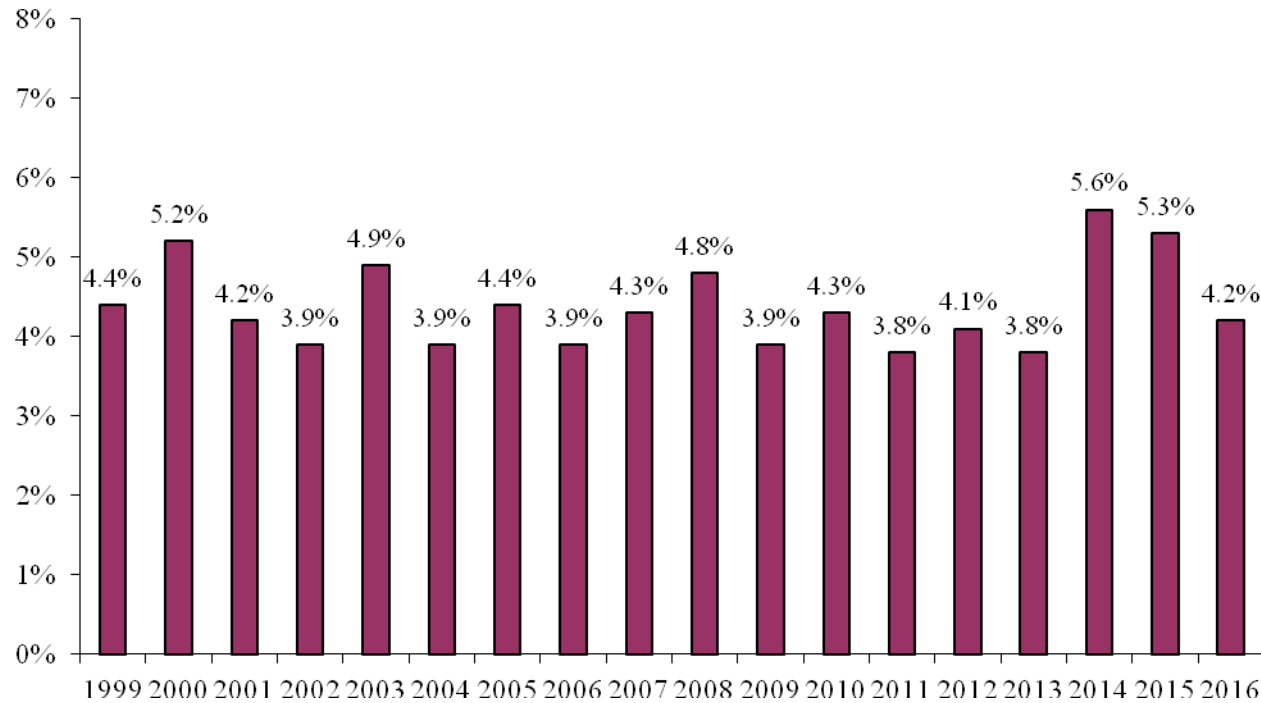
Age	Observation Year																	
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)
<b>0-5 yrs</b>	80.6%	89.1%	91.7%	90.1%	90.3%	94.9%	93.1%	94.4%	92.2%	93.5%	93.6%	94.8%	96.6%	94.7%	93.5%	94.5%	92.1%	92.9%
	(500)	(716)	(703)	(676)	(658)	(743)	(714)	(921)	(930)	(938)	(854)	(811)	(874)	(662)	(789)	(804)	(694)	(573)
<b>6-12 yrs</b>	69.1%	72.1%	76.6%	79.2%	79.7%	81.6%	80.6%	79.1%	84.1%	87.3%	86.5%	89.1%	90.7%	84.9%	85.4%	87.3%	87.2%	84.1%
	(2104)	(2696)	(3122)	(2752)	(2627)	(27411)	(2487)	(2403)	(2819)	(2579)	(2812)	(2809)	(2381)	(2844)	(2494)	(2757)	(2227)	(2184)
<b>13-17 yrs</b>	24.1%	30.5%	31.2%	32.4%	32.0%	29.8%	32.8%	33.5%	31.5%	33.2%	38.9%	35.1%	41.4%	37.6%	34.9%	41.6%	37.2%	41.5%
	(2244)	(2725)	(2893)	(2575)	(2767)	(2572)	(2230)	(2403)	(2652)	(2507)	(2420)	(2127)	(1817)	(2163)	(1933)	(1837)	(1694)	(1675)
<b>0-17 yrs (all youth)</b>	52.1%	55.6%	59.1%	60.0%	60.1%	60.6%	63.5%	60.4%	62.2%	64.5%	67.2%	67.7%	70.7%	67.5%	66.0%	69.9%	67.7%	68.4%
	(4624)	(6094)	(6695)	(5924)	(5970)	(5955)	(5414)	(5713)	(6401)	(6024)	(6086)	(5747)	(5072)	(5669)	(5216)	(5398)	(4615)	(4432)
<b>18-64 yrs</b>	8.8%	10.1%	8.5%	9.2%	10.1%	9.7%	9.9%	10.0%	8.4%	9.1%	8.1%	7.7%	8.5%	9.2%	9.1%	10.4%	11.1%	9.9%
	(24321)	(27100)	(32528)	(31742)	(28551)	(33319)	(30176)	(29591)	(32108)	(30743)	(34632)	(36420)	(33267)	(32298)	(30843)	(33058)	(31012)	(30906)
<b>65+ yrs</b>	12.9%	9.9%	6.9%	6.8%	9.4%	8.3%	11.0%	8.3%	11.7%	6.1%	7.0%	10.7%	7.2%	11.8%	6.9%	13.3%	12.3%	11.0%
	(1147)	(1040)	(1276)	(922)	(1106)	(1331)	(823)	(803)	(881)	(1190)	(1129)	(763)	(951)	(1122)	(1091)	(1634)	(1232)	(1339)
<b>18+ yrs (all adults)</b>	9.0%	10.1%	8.5%	9.1%	10.1%	9.7%	9.9%	9.9%	8.5%	9.0%	8.1%	7.8%	8.5%	9.3%	9.1%	10.6%	11.2%	9.9%
	(25468)	(28140)	(33804)	(32664)	(29657)	(34650)	(30999)	(30394)	(32989)	(31933)	(35761)	(37003)	(34218)	(33420)	(31934)	(34692)	(32244)	(32245)

JSI Research & Training Institute, Inc.  
 2016 National Observational Life Jacket Wear Rate Study  
 \*Factors controlled for: Age & Boat Type.

## Powerboats for Adults (18 years or older)

Figure E and Table 2.2 present information for all powerboats for adults. The 2016 rate for all powerboats is 4.2%, which is down from the highs of 2014 and 2015. Speedboats, the most popular type of powerboat, showed a wear rate of 3.5%, the same rate observed in 2013 and 2014. Open motorboats, which included a combination of skiffs and speedboats, showed a 2016 wear rate of 5.7%.

**Figure E – Adult Wear Rates for ALL Powerboats Except PWCs\***



JSI Research & Training Institute, Inc.  
2016 National Observational Life Jacket Wear Rate Study  
\*Factors controlled for: Age & Boat Type.

**Table 2.2 - Life Jacket Wear Rates by Powerboats for Adults\***

Boat Type	Observation Year																	
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)
All Powerboats	4.4%	5.2%	4.2%	3.9%	4.9%	3.9%	4.4%	3.9%	4.3%	4.8%	3.9%	4.3%	3.8%	4.1%	3.8%	5.6%	5.3%	4.2%
(no PWC's)	(19894)	(22448)	(27864)	(26304)	(24190)	(28285)	(25741)	(25412)	(27623)	(27315)	(29924)	(30894)	(28954)	(27890)	(26786)	(28766)	(26444)	(26774)
Skiff/Utility	10.0%	10.3%	9.7%	5.9%	10.4%	7.9%	7.2%	7.3%	8.5%	9.2%	6.9%	9.7%	8.2%	7.8%	6.4%	13.1%	10.2%	7.4%
	(1867)	(1903)	(2469)	(3177)	(4214)	(4429)	(5038)	(4091)	(5340)	(6633)	(7257)	(6634)	(6530)	(6936)	(7231)	(6776)	(6592)	(7338)
Runabout/ Speedboat	4.2%	5.3%	4.5%	4.3%	4.6%	3.9%	4.7%	3.7%	3.6%	4.1%	3.5%	3.2%	3.0%	3.3%	3.5%	3.5%	4.1%	3.5%
	(13195)	(14463)	(16985)	(14066)	(13057)	(16633)	(13643)	(14512)	(14414)	(13901)	(14635)	(15093)	(14381)	(13441)	(11686)	(13040)	(11853)	(11736)
Runabout/ Speedboat (Excluding Towed Participants)	3.6%	4.6%	3.9%	3.6%	3.9%	3.2%	3.7%	2.8%	2.9%	3.05	2.5%	2.2%	2.3%	2.3%	2.4%	2.6%	3.5%	2.7%
	(13096)	(14364)	(16872)	(13969)	(12963)	(16477)	(13480)	14376)	(14313)	(13744)	(14481)	(14947)	(14279)	(13294)	(11554)	(12923)	(11766)	(11638)
Open Motorboats**	5.5%	6.4%	5.6%	4.7%	5.9%	4.8%	5.3%	4.5%	4.6%	5.2%	4.9%	5.3%	4.8%	5.0%	4.9%	5.8%	6.1%	5.7%
(Skiff/Utility + Runabout/Speedboat)	(15062)	(16366)	(19454)	(17243)	(17271)	(21052)	(18681)	(18603)	(19754)	(20534)	(21892)	(21727)	(20911)	(20377)	(18917)	(19816)	(18445)	(19074)
Cabin Cruiser	1.8%	1.6%	1.2%	1.9%	1.7%	1.0%	1.1%	1.7%	2.0%	1.4%	1.6%	1.5%	1.6%	1.6%	1.0%	2.2%	2.7%	1.4%
	(3396)	(4391)	(6222)	(7111)	(5119)	(5242)	(5054)	(4280)	(5353)	(4430)	(5342)	(5900)	(5085)	(4611)	(4719)	(4669)	(4782)	(4418)
Houseboat	0.0%	0.0%	0.6%	0.8%	0.0%	5.6%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.0%	0.0%	0.8%	1.6%	0.0%
	(151)	(216)	(162)	(124)	(328)	(216)	(219)	(112)	(43)	(51)	(31)	(140)	(309)	(18)	(51)	(131)	(64)	(93)
Pontoon	4.0%	6.2%	1.9%	2.7%	2.9%	2.9%	4.1%	2.4%	2.7%	1.1%	2.1%	1.5%	1.4%	2.3%	1.4%	2.4%	2.6%	1.5%
	(1231)	(1458)	(1929)	(1796)	(1610)	(1770)	(1849)	(2276)	(2150)	(2051)	(2436)	(2922)	(2734)	(2624)	(2917)	(3966)	(2961)	(3080)
PWC	94.2%	97.4%	96.0%	95.8%	94.7%	95.5%	95.3%	97.1%	96.1%	97.6%	97.4%	97.5%	97.7%	96.9%	96.3%	96.9%	97.6%	95.6%
	(1899)	(1761)	(2091)	(1798)	(1589)	(1721)	(1858)	(1962)	(1736)	(2009)	(2093)	(1921)	(1524)	(1811)	(1905)	(1856)	(1501)	(1256)
Powered Inflatable/ Raft	15.7%	22.3%	13.5%	27.2%	14.8%	9.0%	1.9%	11.0%	19.1%	17.6%	11.9%	16.7%	14.3%	14.1%	27.2%	22.9%	12.8%	23.8%
	(205)	(233)	(259)	(154)	(190)	(211)	(157)	(253)	(366)	(228)	(254)	(345)	(224)	(278)	(233)	(315)	(256)	(223)

JSI Research & Training Institute, Inc.  
2016 National Observational Life Jacket Wear Rate Study

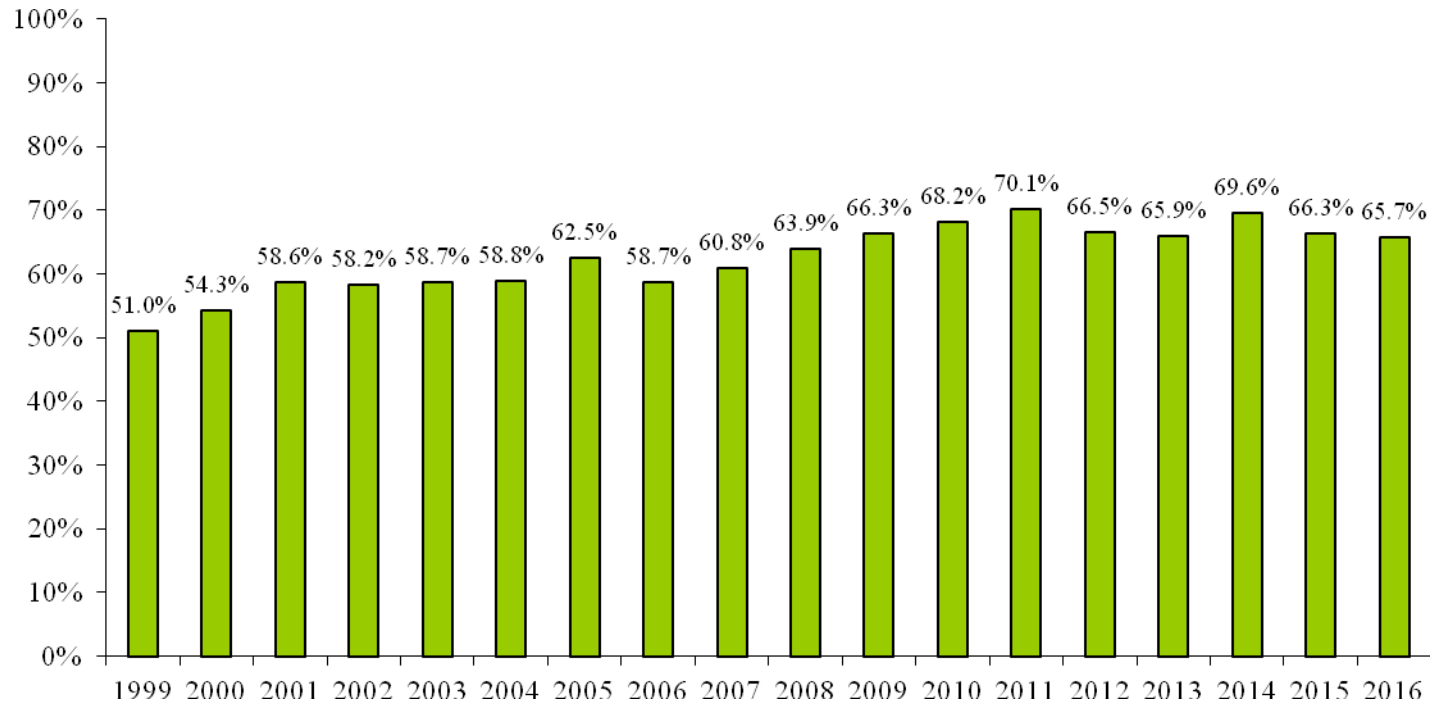
\*Factors controlled for: Age & Boat Type.

\*\* The Open Motorboat category is created by grouping "Skiffs" and "Speedboat/Runabouts" together. Factors controlled for in this line of the chart are Age (proportions of 18 to 64 and 65+ adults) and the proportion of Skiffs to Speedboat/Runabouts has been set in each year within each state to reflect the proportions observed in 2006, the year in which the Strategic Plan goals were first measured. In addition, each state's contribution to the national average is weighted to reflect the 2006 proportion.

## Powerboats for Youth (17 years or younger)

Figure F and Table 2.3 present data for all powerboats for the three age groups of youth combined (17 years or younger). Wear rates for youth have been generally increasing over the years although they have leveled off since 2012. The 2016 wear rate is 65.7%.

**Figure F – Youth Wear Rates for ALL Powerboats Except PWCs\***



JSI Research & Training Institute, Inc.  
2016 National Observational Life Jacket Wear Rate Study  
\*Factors controlled for: Age & Boat Type.



**Table 2.3 – Life Jacket Wear Rates by Powerboats for Youth\***

Boat Type	Observation Year																	
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)
<b>All Powerboats</b>	51.0%	54.3%	58.6%	58.2%	58.7%	58.8%	62.5%	58.7%	60.8%	63.9%	66.3%	68.2%	70.1%	66.5%	65.9%	69.6%	66.3%	65.7%
(no PWCs)	(3834)	(5179)	(5717)	(5162)	(5170)	(5191)	(4737)	(5043)	(5583)	(5257)	(5451)	(5090)	(4589)	(4846)	(4546)	(4798)	(4028)	(3750)
<b>Skiff/Utility</b>	52.7%	49.5%	68.2%	54.9%	63.2%	60.7%	63.3%	58.4%	63.1%	68.4%	70.4%	68.1%	75.4%	65.1%	66.3%	70.8%	68.2%	65.6%
	(338)	(369)	(441)	(557)	(768)	(641)	(781)	(661)	(947)	(988)	(1097)	(862)	(929)	(1022)	(936)	(901)	(948)	(871)
<b>Runabout/Speedboat</b>	51.6%	55.2%	58.8%	59.4%	60.0%	60.0%	63.5%	60.9%	61.7%	64.6%	68.2%	69.7%	71.0%	69.9%	69.2%	70.5%	68.1%	66.3%
	(2744)	(3776)	(3987)	(3479)	(3369)	(3574)	(2966)	(3348)	(3517)	(3256)	(3133)	(2943)	(2624)	(2744)	(2482)	(2696)	(2121)	(1934)
<b>Open Motorboats**</b>	51.8%	54.3%	60.1%	58.7%	60.5%	60.1%	63.5%	60.5%	61.9%	65.2%	68.6%	69.5%	71.6%	69.1%	68.7%	70.6%	68.2%	66.6%
(Skiff/Utility+ Runabout/Speedboat)	(3082)	(4145)	(4428)	(4036)	(4137)	(4215)	(3747)	(4009)	(4464)	(4244)	(4230)	(3805)	(3553)	(3766)	(3418)	(3597)	(3069)	(2805)
<b>Cabin Cruiser</b>	42.6%	48.2%	48.3%	50.7%	45.3%	49.6%	54.6%	50.7%	52.0%	51.0%	51.2%	58.8%	61.6%	50.6%	48.9%	56.6%	58.9%	58.7%
	(418)	(587)	(774)	(690)	(659)	(529)	(528)	(501)	(639)	(581)	(644)	(524)	(507)	(465)	(505)	(364)	(430)	(409)
<b>Houseboat</b>	8.7%	12.7%	25.7%	30.3%	17.8%	24.7%	12.9%	28.2%	37.6%	0.0%	25.8%	19.1%	39.9%	6.9%	84.9%	0.0%	34.2%	43.0%
	(46)	(64)	(44)	(30)	(63)	(35)	(38)	(40)	(5)	(1)	(4)	(18)	(19)	(3)	(1)	(2)	(10)	(8)
<b>Pontoon</b>	38.3%	46.3%	54.8%	55.6%	51.8%	48.5%	64.6%	50.3%	64.1%	65.9%	66.2%	68.4%	65.7%	67.3%	66.7%	71.9%	63.2%	65.5%
	(272)	(379)	(455)	(399)	(338)	(394)	(440)	(505)	(414)	(392)	(530)	(716)	(494)	(580)	(598)	(787)	(511)	(508)
<b>PWC</b>	96.0%	99.1%	99.1%	98.8%	98.0%	98.5%	98.3%	99.2%	98.7%	99.4%	98.6%	99.4%	99.1%	98.7%	98.0%	99.7%	99.0%	98.7%
	(551)	(649)	(691)	(502)	(562)	(543)	(652)	(580)	(522)	(664)	(572)	(427)	(376)	(401)	(371)	(365)	(292)	(154)
<b>Powered Inflatable/Raft</b>	59.3%	69.7%	79.5%	72.8%	66.8%	65.8%	71.2%	70.6%	71.1%	79.7%	70.3%	78.2%	73.1%	58.5%	65.4%	68.9%	69.5%	84.0%
	(62)	(68)	(60)	(37)	(36)	(53)	(22)	(28)	(66)	(39)	(47)	(45)	(35)	(35)	(25)	(50)	(18)	(28)

JSI Research & Training Institute, Inc. 2016 National Observational Life Jacket Wear Rate Study

\*Factors controlled for: Age & Boat Type.

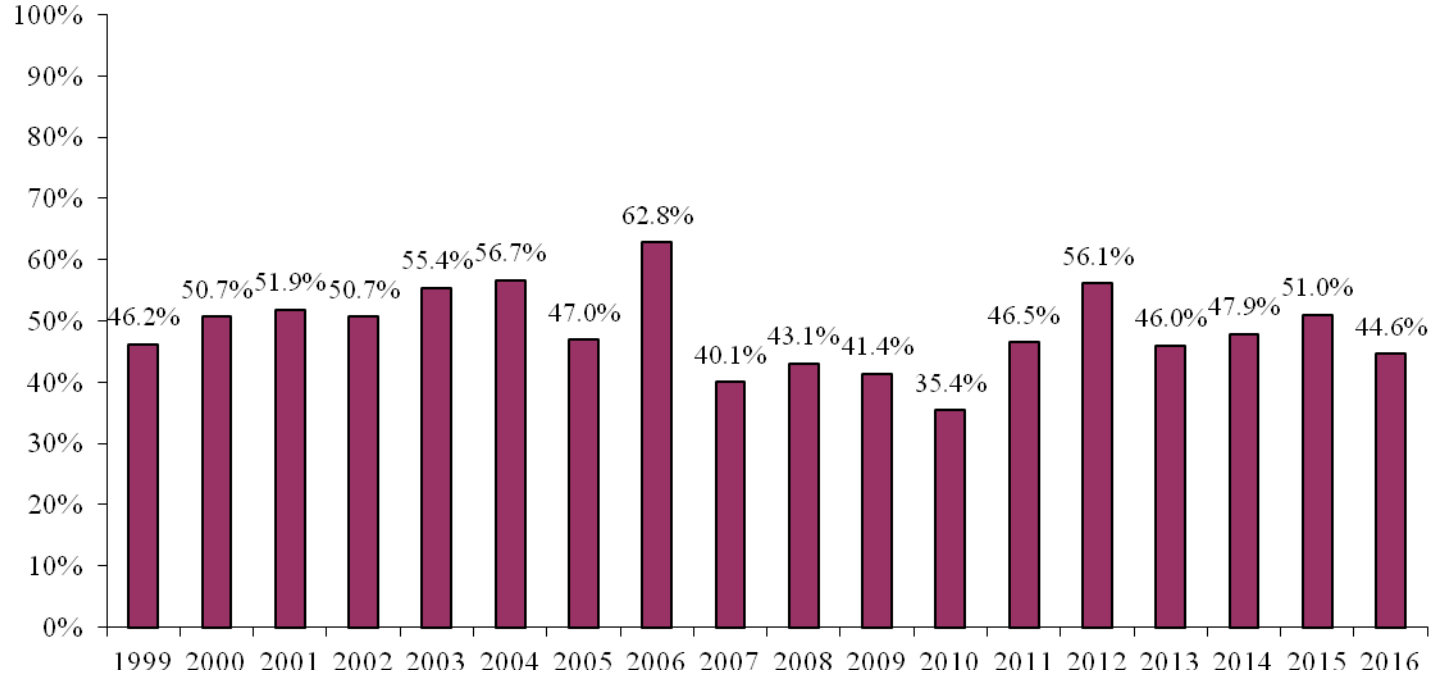
\*\* The Open Motorboat category is created by grouping "Skiffs" and "Speedboat/Runabouts" together. The proportion of Skiffs to Speedboat/Runabouts has been set to reflect the national proportions observed in 2006, the year in which the Strategic Plan goals were first measured. In addition, we control for age of youth as we do for the other boat types in this table.

## All Paddlecraft for Adults (18 years or older)

Table 2.4 presents results for adults in all types of paddlecraft and Figure G shows the trends for all paddlecraft excluding standup paddleboards (since this is a relatively new type of boat to be seen). The rates for all paddlecraft excluding standup paddleboards are the lowest observed since 2010 (44.6%). These changes in rates should be viewed with caution, as paddlecraft activity is mostly observed at only a few sites and, therefore, the overall averages can be highly influenced by local factors such as weather or special events at these sites.

In 2015 we added two rows of data to Table 2.4. One for standup paddleboards (first observed in 2010) and one for an all paddlecraft rate including standup paddleboards. The number of boaters observed has increased since 2010 and wear rates for standup paddleboards have exceeded 50% since 2012.

**Figure G – Adult Wear Rates for ALL Paddlecraft (excluding Paddleboards)\***



JSI Research & Training Institute, Inc.  
2016 National Observational Life Jacket Wear Rate Study  
\*Factors controlled for: Age & Boat Type.

**Table 2.4 – Life Jacket Wear Rates by Paddlecraft for Adults\***

Boat Type	Observation Year																	
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)
<b>All Paddlecraft</b>	46.2%	50.7%	51.9%	50.7%	55.4%	56.7%	47.0%	62.8%	40.1%	43.1%	41.4%	35.4%	46.5%	56.1%	46.0%	47.9%	51.0%	44.6%
(excluding SUPs)	(1676)	(1676)	(1816)	(1864)	(1672)	(1637)	(1616)	(1456)	(2065)	(1523)	(1939)	(2551)	(1608)	(2015)	(1919)	(2555)	(2531)	(2391)
<b>Paddled Inflatable/Raft</b>	71.8%	13.0%	65.1%	65.6%	60.5%	57.8%	76.0%	77.8%	23.9%	38.4%	8.2%	6.9%	10.9%	39.4%	15.8%	18.2%	39.1%	28.2%
	(174)	(198)	(250)	(307)	(290)	(283)	(225)	(308)	(526)	(311)	(340)	(813)	(324)	(485)	(271)	(337)	(455)	(371)
<b>Rowboat/Dinghy</b>	24.4%	37.2%	18.7%	27.3%	22.8%	10.1%	59.2%	26.7%	15.0%	23.0%	35.3%	34.8%	34.3%	60.2%	17.8%	29.0%	22.1%	40.2%
	(82)	(118)	(119)	(193)	(117)	(38)	(71)	(78)	(92)	(65)	(51)	(46)	(87)	(35)	(75)	(79)	(37)	(56)
<b>Canoe</b>	17.7%	33.8%	23.6%	15.4%	30.4%	26.7%	14.8%	29.2%	19.4%	19.7%	25.0%	19.1%	37.4%	32.7%	35.7%	24.9%	30.0%	14.6%
	(809)	(714)	(750)	(701)	(607)	(622)	(679)	(364)	(764)	(481)	(758)	(994)	(386)	(438)	(569)	(744)	(716)	(605)
<b>Kayak</b>	82.7%	85.7%	84.4%	85.7%	81.4%	87.0%	74.1%	77.9%	72.0%	65.5%	72.6%	75.9%	68.6%	74.9%	67.9%	74.9%	70.7%	71.5%
	(611)	(646)	(697)	(663)	(658)	(694)	(675)	(706)	(683)	(648)	(790)	(698)	(811)	(1056)	(1004)	(1395)	(1323)	(1359)
<b>Canoe/Kayak Combined</b>	45.9%	58.6%	53.1%	49.7%	56.8%	58.6%	44.4%	61.2%	44.3%	46.0%	49.1%	47.3%	49.4%	52.8%	50.9%	51.9%	51.6%	47.3%
	(1420)	(1360)	(1447)	(1364)	(1265)	(1316)	(1354)	(1070)	(1447)	(1129)	(1548)	(1692)	(1197)	(1494)	(1573)	(2139)	(2039)	(1964)
<b>Paddleboards (SUPs)</b>												27.8%	41.7%	52.9%	58.7%	53.9%	52.0%	54.6%
												(54)	(84)	(157)	(264)	(397)	(348)	(407)
<b>All Paddlecraft**</b>												35.5%	46.0%	55.0%	45.4%	48.7%	51.1%	46.0%
(including SUPs)												(2605)	(1692)	(2171)	(2183)	(2952)	(2879)	(2798)

JSI Research & Training Institute, Inc.

2016 National Observational Life Jacket Wear Rate Study

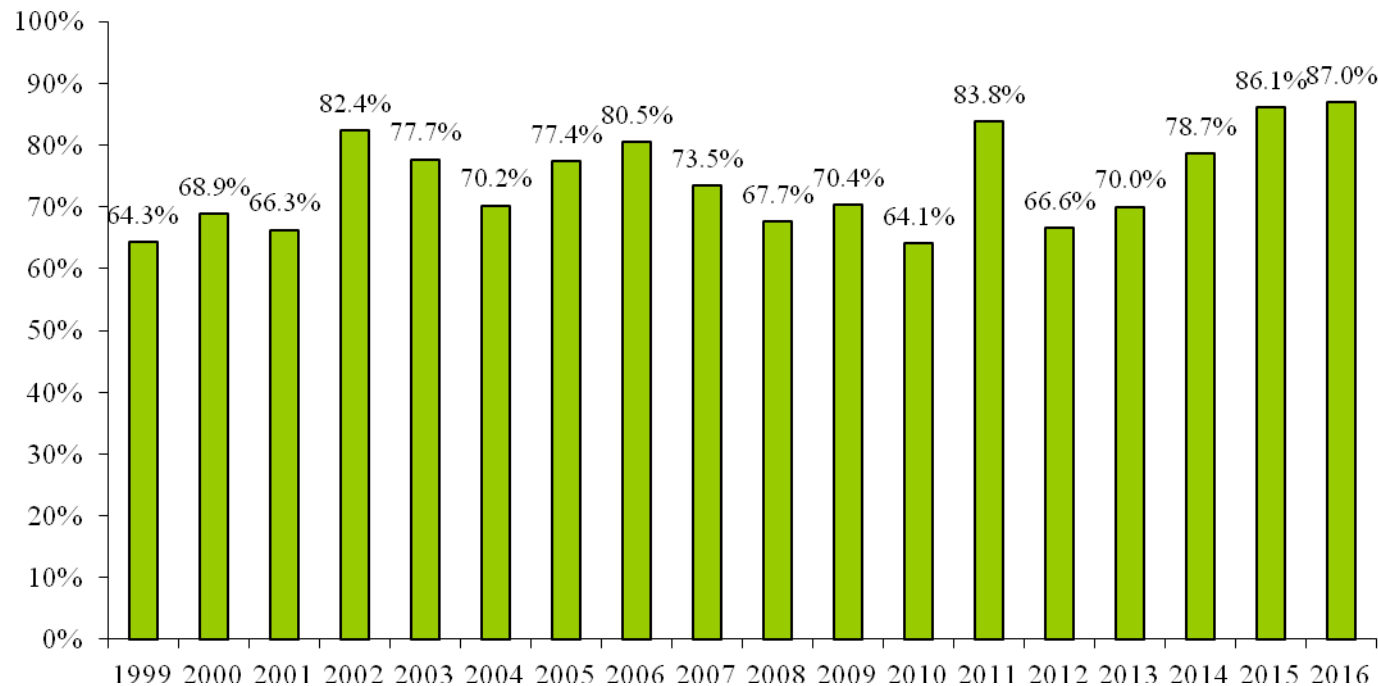
\*Factors controlled for: Age & Boat Type.

\*\*Data for this line in the table have been corrected on 5-21-2015 from the earlier published version

## All Paddlecraft for Youth (17 years or younger)

Figure H and Table 2.5 present results for youth in paddlecraft. Data in this table should be viewed with caution because of the relatively small number of youth who use these types of craft. For all paddlecraft combined excluding standup paddleboards, the wear rate in 2016 is 87.0% which continues an upward trend since 2012. In 2016, the wear rate for youth on standup paddleboards is 73.4%. However, this should be viewed with caution since relatively few youth were observed on standup paddleboards.

**Figure H – Youth Wear Rates for ALL Paddlecraft\***



JSI Research & Training Institute, Inc.  
2016 National Observational Life Jacket Wear Rate Study  
\*Factors controlled for: Age & Boat Type.

**Table 2.5 – Life Jacket Wear Rates by Paddlecraft for Youth\***

Boat Type	Observation year																	
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)	% (N's)
<b>All Paddlecraft</b>	64.3%	68.9%	66.3%	82.4%	77.7%	70.2%	77.4%	80.5%	73.5%	67.7%	70.4%	64.1%	83.8%	66.6%	70.0%	78.7%	86.1%	87.0%
<b>(excluding SUPs)</b>	(317)	(457)	(457)	(312)	(372)	(360)	(281)	(225)	(520)	(487)	(319)	(419)	(231)	(476)	(371)	(337)	(340)	(389)
<b>Paddled Inflatable/Raft</b>	62.4%	45.8%	52.3%	90.3%	68.9%	68.4%	77.5%	77.9%	58.4%	55.6%	59.0%	41.9%	68.5%	50.2%	55.1%	68.7%	83.5%	84.4%
	(82)	(124)	(153)	(136)	(113)	(118)	(79)	(87)	(244)	(218)	(76)	(139)	(49)	(192)	(98)	(100)	(112)	(119)
<b>Rowboat/Dinghy</b>	11.1%	47.1%	60.3%	54.7%	88.6%	58.0%	77.1%	67.3%	61.0%	77.8%	91.1%	98.0%	94.0%	88.0%	90.6%	74.2%	78.2%	99.3%
	(9)	(15)	(32)	(31)	(21)	(11)	(17)	(26)	(21)	(25)	(9)	(14)	(15)	(10)	(10)	(23)	(4)	(15)
<b>Canoe</b>	57.7%	74.6%	62.4%	71.1%	75.0%	60.3%	69.4%	68.9%	81.0%	78.0%	70.6%	68.0%	95.2%	66.5%	78.0%	78.4%	82.1%	70.0%
	(142)	(222)	(181)	(98)	(130)	(146)	(101)	(49)	(123)	(158)	(132)	(169)	(82)	(89)	(139)	(87)	(61)	(57)
<b>Kayak</b>	83.3%	89.2%	94.3%	83.7%	91.6%	91.2%	88.7%	89.0%	90.1%	83.5%	85.3%	85.4%	89.3%	84.8%	77.0%	90.7%	91.9%	85.4%
	(84)	(96)	(91)	(47)	(108)	(85)	(94)	(63)	(132)	(86)	(102)	(97)	(85)	(185)	(124)	(127)	(163)	(198)
<b>Canoe/Kayak Combined</b>	67.3%	78.9%	73.1%	74.5%	82.9%	71.3%	79.6%	82.2%	85.7%	80.0%	76.0%	75.1%	88.8%	74.6%	77.2%	83.3%	85.6%	78.3%
	(226)	(318)	(272)	(145)	(238)	(231)	(195)	(112)	(255)	(244)	(234)	(266)	(167)	(274)	(263)	(214)	(224)	(255)
<b>Paddleboards (SUPs)</b>										0.0%	100%	33.3%	100%	92.3%	51.9%	75.0%	77.5%	73.4%
										(3)	(1)	(9)	(5)	(13)	(52)	(44)	(40)	(84)
<b>All Paddlecraft**</b>										67.3%	70.5%	63.5%	84.1%	67.3%	63.8%	78.3%	85.2%	84.6%
<b>(including SUPs)</b>										(490)	(320)	(428)	(236)	(489)	(423)	(381)	(380)	(473)

JSI Research & Training Institute, Inc.

2016 National Observational Life Jacket Wear Rate Study

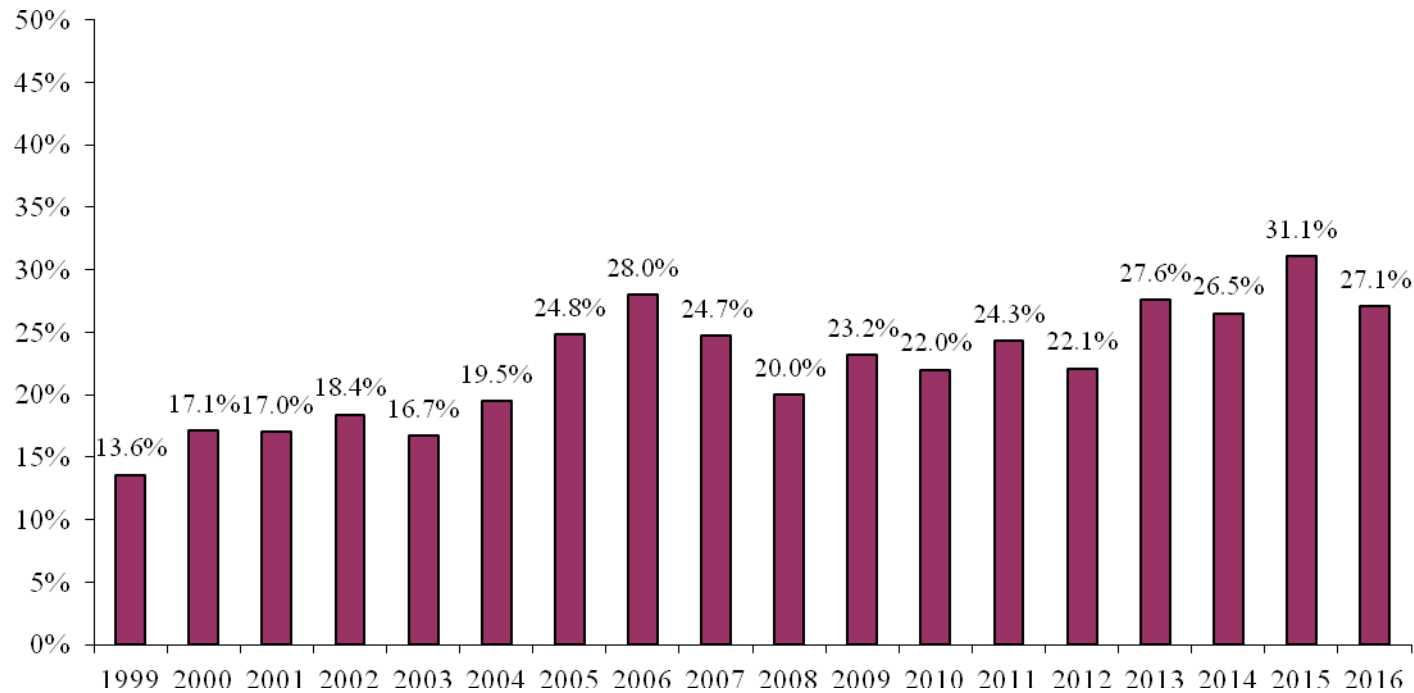
\*Factors controlled for: Age & Boat Type.

\*\*Data for this line in the table have been corrected on 5-21-2015 from the earlier published version.

## Sail Craft for Adults (18 years or older)

Figure I and Table 2.6 document observations of adults in sail craft. For all sail craft combined, the wear rate of 27.1% is a drop from the all-time high of 31.1% in 2015 and reflects decreases for both day sailors and cabin sailboats.

**Figure I – Adult Wear Rates for ALL Sail Craft\***



JSI Research & Training Institute, Inc.  
2016 National Observational Life Jacket Wear Rate Study  
\*Factors controlled for: Age & Boat Type.

**Table 2.6 – Life Jacket Wear Rates by Sail Craft for Adults\***

Boat Type	Observation Year																	
	1999 % (N's)	2000 % (N's)	2001 % (N's)	2002 % (N's)	2003 % (N's)	2004 % (N's)	2005 % (N's)	2006 % (N's)	2007 % (N's)	2008 % (N's)	2009 % (N's)	2010 % (N's)	2011 % (N's)	2012 % (N's)	2013 % (N's)	2014 % (N's)	2015 % (N's)	2016 % (N's)
<b>All Sail Craft</b>	13.6%	17.1%	17.0%	18.4%	16.7%	19.5%	24.8%	28.0%	24.7%	20.0%	23.2%	22.0%	24.3%	22.1%	27.6%	26.5%	31.1%	27.1%
	(3420)	(3565)	(3843)	(4087)	(3149)	(4149)	(3084)	(3279)	(3217)	(3079)	(3733)	(3336)	(3231)	(3297)	(2840)	(2786)	(2800)	(2557)
<b>Sailboard</b>	16.4%	94.0%	80.6%	83.2%	96.7%	92.9%	53.0%	92.1%	83.7%	94.6%	71.9%	83.2%	100%	93.3%	100%	100%	94.5%	90.4%
	(46)	(30)	(15)	(55)	(27)	(40)	(20)	(12)	(18)	(17)	(7)	(29)	(9)	(14)	(10)	(3)	(17)	(10)
<b>Day Sailor</b>	30.7%	35.6%	37.9%	46.7%	38.4%	49.7%	56.4%	59.1%	50.4%	48.3%	61.7%	57.5%	61.3%	54.0%	67.1%	55.1%	69.6%	62.4%
	(739)	(791)	(604)	(1124)	(815)	(984)	(736)	(607)	(397)	(649)	(652)	(731)	(736)	(682)	(469)	(630)	(565)	(532)
<b>Cabin Sailboat</b>	9.1%	11.3%	10.2%	9.5%	10.2%	10.1%	15.4%	19.1%	17.1%	12.0%	13.0%	11.7%	13.4%	12.9%	17.3%	18.3%	20.5%	17.2%
	(2635)	(2744)	(3224)	(2908)	(2307)	(3125)	(2328)	(2660)	(2802)	(2413)	(3074)	(2576)	(2486)	(2601)	(2361)	(2153)	(2218)	(2015)

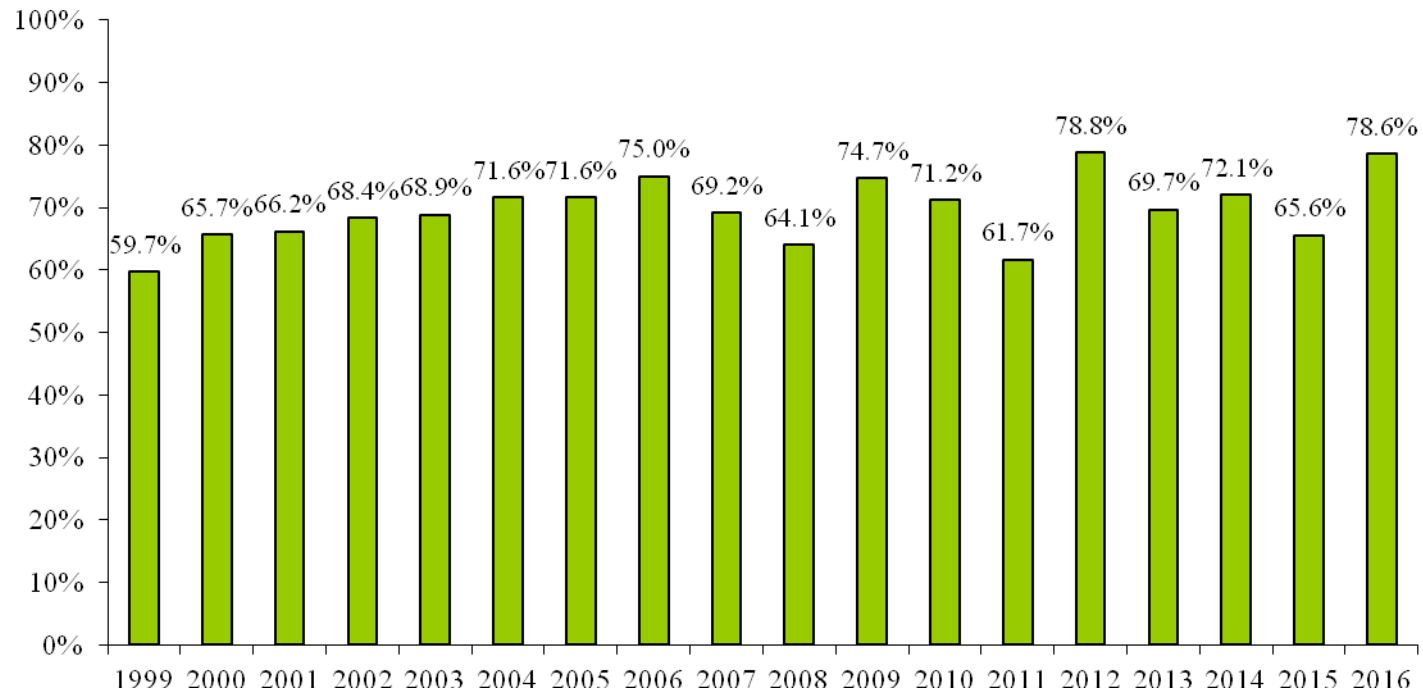
JSI Research & Training Institute, Inc.  
 2016 National Observational Life Jacket Wear Rate Study  
 \*Factors controlled for: Age & Boat Type.



## Sail Craft for Youth (17 years or younger)

Figure J and Table 2.7 show that the national average wear rate on all sail craft for all youth increased from last year (from 65.6% in 2015 to 78.6% in 2016). However, relatively few youth are found on any type of sail craft and, therefore, fluctuations in rates should be interpreted with caution.

**Figure J – Youth Wear Rates for ALL Sail Craft\***



JSI Research & Training Institute, Inc.  
2016 National Observational Life Jacket Wear Rate Study  
\*Factors controlled for: Age & Boat Type.



**Table 2.7 – Life Jacket Wear Rates by Sail Craft for Youth\***

Boat Type	Observation Year																	
	1999 % (N's)	2000 % (N's)	2001 % (N's)	2002 % (N's)	2003 % (N's)	2004 % (N's)	2005 % (N's)	2006 % (N's)	2007 % (N's)	2008 % (N's)	2009 % (N's)	2010 % (N's)	2011 % (N's)	2012 % (N's)	2013 % (N's)	2014 % (N's)	2015 % (N's)	2016 % (N's)
<b>All Sail Craft</b>	59.7%	65.7%	66.2%	68.4%	68.9%	71.6%	71.6%	75.0%	69.2%	64.1%	74.7%	71.2%	61.7%	78.8%	69.7%	72.1%	65.6%	78.6%
	(347)	(329)	(424)	(381)	(323)	(323)	(327)	(371)	(270)	(274)	(305)	(202)	(219)	(313)	(220)	(206)	(170)	(200)
<b>Sailboard</b>	0.0%	100%	66.7%	75.0%	--	92.1%	100%	100%	82.2%	--	--	100%	--	100%	--	100%	--	100%
	(3)	(7)	(6)	(4)	(0)	(48)	(1)	(4)	(8)	(0)	(0)	(1)	(0)	(1)	(0)	(1)	(0)	(1)
<b>Day Sailor</b>	71.1%	81.6%	92.0%	82.1%	84.3%	87.5%	73.4%	93.2%	86.5%	88.0%	92.5%	85.2%	80.2%	98.2%	91.5%	97.2%	87.7%	96.4%
	(114)	(81)	(85)	(113)	(107)	(83)	(67)	(122)	(54)	(75)	(80)	(86)	(57)	(166)	(36)	(54)	(27)	(103)
<b>Cabin Sailboat</b>	58.3%	61.5%	58.2%	63.5%	60.6%	68.3%	69.4%	65.7%	62.4%	56.4%	66.4%	65.9%	54.9%	60.3%	61.7%	61.0%	58.6%	66.7%
	(230)	(241)	(333)	(264)	(216)	(192)	(259)	(245)	(208)	(196)	(225)	(115)	(162)	(146)	(184)	(152)	(143)	(97)

JSI Research & Training Institute, Inc.  
 2016 National Observational Life Jacket Wear Rate Study  
 \*Factors controlled for: Age & Boat Type.



## Boat Type and Size for Adults (18 years or older)

Table 2.8 shows the breakdown of adult wear rates by boat size for three general categories of boat types: powerboats, sailboats, and paddlecraft. Data are presented only for 2004 to 2016, since 2004 was the first year that observations were divided into two size categories of 16 to 21 feet and 21 to 26 feet, from one category (16 to 26 feet was used in prior years.)

Wear rates and boat size show a dependent relationship: wear rates decrease as the size of the boat increases. However, the general level of wear is also highly influenced by the type of boat. The 12 year averages for powerboats range from 8.7% for boats less than 16 feet to 1.6% for boats over 26 feet in length. For sailboats, the 12 year average ranges from 75.2% for sailboats less than 16 feet to 12.1% for sailboats over 26 feet in length. For paddlecraft, the 12 year average for boats less than 16 feet is 52.3% and for boats in the 16 to 21 foot category it is 42.1%.



**Table 2.8 – Life Jacket Wear Rates by Boat Type and Size for Adults\*  
2004 to 2016**

Boat Type and Size	Observation Year													Total % (N's)
	2004 % (N's)	2005 % (N's)	2006 % (N's)	2007 % (N's)	2008 % (N's)	2009 % (N's)	2010 % (N's)	2011 % (N's)	2012 % (N's)	2013 % (N's)	2014 % (N's)	2015 % (N's)	2016 % (N's)	
<b>Powerboats (no PWCs)</b>														
<16 ft.	8.2% (2320)	7.6% (2734)	7.1% (3395)	8.7% (2173)	7.6% (1862)	8.5% (1824)	11.5% (2764)	8.4% (2183)	9.3% (1599)	9.3% (2119)	12.4% (2951)	6.6% (2174)	6.5% (2008)	8.7% (29494)
16-20.9 ft.	4.7% (16298)	5.1% (14629)	4.4% (11778)	4.9% (13034)	6.1% (12586)	5.0% (13125)	5.0% (13944)	5.2% (13255)	5.1% (12898)	4.3% (11424)	7.2% (12217)	6.9% (11763)	6.3% (11340)	5.4% (168238)
21-25.9 ft.	2.4% (6218)	3.2% (5503)	2.4% (6957)	3.7% (8634)	3.4% (9127)	2.3% (10420)	2.4% (9713)	2.0% (8718)	2.7% (9389)	2.5% (9364)	3.4% (9533)	4.2% (8270)	2.2% (9048)	2.8% (110894)
26+ ft.	0.8% (3407)	1.4% (2865)	1.6% (3268)	1.5% (3782)	1.5% (3650)	1.8% (4546)	1.3% (4473)	1.3% (4798)	2.0% (4004)	2.1% (3874)	1.4% (4065)	2.5% (4234)	1.8% (4393)	1.6% (51631)
<b>Sailboats</b>														
<16 ft.	75.0% (481)	74.0% (376)	79.7% (265)	67.6% (77)	73.2% (163)	70.2% (247)	65.5% (299)	74.6% (160)	74.2% (194)	78.7% (136)	70.3% (265)	89.6% (200)	89.0% (197)	75.2% (3060)
16-20.9 ft.	34.2% (357)	41.9% (312)	57.7% (609)	51.8% (193)	46.8% (370)	58.0% (157)	57.4% (346)	63.8% (390)	48.6% (379)	66.3% (314)	43.6% (248)	63.1% (225)	47.8% (339)	52.9% (4275)
21-25.9 ft.	12.2% (1428)	24.1% (1527)	21.0% (793)	25.5% (797)	14.0% (911)	21.5% (949)	16.7% (766)	27.5% (846)	24.3% (989)	27.6% (736)	23.8% (593)	41.1% (654)	29.4% (559)	22.7% (11548)
26+ ft.	9.9% (1864)	3.2% (875)	11.5% (1614)	15.2% (2148)	11.6% (1629)	13.1% (2380)	11.0% (1925)	9.6% (1835)	8.3% (1735)	13.4% (1654)	17.7% (1644)	15.1% (1721)	13.3% (1453)	12.1% (22477)
<b>Paddlecraft (excluding SUP)</b>														
<16 ft.	60.4% (1056)	68.4% (1012)	70.6% (1147)	44.8% (1306)	38.2% (1319)	42.7% (1296)	38.0% (1953)	42.6% (1021)	57.2% (1647)	43.0% (1532)	55.3% (1760)	52.5% (2126)	49.8% (2079)	52.3% (18043)
16-20.9 ft.	49.4% (531)	11.1% (488)	53.0% (171)	35.7% (672)	67.9% (180)	64.4% (347)	42.0% (331)	53.2% (587)	47.3% (367)	56.2% (383)	32.2% (795)	44.0% (395)	38.2% (312)	42.1% (5484)

JSI Research & Training Institute, Inc.  
2016 National Observational Life Jacket Wear Rate Study  
\*Factors controlled for: Age & Boat Type.

### III. ENVIRONMENTAL AND SITUATIONAL INFLUENCES ON LIFE JACKET WEAR RATES

This section of the report looks at influences of environmental and situational factors on wear rates. The tables present information separately for powerboats, sailboats and paddlecraft. Statistical significance of the relationships are reported in the footnotes at the bottom of each table.

**Wave Height.** The roughness of the water that the boating activity is taking place in might be expected to affect wear rates. The study classified wave heights as “calm” (< 6 inches), “choppy” (6 inches to 2 feet), and “rough” (over 2 feet). There is relatively little impact for powerboats until wave heights are 2 feet or greater. Sailboats show increases in wear rates as wave height increases (20.3% to 25.2%). Paddlecraft are the most influenced by wave height increasing from 41.5% in calm water to 74.3% in choppy waters and 89.5% in rough waters.

**Table 3.1 – Wear Rates by Wave Height 1999-2016 – Adult Only**

Condition	Boat Type		
	Powerboats % (N)	Sailboats % (N)	Paddlecraft % (N)
Calm (less than 6 in)	3.9%	20.3%	41.5%
	(371348)	(38977)	(28575)
Choppy (6 in to 2 ft)	3.8%	25.1%	74.3%
	(102663)	(19212)	(6575)
Rough (over 2 ft)	6.0%	25.1%	89.5%
	(3524)	(984)	(917)

*Power Boats (p=.0001) Sail Boats (p<.0001) Paddle Boats (p<.0001)*

**Visibility.** For all three general types of boats, we see wear rates increase as visibility decreases from good visibility to poor visibility. Powerboats increase from 3.8% to 5.7%; sailboats from 21.8% to 24.3%; and paddlecraft from 47.9% to 77.9%.

**Table 3.2 – Wear Rates Observed by Visibility 1999-2016 – Adult Only**

Condition	Boat Type		
	Powerboats % (N)	Sailboats % (N)	Paddlecraft % (N)
Good Visibility	3.8%	21.8%	47.9%
	(439940)	(52007)	(34430)
Fair Visibility	5.0%	22.7%	64.5%
	(33260)	(6700)	(1373)
Poor Visibility	5.7%	24.3%	77.9%
	(2853)	(305)	(213)

*Power Boats (p<.0001) Sail Boats (p=.1192) Paddle Boats (p<.0001)*

**Weather Conditions.** For all three general types of boats, wear rates increase as weather conditions worsen. Powerboats move from 3.8% in sunny weather to 7.6% in stormy weather; sailboats move from 20.7% to 29.3% and paddlecraft move from 50.6% to 72.8%.

**Table 3.3 – Wear Rates Observed by Weather Conditions 1999-2016 – Adult Only**

Condition	Boat Type		
	Powerboats % (N)	Sailboats % (N)	Paddlecraft % (N)
Sunny	3.9% (256607)	20.7% (30926)	50.6% (17318)
Partly Cloudy	3.6% (139056)	23.7% (18129)	45.5% (12895)
Cloudy	4.2% (68187)	22.1% (8688)	47.4% (5066)
Raining	7.1% (10394)	24.8% (1068)	65.8% (702)
Stormy Weather	7.6% (2432)	29.3% (365)	72.8% (114)

*Power Boats (p<.0001) Sail Boats (p<.0001) Paddle Boats (p<.0001)*

**Water Temperature.** As water temperatures get colder, we might expect that wear rates would increase. This turns out to be true for all three general types of boats—wear rates increase as water temperatures decrease. Powerboats move from 2.8% when water temperatures are 80 degrees or greater to 12.5% when water temperatures are below 60 degrees. Sailboats move from 17.3% in warmer waters to 38.5% in the cooler waters. Paddlecraft move from 30.0% in warm waters to 80.5% in cooler water.

**Table 3.4 – Wear Rates Observed by Water Temperature 1999-2016 – Adult Only**

Condition	Boat Type		
	Powerboats % (N)	Sailboats % (N)	Paddlecraft % (N)
Water Temp Below 60°	12.5%	38.5%	80.5%
	(20426)	(1592)	(2348)
60-69°	6.9%	24.9%	60.5%
	(50118)	(15394)	(8682)
70-79°	3.4%	20.7%	49.5%
	(194749)	(26228)	(15027)
80° or Above	2.8%	17.3%	30.0%
	(204817)	(13730)	(9669)

*Power Boats (p<.0001) Sail Boats (p<.0001) Paddle Boats (p<.0001)*

**Air Temperature.** Wear rates are affected by air temperatures for all three general types of boats. For powerboats and paddlecraft the highest wear rates are seen when air temperatures are below 60 degrees. For sailboats the highest wear rates are when air temperatures are below 70 degrees.

**Table 3.5 – Wear Rates Observed by Air Temperature 1999-2016 – Adult Only**

Condition	Boat Type		
	Powerboats % (N)	Sailboats % (N)	Paddlecraft % (N)
Air Temp Below 60°	11.8%	28.6%	79.5%
	(6770)	(555)	(599)
60-69°	8.1%	32.3%	57.4%
	(32434)	(4843)	(2819)
70-79°	5.0%	22.6%	53.9%
	(111296)	(20837)	(10908)
80-89°	3.2%	19.7%	46.4%
	(197553)	(24020)	(14332)
90-99°	2.7%	18.8%	41.8%
	(108871)	(8021)	(6689)
100° or Above	2.7%	13.2%	22.9%
	(20232)	(619)	(755)

*Power Boats (p<.0001) Sail Boats (p<.0001) Paddle Boats (p<.0001)*



**Wind Speed.** Wind speed has only a slight affect on wear rates on powerboats. However, it does affect wear rates on sailboats and paddlecraft. For sailboats the wear rates are lowest when wind speeds are 2 knots or less (20.7%) and highest when wind speeds are 11 knots or greater (36.1%). For paddlecraft, wear rates are lowest when the winds are 2 knots or less (42.6%) and higher when wind speeds increase.

**Table 3.6 – Wear Rates Observed by Wind Speed 1999-2016 – Adult Only**

Condition	Boat Type		
	Powerboats % (N)	Sailboats % (N)	Paddlecraft % (N)
Wind Speed Calm (0 to 2 knots)	4.0% (99353)	20.7% (7590)	42.6% (12377)
Breezy (sustained 3-10 knots)	3.9% (147549)	25.3% (19235)	53.6% (7946)
Windy (11 or more knots)	4.6% (3496)	36.1% (474)	65.6% (439)

*Power Boats (p=.0015) Sail Boats (p<.0001) Paddle Boats (p<.0001)*

**Wear Rates by Activity.** Table 4.7 shows the impact of fishing or intent to fish activities on wear rates from 2007, when JSI first began classifying activities as intent to fish (visible fishing gear even though not fishing at the moment). Data are shown separately for both skiffs and speedboats/runabouts. Almost without exception wear rates are higher when boaters are participating in fishing or intent to fish activities compared to any other activity. The role of fishing tournaments that require wearing life jackets may be influencing wear rates not only during the tournament itself, but also when boaters are fishing outside of a tournament.

**Table 3.7 – Wear Rates Observed on Skiffs and Runabouts by Activity 2007-2016 – Adult Only**

Boat Type	Activity	Observation Year									
		2007 % (N's)	2008 % (N's)	2009 % (N's)	2010 % (N's)	2011 % (N's)	2012 % (N's)	2013 % (N's)	2014 % (N's)	2015 % (N's)	2016 % (N's)
Skiff/Utility	Fishing/Intent to Fish	8.7%	12.3%	8.3%	10.7%	8.6%	9.1%	7.7%	17.3%	13.0%	8.8%
		(1967)	(2944)	(3133)	(3264)	(2689)	(3309)	(3027)	(3163)	(2897)	(3310)
Skiff/Utility	All other Activities	8.2%	6.6%	5.6%	8.7%	7.9%	6.5%	5.2%	9.1%	7.7%	6.3%
		(3370)	(3682)	(4116)	(3364)	(3839)	(3620)	(4194)	(3603)	(3684)	(4225)
Runabout/ Speedboat	Fishing/Intent to Fish	5.2%	2.5%	4.9%	3.4%	2.5%	6.2%	4.5%	6.0%	12.2%	6.3%
		(1313)	(1015)	(862)	(687)	(939)	(671)	(521)	(560)	(797)	(696)
Runabout/ Speedboat	All other Activities	2.7%	3.1%	2.3%	2.2%	2.3%	2.0%	2.3%	2.4%	2.8%	2.5%
		(13000)	(12729)	(13619)	(14260)	(13340)	(12623)	(11033)	(12363)	(10969)	(10942)

## IV. CONCLUSIONS FOR LIFE JACKET WEAR RATES - NATIONAL TREND DATA 1999 TO 2016

This report includes observational data collected from 1999 to 2016. The 2016 data show that while rates have fallen a little from their peak in 2015, there is still evidence of progress in life jacket use in many sectors. There still remains much work to be accomplished and in some types of boating wear rates are particularly low and seem difficult to change. A summary of key findings are:

1. For children under the age of six, wear rates in 2016 are at 92.9%. Rates have steadily increased since 1999 when wear rates were 80.6% for this group.
2. Another long-standing trend of increased life jacket use is seen for children between the ages of 6 and 12 with wear rates in 2016 of 84.1%. A steadily increasing trend has been observed since 1999 when wear rates were 69.1% for this group.
3. The wear rate for teenagers (ages 13-17) in 2016 is 41.5%. This is a significant improvement compared to 1999 when the rate was 24.1%.
4. Wear rates for all adults (18+) on all types of boats excluding PWCs in 2016 is 9.9%, a drop down from the highest ever observed rate (11.2%) in 2015.
5. For open motorboats wear rates are 5.7% in 2016 representing a noted increase since 2006 (4.5%).
6. Cabin sail boat wear rates are at 17.2% for 2016, a drop from the highest ever observed rate (20.5%) in 2015, but still a noted increase of wear rates since 1999 when they were 9.1%.
7. Day sailor rates have also climbed dramatically since 1999 when wear rates were 30.7%. The 2016 wear rate is 62.4%.
8. The number of standup paddleboarders has increased each year since 2010 and wear rates have been in excess of 50% since 2012. In 2016 the wear rate is 54.6%.
9. Wear rates on PWCs for both adults and children are almost universal.
10. Boaters participating in fishing or intent to fish activities have higher wear rates compared to all other activities; this finding is true for skiffs as well as speedboats/runabouts.
11. For all types of boats, as boat length decreases, wear rates increase.
12. Adult boaters on powerboats show increased wear rates when weather or water conditions are poorer: wear rates are 3.8% in good visibility and 5.7% in poor visibility; 3.8% in sunny weather and 7.6% in stormy weather; 2.8% in waters

above 80 degrees but 12.5% in waters colder than 60 degrees; 2.7% when air temperatures are above 100 degrees but 11.8% when temperatures are below 60 degrees; 3.9% in calm waters and 6.0% in rough waters.

13. Adult boaters on sailboats also respond with increased life jacket wear when weather or water conditions are poorer: wear rates are 21.8% in good visibility and 24.3% in poor visibility; 20.7% in sunny weather and 29.3% in stormy weather; 17.3% when water temperatures are above 80 degrees but 38.5% when water temperatures are below 60 degrees; 13.2% when air temperatures are above 100 degrees but 28.6% when below 60 degrees; 20.3% in calm waters but 25.1% in rough waters; when the wind is calm 20.7% but when wind is greater than 11 knots it is 36.1%.
14. Adult boaters on paddlecraft also respond with increase life jacket use when weather or water conditions are poorer; 47.9% in good visibility but 77.9% in poor visibility; 50.6% in sunny weather but 72.8% in stormy weather 30.0% when water temperatures are above 80 degrees but 80.5% when water temperatures are below 60 degrees; 22.9% when air temperatures are above 100 degrees but 79.5% when temperatures are below 60 degrees; 41.5% in calm waters but 89.5% in rough waters; when wind is calm wear rates are 42.6% and when greater than 11 knots they are 65.6%.

## V. APPENDIX: METHODS & DESCRIPTIVE INFORMATION

To provide reliable and valid indicators of changes in life jacket wear rates, it was essential for observation procedures to remain as close as possible to those used in previous years. The same states were observed for each of the years of data collection efforts, during the same period of time (July and August). The vast majority of the sites in each of 30 states observed have remained the same for all years. The following is a detailing of the methods used in all years of data collection.

**Time period** - Observations were conducted during the summer months of each year, beginning the weekend of July 4<sup>th</sup> and ending on Labor Day weekend.

**Site selection** - A total of 30 states were chosen in which to conduct observations. The states were originally selected by a stratified random sampling procedure. Approximately three-fourths of the coastal states (20 out of 26 states) were chosen, and approximately 40% of the inland states (10 out of 24) were selected. Four sites from each state were visited, except in California, where eight sites were observed due to the size of the state. The 124 sites represented a wide range of water venues including lakes, rivers, harbors and bays, and intra-coastal waterways. The sites were selected based on consultations with local offices of the USCG, members of the local Coast Guard Auxiliary or U.S. Power Squadrons, and state boating or fishing law enforcement agencies. Sites were selected to roughly represent a variety of available boating venues in the state, as well as their proximity to one another to allow for relatively short travel time between sites. In addition, sites needed to have suitable shore-based viewing locations from which observations of life jacket wear could be made using high-powered binoculars.

**Observational procedures** - Observations were conducted for four-hour periods either in the morning or the afternoon of a Saturday or Sunday. The goal was to observe as many boats as possible during a four-hour time frame. Viewing locations were on shore at a narrowing, bridge, or near a marina to facilitate observations. Two-person teams observed boating activity. One team member made the observations using high-powered binoculars and called out the information, which was then recorded on observation forms by the second team member. Team members alternated responsibilities frequently to ward off fatigue. In addition to recording information on boating activity and life jacket wear, observers recorded data about the site. This included information on weather and water conditions. JSI project staff trained the observers during two half-day sessions. The first half-day training consisted of reviewing the observation manual, observation forms, and required equipment. The observation manual contained procedures, definitions, and pictures of various types of boats to facilitate consistent classification by the observers. The second half-day of training allowed observation team members an opportunity to practice using the required equipment and observation forms with the assistance and guidance of an experienced JSI project staff member.

**Observation Forms** - There were two observation forms designed. The first was the boat observation form, which was intended to record information about the boat and people on the boat. The second form was the site form, which was designed to record information about the site, weather and water conditions. The forms have remained the same from year to year, with the exception of two changes made in 1999, one change made in 2004, one change made in 2007, and three changes made in 2016. These changes are discussed in detail below.

**A) Boat Forms** - Observers recorded the observation **time period** in two hour blocks of time (7:59 or earlier, 8am – 9:59am, 10am – 11:59pm, 12pm – 1:59pm, 2pm – 3:59pm, 4pm – 5:59pm, 6pm or later); the **type of boat** observed (skiff, speedboat/runabout, cabin cruiser, personal watercraft (PWC), pontoon boat, houseboat, sailboard, day sailor, cabin sailboat, rowboat, inflatable, canoe, kayak, and other); **length of boat** (less than 16 feet, 16-20.9 feet, 21-25.9 feet, 26-45.9, and 46+ feet); **type of operation** (motoring, sailing, paddling, drifting, or at anchor); and **activity** engaged in (fishing, intent to fish, water-skiing, white-water, high speed racing, swimming, pleasure boating, and other). Observers also recorded **operator/passenger status**; **gender** (male, female, or unknown); **age** (less than six, 6 - 12, 13 - 17, 18 - 64, 65 or older); **life jacket wear** and **life jacket type** (buoyant/traditional, inflatable suspender or belt pack, or not wearing). In addition, if the boat was involved in water-skiing or a towing sport, observers indicated which **boaters were skiing** (or being towed) at the time.

**B) Site Forms** - At each site, the observers recorded the beginning time and ending **time of the observation period**, **water type** (lake, river, harbor/bay, Great Lake, intra-coastal waterway), and **water temperature**. The following environmental factors were measured by observers at each two hour time block during the observation period: **air temperature**; **wind speed**; **wave height** (less than six inches, six inches up to

two feet, or over two feet); **weather** (sunny, partly cloudy, cloudy, raining, or stormy); and **visibility** (good, fair, or poor).

Over the past 15 years of observations five categories of information have changed. In 1999, the original 6 to 17 year old age category was divided into a 6 to 12 year old group and a 13 to 17 year old group. Also in 1999, the boat category of canoes/kayaks was separated to record canoes and kayaks individually. In 2004 the USCG requested that JSI breakout the boat size categories from three (less than 16 feet, 16-25 feet and over 26 feet) to four categories (less than 16 feet, 16-20 feet, 21-25 feet and over 26 feet). Observations made in 2004 to 2011 are the only years to record observations using the expanded boat size categories. In 2007, we added an “intent to fish” category distinct from “pleasure”. Intent to fish was indicated when a boat could be observed with obvious fishing gear (fishing rods, trolling motors, etc.) even though at the moment of observation, the boaters were not fishing. In 2016 we removed the type of propulsion category from the form because it was not adding value to our analysis. Instead we added separate boat type categories for “powered” inflatables and “paddled” inflatable the only ambiguous category. Finally, we updated the life jacket wear and type categories for the first time. Until 2016, PFD selection options read “Old,” meaning inherently buoyant, “New,” meaning inflatable and “No,” for not wearing. In order to prevent confusion about these categories, they were renamed to be more explicit to “Buoyant (Trad),” “Inflatable” “Susp” (suspender). “Inflatable” “Belt,” and “Not Wear.”

# JSI Data Collection Form: 2016 Boat Form

**TIME:**    7:59 or earlier    8:00 - 9:59 am    10:00 - 11:59 am    12:00 - 1:59 pm    2:00 - 3:59 pm    4:00 - 5:59 pm    6:00 or later

9795



POWER BOAT:		SAIL:	PADDLE:	GENDER			AGE(years)					PFD			WS
<input type="radio"/> Skiff/Utility <input type="radio"/> Pontoon <input type="radio"/> Runabout <input type="radio"/> Inflatable/Raft <input type="radio"/> Cabin cruiser <input type="radio"/> Houseboat <input type="radio"/> PWC		<input type="radio"/> Day sailor <input type="radio"/> Cabin sailboat <input type="radio"/> Sailboard	<input type="radio"/> Kayak <input type="radio"/> Paddle board <input type="radio"/> Canoe <input type="radio"/> Inflatable <input type="radio"/> Rowboat	M	F	?	0-5	6-12	13-17	18-64	65+	Buoyant (Trad)	Inflatable Susp Belt	Not Wear	Yes
<b>SIZE:</b> <input type="radio"/> Under 16 <input type="radio"/> 16 - 20.9 <input type="radio"/> 21 - 25.9 <input type="radio"/> 26 - 45.9 <input type="radio"/> 46 +		<b>OPERATION:</b> <input type="radio"/> Cruising/Motoring <input type="radio"/> Sailing <input type="radio"/> Rowing/Paddling <input type="radio"/> Drifting <input type="radio"/> Anchored		<b>ACTIVITY:</b> <input type="radio"/> Pleasure <input type="radio"/> Fishing <input type="radio"/> Water skiing <input type="radio"/> Intent to Fish <input type="radio"/> White water <input type="radio"/> Swimming <input type="radio"/> High Speed <input type="radio"/> Other		OP									
				P1											
				P2											
				P3											
				P4											
				P5											
				P6											
				P7											
				P8											

POWER BOAT:		SAIL:	PADDLE:	GENDER			AGE(years)					PFD			WS
<input type="radio"/> Skiff/Utility <input type="radio"/> Pontoon <input type="radio"/> Runabout <input type="radio"/> Inflatable/Raft <input type="radio"/> Cabin cruiser <input type="radio"/> Houseboat <input type="radio"/> PWC		<input type="radio"/> Day sailor <input type="radio"/> Cabin sailboat <input type="radio"/> Sailboard	<input type="radio"/> Kayak <input type="radio"/> Paddle board <input type="radio"/> Canoe <input type="radio"/> Inflatable <input type="radio"/> Rowboat	M	F	?	0-5	6-12	13-17	18-64	65+	Buoyant (Trad)	Inflatable Susp Belt	Not Wear	Yes
<b>SIZE:</b> <input type="radio"/> Under 16 <input type="radio"/> 16 - 20.9 <input type="radio"/> 21 - 25.9 <input type="radio"/> 26 - 45.9 <input type="radio"/> 46 +		<b>OPERATION:</b> <input type="radio"/> Cruising/Motoring <input type="radio"/> Sailing <input type="radio"/> Rowing/Paddling <input type="radio"/> Drifting <input type="radio"/> Anchored		<b>ACTIVITY:</b> <input type="radio"/> Pleasure <input type="radio"/> Fishing <input type="radio"/> Water skiing <input type="radio"/> Intent to Fish <input type="radio"/> White water <input type="radio"/> Swimming <input type="radio"/> High Speed <input type="radio"/> Other		OP									
				P1											
				P2											
				P3											
				P4											
				P5											
				P6											
				P7											
				P8											

POWER BOAT:		SAIL:	PADDLE:	GENDER			AGE(years)					PFD			WS
<input type="radio"/> Skiff/Utility <input type="radio"/> Pontoon <input type="radio"/> Runabout <input type="radio"/> Inflatable/Raft <input type="radio"/> Cabin cruiser <input type="radio"/> Houseboat <input type="radio"/> PWC		<input type="radio"/> Day sailor <input type="radio"/> Cabin sailboat <input type="radio"/> Sailboard	<input type="radio"/> Kayak <input type="radio"/> Paddle board <input type="radio"/> Canoe <input type="radio"/> Inflatable <input type="radio"/> Rowboat	M	F	?	0-5	6-12	13-17	18-64	65+	Buoyant (Trad)	Inflatable Susp Belt	Not Wear	Yes
<b>SIZE:</b> <input type="radio"/> Under 16 <input type="radio"/> 16 - 20.9 <input type="radio"/> 21 - 25.9 <input type="radio"/> 26 - 45.9 <input type="radio"/> 46 +		<b>OPERATION:</b> <input type="radio"/> Cruising/Motoring <input type="radio"/> Sailing <input type="radio"/> Rowing/Paddling <input type="radio"/> Drifting <input type="radio"/> Anchored		<b>ACTIVITY:</b> <input type="radio"/> Pleasure <input type="radio"/> Fishing <input type="radio"/> Water skiing <input type="radio"/> Intent to Fish <input type="radio"/> White water <input type="radio"/> Swimming <input type="radio"/> High Speed <input type="radio"/> Other		OP									
				P1											
				P2											
				P3											
				P4											
				P5											
				P6											
				P7											
				P8											

**PFD Study 2016**

**CODE**

State	Site	Block	Group	Phase	Page Number

# JSI Data Collection Form: 2016 Site Form

**PFD Study 2016**

			<b>ID</b>						
# of Boats Observed				State	Site	Block	Group	Phase	

## 1. Site Information

Observer Names: \_\_\_\_\_ City: \_\_\_\_\_

Site Name: \_\_\_\_\_ Water: \_\_\_\_\_

Date of Observation:      /      /      Day of the week:  Sat.  Sun.

Observation start time:      :       AM  PM Observation end time:      :       AM  PM

## 2. Type of Body of Water

- Bay, inlet or sound       River, stream, creek or canal       Other: \_\_\_\_\_
- Harbor       Lake, pond, or reservoir (not Great Lakes)
- Intracoastal waterway       Great lake (not including tributaries)

## 3. Site Conditions

Water temperature:      degrees F

### A. First Weather Observation (to be completed during 1st time block of boat observations)

Time:  7:59 or before    8-9:59 AM    10-11:59 AM    12-1:59 PM    2-3:59 PM    4-5:59 PM    6 PM or later

<b>Air Temp.</b>	<span style="border: 1px solid black; padding: 2px 5px;">  </span> <span style="border: 1px solid black; padding: 2px 5px;">  </span> <span style="border: 1px solid black; padding: 2px 5px;">  </span> F	<b>Water Conditions</b>	<b>Current</b>	<b>Visibility</b>	<b>Weather Conditions</b>
<b>Wind Speed</b>	<span style="border: 1px solid black; padding: 2px 5px;">  </span> <span style="border: 1px solid black; padding: 2px 5px;">  </span> knots	<input type="radio"/> Calm (less than 6") <input type="radio"/> Choppy (6" to 2') <input type="radio"/> Rough (over 2')	<input type="radio"/> Strong <input type="radio"/> Moderate <input type="radio"/> Weak/None	<input type="radio"/> Good <input type="radio"/> Fair <input type="radio"/> Poor	<input type="radio"/> Sunny <input type="radio"/> Raining <input type="radio"/> Partly Cloudy <input type="radio"/> Stormy <input type="radio"/> Cloudy

\*\*Actual form provides 3 blocks to record Weather Observations across the 4 hours of data collection



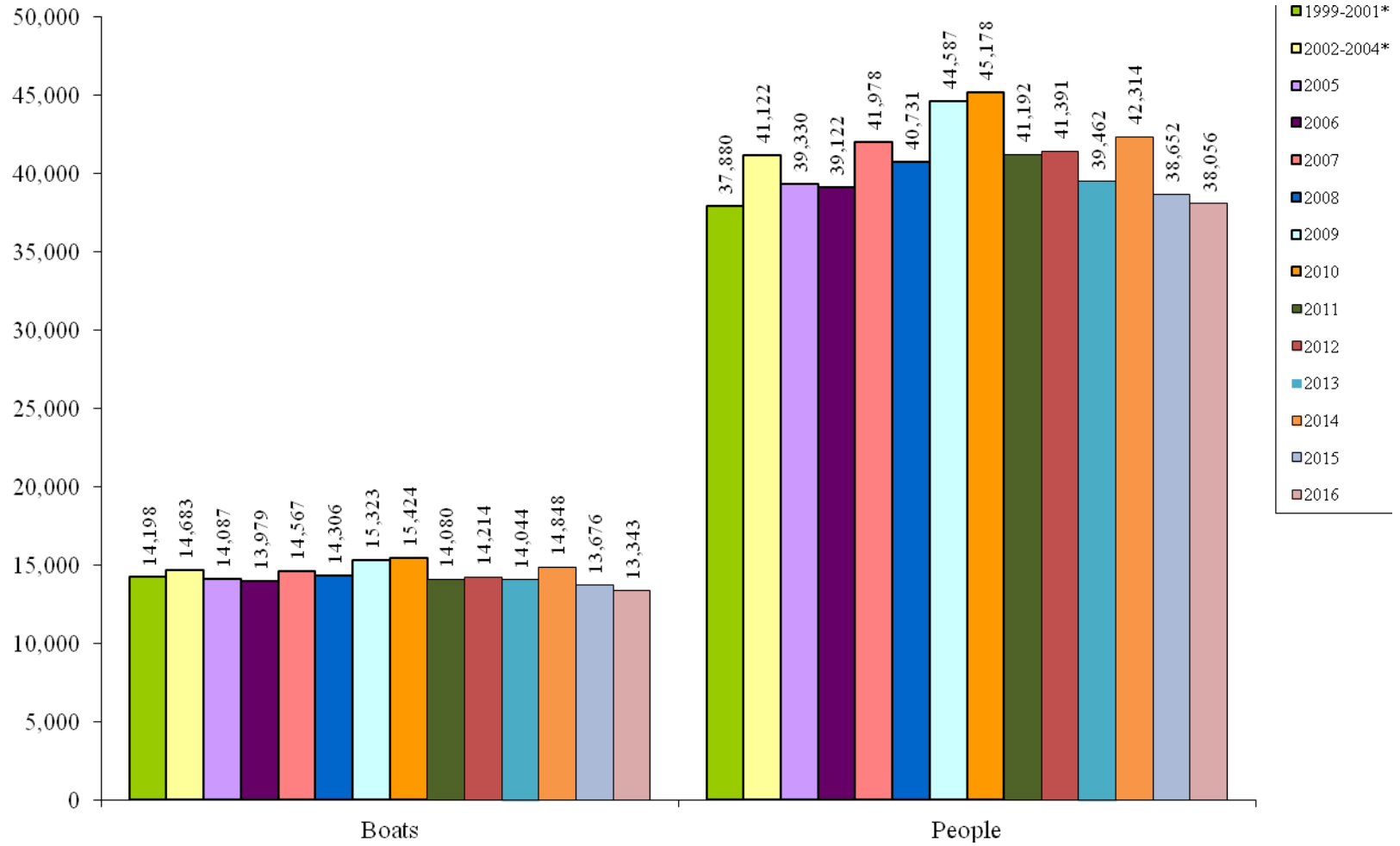
## VI. INFORMATION ON BOATS & PEOPLE OBSERVED

From 1999 to 2016, JSI has observed a total of 258,534 boats and 728,999 boaters (Figure K). This year, 2016, 13,343 boats carrying 38,056 boaters were observed. The proportions of the different types of boats, operation and activity of boats, as well as the age and gender of the boaters observed has remained fairly consistent (see Figures L2 through R2). This indicates not only that the sites chosen yielded diversity in the boats and boaters observed each year, but also that diversity has remained relatively consistent across the years. These figures demonstrate that the degree of representativeness of the sample of recreational boaters and their boating habits remained relatively constant across this seventeen year span.

Figures S through Y illustrate the weather and water conditions across the sites from year to year. Like the boat and boater data, across all of the sites, the mixture of the weather and water conditions remained fairly constant over the years. Therefore, any overall changes reported in life jacket wear rates were not due to changes in types of boats or boaters observed from year to year, and most likely not due to fluctuations in weather or water conditions across the sites. Of course, at individual site locations changes in these factors from year to year could account for sizable fluctuations in wear rates at individual sites.

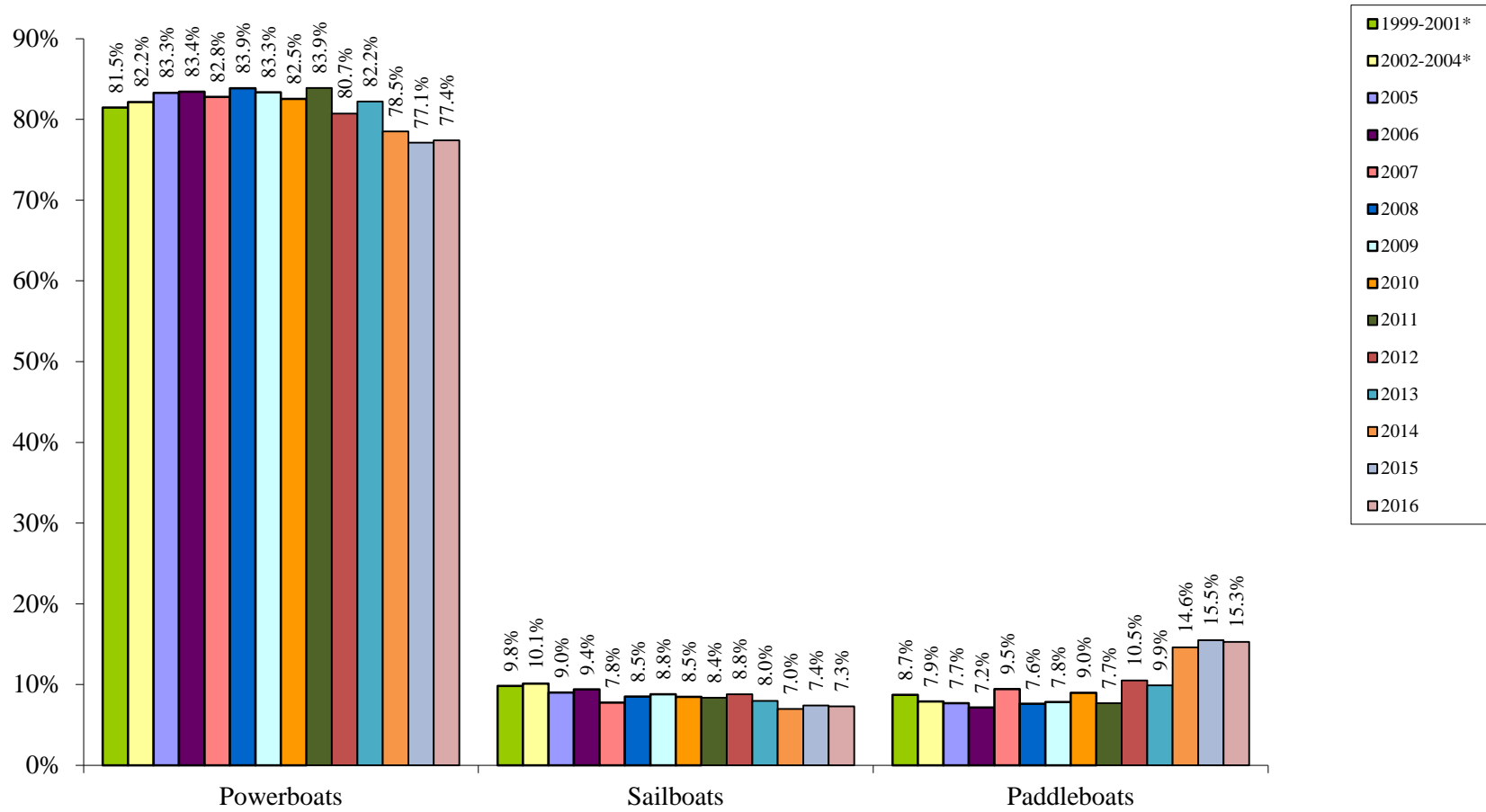
All figures in this section have been modified slightly from reports prior to 2011. The percentages now exclude (like the 2011 report) any missing observations on a particular characteristic. Since missing observations are relatively rare, this switch in presentation does not result in any major shifts in proportions shown in previous reports (before 2011).

Figure K – Number of Boats and People



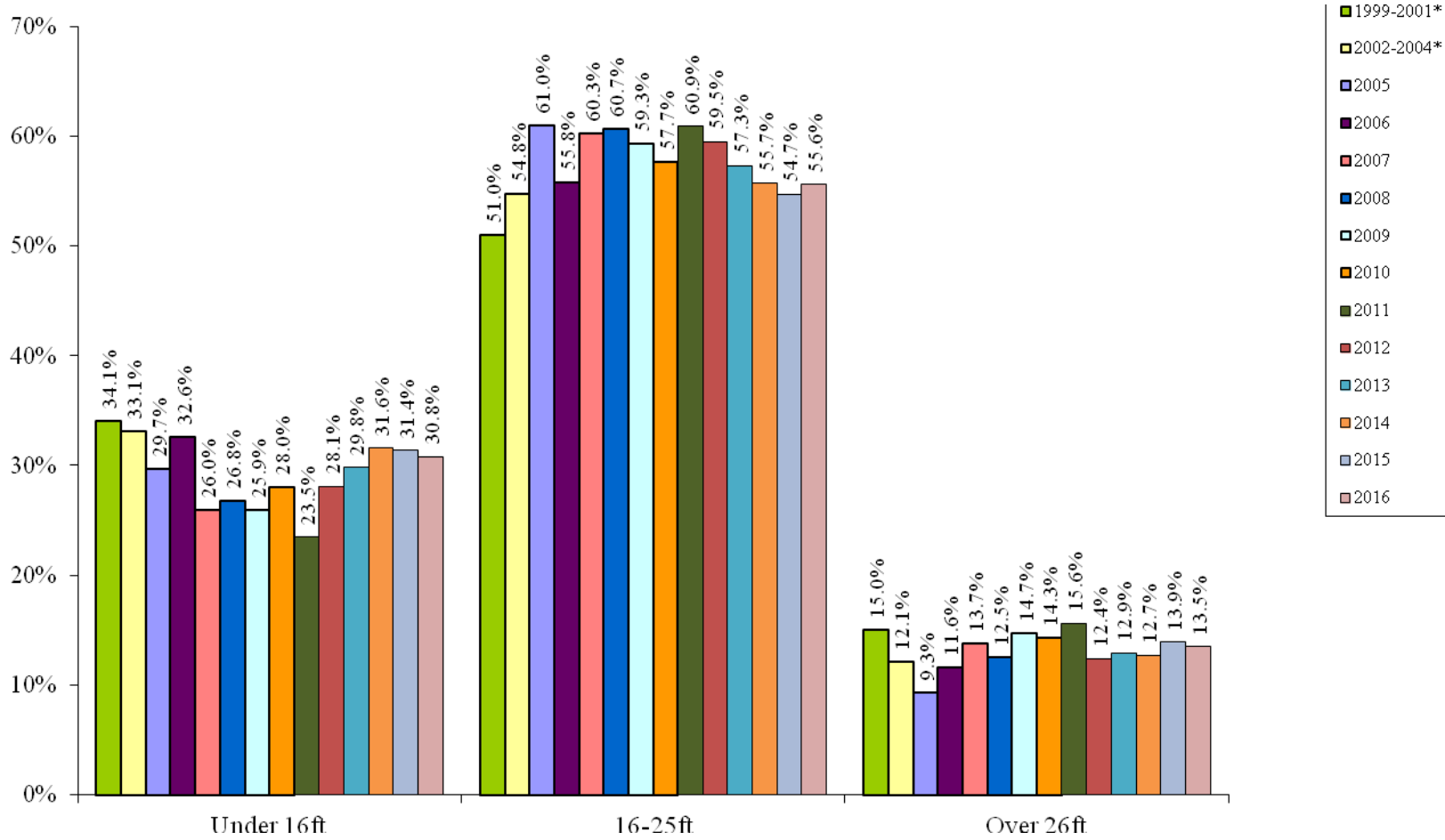
\*Three-year average

Figure L – Types of Boats



\*Three-year average

Figure M – Length of Boats



\*Three-year average

Figure N – Length of Boats 2004-2016 Data Only

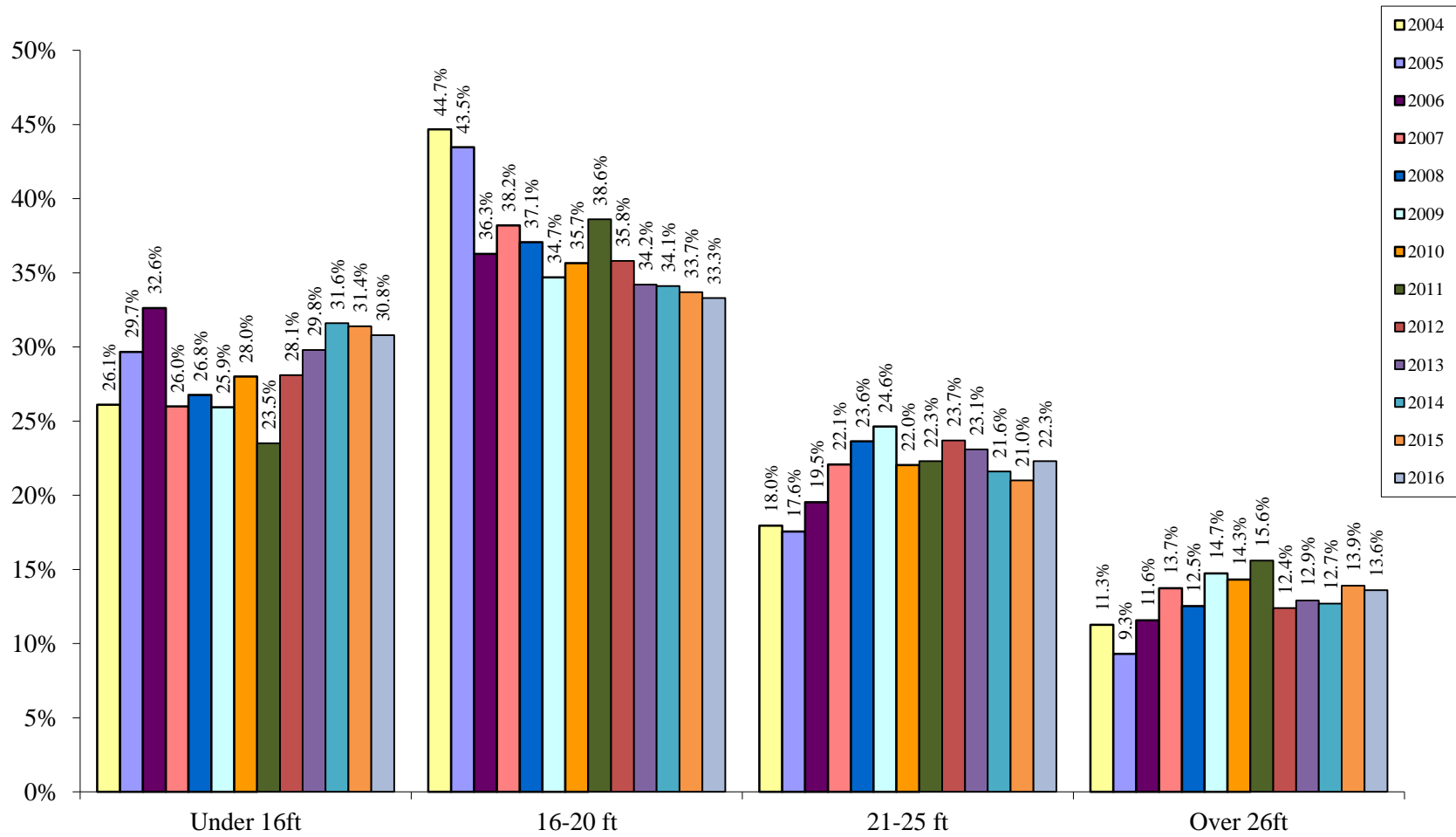
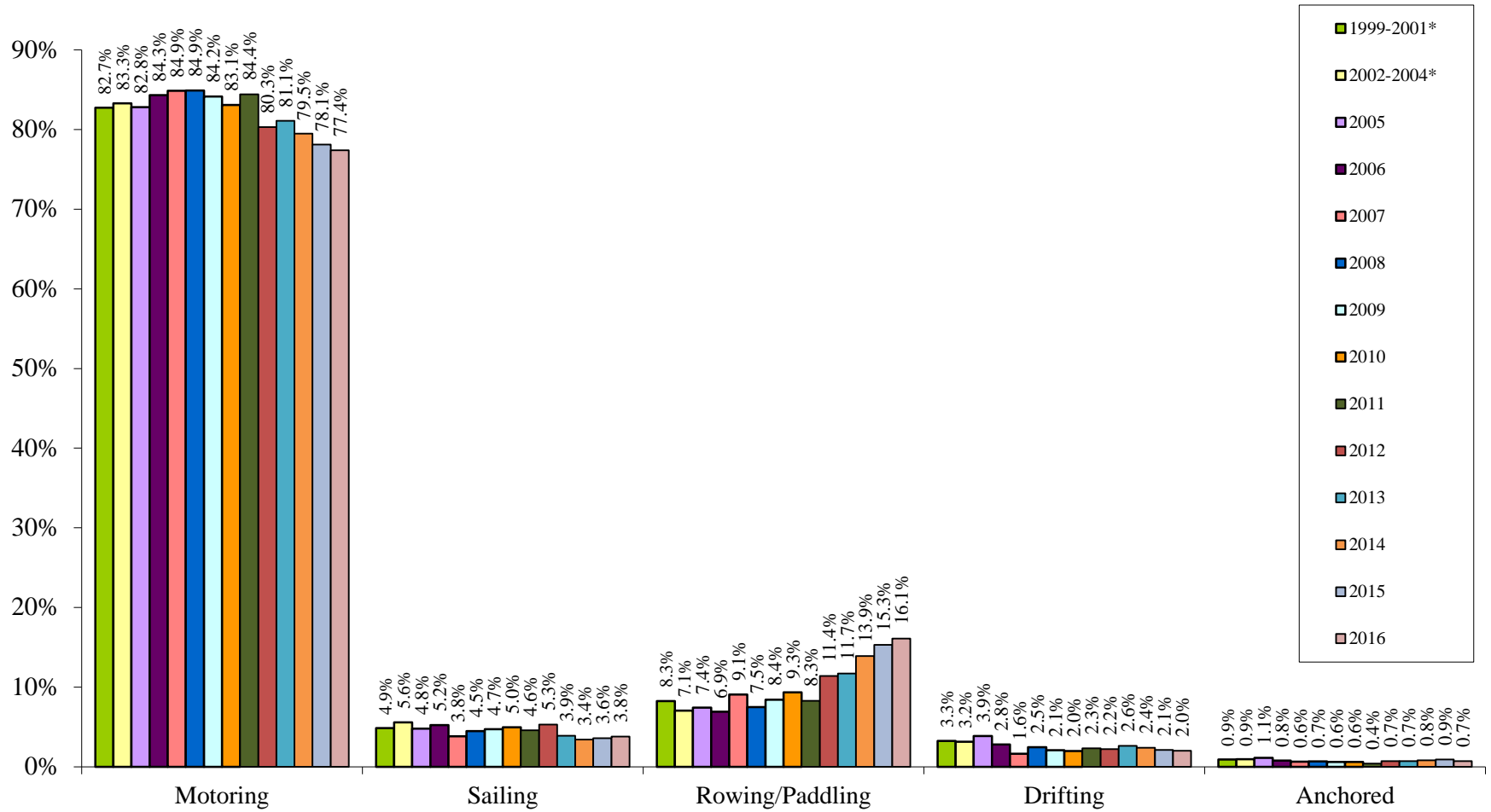
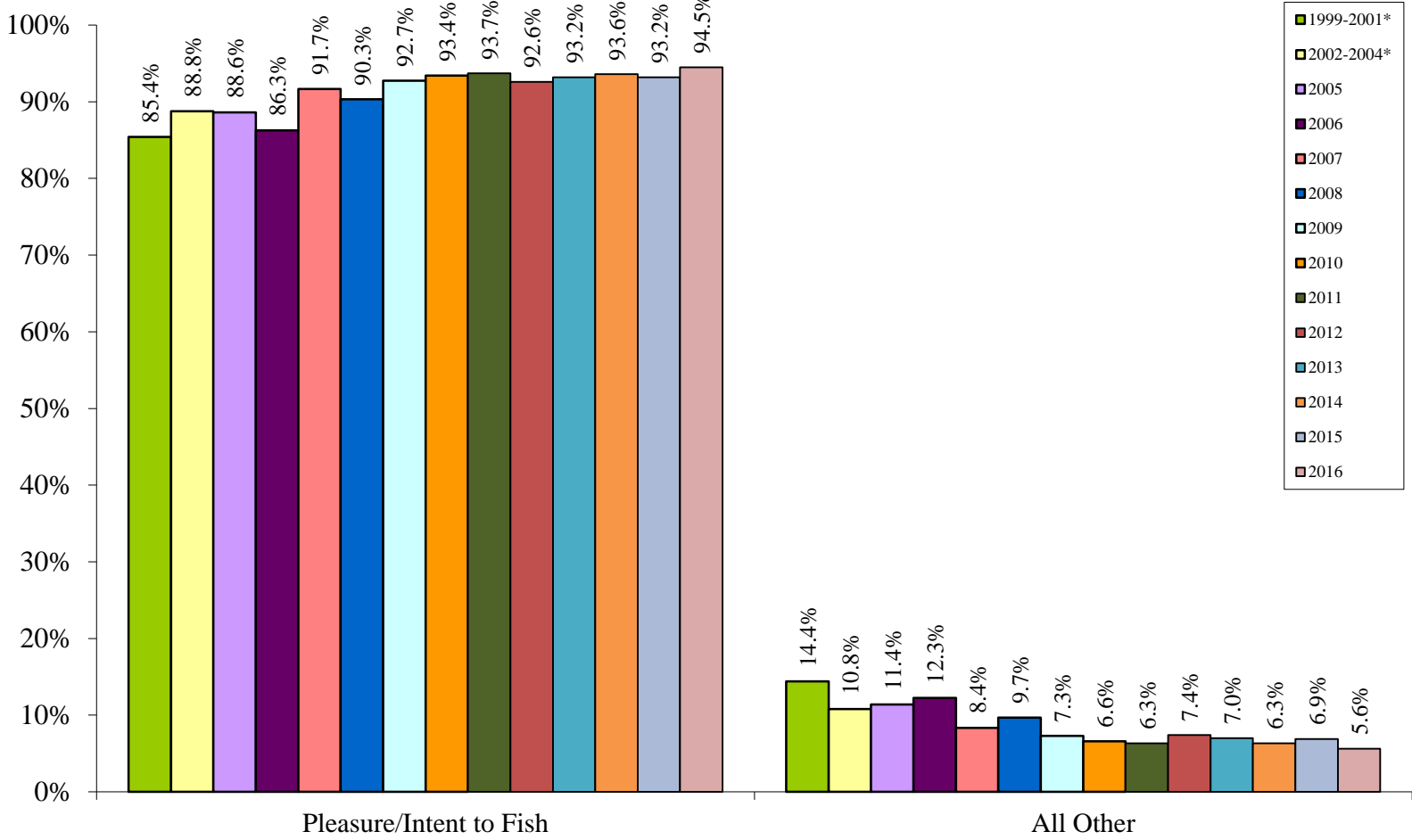


Figure O – Operation of Boats



\*Three-year average

**Figure P1 – Activity of Boaters—ALL YEARS\***



\*Three-year average

Figure P2 – Activity of Boaters 2007-2016 Data

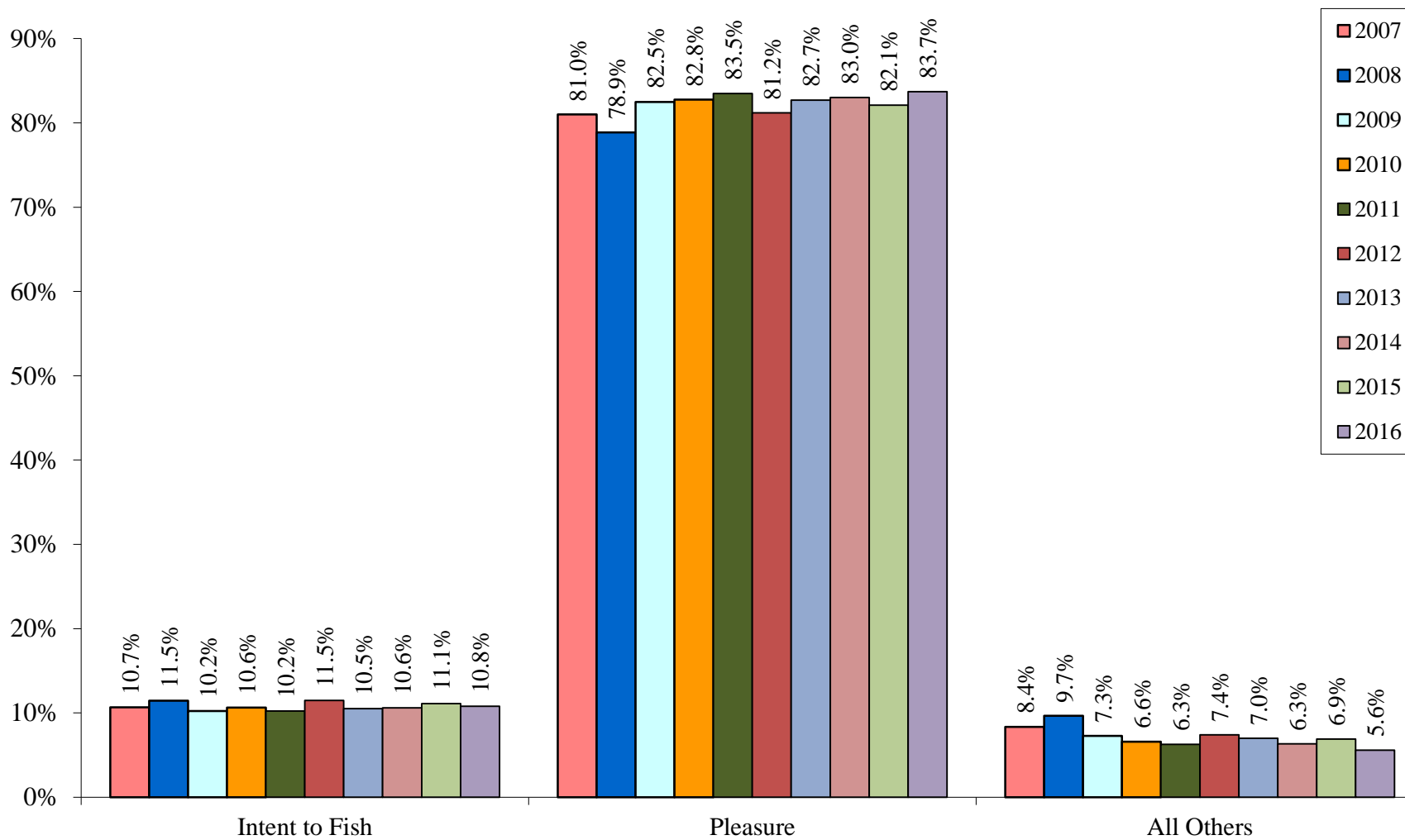
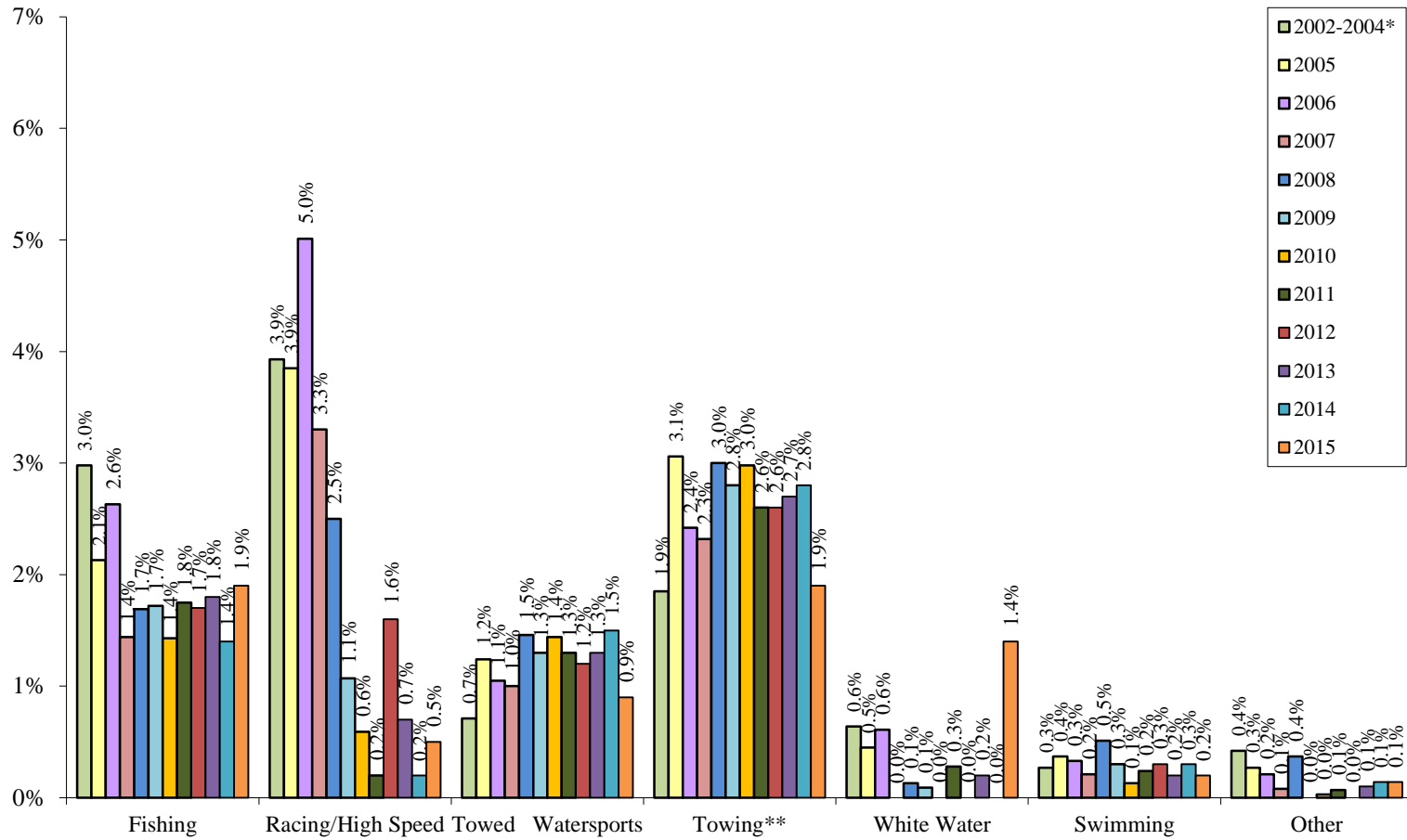




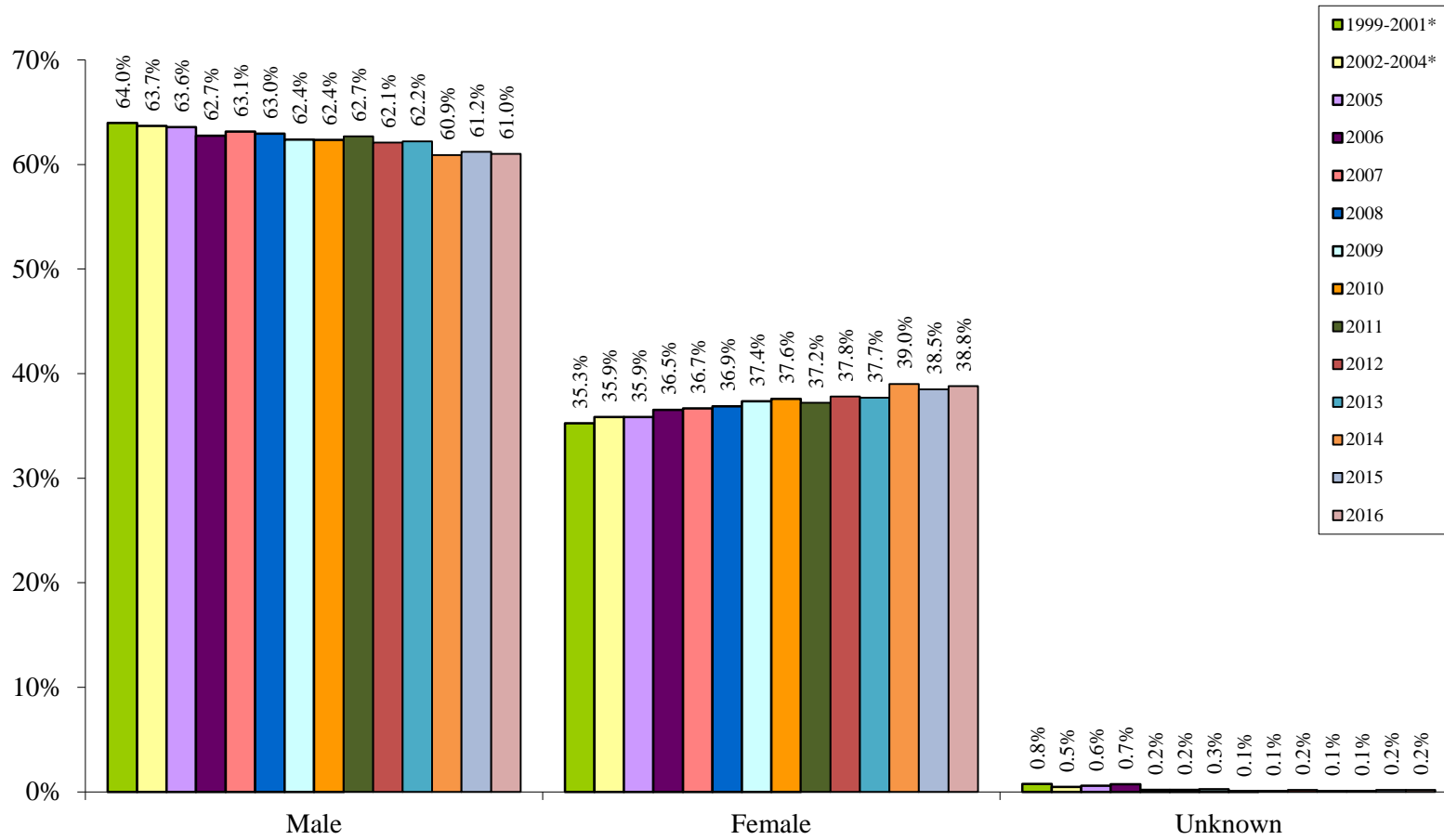
Figure P3 – Activity of Boaters 2002-2016



\*Three-year average

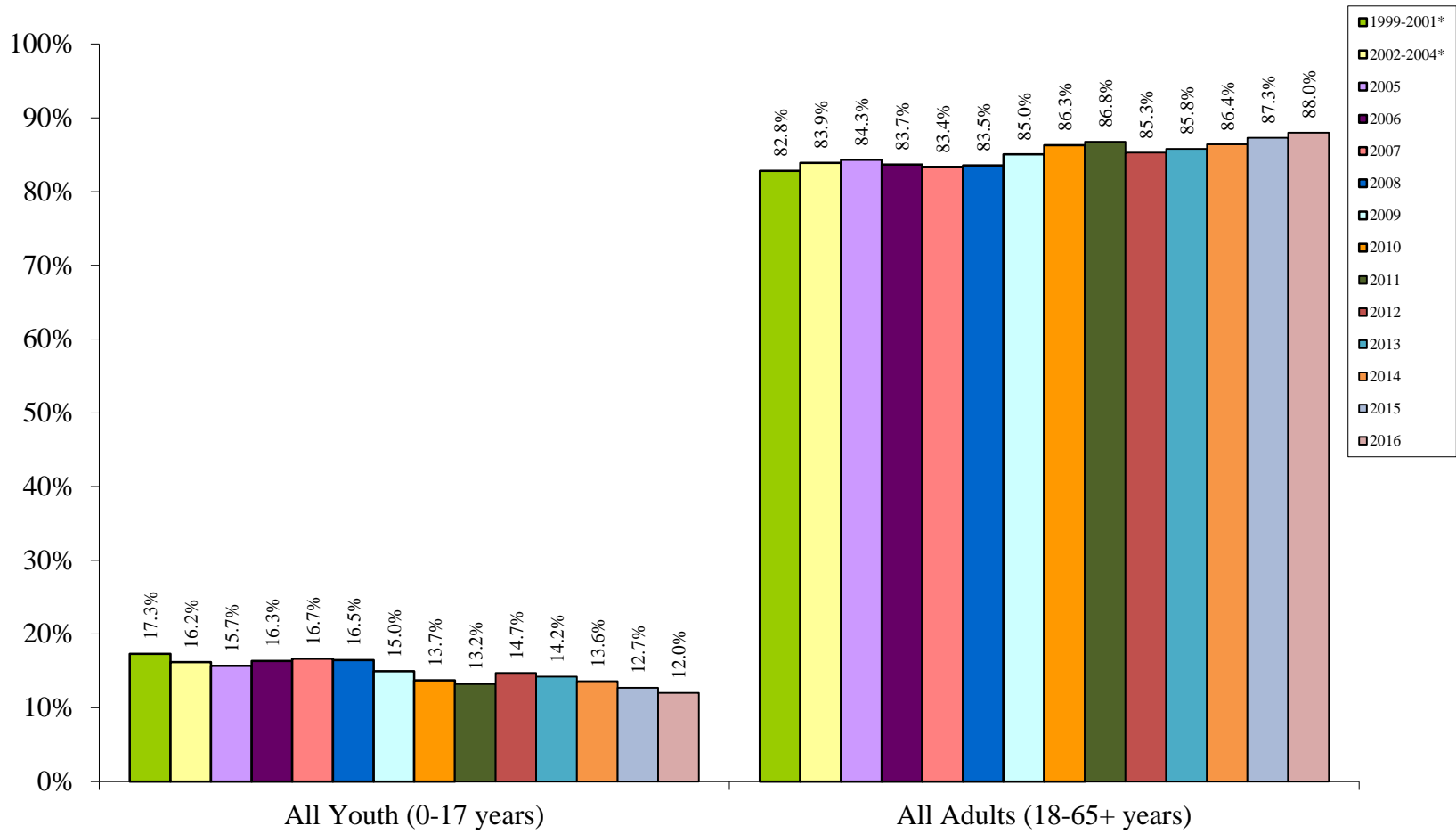
\*\*The activity “Towing” indicates that these boaters were passengers in a boat towing water-skiers or other towing activities. Likewise, “Towed Watersports” includes all towing sports and is reserved for the boaters in the water being towed. The label was changed in April 2010.

Figure Q – Gender of Boaters



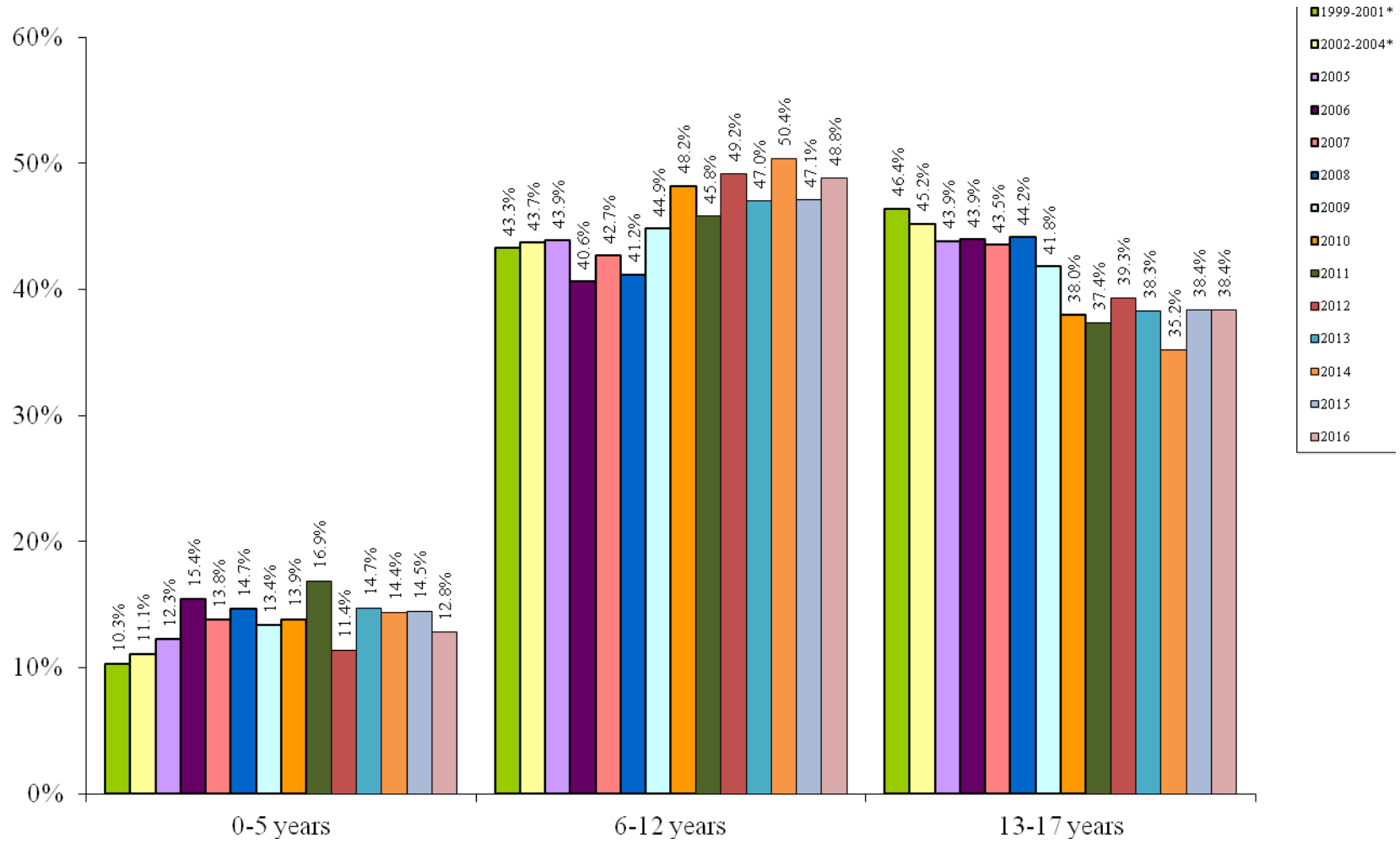
\*Three-year average

Figure R1 – Age of Boaters



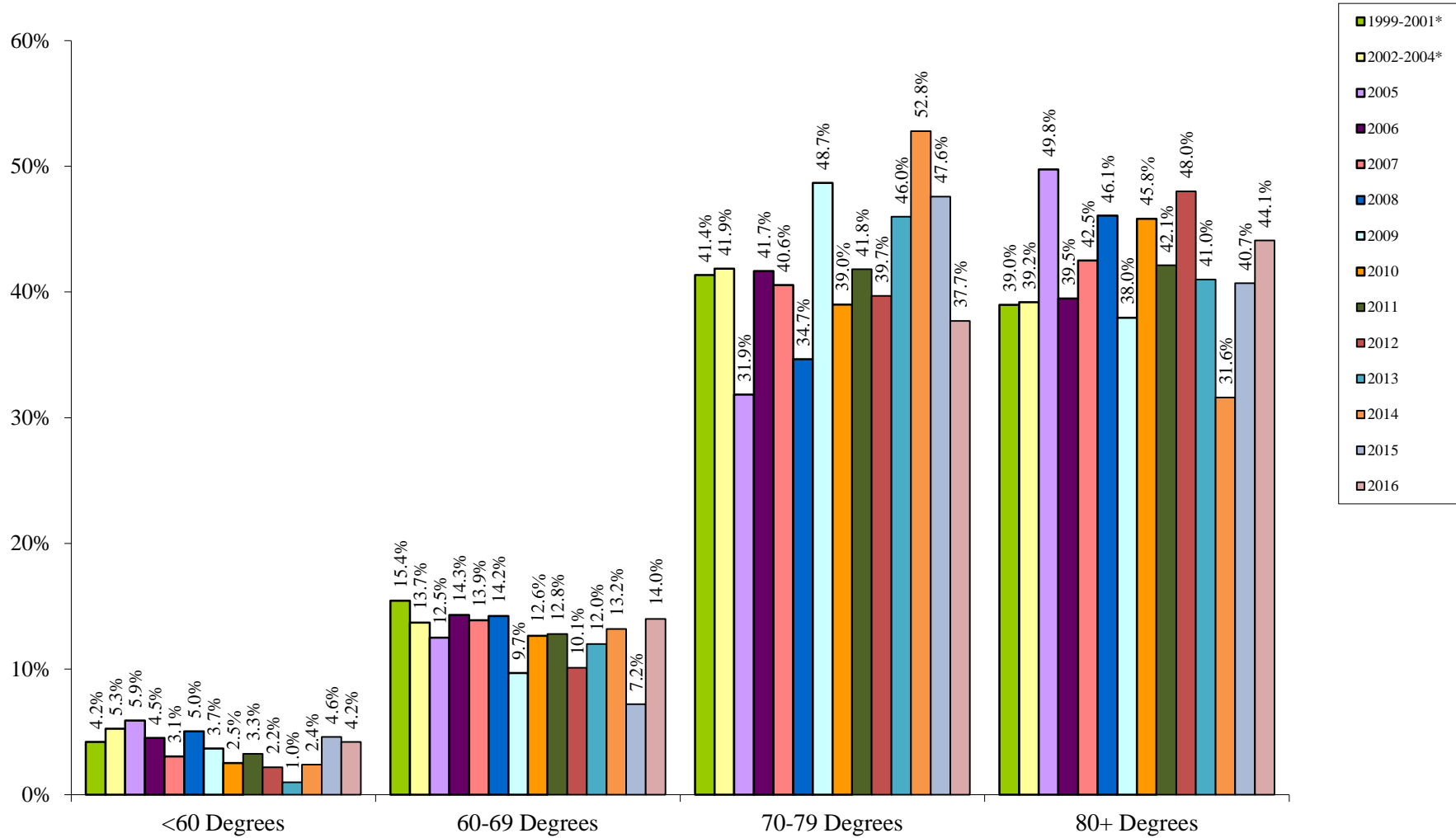
\*Three-year average

Figure R2 – Age of Youth Boaters



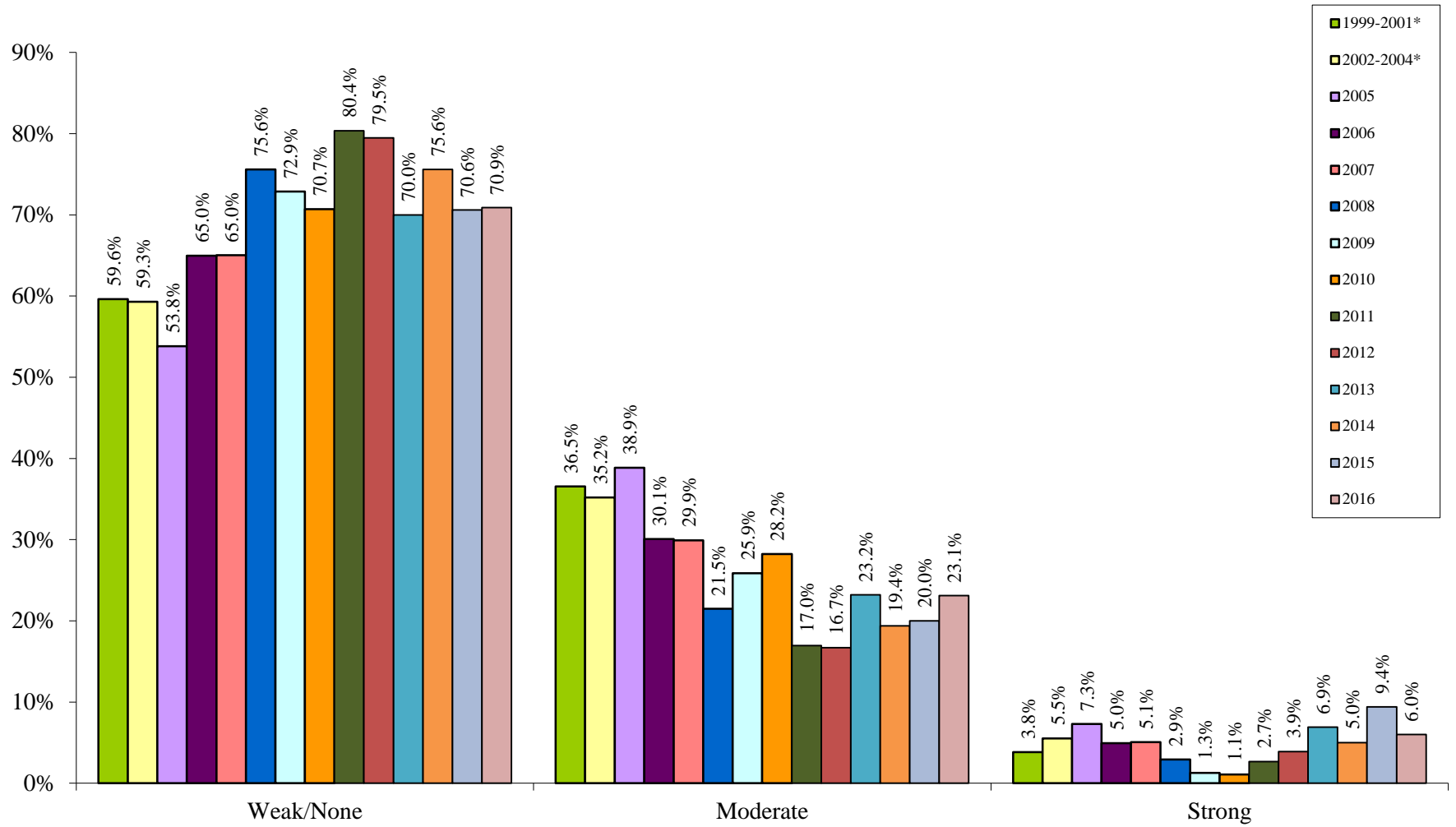
\*Three-year average

Figure S – Water Temperature in which ALL Boaters were Observed



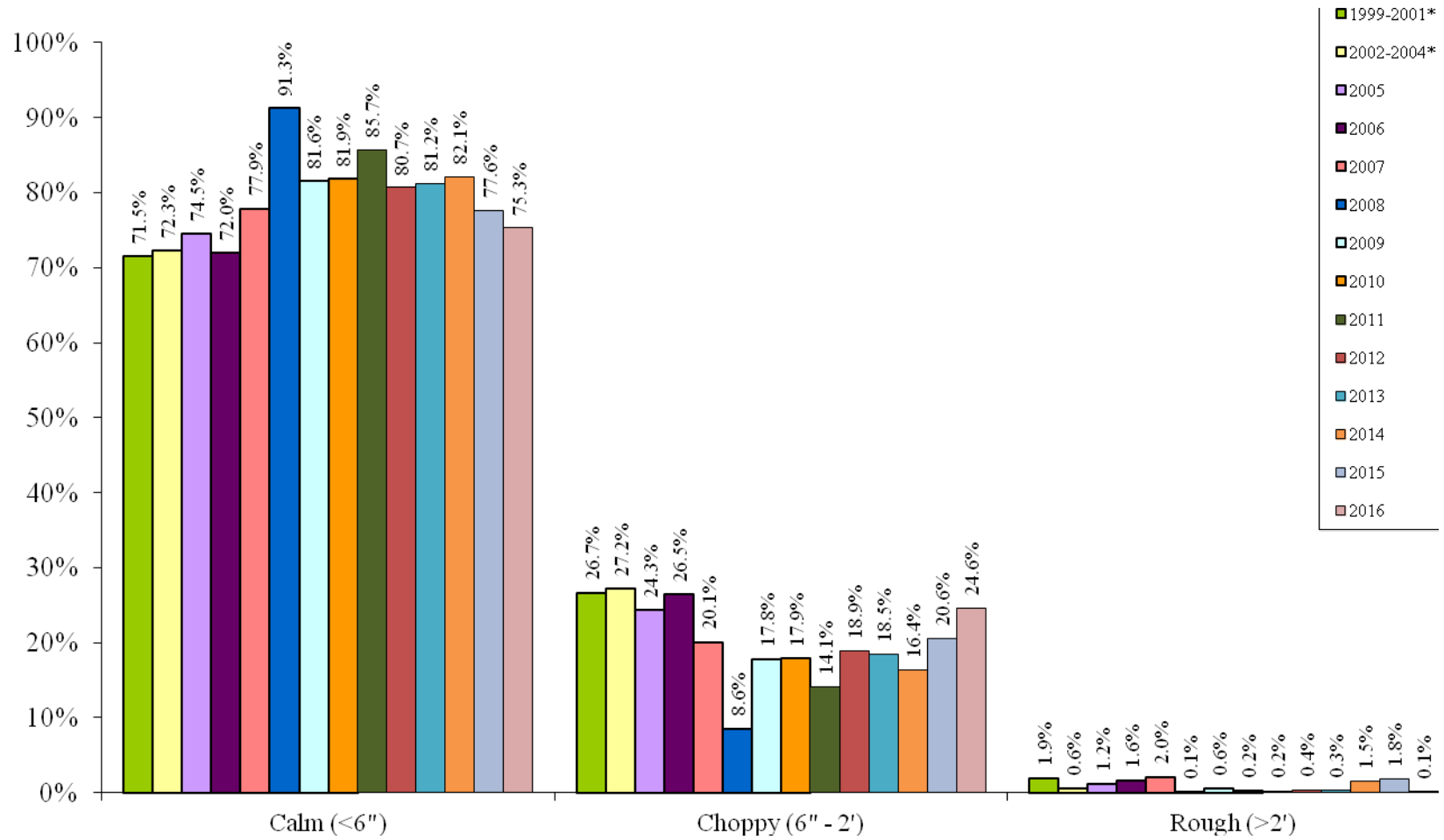
\*Three-year average

Figure T – Water Current in which ALL Boaters were Observed



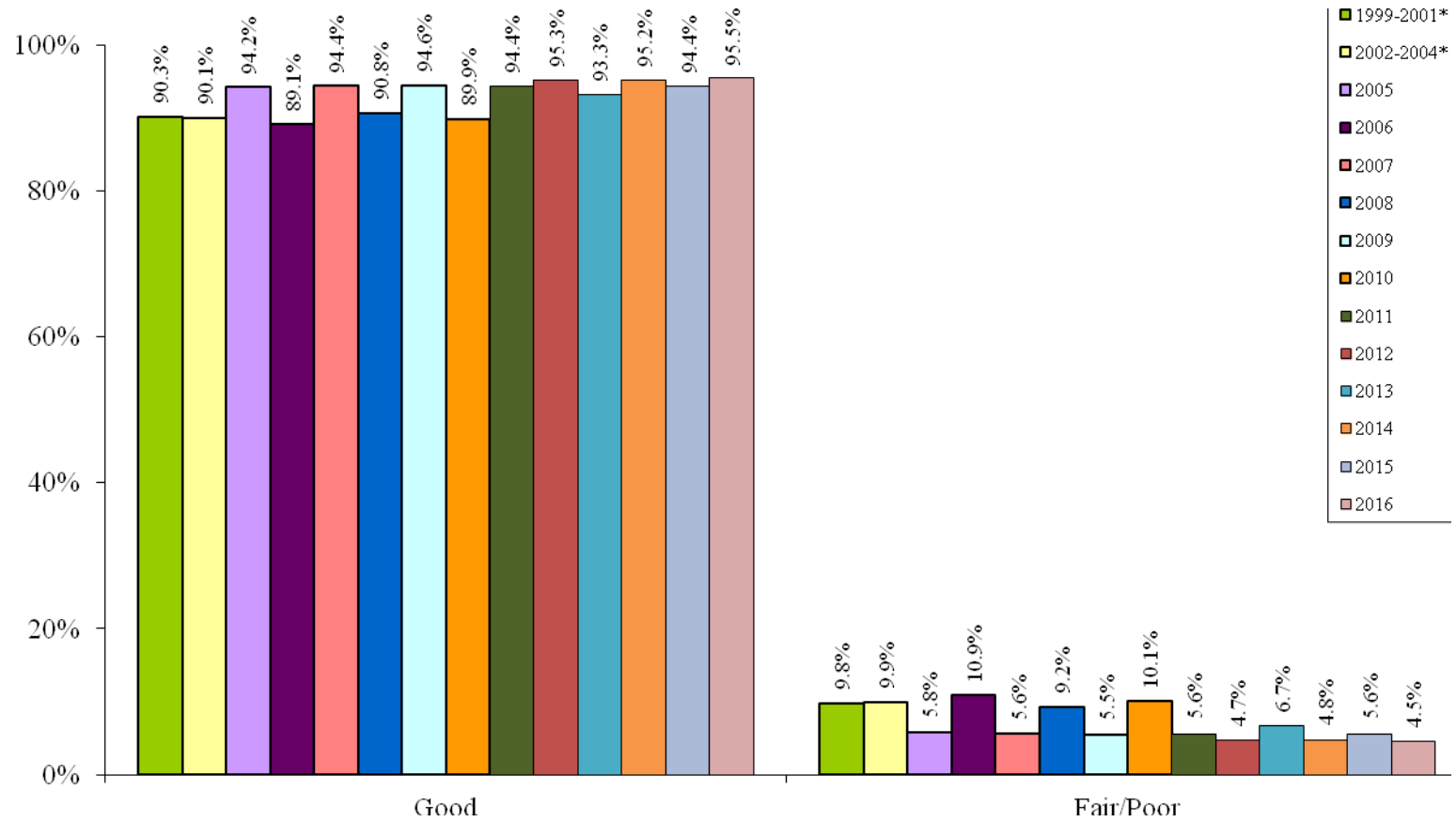
\*Three-year average

Figure U – Wave Height in which ALL Boaters were Observed



\*Three-year average

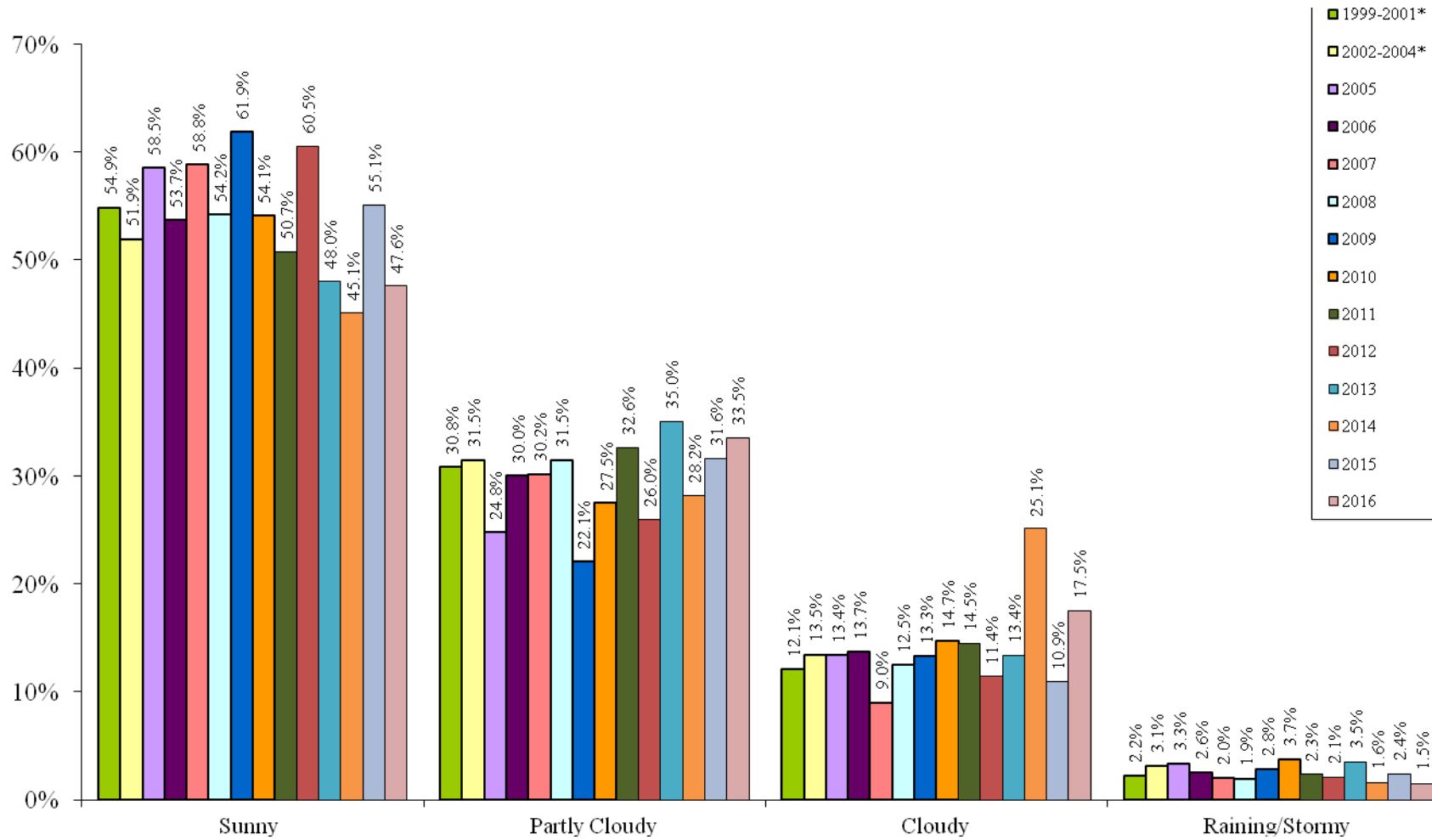
Figure V – Visibility in which ALL Boaters were Observed



\*Three-year average

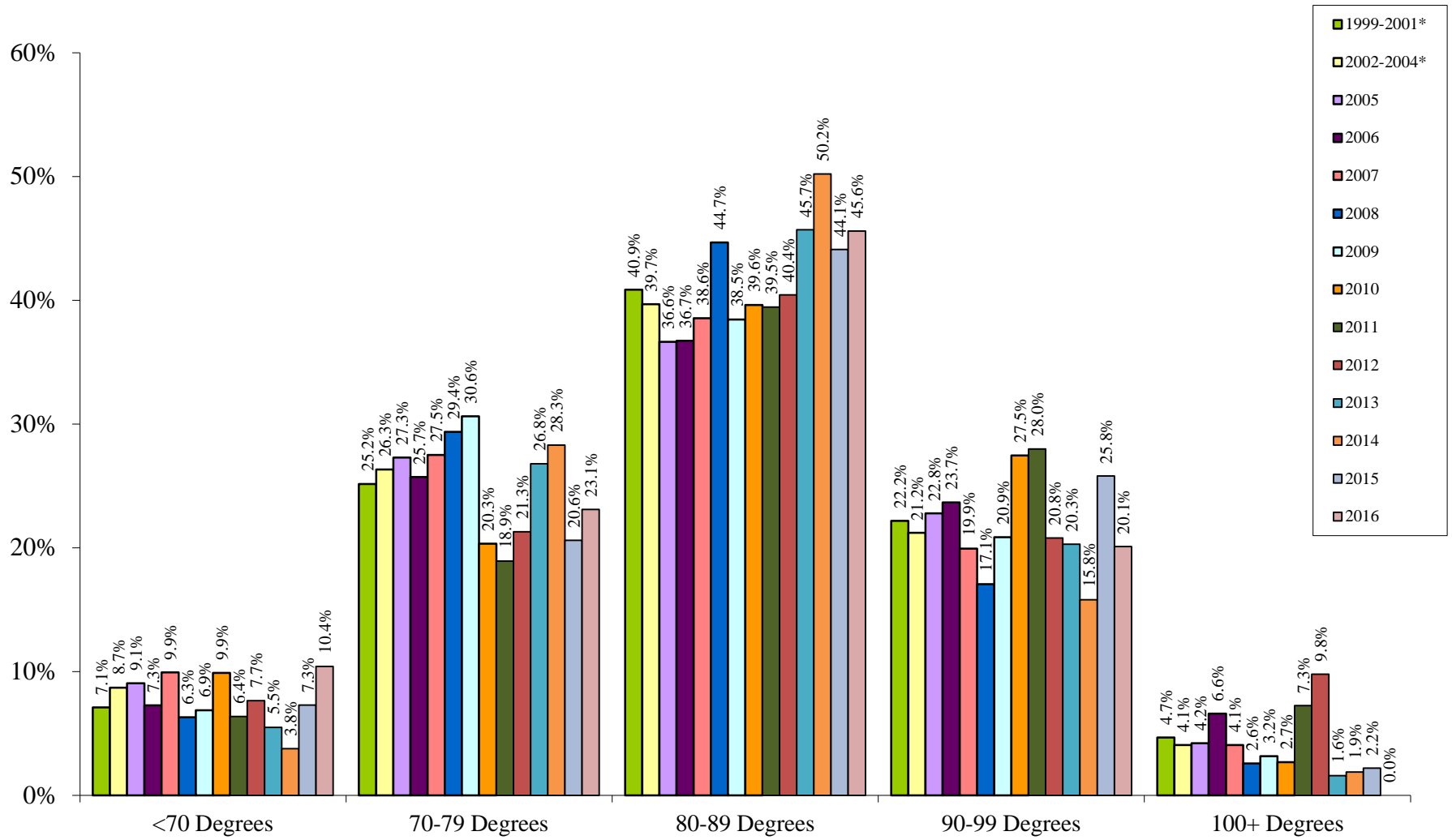


Figure W – Weather in which ALL Boaters were Observed



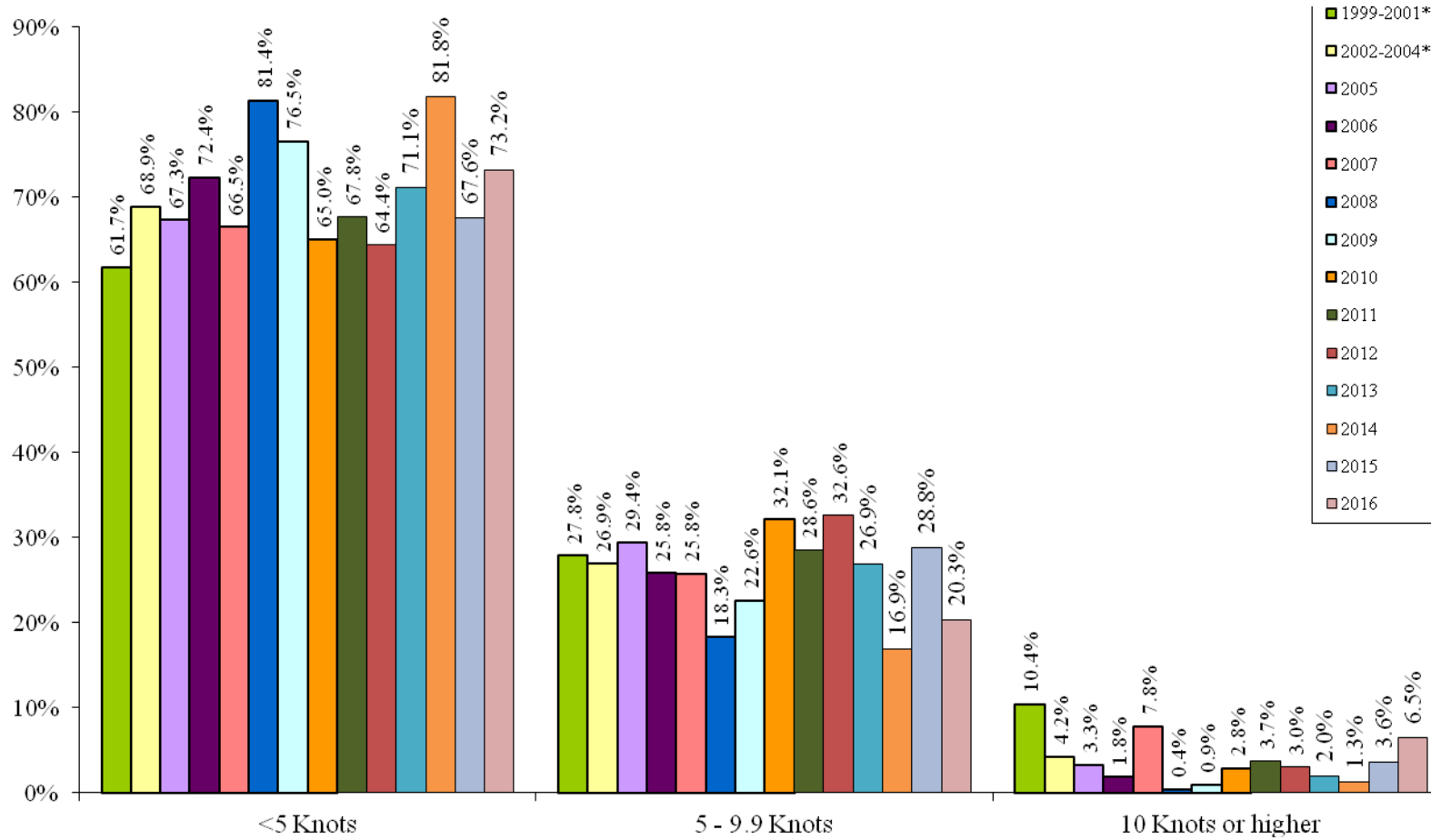
\*Three-year average

Figure X – Air Temperature in which ALL Boaters were Observed



\*Three-year average

Figure Y – Wind Speed in which ALL Boaters were Observed



\*Three-year average