

Loch Lomond Recreational Boat Survey (1989 to 2022)

A Commissioned Report for

The Loch Lomond & the Trossachs
National Park Authority

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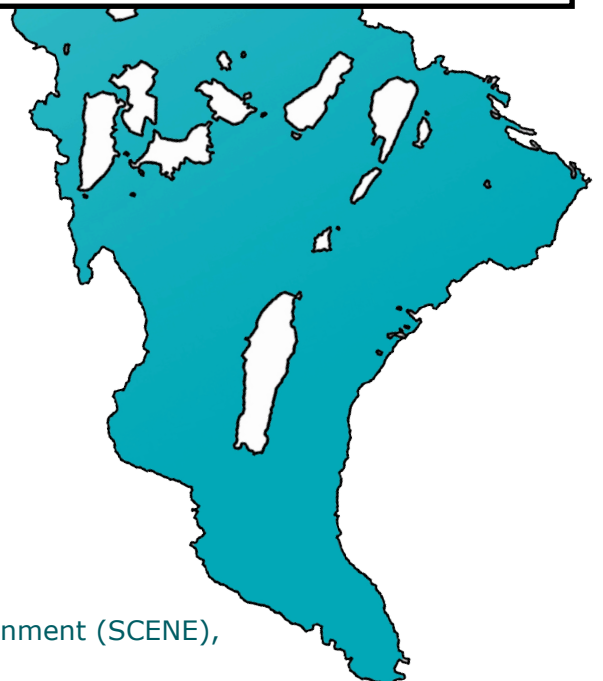
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Introduction

This report examines change in recreational boat activity over the whole of Loch Lomond over time. Boat surveys have been conducted on Loch Lomond since 1989 with yearly surveys until 2013, with a gap in time until 2022. This report examines: total boat numbers; powered boats only; the distribution of boats in different areas; boat types change over time.

Methods

Monitoring of craft activity on Loch Lomond has been conducted using the same methodology since 1989 (see full description in Adams et al. 1992¹). A brief summary of the method is provided in figure 1. Between 1989 and 2013 crafts were counted in 12 geographic areas of Loch Lomond and allocated to 12 boat category types (table 1). For surveys in 2022 an additional craft type, paddleboard, was added.

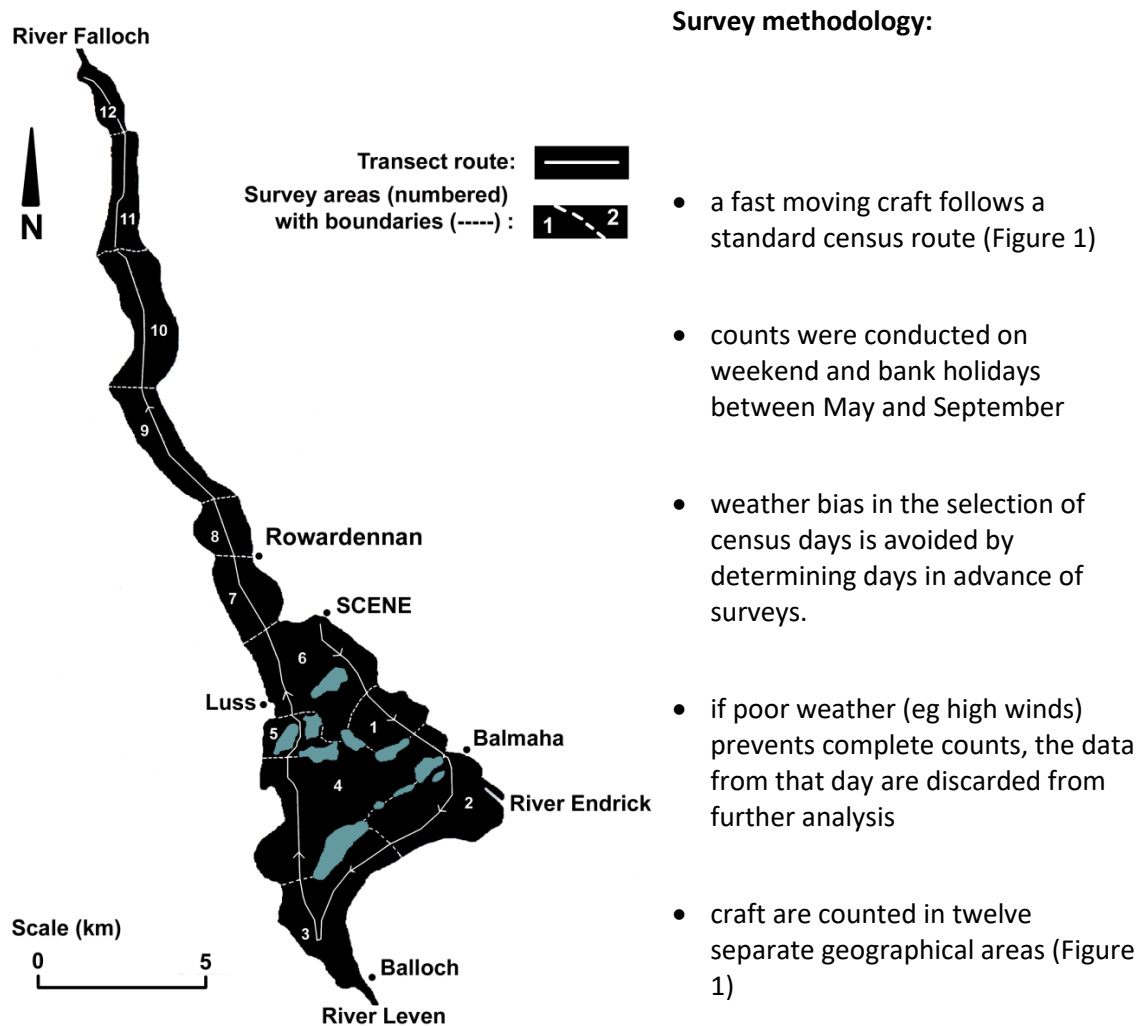


Figure 1: The standard census route taken by the survey vessel

¹ Adams CE, Tippett R, Nunn S & Archibald 1992. The utilisation of a large inland waterway (Loch Lomond, Scotland) by recreational craft. *Scottish Geographical Magazine* **108**:113-118

Table 1: Boat types included in surveys split by powered and non-powered. *Paddleboard added in 2022

Boat type	Powered/non-powered
<i>Fishing boat</i>	<i>Powered</i>
<i>Cruiser</i>	<i>Powered</i>
<i>High Sp.</i>	<i>Powered</i>
<i>Speed Boat</i>	<i>Powered</i>
<i>Pleasure day boat</i>	<i>Powered</i>
<i>Jet Ski</i>	<i>Powered</i>
<i>Tour Boat</i>	<i>Powered</i>
<i>Ferry Boat</i>	<i>Powered</i>
<i>Rowboat</i>	<i>Non-powered</i>
<i>Sailing Dinghy</i>	<i>Non-powered</i>
<i>Wind Surfing</i>	<i>Non-powered</i>
<i>Canoe</i>	<i>Non-powered</i>
<i>Yacht</i>	<i>Non-powered</i>
<i>Paddleboard*</i>	<i>Non-powered</i>

Results-

Descriptive data 2022-

There was a total of 3399 boats recorded in 2022. In 2022 canoes were the most popular boat type with a total 759 of counted across all surveys undertaken. Paddleboards were the second most counted with 739 (Fig.2). The areas 1-6 had higher boat numbers than areas 7-12, with area 5 having the highest, with a total of 855 boats recorded in area 5 from all surveys in 2022. Area 11 was the least popular with a total of 96 boats recorded in 2022. The mean number of boats per area is 348 sd±263.

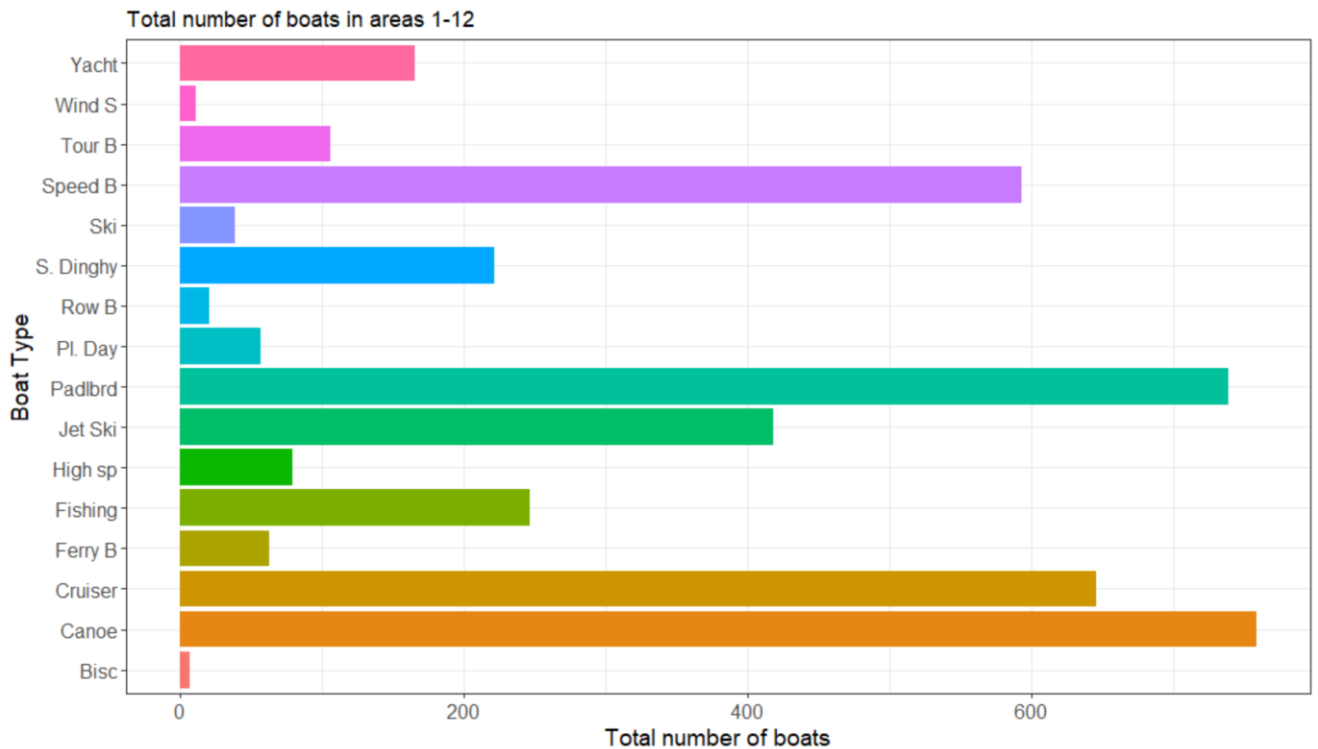


Figure 2: The total number of boats recorded in 2022 in areas 1 to 12 combined split into boat type.

Total boat numbers over time

The daily mean number of boats in the census in 2022 is the 3rd lowest since 1989 (Fig.3 & Table 2). The 1990s saw a large peak in activity, the highest mean was in 1995 with an overall mean of 448 boats a day (Fig.3 & Table 2). The largest number of boats on a single day was in 1999 with 1275 boats, the daily highest count then dropped in the early 2000s and has remained relatively low since then (Fig.3 & Table 2)

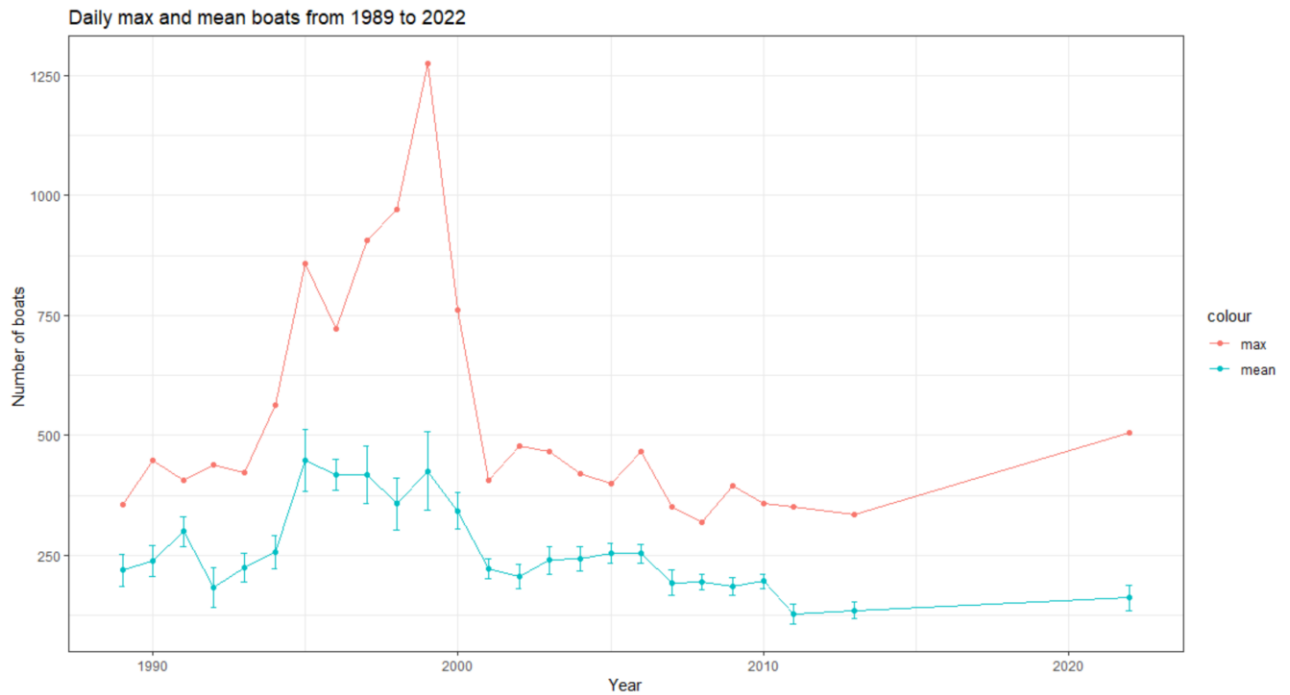


Figure 3: The mean total number of boats (all types, all areas) in Loch Lomond from 1989 to 2022 with standard error bars (blue) and the max number of boats counted on any census day in that year (red).

Table 2: The mean, max, and standard deviation of the daily total number of boats each year and N (number of surveys) and the standard error.

YEAR	MEAN	MAX	STDEV	N	SE	TOTAL
1989	219	357	109	10	34	2193
1990	238	448	102	10	32	2378
1991	300	406	98	10	31	2995
1992	183	440	118	8	42	1466
1993	225	422	96	10	30	2250
1994	257	563	161	22	34	5644
1995	448	857	225	12	65	5370
1996	418	723	134	17	32	7111
1997	418	907	262	19	60	7943
1998	358	971	255	22	54	7870
1999	426	1275	356	19	82	8097
2000	343	762	171	20	38	6866
2001	222	406	89	20	20	4434
2002	206	478	117	20	26	4123
2003	240	466	124	20	28	4793
2004	243	420	112	18	26	4375
2005	255	399	91	18	21	4587
2006	254	467	89	20	20	4569
2007	193	352	83	10	26	2122
2008	195	319	62	16	16	3112
2009	186	396	81	21	18	3915
2010	196	358	72	19	16	3524

2011	128	352	92	19	21	2299
2013	136	336	80	19	18	2449
2022	162	506	118	21	26	3399

Changes in proportion of powered boats over time.

The proportion of powered and non-powered boats using Loch Lomond has changed over time (Fig.7). In early survey years there was a higher percentage of powered boats. For example, in 2013 75% of boats were powered. This has decreased to 54% in 2022 (Fig.7). The relative frequency of powered craft in 2022 is very significantly lower in 2022 ($\chi^2 = 1327, P < 0.001$) than predicted based of the relative proportions of powered and non-powered craft recorded in surveys from 2000-2013. One possible cause of this could be the increase in paddleboarding and canoeing which have grown in popularity. However, paddleboarding has not been included in the data over time as it was only first recorded in 2022.

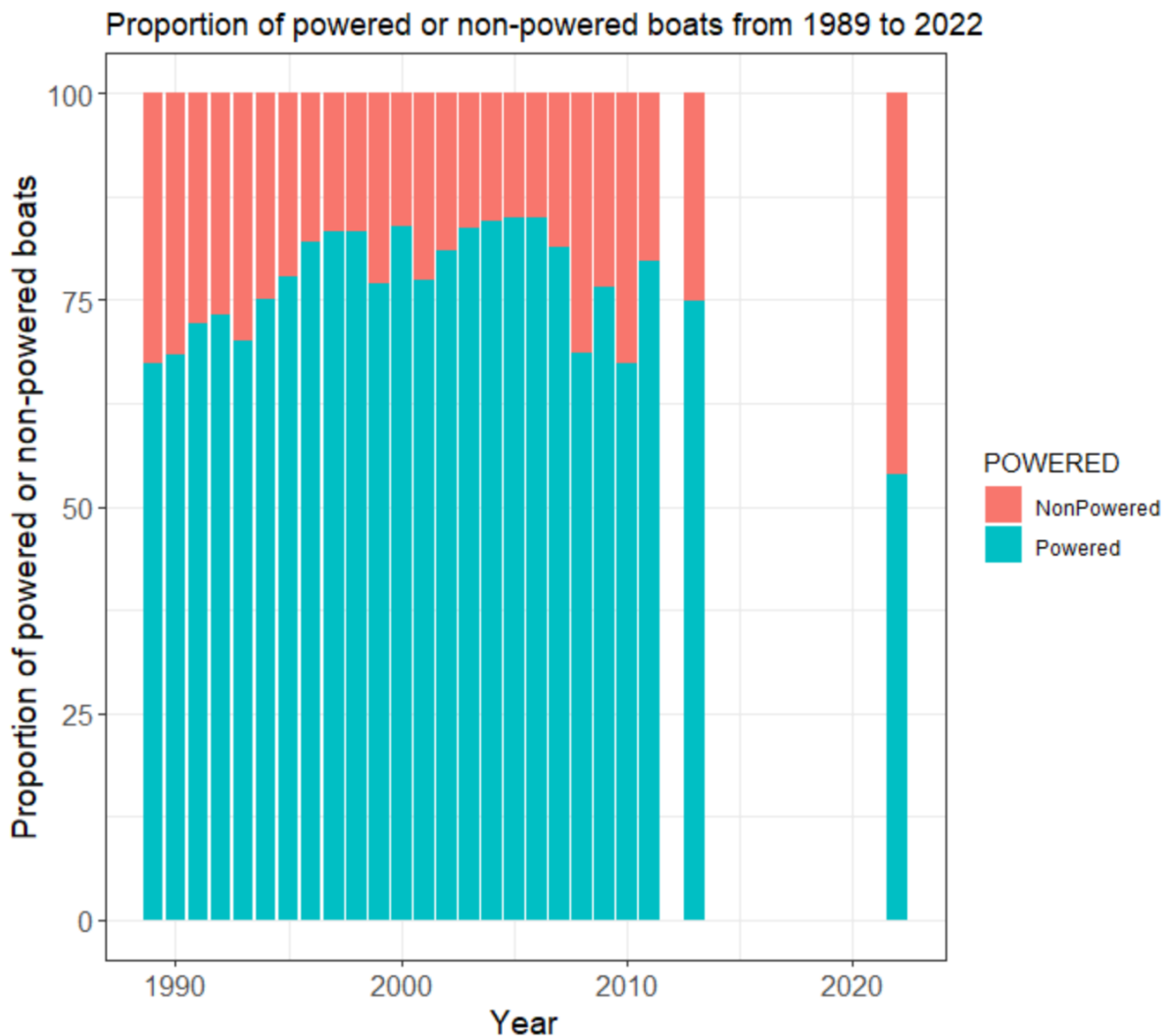


Figure 4: The ratio of powered to non-powered boats in Loch Lomond from 1989 to 2022

Distribution of boats in Loch Lomond over time

Boat density in different areas of Loch Lomond has changed over time. Area 5, which is at Luss, has consistently had the highest boat density since 1989 (Fig.8). This is followed by areas 1 and 12 (Milarrochy and the very north of the loch near the River Falloch). Both areas have high densities of boats, although this is more variable throughout time. In the 2022 census area 1 at Milarrochy is the second highest, followed by area 12 as having the third highest (Fig.8). See appendix for individual area changes over time. The relative difference in mean boat density in 2022 is not significantly different than from 2000-2013 ($\chi^2 = 11.5$, $P > 0.05$).

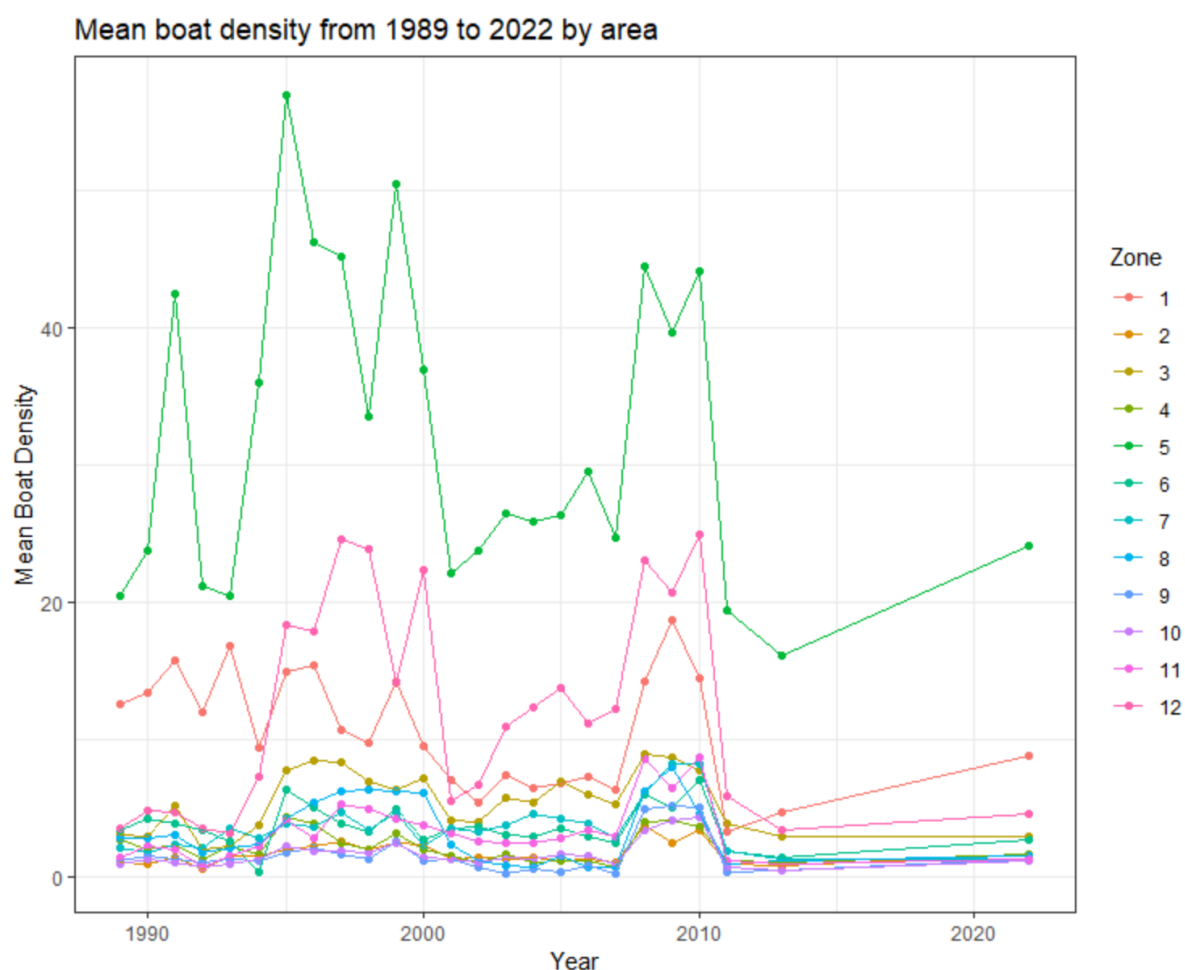


Figure 5: The mean boat density across 12 areas of Loch Lomond from 1989 to 2022

Boat type changes over time

There are some identifiable trends in the boat types using Loch Lomond since 1989. For example, early in the time series speed boats were often the most popular type of boat, overtaken by cruising boats in the early 2000s then after a peak in speed boats in 2013 there was a reduction in speed boat usage indicating that the spatial patterns of craft use has not changed over time. Canoes are the most popular type of boat in 2022 (Fig.9). Canoes have

seen a significant increase in popularity, (fig.9 and for individual trend see appendix). Other notable trends include the reduction in the use of Loch Lomond by windsurfers, having reduced from 9.67% in 1989 to 0.1% in 2022. The relative proportions of boat type in 2022 is significantly different than from that of 2000-2013 ($\chi^2 = 86.2$, $P < 0.005$).

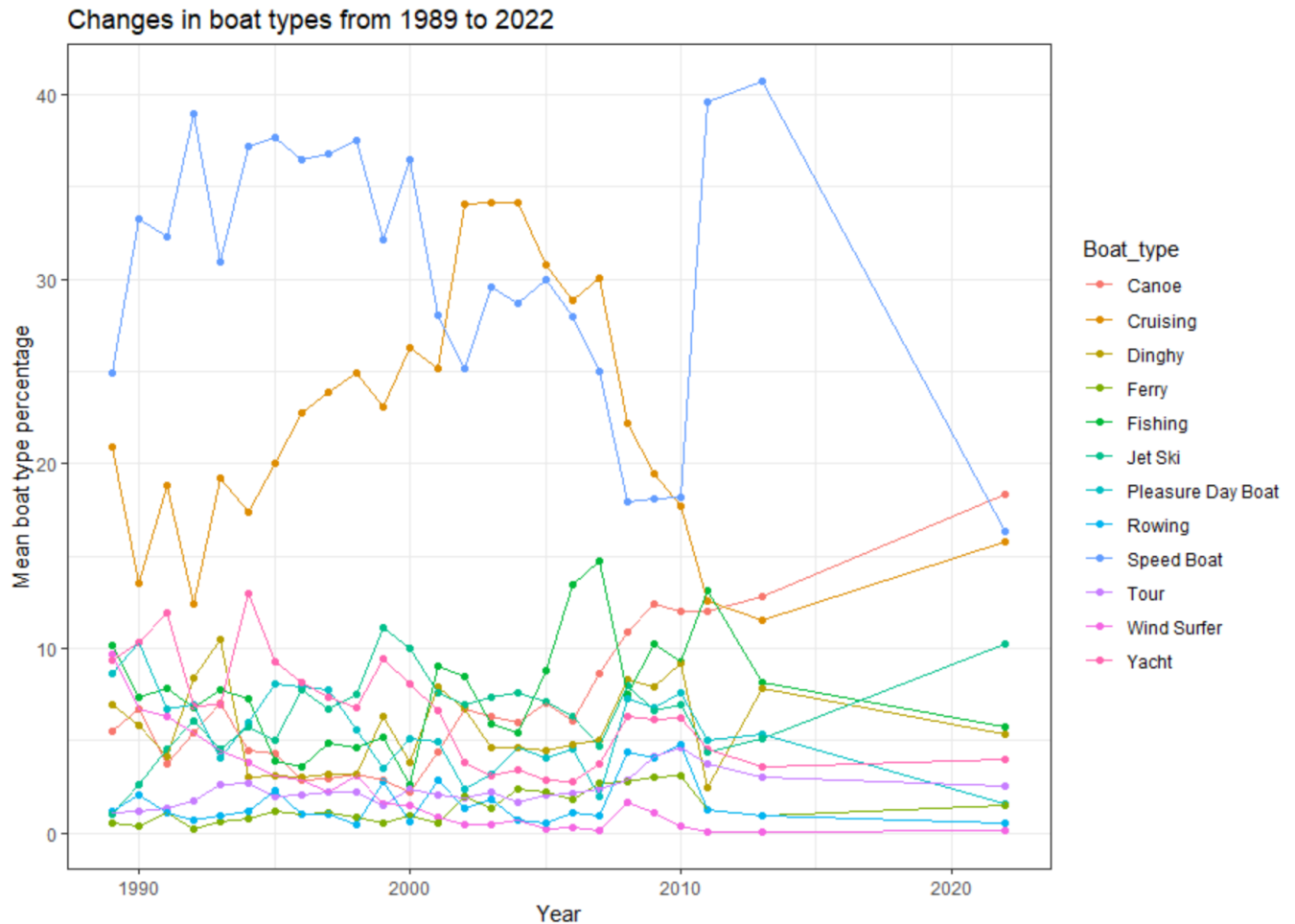


Figure 6: The changes in the percentage of the mean boat type from 1989 to 2022.

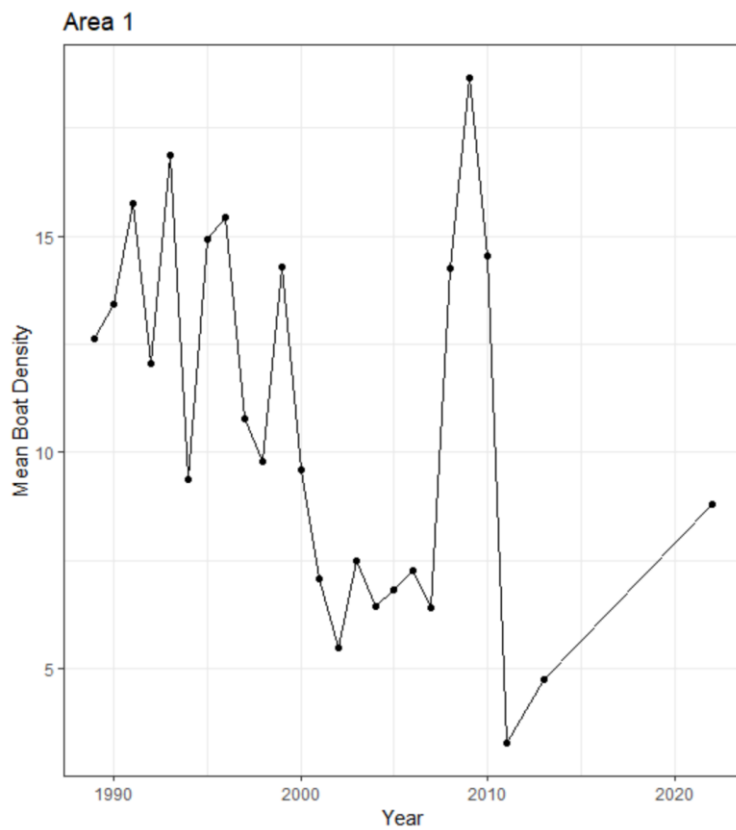
Table 3: Statistical analysis of changes in boat types from 1989 to 2022. Arrows indicate the direction of change (\uparrow = increase with time, \downarrow = decrease, and $-$ indicating no change).

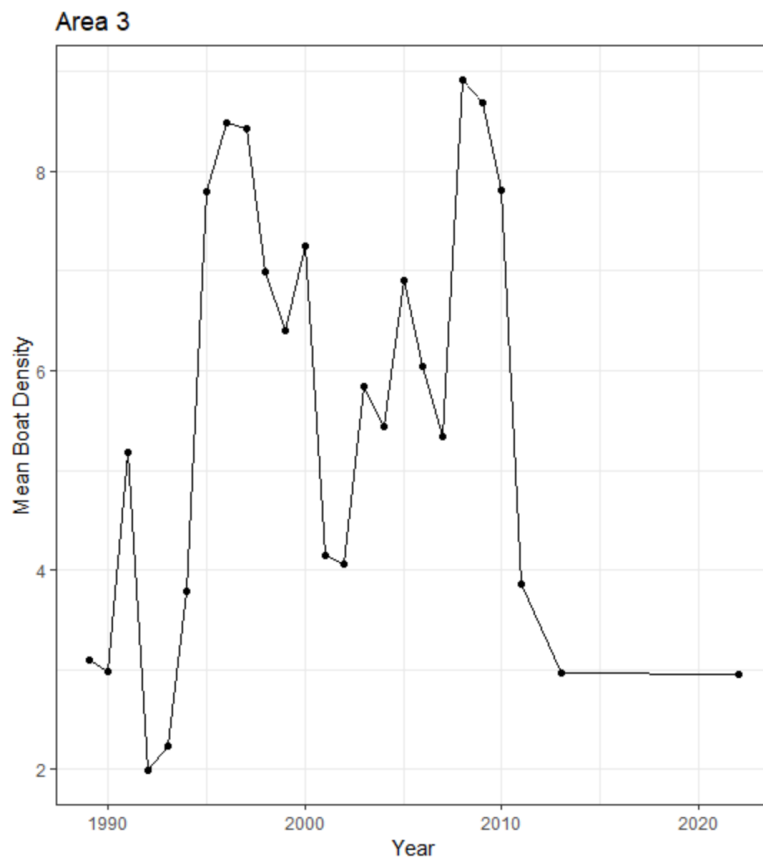
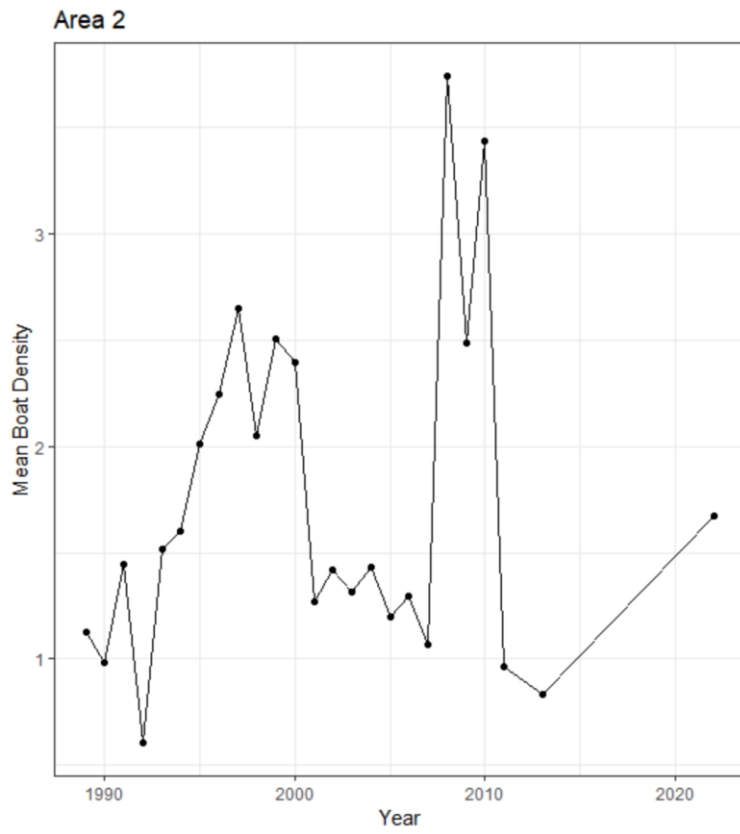
Boat Type	Direction of Change	Z value	p-value
Canoe	\uparrow	7.042	<0.001***
Cruising	$-$	-0.006	>0.5
Ferry	\uparrow	3.881	<0.001***
Fishing	$-$	1.421	>0.1

<i>Pleasure Day Boat</i>	↓	-3.260	<0.005**
<i>Jet Ski</i>	↑	2.766	<0.005**
<i>Rowing Boat</i>	–	0.201	>0.5
<i>Sailing Dinghy</i>	–	0.55	>0.5
<i>Speed boat</i>	↓	-2.840	<0.005**
<i>Tour boat</i>	↑	4.233	<0.001***
<i>Wind Surfer</i>	↓	-14.06	<0.001***
<i>Yacht</i>	↓	-5.002	<0.001***

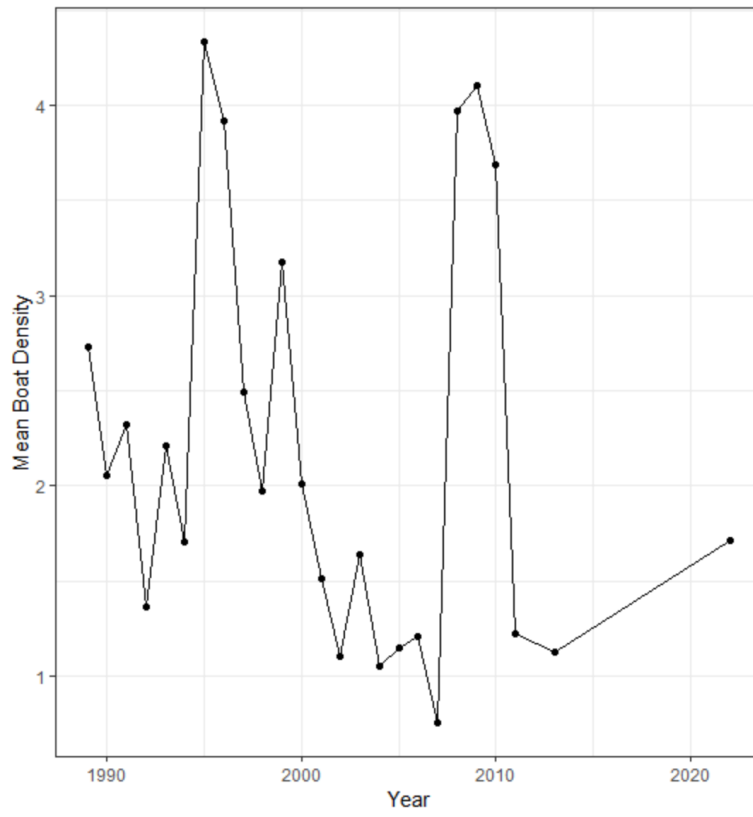
Appendix I-

Annual boat density between 1989 and 2022 for each geographical area of Loch Lomond in areas 1 to 12.

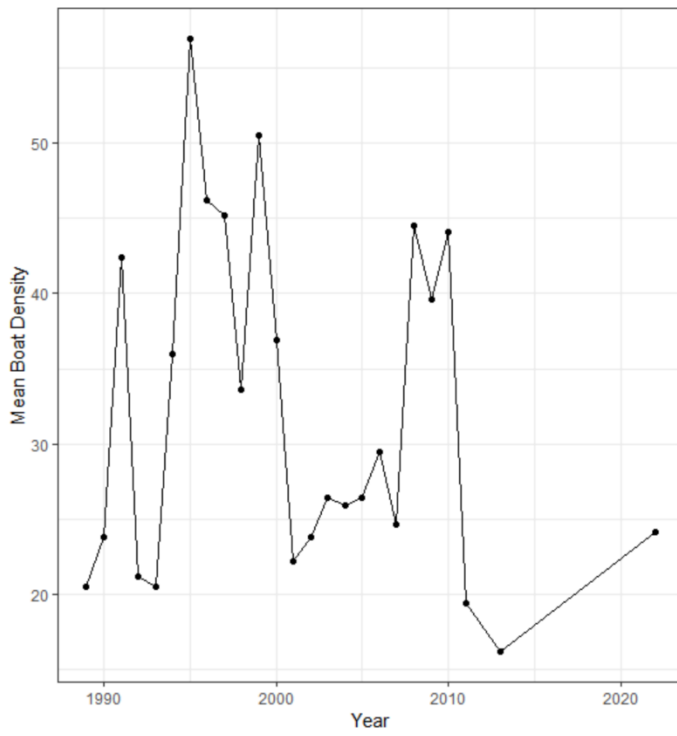


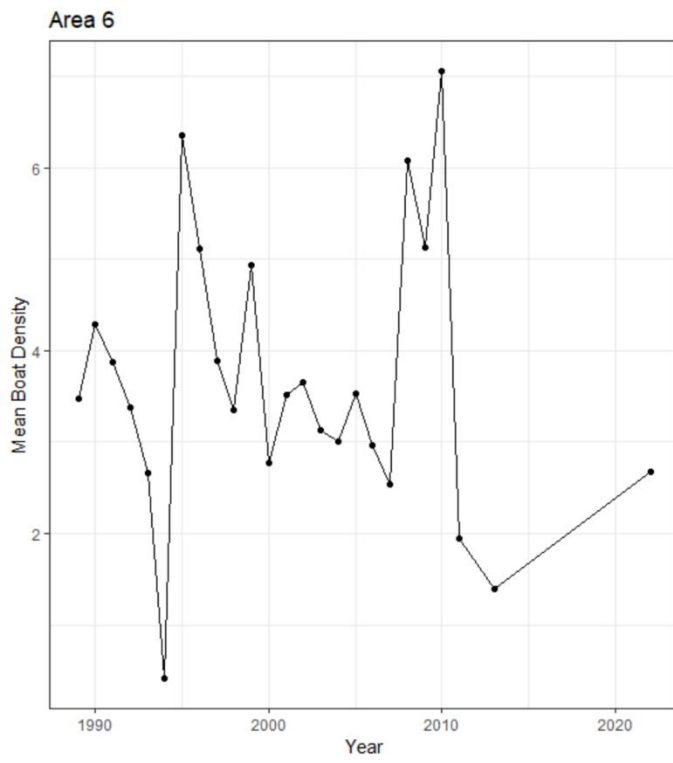


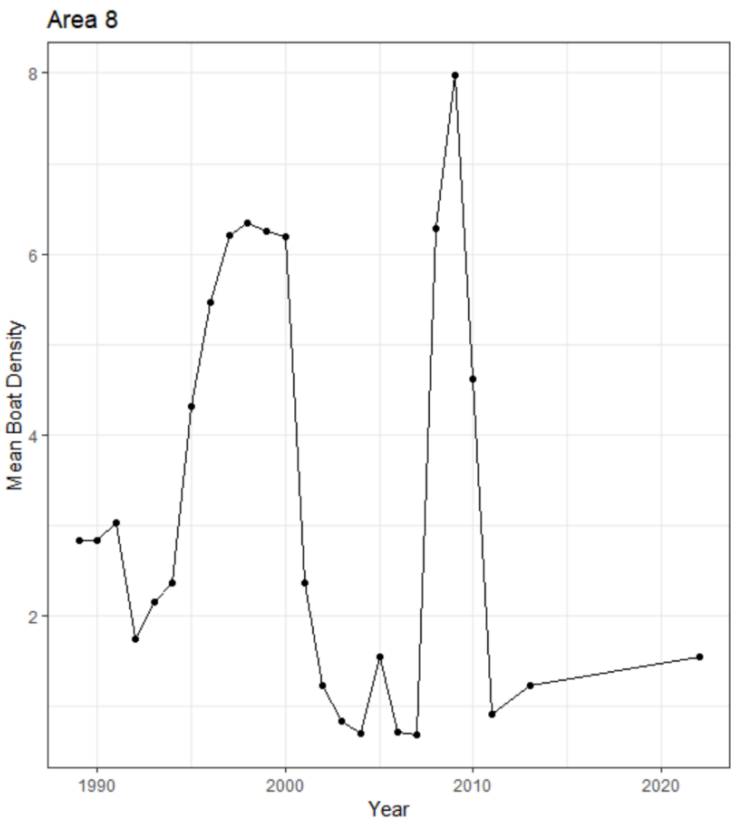
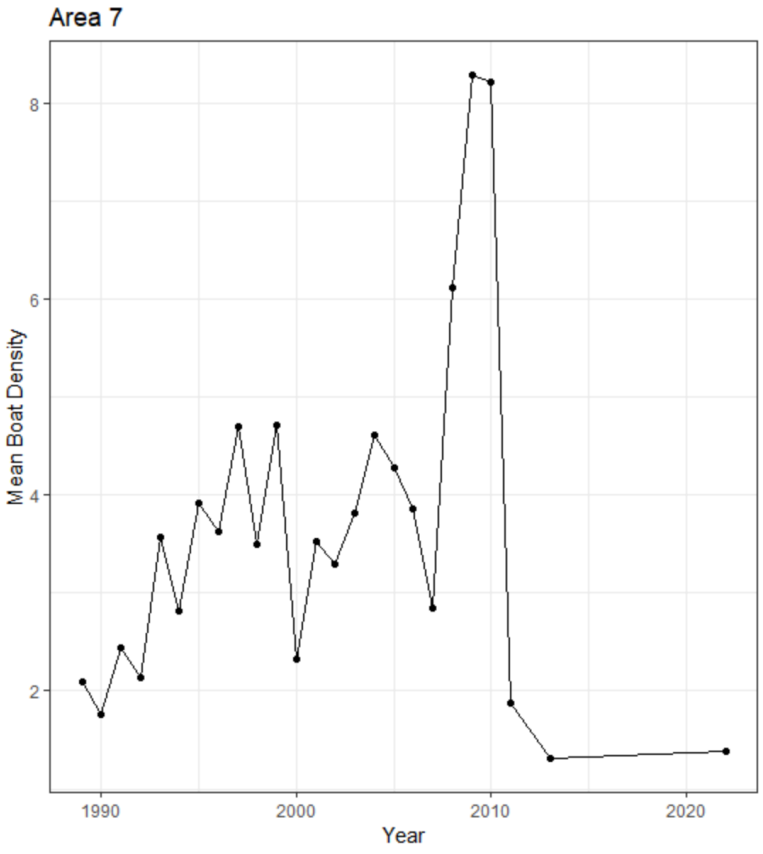
Area 4

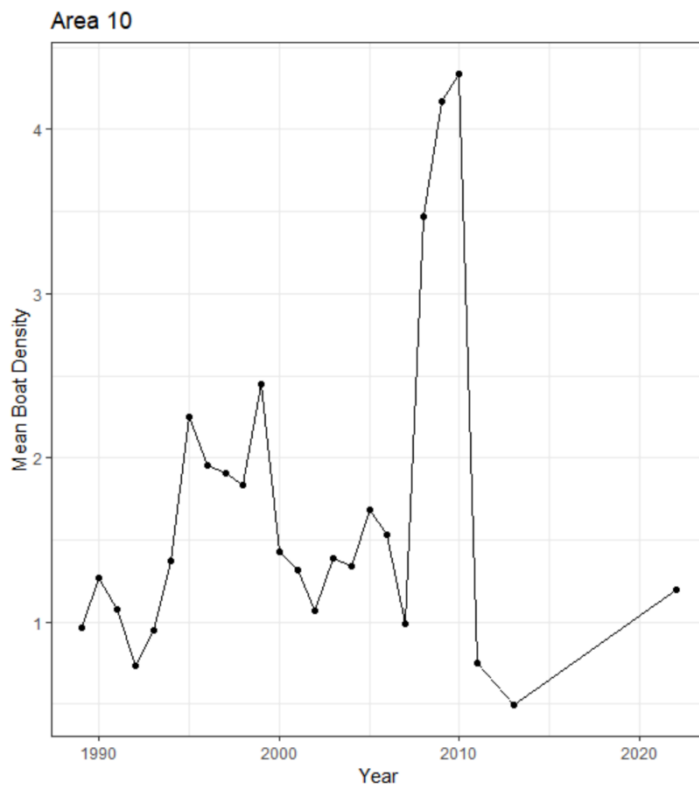
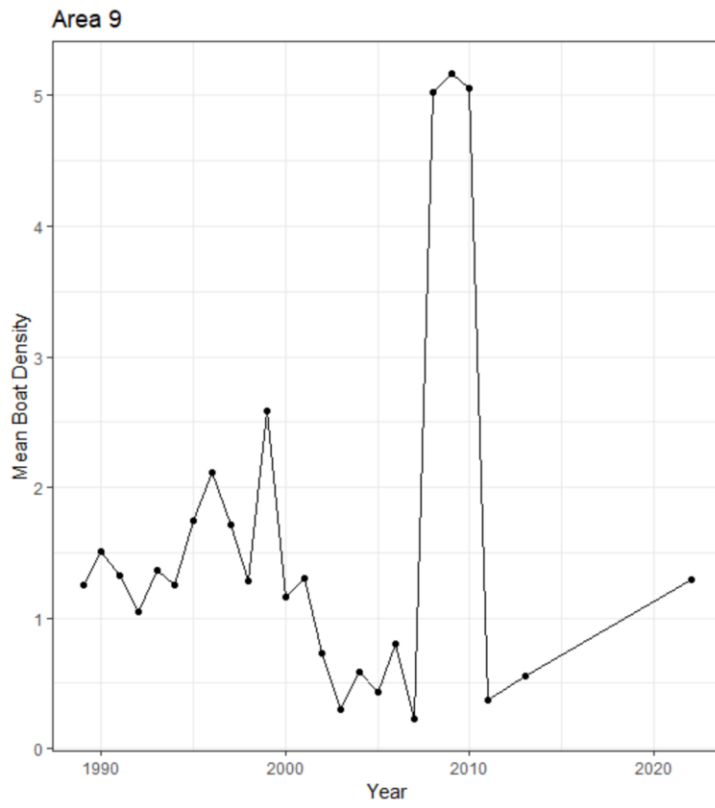


Area 5

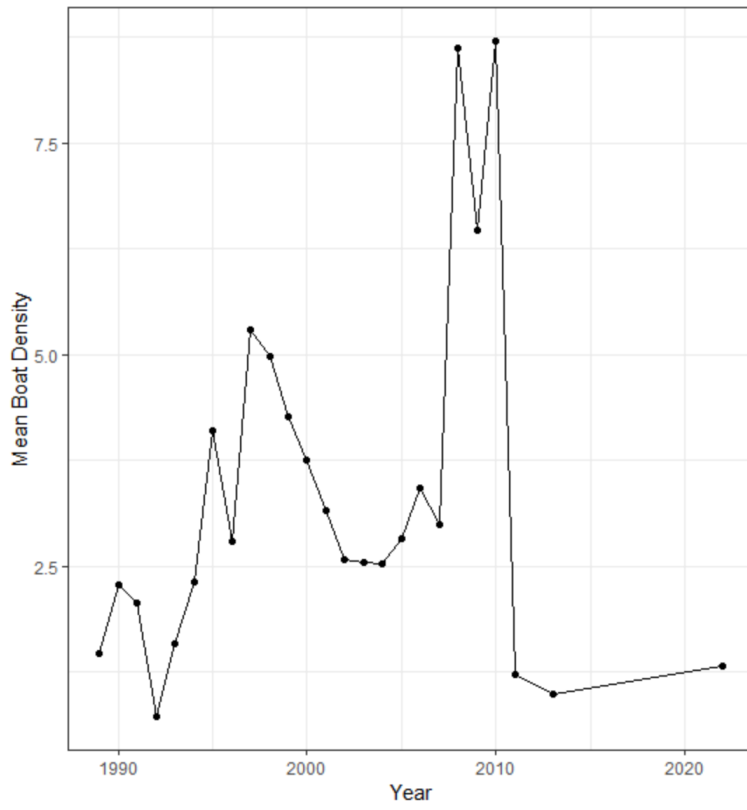




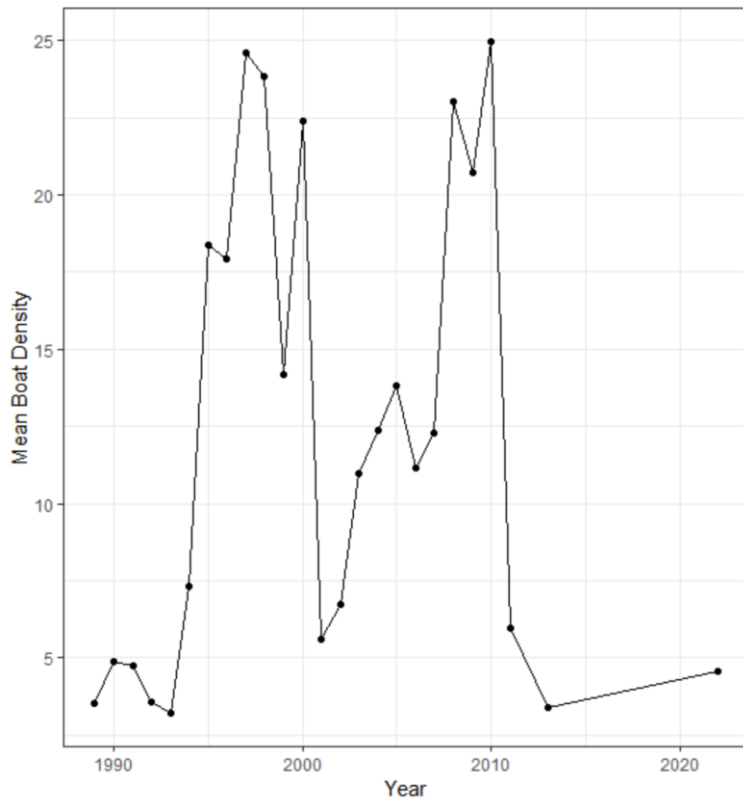




Area 11



Area 12



Appendix II-

Annual boat density between 1989 and 2009 for each boat type

