

CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE RECOMMENDATIONS
ON ADDITIONAL WINTER-RUN PROTECTIONS IN 2016 OCEAN FISHERIES

In April 2015, CDFW recommended additional constraints be applied to California ocean sport and commercial fisheries (CDFW Supplemental Report 4, April 2015, Agenda Item D.1.a). These constraints were specifically designed to minimize contacts with brood year 2014 Sacramento River winter Chinook (winter-run) and to provide conservation benefit to the winter-run stock as a whole. Available information now suggests drought conditions in California lead to greater than 95 percent mortality of juvenile brood year 2014 and 2015 winter-run prior to downstream emigration due to unusually low water storage in Lake Shasta and unsuitable water temperatures in the upper Sacramento River.

Brood year 2013, 2014, and 2015 winter-run also likely encountered abnormally warm and unproductive ocean conditions prior to recruitment to the fishery (see Agenda Item D.1.a NMFS Report 1, State of the California Current Report, March 2016 Council Meeting). Low jack escapement totals for brood year 2013 winter-run were witnessed last summer and were close to the lowest on record, although brood year 2013 otherwise experienced relatively normal juvenile production and survival during emigration. The low jack counts may be indicative of those inhospitable ocean conditions (see Agenda Item E.4.b Supplemental CDFW Report, March 2016 Council Meeting).

In 2016, brood year 2014 and 2013 winter-run will be fully vulnerable to ocean fishery harvest as age-3 and age-4 fish respectively, while brood year 2015 fish may be contacted as sub-legals. In response to facts suggesting these three brood years have fared poorly to date, coupled with persistent drought conditions and unusually warm ocean conditions, CDFW is again recommending the Council consider additional safeguards in 2016 beyond those required by the ESA biological opinion and harvest control rule, in order to further minimize the risk of impacting winter-run in ocean fisheries.

Data summaries provided by CDFW at the April 2015 Council Meeting (Agenda Item D.1.e CDFW Supplemental Report 3, April 2015 Council Meeting) showed that winter-run are primarily contacted south of Point Arena. Of the 663 winter-run CWTs collected in California fisheries from 2000 through 2015, approximately 98 percent of these were taken in the San Francisco and Monterey port areas (**Table 1**). The available CWT data also suggests that these fish tend to be more susceptible to being contacted and/or harvested in ocean fisheries during mid to late summer and early fall, especially south of Pigeon Point. This same report also presented Genetic Stock Identification (GSI) data collected during non-retention sampling by

California commercial salmon trollers in 2010 that suggests winter-run are concentrated south of Pigeon Point in the late summer, and even more so south of Point Sur.

To determine where and when risks of winter-run interactions are highest compared to expected catch of more abundant target stocks, CDFW staff examined the ratio of winter-run to all other stocks in the hatchery component of the commercial and sport harvest south of Point Arena during the last fourteen open seasons (2000-2007, 2010-2015) based on almost 99,000 CWT recoveries (**Table 2**). In addition to being summed by year, month and fishery, CWTs were grouped into four sub-port areas based on port of landing:

Bodega Bay (Pt. Arena to Pt. Reyes)

San Francisco (Pt. Reyes to Pigeon Pt.)

Monterey Bay (Pigeon Pt. to Pt. Sur; "Monterey-north" in 2016 salmon season alternatives)

Morro Bay/Avila (Pt. Sur to U.S.-Mexico border; "Monterey-south" in 2016 salmon season alternatives)

All CWTs were expanded by their respective sampling and hatchery-tagging rates to estimate the hatchery-origin component of the Chinook catch by month, sub-area, and fishery. Tags are expanded for sampling and tag rates for the purpose of understanding total catch of hatchery stocks by run type. The bulk of hatchery harvest is comprised of Sacramento River fall Chinook, which are only tagged at a rate of 25 percent, whereas winter-run are tagged at a rate of 100 percent. By expanding the tag recoveries appropriately, an approximation of the winter-run contribution to total catch is possible as opposed to simply looking at winter-run contribution to raw tag recoveries. The 34,302 CWTs collected in the sport fishery represented just over 322,500 hatchery-origin salmon landed, while the 64,630 CWTs recovered in the commercial fishery expanded roughly to 664,700 hatchery fish. CWT recoveries were grouped as either winter-run (winter) or "other" stocks to determine their average annual harvest by fishery, month and sub-port area.

Figure 1 shows the average annual hatchery harvest and ratio of winter-run salmon to other stocks in the sport fishery by sub-port area and month. The ratio of winter-run harvest to other stocks (shown above each bar on each of the bar charts) was highest toward the end of summer-early fall and in the southern areas. This is the same pattern noted in the CDFW Supplemental Report 3 from the March Council meeting cited above.

Bodega Bay had the lowest total ratio of winter-run harvest to other stocks at 1:1000 (45 winter, 44,653 other). Ratios ranged from 1:1200 in June to 1:700 during July. There were no winter-run hatchery fish encountered during April, May, Sept or October. Average monthly harvest peaked in July with approximately 1,600 hatchery salmon caught, followed by June (400 fish) and August (300 fish).

The total ratio in San Francisco was higher at 1:200 (749 winter, 167,281 other) with monthly ratios ranging from 1:1400 during September to 1:60 during November. Average monthly

hatchery harvest peaked in July with 2,900 hatchery salmon landed, followed by August (2,400), June (1,900) and May (1,700).

In Monterey Bay, the total harvest ratio of 1:140 (739 winter, 102,014 other) was slightly higher than the ratio observed in San Francisco. Ratios ranged from 1:900 during April to 1:30 during August. Average monthly harvest was highest in April with 4,200 fish (highest monthly average among all sub-port areas), but dropped sharply in May (900 fish) and June (700 fish). Landings increased during July (1,200 fish) but again decreased during August and September. Although sampling of the sport fishery south of Pigeon Point did occur throughout the entire season, relatively few CWTs were collected during the last two months (September and October), due to minimal fishing activity.

Morro Bay-Avila had the highest total harvest ratio of 1:18 (374 winter, 6,667 other) among the four sub-port areas, ranging from 1:60 in April to 1:1 in August. Average monthly harvest was highest in April (200 fish), followed by May (125 fish) and June (100 fish). Only a handful of fish were landed in July, August, and September.

In addition to evaluating the ratio of winter-run harvest to that of other target stocks, CDFW examined the proportion of winter-run CWTs to all CWT recoveries (expanded) in the sport fishery by month and sub-port area during the same fourteen year period (**Figure 2**). The total proportion of winter-run in Morro Bay-Avila (5.2 percent) was much higher than that observed north in Monterey Bay (0.7 percent), San Francisco (0.5 percent) and Bodega Bay (0.1 percent). The Morro Bay-Avila sport fishery also had the highest proportion of winter-run CWT recoveries observed during April through August in all areas. The proportion of winter-run CWTs increased sharply from April (1.7 percent) through August (64.1 percent).

Figure 3 shows the average annual hatchery harvest and ratio of winter-run salmon to other stocks in the commercial fishery by sub-port area and month. The ratio of winter-run harvest to other stocks was generally highest toward the end of summer and early fall and increased the further south that fishing occurred.

Bodega Bay had the lowest total winter-run harvest to other stocks ratio of 1:3600 (56 winter, 199,434 other). Ratios ranged from 1:6600 during July to 1:1600 during September. Average monthly harvest peaked in July with approximately 5,700 hatchery salmon caught, after averaging 4,400 salmon in May and June. Average hatchery catch declined to 2,300 and 800 in August and September, respectively.

The total ratio in San Francisco was slightly higher at 1:2500 (112 winter, 278,852 other) with ratios ranging from 1:31000 during May to 1:1300 during June and October. Average monthly harvest was highest in May and June with 8,400 and 7,700 hatchery salmon caught, respectively. The hatchery harvest in July dropped to approximately 3,800 fish with landings steadily declining to the end of the season in October.

In Monterey Bay, the total harvest ratio of 1:1200 (140 winter, 165,427 other) was approximately two and three times greater than the ratios observed in San Francisco and Bodega Bay, respectively. Ratios ranged from 1:4600 during May to 1:7 during September. Average monthly harvest was highest in May with 8,400 fish, followed by June (4,100 fish) and July (2,700 fish). The average hatchery harvest in August and September dropped sharply to approximately 200 and 50 fish; however there are very low sample sizes south of Pigeon Point after about mid-August, in response to very low catch and effort levels. Thus there are relatively few CWTs collected during the last two months of the season.

Morro Bay-Avila had the highest total harvest ratio of 1:200 (99 winter, 20,553 other) among commercial fisheries in the four sub-port areas, ranging from 1:1000 in May to 1:8 in September. Average monthly harvest was highest in May with 1,000 fish, followed by June (700 fish). The average hatchery harvest in July dropped sharply to 100 fish and less than 50 fish landed in August. Only a handful of fish were landed in September.

Figure 4 shows the proportion of winter-run CWTs to all CWT recoveries (expanded) in the commercial fishery by month and sub-port area during the same fourteen year period. The total proportion of winter-run in Morro Bay-Avila (0.5 percent) was much higher than that observed north in Monterey Bay (0.08 percent), San Francisco (0.04 percent) and Bodega Bay (0.03 percent). The highest proportion of winter-run CWT recoveries occurred in Monterey Bay (12.2 percent) and Morro Bay-Avila (11.1 percent) during September. Winter-run proportions in Morro Bay-Avila increased ten-fold between July (0.7 percent) and August (7.7 percent).

Figure 5 shows the location of GSI samples from winter-run (n=55) versus all other stocks (n=31,455) collected by California salmon trollers during 2010-2015 statewide. This includes approximately 4,500 aged samples from the 2010 non-retention study that CDFW analyzed last year (Agenda Item D.1.e CDFW Supplemental Reports 2 and 3, April 2015 Council Meeting), in addition to 26,510 samples collected opportunistically in open fisheries during 2011-2015. Almost 91 percent (n=50) of the winter-run samples were collected south of Pt. Arena, with two-thirds (n=33) of these samples collected south of Pigeon Point and almost half (n=23) sampled south of Pt. Sur. By comparison, the number of other stocks sampled south of Pt. Sur over this six-year time period in the GSI study was only 94 of the 31,455 sampled statewide, or 0.2 percent of the total.

Figure 6 shows the proportion of winter-run GSI samples (n=50) to all GSI samples (n=17,607) collected south of Pt. Arena by month and sub-port area. Similar to the CWT results above, the proportion of winter-run was highest in late summer south of Pigeon Point, especially in the Morro Bay-Avila port area during September (61.1 percent), August (60.0 percent) and July (13.3 percent). Winter-run samples were not recovered in Monterey Bay until July (0.2 percent) and then increased dramatically during August (2.3 percent) and September (5.4 percent). Winter-run proportions in San Francisco and Bodega Bay were relatively small, averaging 0.2 percent and 0.04 percent, respectively.

Table 3 shows the 2015 sport and commercial ocean salmon season structure south of Point Arena in fishery closure dates and total days closed versus the three alternatives adopted at the PFMC March 2016 meeting. The closure dates and number of days closed are determined based on the “full fishing” season structure currently allowed under the 2010 winter-run Biological Opinion. Sport fisheries south of Point Arena may not open before the first Saturday in April and must close by the first Sunday in October south of Pigeon Point. The sport fishery between Point Arena and Pigeon Point must close no later than the second Sunday in November. Commercial fisheries are not allowed to open prior to May 1 and must close by September 30, except for a Monday through Friday fishery between Point Reyes and Point San Pedro that must close no later than October 15. **Table 3** also shows the projected winter-run impacts by fishery and area. It should be noted that the current Winter Run Harvest Model (WRHM) is unable to differentiate fishery impacts north and south of Point Sur in the Monterey management area. Thus the 2015 projected age-3 winter-run impact rate of 17.5 was calculated as if the entire Monterey management area was open utilizing the Monterey-north season for both fisheries. There were no modeled savings for closing 50 additional days in the sport fishery and 15 additional days in the commercial fishery south of Point Sur.

The 2015 closures were implemented specifically to reduce risk to the winter-run stock and provided more protection than indicated by the projected impact rate. Since there were no winter-run CWTs recovered south of Pigeon Point in 2015, these additional closures appear to have helped protect winter-run since Monterey sport and commercial fisheries averaged 19 and 6 winter-run CWT recoveries annually during the previous four seasons. Only two winter-run CWTs were recovered in 2015 – an age-3 fish recovered in the San Francisco sport fishery (July) and an age-4 fish in the San Francisco commercial fishery (July). However, this may also be indicative of low ocean abundance of the winter-run brood years that were vulnerable to harvest in 2015 fisheries (brood year 2013 as age 3; brood year 2012 as age 4).

Conclusions from this Analysis

In March 2016, CDFW recommended that the Council again provide additional protection to winter-run by 1) not allowing the age-3 impact rate to exceed 17.1 percent (which is the preseason winter-run impact rate forecast using 2015 fishery regulations against 2016 ocean abundance forecasts of target stocks) and 2) employing time/area closures where winter-run encounters are greatest (Agenda Item E.4.b Supplemental CDFW Report, March 2016 Council Meeting). The three alternatives that adopted for public review at the March Council meeting all resulted in a predicted winter-run impact rate that falls well below 17.1 percent (**Table 3**). Alternative I and II for the sport fishery are almost identical in structure to the 2015 sport regulations while Alternative III is much more restrictive and includes additional closures in early and mid-summer. Alternative III is also the most constrained for commercial fisheries although the first two alternatives also include several weeks of additional closures in June and July.

CDFW appreciates the industry’s support for public review of Alternative III, allowing an opportunity for the Council to hear comments on the importance of the times and areas where

there is substantial risk of winter-run encounters, and allowing for additional analysis that is contained in this report.

Figures 1 and 2 of this report show generally that sport fishery impacts to winter-run increase significantly as the summer progresses to fall, and also increase significantly moving southward, with the highest rates observed in the Morro Bay Avila area – an area where overall sport catches are low compared with other areas of the state. As depicted in Figure 1, the vast majority of the total hatchery harvest in Monterey Bay sport fisheries occurs before August, making fishing opportunities in this area during April through July particularly important compared to the management areas to the north, which maintain appreciable harvests later into summer and fall.

As shown in Figure 3, the commercial fishery sees over 99 percent of the total hatchery harvest in Monterey Bay before August. In this area, greater value lies in these first three months as compared to the management areas to the north. Meanwhile, the Morro Bay-Avila area sees the bulk of their catch and fishery value in the first two months, continuing the trend of increased importance of fishing early in the season as the fishery moves south.

Impacts to winter-run in commercial fisheries are much less severe as compared to sport fishery impacts, largely in part to larger size limits. Figures 3 and 4 suggest that winter-run tend to become a more significant part of the harvest beginning in August in Monterey Bay and July in Morro Bay-Avila. In both areas, August and September are high risk fisheries for winter-run impacts.

Analysis of available CWT and GSI data across both sport and commercial fisheries suggest that not only do the ratios of winter-run increase significantly south of Pigeon Pt. in the summer and in the San Francisco sport fishery during November, the catch of other target stocks declines precipitously as well (Figures 1 and 3). All data sources show high proportions of winter-run in catches in Morro Bay-Avila from June or July onward. While Monterey-North sport and commercial fisheries in July show an increased proportion of winter-run in CWT recoveries compared with earlier months (Figures 1, 2 and 3), that same increase is not detected in the July GSI data, though it shows a dramatic increase in winter-run catch rates come August (Figure 6). Since July is a month that also experiences relatively high average catches of other species in Monterey-North (Figures 1 and 3), clearly fishing opportunities in that month are very important to the region and local economies.

CDFW Policy Recommendations for Crafting 2016 Ocean Salmon Fisheries

CDFW appreciates the critical need to evaluate the social and economic interests along with the potential risk to the winter-run stock that comes with fisheries operating in these areas. In developing policy guidance for crafting 2016 ocean salmon fisheries, CDFW has considered both the value of time/area opportunities to each of the sport and commercial sectors independently, based on the average annual hatchery harvest information in addition to considering the risk associated with those fisheries to the winter-run stock. Given the

comparatively high catch ratios of winter run to other stocks in the times and areas discussed above, considering the relative value of that fishery opportunity to the fishery as a whole - as well as the local economies - becomes very important in developing recommendations.

Sport fisheries generally rely on open days and opportunities more so than realized catch. Party/charter operations are not likely able or willing to follow fish, like some commercial and private recreational vessels may do to pursue open fishing opportunities beyond their home port. Meanwhile, some commercial fish buyers may operate only locally, or may have buying arrangements dependent on delivery only to certain ports.

Winter-run harvest rates in the Morro Bay-Avila sport fishery show that the likelihood of catching a winter run in April is 1:60, increasing to 1:1 in August – catch rates which pose serious concern when considering recommendations to authorize fisheries. However, CDFW recognizes that there is an overriding statewide interest in providing some opportunity to each sector at some point during the season in every management area, and further recognizes that the needs of sport and commercial fisheries and the communities reliant upon them differ. It would not be equitable to apply a hard-line cutoff point where, as an example, risk would be deemed ‘too high’ any time the chance of harvesting a winter run is greater than one fish in a hundred because of these diverse needs, and because management tools such as size limits can have a significant effect on the ratio information evaluated here. Consistent with the approach taken in 2015, CDFW’s recommendations are based on evaluating the relative risk to winter run combined with the value of fishery opportunity in a given month, compared to other months in that fishery and area.

Considering the Range of Alternatives, **CDFW’s policy recommendation for the Final Preferred Alternative for 2016 is that sport fisheries in Monterey North be closed on July 15th, closed in Monterey South on May 31st, and that the sport fishery in San Francisco be closed in November. For commercial fisheries in Monterey North, CDFW recommends a closure date of July 31st and a closure date for fisheries in Monterey South of June 30th.**

CDFW would like to acknowledge and thank the California contingent of the West Coast GSI Collaboration for assisting with data requests.

Table 1. Winter-run CWT releases and ocean recoveries by major port area, brood years 1978-2014.

Brood year	CWT marked and tagged	KMZ	Fort Bragg	Major port area			Total Ocean recoveries
				San Francisco	Monterey Bay	Pt Sur south	
1978	9,988	0	1	4	1	0	6
1982	10,393	0	0	0	0	0	0
1991	10,866	0	0	2	1	0	3
1992	27,383	0	0	9	6	2	17
1993	17,034	0	0	2	2	1	5
1994	41,412	0	0	3	2	6	11
1995	48,154	0	0	2	2	0	4
1996	4,553	0	0	0	0	0	0
1997	20,846	0	0	0	0	0	0
1998*	147,007	1	0	9	23	4	37
1999	30,367	0	2	11	5	2	20
2000	162,198	0	0	12	10	2	24
2001	242,383	0	0	9	2	1	12
2002	221,334	1	2	136	69	18	226
2003	216,676	0	1	61	22	49	133
2004	143,280	0	0	3	1	0	4
2005	163,935	0	0	1	2	2	5
2006	181,681	0	0	0	0	0	0
2007	69,066	0	1	0	0	0	1
2008	133,520	0	0	1	0	1	2
2009	183,644	0	3	15	36	17	71
2010	113,905	0	1	4	2	8	15
2011	185,313	0	0	9	24	1	34
2012	169,967	0	2	17	8	5	32
2013	190,905	0	0	1	0	0	1
2014	590,623	0	0	0	0	0	0
		2	13	311	218	119	663
		0.3%	2%	47%	33%	18%	

* Livingston Stone Hatchery began production in 1998.

Table 2. Total raw winter-run CWT recoveries by fishery, year and sub-port area, 2000-2015.*

Year	<u>Ocean Salmon Sport Fishery CWT recoveries</u>				Total
	Bodega Bay	San Francisco	Monterey Bay	Morro Bay- Avila	CWTs
2000	148	589	632	23	1,392
2001	200	758	391	5	1,354
2002	294	1,202	619	59	2,174
2003	256	1,318	314	2	1,890
2004	259	2,167	815	48	3,289
2005	189	1,148	331	67	1,735
2006	260	529	105	6	900
2007	86	378	98	3	565
2010	196	259	337	3	795
2011	445	2,192	1,013	26	3,676
2012	893	3,290	1,828	139	6,150
2013	622	2,608	530	45	3,805
2014	492	2,401	1,044	57	3,994
2015	<u>277</u>	<u>2,048</u>	<u>231</u>	<u>27</u>	<u>2,583</u>
Total	4,617	20,887	8,288	510	34,302

Year	<u>Ocean Salmon Commercial Fishery CWT recoveries</u>				Total
	Bodega Bay	San Francisco	Monterey Bay	Morro Bay- Avila	CWTs
2000	304	1,088	1,458	277	3,127
2001	886	1,350	664	69	2,969
2002	836	2,147	999	36	4,018
2003	2,076	1,695	807	0	4,578
2004	1,299	3,571	1,516	71	6,457
2005	597	776	1,376	185	2,934
2006	382	103	142	2	629
2007	634	427	77	0	1,138
2010	43	25	153	0	221
2011	934	664	462	70	2,130
2012	5,047	4,052	4,161	960	14,220
2013	3,633	4,895	1,813	206	10,547
2014	3,277	3,151	766	33	7,227
2015	<u>1,190</u>	<u>1,413</u>	<u>1,537</u>	<u>295</u>	<u>4,435</u>
Total	21,138	25,357	15,931	2,204	64,630
TOTAL					98,932

* California sport and commercial ocean fisheries closed or heavily constrained during 2008 and 2009.

Table 3. 2015 sport and commercial season structure and winter-run impacts versus three alternatives and CDFW recommendation for 2016 fisheries

Sport	2015 season			2016 season - Alt I			2016 season - Alt II			2016 season - Alt III			2016 season - CDFW		
	Fishery closure dates	days closed	Projected winter impacts	Fishery closure dates	days closed	Projected winter impacts	Fishery closure dates	days closed	Projected winter impacts	Fishery closure dates	days closed	Projected winter impacts	Fishery closure dates	days closed	Projected winter impacts
Port Area															
San Francisco	Nov 1-8	8	5.26	Nov 1-13	13	5.25	Jun 1-10	10	4.38	Jun 1-17	17	3.39	Nov 1-13	13	4.79
Monterey-north	Sep 8-30 Oct 1-4	27	8.58	Sep 6-30 Oct 1-2	27	6.88	Sep 6-30 Oct 1-2	27	6.92	Jul 1-31 Aug 1-31 Sep 1-30 Oct 1-2	94	3.09	Jul 16-31 Aug 1-31 Sep 1-30 Oct 1-2	79	4.42
Monterey-south	Jul 20-31 Aug 1-31 Sep 1-30 Oct 1-4	77	*Incl. above	Jul 18-31 Aug 1-31 Sep 1-30 Oct 1-2	77	*Incl. above	Jul 18-31 Aug 1-31 Sep 1-30 Oct 1-2	77	*Incl. above	Jun 1-30 Jul 1-31 Aug 1-31 Sep 1-30 Oct 1-2	124	*Incl. above	Jun 1-30 Jul 1-31 Aug 1-31 Sep 1-30 Oct 1-2	124	*Incl. above
Total Sport	112	13.84	79%	117	12.13	84%	114	11.3	83%	235	6.48	77%	216	9.21	79%
Commercial	2015 season			2016 season - Alt I			2016 season - Alt II			2016 season - Alt III			2016 season - CDFW		
	Fishery closure dates	days closed	Projected winter impacts	Fishery closure dates	days closed	Projected winter impacts	Fishery closure dates	days closed	Projected winter impacts	Fishery closure dates	days closed	Projected winter impacts	Fishery closure dates	days closed	Projected winter impacts
Port Area															
San Francisco	Jun 1-6 Jul 1-7	13	1.57	Jun 1-20 Jul 1-24	44	1.04	Jun 1-15 Jul 1-31	46	0.84	Jun 1-20 Jul 1-31	51	0.76	Jun 1-15* Jul 1-15*	30	1.17
Monterey-north	Jun 1-6 Jul 1-7 Aug 16-31 Sep 1-30	59	2.06	Jun 1-20 Jul 1-31 Aug 16-31 Sep 1-30	97	1.27	Jun 1-15 Jul 1-31 Aug 16-31 Sep 1-30	92	1.48	Jun 1-15 Jul 1-31 Aug 1-31 Sep 1-30	107	1.16	Jun 1-15* Jul 1-15* Aug 1-31 Sep 1-30	91	1.25
Monterey-south	Jun 1-6 Jul 1-7 Aug 1-31 Sep 1-30	74	*Incl. above	Jun 1-20 Jul 1-31 Aug 16-31 Sep 1-30	97	*Incl. above	Jun 1-15 Jul 1-31 Aug 1-31 Sep 1-30	107	*Incl. above	Jun 1-30 Jul 1-31 Aug 1-31 Sep 1-30	122	*Incl. above	Jun 1-15* Jul 1-30 Aug 1-31 Sep 1-30	106	*Incl. above
Total Comm	146	3.63	21%	238	2.31	16%	245	2.32	17%	280	1.92	23%	227	2.41	21%
Total winter impacts		17.5		14.4			13.6			8.4			11.6		

*June-July placeholder dates

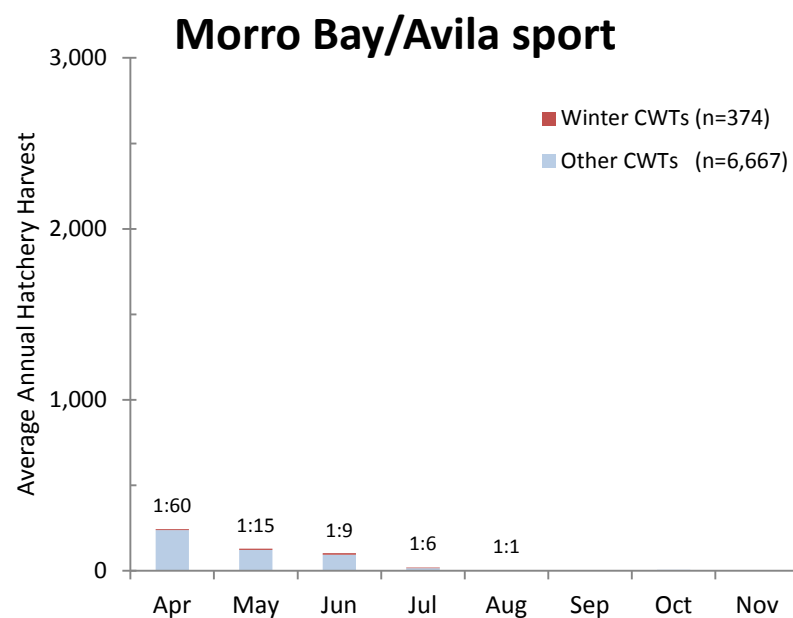
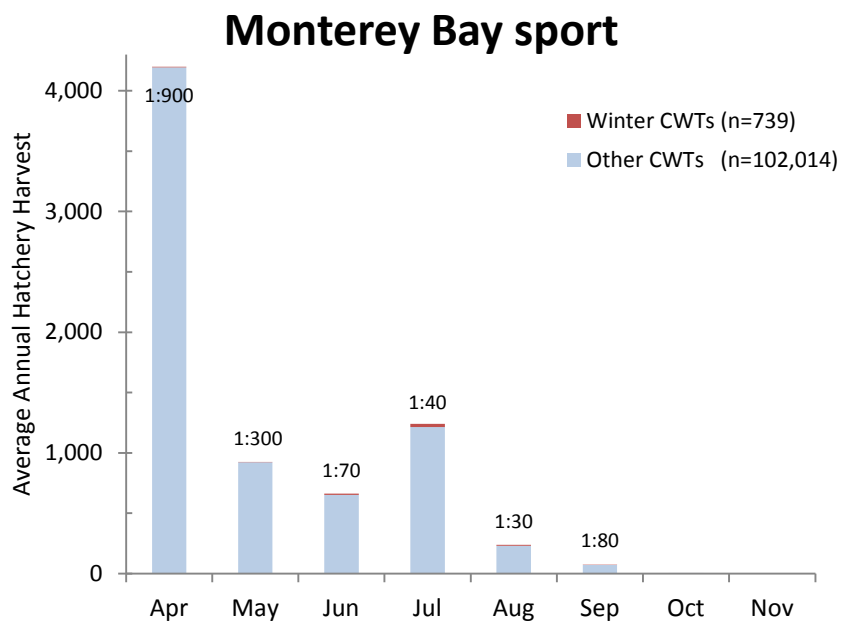
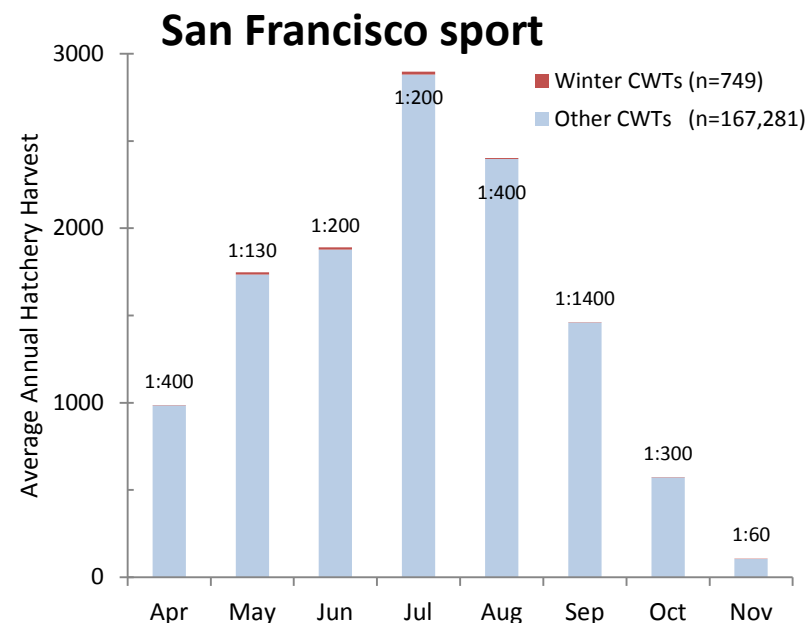
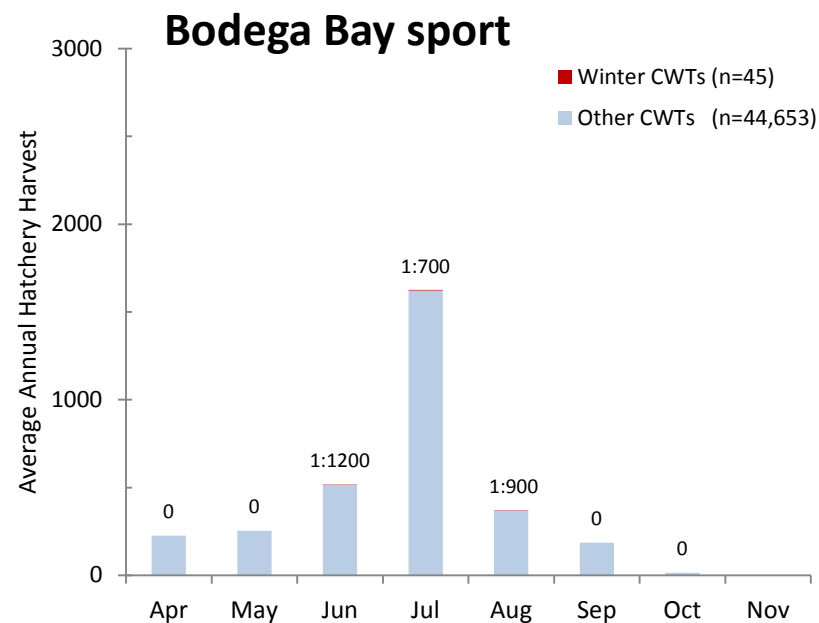


Figure 1. Average annual harvest of hatchery-origin winter-run (Winter) versus all other stocks (Other) in the ocean salmon sport fishery south of Point Arena based on expanded CWT recoveries by sub-port area and month, 2000-2015. Ratio of Winter harvest to Other harvest above each bar.

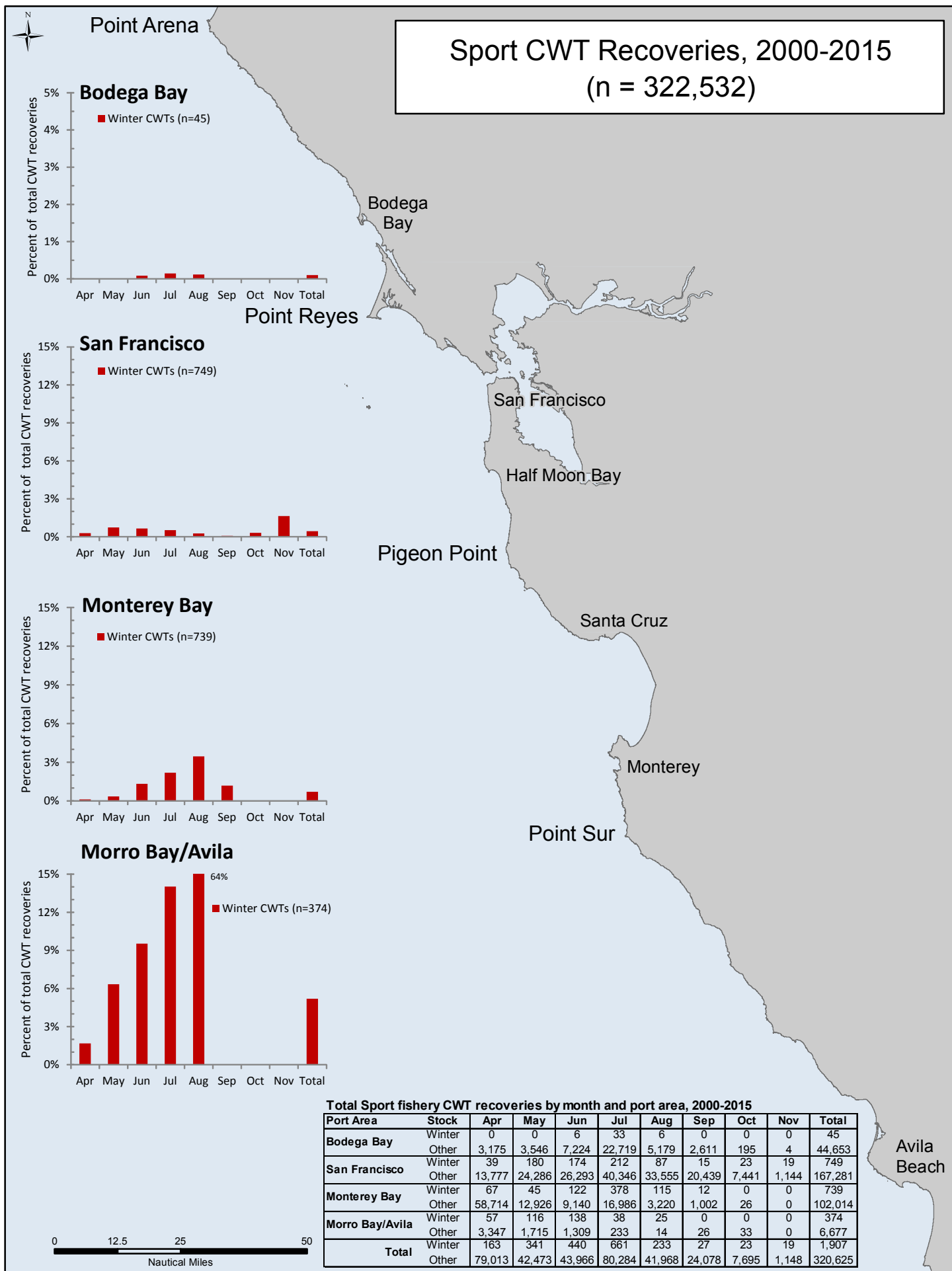


Figure 2. Proportion of winter CWT recoveries to total CWT recoveries (expanded) in ocean salmon sport fishery south of Pt. Arena by month and sub-port area, 2000-2015.

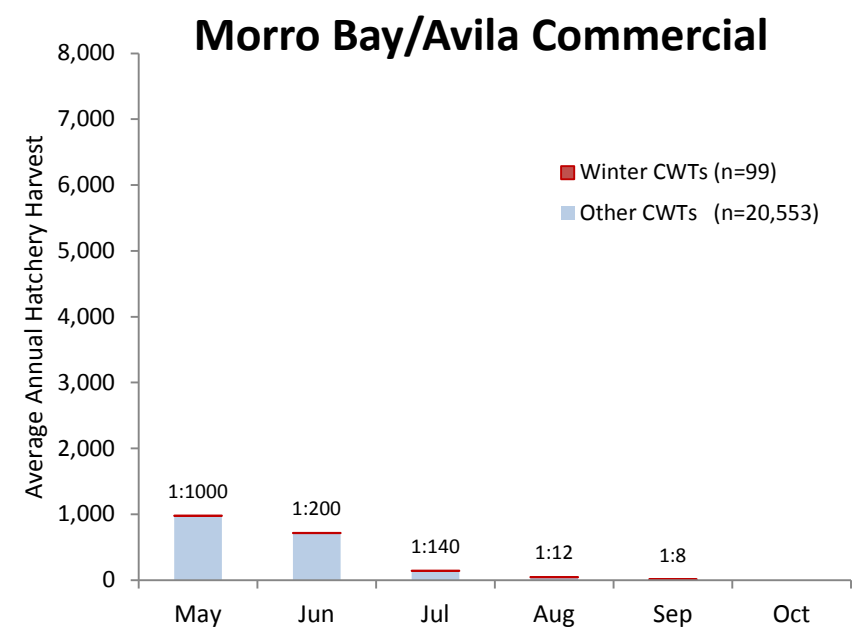
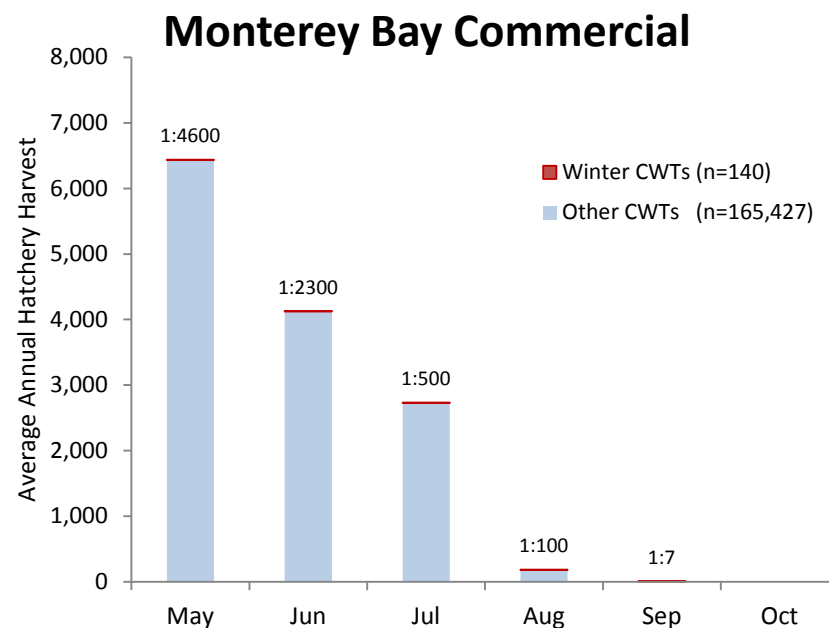
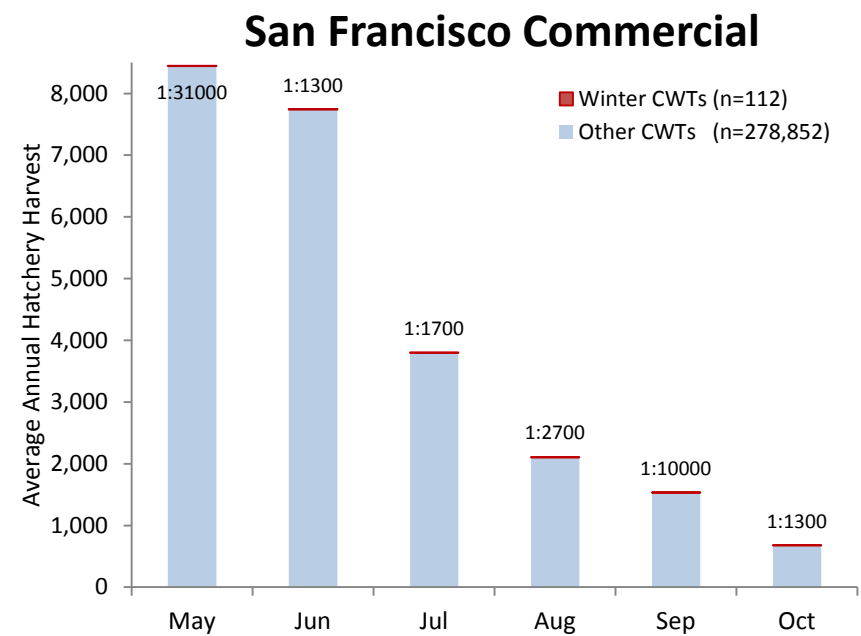
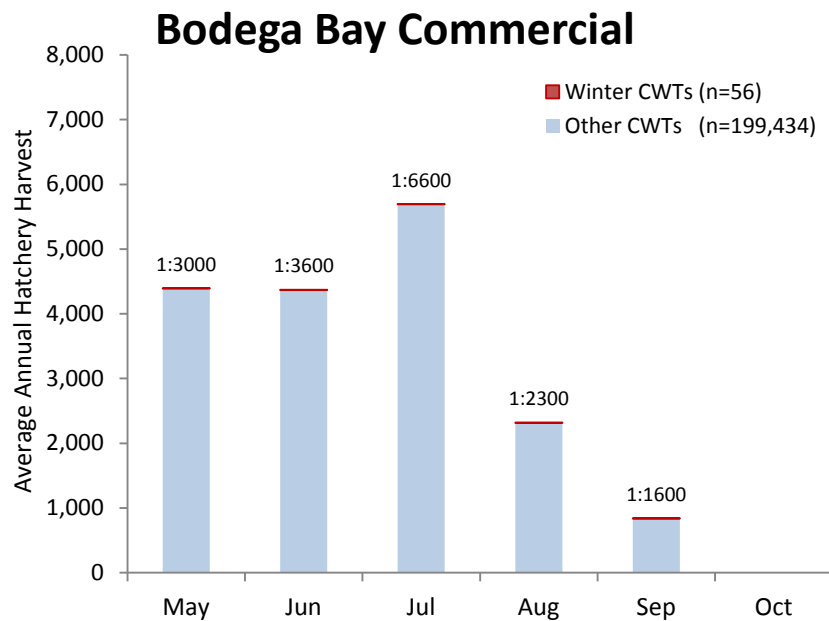


Figure 3. Average annual harvest of hatchery-origin winter-run (Winter) versus all other stocks (Other) in the ocean salmon commercial fishery south of Point Arena based on expanded CWT recoveries by sub-port area and month, 2000-2015. Ratio of Winter harvest to Other harvest above each bar.

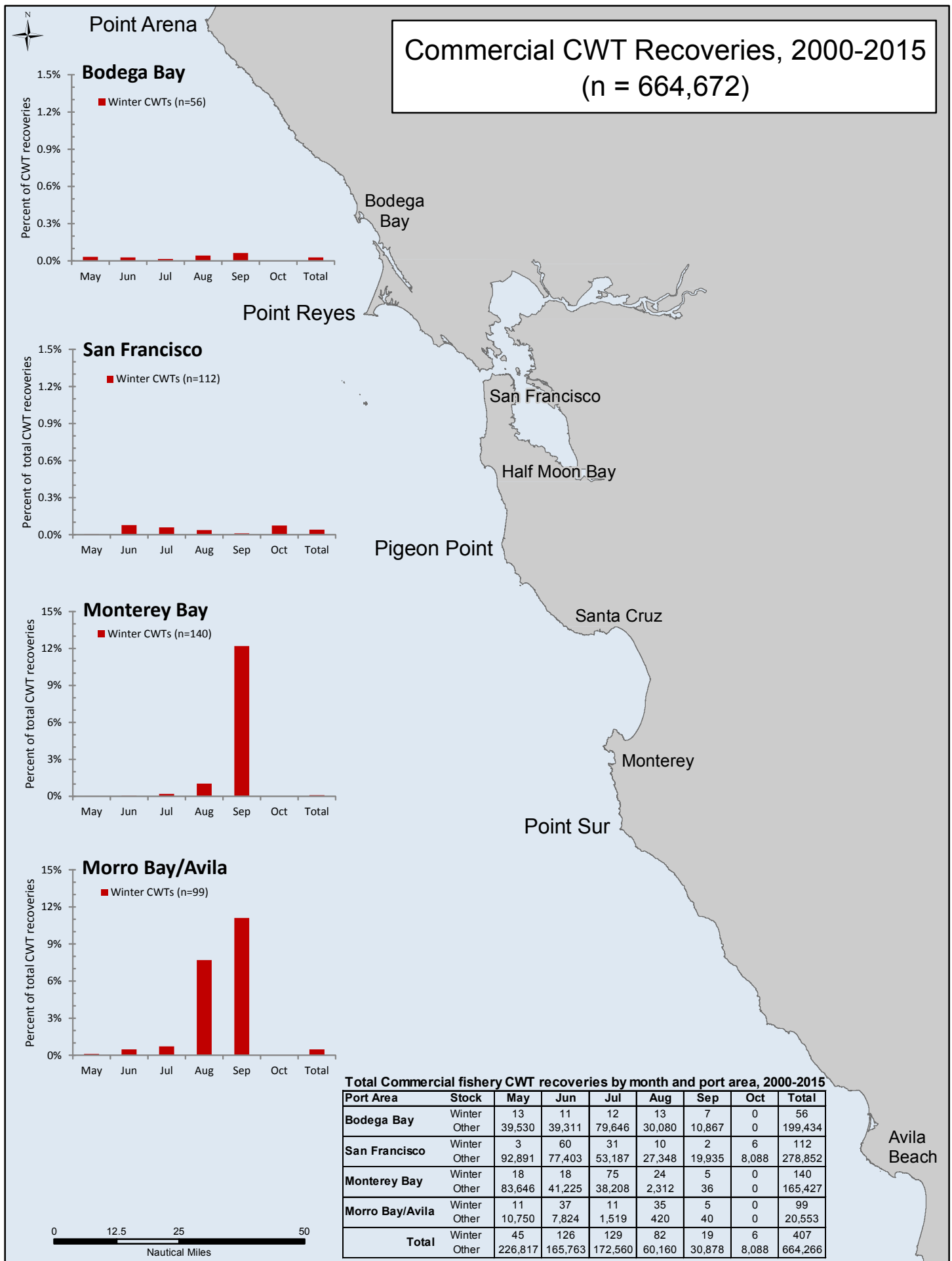


Figure 4. Proportion of winter CWT recoveries to total CWT recoveries (expanded) in ocean salmon commercial fishery south of Pt. Arena by month and sub-port area, 2000-2015.

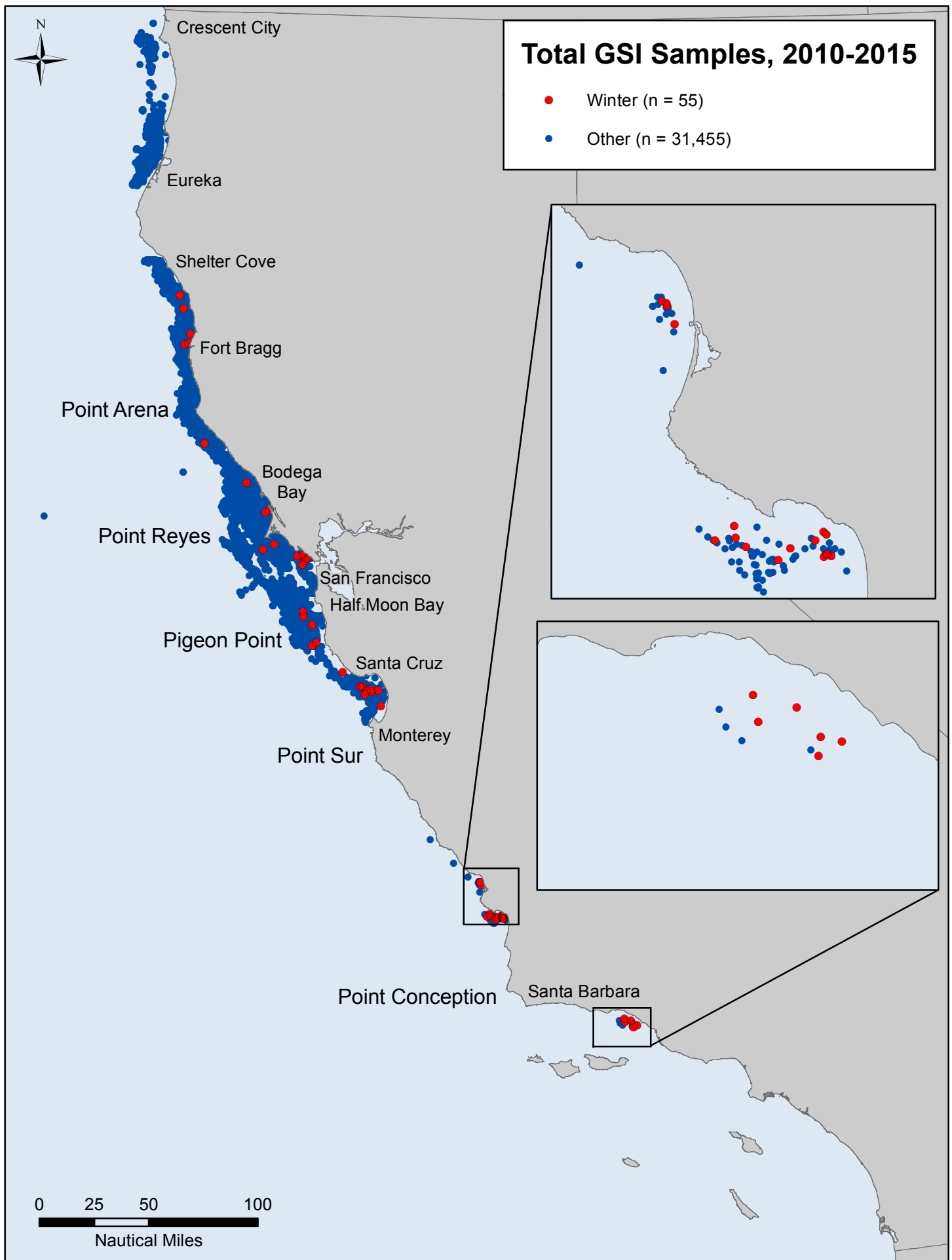


Figure 5. Map of GSI samples from winter-run (Winter) and all other stocks (Other) collected by California salmon trollers during non-retention study in 2010 and opportunistic sampling during 2011-2015 open commercial fisheries.

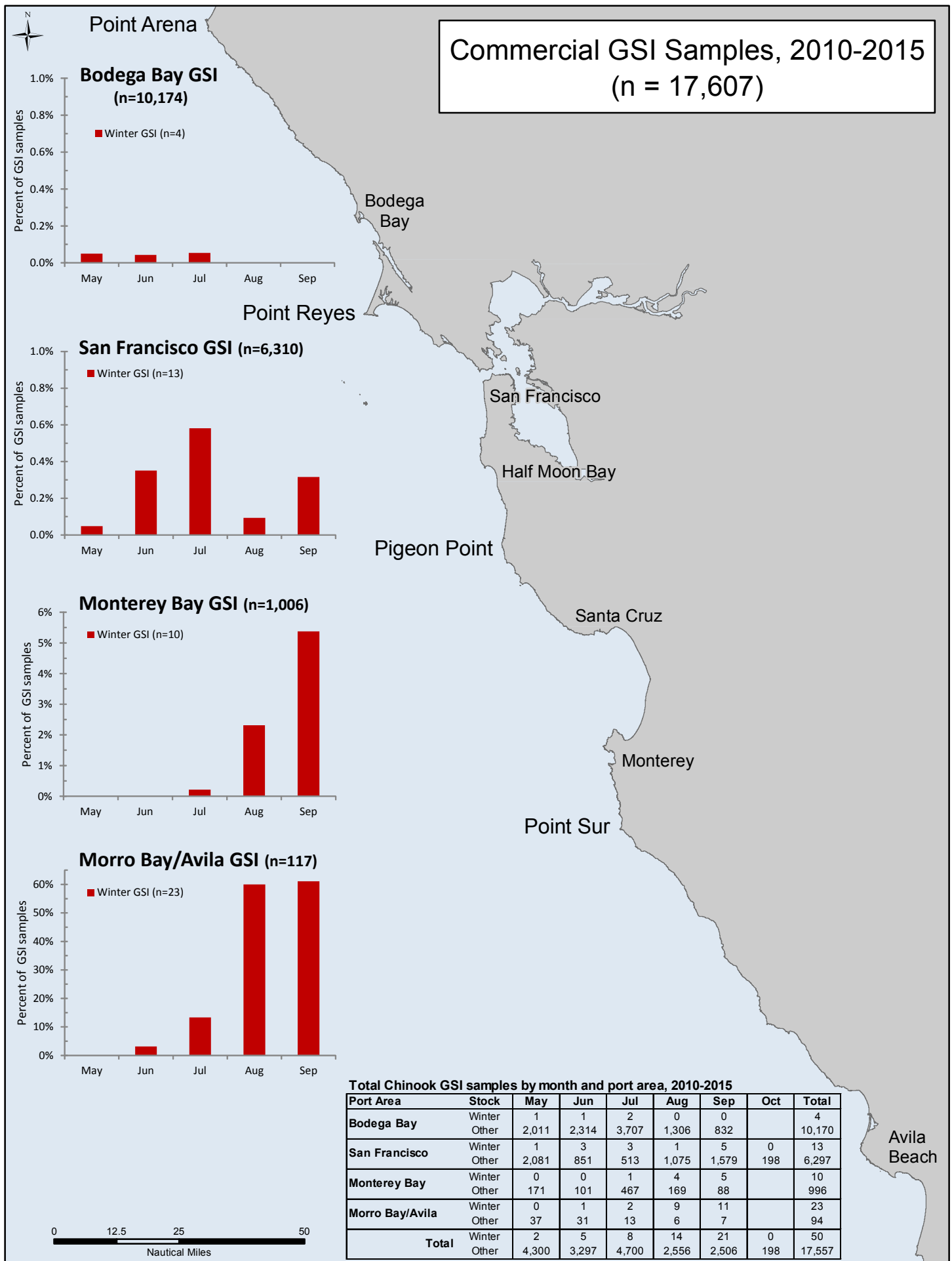


Figure 6. Proportion of winter GSI samples to all GSI samples collected by California salmon trollers south of Pt. Arena during non-retention study in 2010 and opportunistic sampling during 2011-2015 open commercial fisheries by month and sub-port area.