Western and Central Pacific Fisheries Commission

COMMISSION
FIFTEENTH REGULAR SESSION

Honolulu, Hawaii, USA
10 - 14 December 2018

An assessment of the number of vessels fishing
for south Pacific albacore south of 20ᵒS

Stephen Brouwer[1], Graham Pilling[1], Peter Williams[1]

[1] Oceanic Fisheries Programme, The Pacific Community (SPC)

Contents

1 Summary

The Western and Central Pacific Fisheries Commission Conservation and Management Measure CMM2015-02 stipulates that *"CCMs shall not increase the number of their fishing vessels actively fishing for South Pacific albacore in the Convention Area south of 20ºS above 2005 levels or recent historical (2000-2004) levels."* However, the measure does not define **"actively fishing for"**, nor does it specify which vessels need to be included (i.e. longline and/or troll). While WCPFC CCMs are required to submit data annually on their vessels fishing for albacore south of 20ºS there is no requirement to submit data for the baseline years (2000-2005). This paper attempts to quantify the number of longline vessels fishing for south Pacific albacore south of 20ºS. We note that different catch proportions can be used when assessing whether or not a vessel is fishing for albacore. We assess the number of vessels that land <50% albacore; 50-60% and >60% albacore annually by flag. We track each vessels history and assess the proportion of albacore in its catch through time. Finally, we assess the change in catch proportions in 5 degree bands from the Equator to 50ºS and compare these annually by flag to the levels in 2000-2004 and 2005.

We invite members to consider the following recommendations:

- **Recommend** that vessels whose annual catch consists of 50% or more albacore (in either weight or numbers) be considered to be fishing for albacore.

- **Recommend** that Members advise SPC as to whether or not SPC should expand the effort tables through an analysis of the aggregated data.

- **Recommend** that Members advise SPC as to what modifications to this paper they would find informative for WCPFC15.

2 Introduction

The south Pacific albacore fishery is severely impacted by the economic conditions within the fishery (**?**), this is largely due to the relatively low value of the resource. The result of this is that catch rates need to be maintained at a relatively high level in order for vessels to remain economically viable. While the resource is not overfished and overfishing is not taking place the Western and Central Pacific Fisheries Commission (WCPFC) has taken steps to limit the catch and effort on this resource through the development of a Conservation and Management Measure for south Pacific albacore (CMM 2015-02) in order to maintain the economic viability of the longline fisheries particularly in coastal states.

Included in CMM 2015-02 (WCPFC, 2015) is an attempt to limit fishing effort on the south Pacific albacore stock. This CMM requires that *"CCMs shall not increase the number of their fishing vessels actively fishing for South Pacific albacore in the Convention Area south of 20ºS above 2005 levels or recent historical (2000-2004) levels."* The CMM also notes that *"CCMs shall report . . . the number of vessels actively fishing for South Pacific albacore, in the Convention area south of 20ºS."* However, the measure does not define **"actively fishing for"**, nor does it specify which vessels need to be included (i.e. longline and/or troll). As there was no definition of albacore targeting at the time the first measure was developed (or subsequent measures), countries may have used their own definition when establishing their baseline reference vessel numbers. This paper presents some information to consider in an attempt to define actively fishing for, and presents effort information submitted to the WCPFC for CCMs fishing south of 20ºS. This paper focuses on the longline fishery, toll vessels were not included as it is assumed that all troll vessels south of 20ºS were targeting albacore.

3 Methods

Data were extracted from the regional operational logsheet database, which includes data submitted to the WCPFC and data submitted by SPC member countries. These data are from logsheets from longline vessels fishing between 2005 and 2017. Where logsheet data are not available, data from submissions under CMM 2015-02 were used. For Chinese Taipei, while the data submission separates large and small vessels these are combined for this analysis. Troll vessels were not included as it is assumed that all troll vessels south of 20ºS were targeting albacore and can be considered separately if required. Vessels chartered by a coastal state are considered to be flagged to that state for the purposes of this analysis.

Vessel flagged to Senegal and Portugal who fished in the Convention Area for a short time have also been excluded at this stage.

For each vessel that fished south of 20ºS at any stage between 2005 and 2017 catch data were extracted and tabled by vessel. As no targeting information are provided, fishing for albacore was inferred through the catch proportions in either weight or number of fish. The proportion of albacore in each vessels annual catch was grouped into one of three groups: Group 1 - vessels whose annual catch had less than 50% albacore. These vessels are considered not to be targeting albacore. Group 2 - vessels with 50-59% albacore. This group is considered to be targeting albacore but are separated from Group 3 to assess different target levels. Group 3 - vessels whose catch contained 60% or more albacore, these vessels could be considered albacore specialists or fishing in areas where few other species are caught. These catch proportions were for the amount of albacore in the catch relative to the other main tunas in the catch (bigeye and yellowfin) as well as swordfish which is the other main target species south of 20ºS. Other species such as sharks, while included in the reporting requirements of the measure, were not included in the data extract due to changes in their reporting through time and variability in reporting by Members, Cooperating Non-members and Participating Territories (CCMs) (that is, reporting of shark catches has improved over time).

The WCPFC Convention Area south of the Equator to 50ºS was divided into 5 degree bands to assess trends in effort as you move from the equator south (Figure 1). From 2000 to 2017 catch was assessed (Figure 2) in broad areas and effort collated in the 5 degree bands (Figure 3).

Each vessels' data were collated by year to avoid miss-specification caused by a singular anomalous catch event. These data are presented annually for each flag state, firstly the catch proportions by vessel are presented for the entire fishery (Figure 4) and for each fleet (Figure 5 - Figure 23) and then for each vessel (Figure 24 - Figure 42).

Trends in vessel numbers are presented in 5 degree bands from the Equator to 50ºS. These data are split into vessels whose catch was more or less than 50% albacore (Figure 43 - Figure 61). Also shown is the proportion of vessels where albacore makes up more or less than 50% of the annual catch for each vessel.

The average number of vessels fishing in each Latitudinal band and whose catch consists of 50% or more albacore, are presented by flag in three time periods (2000-2004; 2005; 2005-2017) that correspond to the years quoted in CMM2015-02 (Figure 62 - Figure 80). The coverage of operational data presented herein varies over time and readers are directed to the Scientific Committee (SC) Data Gaps papers (from SC1 onward) (e.g. Williams (2018)) which provides an indication of the coverage by YEAR and FLEET. For example, the coverage of operational longline catch/effort data has gradually improved, and particularly since 2016 with the provision of operational data for the distant-water fleets.

4 Discussion

South of the Equator approximately 80% of the tuna catch in the WCPFC Convention Area comes from the area between the Equator and 20ºS. Between the Equator and 20ºS the overall catch increased from 2000 to 2017. In this area albacore make up about 30-55% of the catch with yellowfin (15-20%) and bigeye (10-40%) making up the bulk of the remaining catch, swordfish making up less than 5% of the catch in this area. There are variations in species composition longitudinally, in the eastern areas of 0-20ºS, the fishery is largely a bigeye tuna target fishery, whereas in the west the fishery is predominantly targeting yellowfin (McKechnie et al., 2018). South of 20ºS the catch is dominated by albacore, and catch has fluctuated with peaks in the early to mid-2000s, 2009-10 and 2017. South of 20ºS albacore makes up 50-80% of the catch with swordfish being the next most abundant species (between 20 and 30% of the catch), and bigeye and yellowfin make up 5-10% and 10-20% respectively (Figure 2).

Overall the number of vessels has fluctuated without trend (Figure 3). However, between the Equator and 20ºS the number of vessels has increased markedly between 2000 and 2017. In the area south of 20ºS the number of vessels has largely declined. Note, **summing the number of vessels by band will result on double counting as a single vessel can fish in more than one band, as a result the total in the plots is to demonstrate overall trends and NOT the total number of vessels.**

Without explicit targeting information from the vessel captain, determining whether a vessel is fishing for albacore is difficult. However, the catch proportions should infer targeting, as vessels are only likely to survive economically if they catch their intended target species. While other species will be retained and

be important contributors to the catch the main target species is likely to be the predominant species in the catch. In this analysis we are assessing 'targeting' over a year, we know that targeting in particular places might be constrained to certain seasons, which we cannot take into account from the data supplied under the CMM, which is supplied by vessel-year.

Overall the analysis indicates that for vessels fishing south of 20°S a high proportion of them have catch that is made up of more than 50% albacore (Figure 4).

The data show that it is important to consider catch in terms of both numbers and weight. This is largely due to the difference in the size of albacore and other species. For example albacore further south are smaller and swordfish are larger in that area, the result is that vessels fishing further to the south will have high albacore catch proportions by number but low catch proportions by weight (e.g. Figure 18). Whereas, those vessels fishing in the mid-latitudes have similar catch proportions when considered by weight and number. In addition, some CCMs only report catch in weight (e.g. Figure 12) while others report in both weight and numbers. The reporting of catch in weight was the specific reporting requirement under CMM 2015-02. Catch in weight is a visual estimate, while catch in number should be more accurate and highlights any bias in the reporting of catch in weight.

Assessing the number of vessels by Latitudinal band allows us to determine the spatial extent of a fleet from a north-south perspective. Many fleets have higher numbers of vessels in the low latitudes and few vessels in the high latitudes, with some notable exceptions such as New Zealand (e.g. Figure 55). The Distant Water Fishing Nations (DWFNs) show strong trends with high numbers of vessels fishing in the tropics and decreasing effort with increasing latitude, whereas most Pacific Island Countries (PICs) have the highest effort in the Latitudinal bands the correspond to their EEZ. Some fleets use a wide area, fishing from the Equator to the high latitudes and show an increasing dependency on albacore as they move south (e.g. Figure 61). Others are more variable and show lower albacore dependency in the southern areas, these vessels are likely targeting other species such as swordfish (e.g. Figure 55). Most fleets fishing in the equatorial zones (Equator to 10°S) are not albacore reliant and catch mostly bigeye and yellowfin tuna.

The WCPFC Conservation and Management Measure CMM2015-02 paragraph 1 stipulates that *(CCMs) shall not increase the number of their fishing vessels actively fishing for South Pacific albacore in the Convention Area south of 20°S above 2005 levels or recent historical (2000-2004) levels.* Note that it is unclear from the CMM what is meant for the period 2000-2004, is it the average over that period or the maximum? Clarifying this would assist in future analyses. In order to track these effort trends the CMM states that "CCMs shall report annually to the Commission the catch levels of their fishing vessels that have taken South Pacific Albacore as a bycatch as well as the number and catch levels of vessels actively fishing for South Pacific albacore in the Convention area south of 20°S." This requirement starts from 2006 and is an annual requirement thereafter, but there is no provision of data required for the reference years (2000-2005). Assessing the number of vessels fishing for albacore, and assuming that a vessel whose catch consists of 50% or more albacore is targeting albacore, will allow managers to determine the base line for the CMMs effort levels and compliance with CMM2015-02. Managers will need to decide whether to use catch by weight or numbers (or allow CCMs to choose) as these trends will change as you move south. Albacore in the south are small but abundant therefore fleets that fish predominantly in the southern areas will have high catch rates of albacore by number but low by weight. However, in the lower latitudes catch by weight and number are similar. Some CCMs show an increase in the number of vessels south of 20°S (e.g. Figure 64) whether assessed relative to 2000-2004 or 2005, while others show declines (e.g. Figure 80). To compare the vessel numbers fishing for albacore in Table 1 or Table 2 with those submitted to the WCPFC (Table 3), only 2017 is truly comparable as that is the only year where the SPC has a full set of operational data.

Assessing these trends using the SPC held aggregated data provides variable results. For some flags the data are quite different, as in the case of Japan (Figure 81) where SPC does not have access to the full suite of operational level data. Whereas for New Zealand (e.g. Figure 82) the data are fairly similar in terms of the effort trends but the proportion of vessels with catch compositions dominated by albacore differ slightly.

The data presented here allow CCMs to consider how many vessels for each flag are fishing for albacore and how those numbers have changed through time. Furthermore, CCMs should decide on what catch proportion should be used for defining fishing for south Pacific albacore. Once this decision is made we can provide tables of numbers of vessels fishing for south Pacific albacore by year and CCM.

In the absence of any recommended cut-off limit we consider vessels with 50% or more albacore in the catch to be fishing for albacore. The decision as to whether this should be based on catch in weight or numbers is largely dependent on where the vessels are fishing. The fleets fishing further south may wish to choose numbers, for those fleets that fish in the areas closer to 20°S the assessments in weight vs. numbers provide similar results. Misreporting might occur if catch in weight is selected as a measure (i.e. under-reported weights). Catch in number should be easier to report consistently on logbooks and can more easily be validated at unloading (since albacore may not necessarily be weighed at landing, but more easily counted by independent fisheries officers). As a first attempt to assess the numbers of vessels fishing for albacore by fleet we have tabled the number of vessels fishing south of 20°S whose catch ratio of albacore is 50% or greater in either weight or numbers (Table 1 and Table 2). These tables include longline vessels only; it is assumed countries will include their own troll vessels in any data required by the Commission. However,these analyses used operational level data which are incomplete for the DWFN fleets until recently, as a result the number of vessels for these fleets, both historically and since CMM2010-05 came into force, may be underestimated. If requested, an estimation of effort could be developed based on hooks set (noting that hooks, but not vessels, are available in the aggregate data which represents full coverage of catch/effort data). Estimates based on hooks will, however, not align with effort expressed as number of vessels, which may be a more appropriate measure from a management perspective. Potential biases with interpretation of *hooks* and *number of vessels* include:

- The data will need to be in hooks set per year, if one vessel fishes in a Latitudinal band for one day and then and another for 200 days averaging these will be problematic and using vessel as a measure of effort will likely be biased;

- The DWFN data that we do have operational data for is largely from vessels fishing within PIC EEZs. If DWFN vessels fish differently on the high seas, averaging the hooks set per year by flag for these vessels will be biased.

As a request from TCC14, the SPC has been asked as part of this work to present the level of longline observer coverage in the Convention area south of 20°S. These data are presented in Table 4. These data include both the Regional Observer Programme (ROP) and National Observer Programme coverage. Overall the observer coverage is low, but tends to increase as you move south. Some of the high numbers in the high latitudes result from the overlap with the southern bluefin tuna fishery where effort is lower than areas to the north, and the targeted observer coverage is higher.

5   Recommendations

We invite members to consider the following recommendations:

- **Recommend** that vessels whose annual catch consists of 50% or more albacore (in either weight or numbers) be considered to be fishing for albacore.

- **Recommend** that Members advise SPC as to whether or not SPC should expand the effort tables through an analysis of the aggregated data, noting the issues outlined above.

- **Recommend** that Members advise SPC as to what modifications to this paper they would find informative for WCPFC15.

References

McKechnie, S., Brouwer, S., and Pilling, G. (2018). Preliminary analyses of longline fishing for south pacific albacore. Technical Report Working paper 03, 8th Meeting of the Participants to the Tokelau Arrangement, Oceanic Fisheries Programme, The Pacific Community.

WCPFC (2015). Conservation and Management Measure for south Pafific Albacore. Technical Report CMM2015-02, Western and Central Pacific Fisheries Commission.

Williams, P. (2018). Scientific data available to the Western and Central Pacific Fisheries Commission. Technical Report WCPFC-SC14-2018 ST-WP-01, Busan, Republic of Korea, 8-16 August 2018.

Tables

Table 1: The estimated number of vessels fishing for albacore between 20S and 50S within the WCPFC convention area based on a catch ratio of 50 percent or more albacore by number of fish according to available operational catch and effort data.

Flag	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AS	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AU	3	8	0	1	33	13	28	18	10	39	8	6	7	19	9	6	17	18
BZ	1	2	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CK	0	1	11	27	15	7	7	3	6	4	7	6	9	4	3	2	5	11
CN	0	0	10	17	12	16	20	23	20	38	34	49	59	49	55	62	78	61
FJ	35	62	76	88	80	82	84	79	61	55	68	88	80	71	54	46	66	56
FM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	5
ID	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
JP	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0
KI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
KR	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
NC	14	13	19	13	21	21	17	24	24	21	17	18	19	17	18	15	17	16
NU	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
NZ	105	128	150	127	95	53	47	38	28	39	43	36	34	35	30	25	27	31
PF	13	7	5	31	35	32	20	27	38	27	26	27	28	29	34	42	50	52
SB	0	0	0	0	0	0	0	0	1	0	3	0	5	1	7	4	1	0
TO	13	18	24	25	11	9	11	9	4	6	4	0	2	0	0	0	0	0
TW	19	20	50	48	26	18	15	12	13	14	9	16	13	19	8	5	32	55
US	0	1	1	18	6	0	0	2	1	3	2	0	2	2	0	3	2	3
VU	3	6	21	21	51	52	37	35	33	40	40	22	40	20	17	21	17	25
WS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2

Table 2: The estimated number of vessels fishing for albacore between 20S and 50S within the WCPFC convention area based on a catch ratio of 50 percent or more albacore by weight of fish.

Flag	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AS	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AU	0	0	0	0	1	2	17	14	0	2	1	2	2	2	0	0	0	1
BZ	1	2	5	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CK	0	0	8	19	10	5	5	2	3	3	7	5	9	3	3	2	5	11
CN	0	0	10	17	12	16	20	23	20	38	34	49	56	48	55	59	78	60
FJ	34	60	72	85	79	82	84	77	61	55	67	87	78	71	52	46	64	54
FM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
ID	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
KI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2
KR	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
NC	14	10	18	11	19	20	17	22	24	21	17	18	17	17	17	14	17	16
NU	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0
NZ	51	97	123	109	59	30	17	9	4	15	18	5	4	6	10	6	5	6
PF	13	5	5	32	33	31	20	27	38	27	26	27	28	29	34	42	50	52
SB	0	0	0	0	0	0	0	0	1	0	3	0	5	1	7	4	1	0
TO	13	18	24	23	7	7	9	7	2	6	4	0	2	0	0	0	0	0
TW	19	20	50	48	25	18	14	12	13	14	9	15	10	17	6	2	32	54
US	0	1	1	18	6	0	0	1	1	3	2	0	2	2	0	3	1	3
VU	3	6	21	20	51	52	37	35	33	40	40	22	37	20	17	21	17	25
WS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2

Table 3: The data submitted to the WCPFC under CMM2015-02.

Flag	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
AU	108	88	56	49	51	48	46	40	36	36	36	34	36
CK	16	15	11	9	6	9	6	9	4	4	2	5	11
CN	16	20	23	20	39	34	50	57	49	57	65	86	64
ES	10	21	18	17	9	5	5	5	5	5	3	4	3
FJ	86	87	81	67	58	70	93	81	75	64	47	71	65
FM	0	0	0	0	0	0	0	0	0	1	1	0	5
ID	0	0	0	0	0	0	0	0	0	1	0	0	0
JP	0	34	21	19	19	26	34	29	28	26	0	1	0
KI	0	0	0	0	0	0	0	0	0	0	0	1	2
KR	0	0	0	0	0	1	2	0	0	0	2	0	0
NC	24	20	24	24	21	17	18	19	17	18	26	17	16
NU	2	1	4	0	0	0	0	0	0	0	0	0	0
NZ	57	55	45	35	40	44	41	43	39	36	34	32	32
PF	35	26	29	38	27	29	28	29	29	37	42	51	53
PT	0	0	0	0	0	0	0	0	0	1	1	0	0
SB	0	0	0	1	0	3	0	5	1	8	4	1	0
SN	0	2	2	0	0	0	0	0	0	0	0	0	0
TO	13	14	13	10	7	5	3	4	1	5	5	4	6
TW	0	57	49	53	53	44	69	57	62	52	45	44	55
US	0	0	2	1	3	2	1	2	2	0	3	2	3
VU	53	38	35	33	41	40	22	40	20	17	21	18	26
WS	0	0	0	0	0	0	0	0	0	0	0	0	2

Table 4: The percentage of hooks observed between the Equator and 50S within the WCPFC convention area.

Year	0-5S	05-10S	10-15S	15-20S	20-25S	25-30S	30-35S	35-40S	40-45S	45-50S
2000	0.0%	0.5%	0.7%	0.0%	0.1%	0.1%	0.5%	0.5%	6.3%	55.7%
2001	0.1%	0.6%	0.5%	0.0%	0.2%	0.0%	1.1%	1.3%	3.6%	48.6%
2002	0.3%	0.9%	1.6%	0.4%	0.6%	0.0%	0.2%	0.3%	2.6%	41.9%
2003	0.1%	0.7%	0.8%	0.5%	1.2%	1.0%	0.9%	0.7%	5.3%	43.3%
2004	0.1%	0.2%	0.4%	1.5%	2.3%	0.9%	0.3%	0.4%	9.2%	38.6%
2005	0.2%	0.5%	0.4%	2.1%	3.4%	0.7%	0.1%	0.1%	5.1%	59.9%
2006	0.0%	0.1%	1.5%	2.1%	3.4%	1.1%	0.8%	0.8%	10.5%	65.8%
2007	0.1%	0.2%	1.8%	1.6%	2.4%	0.7%	1.8%	4.6%	16.3%	46.8%
2008	0.1%	0.4%	1.4%	1.9%	4.4%	2.0%	3.2%	2.9%	8.2%	15.1%
2009	0.0%	0.0%	1.1%	1.7%	5.2%	0.6%	2.3%	2.6%	24.2%	34.6%
2010	0.1%	0.2%	2.1%	2.0%	2.6%	0.2%	1.0%	1.8%	9.9%	46.4%
2011	0.5%	1.2%	2.6%	2.6%	3.2%	0.6%	1.5%	2.2%	4.7%	22.0%
2012	0.9%	2.1%	2.5%	1.6%	1.1%	1.7%	1.6%	6.5%	7.2%	70.4%
2013	0.9%	3.4%	3.1%	4.7%	2.8%	2.9%	4.7%	2.0%	7.1%	52.6%
2014	0.8%	1.9%	2.9%	4.5%	5.5%	2.0%	2.0%	2.2%	7.9%	20.0%
2015	1.3%	0.8%	1.7%	6.8%	8.4%	0.3%	0.4%	4.3%	28.2%	21.3%
2016	0.5%	1.2%	3.5%	9.4%	11.0%	0.3%	0.4%	3.5%	2.2%	
2017	0.2%	0.4%	1.3%	3.8%	5.7%	0.1%	0.3%	2.7%	4.0%	0.0%
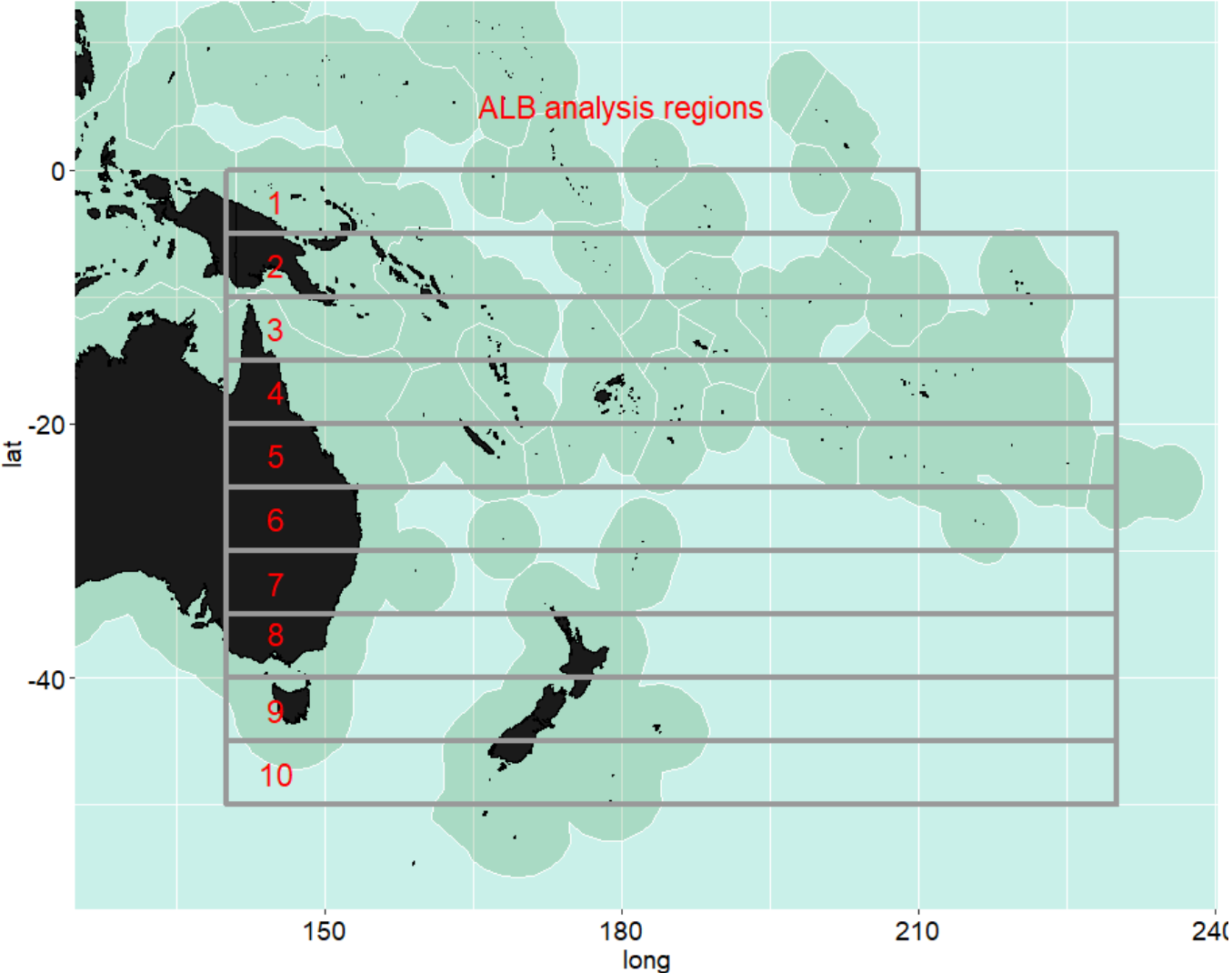
Figures

Figure 1: The regional breaks used in this analysis.
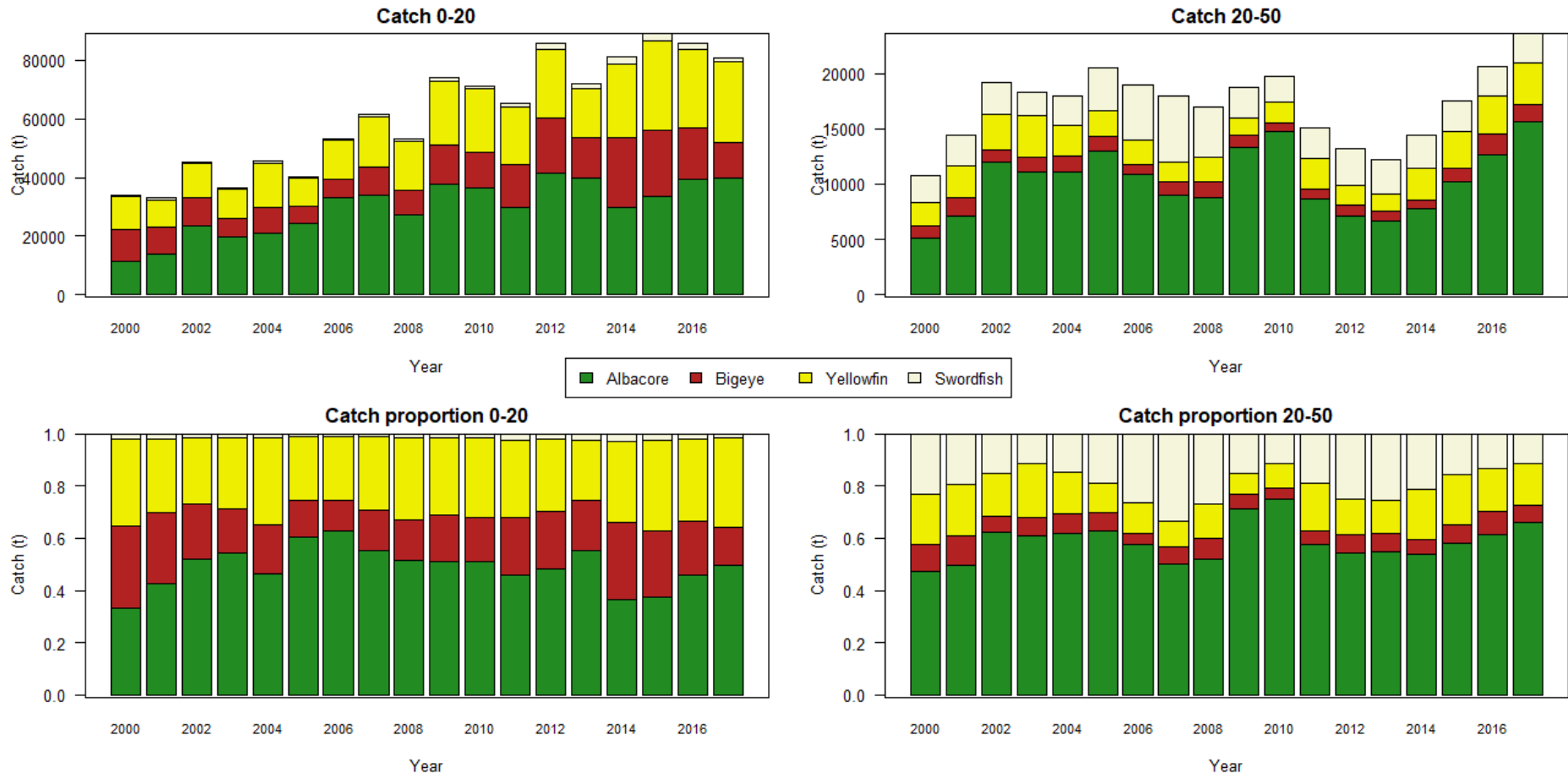
Figure 2: Trends in the tuna and swordfish catch above and below 20°S and the proportion of their catch contribution.
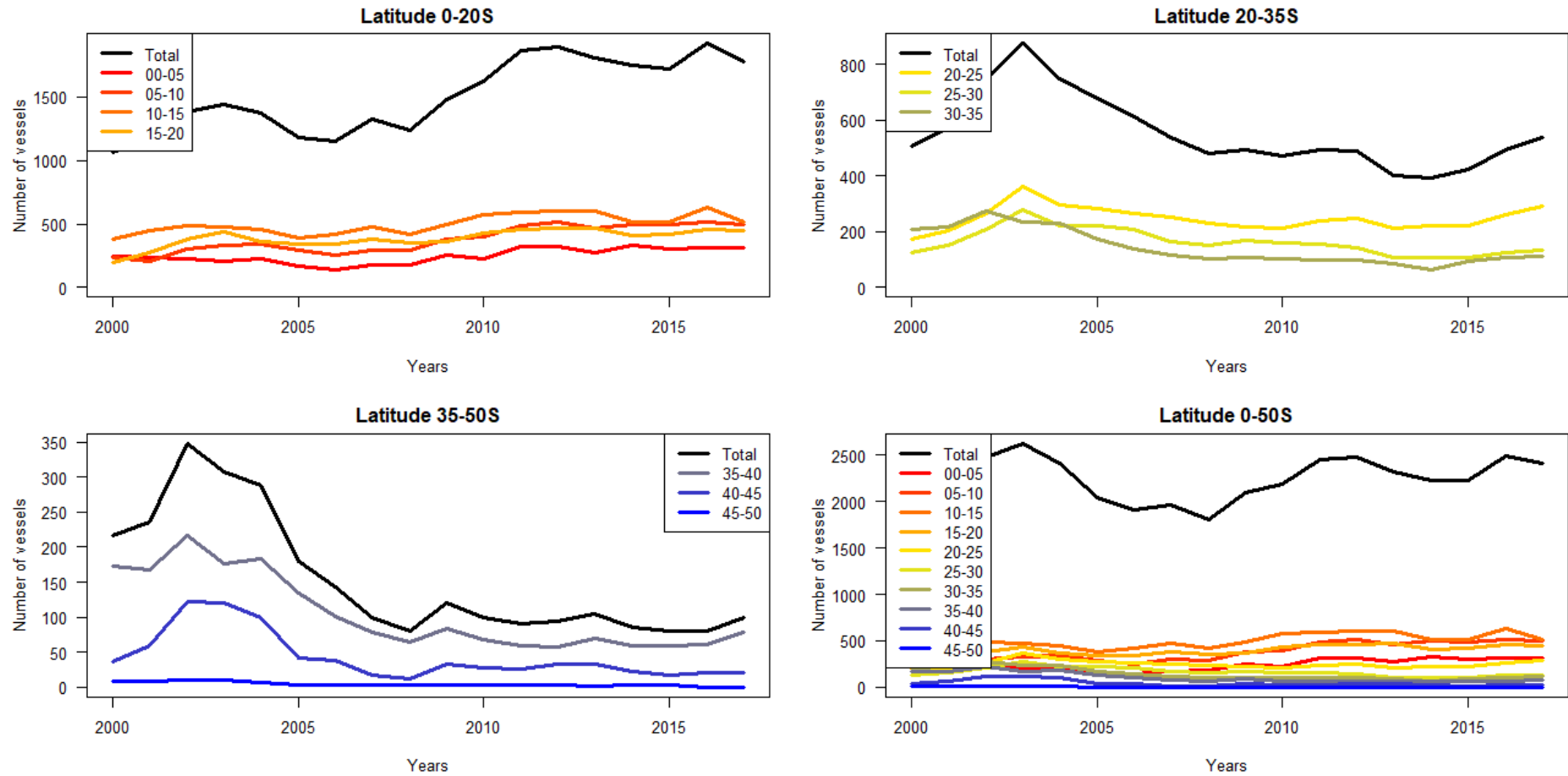
Figure 3: Trends in the the number of vessels south of the Equator in 10 Latitudinal bands between the equator and 50^oS. Note, summing the number of vessels by band will result on double counting as a single vessel can fish in more than one band, as a result the total in the plots is to demonstrate overall trends and NOT the total number of vessels.
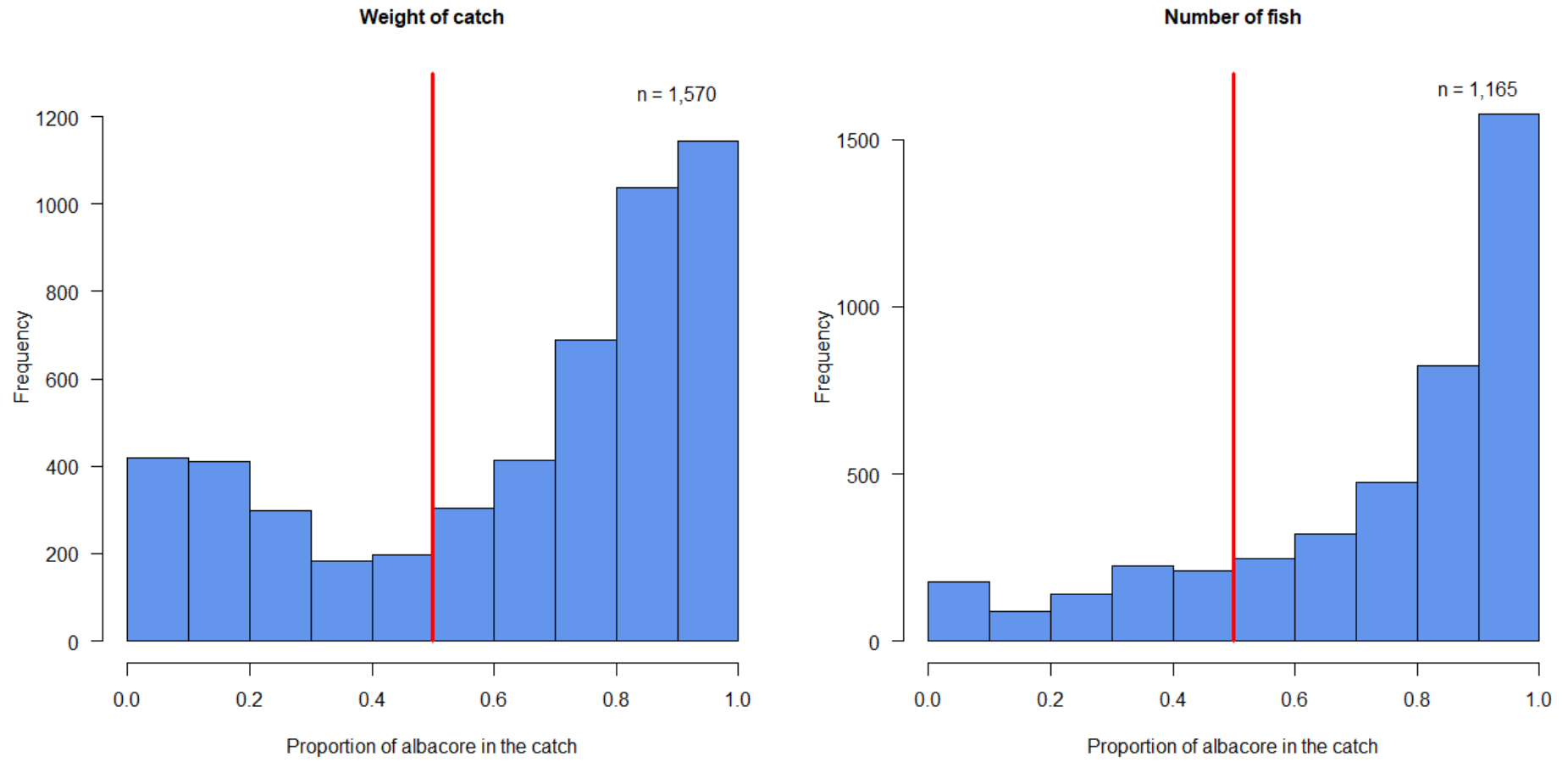
Figure 4: **Trends in the number of vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.**
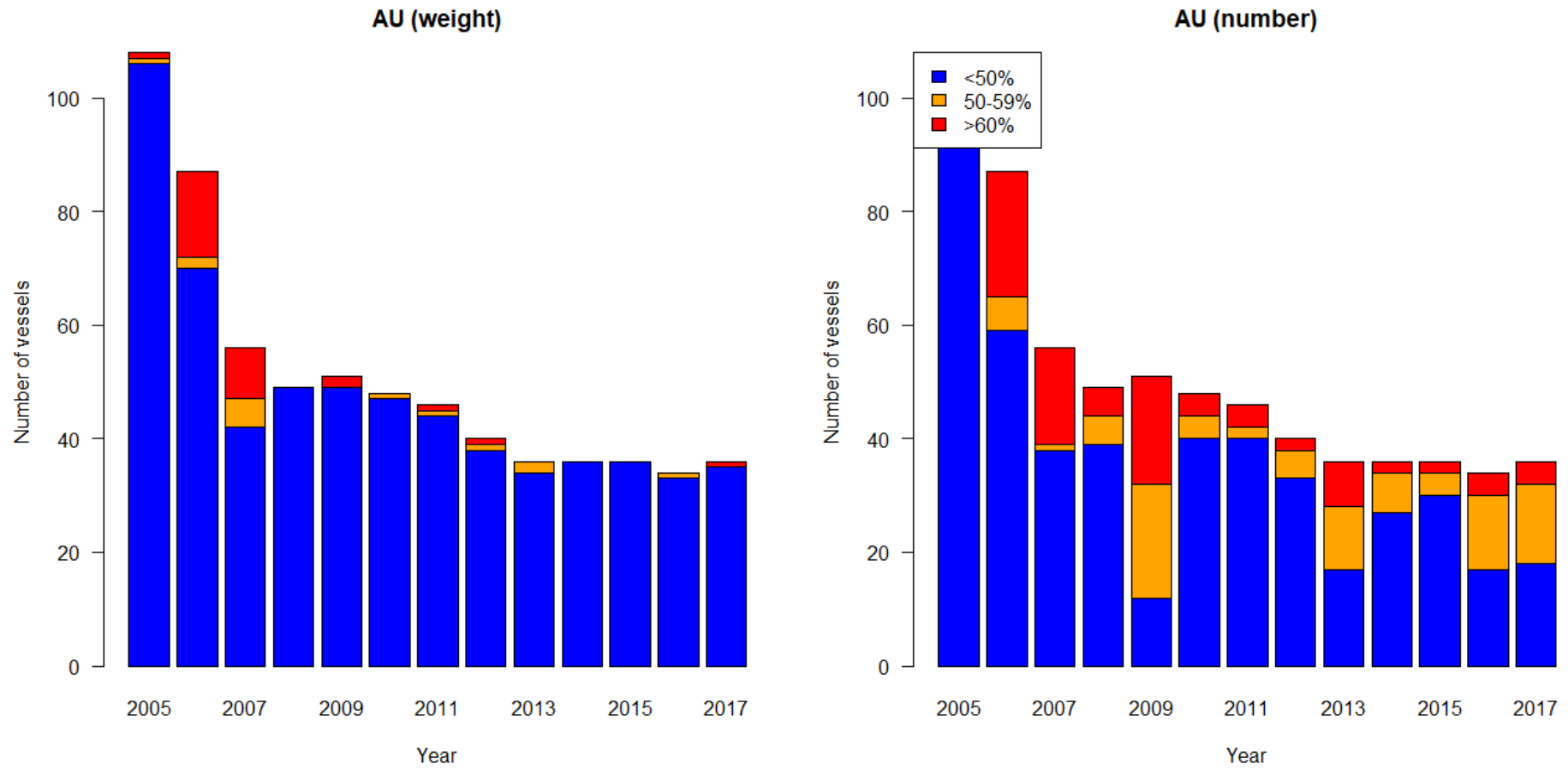
Figure 5: Trends in the number of Australian vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
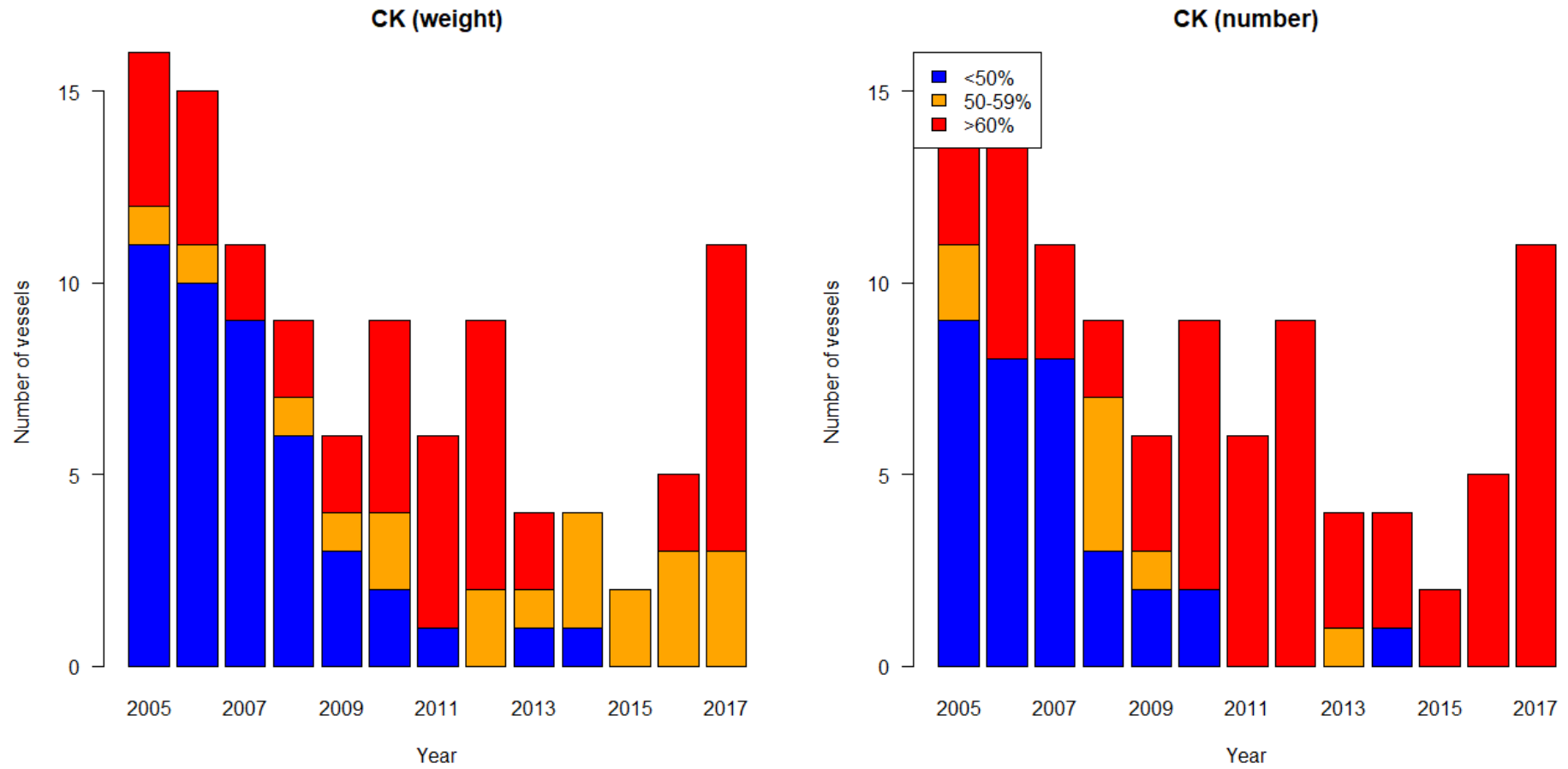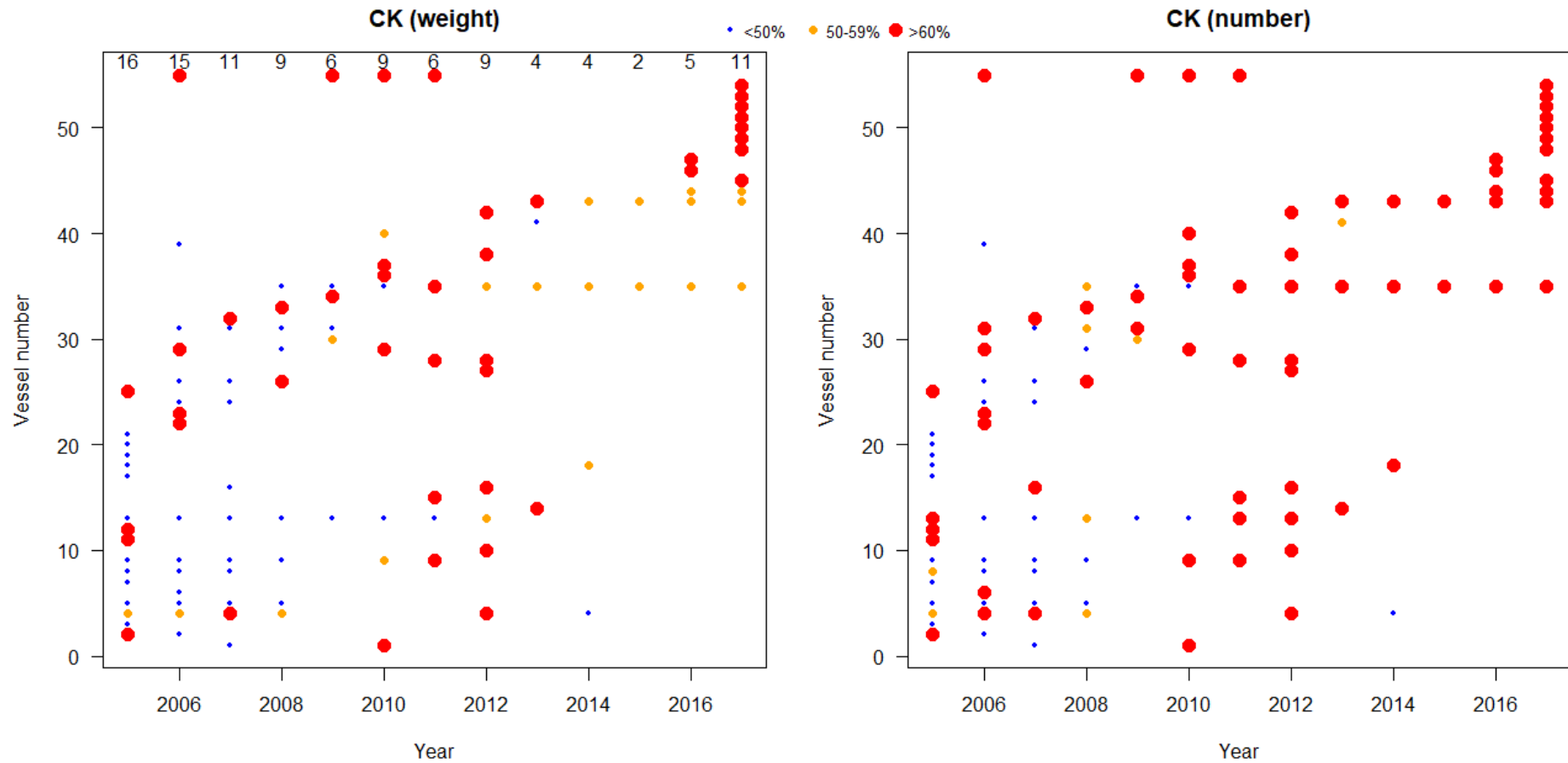
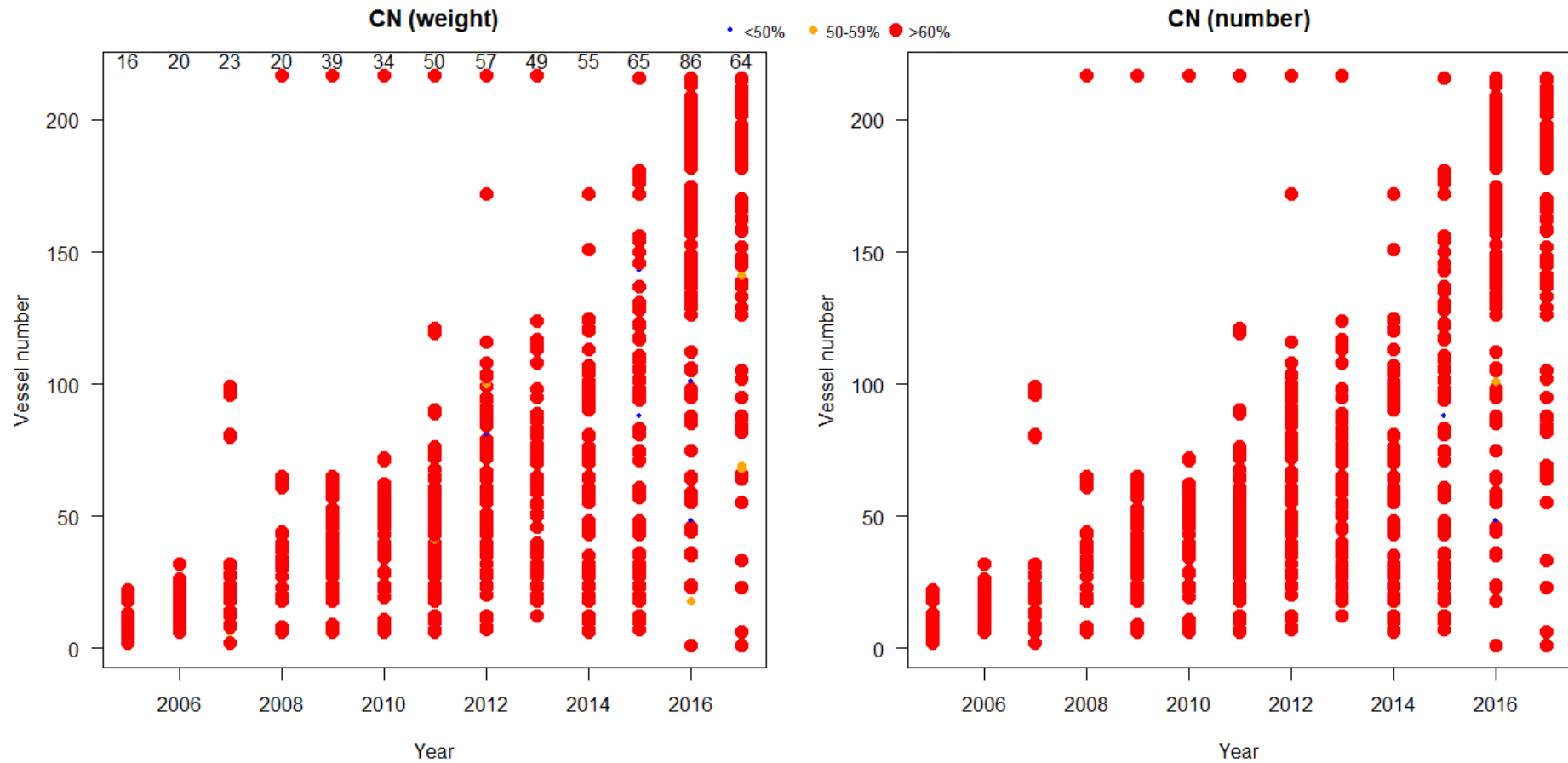**Figure 6:** Trends in the number of Cook Island vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
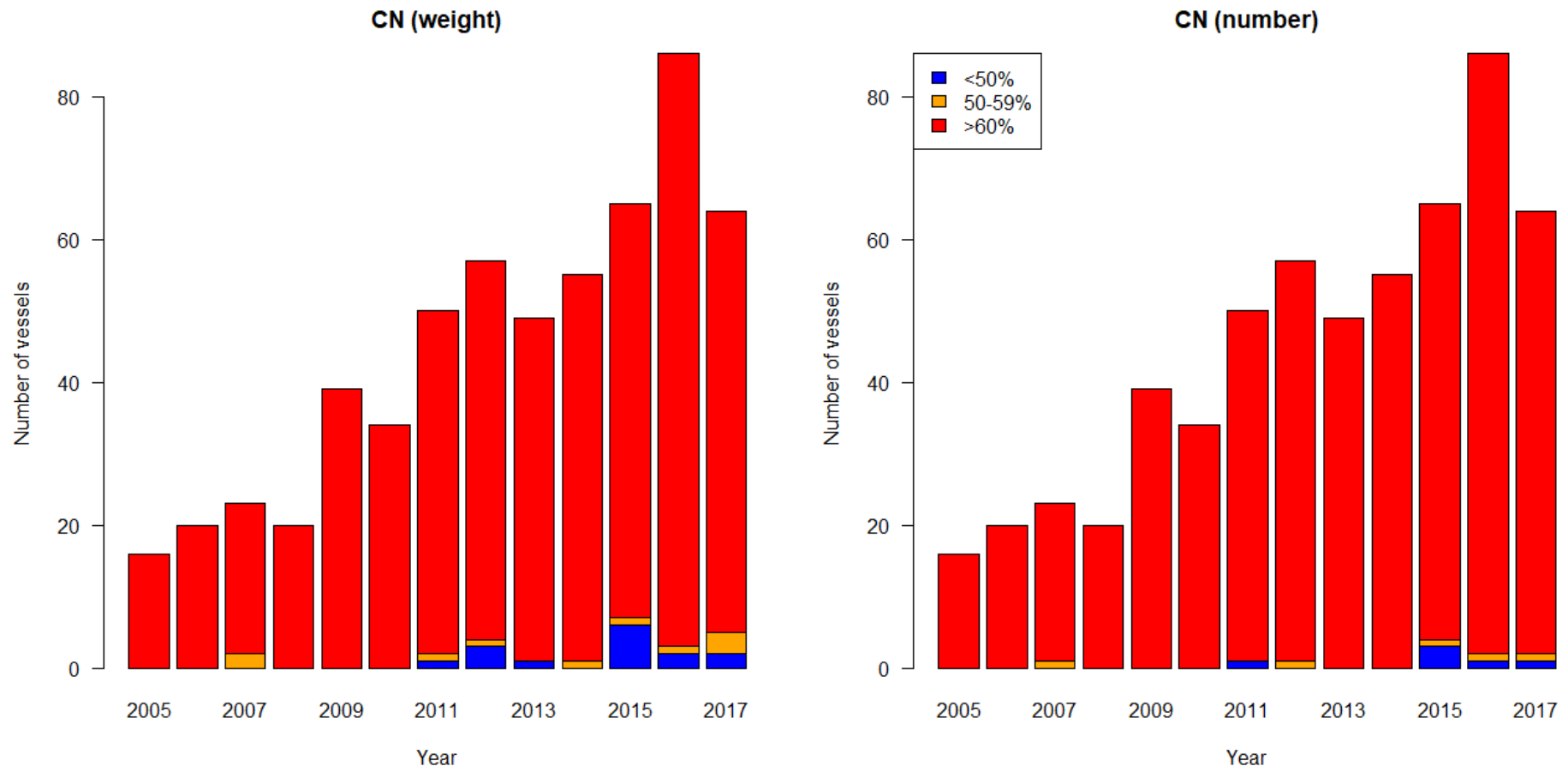
Figure 7: Trends in the number of Chinese vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
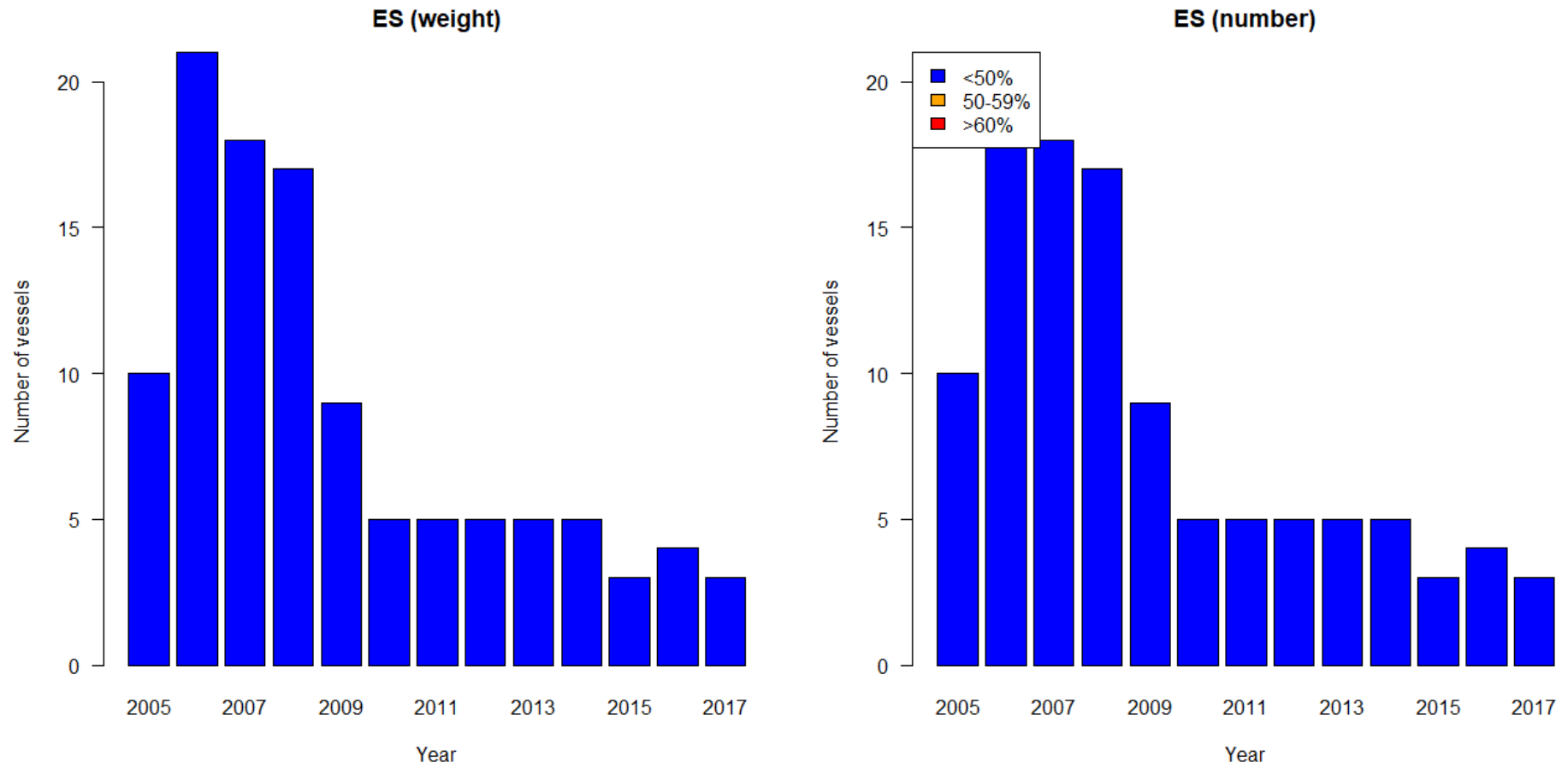
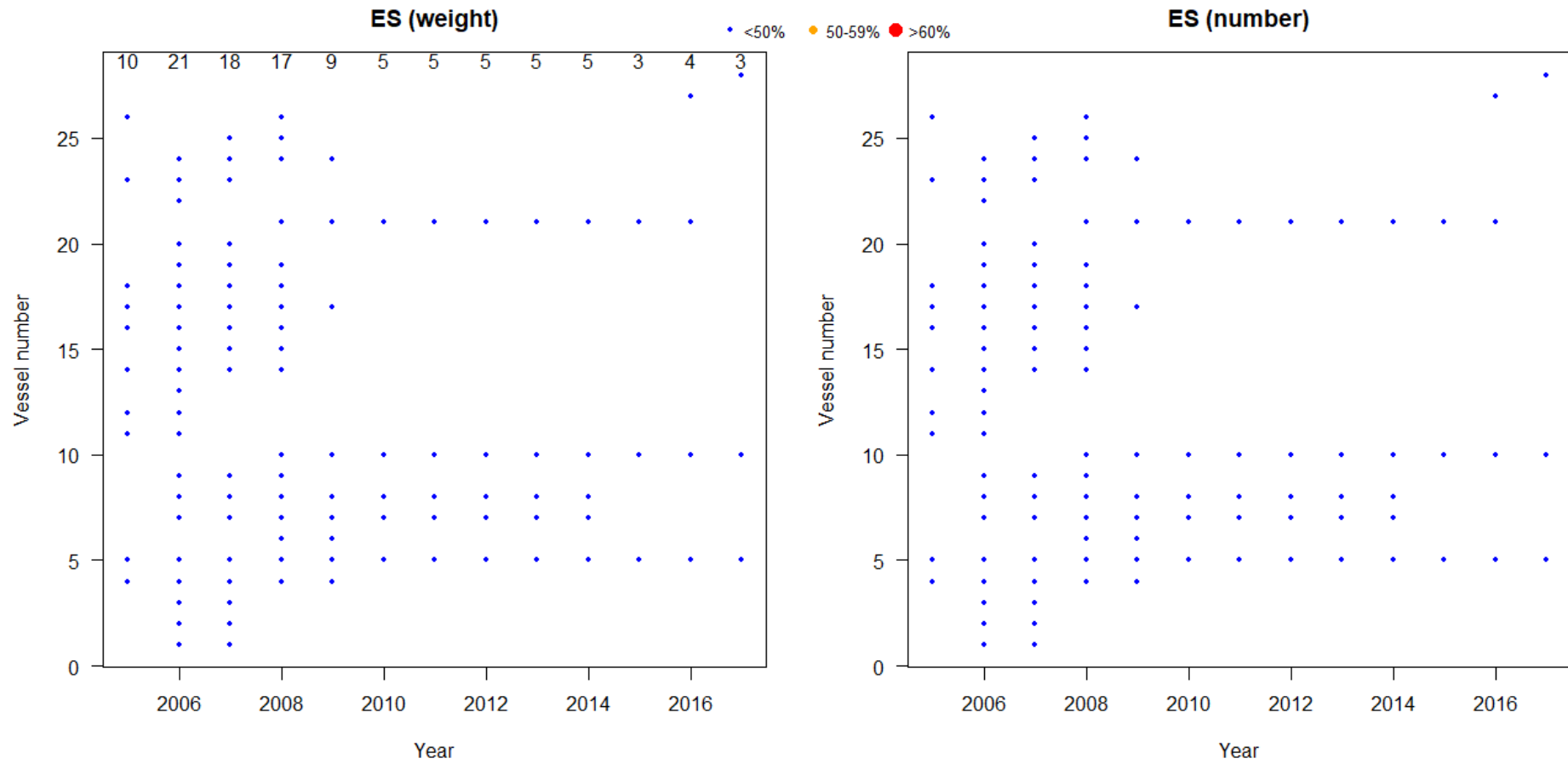Figure 8: Trends in the number of EU (Spain) flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
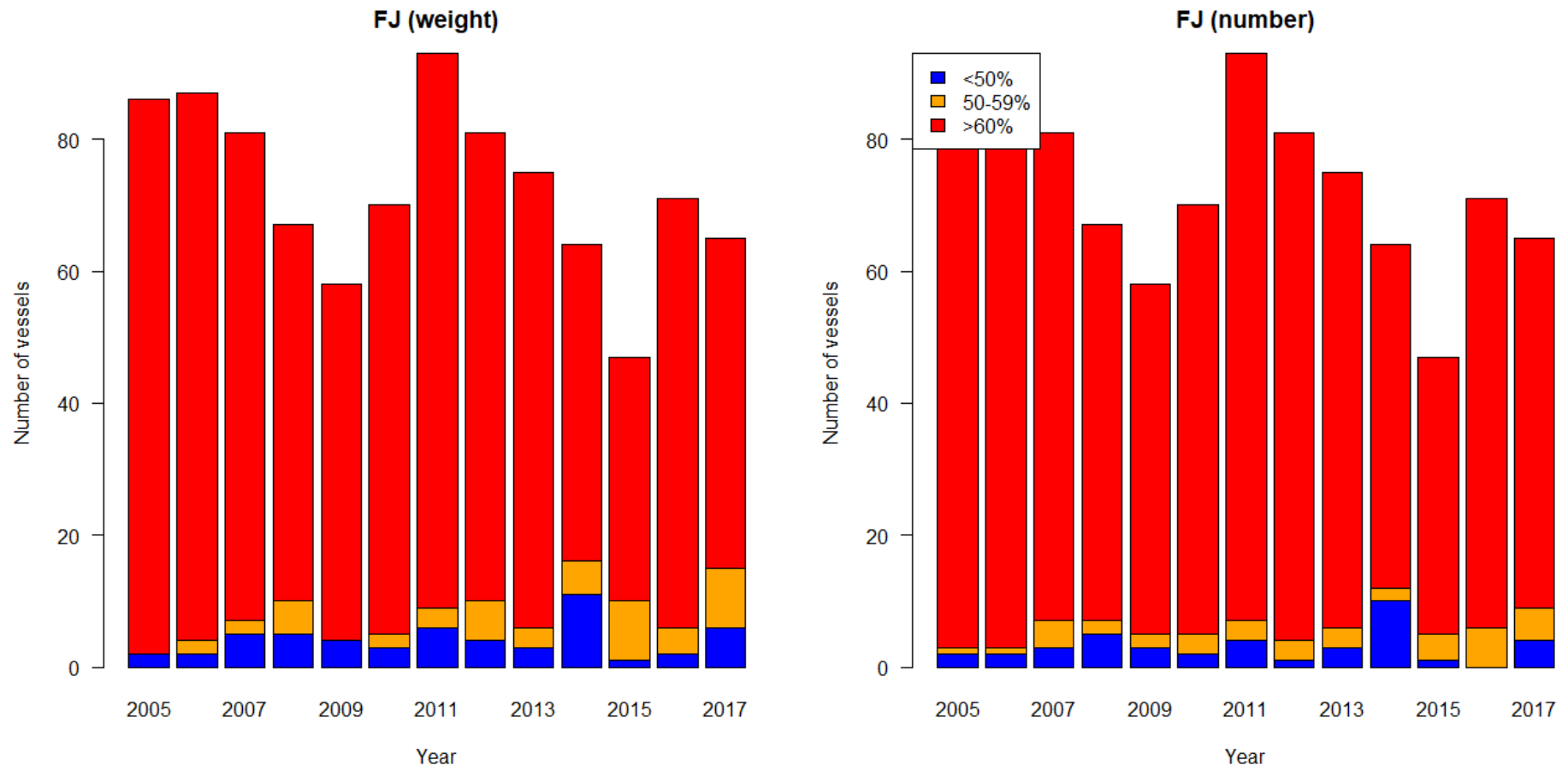
Figure 9: Trends in the number of Fijian flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
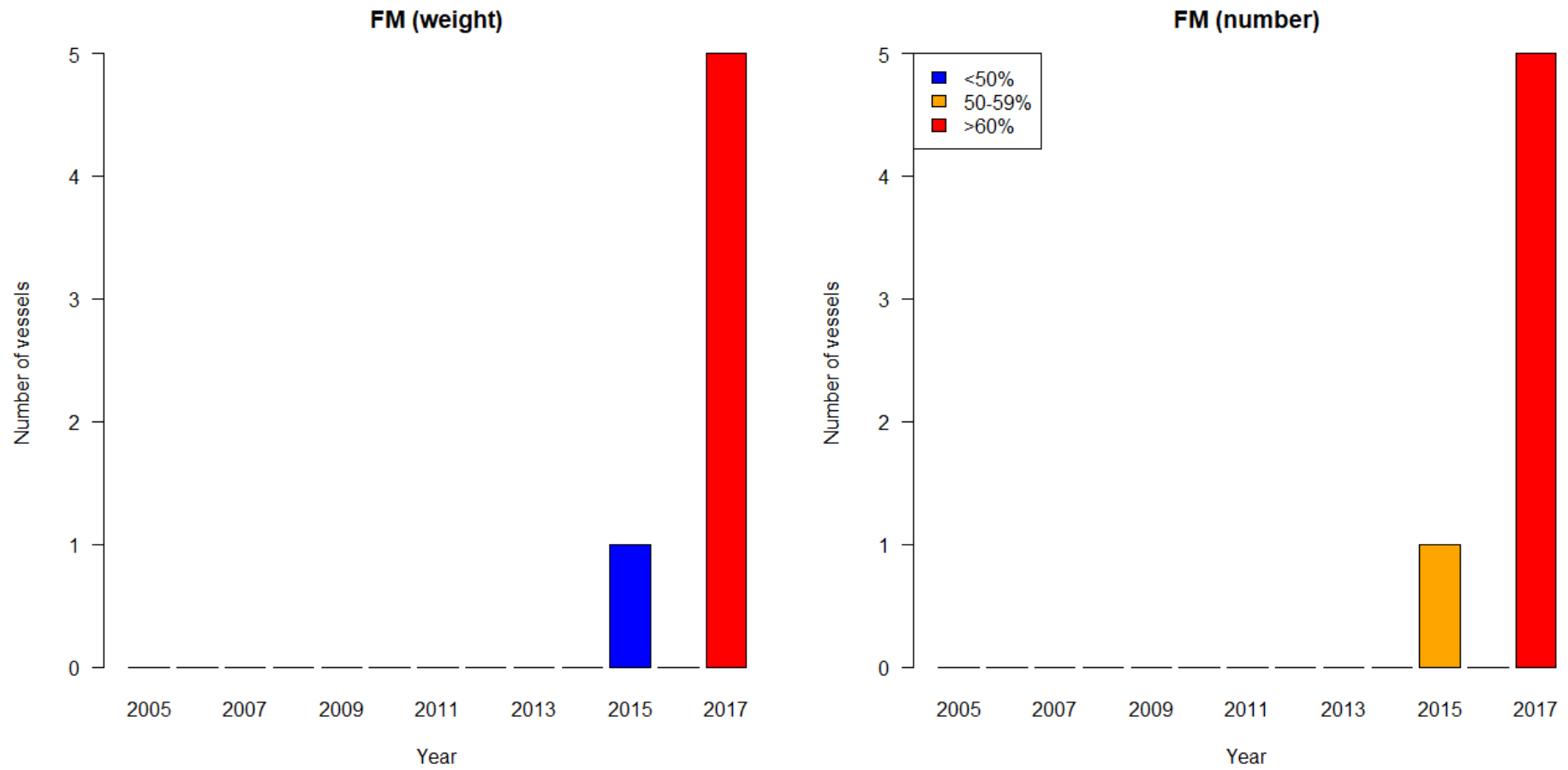
Figure 10: Trends in the number of Micronesia flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
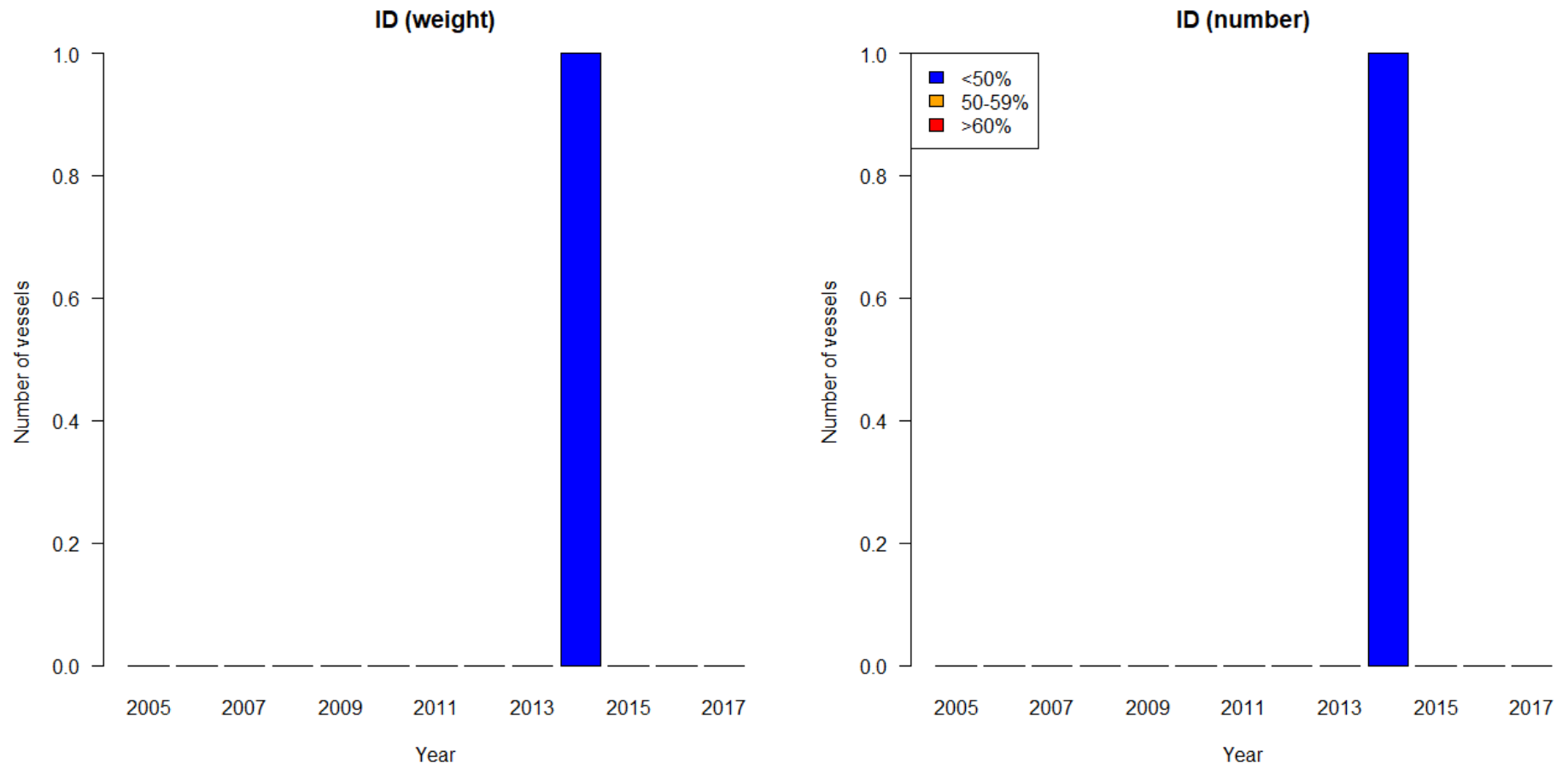
Figure 11: Trends in the number of Indonesian flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
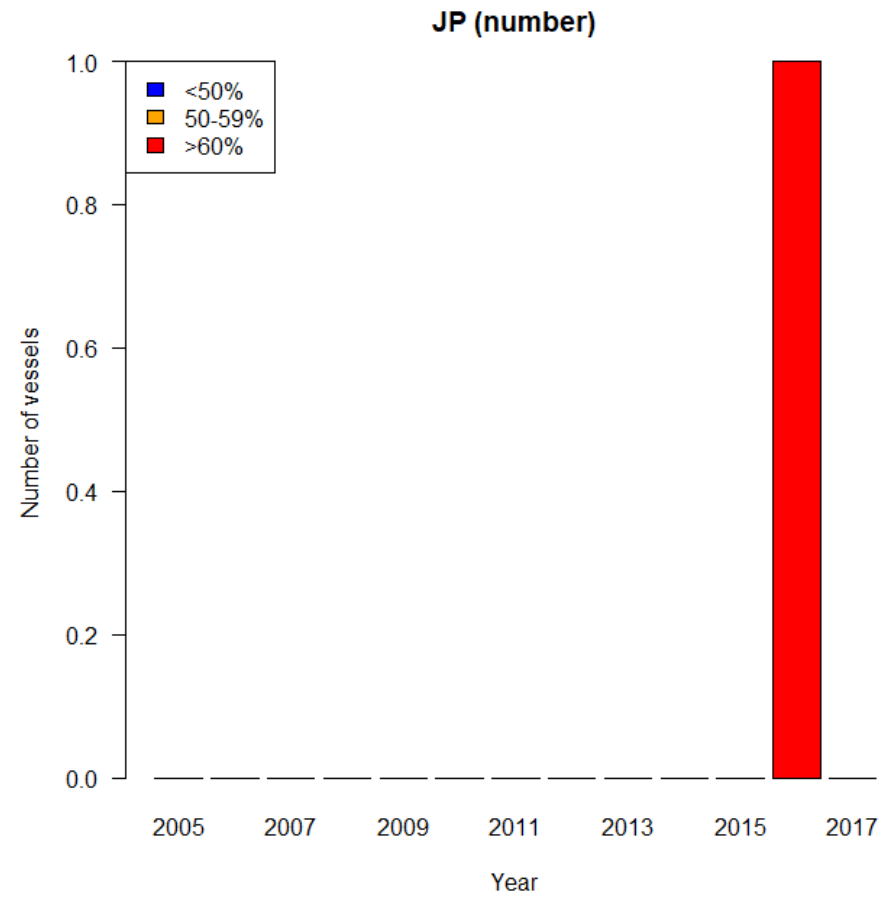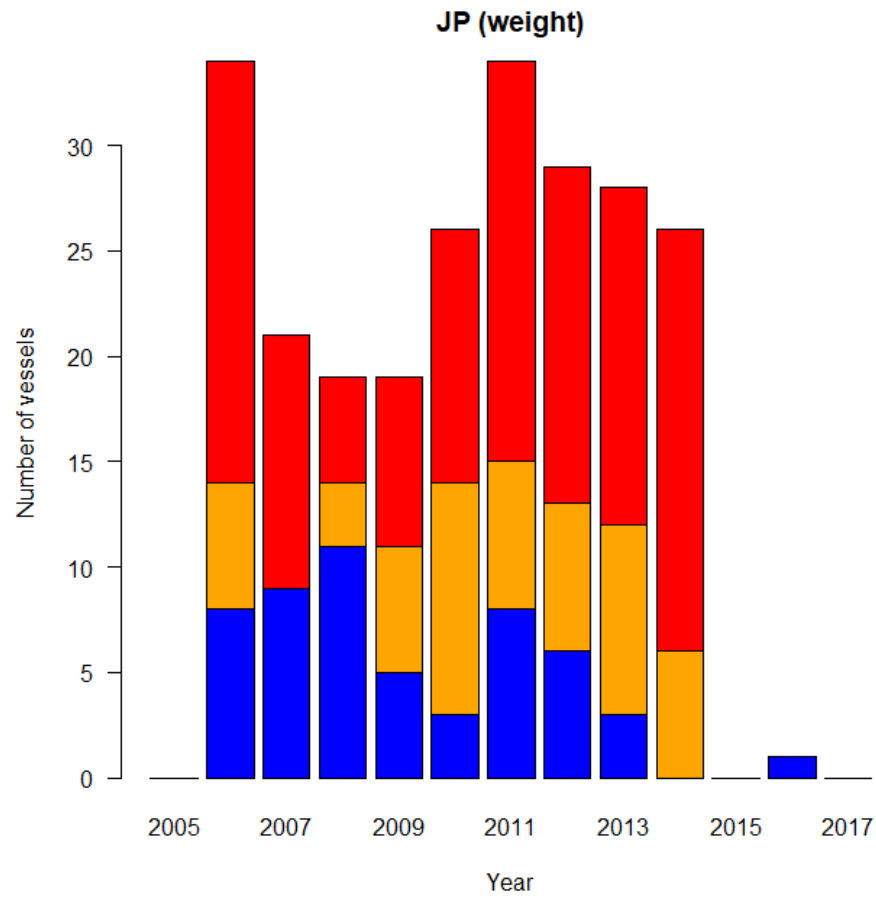
Figure 12: Trends in the number of Japanese flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
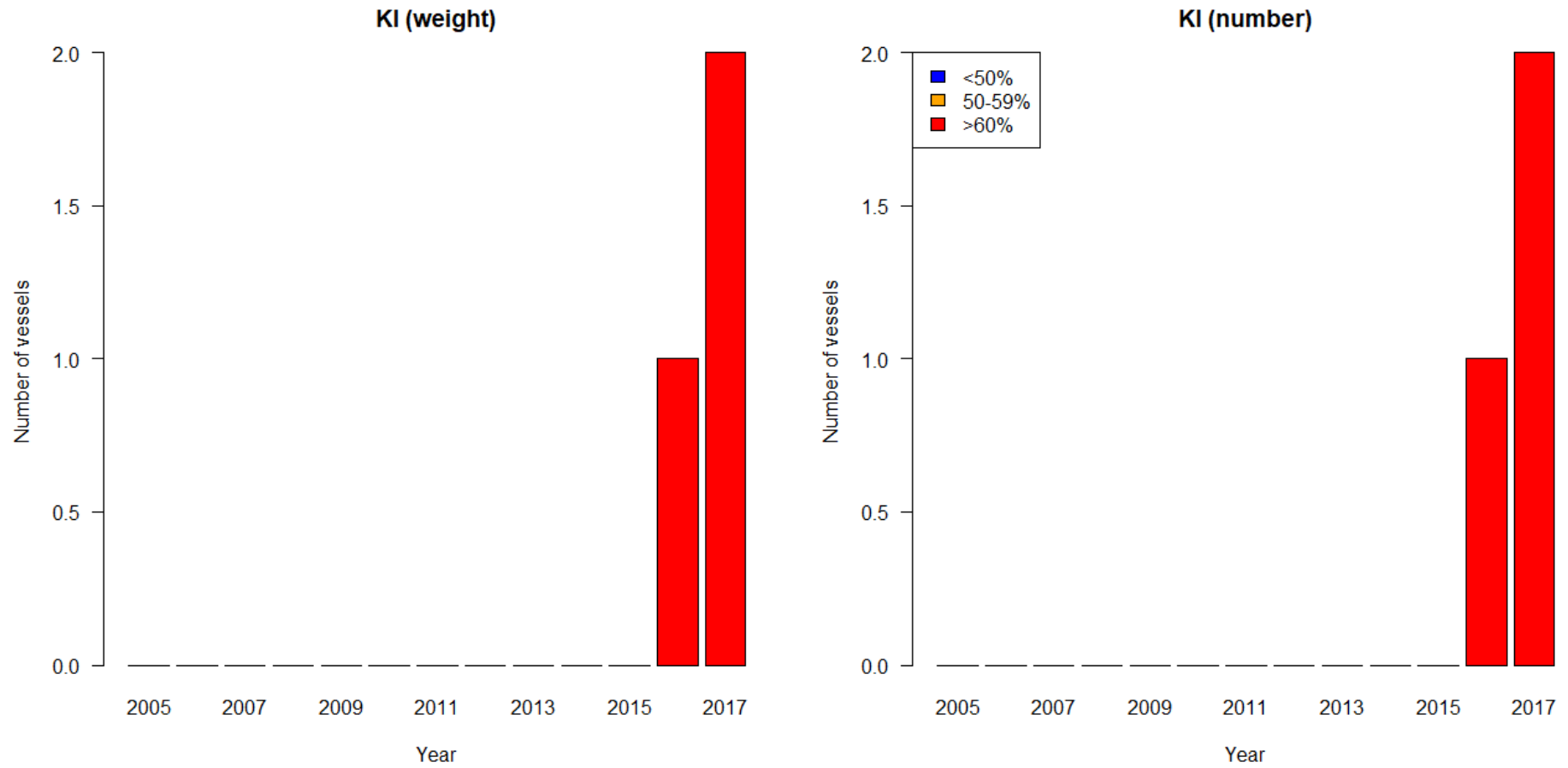
Figure 13: Trends in the number of Kiribati flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
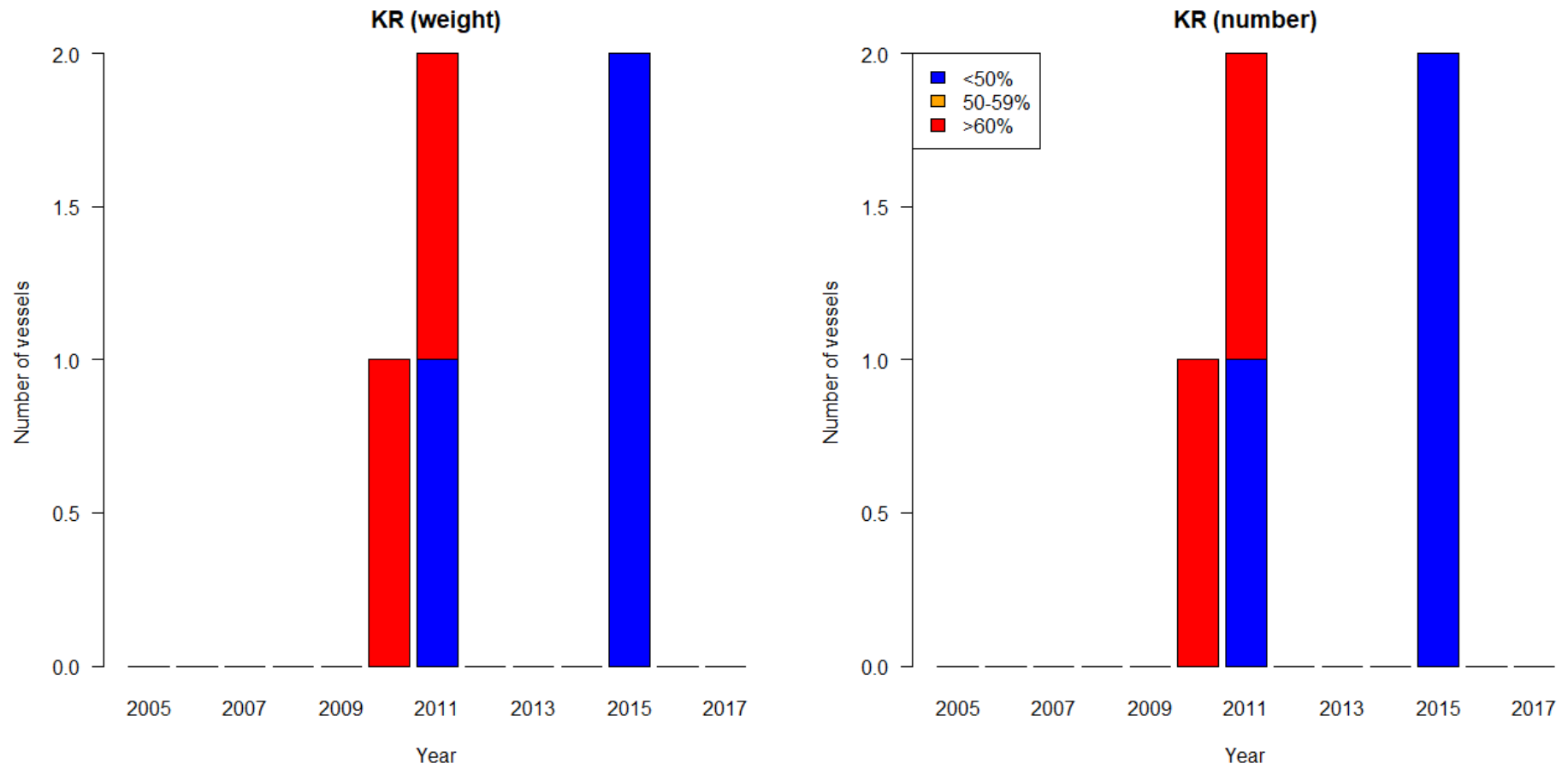
Figure 14: Trends in the number of Korean flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
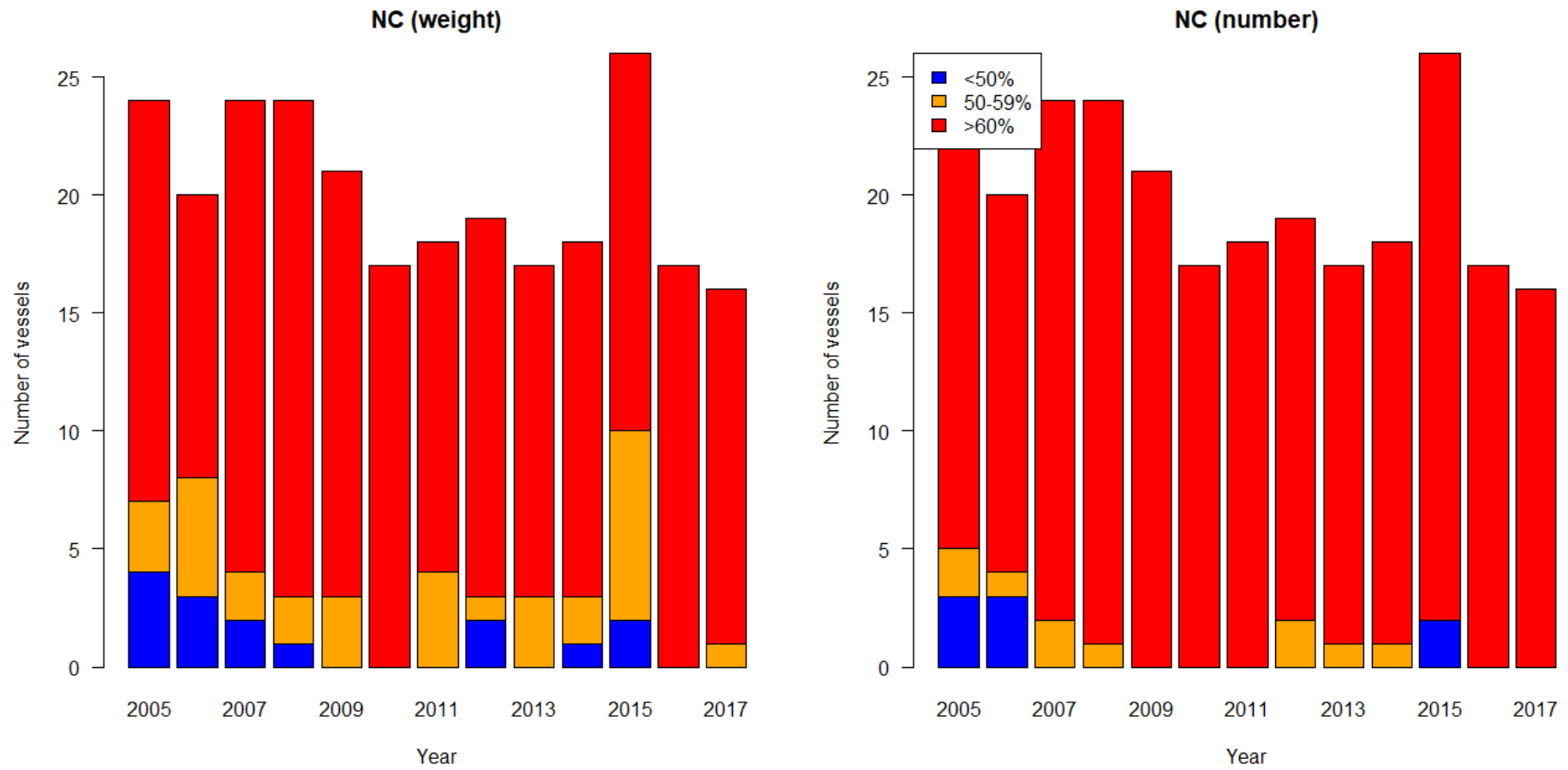
Figure 15: Trends in the number of New Caledonian flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
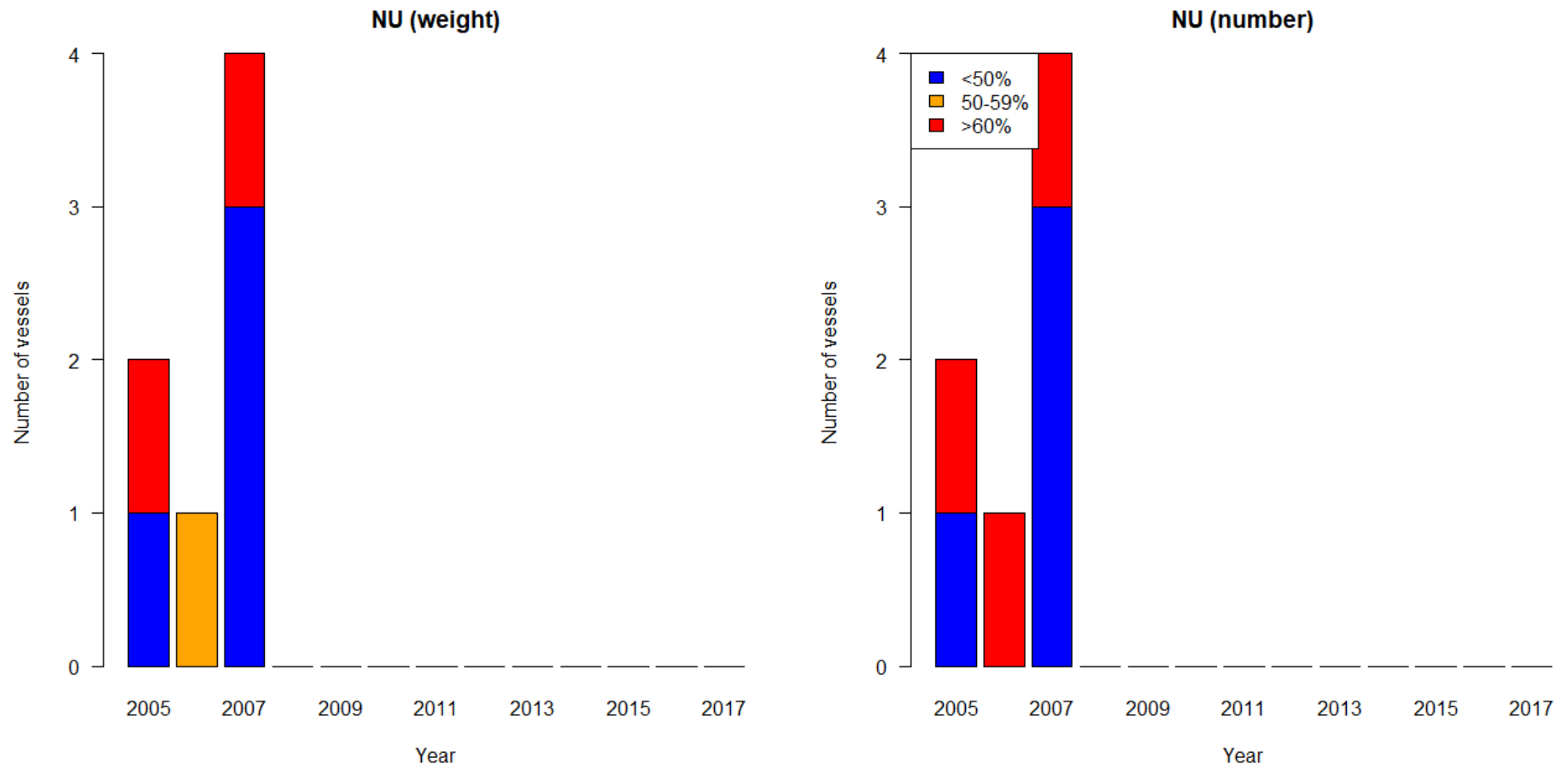
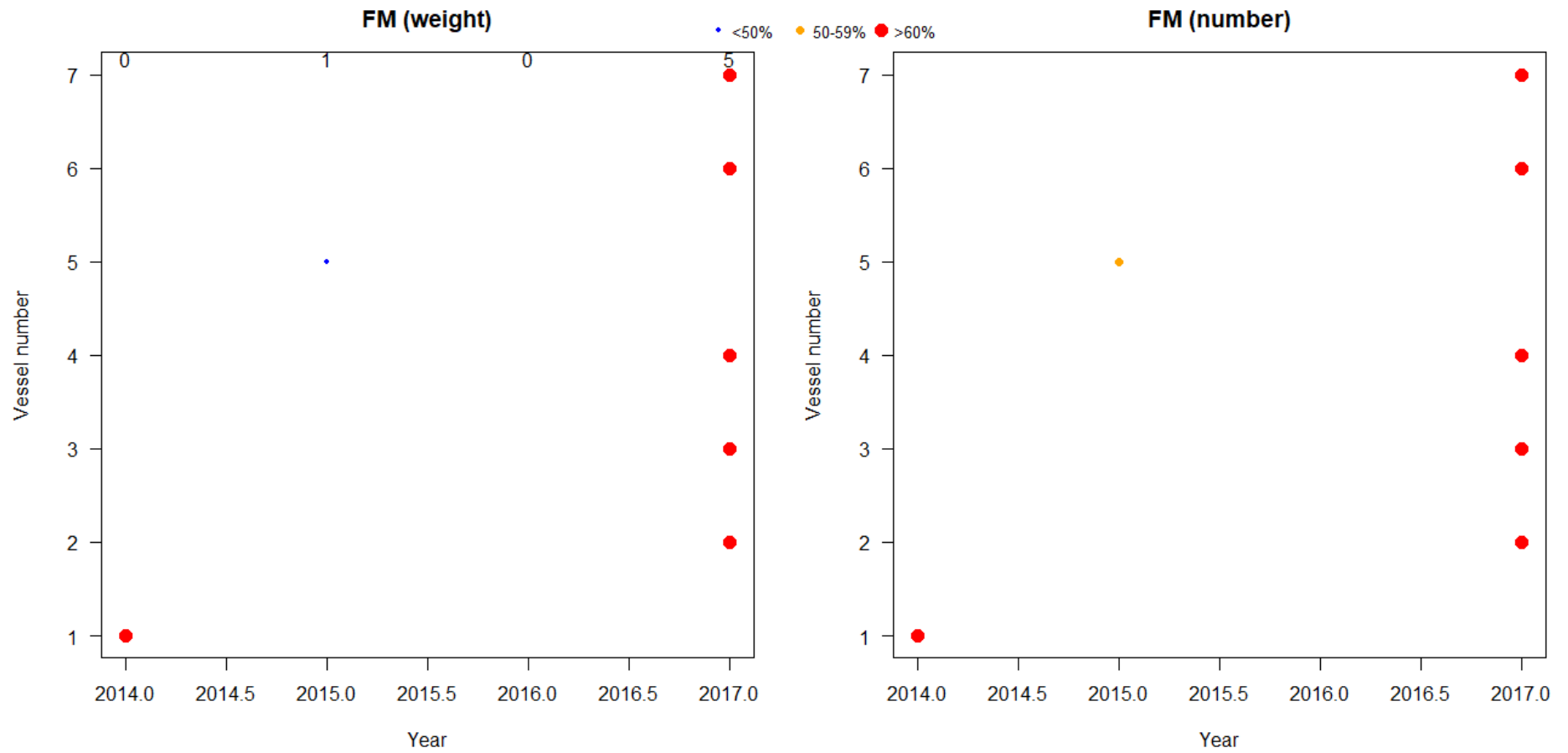Figure 16: Trends in the number of Niuean flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
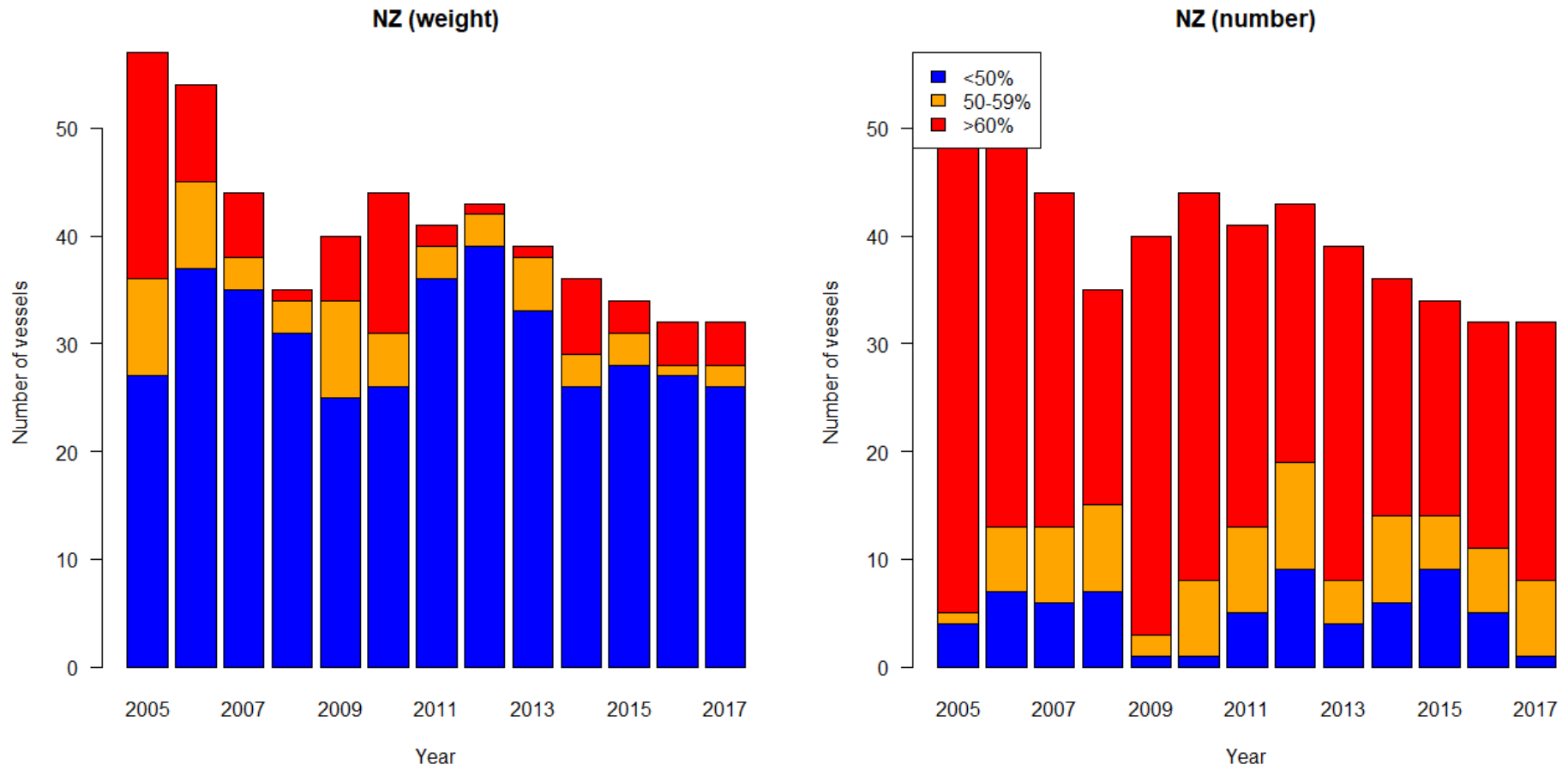
Figure 17: Trends in the number of New Zealand flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
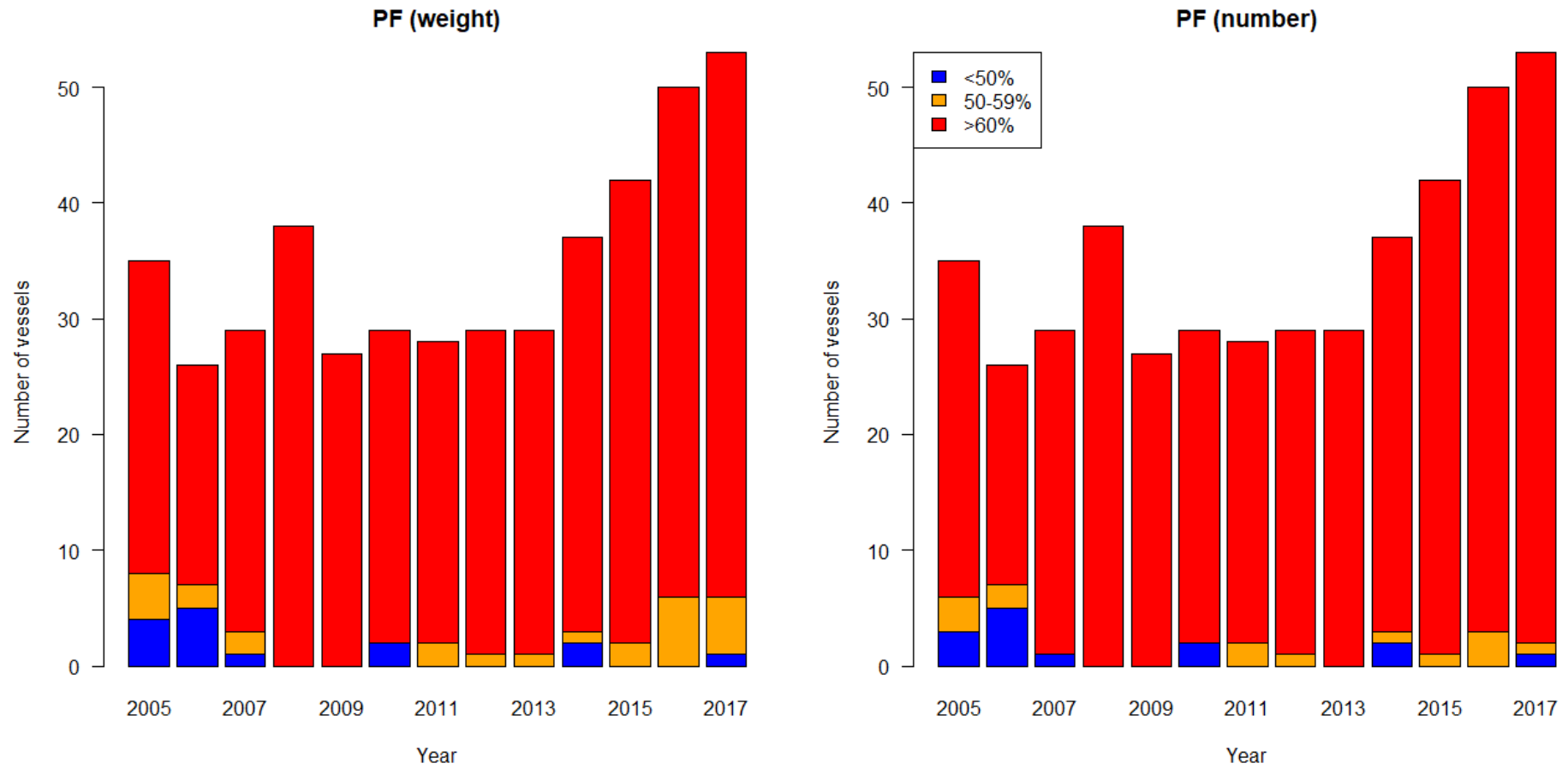
Figure 18: Trends in the number of French Polynesian flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
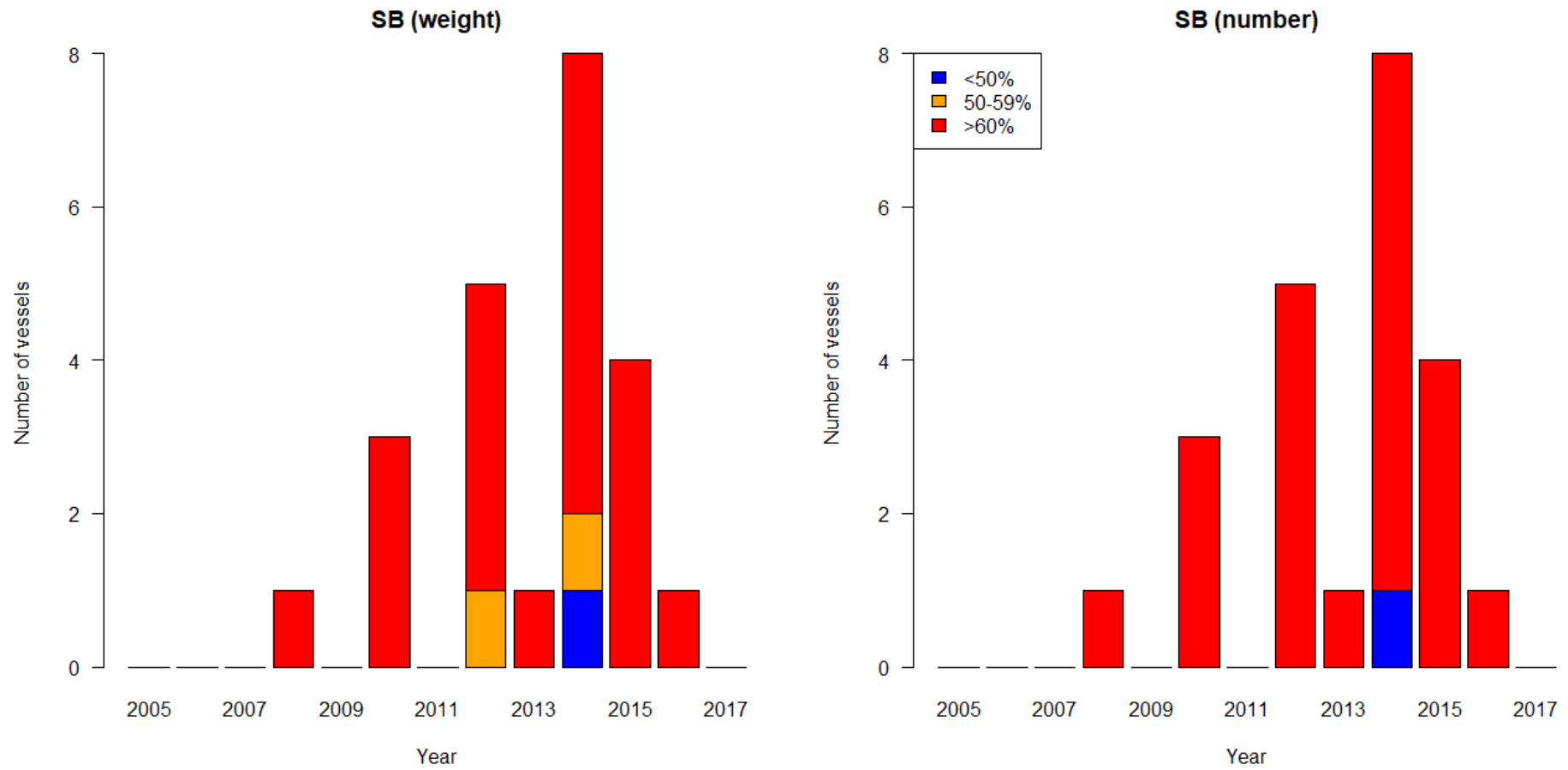
Figure 19: Trends in the number of Solomon Island flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
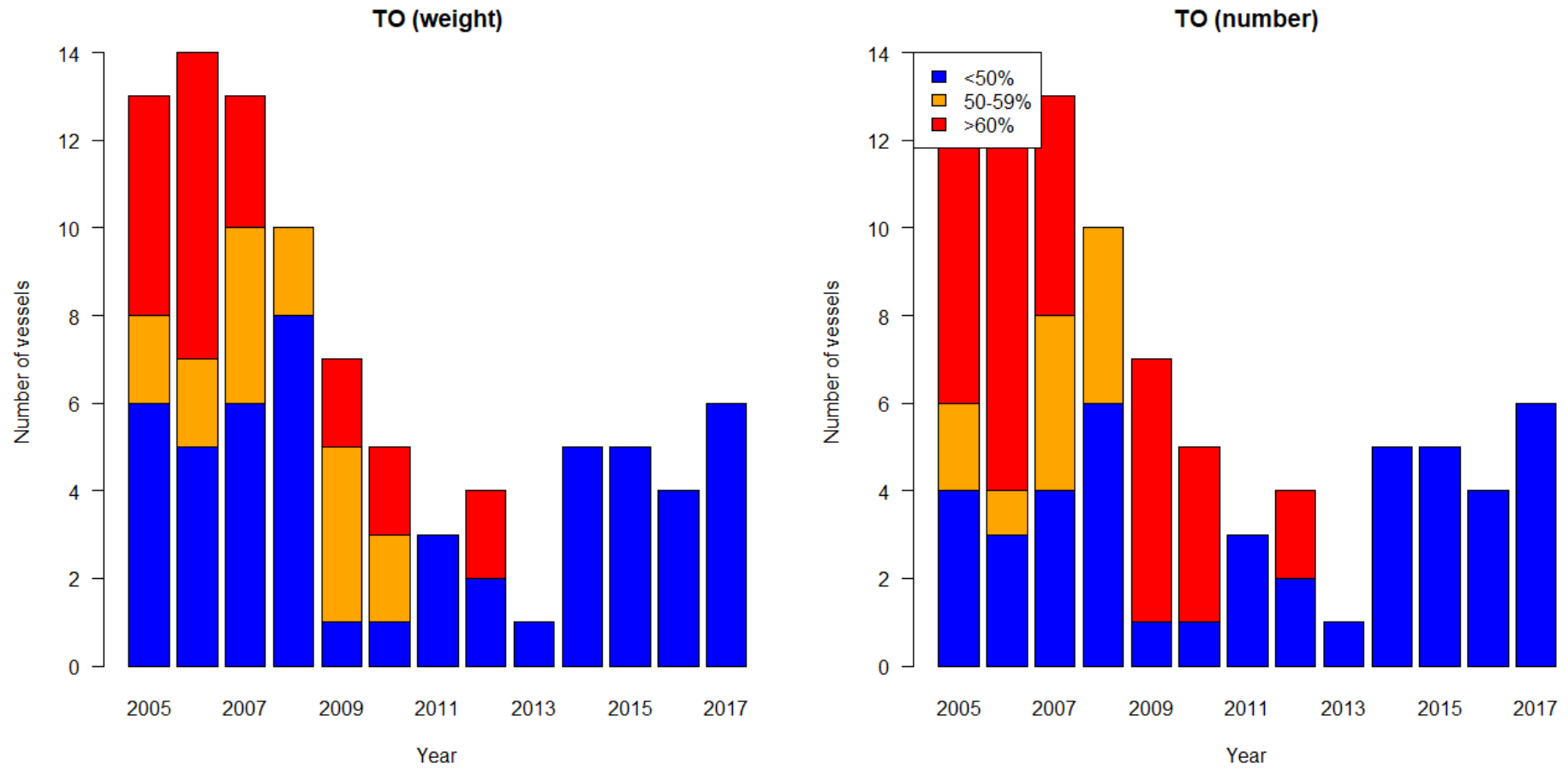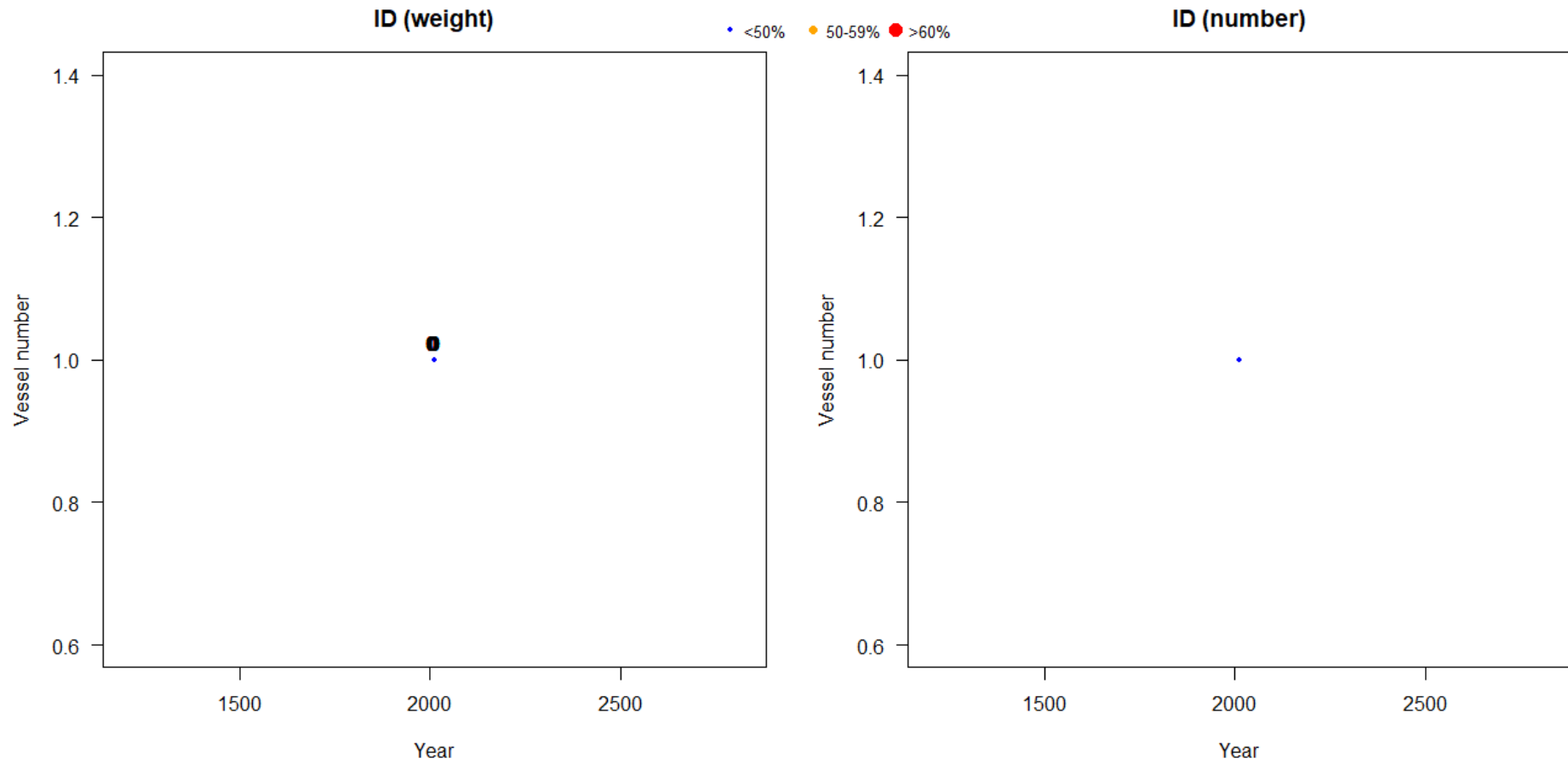
Figure 20: Trends in the number of Tongan flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
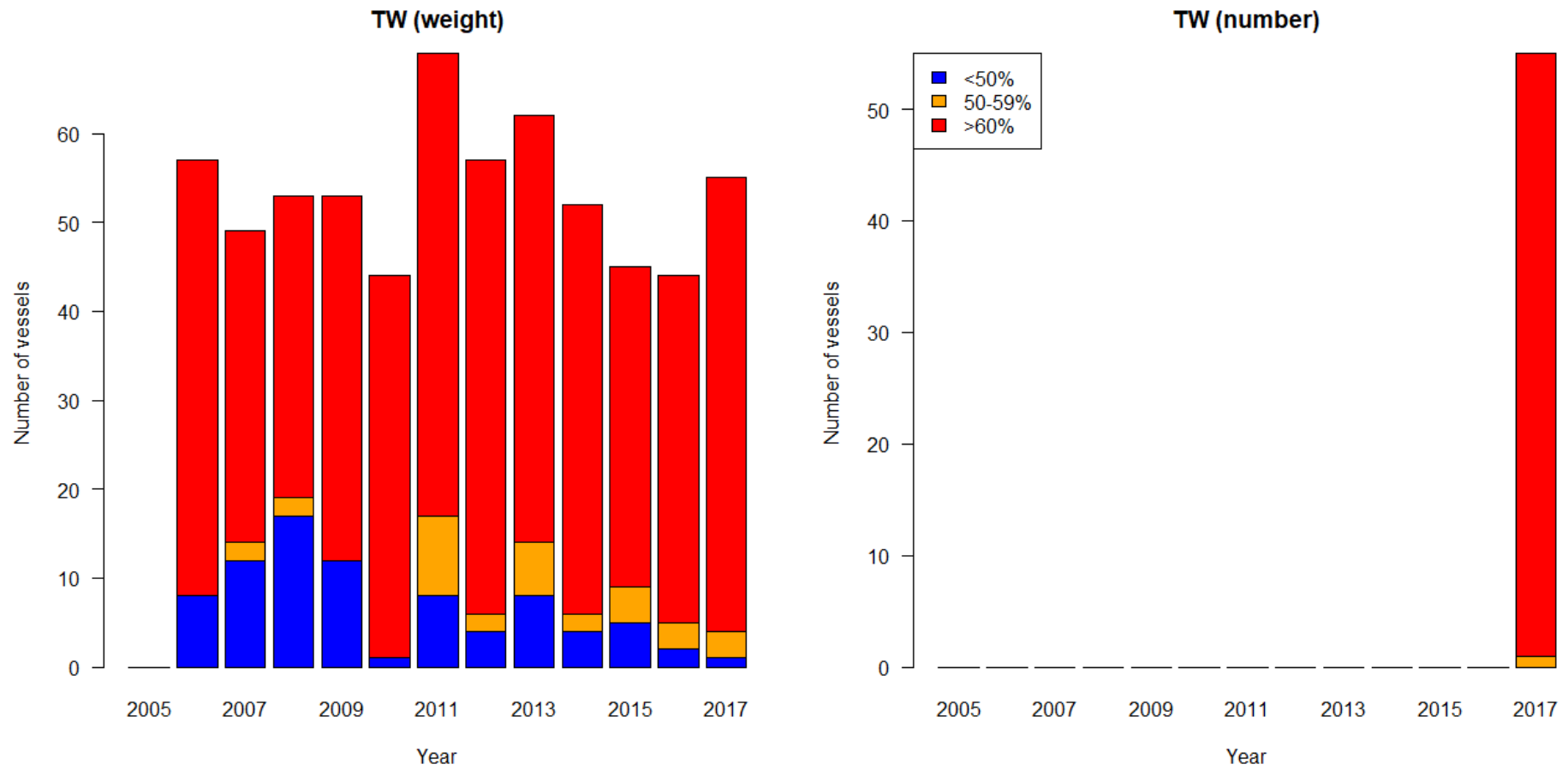
Figure 21: Trends in the combined number of large and small vessels flagged to Chinese Taipei fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
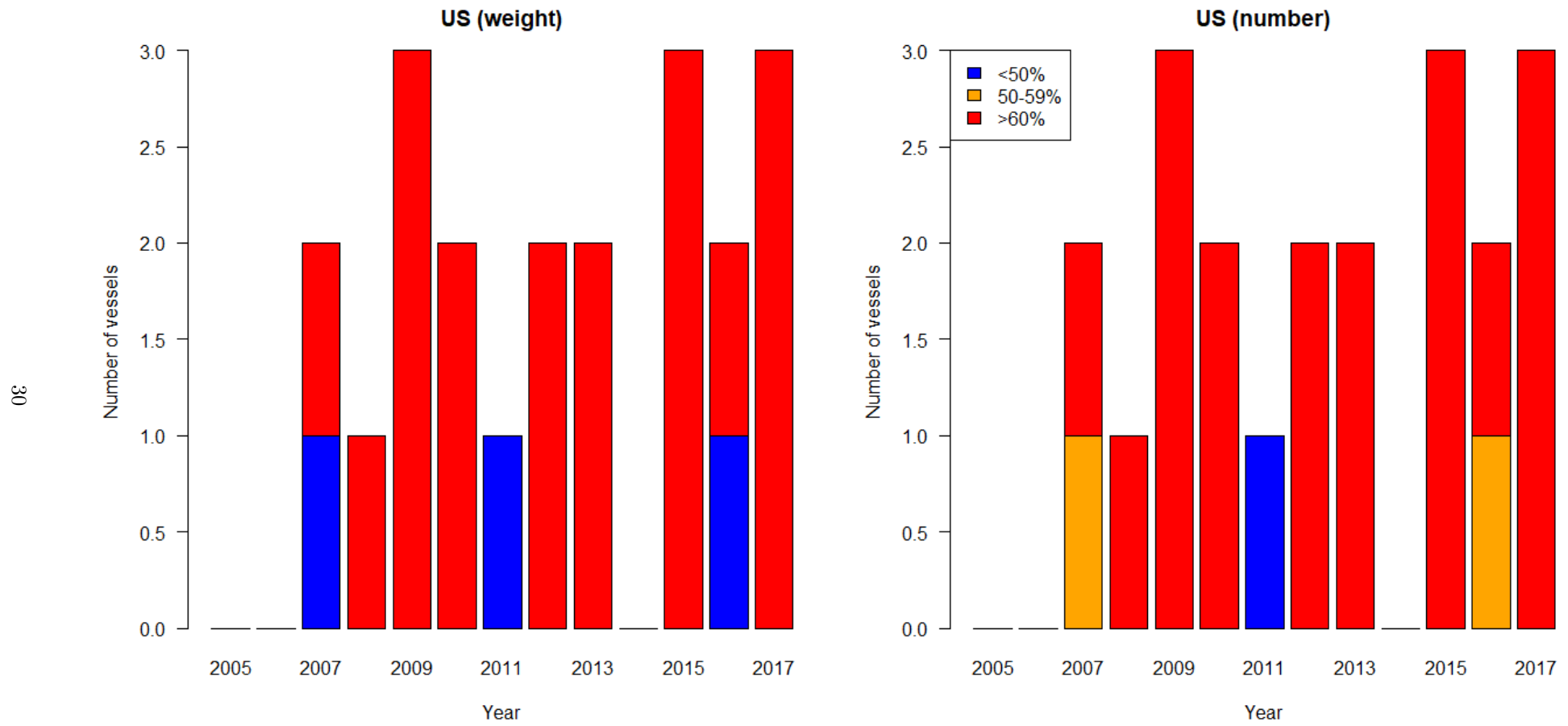
Figure 22: Trends in the number of USA flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
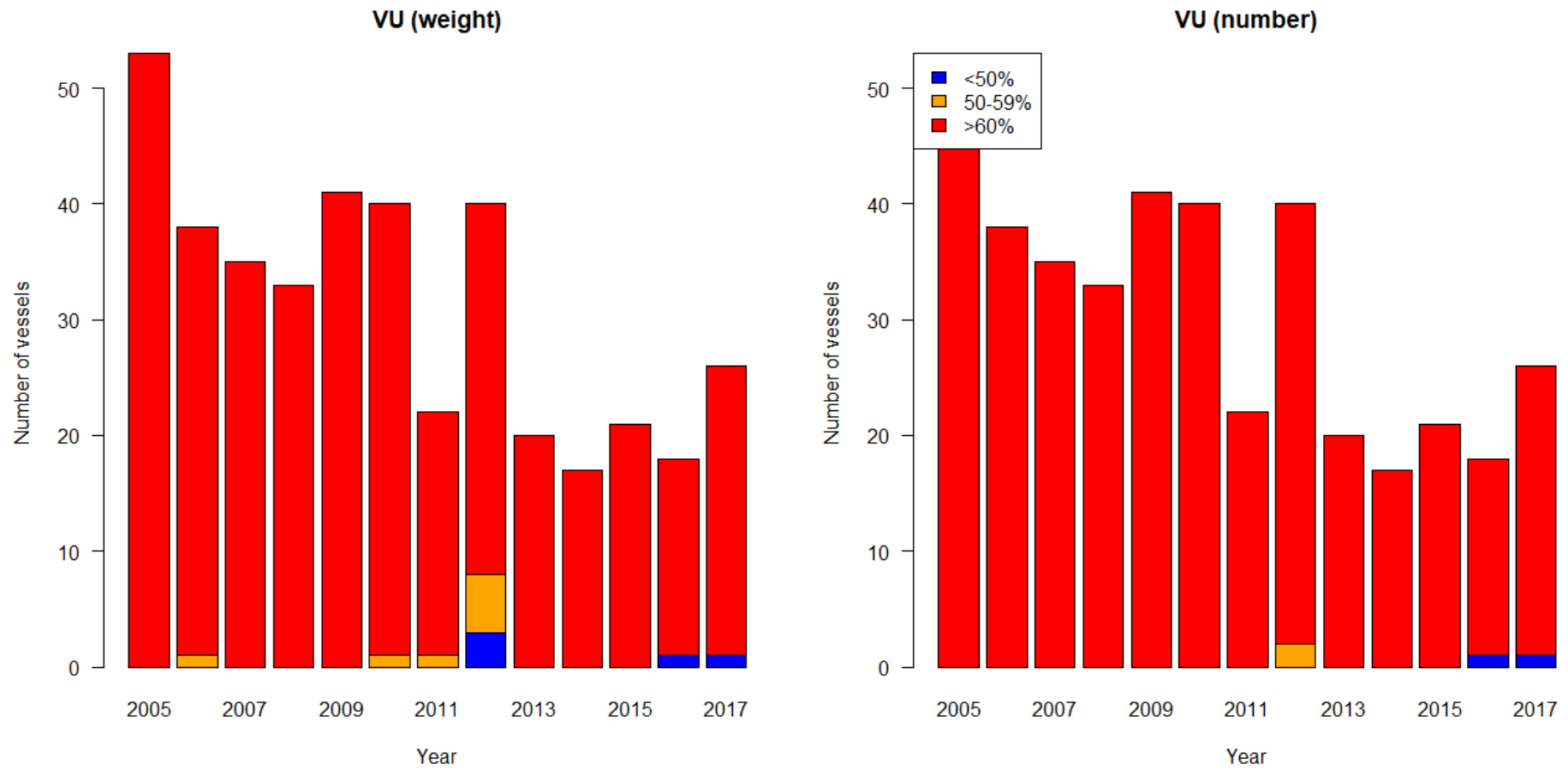
Figure 23: Trends in the number of Vanuatu flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna.
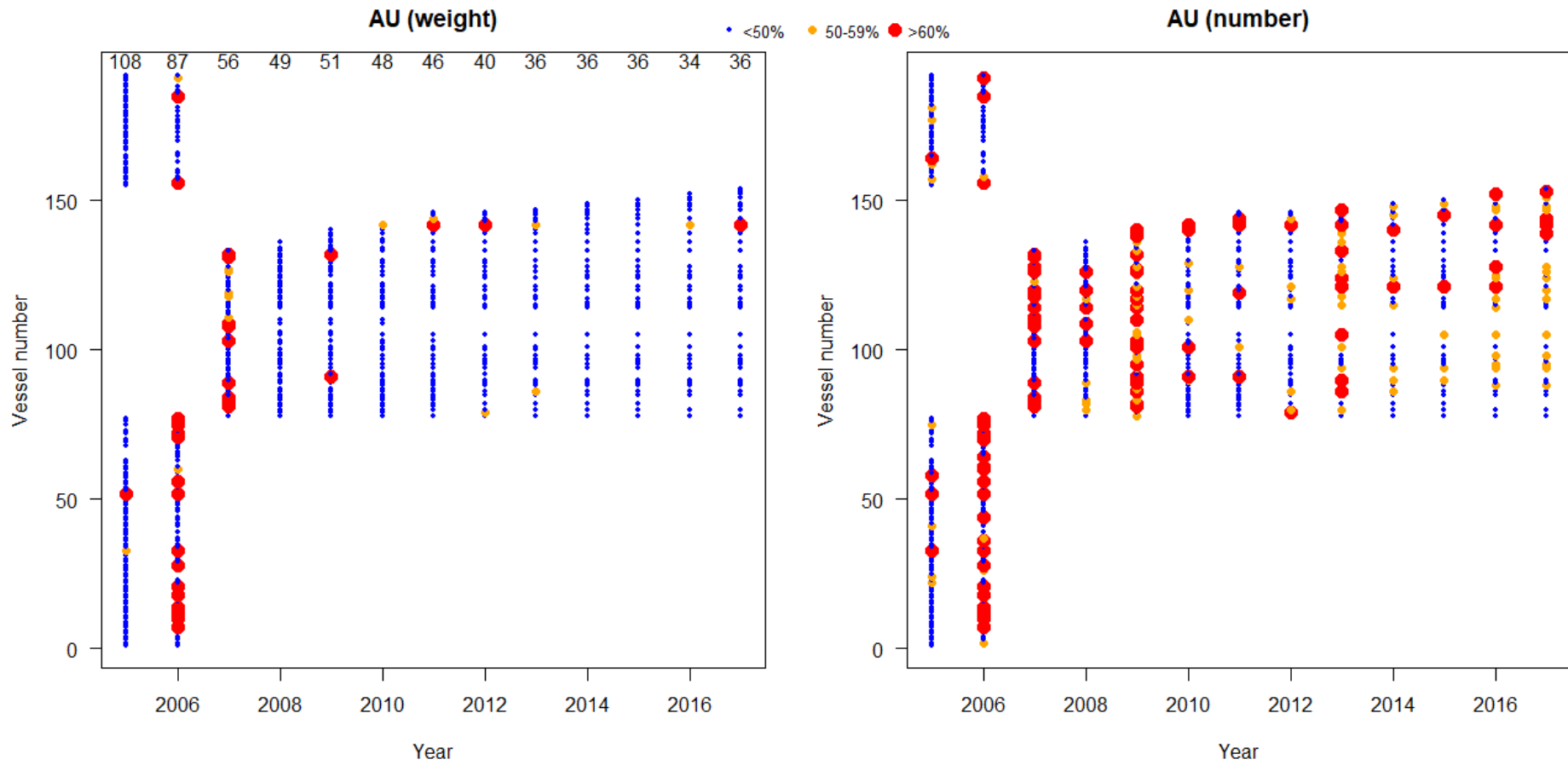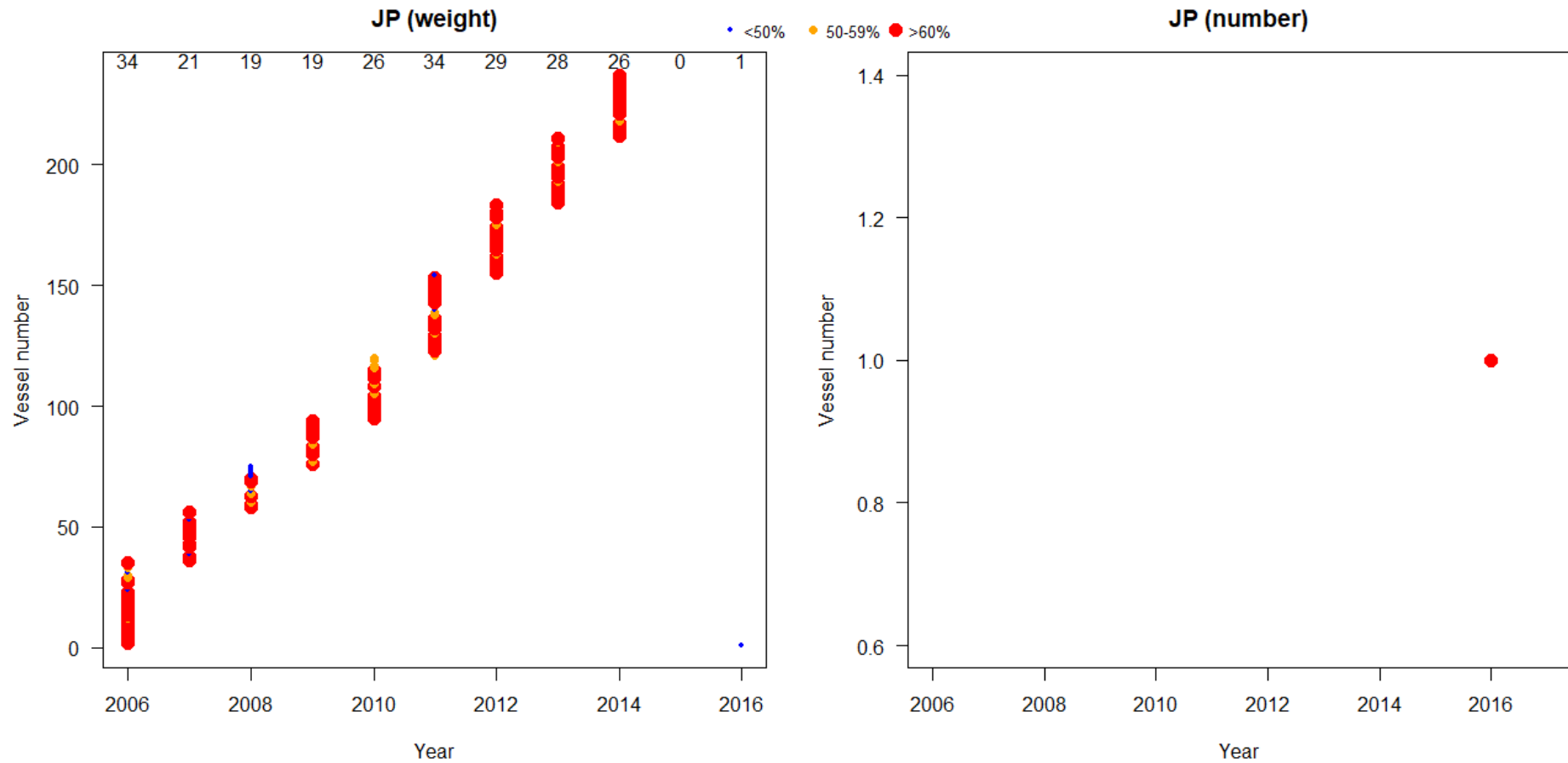
Figure 24: The number of Australian flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 25: The number of Cook Island flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.
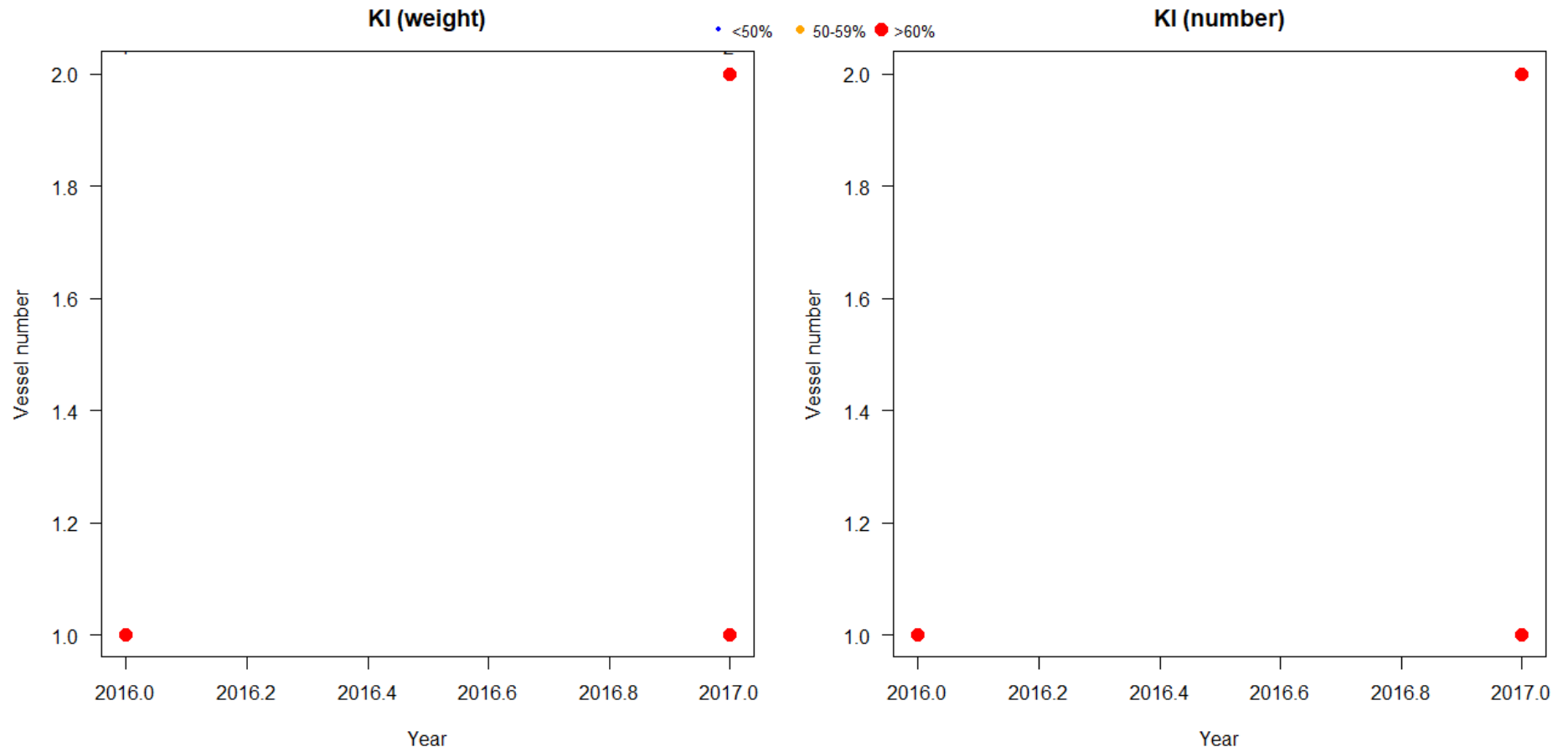
Figure 26: The number of Chinese flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 27: The number of EU (Spain) flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.
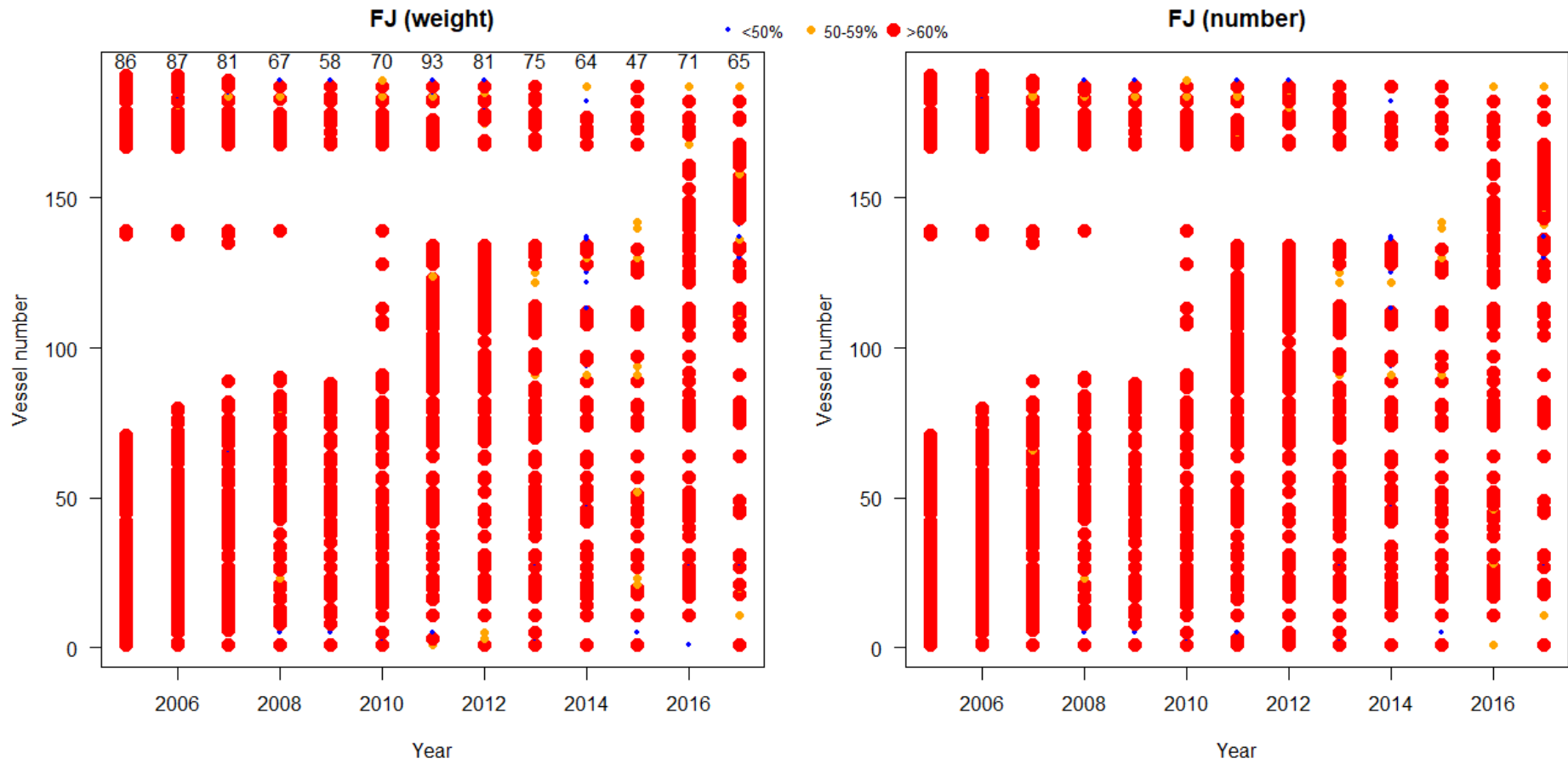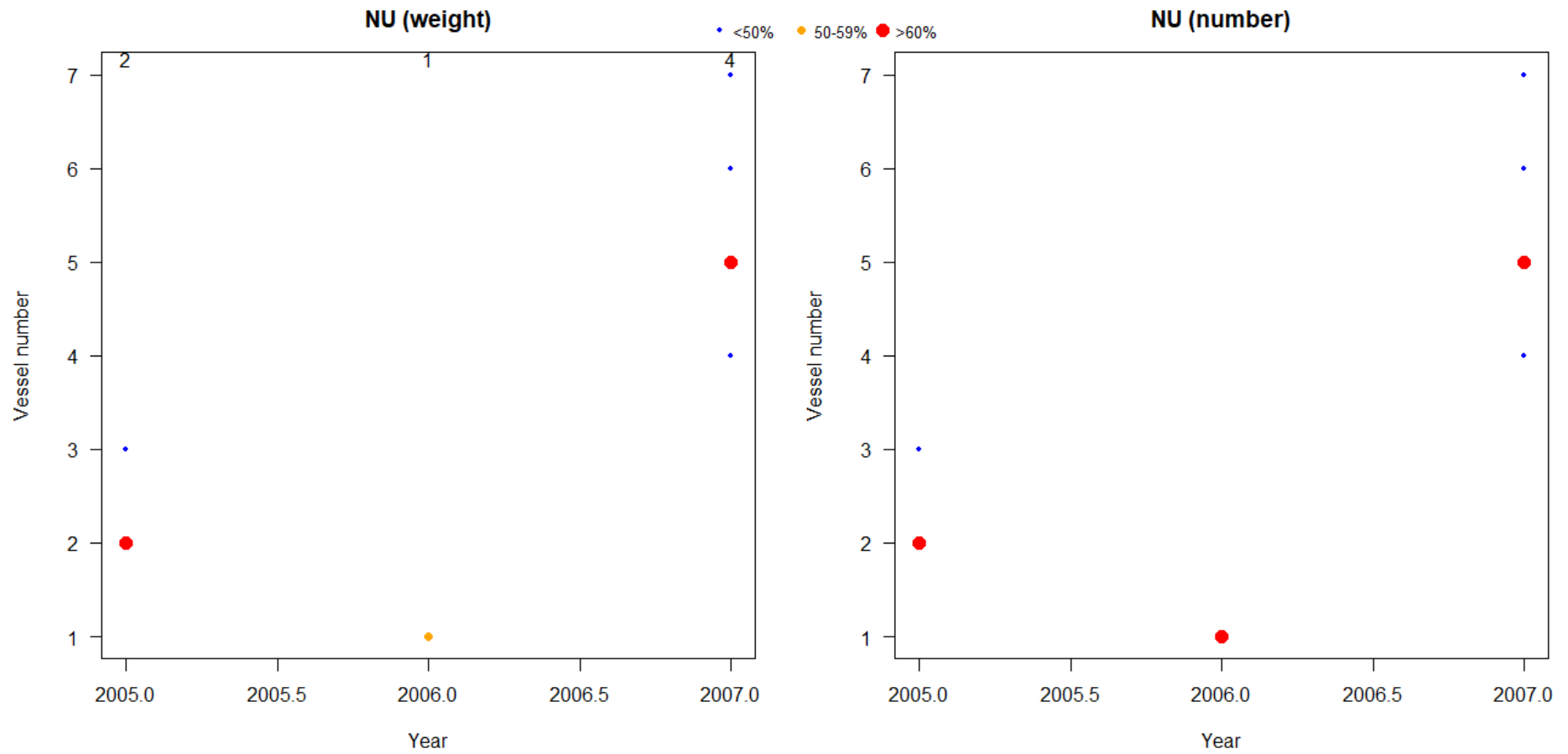
Figure 28: The number of Australian Fijian vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 29: The number of Micronesian flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 30: The number of Indonesian flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 31: The number of Japanese flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.
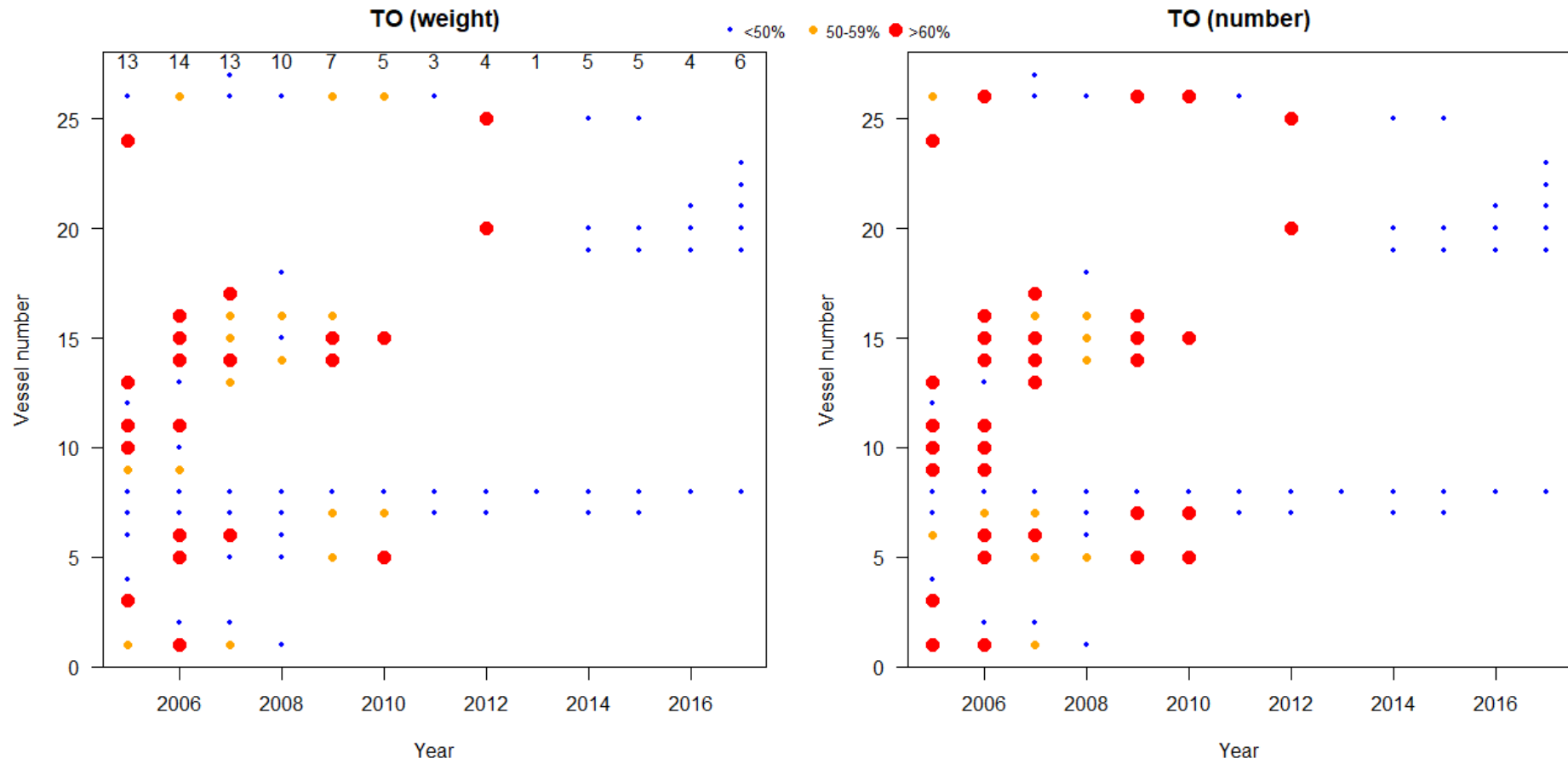
Figure 32: The number of Kiribati flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 33: The number of Korean flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 34: The number of New Caledonian flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.
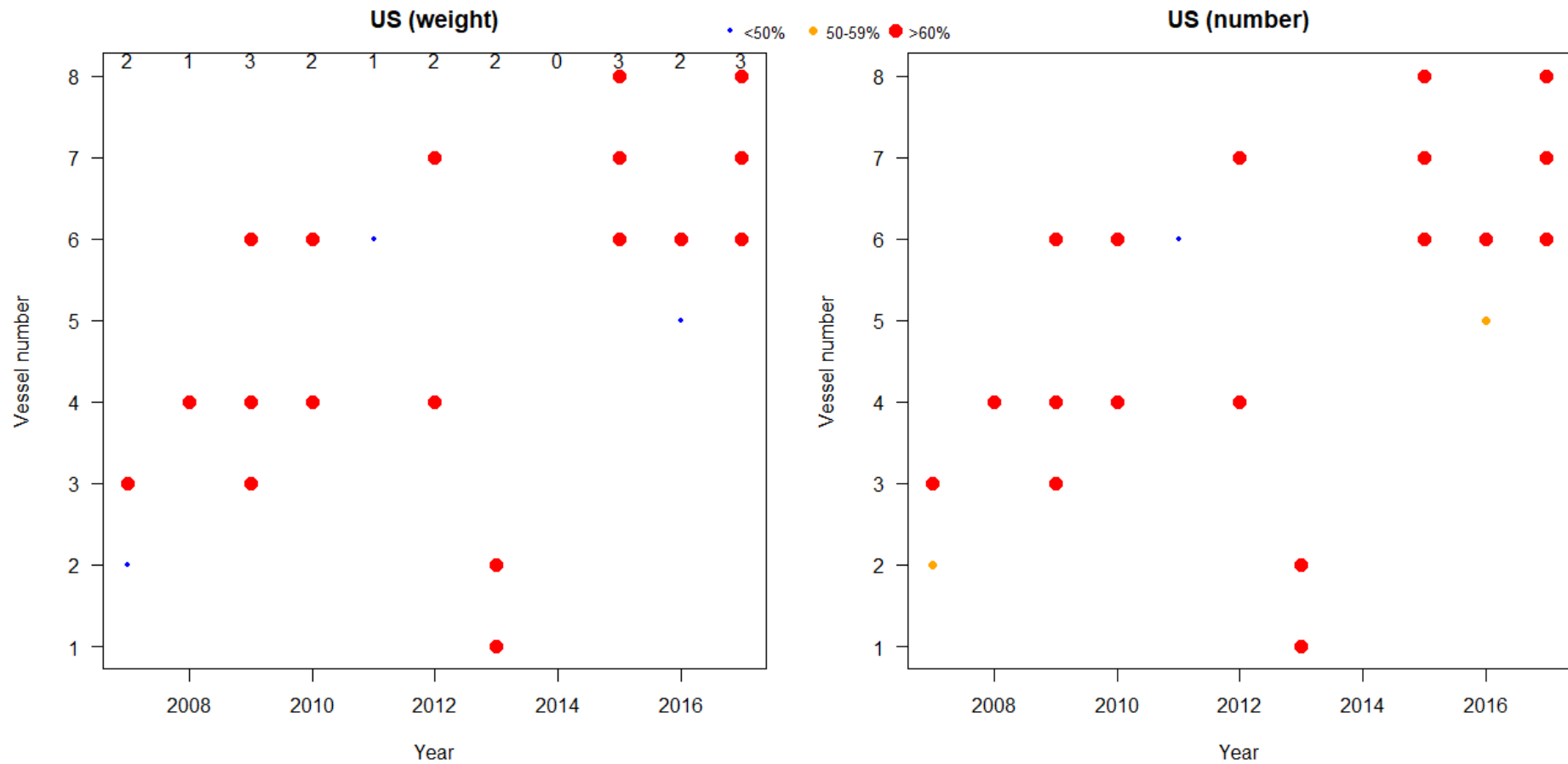
Figure 35: The number of Niuean flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 36: The number of New Zealand flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 37: The number of French Polynesian flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 38: The number of Solomon Island flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 39: The number of Tongan flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 40: The combined number of large and small vessels flagged to Chinese Taipei fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 41: The number of USA flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.

Figure 42: The number of Vanuatu flagged vessels fishing south of 20°S and the proportion of their catch consisting of albacore tuna for each individual vessel from 2005-2017. The numbers on the top of the left panel represent the total number of vessels each year fishing south of 20°S. the coloured points represent a vessels catch proportion: blue <50% albacore; orange 50-59% albacore; and red >60% albacore.
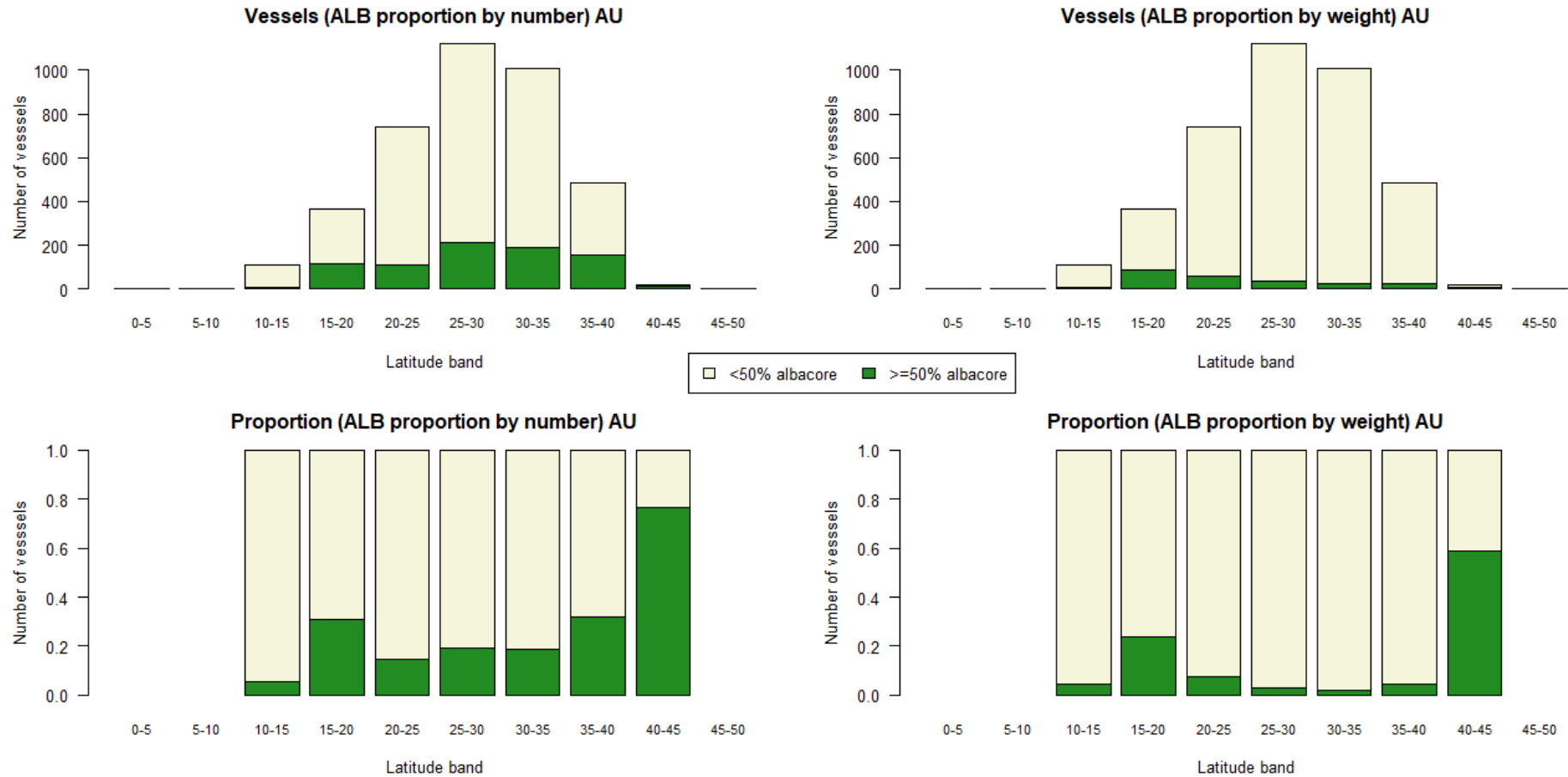
Figure 43: The number of Australian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
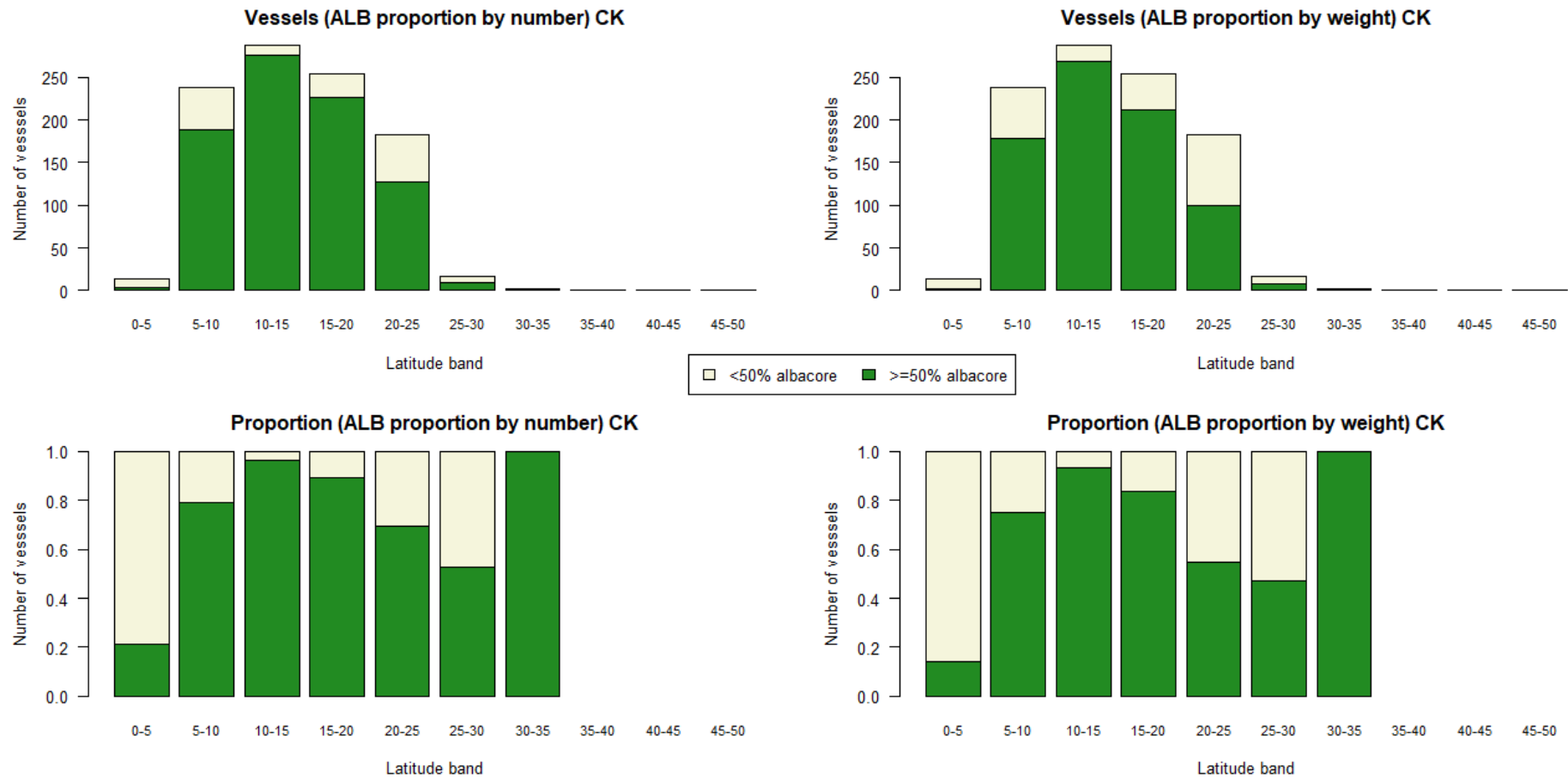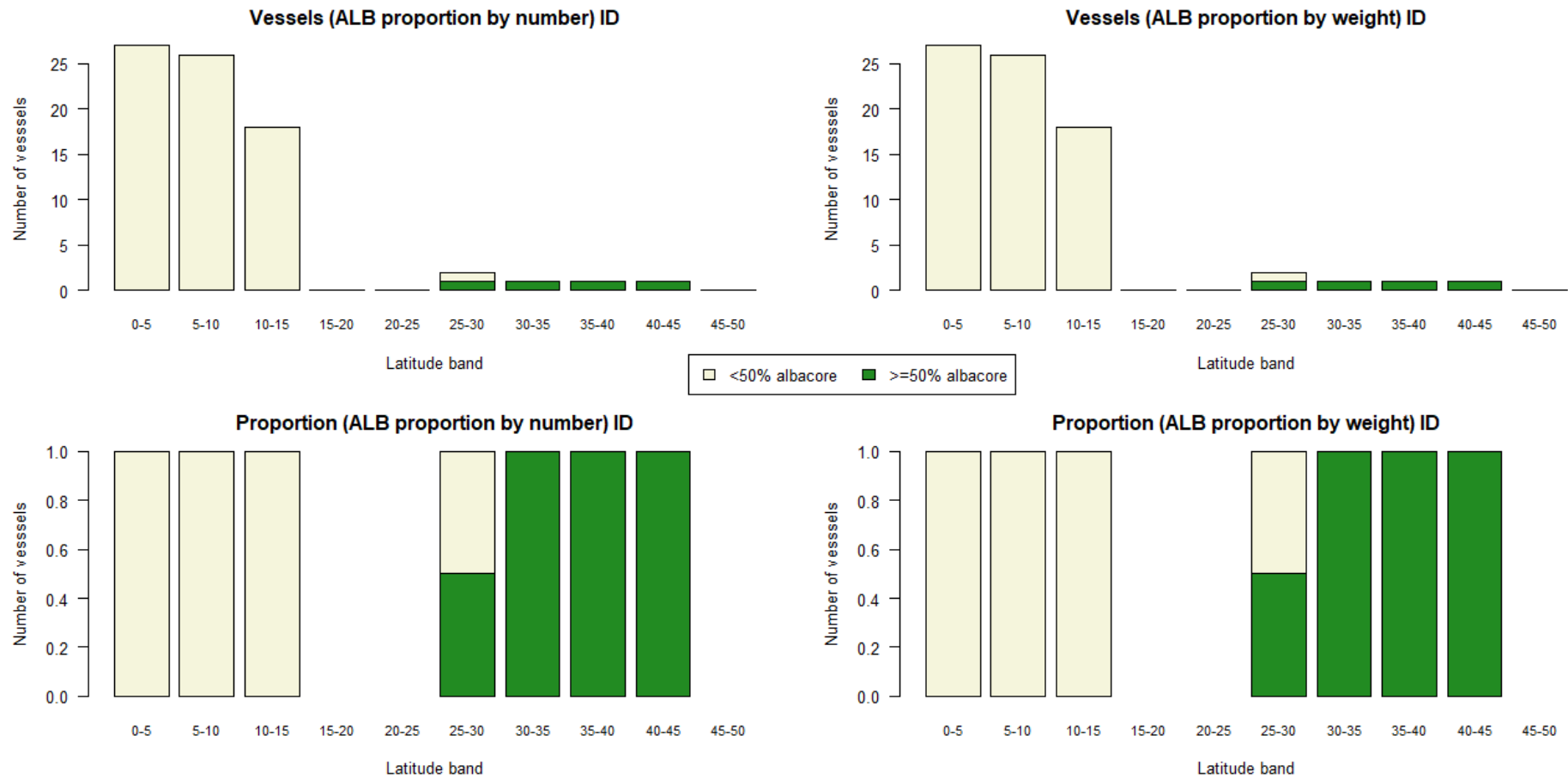
Figure 44: The number of Cook Island flagged vessels fishing in each Latitudinal band from the equator to 50^oS between **2000** and **2017** and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
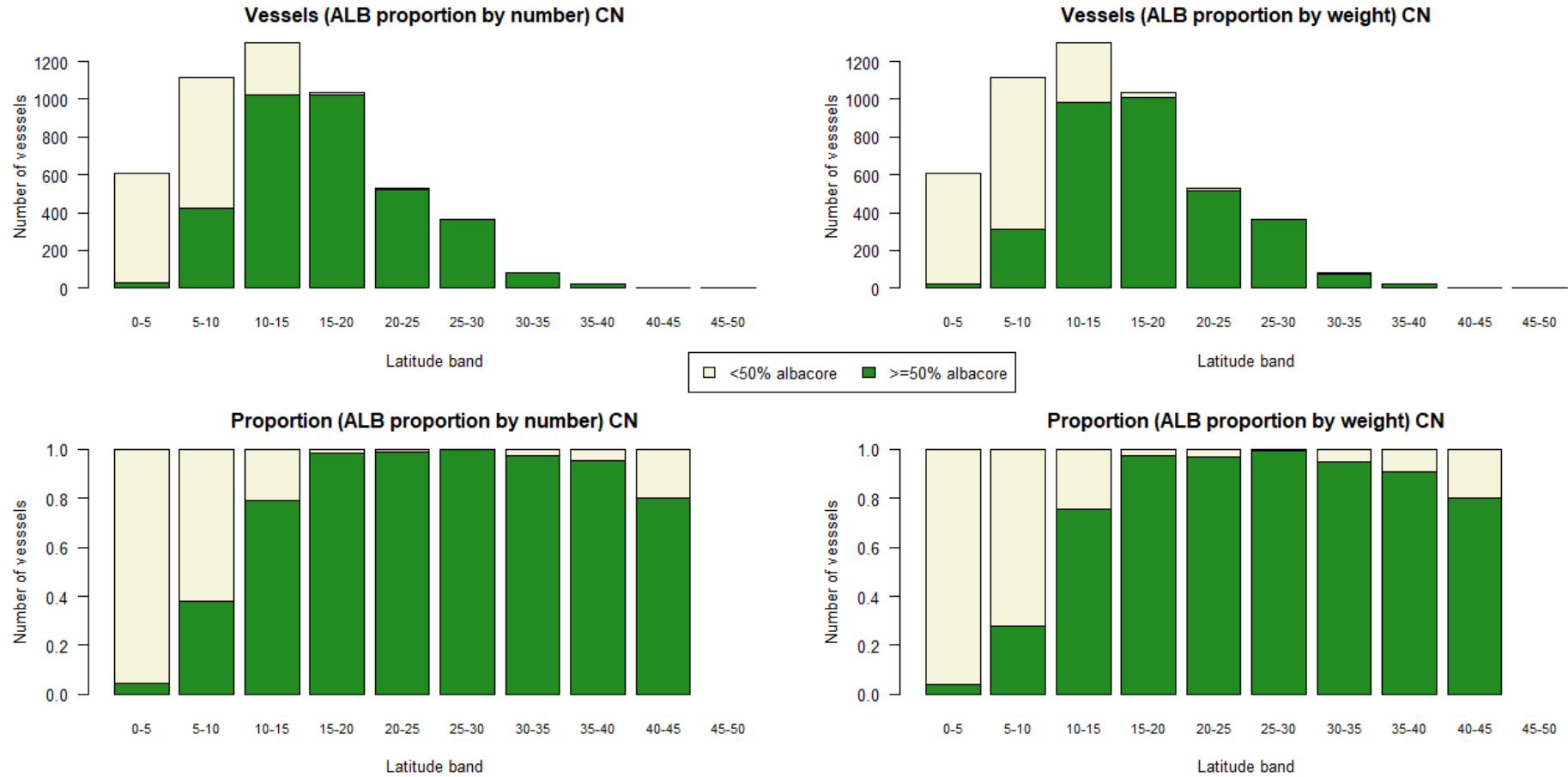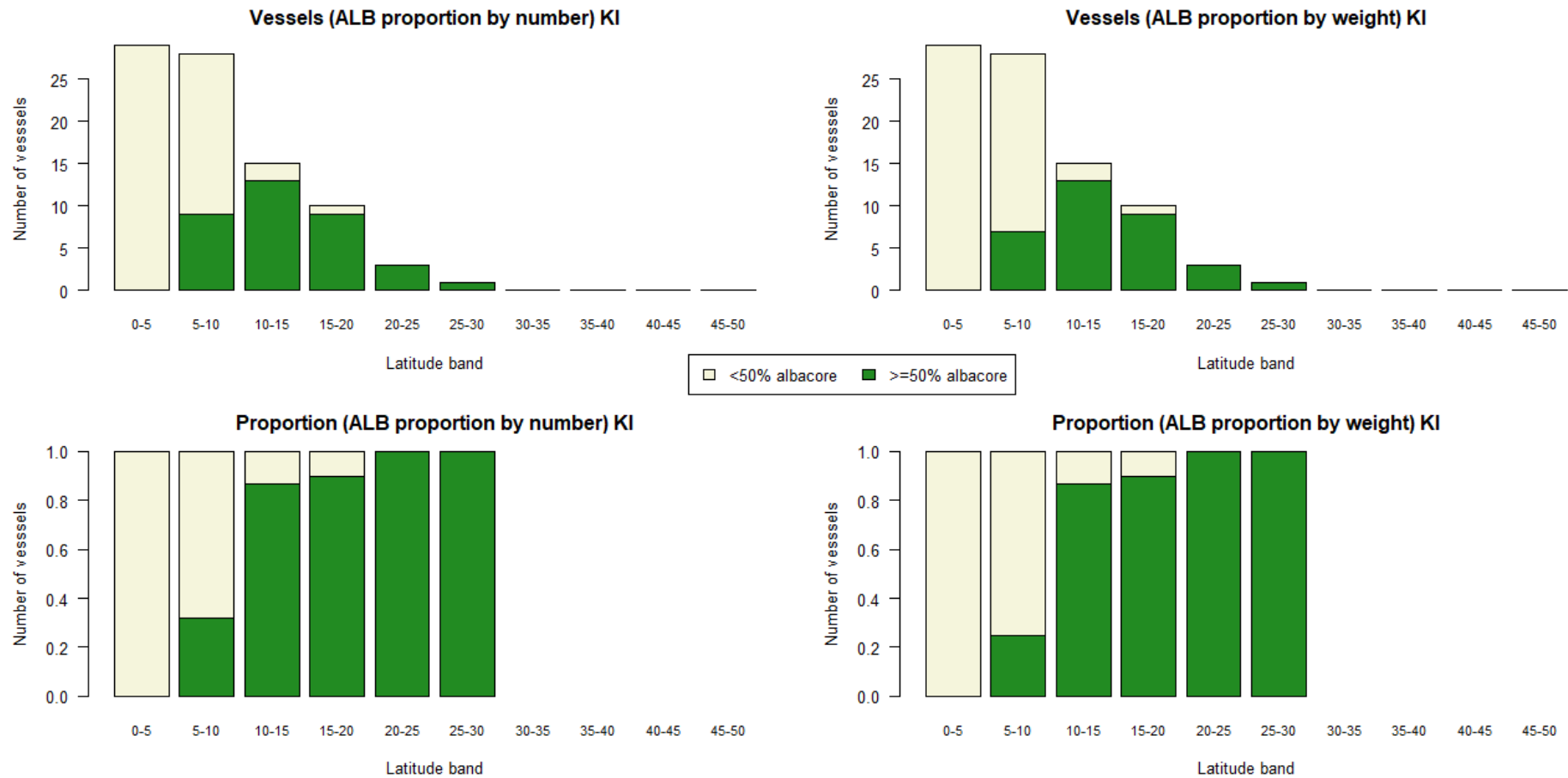
Figure 45: The number of Chinese flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom).
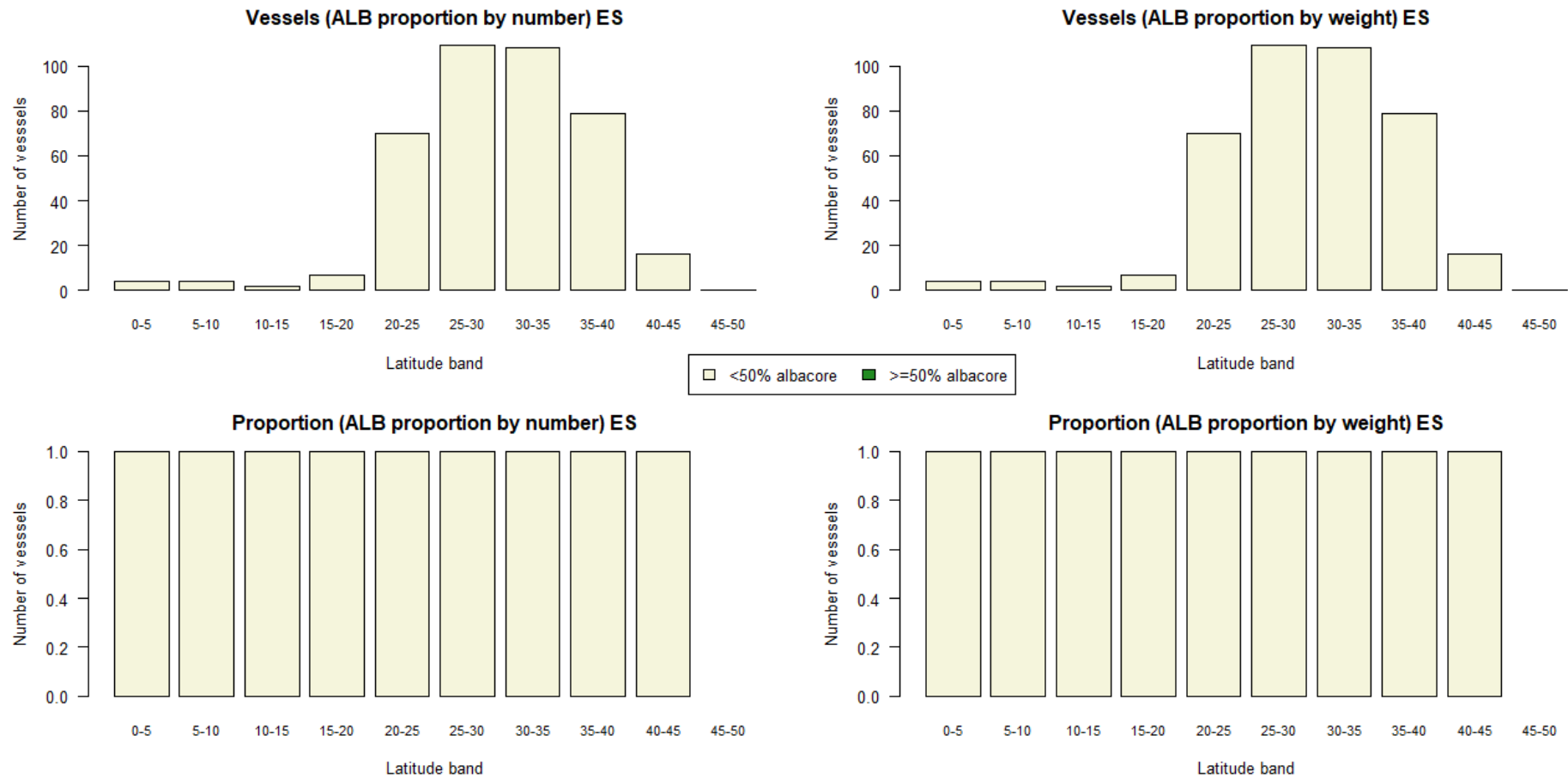
Figure 46: The number of EU (Spain) flagged vessels fishing in each Latitudinal band from the equator to 50^oS between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
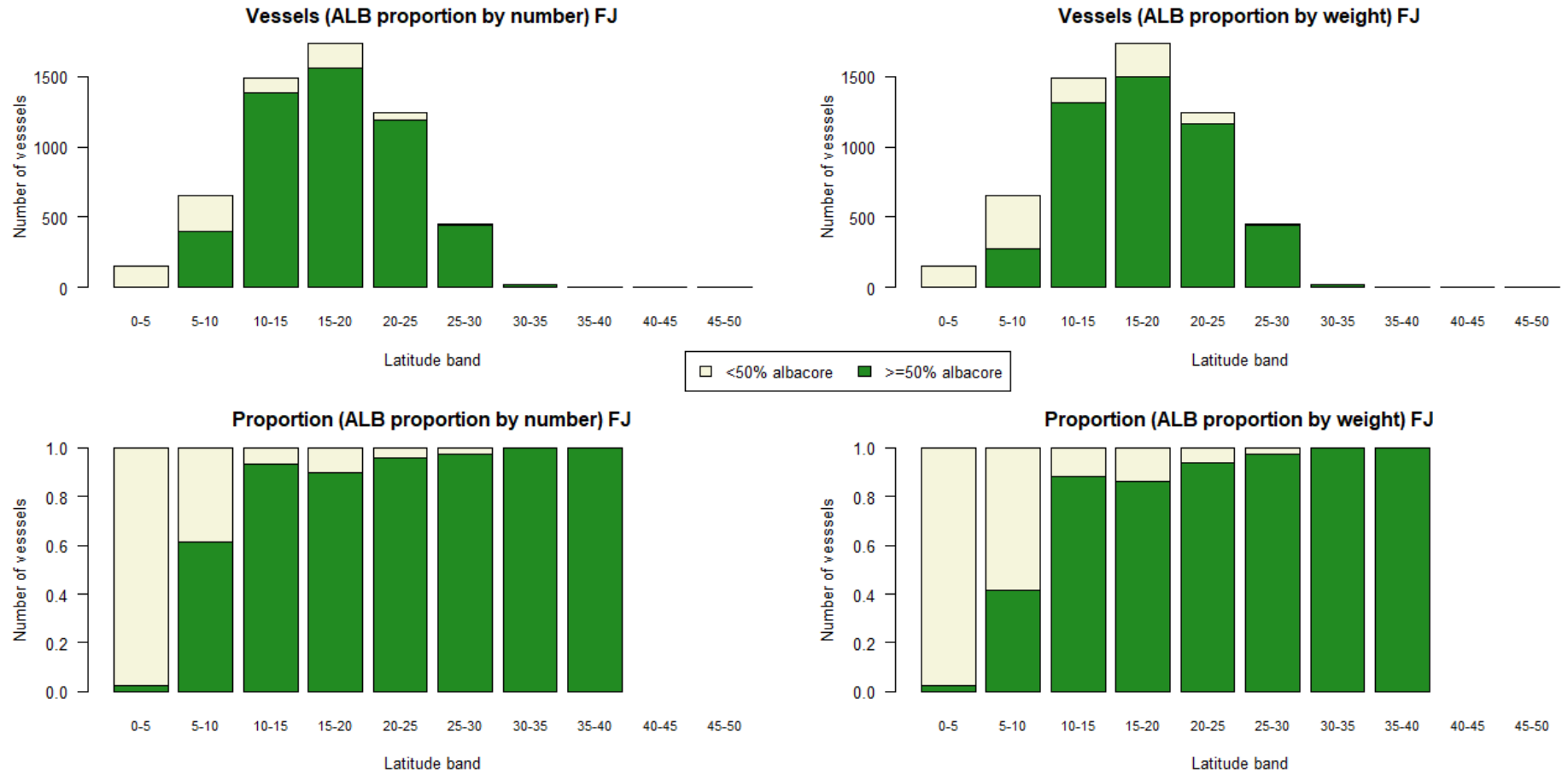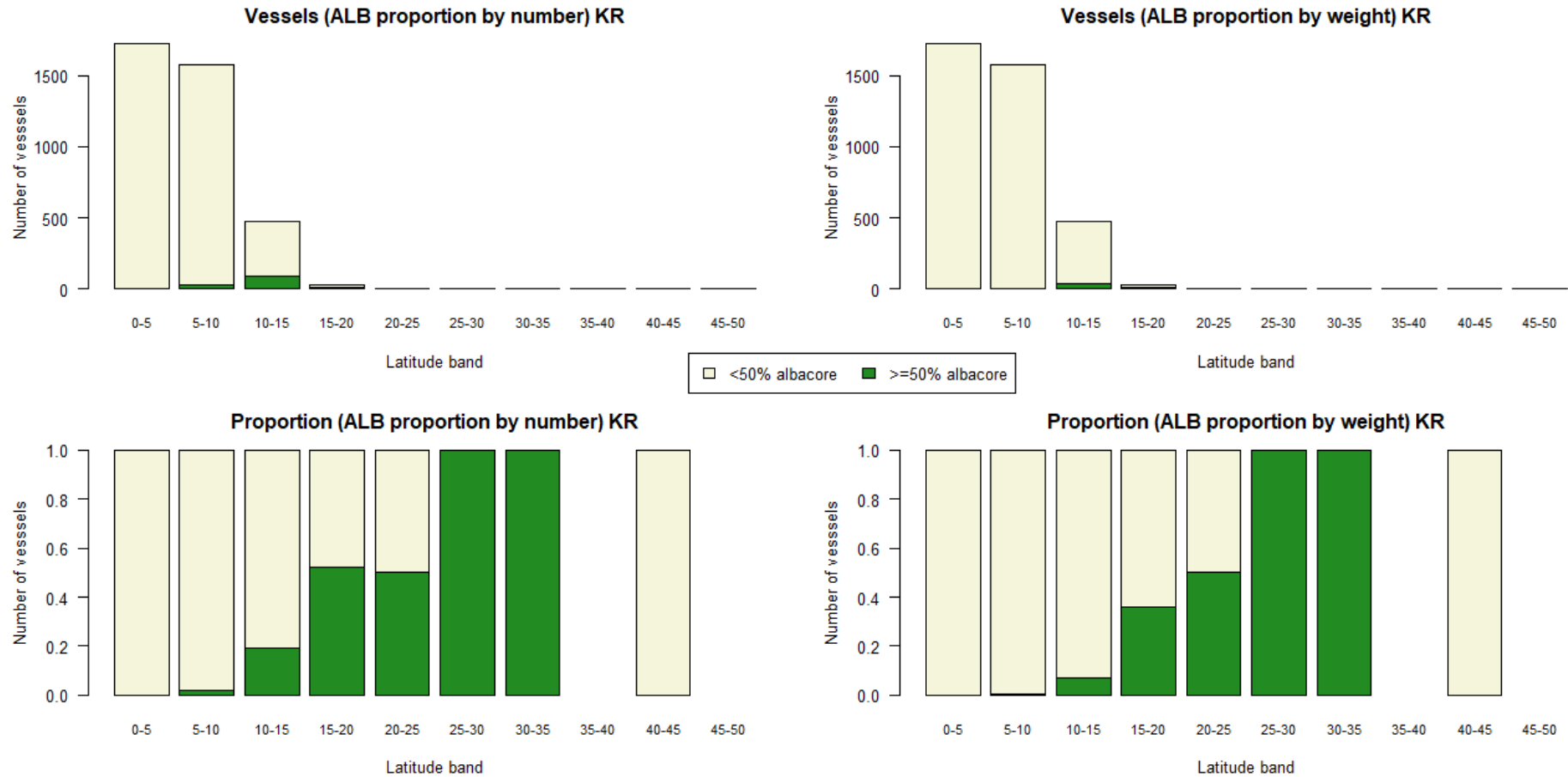
Figure 47: The number of Fijian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
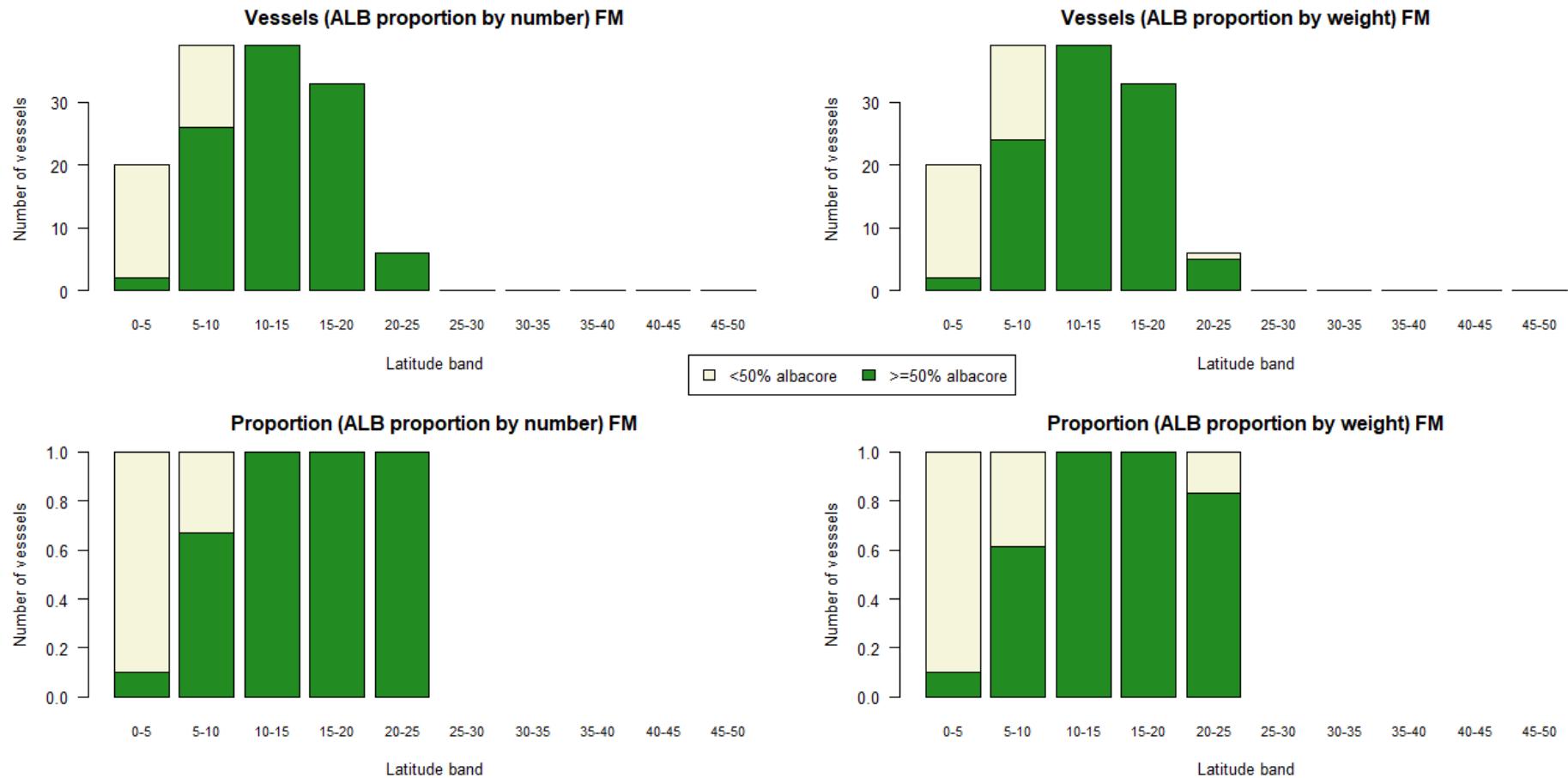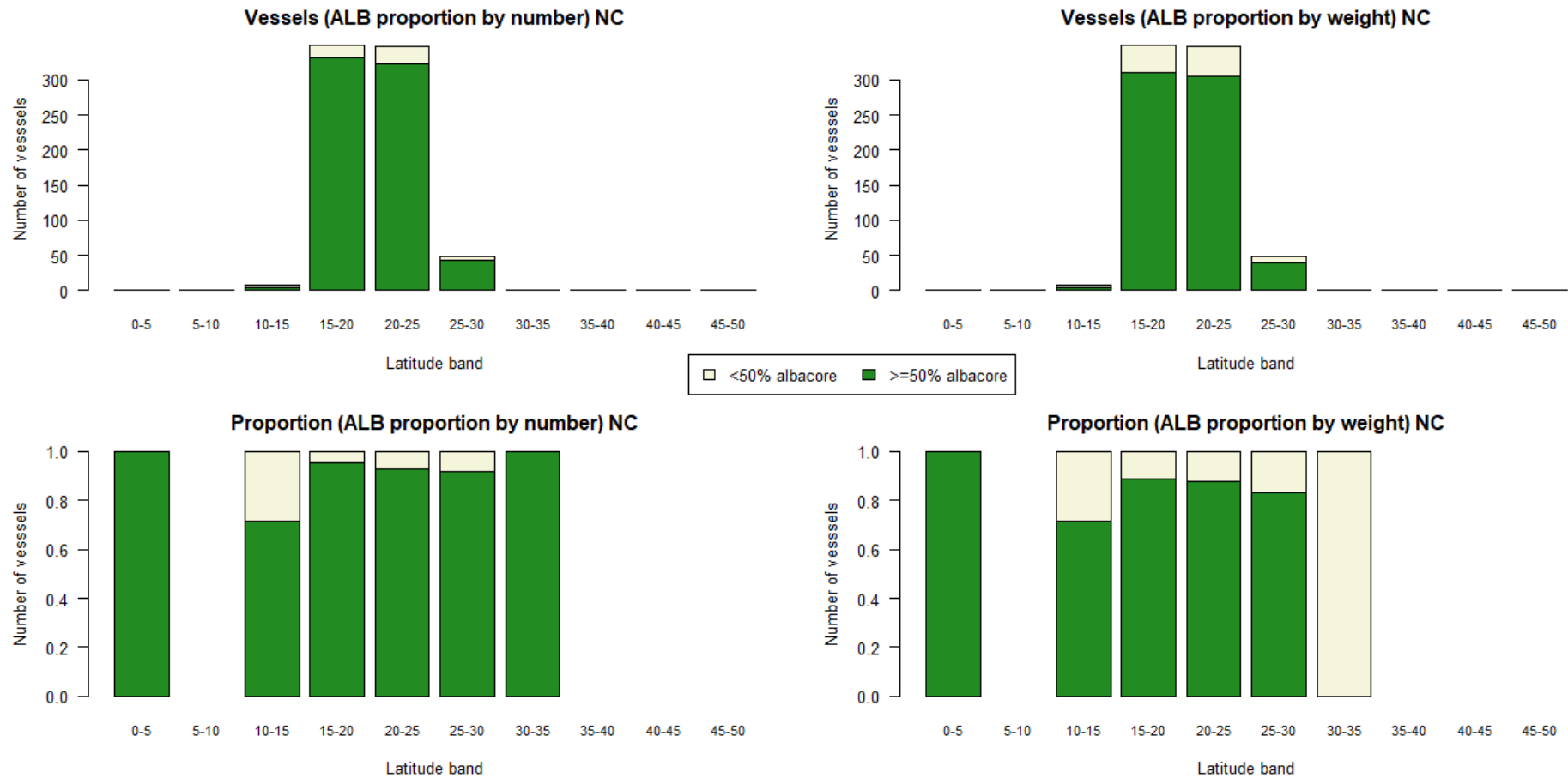
Figure 48: The number of FSM flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
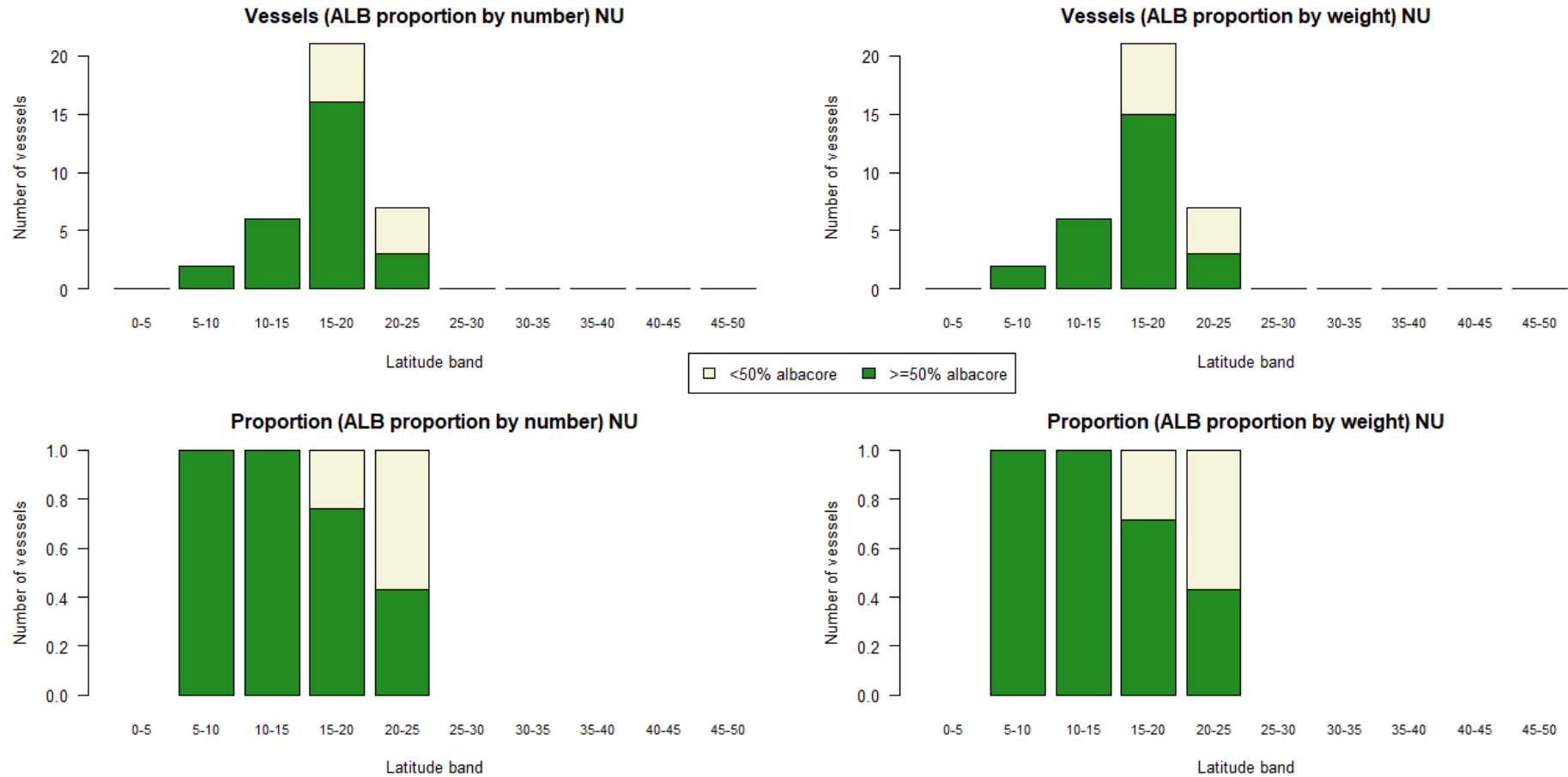
Figure 49: The number of Indonesian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
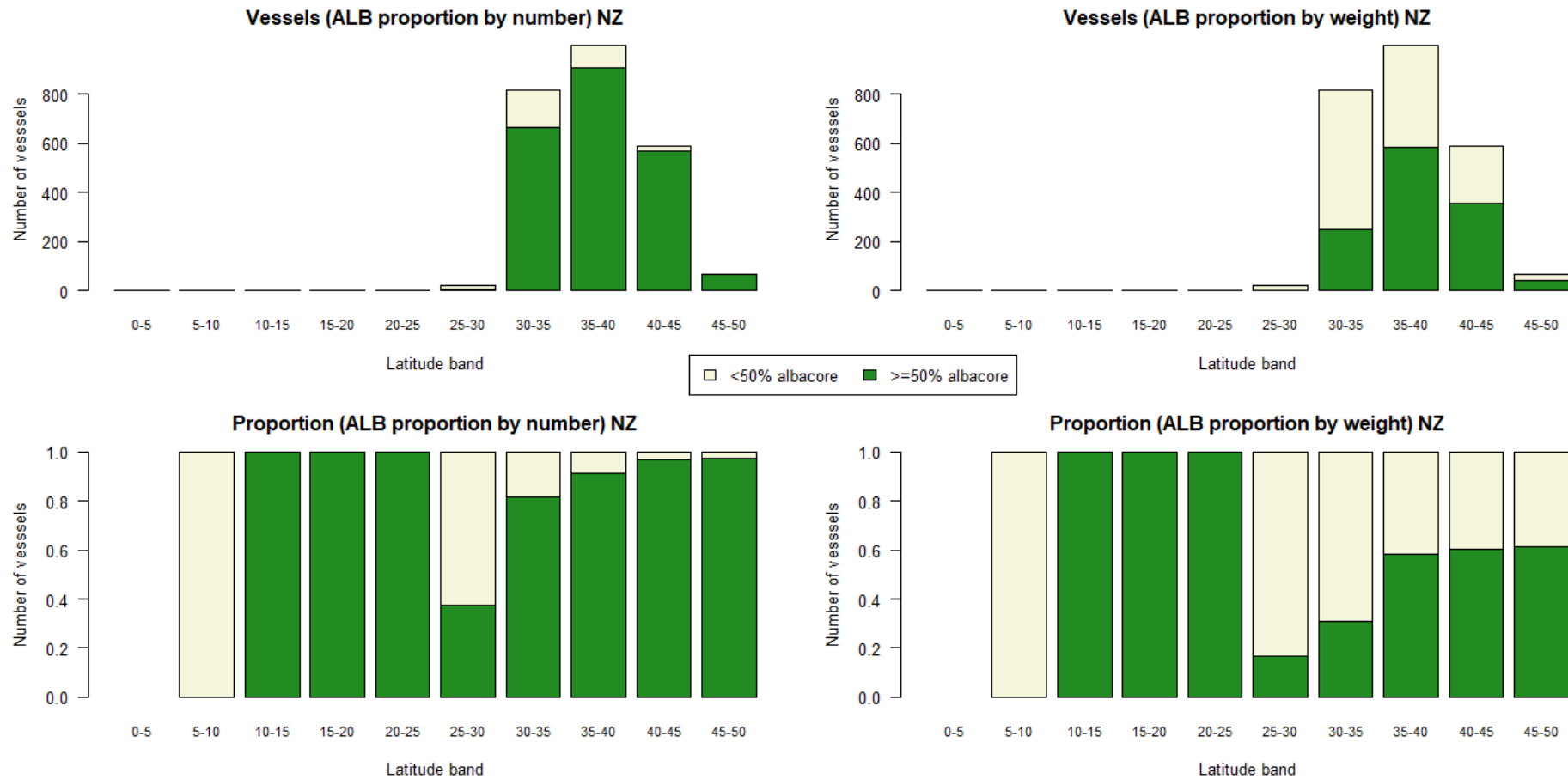
Figure 50: The number of Japanese flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.

Figure 51: The number of Kiribari flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
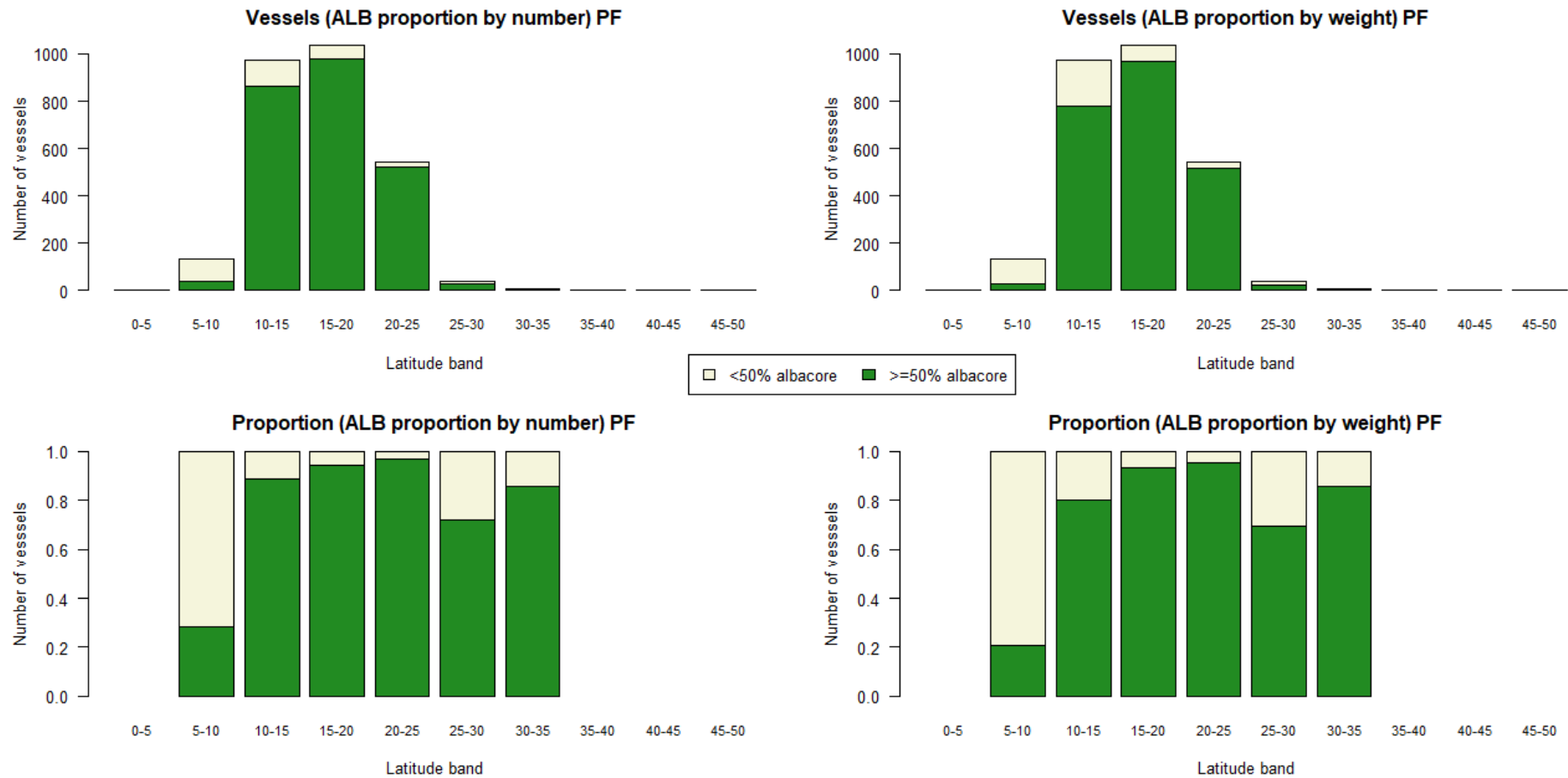
Figure 52: The number of Korean flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
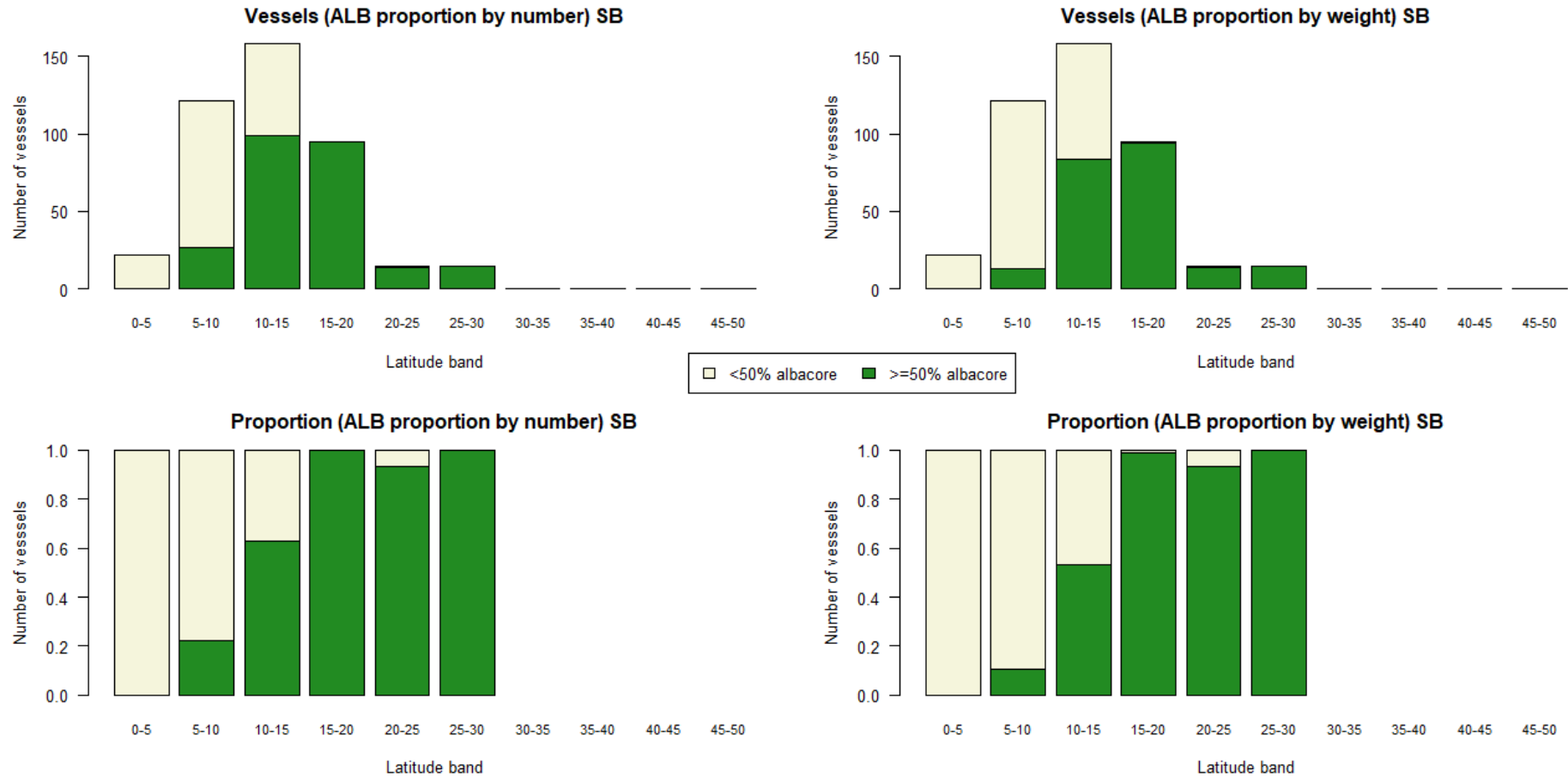
Figure 53: The number of New Caledonian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
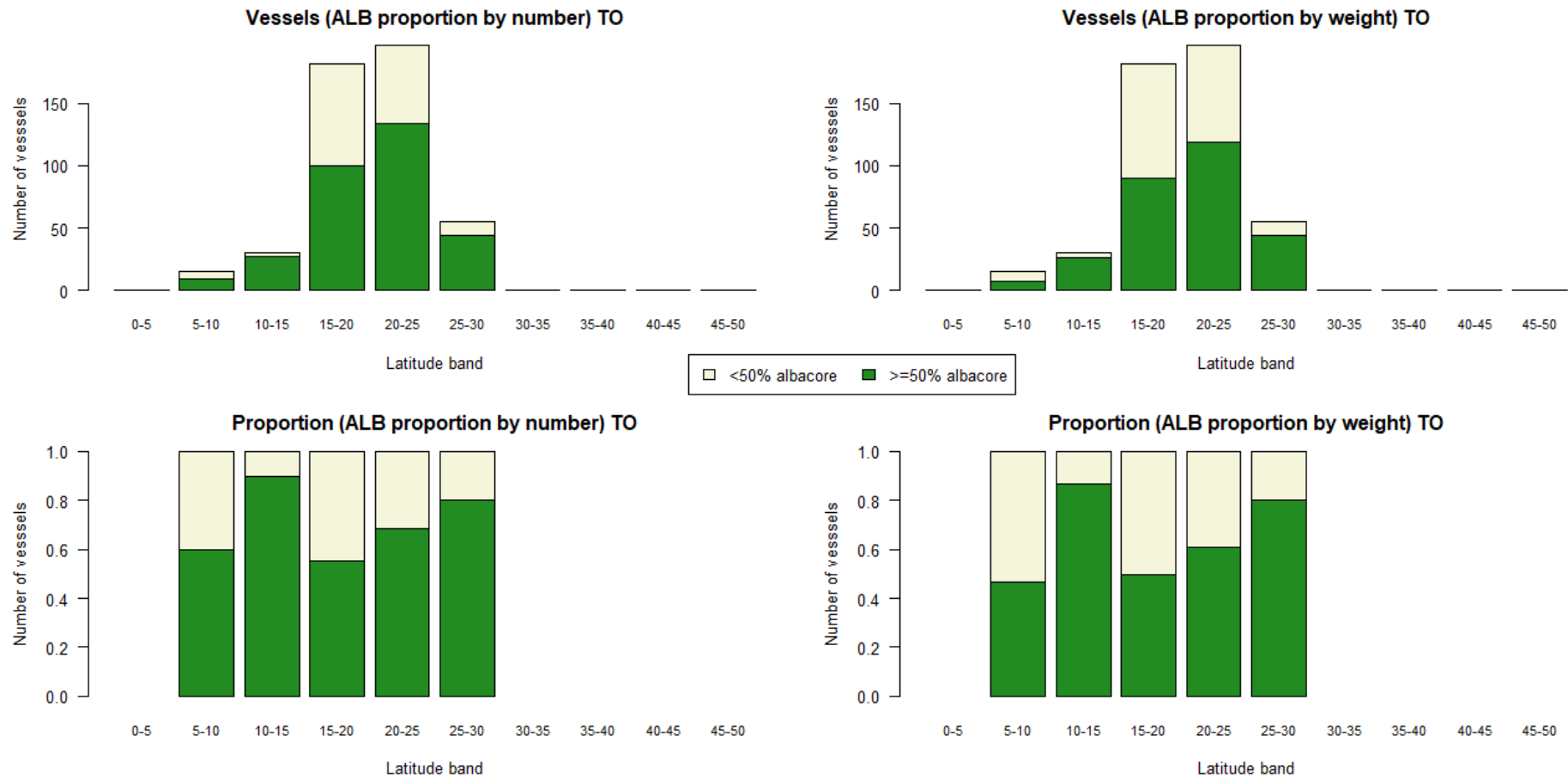
Figure 54: The number of Niuean flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
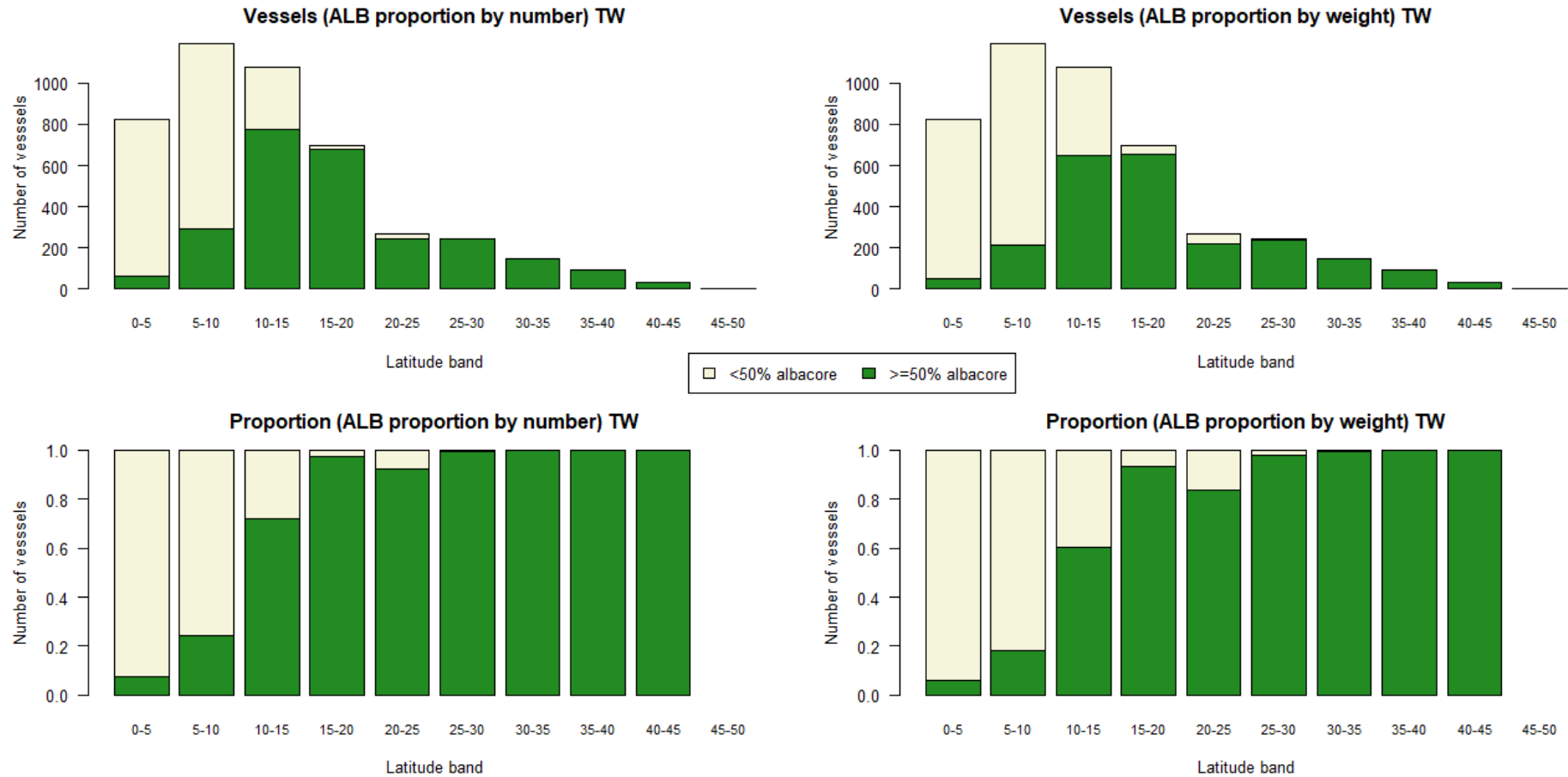
Figure 55: The number of New Zealand flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.

Figure 56: The number of French Polynesian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
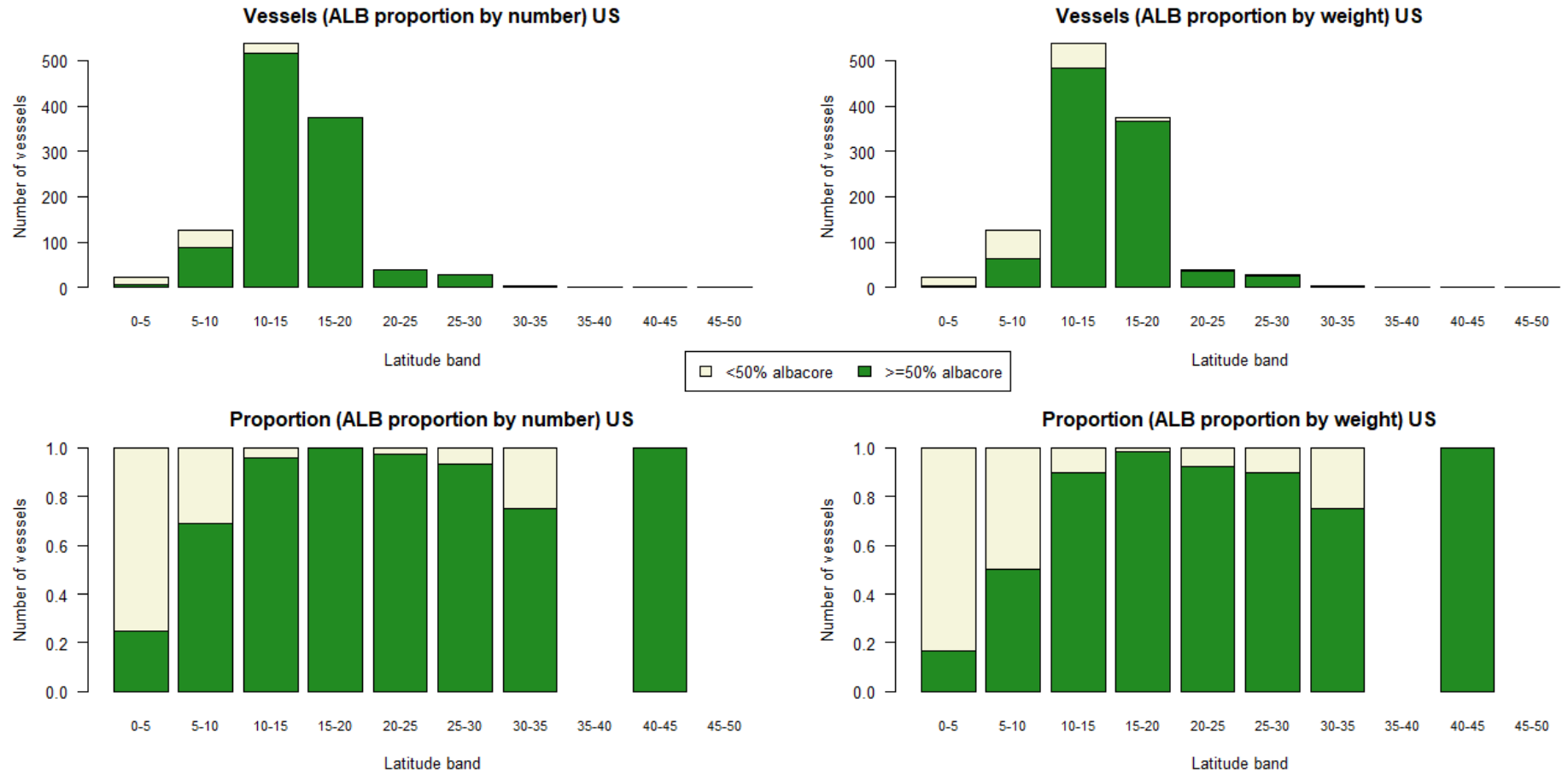
Figure 57: The number of Solomon Island flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
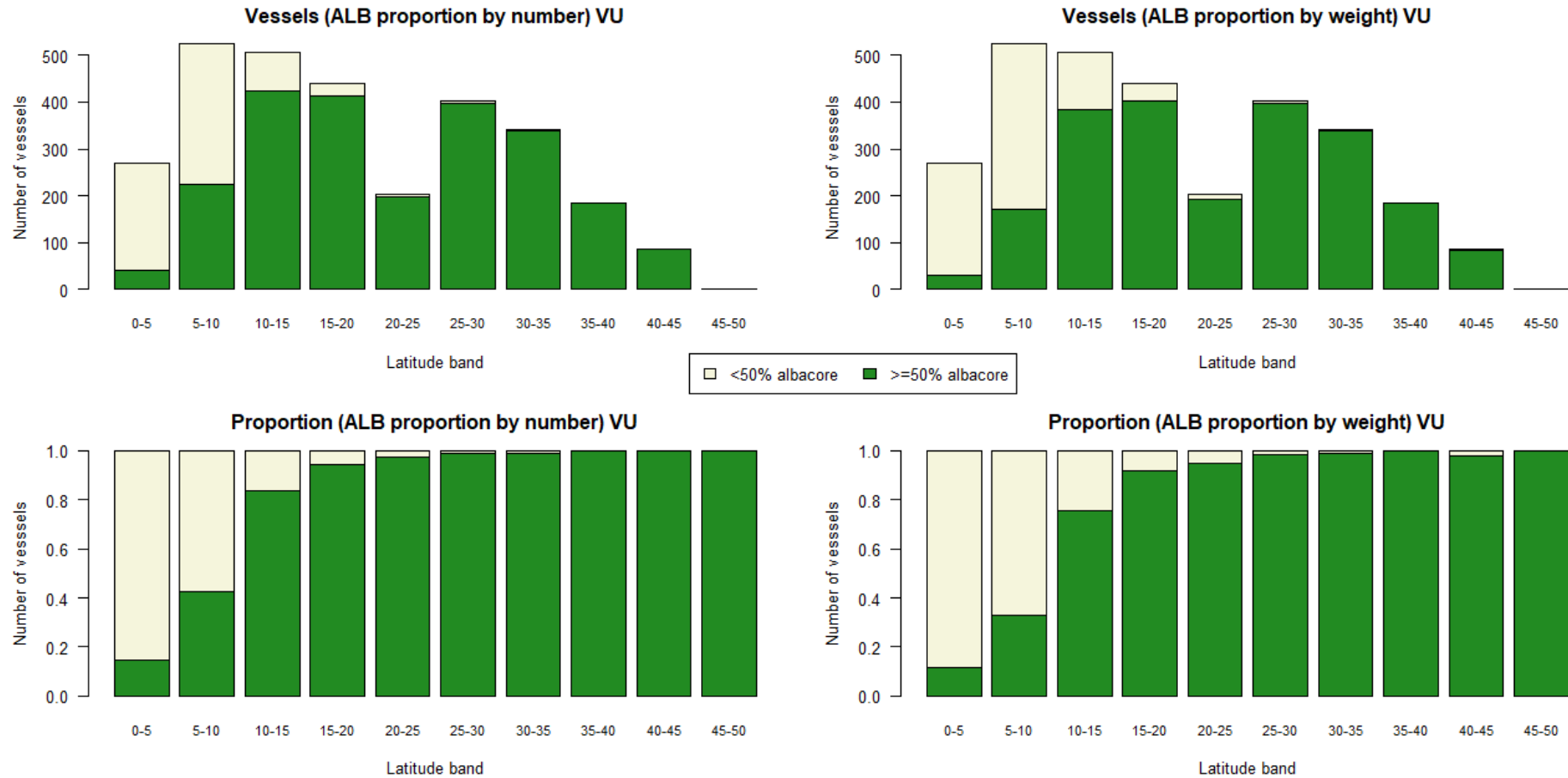
Figure 58: The number of Tongan flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.

Figure 59: The number of Chinese Taipei flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
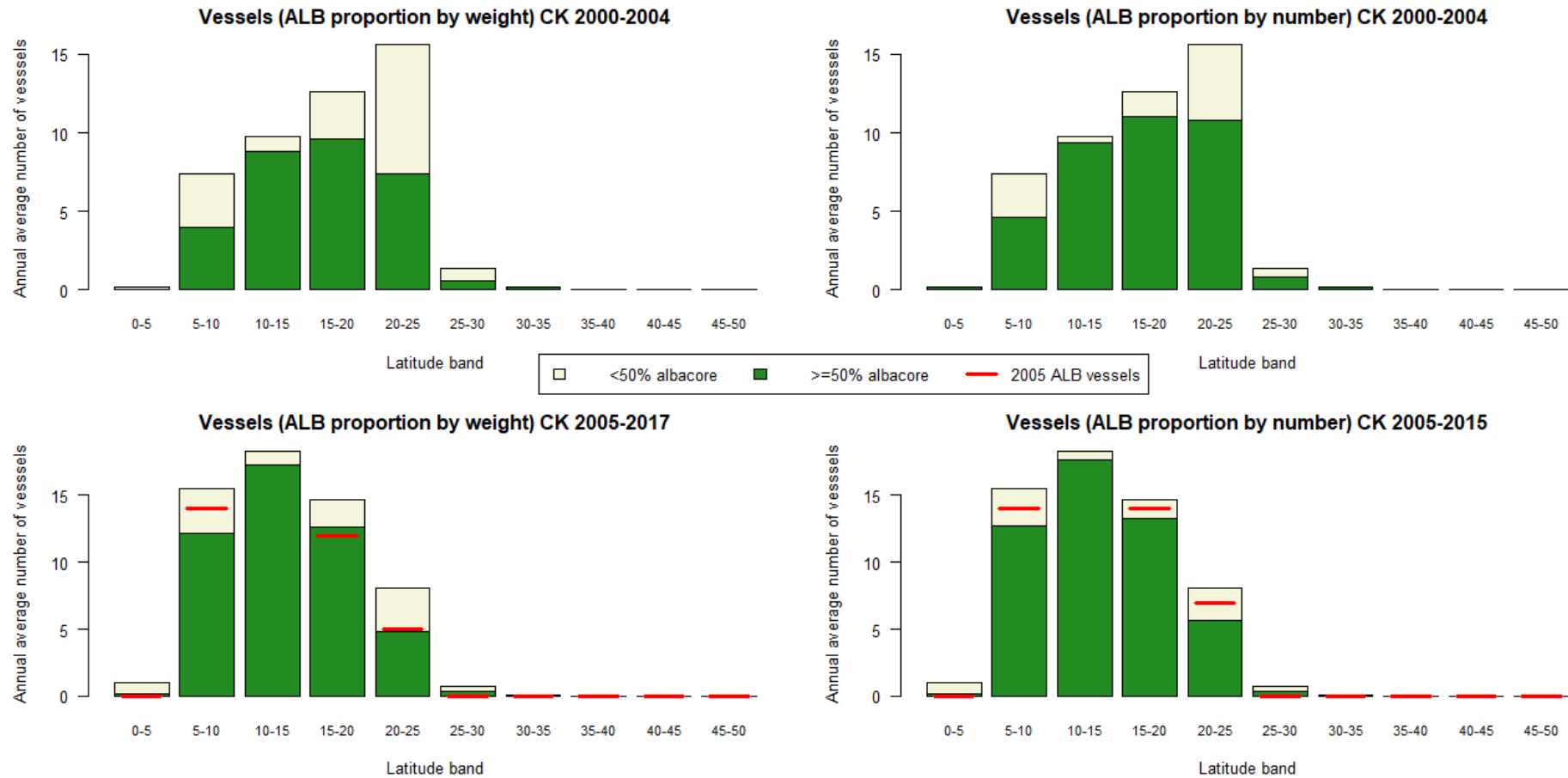
Figure 60: The number of USA flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.

Figure 61: The number of Vanuatu flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2017 and the proportion of albacore in their annual catch (top) and the proportion of vessels targeting albacore (bottom). Note: vessels can fish in more than one band and more than one year so these values will include double counting of the same vessel.
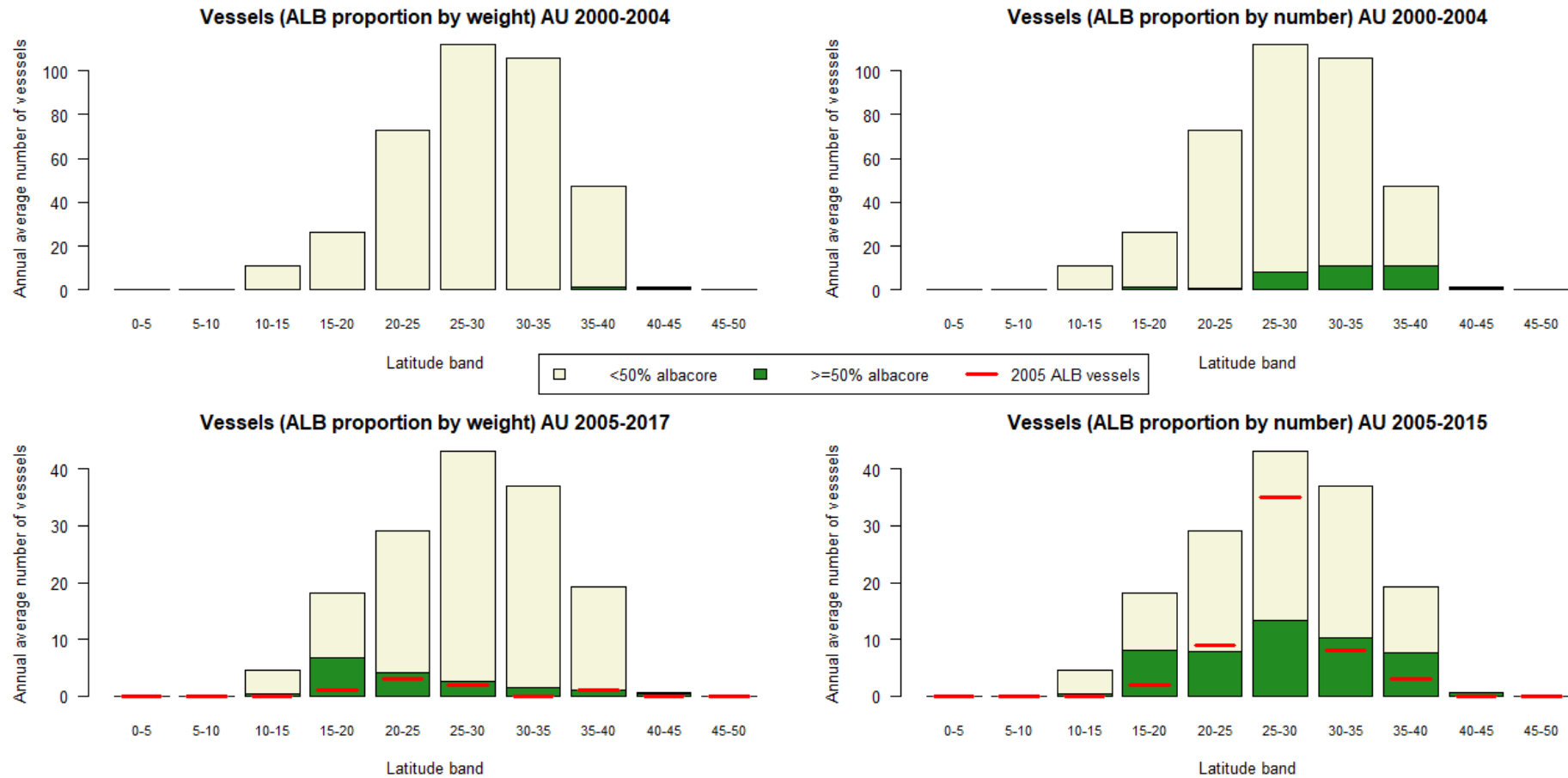
Figure 62: The annual average number of Australian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of Australian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
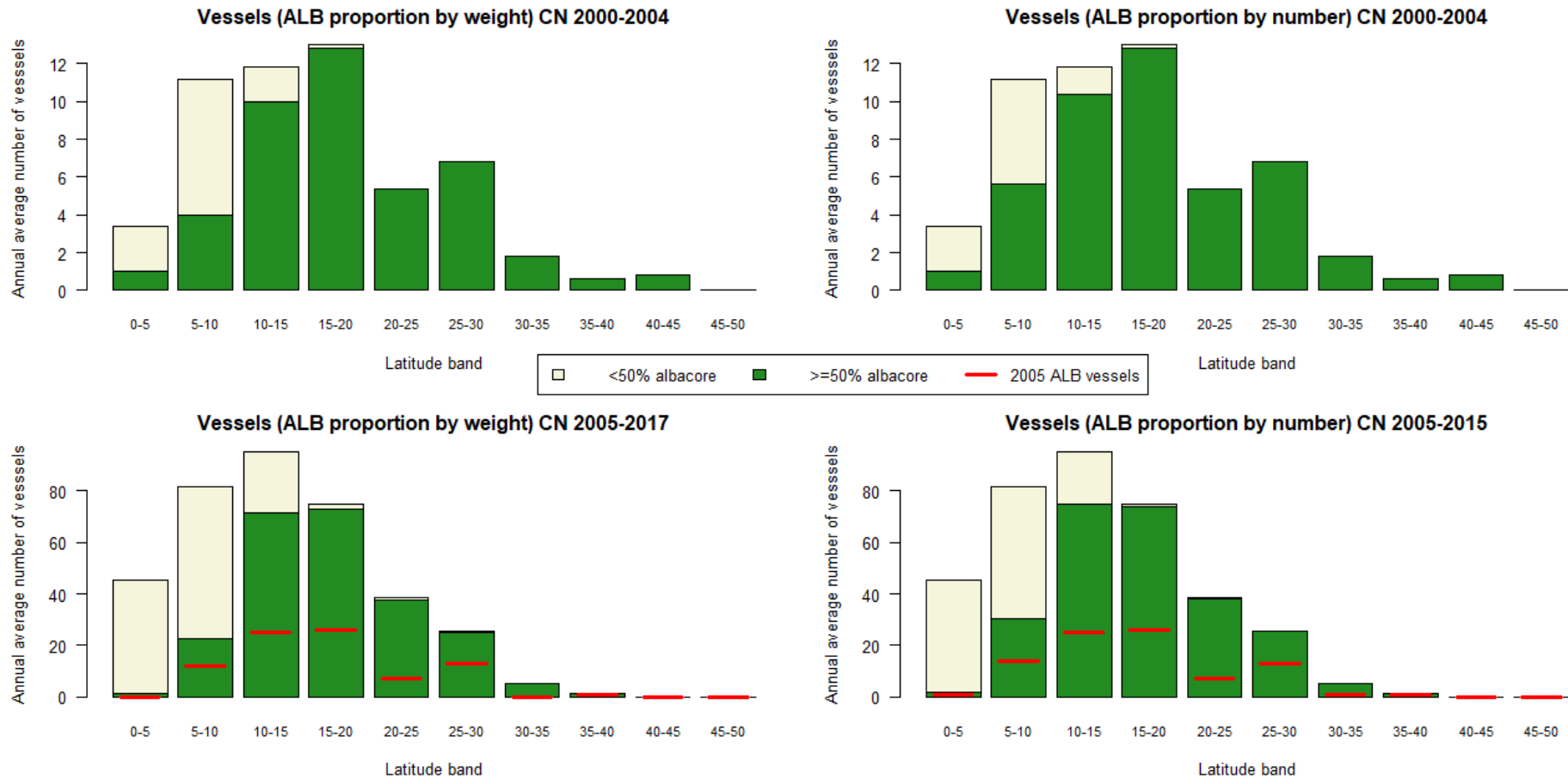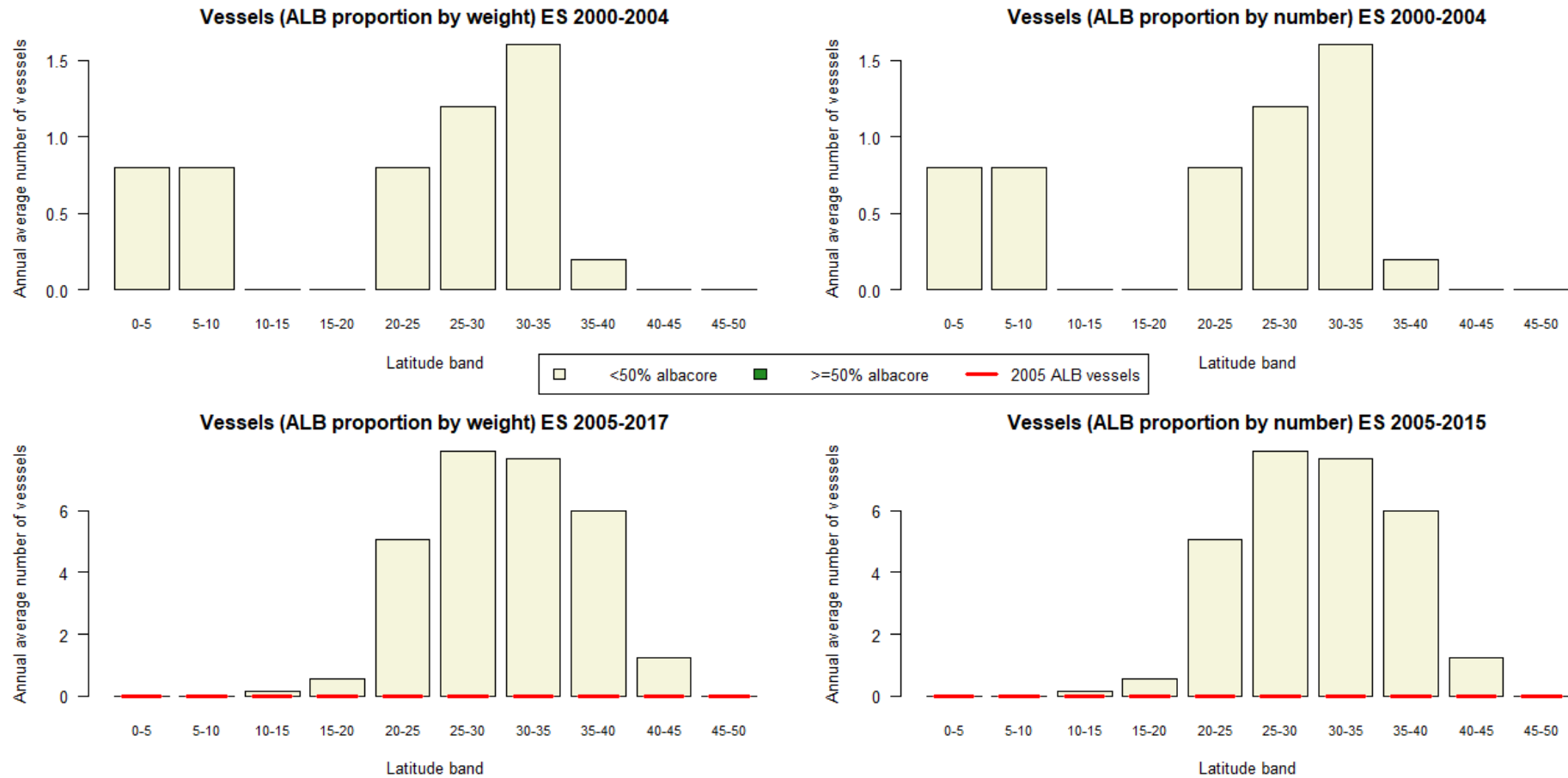
Figure 63: The annual average number of Cook Island flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of Cook Island flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
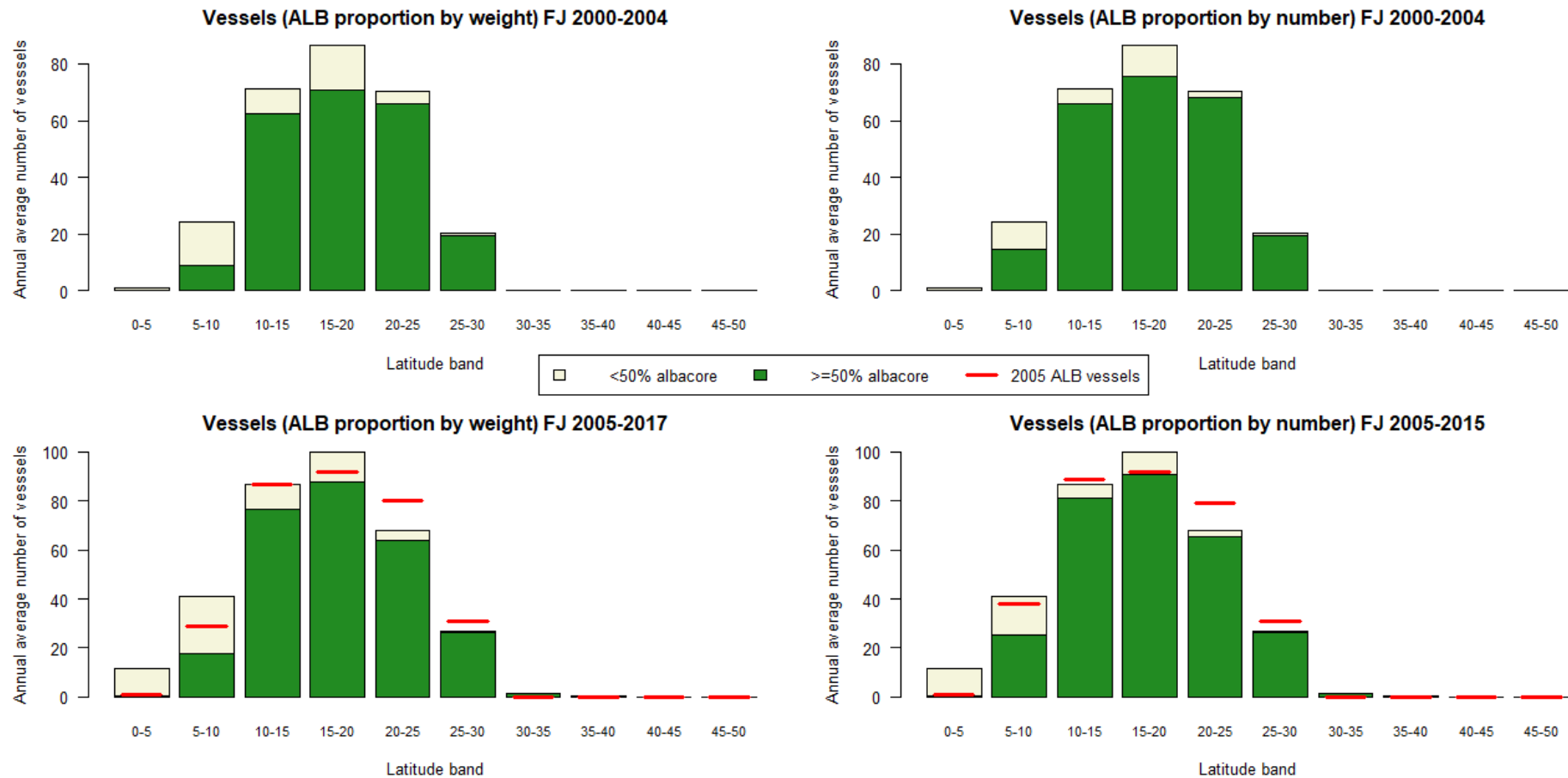
Figure 64: The annual average number of Chinese flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of Chinese flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
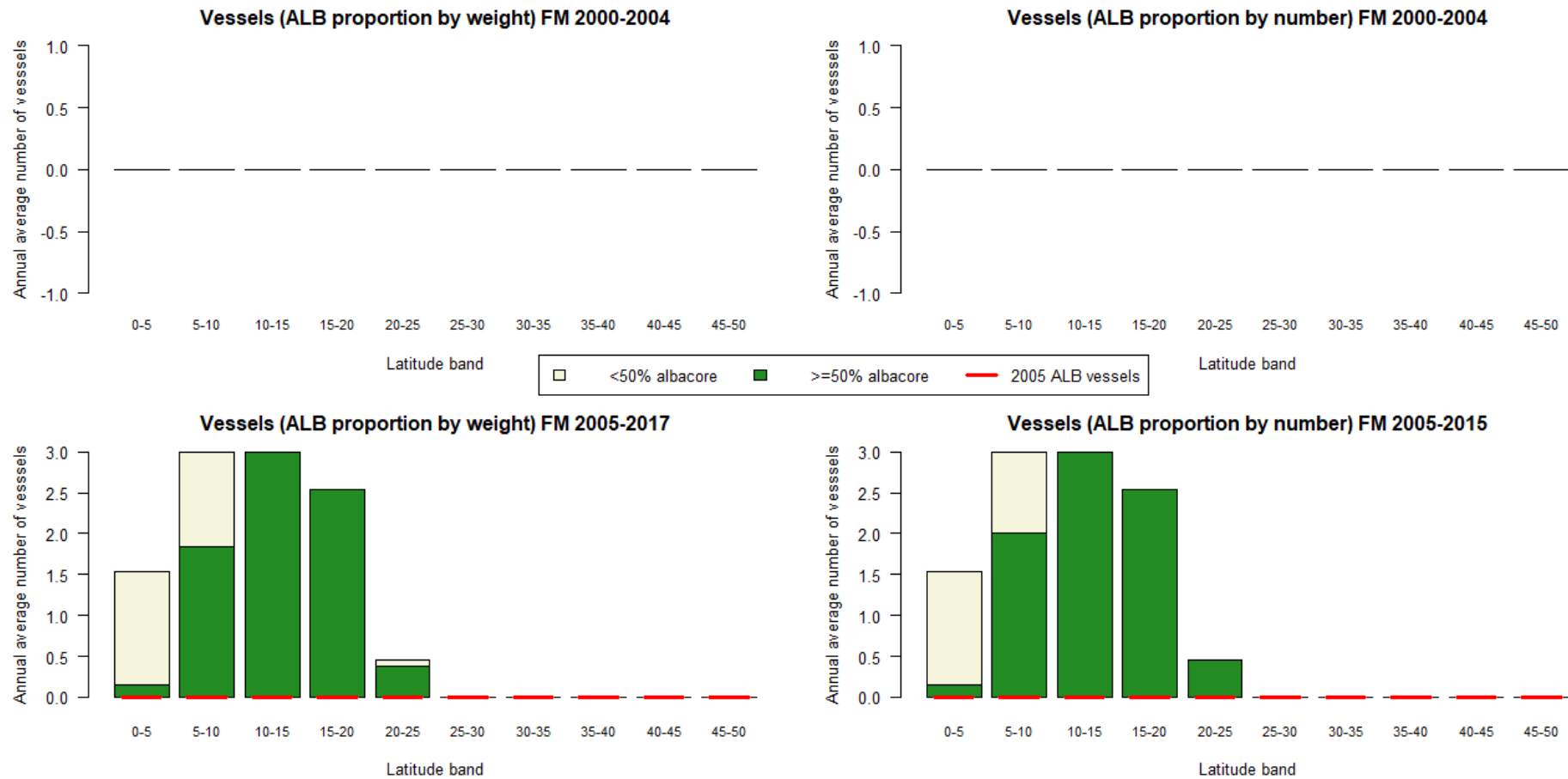
Figure 65: The annual average number of EU (Spain) flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of EU (Spain) flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.

Figure 66: The annual average number of Fijian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of Fijian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
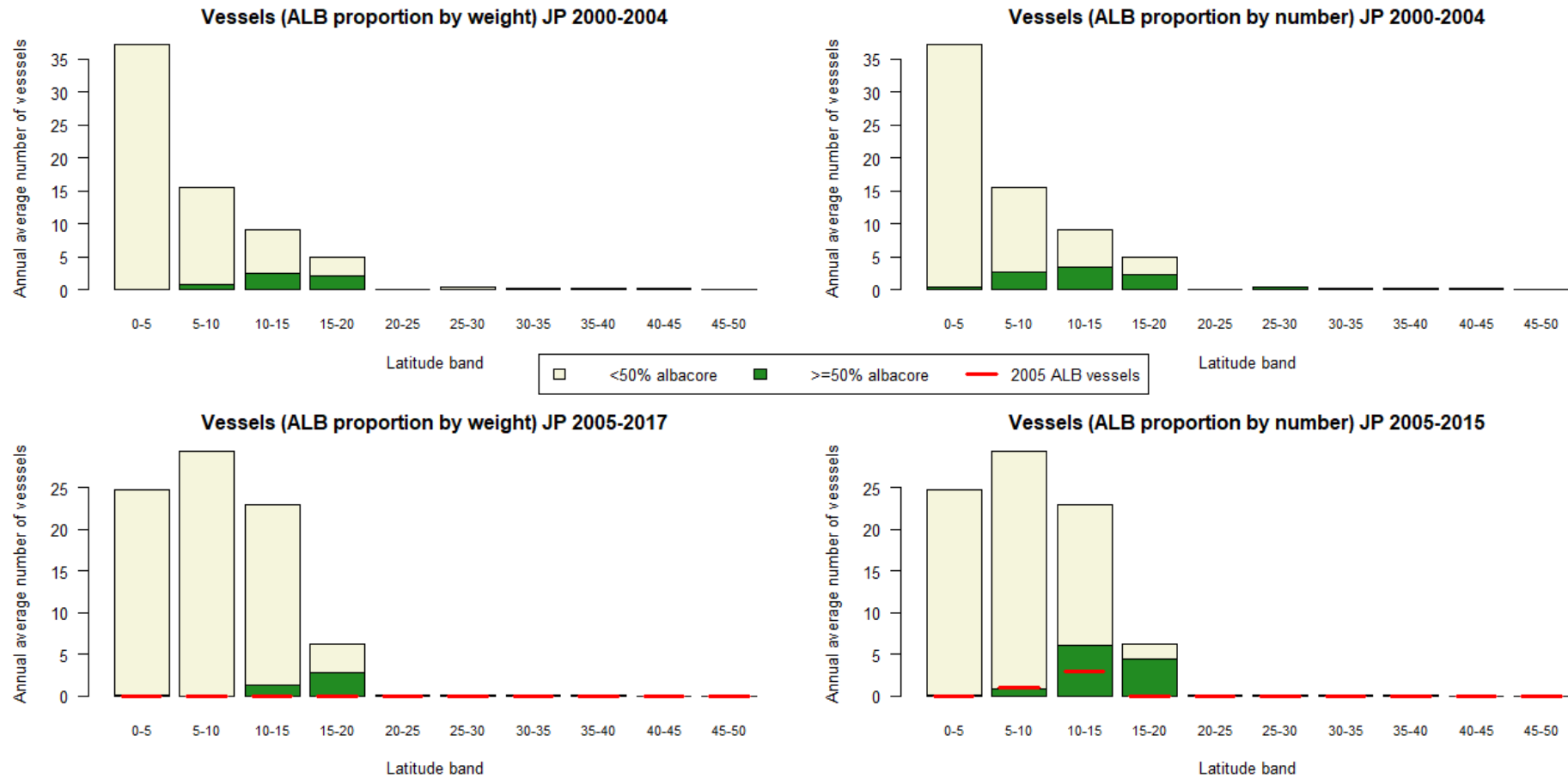
Figure 67: The annual average number of FSM flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of FSM flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.

Figure 68: The annual average number of Indonesian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of Indonesian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
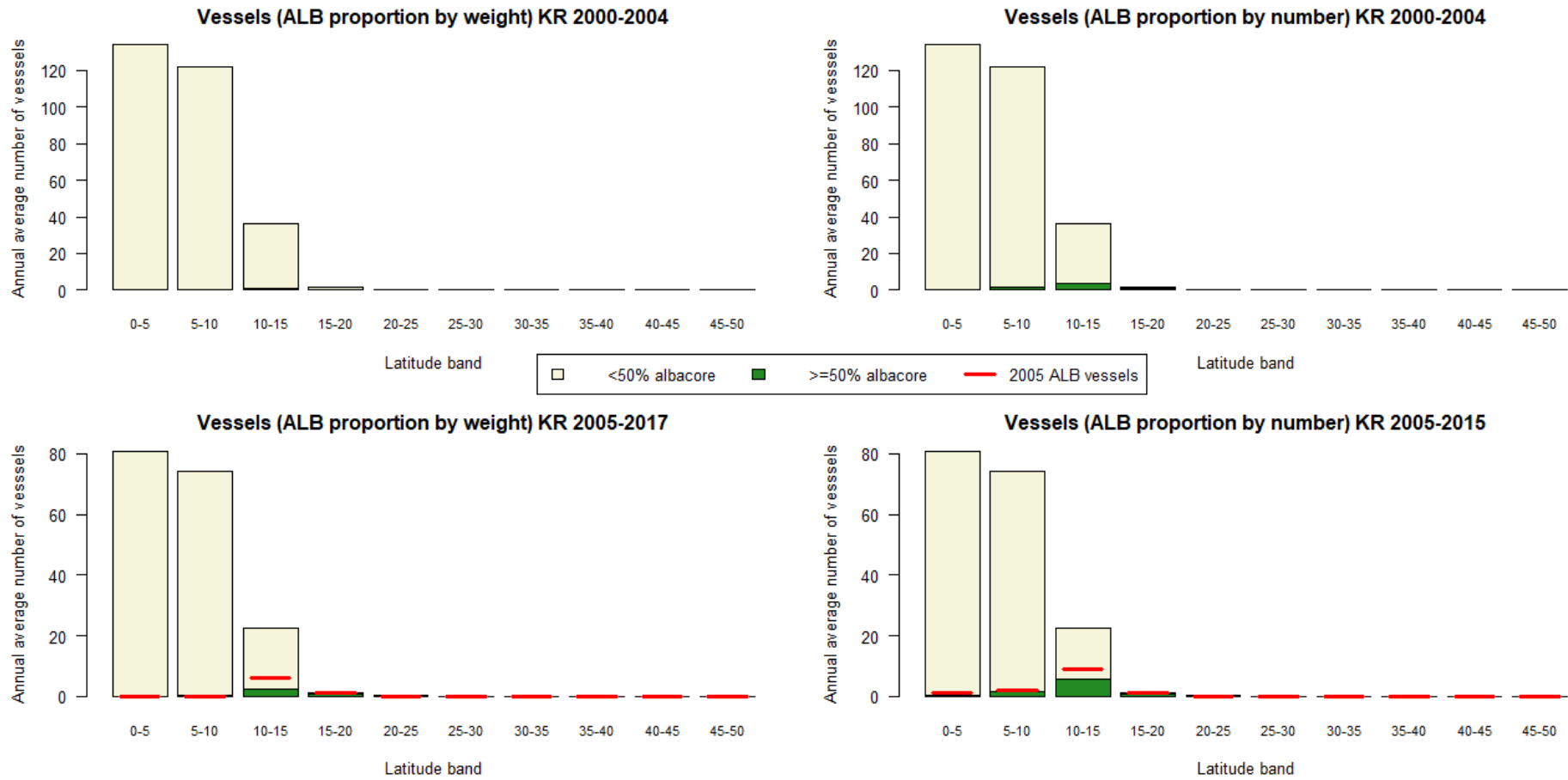
Figure 69: The annual average number of Japanese flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of Japanese flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
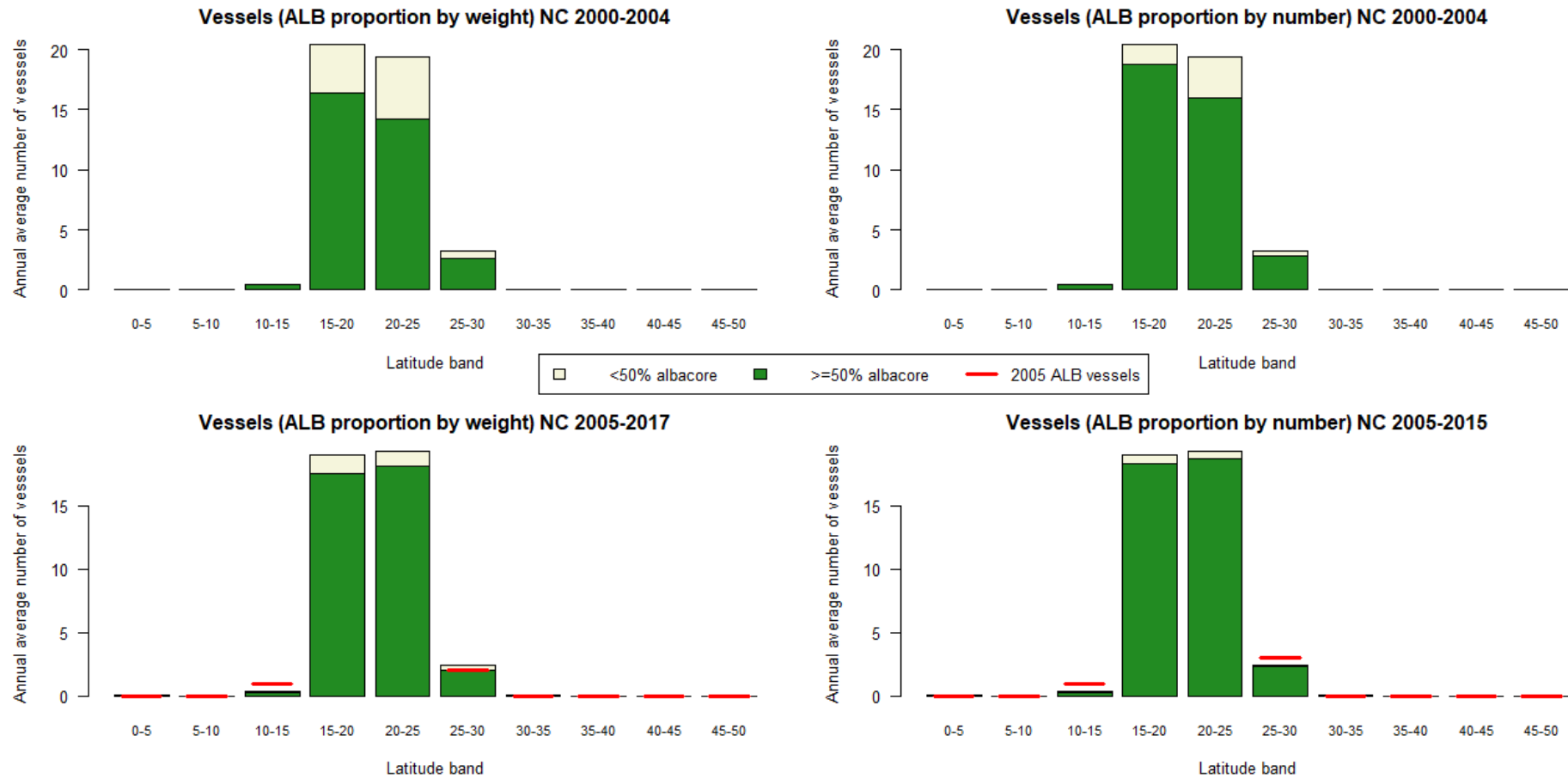
Figure 70: The annual average number of Kiribati flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of Kiribati flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.

Figure 71: The annual average number of Korean flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of Korean flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
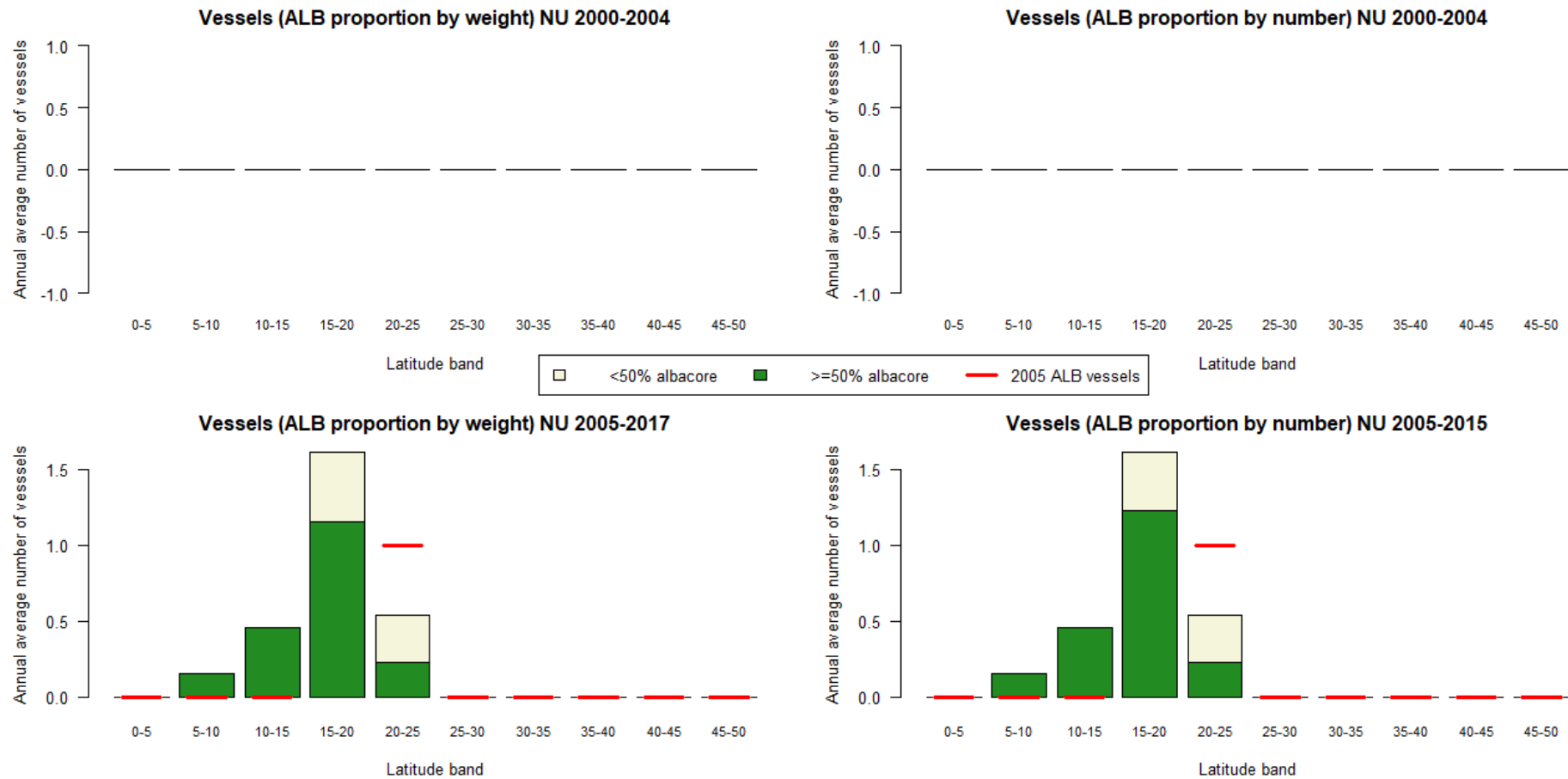
Figure 72: The annual average number of New Caledonian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of New Caledonian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
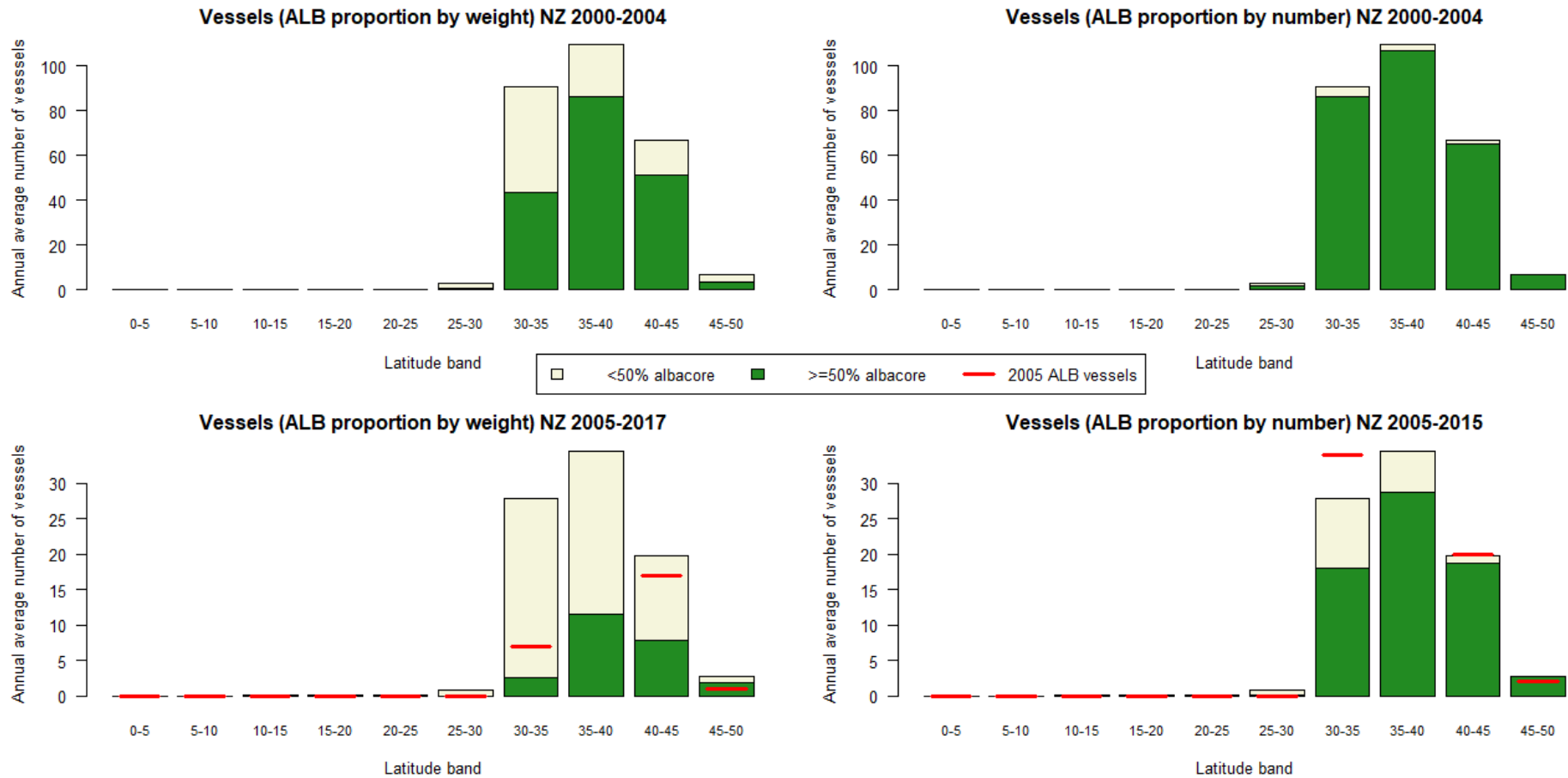
Figure 73: The annual average number of Niuean flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of Niuean flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
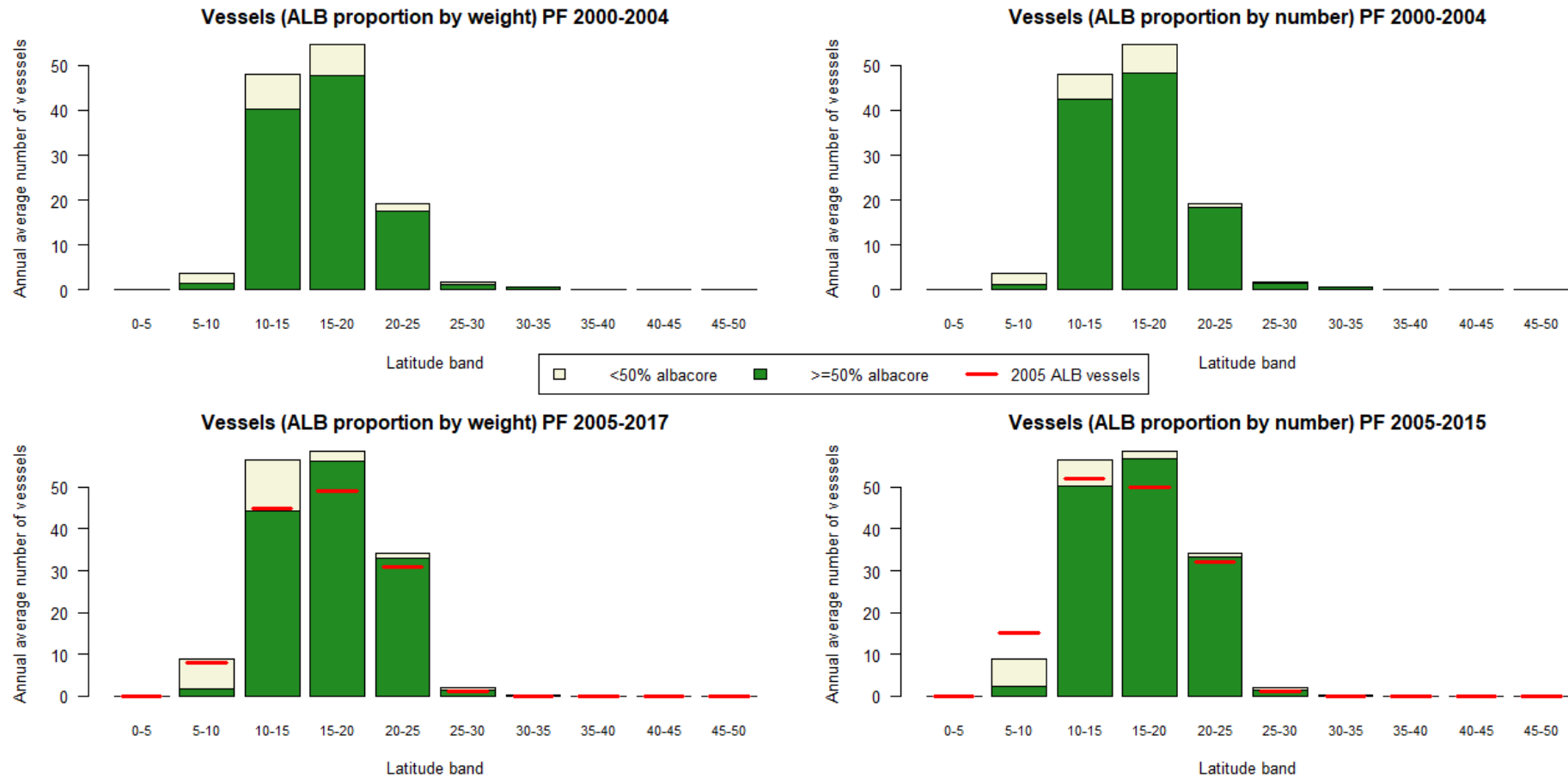
Figure 74: The annual average number of New Zealand flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of New Zealand flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
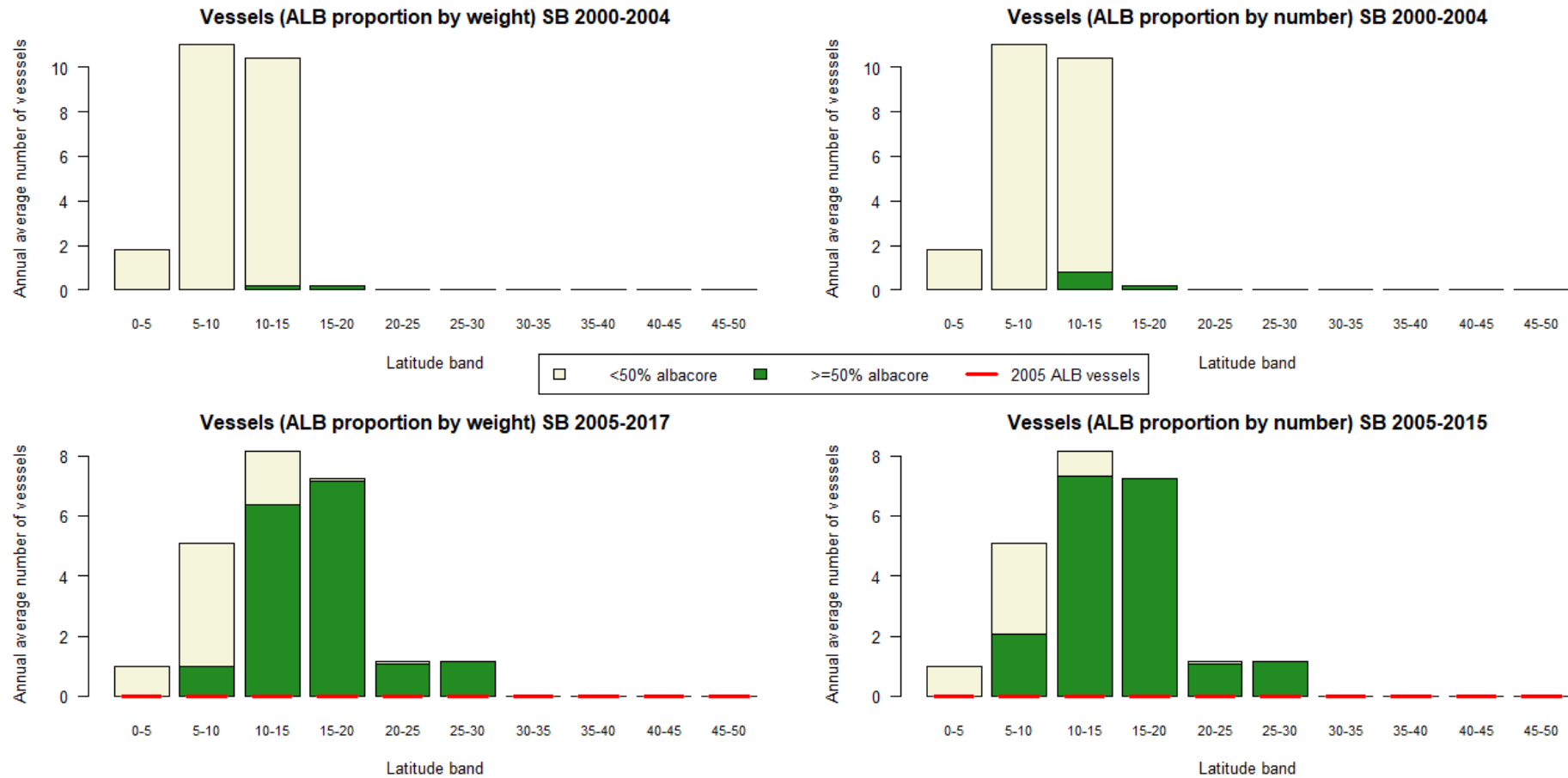
Figure 75: The annual average number of French Polynesian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of French Polynesian flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
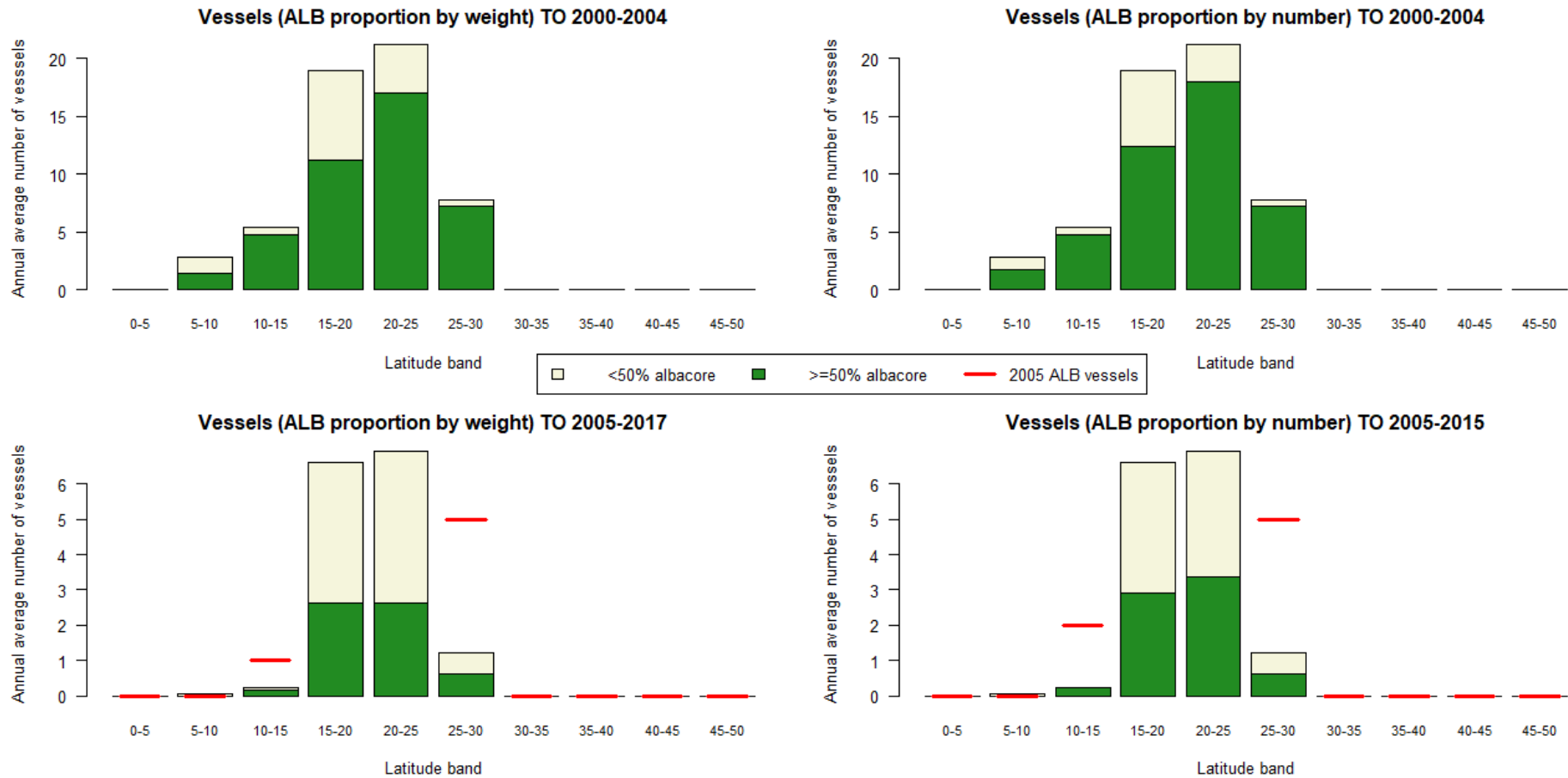
Figure 76: The annual average number of Solomon Island flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of Solomon Island flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.

Figure 77: The annual average number of Tongan flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of Tongan flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
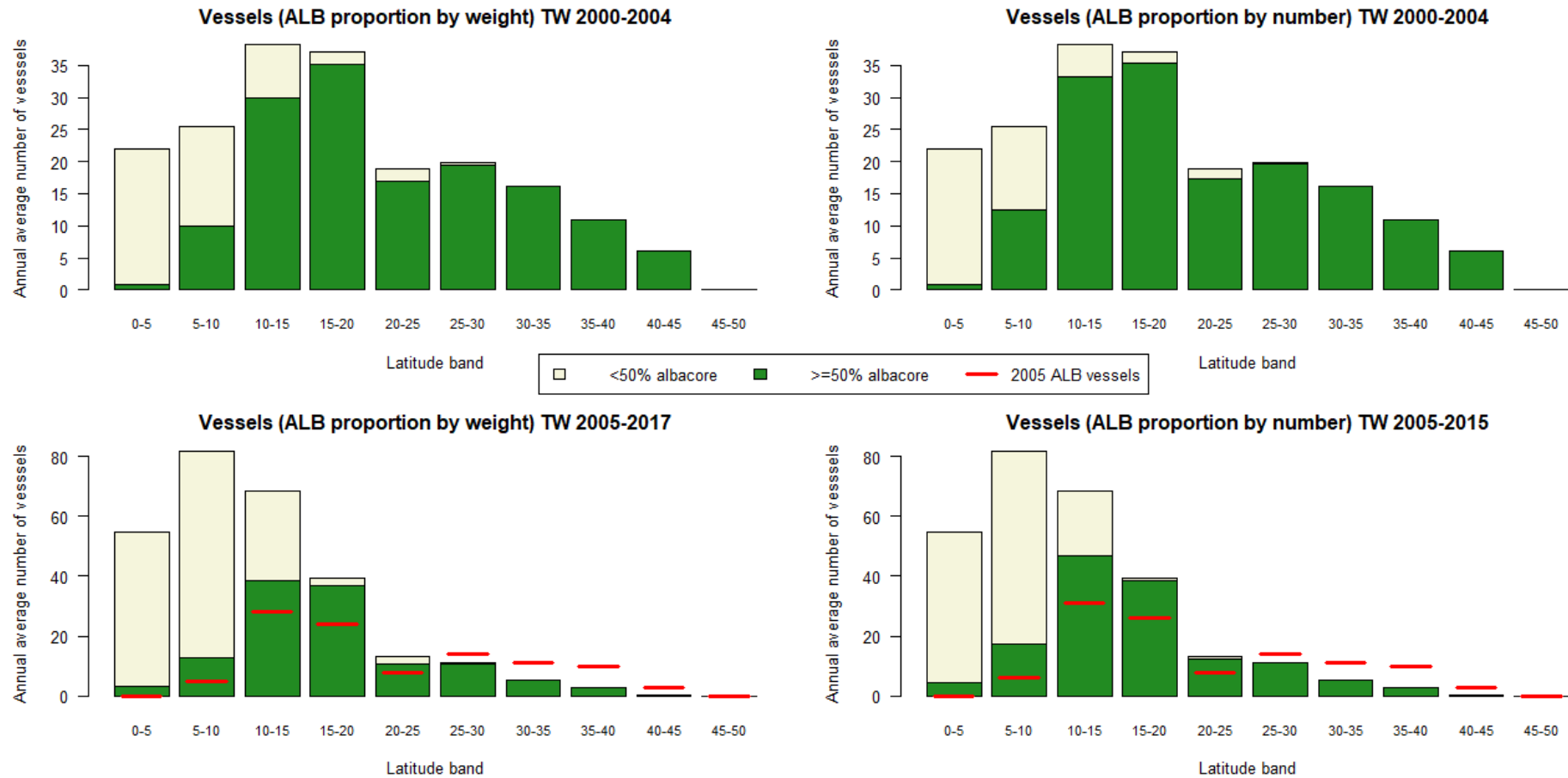
Figure 78: The annual average number of Chinese Taipei flagged vessels fishing in each Latitudinal band from the equator to 50^oS between 2000 and 2004 (top) and the annual average number of Chinese Taipei flagged vessels fishing in each Latitudinal band from the equator to 50^oS between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
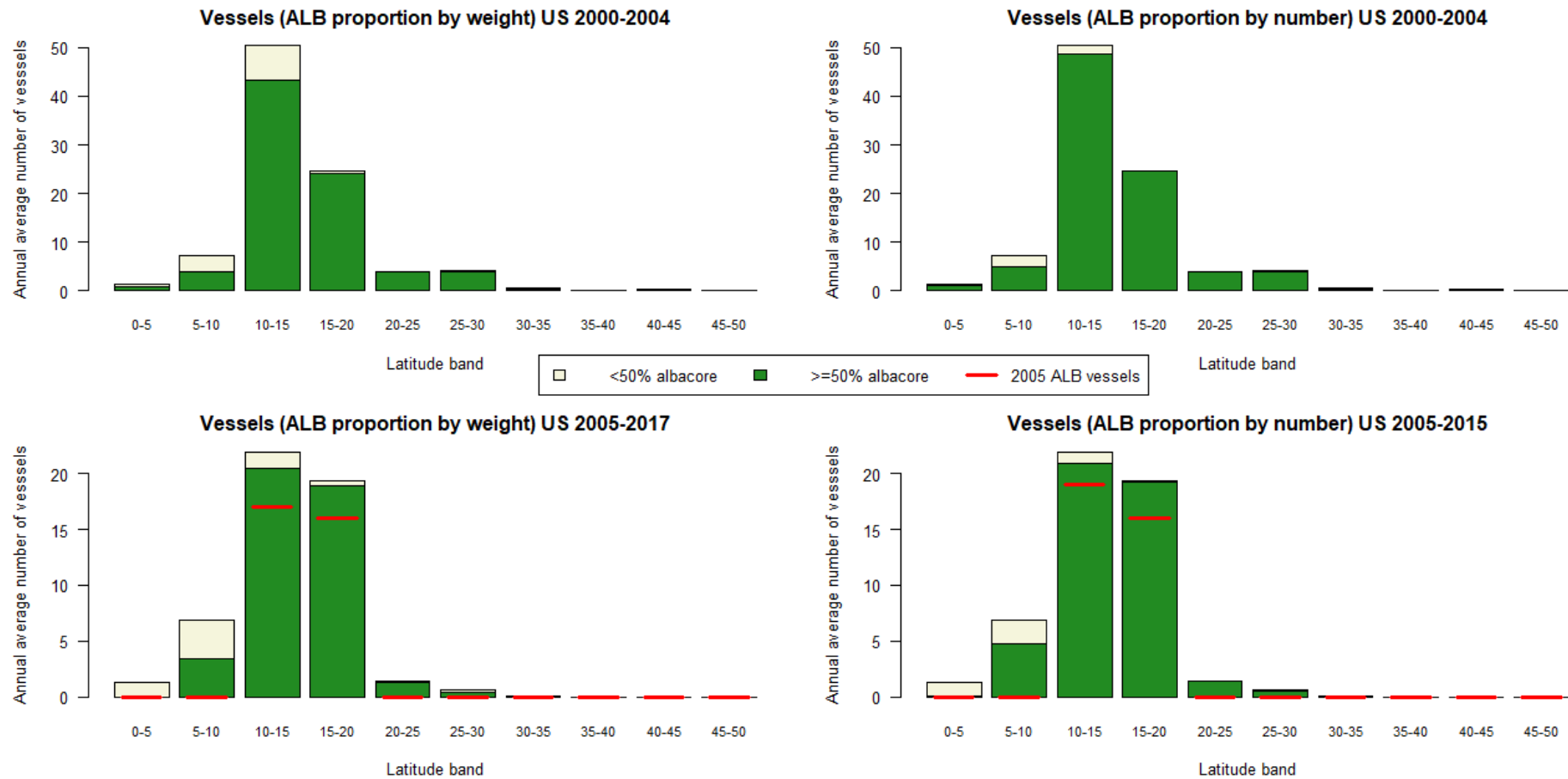
Figure 79: The annual average number of USA flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of USA flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
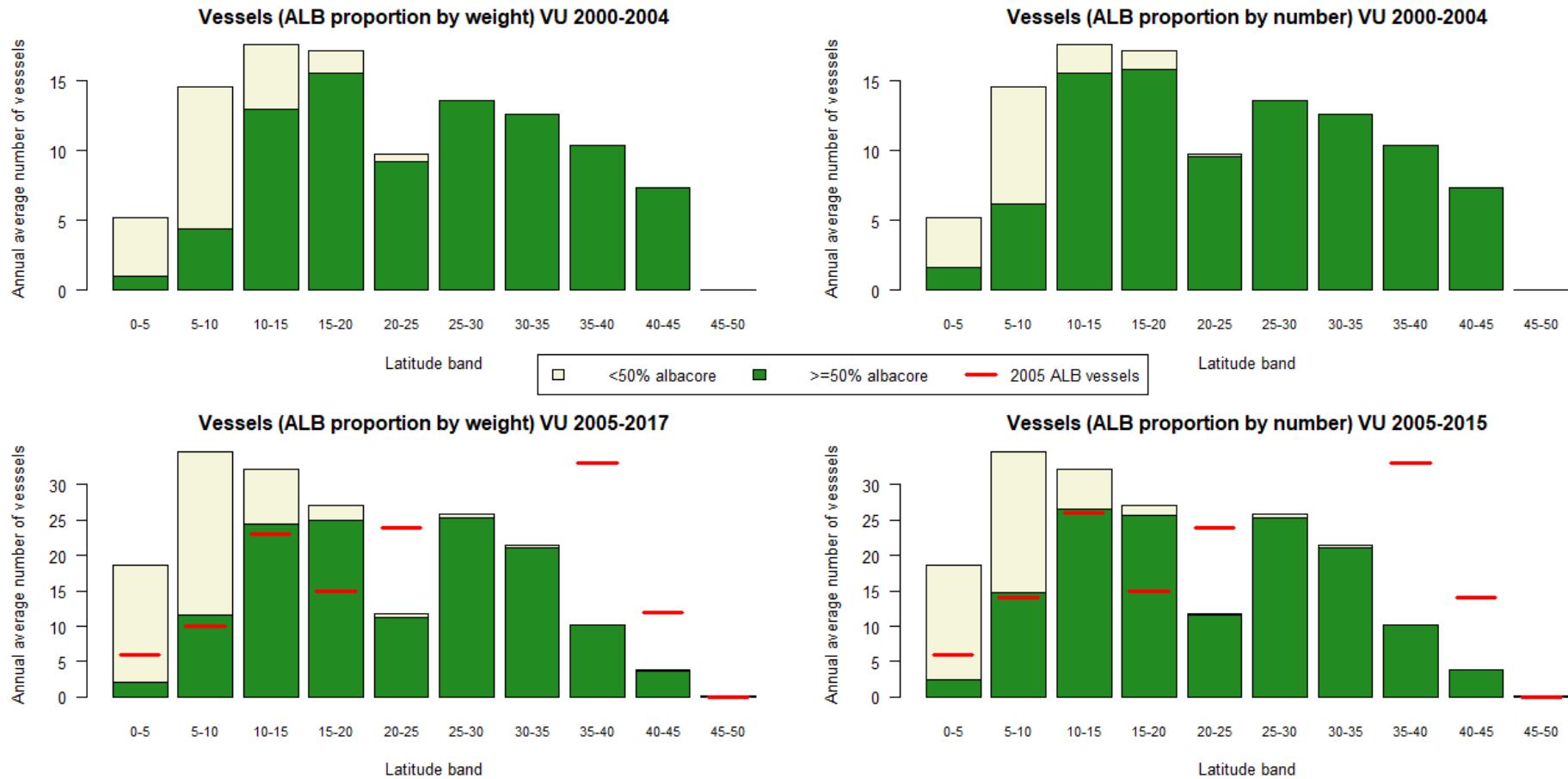
Figure 80: The annual average number of Vanuatu flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004 (top) and the annual average number of Vanuatu flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2005 and 2017, the red bars show the number of vessels in 2005 (bottom). The number of vessels whose catch was more the 50% albacore are shown in green.
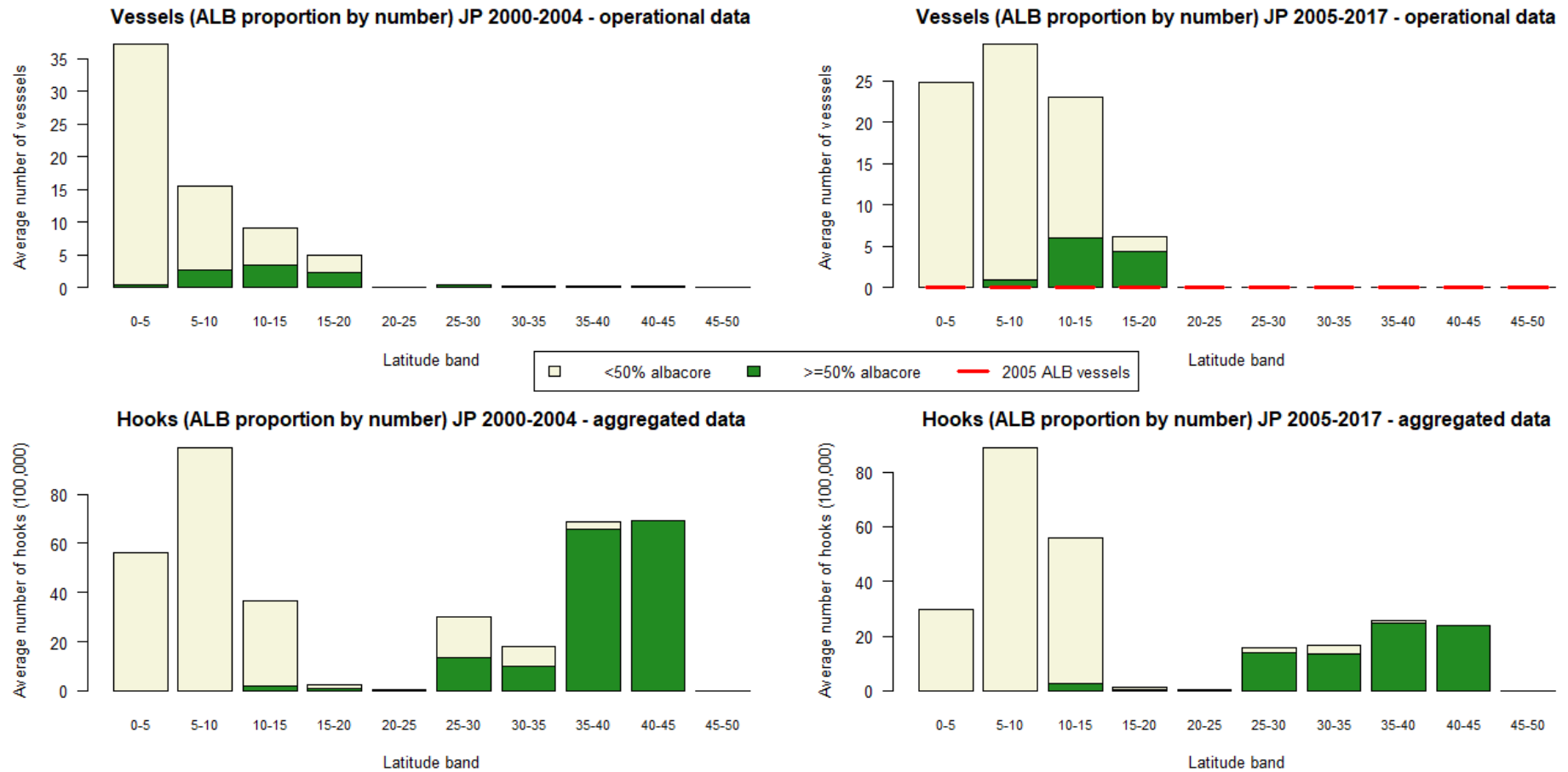
Figure 81: The annual average number of Japanese flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004; and between 2005 and 2017, the red bars show the number of vessels in 2005 estimated using the SPC held operational data (top); and the same estimates using hooks set from the aggregated data (bottom). The number of vessels whose catch was more the 50% albacore by number of fish are shown in green.
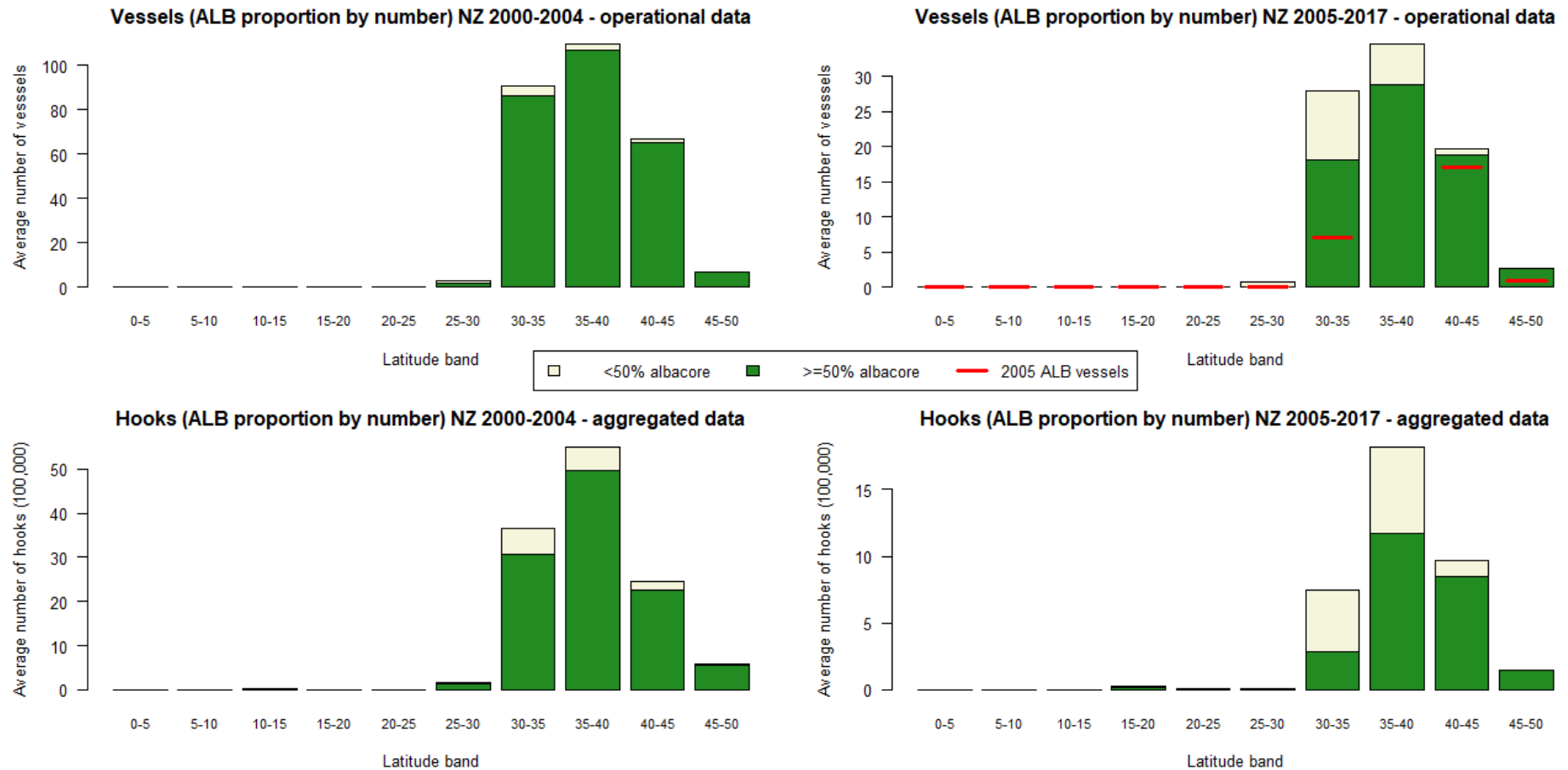
Figure 82: The annual average number of New Zealand flagged vessels fishing in each Latitudinal band from the equator to 50°S between 2000 and 2004; and between 2005 and 2017, the red bars show the number of vessels in 2005 estimated using the SPC held operational data (top); and the same estimates using hooks set from the aggregated data (bottom). The number of vessels whose catch was more the 50% albacore by number of fish are shown in green.