

## Updated catch length frequencies for the Tristan group of islands using factory pack category data



S.J. Johnston

MARAM  
Department of Mathematics and Applied Mathematics  
University of Cape Town  
Rondebosch, Cape Town

### Introduction

Reliable factory processing records of lobsters caught at all four islands of the Tristan group are available since 2001<sup>1</sup>. These “pack category” data record the number of lobsters that fall into different packing categories. There are two types of product for which data have been collected: “tails” (where only the tails are packed into cartons) and “whole” where either whole cooked or whole raw frozen lobsters are packed. The pack-categories however refer to certain weight ranges, with different categories applying to “tails” and to “whole” product. Tables 1a and b list the pack categories and the associated weight ranges.

Johnston (2010) applied the method described below to convert factory pack category data into catch length frequencies for data for the period 2001 – 2008. Recently, two further year’s of factory pack category records have become available, and this document serves to update the work presented in Johnston (2010) with the 2009 and 2010 data.

In order to convert the pack category data into a single catch-at-length frequency for each island and season, the following steps are followed:

**Step 1:** Work out to what each pack category refers to with respect to mean weight (in g - will be either tail weight or total weight). This is done simply by taking the average of the maximum and minimum values of the weight range for each pack category. These values are reported in Tables 1a and b.

**Step 2:** Convert the weight of each pack category into a carapace length (in mm) as follows:

**a) For Tail counts** (i.e. weight reflects the average tail weight):  
From Roscoe (1979) for *Jasus tristani* we have:

$$L = 14.77W^{0.3687}$$

where  $L$  = carapace length (in mm) and  $W$  = tail weight (in g).

It is thus easy to calculate the corresponding minimum, maximum and average  $L$  for each pack category.

<sup>1</sup> In this document, split seasons are denoted by first “year” e.g. 2001 refers to the split season 2001/02

**b) For whole weights**

From Heydorn (1969) for *Jasus lalandii* we have:

$$\text{Males: } W = 0.6518L^{2.8990}$$

$$\text{Females: } W = 0.5869L^{2.9729}$$

where  $L$  = carapace length (in cm) and  $W$  = total body weight (in g).

For each 1mm  $L$ , we can calculate both a male and female  $W$ . For these calculations, the average of the male and female  $W$  values are assumed. Corresponding length ranges for each pack category can thus be estimated.

**Step 3:** Create catch length frequencies for each island for 2001 – 2010 separately for “tails” and “whole weight” data. It is interesting to compare “tails” versus “whole weight”. Note however that there are different CL categories between the tails and the whole product.

**Step 4:** Combine the data from tail and whole product pack categories for each season and island. In order to do this each pack category from the whole product is assigned to a pack category of the tail product. Table 3 reports which whole pack categories are assigned to which tail pack category. A combined catch length frequency (using the tail pack categories) can now be calculated.

Table 4 reports the numbers of lobsters for each product type over the seasons and islands.

**Results**

Tables 5a-d report the combined (tails plus whole lobster) catch length frequencies for each island.

Note that the catch length categories do not correspond to length class divisions of the same length, e.g. between category “AAA” and “AA” there is a 15mm difference, but between “J” and “M” categories there is a difference of only 6mm. Hence multi modality in some plots that follow does not necessarily reflect multi-modal length distributions.

Figures 1a-d compare the catch length frequencies between tails, whole, and tails plus whole combined product for each of the four islands for 2001-2010. Figures 2a-d show the same plots but for the four most recent seasons only (2007-2010).

From these Figures, Figures 2a-d in particular, it is clear that there appears to be a trend of relatively more smaller lobsters being caught progressively over the last four seasons (2007-2010) for Inaccessible, Nightingale and Tristan islands. No such trend appears evident from the data from Gough island.

From these data, it can not be determined whether this trend is due to an increase of small lobster in the resource e.g. through results of good recruitment, or if this is a

result of reduced abundance of large lobsters as a result of recent higher fishing mortality.

### **References**

Heydorn, A.E.F. 1969. The rock lobster of the South African west coast *Jasus lalandii* (H. Milne-Edwards). 2. Population studies, behaviour, moulting, growth and migration. Investl Rep. Div. Sea Fish. S. Afr. 71: 52pp.

Johnston, S.J. 2010. Creating catch length frequencies for the Tristan group of islands using factory pack category data. MARAM/Tristan/2010/Feb/01. 11pp.

Roscoe, M.J. 1979. Biology and exploitation of the rock lobster *Jasus tristanii* at the Tristan da Cunha islands, South Atlantic, 1949-1979. Invesl Rep. Div. Sea Fish. S. Afr. 118: 47pp.

Table 1a: Pack category specifications for the tails product.

Pack category	Total weight (g)		
	min	max	Ave
AAA	570	760	665
AA	454	569	511.5
A	410	453	431.5
B	380	409	394.5
C	285	379	332
D	215	284	249.5
F	180	214	197
G	150	179	164.5
H	130	149	139.5
J	115	129	122
M	90	114	102
KZ	65	89	77
K	50	64	57

Table 1b: Pack category specifications for the whole product.

Pack category	Weight range (g)	Mean whole weight (g)
72	138-150	144
68	150-155	152.5
64	156-165	160.5
60	166-180	173
56	181-190	185.5
52	191-205	198
48	206-225	215.5
44	226-245	235.5
40	246-270	258
36	271-305	288
32	306-345	325.5
28	346-400	373
24	401-470	435.5
20	471-540	505.5
18	541-615	578
16	616-700	658

Table 2a: Corresponding carapace length (CL) ranges for each pack category for the tails product.

Pack category	CL (mm)		
	Min	max	ave
AAA	153	170	162
AA	141	153	147
A	136	141	138
B	132	136	134
C	119	132	126
D	107	119	113
F	100	107	104
G	94	100	97
H	89	93	91
J	85	89	87
M	78	85	81
KZ	69	77	73
K	62	68	66

Table 2b: Corresponding carapace length (CL) ranges for each pack category for the whole product.

Pack category	CL (mm)	
	CL range	Ave CL
72	63.1-64.8	64
68	64.9-65.7	65.3
64	65.8-67.0	66.4
60	67.1-69.0	68.1
56	69.1-70.3	69.8
52	70.4-72.2	71.3
48	72.3-74.5	73.4
44	74.6-76.7	75.7
40	76.8-79.3	78.1
36	79.4-82.6	81
32	82.7-86.2	84.5
28	86.3-90.7	88.5
24	90.8-95.8	93.3
20	95.9-100.4	98.2
18	100.5-104.9	102.7
16	105.0-109.7	107.4

Table: The assignment of whole pack categories to the tail pack categories.

<b>Tail pack category</b>	<b>Whole pack category</b>
AAA	
AA	
A	
B	
C	
D	
F	16,18
G	20
H	24
J	28,32
M	36,40
KZ	44,48,52,56
K	60,64,68,72

Table 4: Numbers of lobsters packed as either tails or whole product for each island and season.

	<b>Gough</b>		<b>Inaccessible</b>		<b>Nightingale</b>		<b>Tristan</b>	
	Tails	Whole	Tails	Whole	Tails	Whole	Tails	Whole
<b>2010</b>	2590	5153	1640	2875	1687	3974	7329	4698
<b>2009</b>	2672	4065	2838	7125	1699	4946	8054	7463
<b>2008</b>	2940	2592	4374	5224	2992	2983	7344	8240
<b>2007</b>	2382	2818	3854	5943	2790	2606	8286	5391
<b>2006</b>	1701	3217	3042	5946	1700	3774	9107	5117
<b>2005</b>	1689	3275	2473	5715	2095	3230	9249	3324
<b>2004</b>	2563	2013	3260	4137	2338	2863	9689	2700
<b>2003</b>	4658	1969	3640	2564	3002	1531	9169	1402
<b>2002</b>	3331	3381	3247	2478	2364	2310	5652	4775
<b>2001</b>	4136	2350	2959	2878	2751	1841	7077	3026

Table 5a: Combined catch length frequencies for Gough island.

Category	<b>AAA</b>	<b>AA</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>J</b>	<b>M</b>	<b>KZ</b>	<b>K</b>
Ave CL (mm)	<b>162</b>	<b>147</b>	<b>138</b>	<b>134</b>	<b>126</b>	<b>113</b>	<b>104</b>	<b>97</b>	<b>91</b>	<b>87</b>	<b>81</b>	<b>73</b>	<b>66</b>
2010	0.00	0.42	0.92	1.15	9.14	9.49	5.83	7.82	11.65	23.60	21.57	8.38	0.03
2009	0.02	0.45	0.81	1.00	6.30	9.55	10.25	7.03	7.98	20.06	24.70	11.85	0.00
2008	0.04	0.35	0.65	0.83	8.13	14.10	10.84	10.81	8.54	19.49	18.55	7.67	0.02
2007	0.08	0.53	0.85	0.88	9.14	16.17	8.67	4.62	8.30	20.10	20.98	9.68	0.00
2006	0.08	0.33	0.51	0.60	6.38	12.60	6.92	7.68	11.30	22.21	22.17	9.22	0.00
2005	0.02	0.20	0.22	0.24	3.86	9.20	6.75	4.55	12.40	24.70	25.03	12.79	0.02
2004	0.33	0.51	0.46	0.48	4.11	9.52	9.61	13.06	9.08	13.43	25.99	13.37	0.04
2003	0.03	0.37	0.24	0.37	5.11	10.70	9.83	11.73	10.35	14.70	20.76	14.88	0.93
2002	0.21	0.47	0.38	0.48	3.80	8.88	8.48	8.88	9.88	19.39	21.85	16.12	1.18
2001	0.16	0.48	0.44	0.58	3.61	9.82	10.73	10.68	10.80	15.52	20.95	14.52	1.71

Table 5b: Combined catch length frequencies for Inaccessible island.

Category	<b>AAA</b>	<b>AA</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>J</b>	<b>M</b>	<b>KZ</b>	<b>K</b>
Ave CL (mm)	<b>162</b>	<b>147</b>	<b>138</b>	<b>134</b>	<b>126</b>	<b>113</b>	<b>104</b>	<b>97</b>	<b>91</b>	<b>87</b>	<b>81</b>	<b>73</b>	<b>66</b>
2010	0.00	0.09	0.11	0.09	0.78	1.76	1.69	2.51	3.98	8.39	15.84	40.31	24.45
2009	0.07	0.12	0.07	0.16	1.36	2.81	2.79	2.98	3.36	9.70	15.78	36.14	24.67
2008	0.06	0.20	0.17	0.18	1.58	3.59	3.27	4.50	3.65	7.97	16.24	33.56	25.03
2007	0.03	0.20	0.15	0.18	1.69	5.20	4.29	4.88	5.74	14.16	20.49	29.86	13.14
2006	0.02	0.14	0.19	0.23	1.64	4.82	3.98	4.88	6.50	15.68	21.41	28.10	12.41
2005	0.09	0.32	0.27	0.25	1.73	3.56	3.51	4.05	4.16	12.96	23.12	35.12	10.86
2004	0.34	0.69	0.48	0.37	2.49	4.42	4.40	6.65	6.16	8.39	19.68	32.21	13.71
2003	0.57	2.25	1.64	1.02	5.04	7.84	6.23	6.92	6.31	10.17	17.08	25.57	9.36
2002	0.04	0.27	0.43	0.43	3.78	7.25	4.99	6.75	5.95	10.78	18.78	34.41	6.15
2001	0.00	0.16	0.25	0.49	2.45	6.57	5.76	5.19	7.31	12.00	19.80	34.16	5.87

Table 5c: Combined catch length frequencies for Nightingale island.

Category	<b>AAA</b>	<b>AA</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>J</b>	<b>M</b>	<b>KZ</b>	<b>K</b>
Ave CL (mm)	<b>162</b>	<b>147</b>	<b>138</b>	<b>134</b>	<b>126</b>	<b>113</b>	<b>104</b>	<b>97</b>	<b>91</b>	<b>87</b>	<b>81</b>	<b>73</b>	<b>66</b>
2010	0.00	0.04	0.07	0.09	1.08	2.43	2.00	3.31	6.54	15.95	28.62	35.80	4.06
2009	0.00	0.02	0.11	0.15	1.69	3.51	4.65	4.05	5.66	15.84	26.68	34.32	3.33
2008	0.00	0.05	0.14	0.22	2.56	6.85	6.13	7.36	6.61	13.30	26.06	27.42	3.30
2007	0.00	0.08	0.23	0.36	4.92	12.83	9.63	8.16	8.07	16.40	18.26	18.21	2.86
2006	0.02	0.07	0.17	0.35	4.11	10.71	5.67	8.14	10.79	18.75	19.63	19.74	1.85
2005	0.00	0.19	0.26	0.28	3.05	7.09	7.58	6.64	9.01	19.59	22.17	22.62	1.51
2004	0.02	0.12	0.12	0.21	2.36	4.97	4.82	7.74	7.37	9.21	21.98	36.13	4.95
2003	0.02	0.25	0.25	0.27	4.32	7.78	6.46	8.96	9.49	12.48	20.72	26.52	2.50
2002	0.00	0.02	0.07	0.13	1.24	3.96	4.24	5.57	5.46	11.34	26.17	38.27	3.52
2001	0.02	0.09	0.11	0.20	1.97	5.88	7.64	9.54	9.30	12.66	20.81	27.68	4.11

Table 5d: Combined catch length frequencies for Tristan island.

Category	<b>AAA</b>	<b>AA</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>	<b>F</b>	<b>G</b>	<b>H</b>	<b>J</b>	<b>M</b>	<b>KZ</b>	<b>K</b>
Ave CL (mm)	<b>162</b>	<b>147</b>	<b>138</b>	<b>134</b>	<b>126</b>	<b>113</b>	<b>104</b>	<b>97</b>	<b>91</b>	<b>87</b>	<b>81</b>	<b>73</b>	<b>66</b>
2010	0.00	0.00	0.00	0.00	0.02	0.74	6.28	10.13	11.47	18.29	28.26	23.03	1.79
2009	0.00	0.00	0.00	0.00	0.04	2.65	11.72	12.60	12.46	18.77	21.82	18.60	1.35
2008	0.00	0.00	0.00	0.00	0.08	4.21	10.76	13.37	10.29	18.79	20.39	19.97	2.15
2007	0.00	0.00	0.00	0.00	0.03	3.17	12.73	15.92	16.63	20.27	17.80	12.34	1.10
2006	0.00	0.00	0.00	0.00	0.06	4.28	11.11	17.63	14.55	18.39	18.79	13.45	1.74
2005	0.00	0.00	0.00	0.00	0.09	4.45	10.32	15.22	13.00	17.25	21.97	16.02	1.69
2004	0.00	0.00	0.00	0.00	0.11	5.09	12.11	15.80	12.42	13.16	23.97	15.81	1.53
2003	0.00	0.00	0.00	0.00	0.16	6.03	14.18	18.79	13.84	11.85	18.82	15.16	1.17
2002	0.00	0.00	0.00	0.00	0.11	4.03	10.79	14.39	11.02	15.27	21.63	21.06	1.71
2001	0.00	0.00	0.00	0.00	0.09	4.55	11.89	16.83	12.17	13.03	19.78	19.46	2.21



Figure 1a: Catch length frequencies for tail, whole and combined product for Gough island for 2001-2010.

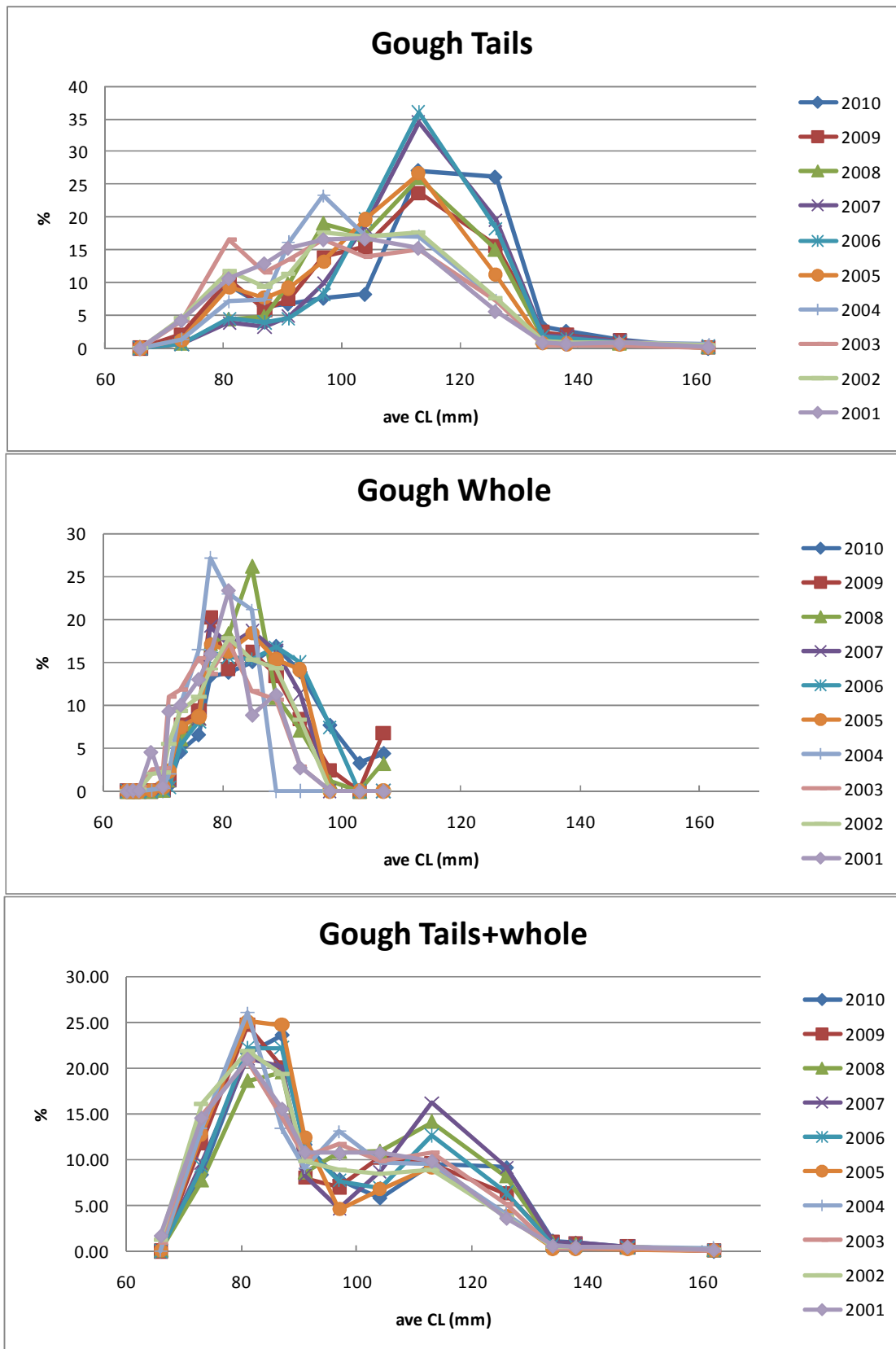


Figure 1b: Catch length frequencies for tail, whole and combined product for Inaccessible island for 2001-2010.

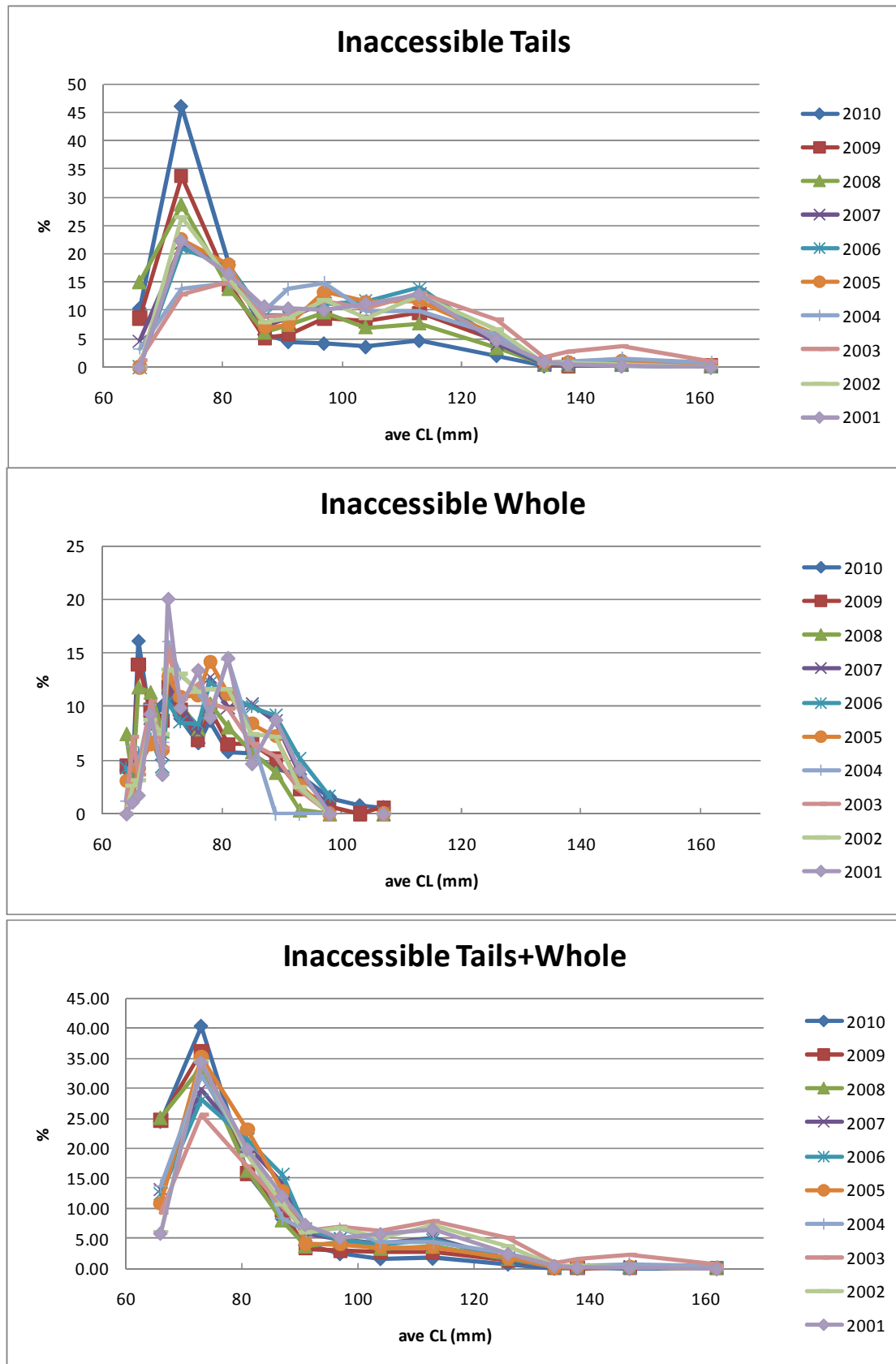


Figure 1c: Catch length frequencies for tail, whole and combined product for Nightingale island for 2001-2010.

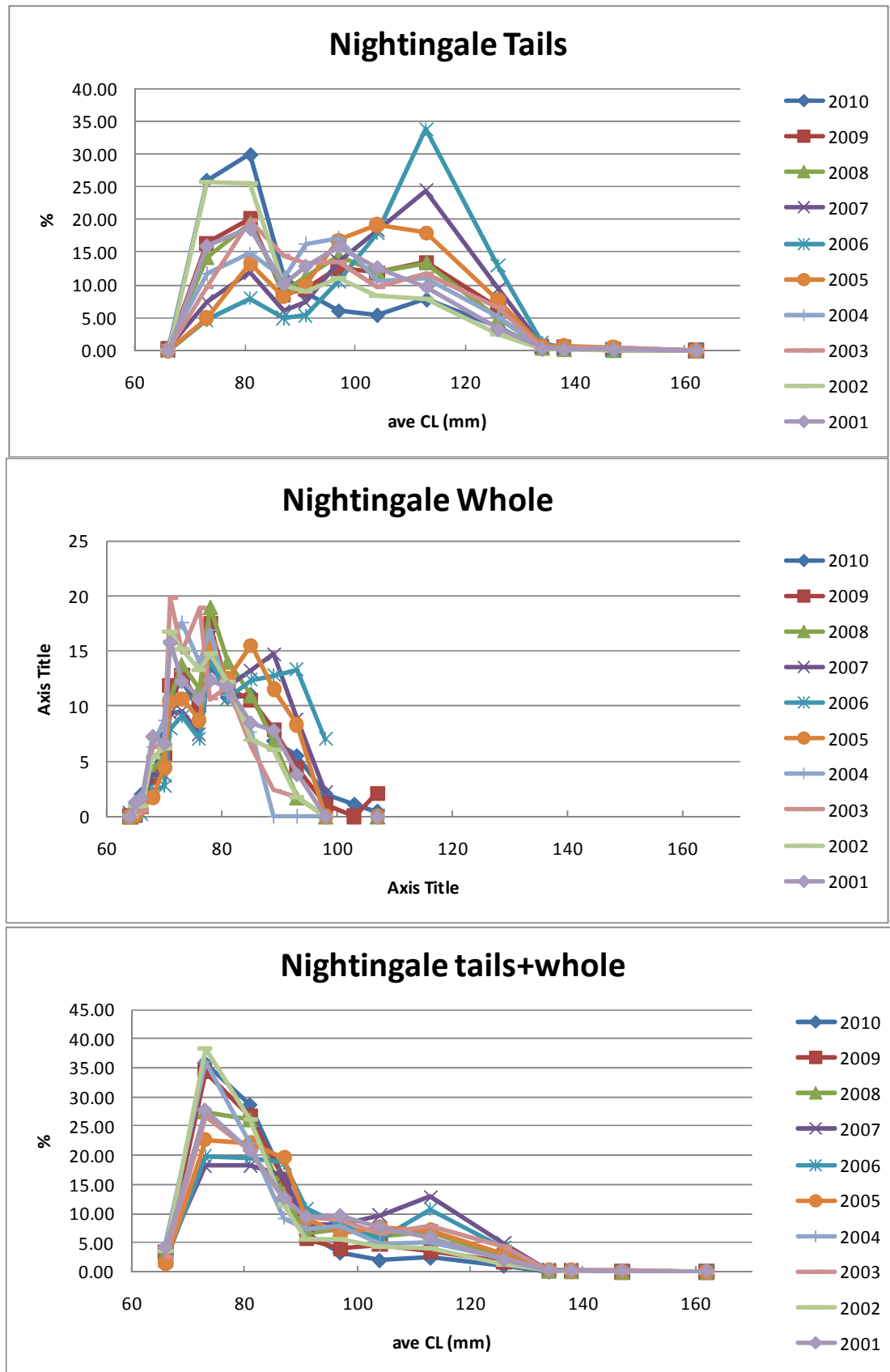


Figure 1d: Catch length frequencies for tail, whole and combined product for Tristan island for 2001-2010.

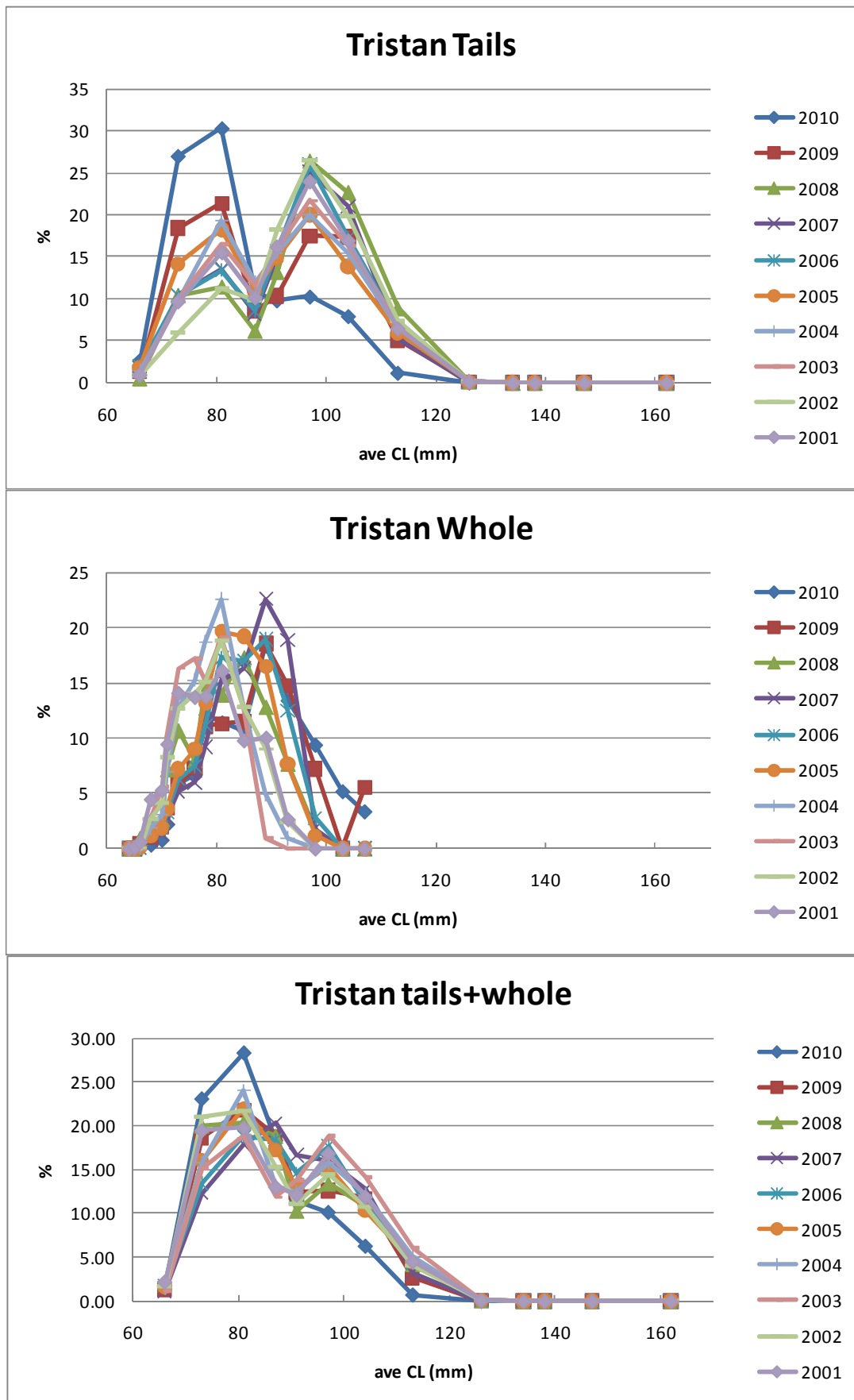


Figure 2a: Catch length frequencies for tail, whole and combined product for Gough island for 2007-2010.

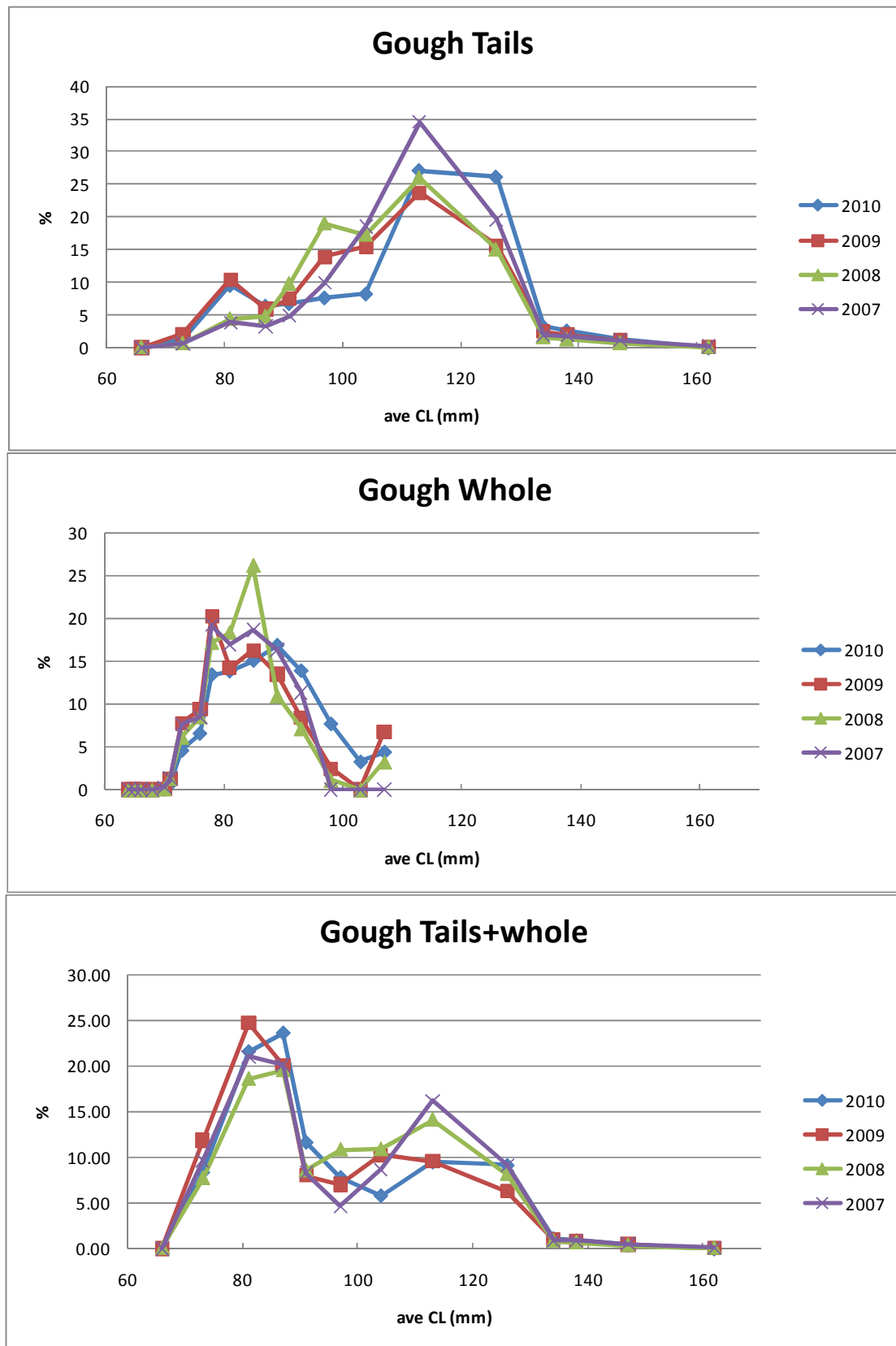


Figure 2b: Catch length frequencies for tail, whole and combined product for Inaccessible island for 2007-2010.

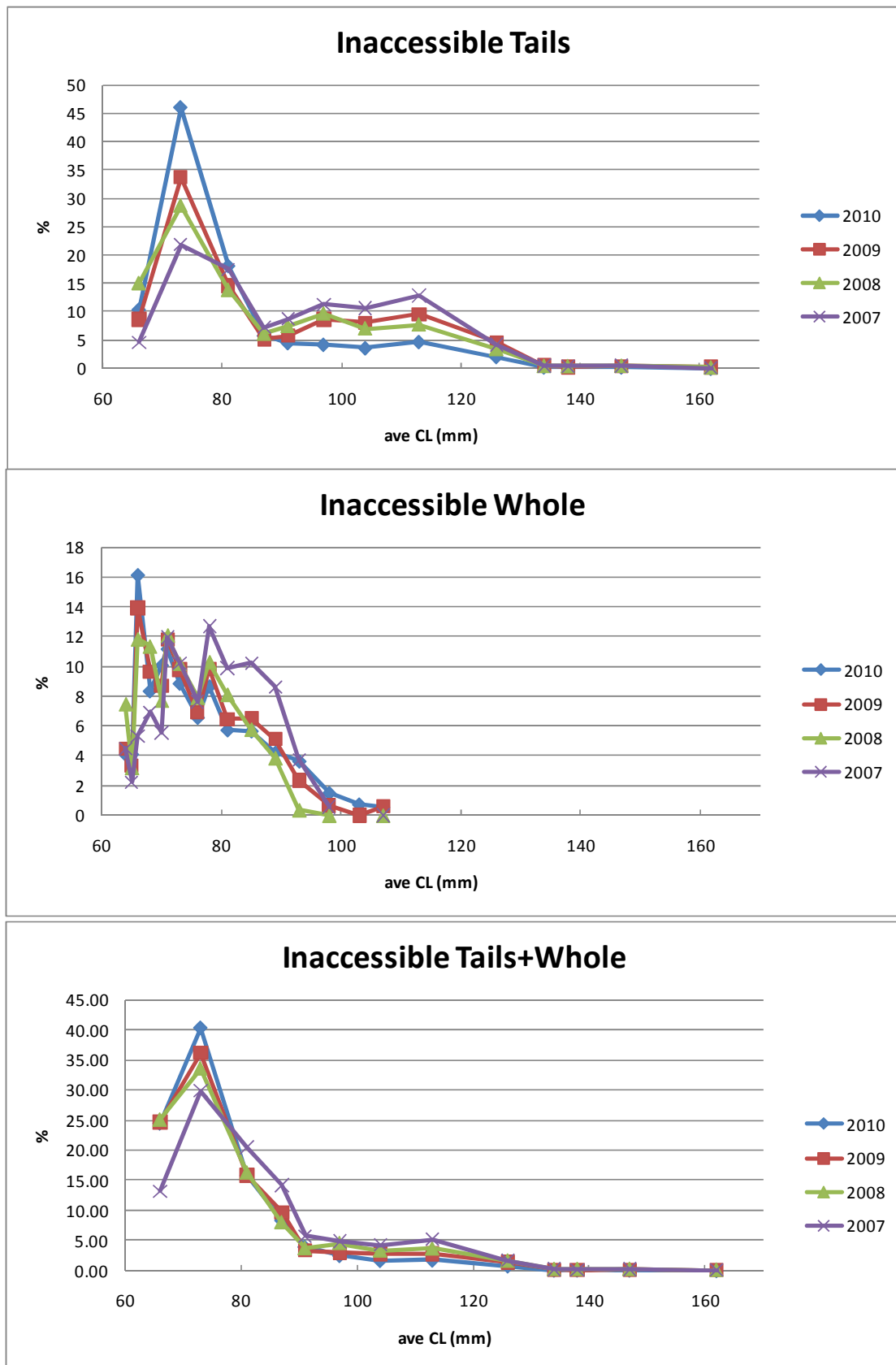


Figure 2c: Catch length frequencies for tail, whole and combined product for Nightingale island for 2007-2010.

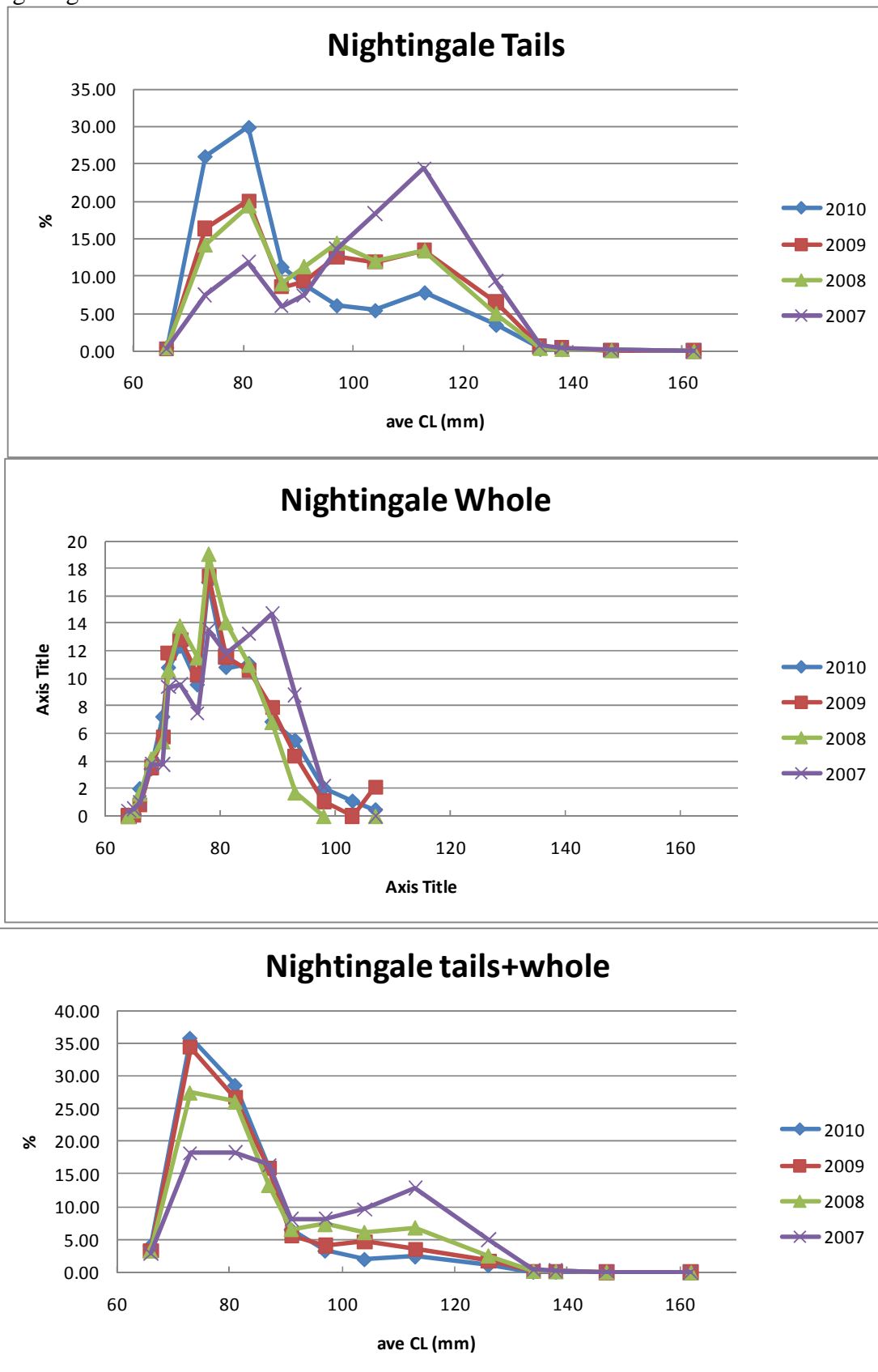


Figure 2d: Catch length frequencies for tail, whole and combined product for Tristan island for 2007-2010.

