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HUMBER ESTUARY SPA WATERBIRD POPULATIONS: TREND ANALYSES BY COUNT SECTOR

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EXECUTIVE SUMMARY

1. The Humber Estuary is a site of national and international importance for its wader and wildfowl populations, supporting c. 154,000 waterbirds during the winter and passage periods. It has been designated as a Special Protection Area (The Humber Estuary SPA) for 23 species of waterbird.

2. The Wetland Bird Survey (WeBS) is a long-running survey that records the number of all waterbird species on 40 different geographical count units (sectors) of the Humber Estuary (as well as many other sites nationally) at monthly intervals. These data can be used to assess population trends in different parts of the estuary.

3. This study aimed to assess population trends of waterbird species in different parts of the estuary, in order to identify areas where species were declining contrary to, or in excess of, the trend for the estuary as a whole and, furthermore, to identify sectors that support an increasing proportion of species that are declining across the estuary as a whole.

4. Smoothed population trends were generated for the 15-year period from 1991-92 to 2006-07, for each of the 23 waterbird species specified by Natural England, on each count sector for which there were sufficient data. In addition, for each species the importance of each sector in relation to the whole estuary population, over time, was assessed by investigating whether the proportion of the entire estuary population supported by each sector had increased or decreased significantly.

5. Populations of most wader species, and Shelduck, had declined across a wide geographical area on the middle and outer (eastern) parts of the southern shore of the estuary from Pyewipe (just west of Grimsby) to the eastern end of the estuary. The only count sector in this area where most species had increased rather than declined was Grainthorpe Haven Pye's Hall to Horseshoe Point (sector 35485), but increases here did not compensate for the declines on all other sectors in this part of the estuary. There were also declines in a range of species on the two easternmost sectors of the northern shore of the estuary opposite this area.

6. Populations of three dabbling duck species (Mallard, Wigeon and Teal) had declined on the upper part of the estuary between Blacktoft Sands and Winteringham Haven, on both the northern and southern shores of the estuary.

7. Other areas where a large number of species are declining include South Ferriby (sector 38417) and Brough Haven to North Ferriby (38433), which are opposite each other on the southern and northern shores of the estuary.

8. On the Humber as a whole, numbers of Mallard, Oystercatcher and Dunlin had declined during the 15 years covered by this report, and the numbers of Pink-footed Geese, Brent Geese, Gadwall, Shoveler, Tufted Duck, Golden Plover, Black-tailed Godwit, Bar-tailed Godwit and Curlew had increased. Many of these changes were in line with regional trends, but Golden Plover had not increased as much on the Humber as elsewhere in the region.

1. INTRODUCTION

1.1 Background

The Humber Estuary is the largest British macro-tidal coastal plain estuary on the North Sea, and is one of the finest examples of an estuary of its type. The Humber Estuary is also a site of national and international importance for its wader and wildfowl populations, in addition to a range of other habitats and species. It is one of the top six sites in the UK for its waterbird population, currently supporting c154,000 waterbirds during winter and passage periods. This total includes nationally important numbers of 22 species in winter and of nine species during passage. As a result, it enjoys the highest levels of legal protection currently possible in this country and is designated as a Site of Special Scientific Interest, Special Protection Area, candidate Special Area of Conservation and Ramsar site. The Humber Estuary SPA is thus designated for its internationally important populations of 23 species of waterbird. However, there is concern that some of these species have declined in numbers across the SPA over recent years.

Under the Wildlife and Countryside Act 1981 (as amended by CroW 2000) Natural England (NE) must consider notices for operations on the Humber Estuary SSSI, such as wildfowling, and determine whether to consent or refuse these proposals, or to impose conditions on the way they are carried out. Under the auspices of the Conservation (Natural Habitats &c.) Regulations 1994, Natural England also undertakes and advises on appropriate assessments concerning the effects of plans and projects on the estuary as a European site (SPA, cSAC and Ramsar site). One of the major considerations in consenting activities and undertaking/advising on appropriate assessments is the likely impact of the proposed activity or development on SPA birds.

To this end, an analysis of information on trends across the entire site and how these relate to regional and country-wide population trends informs as to which waterbird species give particular cause for concern across the Humber as a whole. This information can be obtained from the WeBS-Alerts report (Maclean and Austin 2008). To help Natural England understand how waterbirds may be redistributing within the site and identify areas where there has been a net loss or gain relative to numbers across the whole site, WeBS data are used here to calculate and compare species trends for the SPA and component units. This will in turn contribute towards gaining a better understanding of fluctuations in bird numbers on the estuary both temporally and spatially and thus inform the assessment the potential impacts of activities and developments on SPA populations. Natural England has specified 23 species of concern, comprised of those for which The Wetland Bird Survey (WeBS) has issued a site alert, target species (quarry or wader-ringing), any Annex 1 or species for which the Humber Estuary SPA is designated, and any species occurring in numbers in excess of 1% of the total Humber waterbird assemblage (i.e. ≥1539 individuals).

1.2 Objectives

Thus the objectives of this report are to gain an estuary-wide understanding of fluctuations in numbers of certain waterbird species to inform the consenting of operations and appropriate assessments of plans and projects on the Humber Estuary by:

- identifying the abundance trends over the last 15 years in each of the WeBS count sectors of the Humber Estuary for 23 waterbird species and comparing these trends to the estuary as a whole.

- identifying those WeBS sectors in which substantial numbers of species are declining contrary to, or more rapidly than on the estuary as a whole.

- identifying those sectors that support a substantial proportion of species that are declining on the estuary as a whole.

The species to be analysed are:

Pink-footed goose	Shelduck	Oystercatcher
Dark-bellied brent goose	Wigeon	Ringed plover
	Gadwall	Golden plover
	Teal	Grey plover
	Mallard	Lapwing
	Pintail	Knot
	Shoveler	Dunlin
	Pochard	Black-tailed godwit
	Tufted duck	Bar-tailed godwit
	Goldeneye	Curlew
		Redshank

2. METHODS

2.1 Waterbird Data

WeBS is a long-running survey that monitors waterbird numbers on sites throughout the UK by monthly site visits when numbers of all waterbird species are recorded (Musgrove *et al.* 2007). On large sites, such as the Humber Estuary, where it is not feasible, or indeed desirable, to make a single count for the entire site, synchronous counts of smaller count sectors are undertaken. These sector counts are routinely summed to give the overall site total and during this process the completeness of the overall count assessed. This is necessary because all sectors are not necessarily counted on all occasions. This is undertaken in a species specific manner because the absence of data from a given section would not be expected to affect the overall total equally for all species. Furthermore, completeness is assessed on a month by month, year by year basis using algorithms that allow for both seasonal and long-term trends in site usage. Thus a consolidated count for a site composed of multiple sectors is considered complete when those sectors counted on the month in question would be expected to hold at least 75% of the site total for the species in question for the season and year in question. Whilst the division of large sites into sectors has evolved principally in response to the practicality of undertaking counts, the divisions between sectors typically follow distinctive features of the environment. Thus an analysis of waterbird trends on the individual sectors can inform in a biologically meaningful manner.

There are forty constituent and extant sectors of the Humber (Figure 2.1.i). This hierarchical structure of the overall site (Figure 2.1.ii) has evolved through time as existing sectors have been subdivided. Where this subdivision has occurred in recent years, it is necessary to recombine the counts into the older division in order to generate long-term trends. The coincidence of the WeBS count sectors in relation to the boundary of the Humber Estuary SPA are given in Appendix A.

Figure 2.1.i Locations of each count sector on the Humber Estuary. Four groupings of sectors are shown as follows: "Humber Estuary (North)" is shown in dark pink; "Humber South (Inner)" in light pink; "Humber South (Mid)" in lilac; and "Humber South (Outer)" in pale yellow.

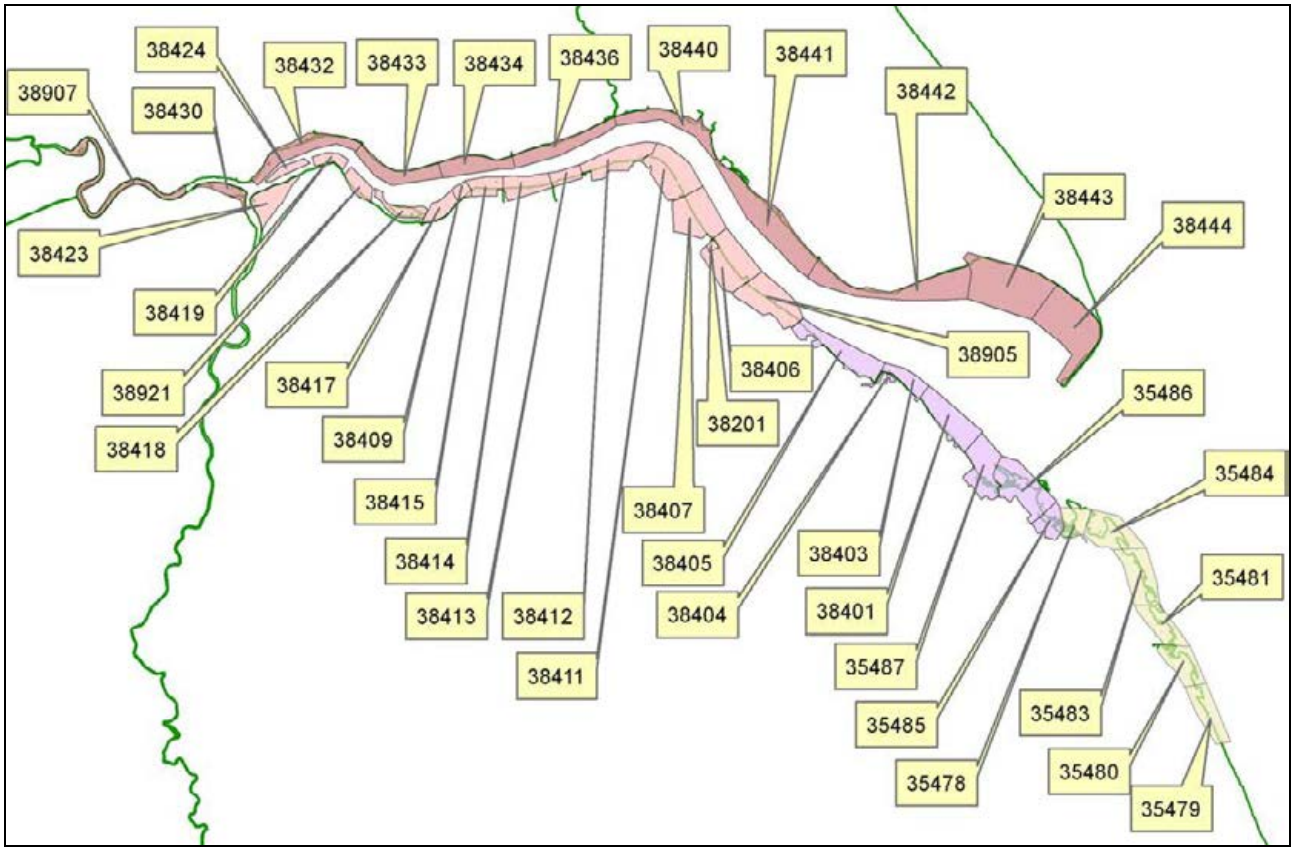
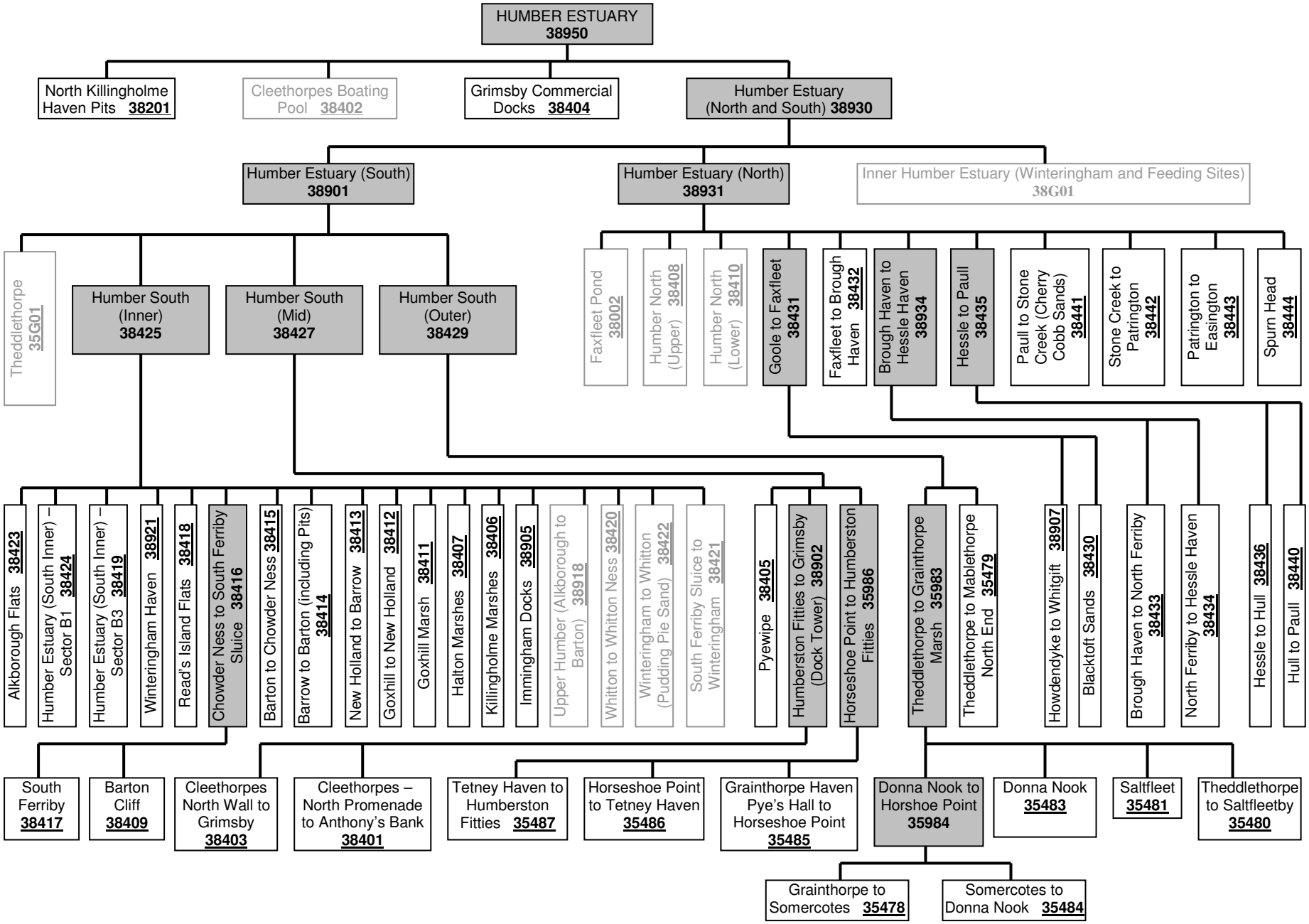


Figure 2.1.ii Structural hierarchy of count sectors on the Humber Estuary. Grey filled boxes identify 'complex sectors' i.e. those that are sub-divided for counting purposes and toned-down information within a box identifies sectors for which data for at least the most recent five winters are unavailable.



2.2 Smoothed Waterbird Trends and Percentage Change

The methodology used to produce smoothed site, regional and national trends as reported by WeBS Alerts (Maclean and Austin 2008) can be usefully extended to generate trends on smaller areas of interest such as WeBS count sectors or appropriately grouped count sectors. It is, however, important to recognise that the numbers of birds underlying the observed trend on sectors are generally much lower than those underlying site trends reported by WeBS Alerts which are, by definition, are at least equal to the national qualifying threshold. Consequently, individual trends should not be 'over-interpreted'. For example, a 50% decline from 30 birds to 15 birds would give much less cause for concern than a 50% decline from 1000 to 500 birds the latter being much more likely to reflect a real and substantial loss of birds from an area than the former. While bearing this in mind, a consistent pattern of decline across multiple species, even when the numbers involved for some of them are comparatively low, is strongly indicative of adverse factors affecting the sector in question and the particular suite of species showing a decline in numbers can guide us in where to look for problems (e.g. does the suite of species represent those known to be particularly sensitive to disturbance or those with similar ecological requirements).

Thus, using the latest available validated WeBS data (to winter 2006/07 inclusive), following Atkinson *et al*. (2000, 2006), smoothed indices (trends) were calculated using Generalized Additive Models (GAMs) for the relevant species. The smoothing is to ensure that year-specific factors, such as poor conditions on the breeding grounds or particularly harsh weather on the wintering grounds, that are not related to changes in the quality of the Humber itself, do not contribute overly to the trend. Percentage change has been calculated for short- (5yr) medium- (10yr) and long-term (15yr). WeBS does not have the necessary data collated at the sector level to support analysis of longer time-series. By way of analogy with the WeBS Alerts system, declines of at least 25% a but below 50% are flagged as medium-declines, and declines of 50% or greater are flagged as high-declines (we specifically do not use the terms medium- and high-Alerts because unlike the percentage change reported by WeBS Alerts, medium and high declines reported at the sector level do not constitute a formal WeBS Alert). The corresponding percentage change required to balance the numbers to their former level following a decline or increase are likewise termed medium- (at least 33% but below 100%) and high- (100% or greater) increases.

2.3 Placing The Smoothed Waterbird Indices Into Context

Once the smoothed sector indices have been produced the observed trends are placed in context of the site trends. The latest WeBS methodology (Banks & Austin 2004) as used to compare site trends with regional and national trends (Maclean and Austin 2008) is extended here to compare counts sector trends with site trends. If waterbird numbers of a given species on a given count sector follow those of the species across the site as a whole then the proportion contribution of numbers on the site would remain constant. Any significant deviation from this gradient of zero would indicate that the waterbird populations on the relevant count sector are doing either better or less well than would be expected from the site trend. Consequently:

- where a decline on a sector reflects a decline across the site as a whole it is unlikely that the observed site trends is being driven by factors affecting that sector. If this is true of the majority of sectors, then this may indicate that the observed site decline in the species in question is due to factors external to the site and are thus not due to site management issues *per se*;

- where a decline on a sector is more substantial than that across the site as a whole, this may suggest that factors affecting that sector could be contributing to the overall decline;

- where a decline on a sector is less than the decline across the site as a whole, this suggests that relatively favourable conditions on that sector are helping buffer site declines;

- where an increase on a sector is less than that across the site as a whole, this suggests that the sector is already at carrying capacity for the species in question or, if historically it supported greater numbers, that the quality of the sector to that species has diminished;

- where an increase on a sector is greater than that across the whole site, this suggests that trends on that sector are driving the increase across the site or that the sector in question is relatively attractive compared to the site as a whole when increased numbers arrive at the site due to external factors.

The comparisons between sectors and site are derived from a logistic regression model with a binomial error term. The resulting plots depict the percentage contribution of the sector to the site as a whole and the associated confidence limits represent both variation in this proportion between months in a given year and the underlying sample size (e.g. we would be more confident of our estimate that a sector contributed 10% of the site total if 100 birds out of 1000 on the site were counted there than we would be if this was 10 out of 100). This is based on the winter period as routinely used for all WeBS reporting (Nov-Mar for waders and Sep-Mar for other species). Only data from months where counts consolidated across the site as a whole had been assessed as complete were available were used - following standard WeBS protocol described above.

Having considered the trends on the sectors, each in the context of trends across the site as a whole, it is worth considering the site trends in the context of the region – here the East of England (comprised of Environment Agency Anglian and North East England Regions following standard WeBS Alerts reporting), as this can modify our interpretation of the pattern of change across all sectors. This is especially important where there has been a increase or decline regionally. Consequently:

- where there has been an apparent re-distribution of a species within the Humber (i.e. declines on some sectors appear to be balanced by increases on other sectors), but the proportional contribution of the Humber to increasing regional numbers is declining, then this implies that those sectors on the Humber with static or declining numbers are actually of concern because we would expect them to be increasing in parallel with the other sectors. Thus, in such cases, the apparent redistribution within the Humber is misleading and the species in question may be facing problems on those sectors not supporting an increase in numbers;

- where a species is in regional decline we would expect declines on at least some of the sectors of the Humber regardless of whether birds are being affected by adverse factors locally. Thus, we would expect those sectors of least suitable habitat to a given species to be the first to show a decline in numbers.

3. RESULTS

3.1 Sector Plots

The trends of each species on each sector are given in Appendix B, together with plots comparing the count sector trends with the site trends putting the former into the context of trends on the Humber estuary as a whole. Plots are grouped by sector and species presented in taxonomic order. This information is summarised below (Tables 3.1.i and 3.1.ii) and the underlying values representing percentage change and proportional contributions to the Humber Estuary SPA are available from Appendix D. Colour coding is used to represent declines or increases; species are listed in taxonomic order and sectors have been listed in geographical order. Caution is advisable in interpreting individual cells in these tables as, for example, a 50% decline (shown in red) could represent a decline from 10,000 to 5,000 birds or could be a decline from 20 to 10, and therefore the plots in the appendix should also be referred to. However, consistency between adjacent cells would suggest that either a group of species or a group of adjacent sectors have similar trends. Where this is the case, this may suggest that the trends represent real ecological changes.

This information is also presented in map format, which better facilitates a geographic interpretation of the trends (Figures 3.1.i & 3.1.ii).

The importance of individual sectors for given species can be determined by considering the five-year mean of peak counts (Table 3.1.iii).

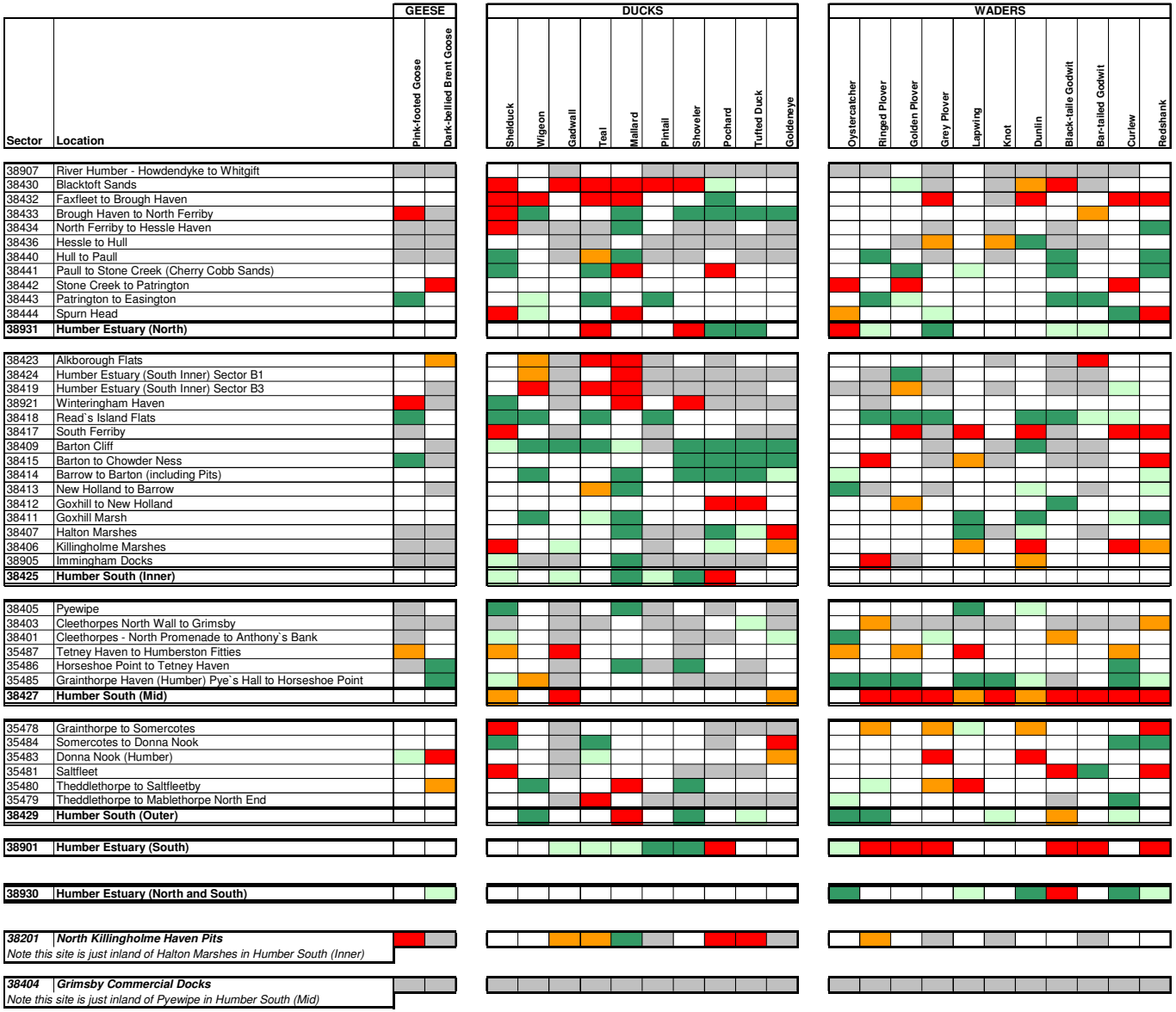
Population trends have also been produced for each species across the Humber Estuary as a whole, along with plots showing changes in the proportion of the east of England regional population that is supported on the Humber Estuary, which put the Humber population trends into a regional context (Appendix C).

Table 3.1.i Overview of population trends of each species by sector assessed over three timescales: short- (5-year), medium- (10-year) and long-term (15-year). For complete details refer to Appendix D, Table D.i. For each sector, declines are given precedence over increases as the former are of primary concern. Cells are coloured to indicate trend status as follows: Red - a maximum decline in numbers of at least 50% over at least one timescale; Orange - a maximum decline in numbers of at least 25% but less than 50% over at least one timescale; Light green – a maximum increased of at least 33% but less than 100% over at least one timescale; Dark green - a maximum increase of at least 100% on at least one timescale; White - a maximum decline less than 25% and a maximum increase less than 33% on all three timescales. Grey - insufficient data for or too few individuals (arbitrarily taken as an average of ten or less) of, a given species to allow meaningful smoothed trends to be generated. S/s (short), M/m (medium) and L/l (long) are used to indicate the timeframe associated with any declines: upper case for high declines, lower case for medium declines

		GEESE		DUCKS									WADERS										
Sector	Location	Pink-footed Goose	Dark-bellied Brent Goose	Shelduck	Wigeon	Gadwall	Teal	Mallard	Pintail	Shoveler	Pochard	Tufted Duck	Goldeneye	Oystercatcher	Ringed Plover	Golden Plover	Grey Plover	Lapwing	Knot	Dunlin	Black-tailed Godwit	Bar-tailed Godwit	Curlew	Redshank
38907	River Humber - Howdendyke to Whitgift							l										m						
38430	Blacktoft Sands			mL			s	mL		S										SML				
38432	Faxfleet to Brough Haven	SML		smL	ml		l	sML								m		m		sML			ml	sML
38433	Brough Haven to North Ferriby						s									sml		smL		SmL				SmL
38434	North Ferriby to Hessle Haven																	SML						
38436	Hessle to Hull							SmL																s
38440	Hull to Paull							S								M		ML						
38441	Paull to Stone Creek (Cherry Cobb Sands)							mL	SML					smL										
38442	Stone Creek to Patrington													ML		m	l	SML	sML	ml		SMl	s	
38443	Patrington to Easington							l						ml										
38444	Spurn Head			M	sm			m						sML	SML	S		sml		sML		s	s	sMl
38931	**Humber Estuary (North)**							l						mL				l						
38423	Alkborough Flats				sML		s l	ML								s								
38424	Humber Estuary (South Inner) Sector B1				l			SML																
38419	Humber Estuary (South Inner) Sector B3			l	sMl		SML	sML								M		SML		SML				
38921	Winteringham Haven	SML			sML		S l	SML										MI					s	
38418	Read`s Island Flats																							
38417	South Ferriby			sML	MI			ml								SML		SML		SML			sML	SML
38409	Barton Cliff																							
38415	Barton to Chowder Ness							l												SML				sML
38414	Barrow to Barton (including Pits)															SML		m						
38413	New Holland to Barrow																	SML						
38412	Goxhill to New Holland				s			l			M	m	s			SMl		sML					s	
38411	Goxhill Marsh																							
38407	Halton Marshes															S L		s						
38406	Killingholme Marshes																	SML		SML			ML	ML
38905	Immingham Docks																			SML				s
38425	**Humber South (Inner)**				M						M		s	sM	SML					m			s	
38405	Pyewipe													mL	S l				L	s				
38403	Cleethorpes North Wall to Grimsby																							
38401	Cleethorpes - North Promenade to Anthony`s Bank							l						l	SML			m						
35487	Tetney Haven to Humberston Fitties			l	l									mL			sml	MI	l	ml		S		
35486	Horseshoe Point to Tetney Haven			l	L									l		M	l	sML	ml	l				
35485	Grainthorpe Haven Pye`s Hall to Horseshoe Point																							
38427	**Humber South (Mid)**			SML	L			SML						L	SML	SML	SML	SML	SML	SML		SML	SML	SML
35478	Grainthorpe to Somercotes		sML	smL	ml									S L			SML		s L	SML		SmL	s	ml
35484	Somercotes to Donna Nook							l						smL			SML			s l		sML		
35483	Donna Nook		sML	L	ML									SML		SML	SML	ML	SML	SML				SmL
35481	Saltfleet			smL										L			l	MI	s l	smL			s	sML
35480	Theddlethorpe to Saltfleetby		SmL	smL				sML						s L		ML	SML	MI	SML	SML		SMl		s l
35479	Theddlethorpe to Mablethorpe North End	SML														ML		ML	SML	SML				S l
38429	**Humber South (Outer)**			l				ml						s	Sm		SML	m		SmL		s		s l
38901	**Humber Estuary (South)**			s l	m						M		s	l	SML		SML	m	SmL	SML	SM	SML	s	sml
38930	**Humber Estuary (North and South)**							l	l		M		s	l	SML			m		sm	s	s		
38201	***North Killingholme Haven Pits***						S											ml						
	Note this site is just inland of Halton Marshes in Humber South (Inner)																							
38404	***Grimsby Commercial Docks***																							
	Note this site is just inland of Pyewipe in Humber South (Mid)																							

The two sites in italics are separate from the Humber Estuary (North and South) subsite (38930) and therefore not part of the Humber Estuary (South) grouping, but are part of the whole Humber Estuary WeBS Site (38950)

Table 3.1.ii Changes in the proportion of the total site population of each species supported by each sector, assessed over the most recent 15-year period. Cells are coloured to indicate a sector's proportional contribution to numbers on the Humber estuary as a whole, as follows: Red - a highly significant decline ($P < 0.01$); Orange - a significant decline ($P < 0.05$); Light green – a significant increase ($P < 0.05$); Dark green - a highly significant increase ($P < 0.01$); White – no significant trend over the period. Grey - insufficient data for or too few individuals (arbitrarily taken as an average of ten or less) of, a given species to allow a meaningful Logit model to be fitted. Underlying values are available from Appendix D, Table D.ii



The two sites in italics are separate from the Humber Estuary (North and South) subsite (38930) and therefore not part of the Humber Estuary (South) grouping, but are part of the whole HUMBER ESTUARY site (3

Table 3.1.iii Peak counts by species and count sector for the Humber Estuary shown as the mean of peak counts over the most recent available five winters (first number) and the peak count in the latest winter (second number). Colours show sites that hold a substantial proportion of the Humber population arbitrarily defined and in order of priority as follows: Dark Green – sectors with a mean of peak counts over the last five winters that is at least 20% of the total mean of peak counts for the estuary over the same period; Dark Blue – Sites with a mean of peak count over the last five winters that is between 10% and 20% of the total mean of peak count for the estuary over the same period; Light Green – Sites with a peak count in the latest year that is at least 20% of the total peak count for the estuary in the latest year; Light Blue – Sites with a peak count in the latest year that is between 10% and 20% of the total peak count for the estuary in the latest year.

		GEESE		DUCKS										WADERS											
Sector	Location	Pink-footed Goose	Dark-bellied Brent Goose	Shelduck	Wigeon	Gadwall	Teal	Mallard	Pintail	Shoveler	Pochard	Tufted Duck	Goldeneye	Oystercatcher	Ringed Plover	Golden Plover	Grey Plover	Lapwing	Knot	Dunlin	Black-tailed Godwit	Bar-tailed Godwit	Curlew	Redshank
38907	River Humber - Howdendyke to Whitgift			0;	31;		12;	86;						0;		367;	5;	188;					0;	35;
38430	Blacktoft Sands	413; 1500	0; 0	59; 64	622; 480	24; 26	460; 608	136; 135	1; 0	46; 46	22; 16	1; 0	1; 2	1; 0	0; 0	5208; 18000	0; 0	2543; 7500	0; 0	53; 20	10; 7	0; 0	24; 41	29; 41
38432	Faxfleet to Brough Haven	16; 0	0; 0	472; 378	2018; 837	12; 46	434; 143	172; 82	1; 0	8; 6	9; 16	8; 4	0; 0	1; 0	7; 5	5564; 4431	0; 0	5111; 4132	0; 0	515; 483	3; 2	21; 70	194; 213	67; 61
38433	Brough Haven to North Ferriby	0; 0	0; 0	44; (8)	108; (19)	; (92)	94; (38)	; (143)	2; (0)	; (14)	142; (29)	70; (40)	10; (17)	; (3)	13; (15)	749; (0)	0; 0	882; (131)	0; 0	159; (19)	5; (10)	2; (0)	66; (98)	114; (22)
38434	North Ferriby to Hessle Haven			0; 0	0; 0		0; 0	46; 35	0; 0		0; 0	1; 1	0; 0	0; 1	4; 15	0; 0	0; 0	11; 1		30; 1		0; 0	0; 1	50; 42
38436	Hessle to Hull			2; 0	0; 0			15; 6						0; 0	14; 0	0; 0	0; 0	155; 196	0; 0	607; 382		0; 0	2; 2	60; 11
38440	Hull to Paull		0; 0	169; 240	0; 0		471; 406	131; 140			0; 0			2; 4	146; 119	9553; 22559	0; 0	2869; 4120	2; 12	2151; 2213	103; 121	68; 235	294; 468	337; 345
38441	Paull to Stone Creek (Cherry Cobb Sands)	8; (14)	5; 1	1453; 1276	515; 674	8; 0	653; 621	834; (629)	7; 3	3; 2	0; 0	0; 0	0; 0	42; (27)	6; 0	21741; 14532	821; (1199)	6852; 2110	722; 704	4079; 2628	187; 54	646; (225)	879; 1310	1356; 1052
38442	Stone Creek to Patrington	97; 12	70; 220	672; (1220)	439; (295)	2; 2	61; (108)	333; 524	11; (44)	0; 0	0; 0	0; 0	1; 1	117; (109)	1; (1)	3552; 400	414; 1200	2176; (350)	1778; (1226)	1614; (2590)	97; 0	206; (34)	471; 247	304; 353
38443	Patrington to Easington	145; 0	65; 29	1223; 1750	54; 0	0; 0	15; 34	206; 228	90; 144	0; 0	0; 0	0; 0	0; 0	417; 773	4; 2	3247; 2545	301; 114	558; 340	8560; 14000	6800; 10000	25; 1	1248; 247	1291; 1000	624; 197
38444	Spurn Head	3; 6	421; 500	364; 436	101; 7	2; 0	58; 3	102; 79	2; 0	3; 0	3; 0	1; 0	5; 2	1158; 594	26; 39	1829; 950	297; 217	600; 377	15250; 25301	2014; 941	40; 6	274; 51	322; 328	807; 423
38931	**Humber Estuary (North)**	625; 1518	478; 636	3166; 4238	2689; 1640	106; (135)	1413; 1138	1491; 1043	119; 144	63; 52	169; (61)	75; (41)	17; (17)	1558; 1161	176; 148	37114; 39878	1323; 1787	16747; 11224	20005; 31252	13519; (13790)	428; 161	1925; 581	3004; 3175	3031; 2256
38423	Alkborough Flats	1; 0	0; 0	26; 69	39; 13	1; 7	34; 50	25; 62	0; 0	5; 18	0; 0	0; 0	0; 0	1; 0	0; 1	195; 860	0; 0	152; 589		37; 185	0; 0	0; 0	71; 70	6; 9
38424	Humber Estuary (South Inner) Sector B1	0; 0	0; 0	9; 12	183; 296	0; 0	12; 50	0; 0	0; 0	0; 0	0; 0			0; 0		439; 1500	0; 0	176; 668	0; 0	0; 0			54; 70	5; 10
38419	Humber Estuary (South Inner) Sector B3	17; 0		34; 0	671; 393		0; 0	6; 2					0; 0	0; 0	0; 0	51; 0	0; 0	66; 0		3; 0			33; 0	0; 0
38921	Winteringham Haven	1; 0		547; 228	28; 0		268; 0	65; 2	2; 0	0; 0				0;	0;	539;	0;	445;	1;	212;	0;	0;	115;	25;
38418	Read`s Island Flats	4594;	0;	599;	874;	4;	1728;	88;	18;	8;	0;	0;	0;	19;	41;	6250;	3;	3838;	2;	2032;	6;	33;	287;	153;
38417	South Ferriby		0;	15;	63;	1;	53;	29;		2;	0;			4;	0;	0;	0;	23;	0;	10;	0;	0;	24;	26;
38409	Barton Cliff	0; 0		10; 28	4; 12	8; 16	59; 65	42; 32	0; 0	13; 10	24; 23	35; 40	8; 16	1; 0	0; 0	0; 0	0; 0	50; 53	0; 0	16; 37	0; 0	0; 0	25; 1	26; 6
38415	Barton to Chowder Ness	96; 0		0; 2	2; 4	22; 6	11; 22	83; 56	0; 0	6; 4	48; 73	44; 35	7; 4	1; 0	0; 0	45; 0	0; 0	39; 5	0; 0	67; 0		0; 0	20; 38	17; 0
38414	Barrow to Barton (including Pits)	0; 0	0; 0	9; 7	148; 88	53; 51	29; 22	189; 225	0; 0	26; 20	112; 53	106; 156	29; 43	2; 2	5; 0	1; 0	0; 0	379; 450	0; 0	152; 28	0; 0	0; 0	30; 39	117; 88
38413	New Holland to Barrow	0; 0		3; 2	0; 0	2; 1	0; 0	124; 56	0; 0	2; 2	11; 7	16; 14	0; 1	1; 1	0; 0	0; 0		64; 0	0; 0	136; 65	0; 0	0; 0	16; 0	129; 72
38412	Goxhill to New Holland	1; 0	0; 0	2; 9	61; 14	2; 10	11; 51	166; 71	0; 0	2; 6	166; 110	227; 270	446; 370	0; 1	1; 1	1184; 200	0; 0	1049; 200	0; 1	505; 640	5; 9	0; 0	31; 5	50; 66
38411	Goxhill Marsh	1; 0	3; 0	22; 38	39; 69	5; 0	168; 60	276; 242	0; 0	4; 1	0; 0	6; 4	17; 0	1; 2	4; 0	4350; 0	0; 0	3156; 1108	2; 0	320; 400	16; 44	7; 30	346; 500	103; 70
38407	Halton Marshes			5; 4	0; 0	1; 0	6; 0	25; 29		0; 0	12; 42	5; 2	0; 0	1; 0	0; 0	405; 0	0; 0	1356; 1635		110; 114	1; 0	0; 0	45; 1	54; 24
38406	Killingholme Marshes			4; 2	1; 0	4; 3	16; 0	19; 7		14; 18	5; 0	4; 7	0; 0	0; 0	0; 0	0; 0	0; 0	11; 0	0; 0	23; 15	2; 2	0; 0	31; 58	50; 127
38905	Immingham Docks			67; 60	0; 0		37; 0	70; 42						1; 0	3; 2		0; 0	78; 0	1; 0	189; 94	81; 145	0; 0	32; 18	237; 51
38425	**Humber South (Inner)**	3683; 0	3; 0	1190; (278)	1720; (393)	85; 72	1989; (149)	823; (584)	18; (0)	46; (32)	343; 184	328; 394	464; 390	31; (4)	50; (2)	11470; (1500)	4; (0)	8903; (2981)	5; (1)	2877; (733)	93; 145	33; (30)	815; (562)	670; (297)
38405	Pyewipe		0;	670;	0;		5;	104;		0;	0;	0;	0;	24;	3;	670;	19;	720;	6;	360;	1300;	3;	228;	345;
38403	Cleethorpes North Wall to Grimsby													2;	0;					0;				0;
38401	Cleethorpes - North Promenade to Anthony`s Bank		144;	229;	4;		10;	48;	0;		0;	0;	0;	730;	112;	2310;	197;	360;	9100;	3370;	3;	590;	94;	180;
35487	Tetney Haven to Humberston Fitties	0;	800;	56;	80;	0;	9;	60;	1;		0;	0;	1;	137;	29;	3220;	27;	144;	1160;	700;	0;	45;	40;	62;
35486	Horseshoe Point to Tetney Haven	0; 0	1190; 1130	91; 42	1; 0		10; 0	50; 0	2; 3	1; 0	0; 0	0; 0	0; 0	195; 240	45; 0	0; 0	86; 122	750; 0	1950; 3100	238; 116	0; 0	135; 270	58; 96	39; 18
35485	Grainthorpe Haven Pye`s Hall to Horseshoe Point	16; 0	1351; 2660	186; 214	61; 41	0; 0	10; 27	6; 4	2; 3				0; 0	1732; 655	7; 22	1565; 2730	114; 118	1047; 990	3980; 4500	697; 578	0; 1	36; 104	138; 243	319; 395
38427	**Humber South (Mid)**	16; 0	; (2660)	1001; (256)	115; (41)	0; 0	26; (27)	198; (4)	3; (4)	0; 0	0; 0	0; 0	0; 0	; (855)	70; (22)	; (2730)	; (240)	; (990)	; (7600)	3950; (694)	433; (1)	646; (279)	398; (243)	576; (395)
35478	Grainthorpe to Somercotes	285; 1100	279; 460	138; 203	109; 256		23; 23	5; 1	21; 1	1; 0				488; 319	2; 0	514; 192	103; 47	1820; 332	1404; 470	330; 250	1; 0	30; 68	78; 102	97; 64
35484	Somercotes to Donna Nook	162; 0	736; 750	228; 168	88; 80	0; 0	131; 70	118; 160	2; 6	0; 0		4; 2	0; 0	142; 110	1; 0	1270; 1680	122; 109	777; 1100	3950; 700	804; 140	0; 0	71; 25	42; 39	179; 137
35483	Donna Nook	21; 0	310; 0	184; 63	12; 0		43; 57	4; 6	1; 0	0; 0	0; 0	7; 18	0; 0	3; 0	1; 0	160; 0	18; 0	244; 65	693; 0	83; 0	1; 0	10; 0	80; 86	47; 4
35481	Saltfleet	81; 28	750; 356	256; 170	25; 2		24; 9	8; 4	2; 4				2; 9	39; 17	18; 6	1420; 1300	78; 85	1130; 2000	1861; 124	1074; 850	0; 0	142; 188	162; 97	171; 92
35480	Theddlethorpe to Saltfleetby	211; 370	128; 76	192; 106	445; 450	0; 0	436; 280	30; 41	1; 0	7; 17	0; 0	6; 22	1; 1	61; 43	22; 8	442; 0	48; 27	783; 700	187; 94	329; 66	1; 0	33; 24	183; 241	234; 254
35479	Theddlethorpe to Mablethorpe North End	11; 0	0; 2	4; 0	0; 0		0; 0	0; 0				0; 0		20; 31	7; 0	16; 0	22; 3	86; 27	101; 0	125; 0	0; 0	11; 7	148; 227	70; 17
38429	**Humber South (Outer)**	627; 1246	1726; 1352	752; 576	549; 656	0; 0	477; 298	140; 188	23; 6	7; 17	0; 0	17; 42	3; 9	631; 432	39; 14	2870; 2980	250; 221	3940; 3307	5808; 994	2080; 940	1; 0	209; 237	586; 717	670; 532
38901	**Humber Estuary (South)**	4822; (1246)	3025; 3950	; (848)	1817; (892)	85; 72	2313; (372)	946; (723)	34; 9	49; (40)	343; 184	330; 403	464; 390	; (1120)	209; (27)	; (7210)	622; (461)	; (7278)	; (8594)	9662; (2273)	1303; (145)	969; (516)	1732; (1365)	1779; (1071)
38930	**Humber Estuary (North and South)**	6562; (1518)	3611; 4586	4522; (4569)	4596; (2532)	178; (179)	3444; (1510)	2320; 1742	140; 147	104; 82	433; 210	377; 444	472; 401	; (1841)	273; (175)	45785; 47088	1923; 1923	34144; (17479)	26595; (32162)	24166; (14075)	1311; (186)	2688; (805)	3966; 4540	4391; 3230
38201	***North Killingholme Haven Pits***	0; 0	0; 0	9; 7	0; 0	1; 0	53; 26	43; 84	0; 0	34; 34	0; 0	1; 0	0; 0	1; 0	0; 0	37; 1	0; 0	420; 22	0; 0	394; 0	718; 38	0; 0	13; 22	202; 86
	Note this site is just inland of Halton Marshes in Humber South (Inner)																							
38404	***Grimsby Commercial Docks***																							
	Note this site is just inland of Pyewipe in Humber South (Mid)																							

The two sites in italics are separate from the Humber Estuary (North and South) subsite (38930) and therefore not part of the Humber Estuary (South) grouping, but are part of the whole Humber Estuary (38950)

Figure 3.1.i Population trends of species by sector in (a) Humber Estuary (North); (b) Humber South (Inner); (c) Humber South (Mid) and (d) Humber South (Outer). The size of each pie chart relates to the number of species for which there is sufficient data to generate trends, and within each pie chart the proportion of species whose populations have shown high declines (>50%), medium declines (25% to 50%), no medium or high change (-25% to +33%), medium increase (33% to 100%) or high increase (>100%) are represented by red, orange, white, light green and dark green respectively.

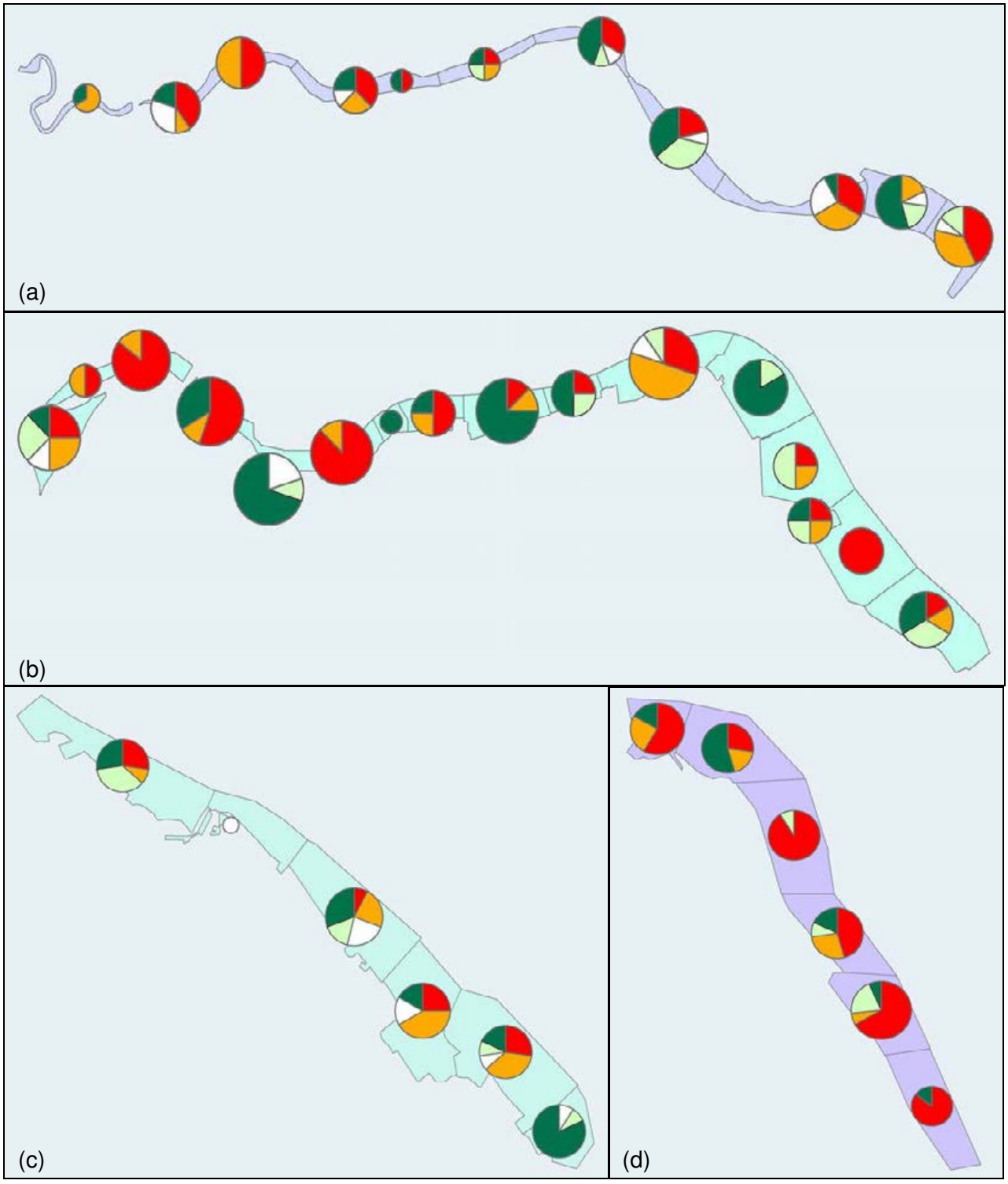
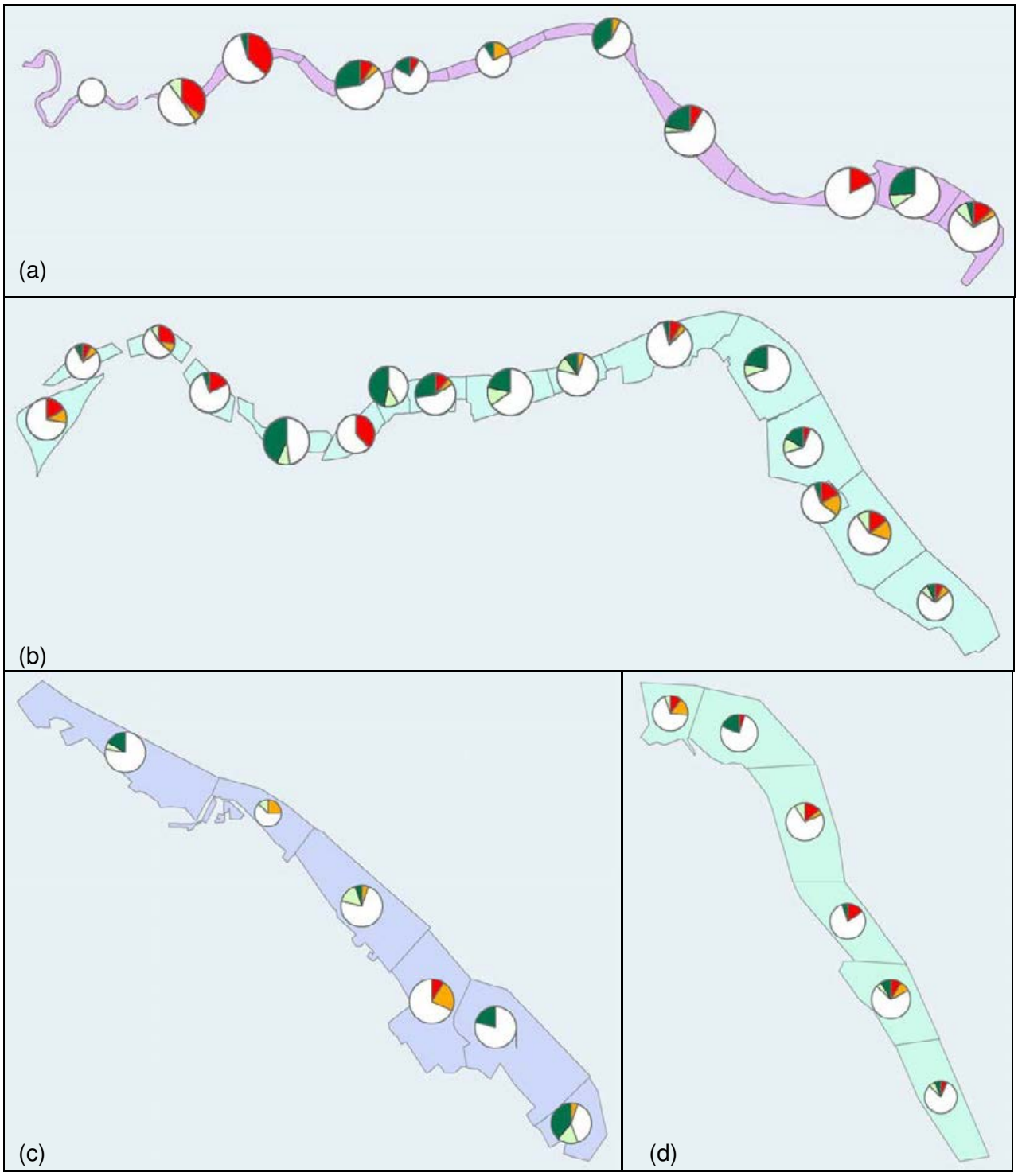


Figure 3.1.ii Changes in the proportion of the Humber Estuary population of species supported by each sector in (a) Humber Estuary (North); (b) Humber South (Inner); (c) Humber South (Mid) and (d) Humber South (Outer). The size of each pie chart relates to the number of species for which there is sufficient data to generate trends, and within each pie chart the numbers of species where the proportion of the Humber Estuary population supported by the sector has shown highly significant declines ($P < 0.01$), significant declines ($P < 0.05$), no significant change, significant increase ($P < 0.05$) or highly significant increase ($P < 0.01$) are represented by red, orange, white, light green and dark green respectively.



4. DISCUSSION AND CONCLUSIONS

4.1 Species Trends

4.1.1 Pink-footed Goose *Anser brachyrhynchus*

Across the Humber estuary the numbers of this species recorded in WeBS counts increased substantially in the late 1990s so that the numbers counted from 2002 onwards were approximately four-times those counted in the early 1990s. However this species may be better investigated by reference to goose roost counts conducted as part of the Icelandic-breeding Goose Census (Worden 2006) rather than standard WeBS daytime counts. Within the estuary, numbers have increased on most sectors but declined on a few, most notably Faxfleet to Brough Haven (38432) and Winteringham Haven (38921) which are almost opposite each other on the north and south shores of the upper Humber, but these birds may have moved to nearby Blacktoft Sands (38430) where numbers have increased. Counts are relatively low (fewer than 100 birds) on most of these sites so these patterns should be interpreted with caution. The sectors holding the highest numbers of this species are Read's Island Flats (38418) and Blacktoft Sands (38430). Grainthorpe to Somercotes (35478) and Theddlethorpe to Saltfleetby (35480) also have relatively high peak counts.

4.1.2 Brent Goose (Dark-bellied) *Branta bernicla bernicla*

Brent Goose numbers increased across the Humber Estuary during the 15 years from 1991-2 to 2006-7, but much of this increase can be explained by a rapid increase in numbers between 2003-4 and 2006-7, as numbers had actually declined slightly prior to 2003. Trends for the Humber appear to follow those for the eastern England region. Within the Humber, Brent Geese have done particularly well in the Humber South (Mid) section of the estuary between Cleethorpes and Grainthorpe Haven (sectors 38401, 35487, 35486 and 35485). There have been declines on some sectors of the Humber South (Outer) part of the estuary but these may represent a local redistribution of birds as overall numbers in the Humber South (Outer) have increased (Table 3.1.i). The sectors with the highest peak counts of Brent Goose are Grainthorpe Haven Pye's Hall to Horseshoe Point (35485) and Horseshoe Point to Tetney Haven (35486). Tetney Haven to Humberston Fitties (35487), Saltfleet (35481) and Somercotes to Donna Nook (35484) also hold good numbers of this species.

4.1.3 Shelduck *Tadorna tadorna*

Overall numbers on the Humber remained relatively stable during the past 15 years, possibly increasing very slightly. Shelduck are doing better on the Humber than other sites in the east-coast region, as the proportion of the regional population found on the Humber has increased. Within the estuary, Shelduck numbers have declined on the middle and outer parts of the southern shore, but these declines appear to be balanced by increases on some parts of the northern shore and the Humber South (Inner) section. Some of these areas also hold the highest numbers of Shelduck; sectors with the highest peak counts include 38441 (Paull to Stone Creek (Cherry Cobb Sands)), 38442 (Stone Creek to Patrington) and 38443 (Patrington to Easington) on the outer part of the northern shore and Read's Island Flats (38418) and Winteringham Haven (38921) on the south inner section. Pyewipe (38405) also has high peak counts.

4.1.4 Wigeon *Anas penelope*

Wigeon numbers on the Humber were relatively stable and followed the regional trend between 1991-2 and 2006-7, however there has been a slight decline in numbers during the latest 4 years (Figure B). Numbers have declined markedly on several sectors in the upper Humber (both north and south shores), which gives cause for concern as these sectors hold some of the highest densities of this species on the estuary (Musgrove *et al*. 2004).

4.1.5 Gadwall *Anas strepera*

The Humber supports only low numbers of this species, but numbers have increased in recent years, following regional trends. There were insufficient data to generate trends for any individual sector.

4.1.6 **Teal** *Anas crecca*

The number of Teal on the Humber as a whole has increased, with the highest increase during the late 1990s and a subsequent dip in the latest 3 years (although numbers are still higher than in 1991-2). Numbers have declined on several sectors on the western part of the estuary on both the north and south shores, areas that hold relatively high densities of this species (Musgrove *et al*. 2003).

4.1.7 **Mallard** *Anas platyrhynchos*

There has been a long-term decline in Mallard numbers on the Humber, following regional trends. Sectors with the highest declines include most sectors on the north shore, and all of the westernmost sectors of the southern shore from Alkborough Flats to Winteringham Haven (38423, 38424, 38419 and 38921). The sectors with the highest peak counts of Teal are Read's Island Flats (38418), Paull to Stone Creek (Cherry Cobb Sands) (38441), Hull to Paull (38440) and Blacktoft Sands (38430).

4.1.8 **Pintail** *Anas acuta*

Only low numbers of this species are found on the Humber (total WeBS counts usually less than 100 individuals). Particularly high counts during the first two years of the fifteen covered by this report suggest that numbers on the Humber may have declined during the early 1990s, and subsequently increased, but these trends should be interpreted with caution because the low sample sizes will be more sensitive to count errors or random effects. There were insufficient data to produce reliable trends for any individual sectors.

4.1.9 **Shoveler** *Anas clypeata*

Shoveler numbers on the Humber increased during the late 1990s and have now stabilised at a slightly higher level than during the early 1990s, however numbers are low (fewer than 100 birds counted in most years) and therefore trends should be interpreted with caution. There were insufficient data to generate reliable trends for most sectors, and the only sector where a trend was generated (Blacktoft Sands, 38430) relied heavily on imputed data.

4.1.10 **Pochard** *Aythya ferina*

Across the whole Humber estuary, Pochard numbers have fluctuated widely, but the highest counts occurred during the early- to mid-1990s. Only a few sectors had sufficient data to generate trends, and numbers have increased on some and declined on others with no noticeable geographical patterns. Only three sectors had peak counts of more than 100 Pochard; 38412 (Goxhill to New Holland), 38433 (Brough Haven to North Ferriby) and 38414 (Barrow to Barton (including Pits)).

4.1.11 **Tufted Duck** *Aythya fuligula*

Tufted Duck numbers increased on the Humber during the 15 years from 1991-2 to 2006-7. The only sector where numbers have declined by more than 25% is Goxhill to New Holland (38412) and this is also the only sector that now supports a significantly lower proportion of the Humber population than in previous years (Table 3.1.ii, Figure B.38412). The sectors with the highest counts of Tufted Duck were the same as those for Pochard (38412, 38414 and 38433), which is unsurprising given the similar ecological niche occupied by these species.

4.1.12 **Goldeneye** *Bucephala clangula*

Only low numbers of Goldeneye are found on the Humber and their numbers fluctuate widely between years, however the proportion of the regional population found on the Humber is relatively constant. There has been a short-term decline during the latest five years on the sector Goxhill to New Holland (38412) but this may be due to inter-year fluctuations, which appear to be within the normal range for this species on this sector (Figure B.38412). This is also the only sector with a high peak count for Goldeneye (peak of 446 individuals), while no other sector had a peak count of more than 30 individuals.

4.1.13 Oystercatcher *Haematopus ostralegus*

During the 15 years covered by this study Oystercatcher numbers have declined on the Humber as a whole, although this follows a peak in numbers around 1990 (Maclean and Austin 2008) and therefore the present numbers are only slightly lower than pre-1990 levels, although there has still been a decline. The highest densities of Oystercatchers occur on the outer (eastern) part of the estuary on both the north and south shores, and it is on these sectors that numbers have declined. All four of the outermost sectors on the northern shore (from Paull to Spurn Head, sectors 38441, 38442, 38443 and 38444) and most sectors in the Humber South (Mid) and Humber South (Outer) parts of the estuary have declined by more than 50% during either the short-, medium- or long-term timescales. Looking at changes in the proportion of the Humber population supported by each sector, it appears that declines are more severe on the northern shore of the Humber, where the proportion of the Humber population has declined significantly, while the proportion of the population supported by the Humber South (Outer) section of the estuary has increased significantly (Table 3.1.ii). The sectors with the highest peak counts are Grainthorpe Haven Pye's Hall to Horseshoe Point (35485) and Spurn Head (38444) which are almost opposite each other on the northern and southern shores respectively. Other sectors with high peak counts were also in this part of the estuary and include 38401 and 35478 on the southern shore, and 38443 on the northern shore.

4.1.14 Ringed Plover *Charadrius hiaticula*

Ringed Plover numbers on the Humber have declined, particularly since the late 1990s (Figure B), and it appears that numbers may have declined more rapidly than the regional trend during this time. Numbers have at least halved on all sectors where there was sufficient data to generate trends except for Hull to Paull (38440), where numbers have more than doubled from around 20 individuals to around 50 (Figure A.38440). However, counts are low on all sectors where trends have been generated (usually fewer than 50 individuals and often fewer than 20) and there is some imputed data, therefore the trends should be interpreted with caution. Only two sectors had peak counts of over 100 birds, and these were Hull to Paull (38440) and Cleethorpes - North Promenade to Anthony's Bank (38401).

4.1.15 Golden Plover *Pluvialis apricaria*

Golden Plover numbers have increased over the estuary as a whole, but numbers on the Humber have not increased as much as elsewhere in the region (Figure B). Table 3.1.i shows that although Golden Plover numbers have increased on many sectors, there are also a large number of sectors where the numbers have gone down, which may be the reason why the Humber population has not increased as fast as the regional population on the east coast of England. Sectors with the highest numbers of Golden Plover were 38441 and 38440 (Hull to Stone Creek), 38418 (Read's Island Flats), 38432 (Faxfleet to Brough Haven) and 38430 (Blacktoft Sands). However several other sectors also held high numbers of this species with peak counts of more than 3,000 (38411, 38442, 38443 & 35487).

4.1.16 Grey Plover *Pluvialis squatarola*

Numbers of Grey Plover on the Humber were relatively stable over the last 15 years, but with some fluctuations (Figure B), and there is little difference from the regional trend. Within the estuary, Grey Plovers are doing particularly badly on the Humber South (Outer) section, where numbers have declined by more than 50% in most sectors (Table 3.1.i), however these declines may have been balanced to some extent by increases on some sectors on the northern shore, where both the absolute number of birds, and the proportion of the Humber population supported has increased (Tables 3.1.i & 3.1.ii). This area supports the highest numbers of grey plover on the estuary, with the area between Paull and Spurn Head (sectors 38441, 38442, 38443 & 38444) being the most important for this species.

4.1.17 Lapwing *Vanellus vanellus*

The number of Lapwing on the Humber as a whole has fluctuated but with no obvious increase or decline during the last 15 years. Table 3.1.i suggests that there has been a medium-term decline of more than 25%, but this follows a peak in numbers in the early 1990s, so that numbers have only declined by about 2% from their levels 15 years ago, prior to this peak. As with many other waders, Lapwings are declining on many

sectors in the middle and outer parts of the southern shore of the estuary, while on other parts of the estuary there have been declines on some sectors and increases on others, perhaps representing a redistribution of birds in some areas. The sectors supporting the highest numbers of Lapwing were Paull to Stone Creek (Cherry Cobb Sands) (38441), and Faxfleet to Brough Haven (38432), however several others also had peak counts of more than 2,000 individuals (38418, 38411, 38440, 38430 and 38442).

4.1.18 **Knot** *Calidris canutus*

Knot are found in very high densities throughout the middle and outer parts of the estuary on both the northern and southern shores (Musgrove *et al*. 2003). Numbers remained stable across the Humber in line with the regional trend during the 15 years covered by this report, and the average number of individuals counted on the estuary was around 20,000 (Figure B). However, within the estuary there appears to have been a redistribution of knot with numbers declining on most sectors of the south shore, but increasing on the north shore as well as a few sectors on the south shore (e.g. Somercotes to Donna Nook 35484). Sectors with the highest counts of knot are Spurn Head (38444), Cleethorpes- North Promenade to Anthony's Bank (38401) and Patrington to Easington (38443).

4.1.19 **Dunlin** *Calidris alpina*

Dunlin numbers on the Humber have declined during the last 15 years, but the proportion of the regional population found on the Humber has remained relatively stable, suggesting that declines have also occurred on a wider geographical scale and may not be related to local factors. However, within the Humber there have been more declines on sectors in the outer part of the estuary than on the Humber South (Inner) section, although declines have also occurred here in places. The sectors holding the highest numbers of Dunlin during the past five years are Patrington to Easington (38443), Paull to Stone Creek (Cherry Cobb Sands) (38441) and Cleethorpes- North Promenade to Anthony's Bank (38401).

4.1.20 **Black-tailed Godwit** *Limosa limosa*

Numbers of this species have increased on the Humber since the early 1990s when almost none were counted; since the late 1990s a few hundred have been recorded across the estuary in WeBS counts on average, although there have been some fluctuations (Figure B). Only a few sectors have sufficient data to generate trends, but it appears that this species is doing better on the north shore of the Humber than on the south shore, as the proportion of the population supported has increased in the north but declined in the south (Table 3.1.ii). Sectors that support a significant proportion of the Humber Black-tailed Godwit population include Pyewipe (38405) and North Killingholme Haven Pits (38201).

4.1.21 **Bar-tailed Godwit** *Limosa lapponica*

The Humber population of this species increased during the 1990s but has subsequently declined, so that numbers are now similar to their early 1990 levels. Within the estuary there have been declines in the south and increases in the north, perhaps suggesting a redistribution of birds to sectors on the northern part of the estuary. The sectors supporting significant proportions of the Humber Bar-tailed Godwit population encompassed the area between Paull and Spurn Head (38441, 38442, 38443 & 38444) as well as one sector on the southern shore (38401 - Cleethorpes- North Promenade to Anthony's Bank).

4.1.22 **Curlew** *Numenius arquata*

Curlew numbers increased on the Humber during the 15-year period covered by this report, roughly following the regional trend although the proportion of the regional population on the Humber may also have increased slightly (Figure B). Within the estuary there have been increases on some sectors and declines on others, but with particularly high declines at South Ferriby (38417) and at Killingholme Marshes (38406), although both of these sites support less than 50 birds so may not be especially important in the context of the Humber as a whole. The sectors supporting the highest numbers of Curlew were in the area between Paull and Easington (38441, 38442 & 38443) but Spurn Head (38444) and Goxhill Marsh (38411) also held reasonable numbers of this species.

4.1.23 Redshank *Tringa totanus*

The redshank population on the Humber has remained relatively stable and followed the regional trend during the 15 years from 1991-2 to 2006-7. However, within the estuary numbers declined on the middle and outer parts of the southern shore while those on the inner part of the southern shore increased and the north shore numbers were relatively stable overall with increases on some sectors and declines on others. As with several other wader species the sectors supporting the highest numbers of redshank were on the outer part of the northern shore between Paull and Spurn Head (38441, 38444 & 38443).

4.2 Broad Patterns

4.2.1 Waders and Shelduck

Shelduck and waders are discussed together because Shelducks feed on mudflat invertebrates, as do the waders, and therefore they are likely to respond in similar ways to changes in the environment.

In the Humber estuary as a whole, populations of many wader species have been relatively stable with some fluctuations during the past 25 years, while for some species such as the godwits and some of the plovers, numbers have increased (Maclean and Austin 2008). The exception is the Dunlin, numbers of which have declined steadily during the last 30 years, leading to a "medium alert" for Dunlin on the Humber being triggered by the Wetland Bird Survey (WeBS) Alerts (Maclean and Austin 2008). There is also a medium alert for Shelduck, whose numbers on the Humber have declined by around 29% during the last 25 years (Maclean and Austin 2008). During the 15-year period covered by this report Oystercatcher numbers have also declined across the Humber estuary, and numbers of both Bar-tailed and Black-tailed Godwit increased during the early 1990s but subsequently declined from the late 1990s onwards.

In light of the overall trends for the Humber described above, it is interesting to note that most wader species have declined severely in number in the middle and outer sectors of the southern shore of the Humber estuary (constituent sectors of 38427 & 38429), as has Shelduck, which also feeds on mudflats (Table 3.1.i). The proportion of the Humber populations of these species found on these sectors has also fallen, particularly in the middle sector of the southern shore, suggesting that the quality of the mudflat habitat may have declined in this part of the estuary compared to other sectors. Oystercatcher and Shelduck have also done badly on the northern shore of the Humber, where their numbers have declined relative to the whole Humber population (Table 3.1.ii).

4.2.2 Dabbling Ducks

Dabbling ducks, in particular Wigeon, Mallard and Teal, have declined in number in the upper parts of the Humber estuary to the west of Hull on both the north and south shores. The sectors particularly affected are Blacktoft Sands (38430) and Faxfleet to Brough Haven (38432) on the north shore, and four sectors from Alkborough Flats to Winteringham Haven (38423, 38424, 38419 and 38921) on the south shore. Mallard numbers have declined on all of these sectors, but declined more rapidly in the early 1990s in the four western sectors (38430, 38432, 38423 and 38424), although declines have continued in recent years at a slower rate, while on sectors 38419 and 38921 declines occurred at a steady pace throughout the 1990s and 2000s. Teal and Wigeon numbers have declined steadily on all sectors in this part of the estuary where they regularly occur. As well as the absolute numbers of dabbling ducks declining in this part of the estuary, the proportion of the Humber population found in these sectors has also declined significantly (Table 3.1.ii). Dabbling ducks have fared better on some sectors further east from this area; the proportion of the population of these species supported on the more eastern sectors has increased. This pattern may be partly explained by a redistribution of some birds, however Mallard numbers have declined across the estuary as a whole, and numbers of Wigeon and Teal fluctuated during the 15 years from 1991 – 2006, but with declines during the latter four years. Since the upper parts of the Humber estuary support some of the highest densities of birds of these species (Musgrove *et al*. 2003), it seems likely that declines in these sectors could affect the wider population.

4.2.3 Other Wildfowl

Both goose species (Pink-footed Goose and Dark-bellied Brent Goose) are increasing on most parts of the estuary, and although there have been declines on some individual sectors there have been no declines over wider geographical areas. There are only small numbers of diving ducks (Pochard, Tufted Duck and Goldeneye) present on the Humber, and therefore trends have only been produced for a few sectors. However all three species have declined on one sector (Goxhill to New Holland 38412). These birds may have redistributed to the three sectors between Barton Cliff and Barrow to Barton (including Pits) where the proportion of the population supported has increased (Table 3.1.ii).

4.3 Summary

Parts of the estuary that give particular cause for concern are the middle and outer sections of the southern shore (constituent sectors of 38427 and 38429) where waders and Shelduck have all declined, and parts of the inner Humber estuary on both the north and south shores (from Blacktoft Sands to Winteringham Haven, sectors 38430, 38432, 38423, 38424, 38419 and 38921). Other sectors where a large number of species are declining include South Ferriby (38417), where all species of wildfowl and waders with sufficient data to generate trends have declined. Brough Haven to North Ferriby (38433), which is opposite this sector but on the northern shore, also has a large number of declining species. There are also a large number of declining species on the sector Goxhill to New Holland (38412). Two sectors towards the western end of the north shore of the Humber also have a high proportion of species with declining populations. These are Stone Creek to Patrington (38422) where almost all waders have declined, and Spurn Head (38444) where the numbers of eleven out of fourteen species for which there was sufficient data to generate trends have declined.

Areas of the estuary where the number of birds has increased include Read's Island Flats (38418) where all species with sufficient data to generate trends have either remained stable or increased, and Goxhill Marsh (38411) where many waders have increased. Waders have also fared well on sector 35485 (Grainthorpe Haven Pye's Hall to Horseshoe Point), in contrast to the general pattern of declines for wader species in the surrounding parts of the estuary. There have been increases in several species on four sectors on the southern shore between Barton Cliff and New Holland (38409, 38415, 38414 and 38413) although some species have also declined in this area.

Five species have shown population declines on the Humber as a whole (Wigeon, Mallard, Oystercatcher, Ringed Plover and Dunlin). There are no strong patterns in the sites that hold the highest numbers of these species, but three sectors hold significant numbers of two or more of these species. These are 38441 - Paull to Stone Creek / Cherry Cobb Sands (Mallard and Dunlin); 38443 - Patrington to Easington (Mallard, Oystercatcher and Dunlin); and 38401 - Cleethorpes North Promenade to Anthony's Bank (Oystercatcher, Ringed Plover and Dunlin). However, these three sectors also hold significant numbers of several other species whose populations are stable or increasing suggesting that the population declines are not likely to be caused by problems at these particular sites.

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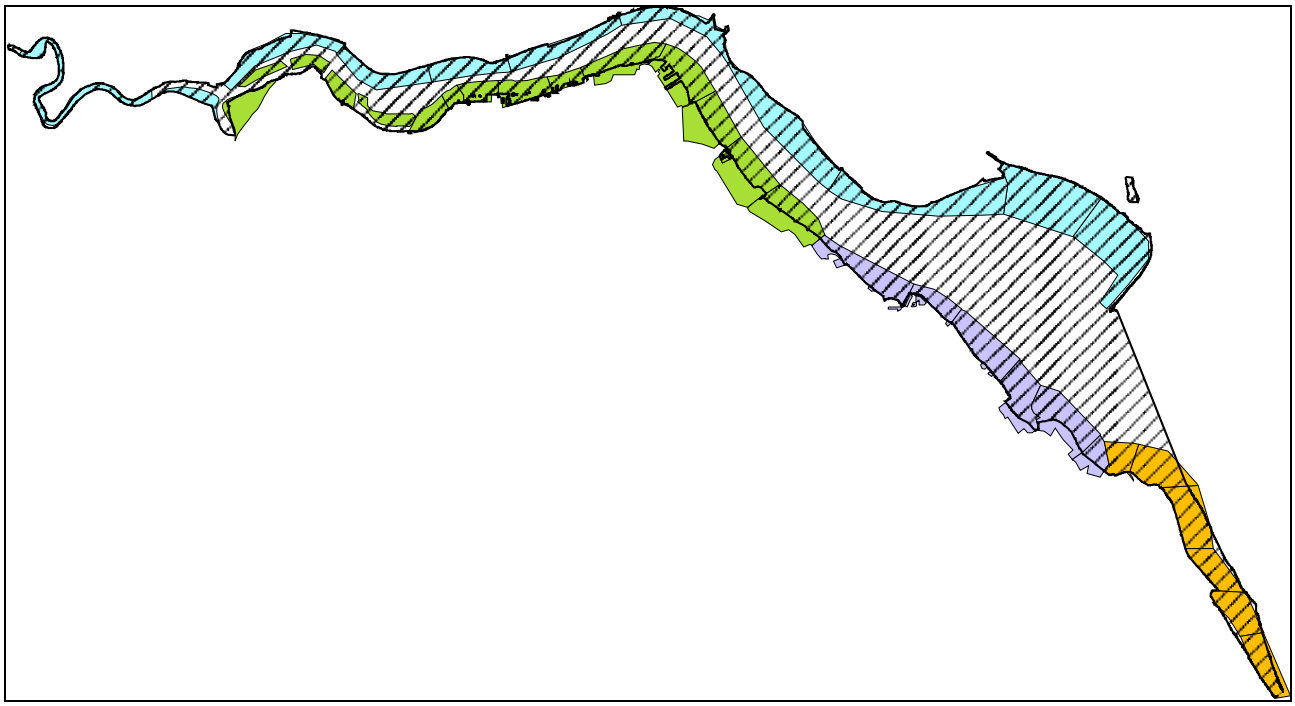
Appendix A

WeBS count sectors on the Humber Estuary in relation to the Humber Estuary SPA. Areas within the boundaries of the Humber Estuary SPA (red hatch). Sectors coloured according to broad within-estuary regions referred to in this report (Pale blue - sectors of Humber North; Green - sectors of Humber inner-South; Violet – sectors of Humber mid-South; Orange – sectors of Humber outer-South) and areas within the boundaries of the Humber Estuary SPA are indicated by cross-hatching.



Appendix B

Population trends of each species for each sector of the Humber Estuary SPA, with additional trends for multi-sector consolidations frequently used by WeBS (the north shore the inner-, mid- and outer-south shore and the Humber north and south which excludes several satellite pools). Two types of plot are presented for each species / sector 1) the mean winter count (Sep to Mar) with, where average winter long-term numbers exceed 10 individuals, the smoothed trend and 2) the proportional contribution of the sector towards numbers on the estuary as a whole. Note that Figure numbering is based on WeBS count sector codes.

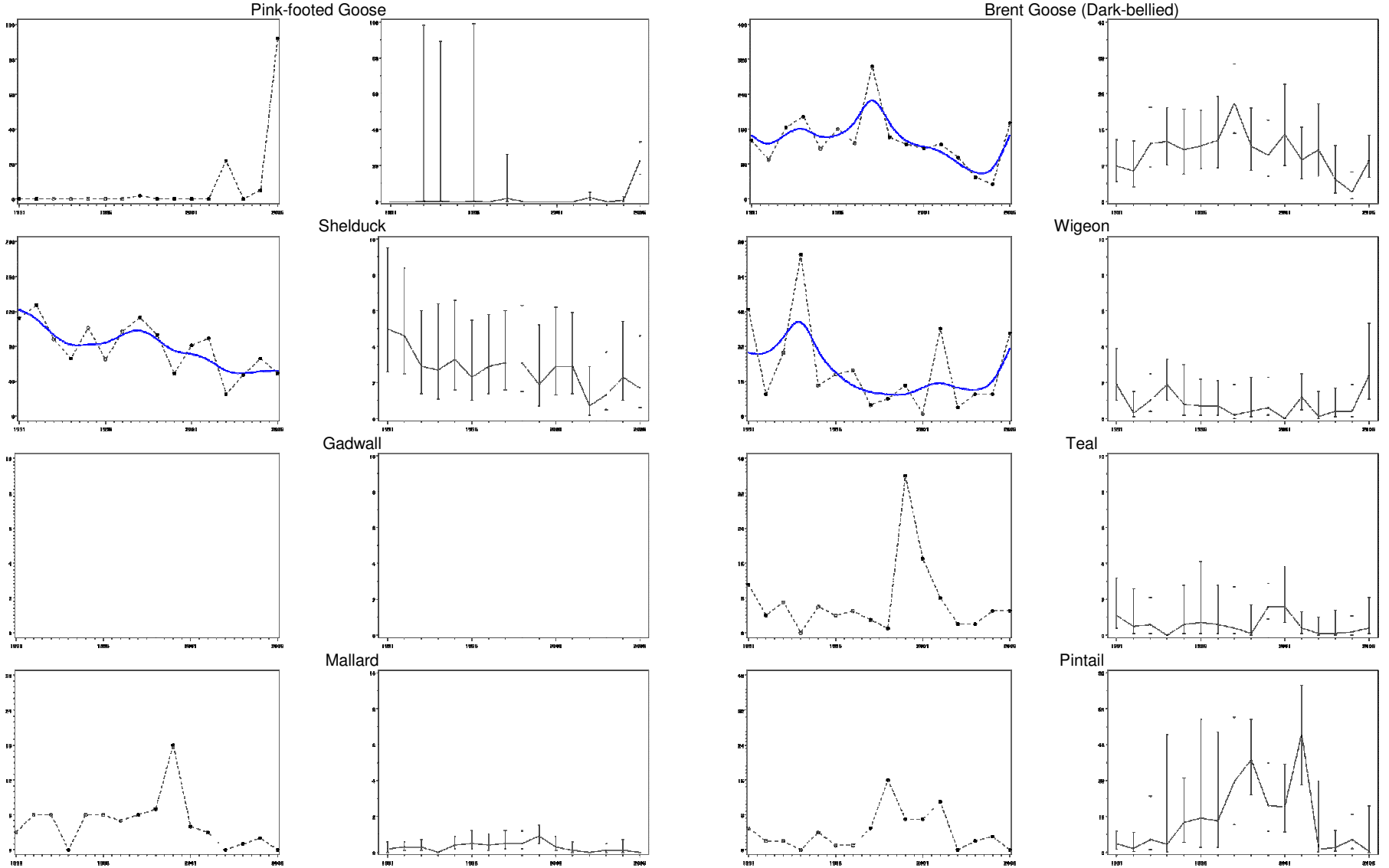
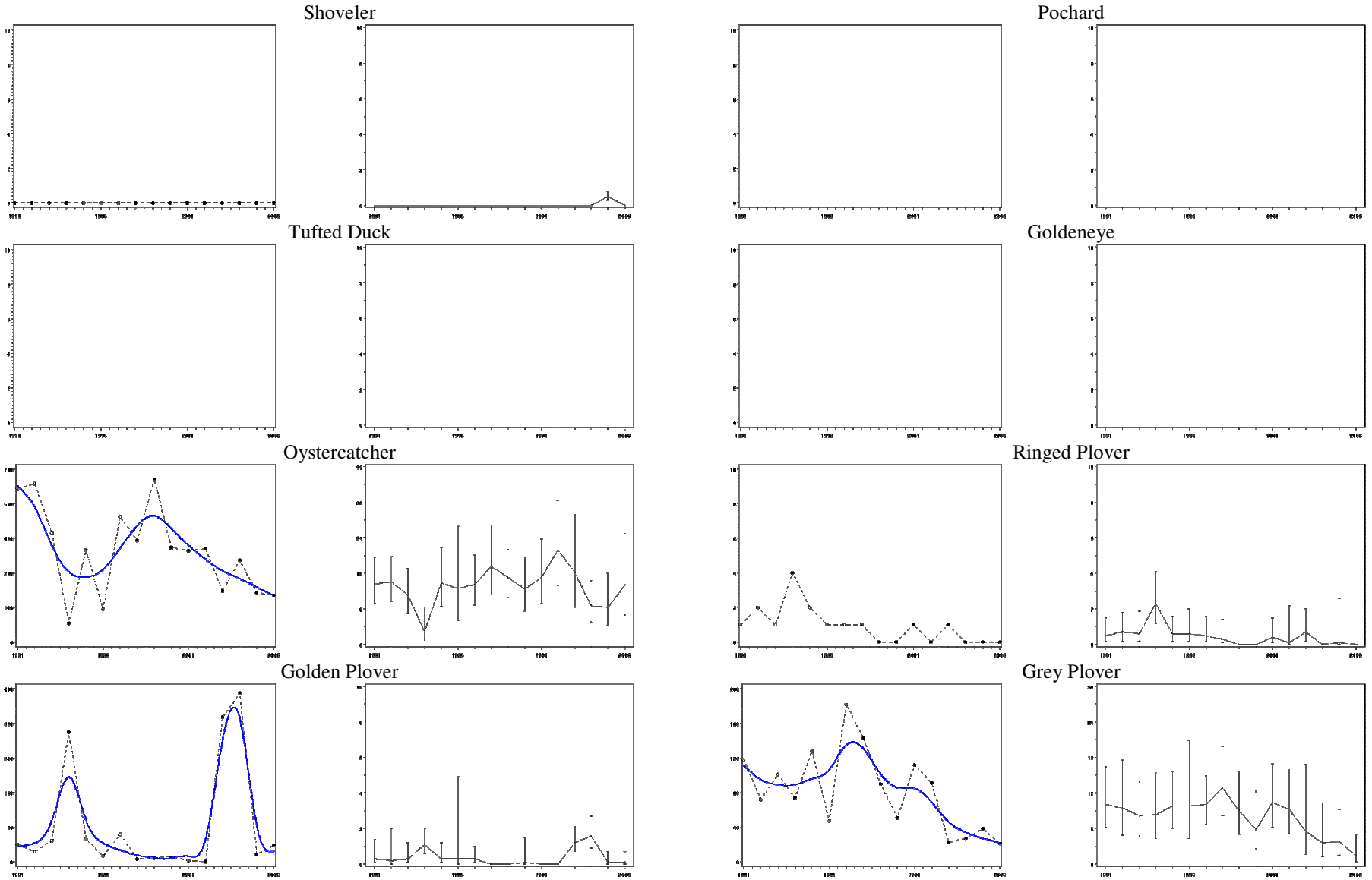


Figure B.35478 Population trends of each species in sector 35478 (Grainthorpe to Somercotes) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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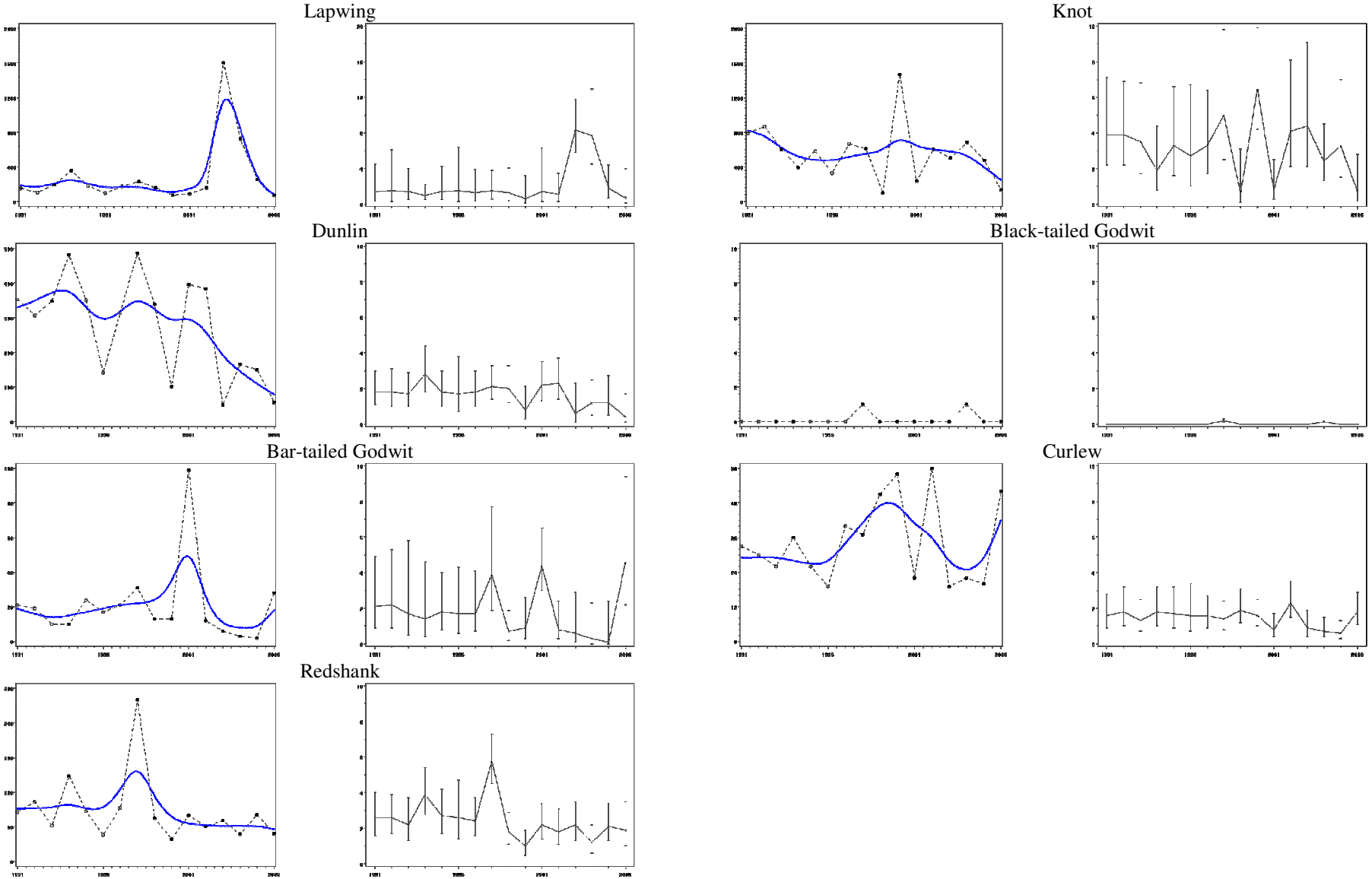

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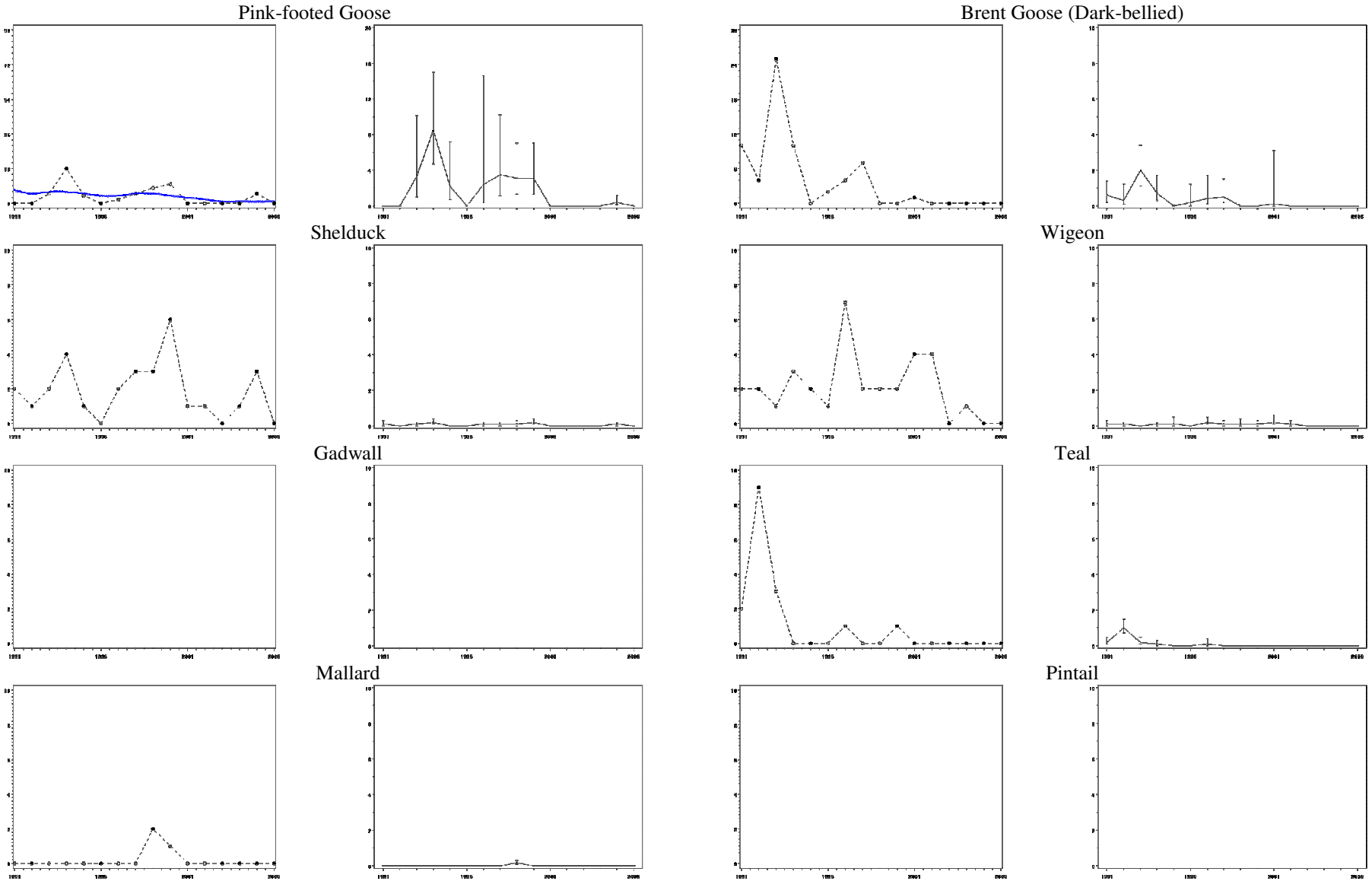
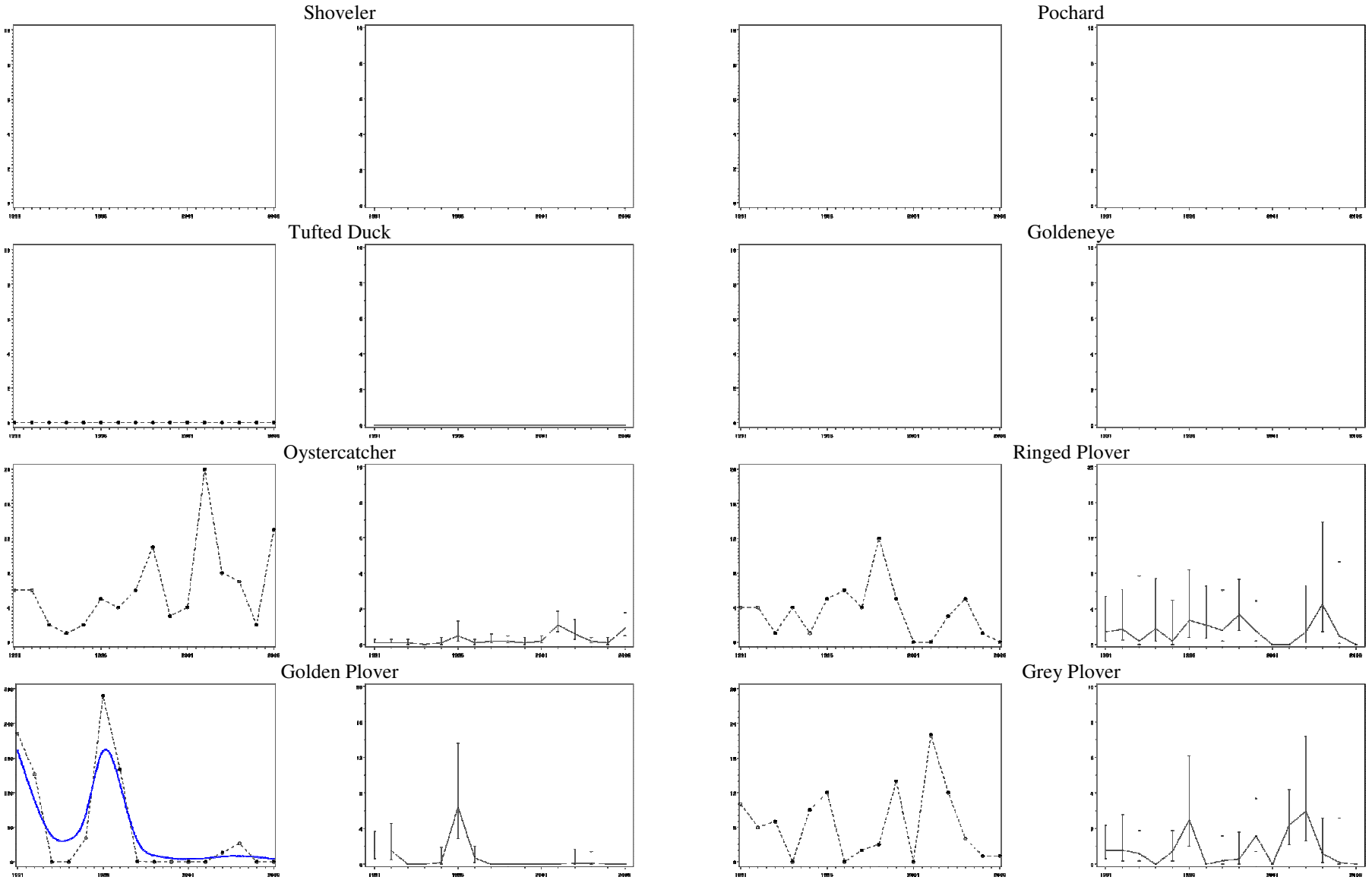


Figure B.35479 Population trends of each species in sector 35479 (Theddlethorpe to Mablethorpe North End) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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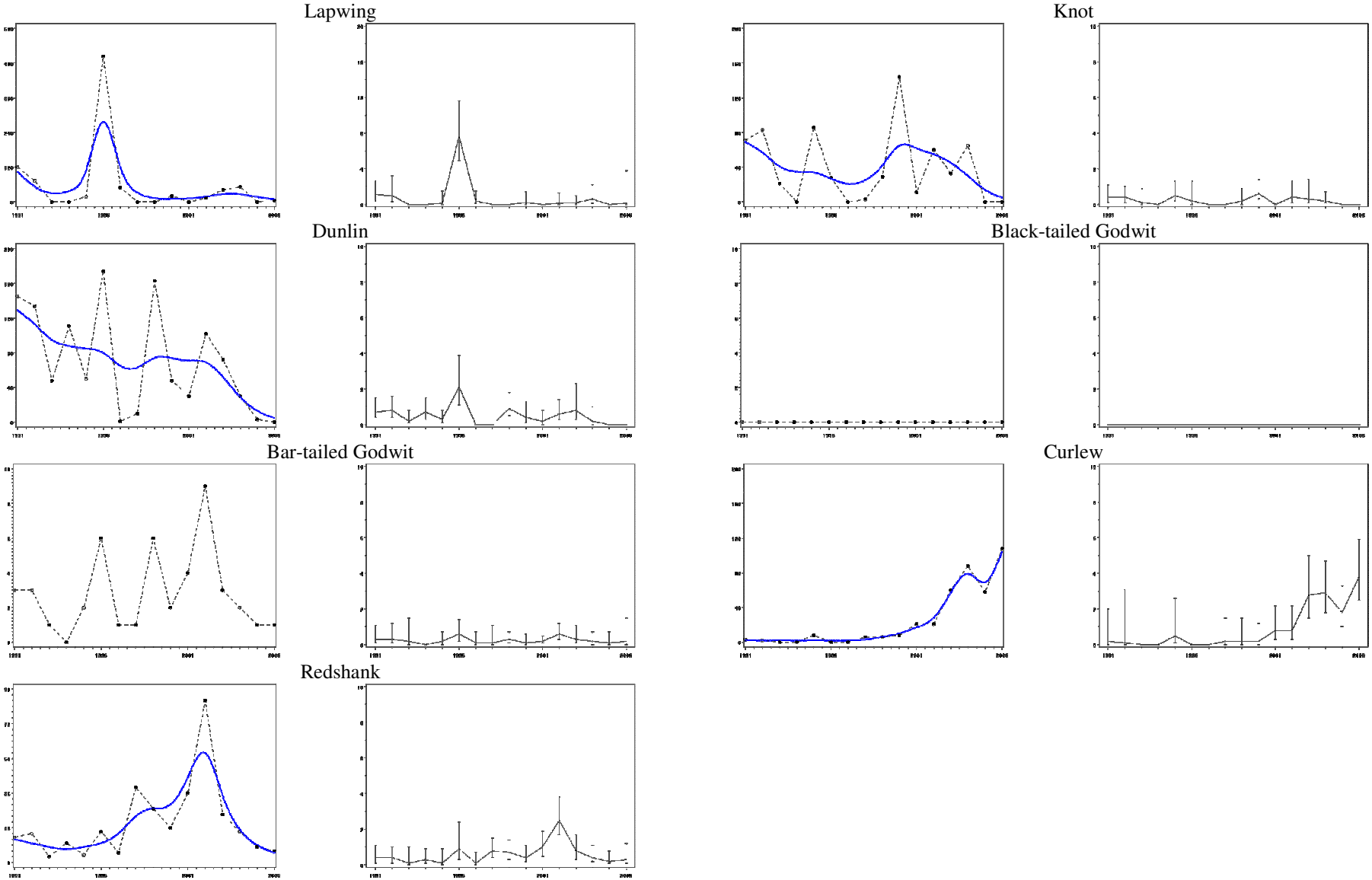

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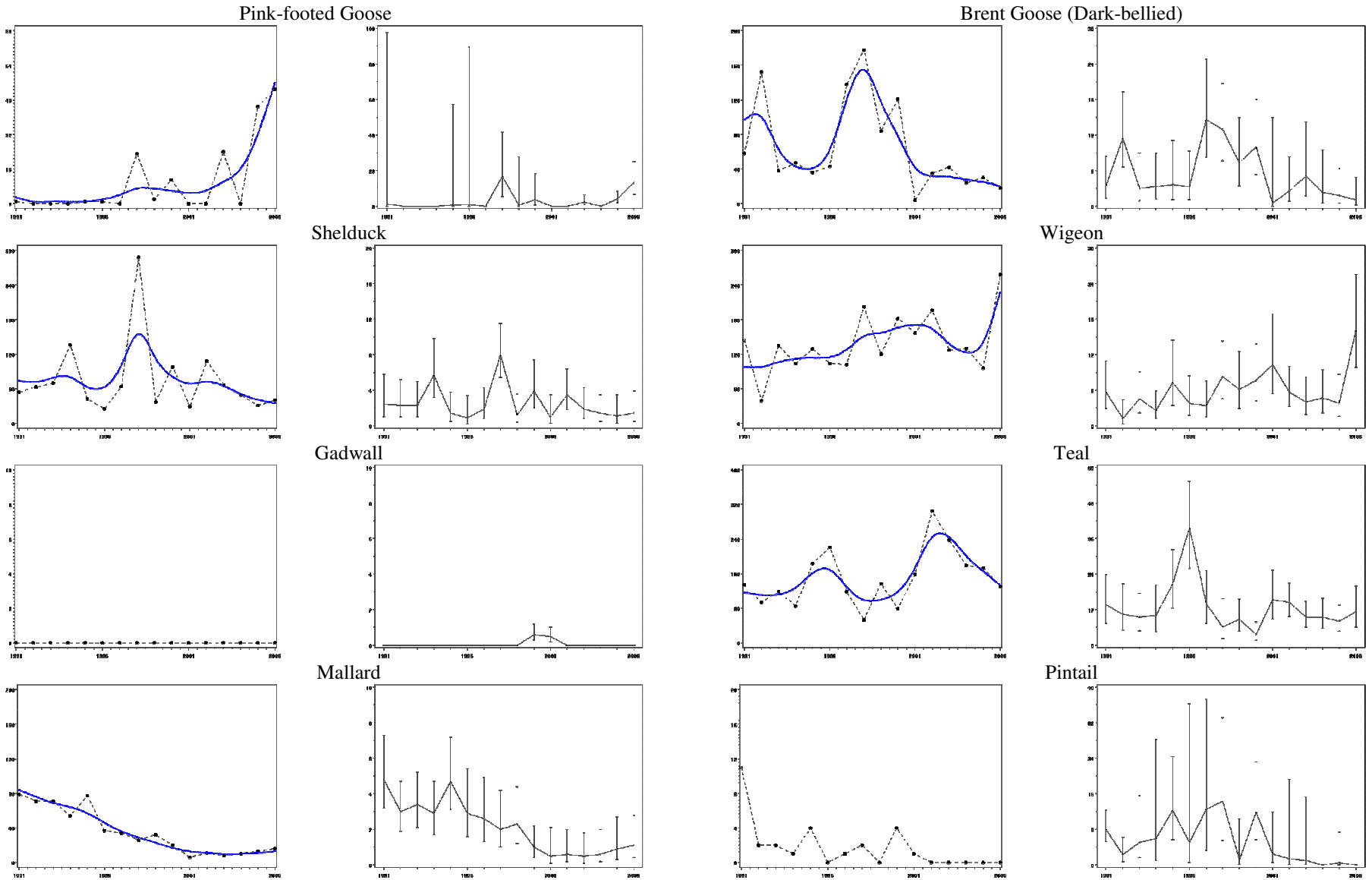
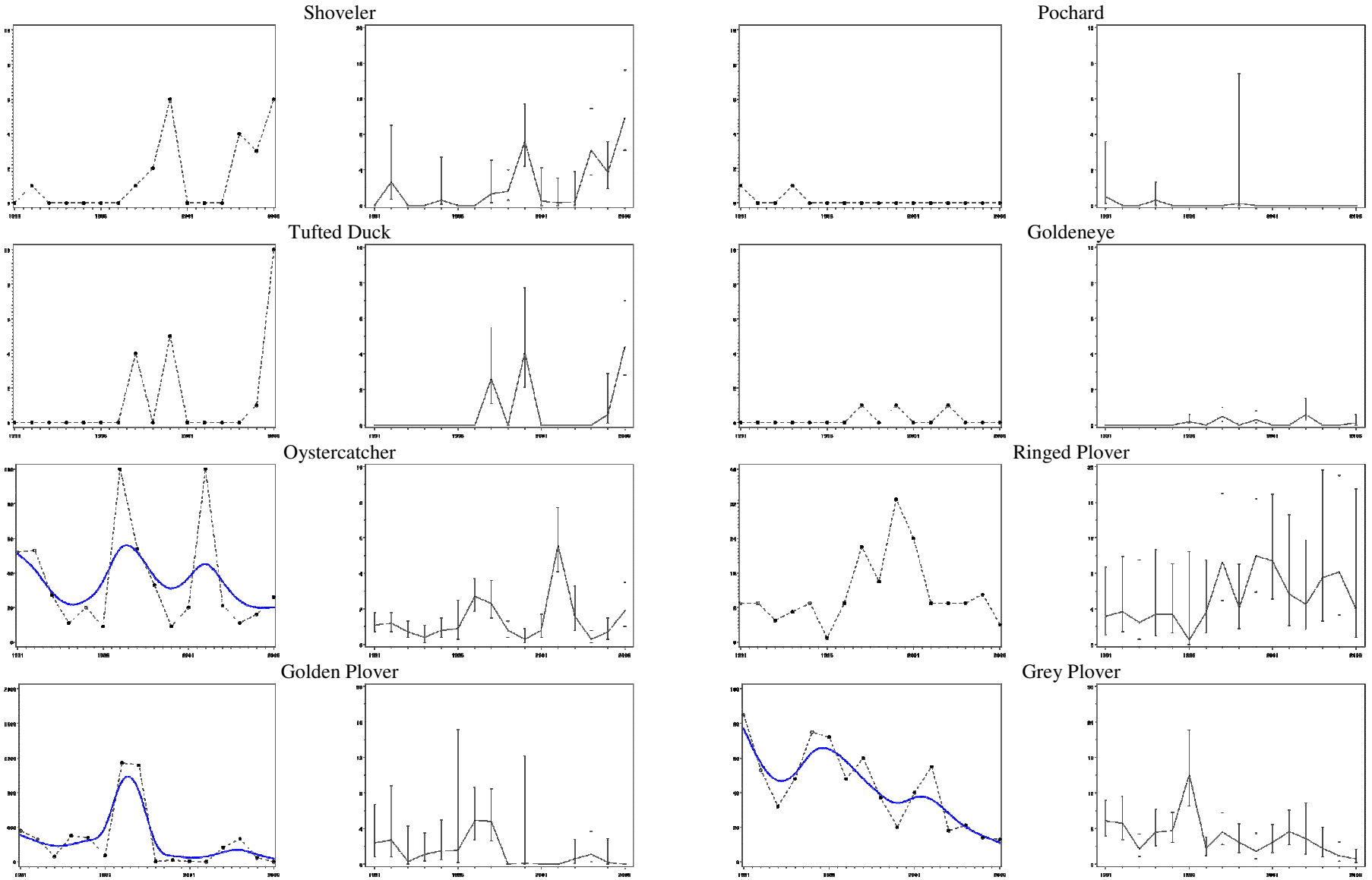


Figure B.35480 Population trends of each species in sector 35480 (Theddlethorpe to Saltfleetby) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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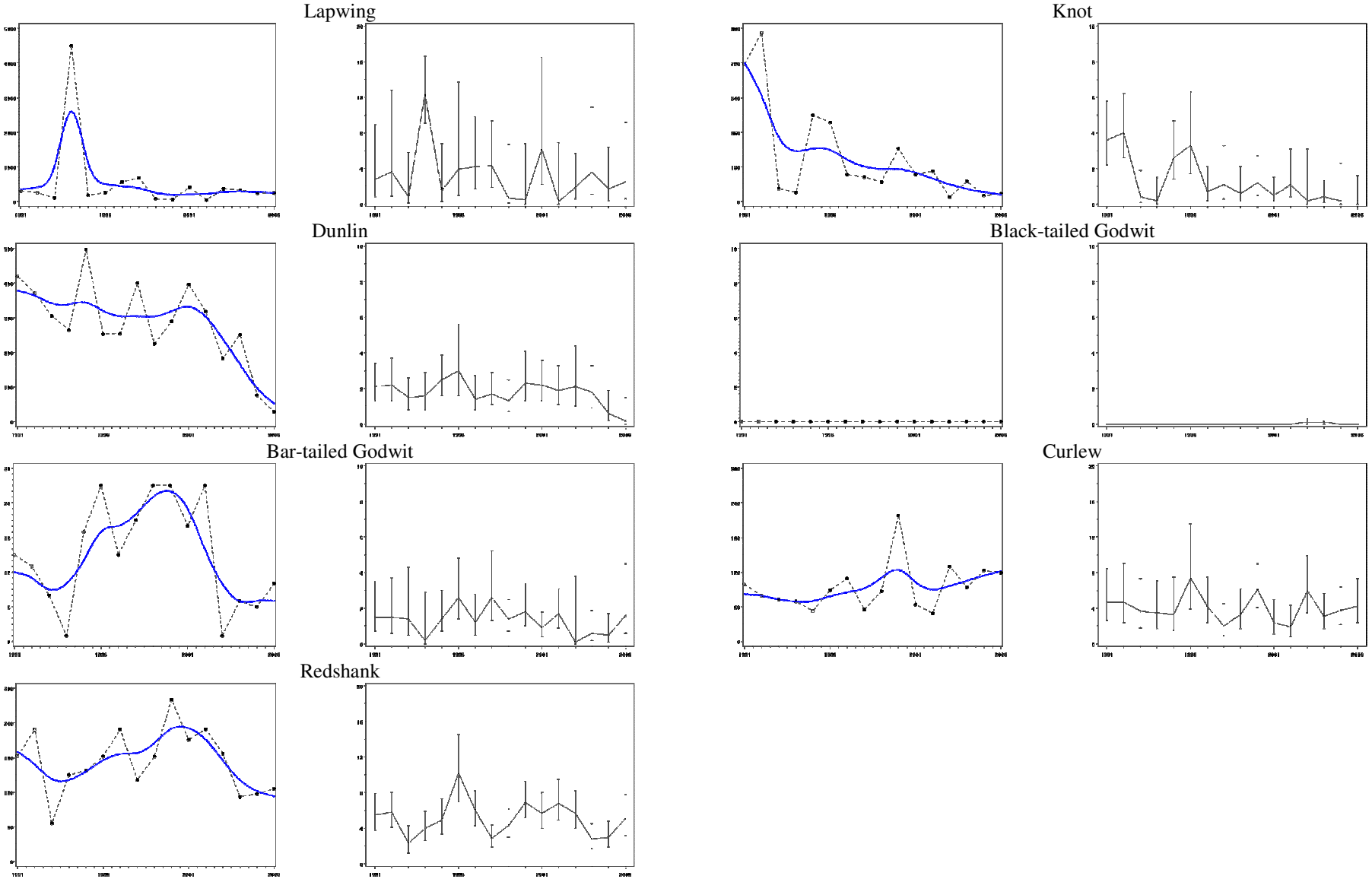

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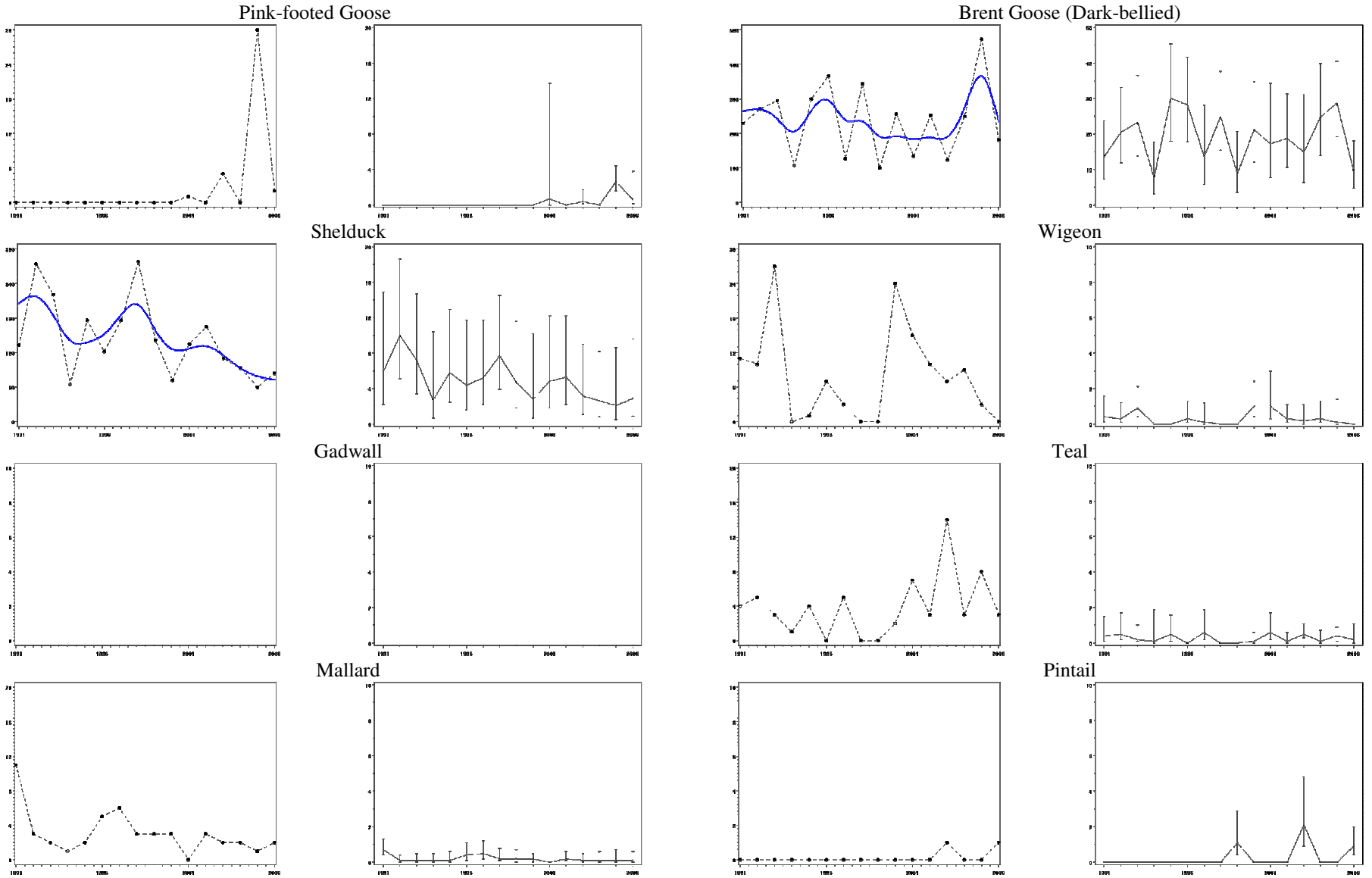
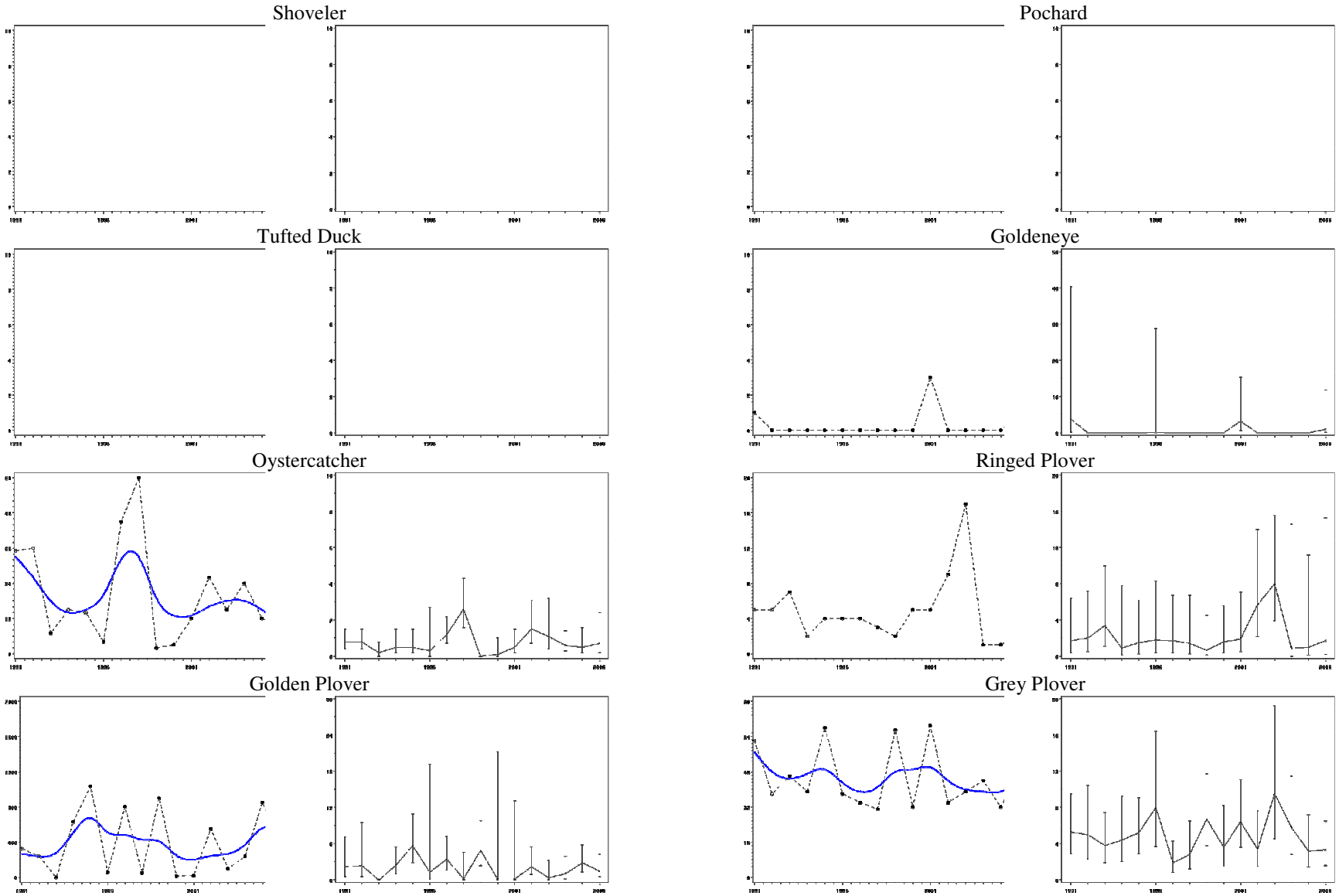


Figure B.35481 Population trends of each species in sector 35481 (Saltfleet) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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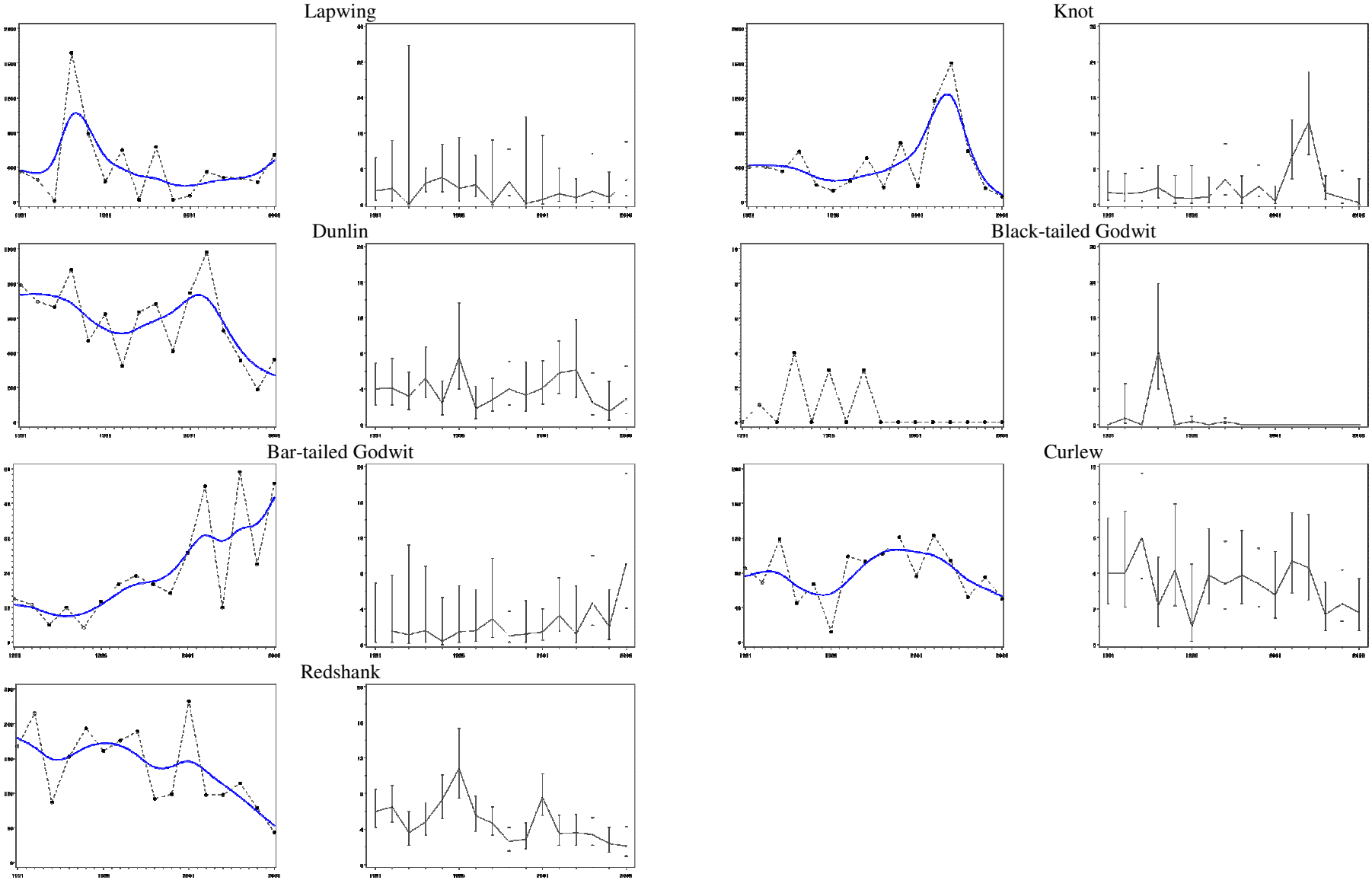

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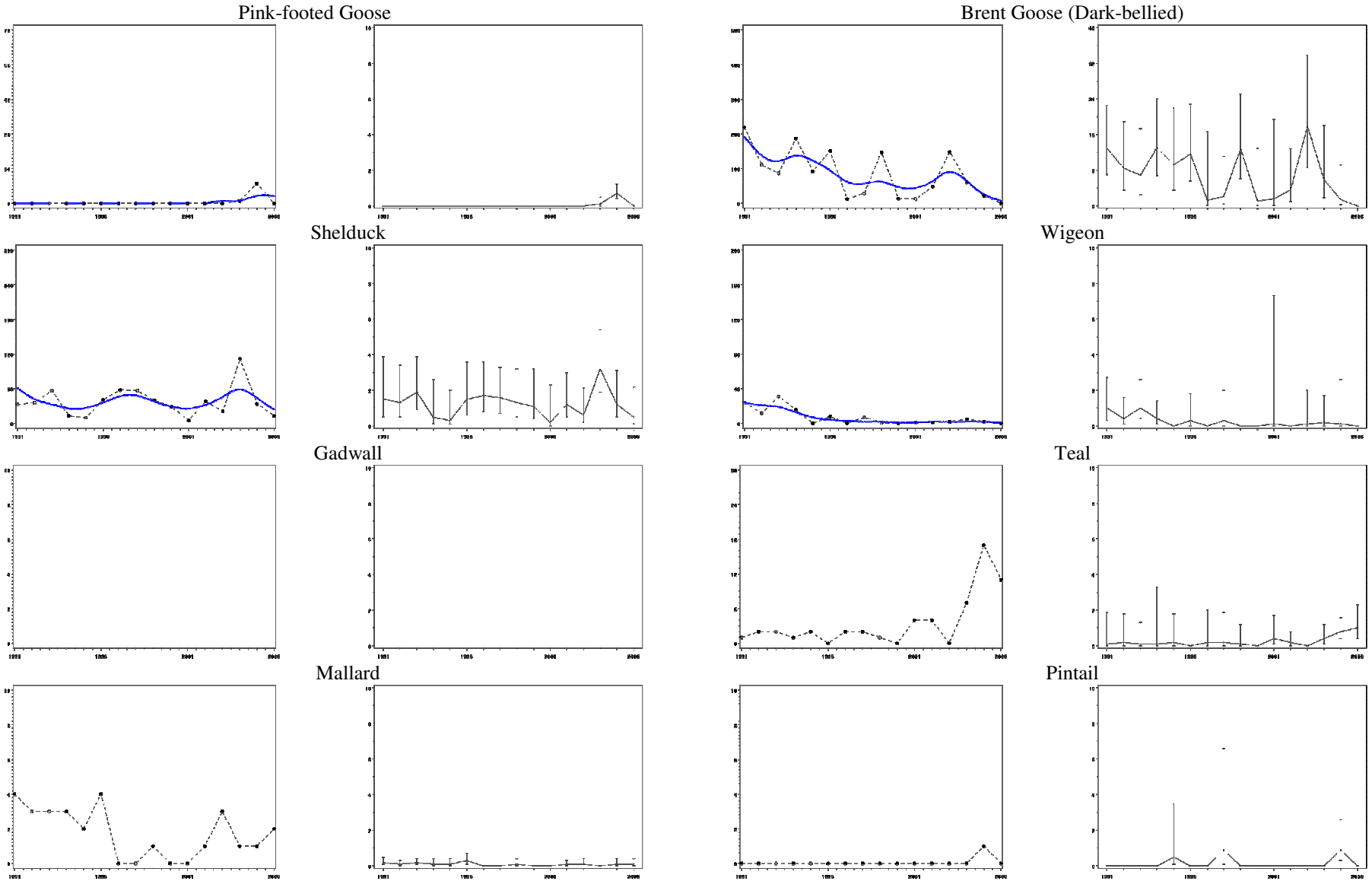
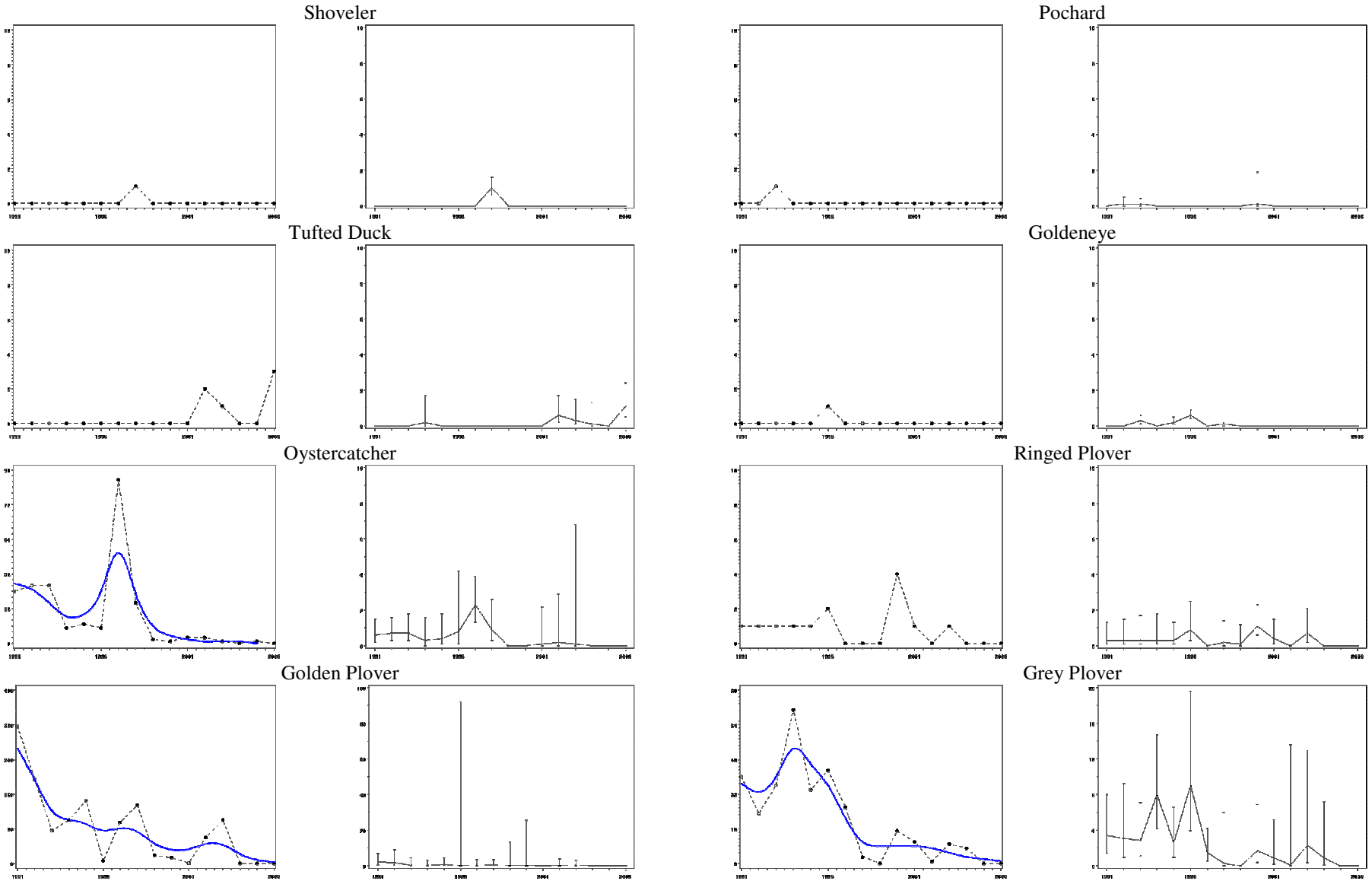


Figure B.35483 Population trends of each species in sector 35483 (Donna Nook (Humber)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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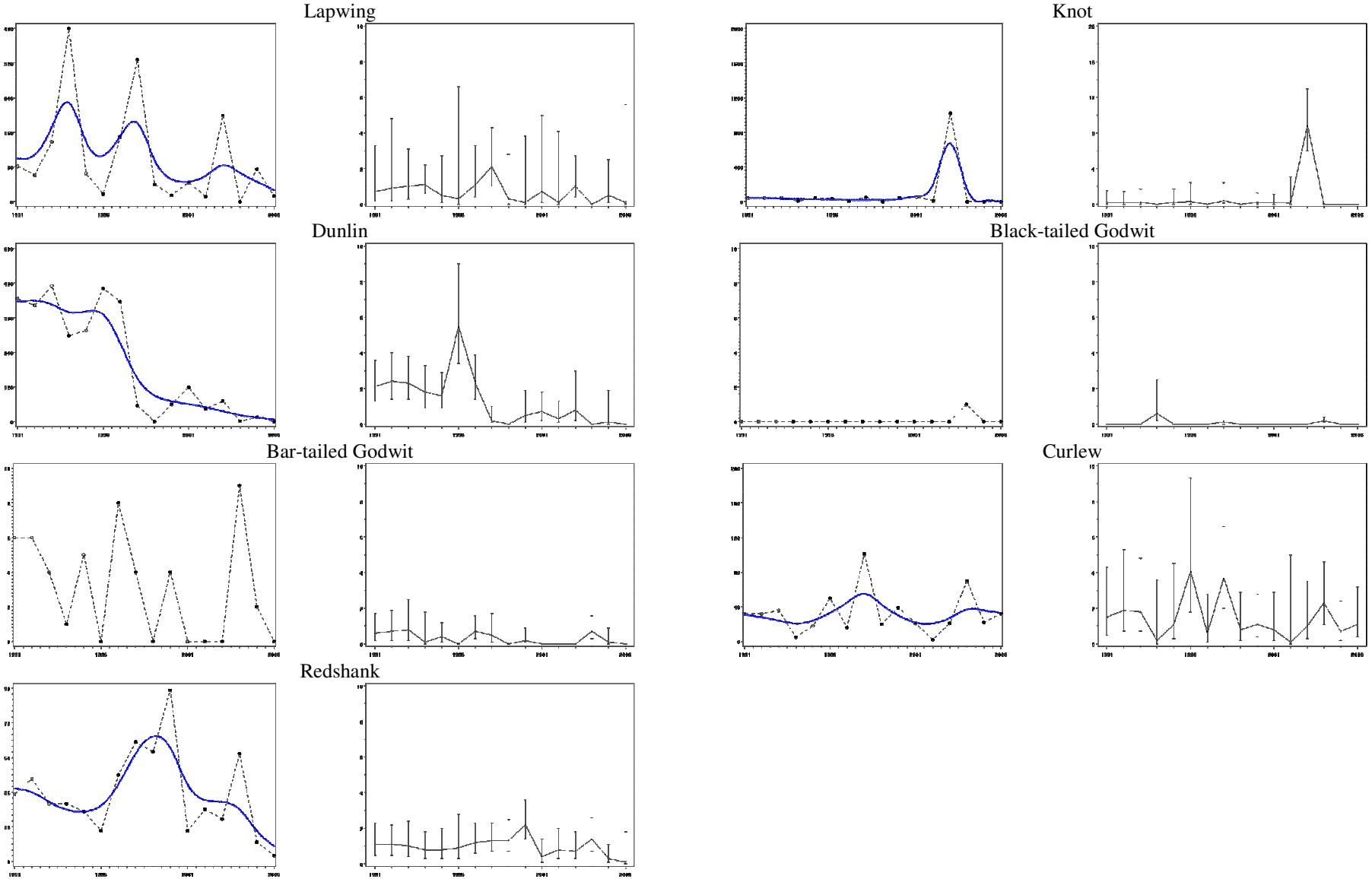

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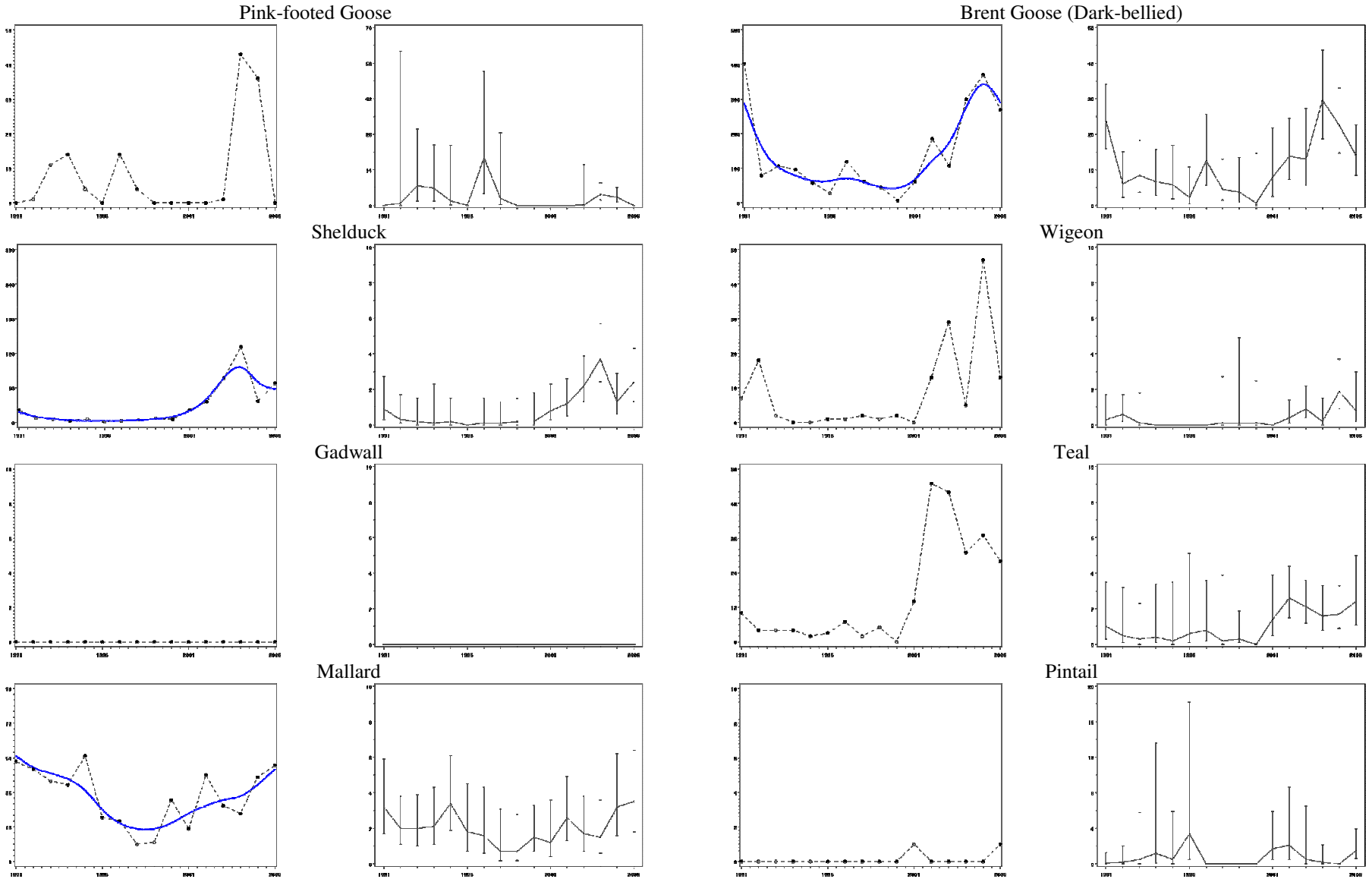
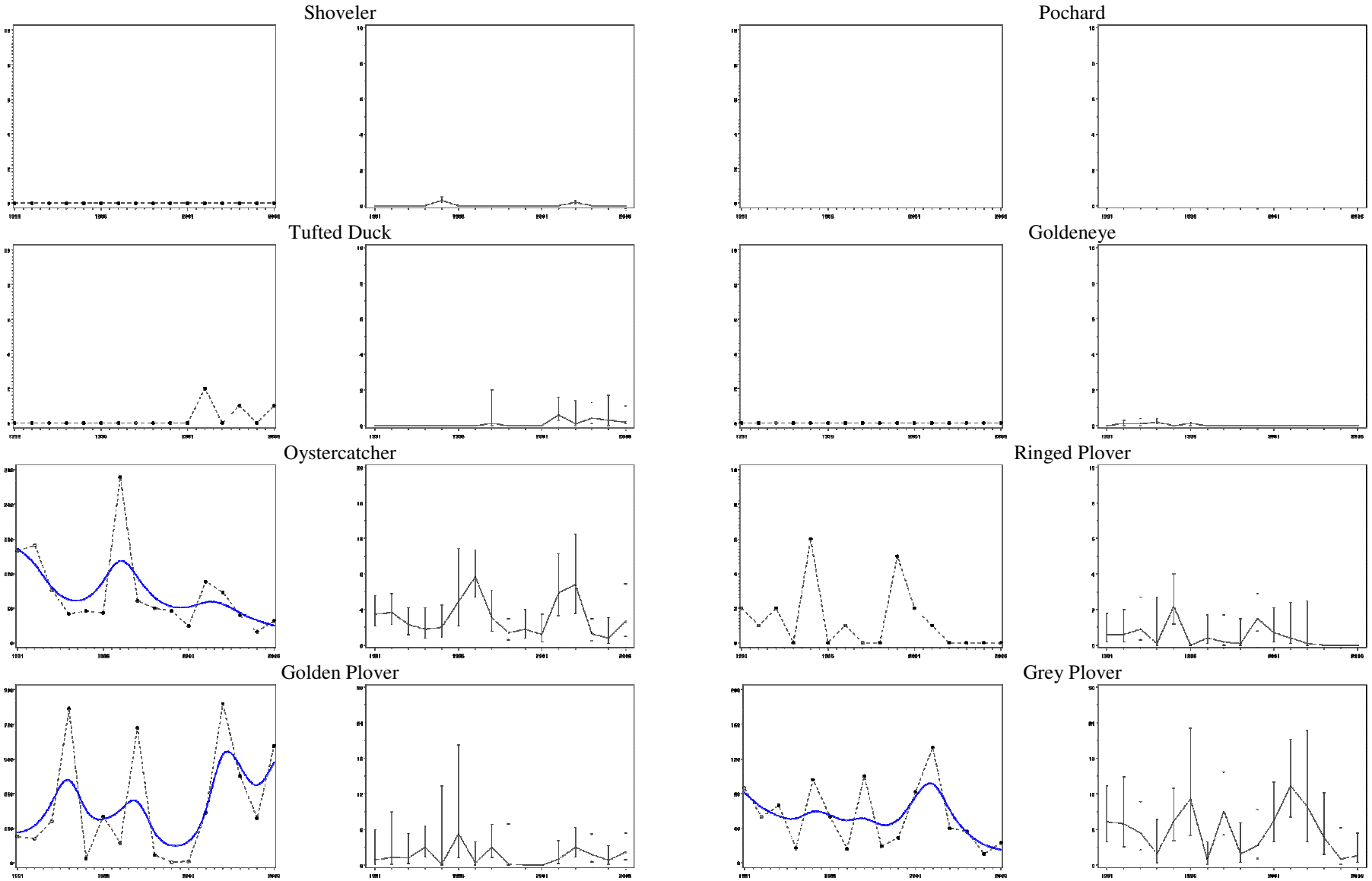


Figure B.35484 Population trends of each species in sector 35484 (Somercotes to Donna Nook) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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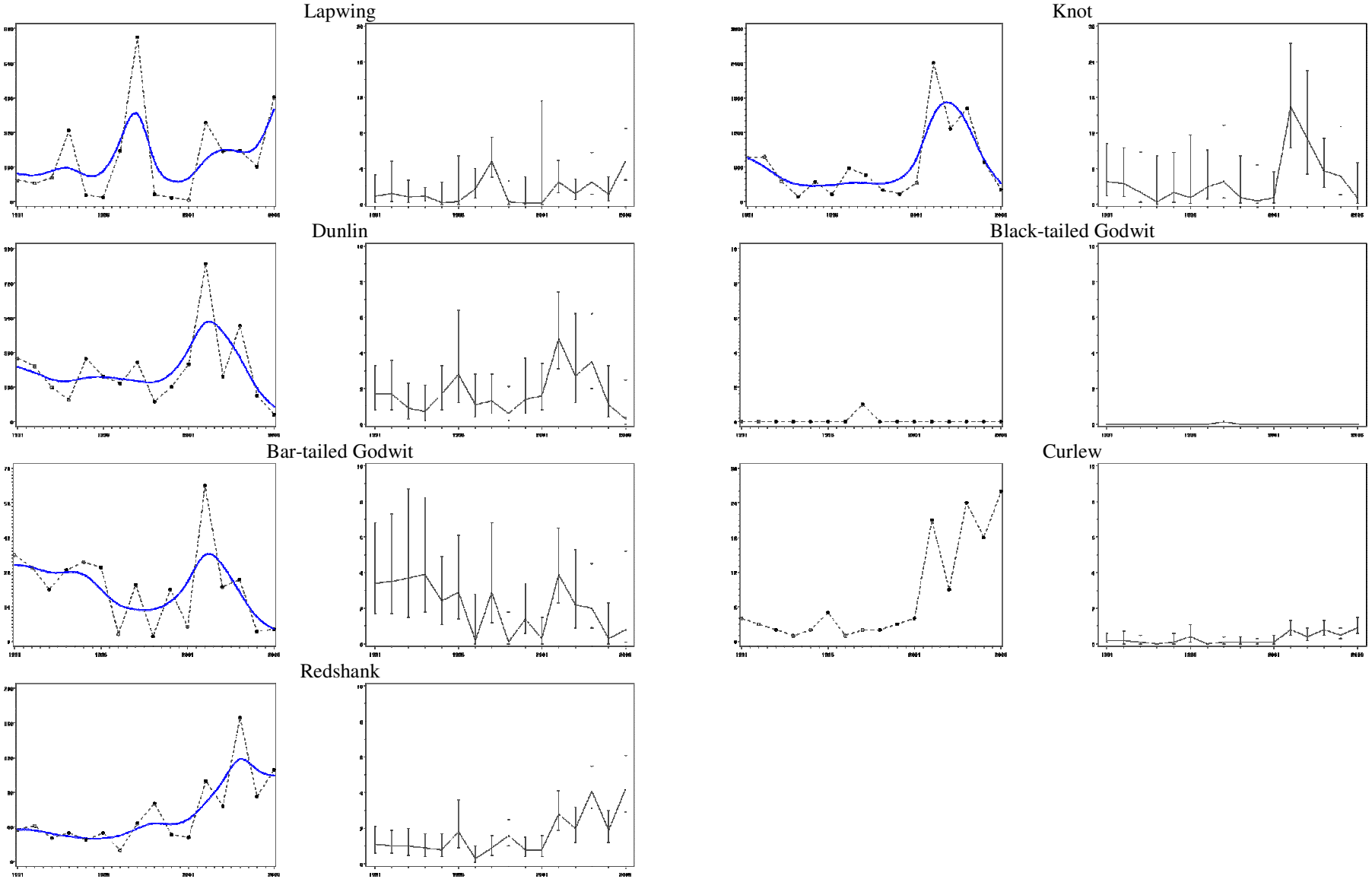

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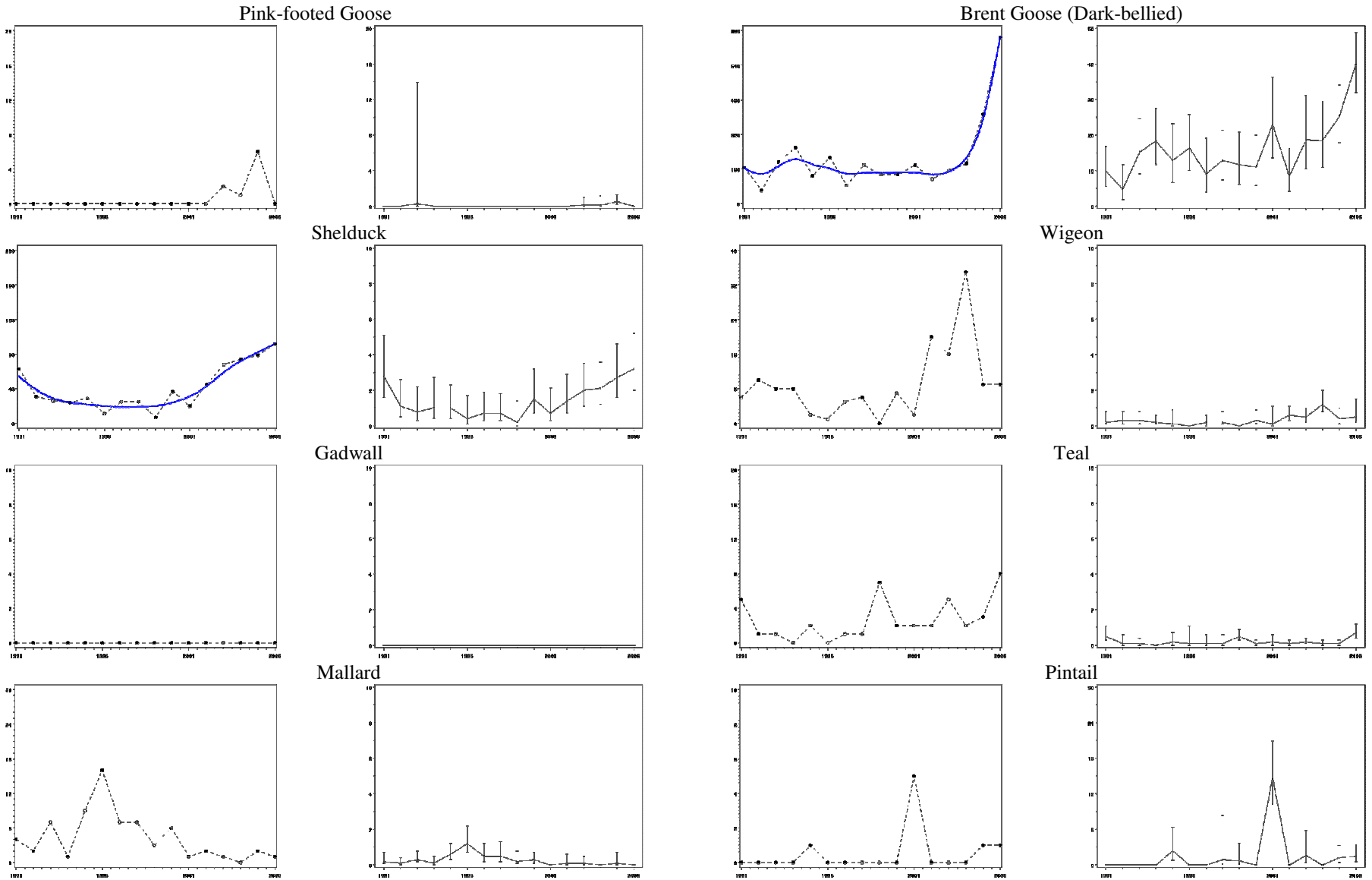
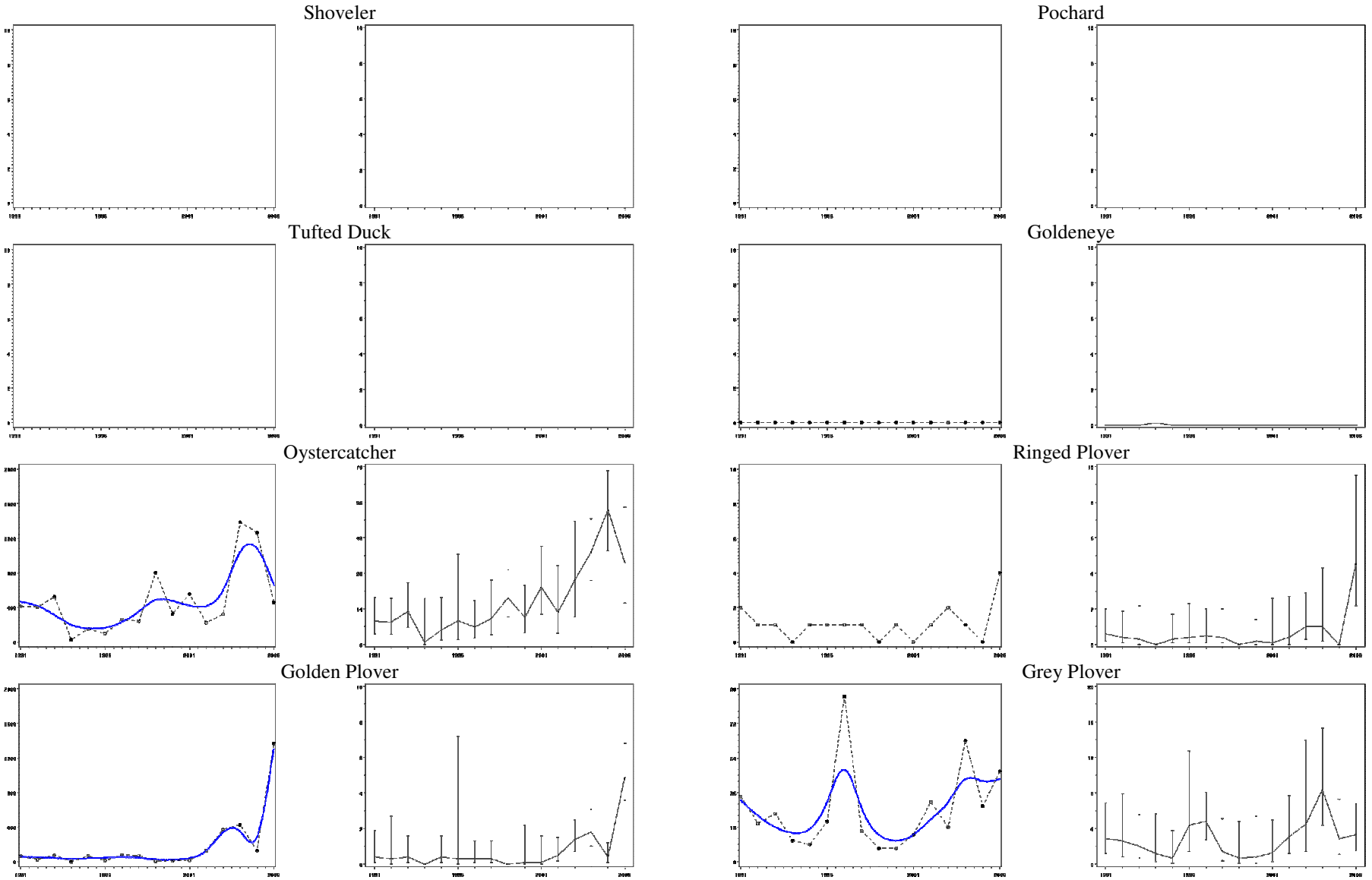


Figure B.35485 Population trends of each species in sector 35485 (Grainthorpe Haven (Humber) Pye`s Hall to Horseshoe Point) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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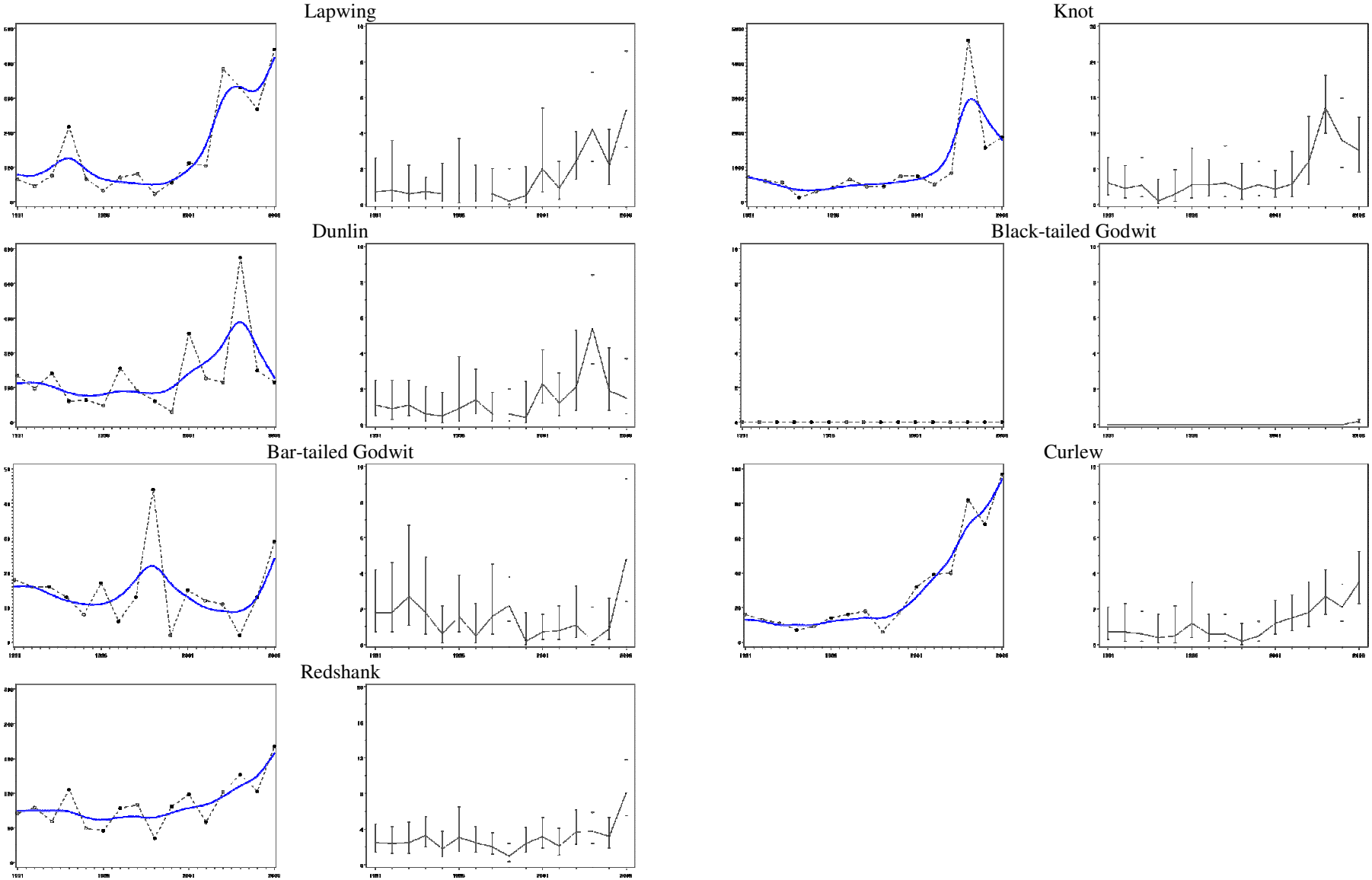

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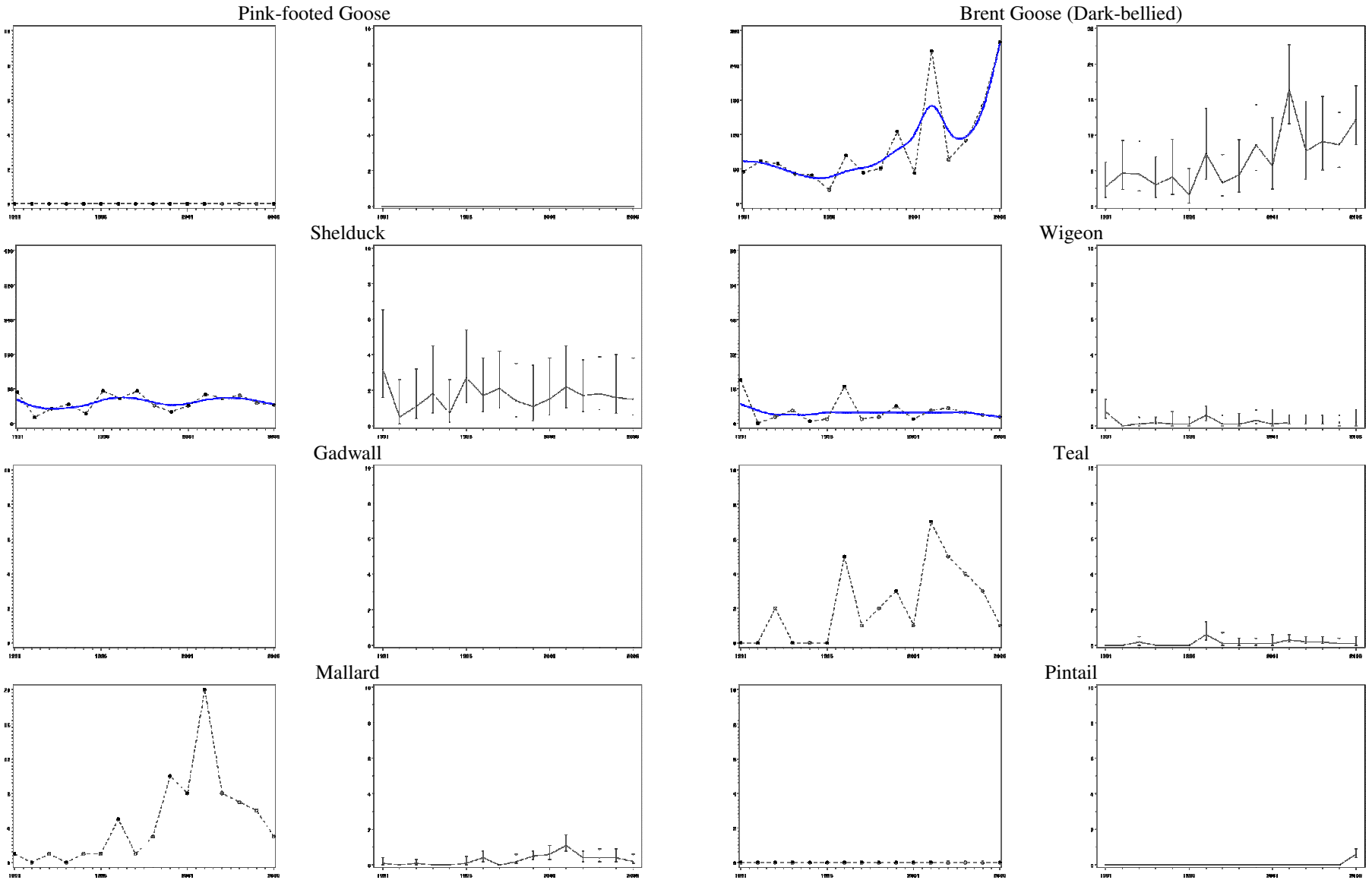
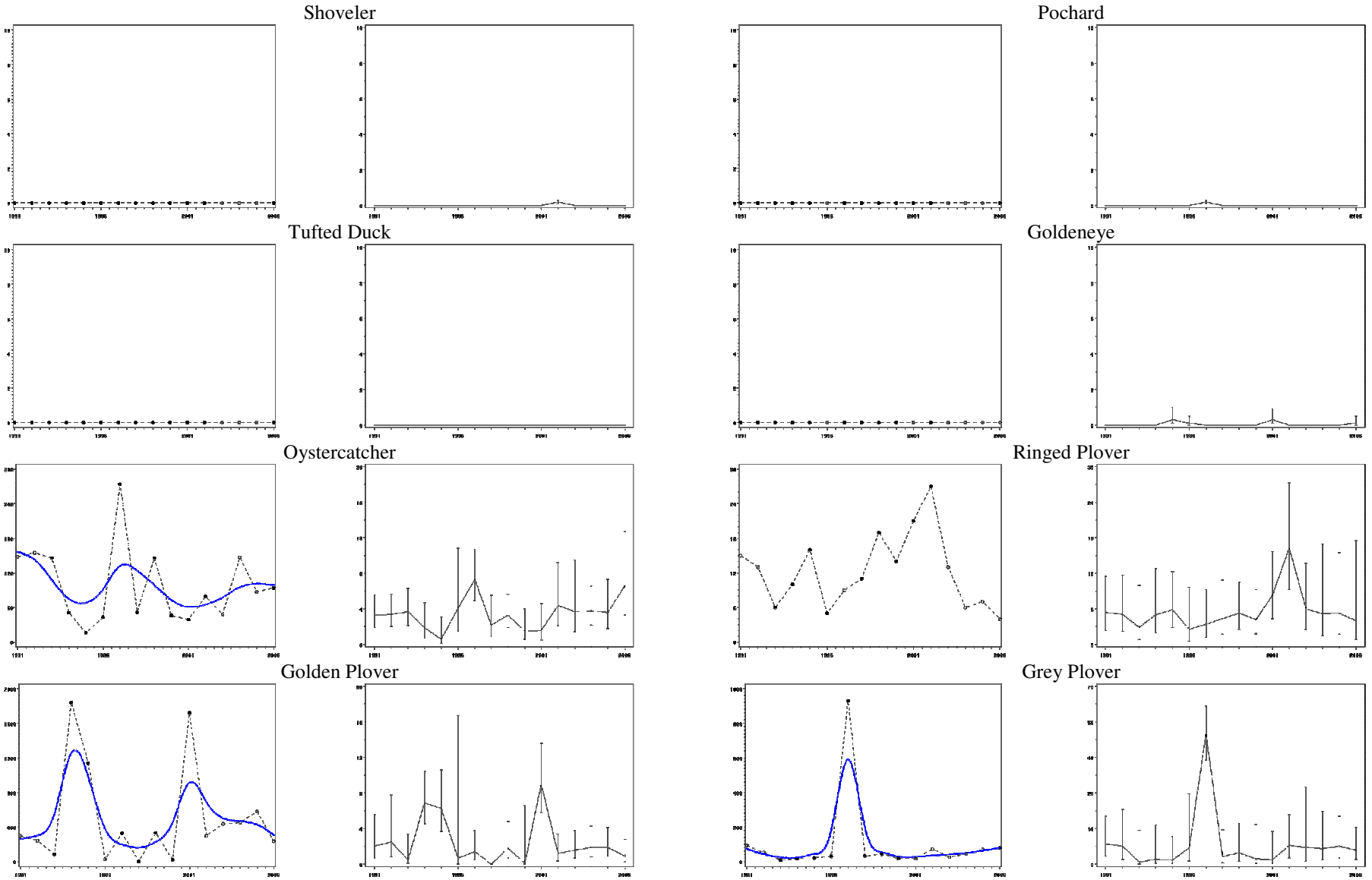


Figure B.35486 Population trends of each species in sector 35486 (Horseshoe Point to Tetney Haven) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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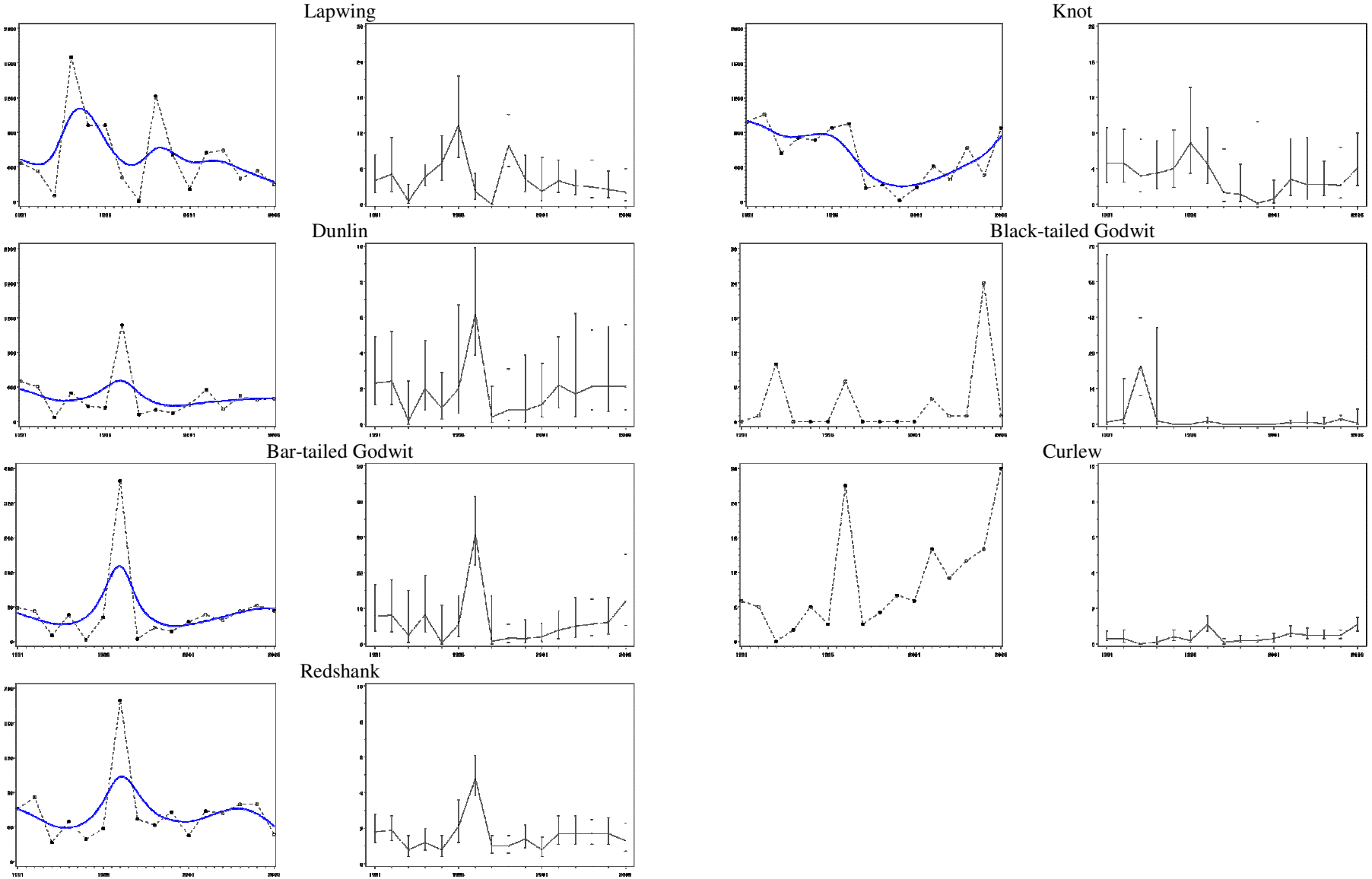

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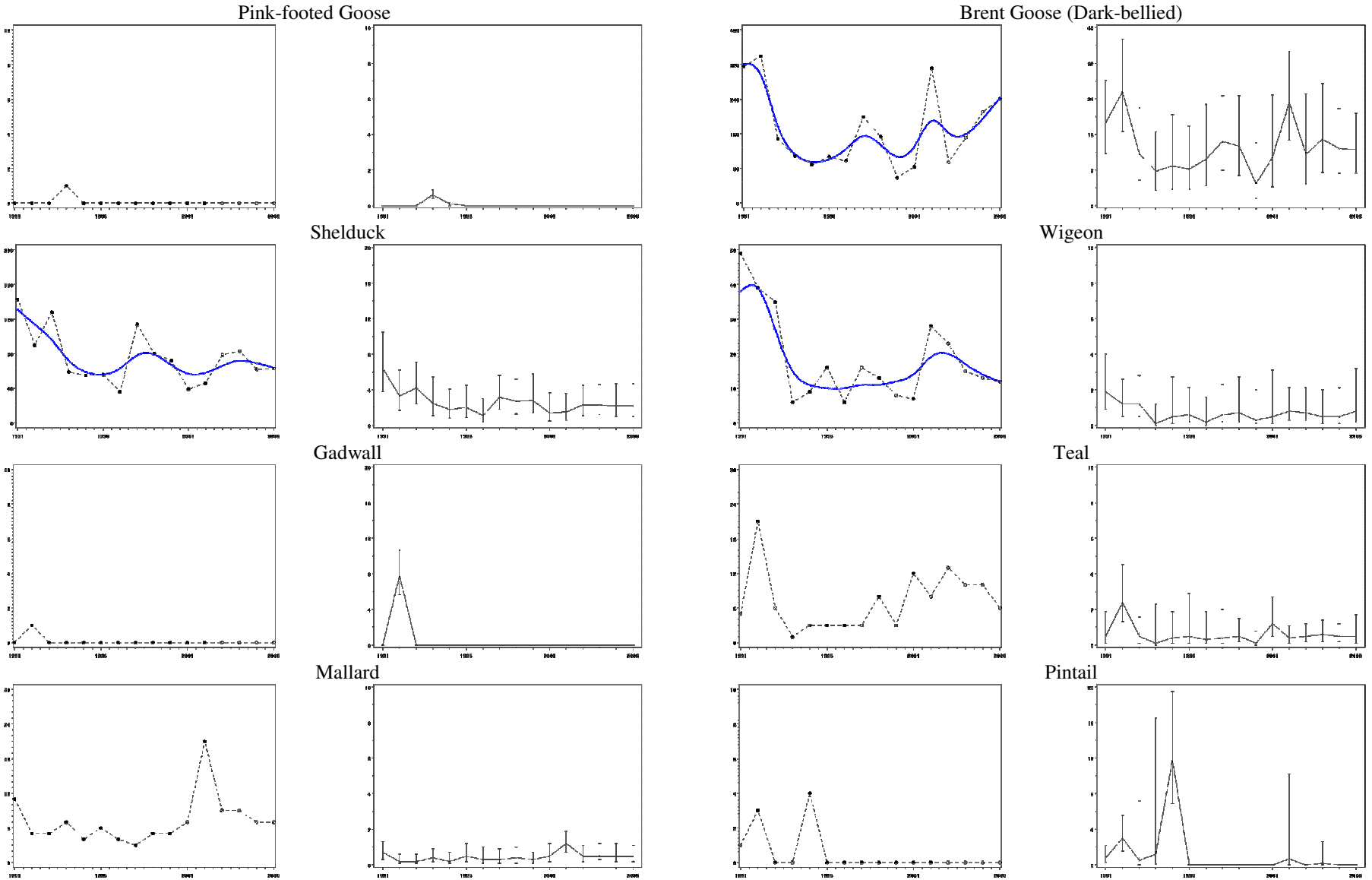
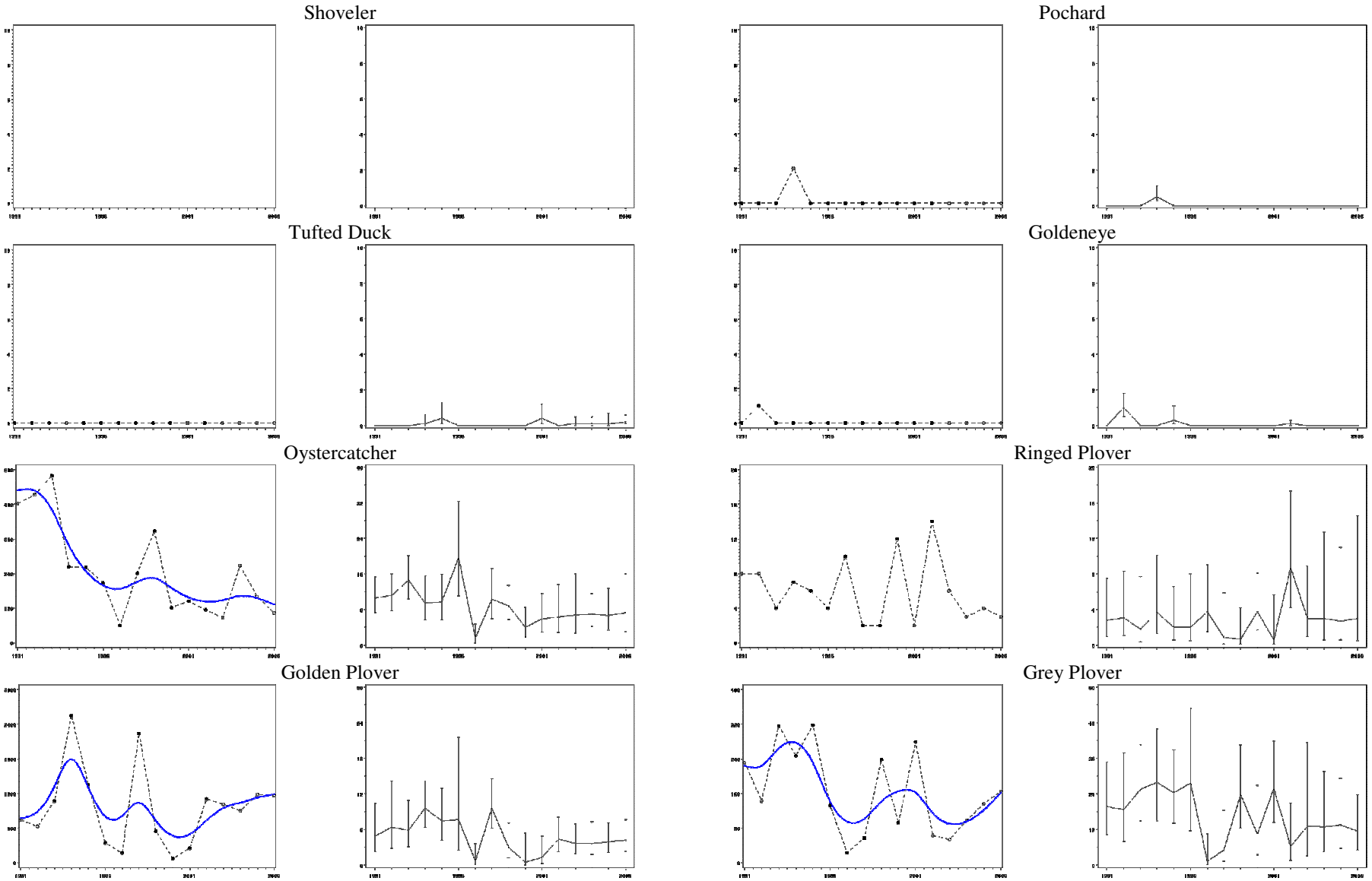


Figure B.35487 Population trends of each species in sector 35487 (Tetney Haven to Humberston Fitties) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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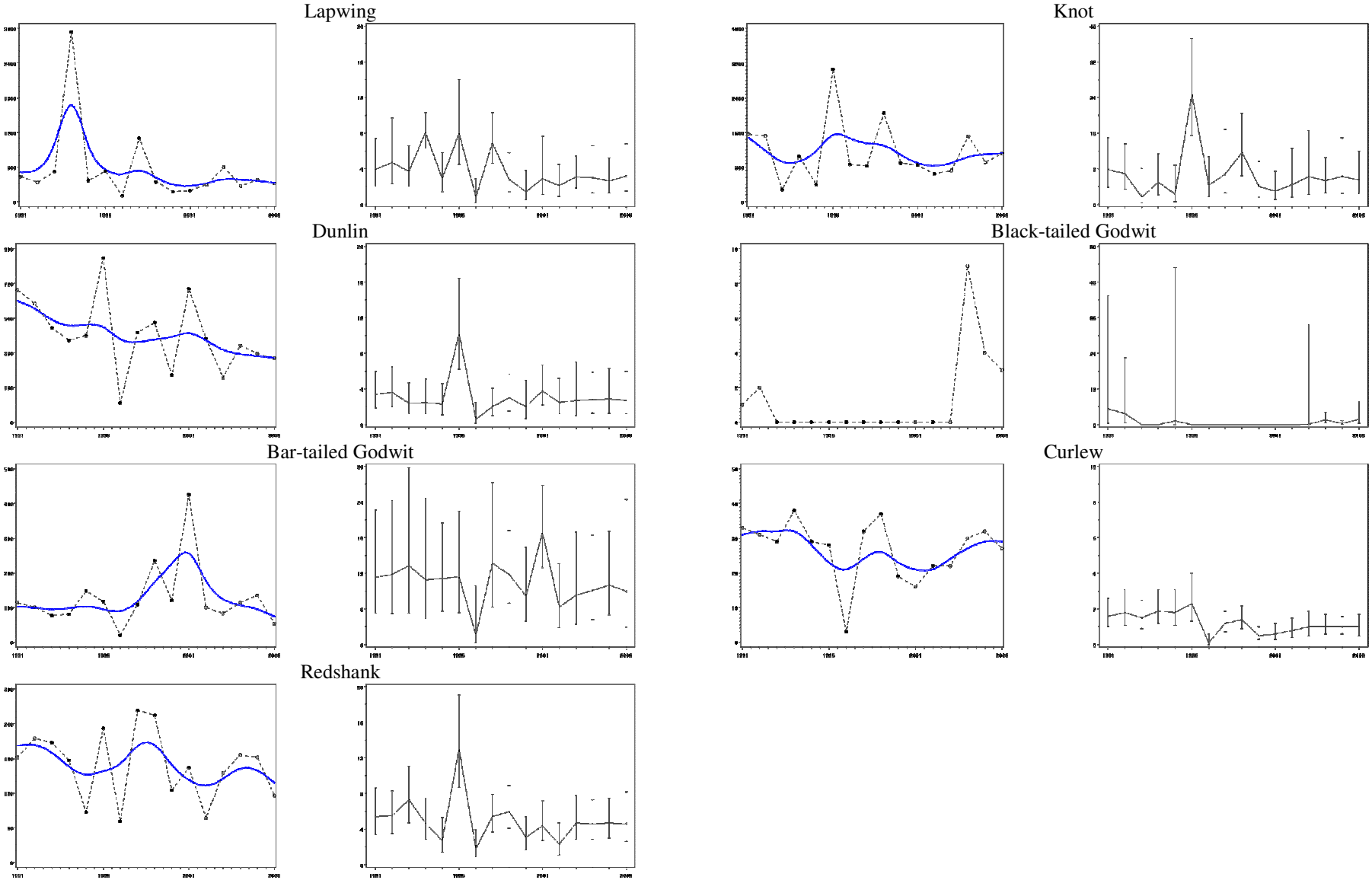

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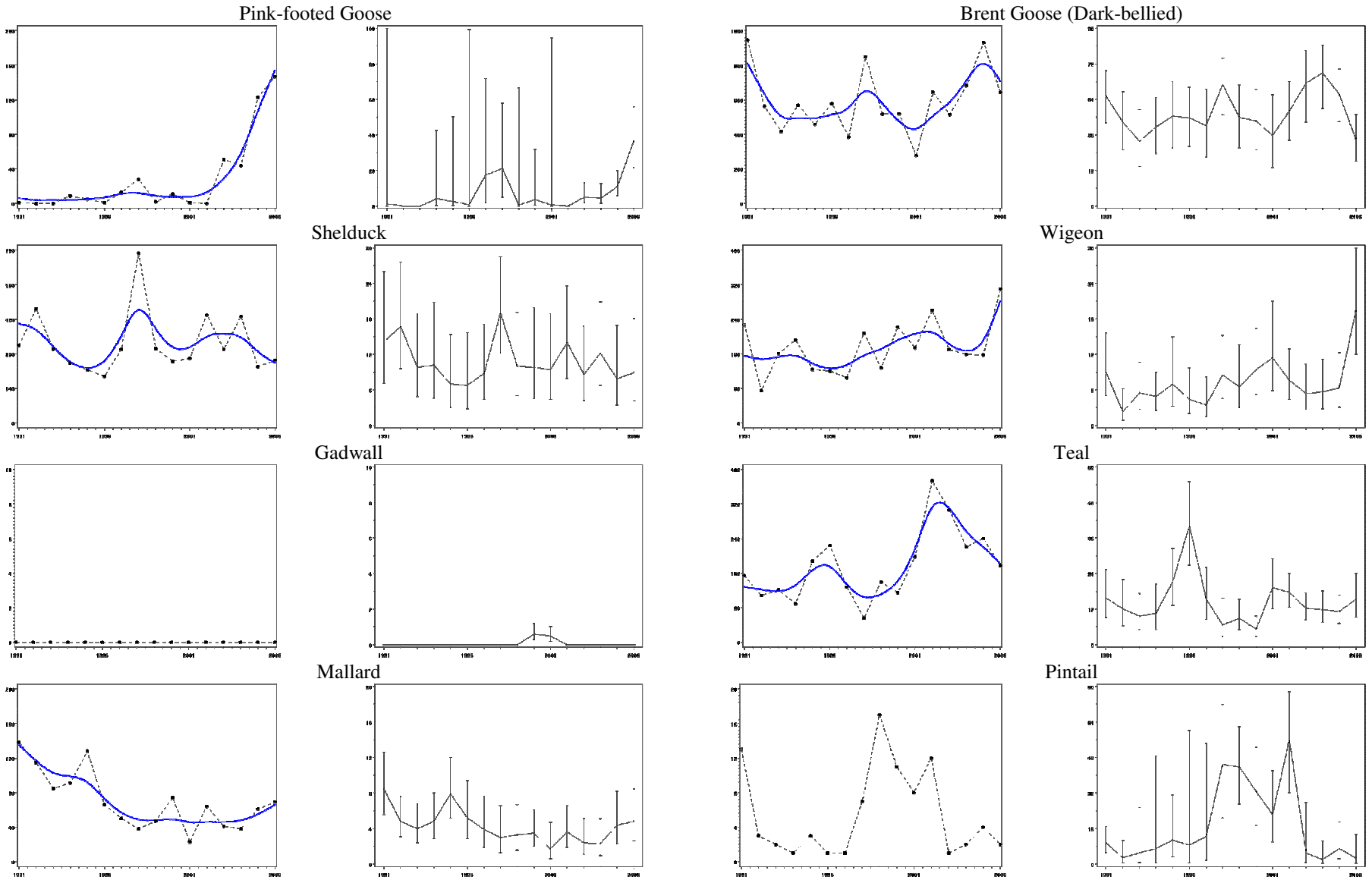
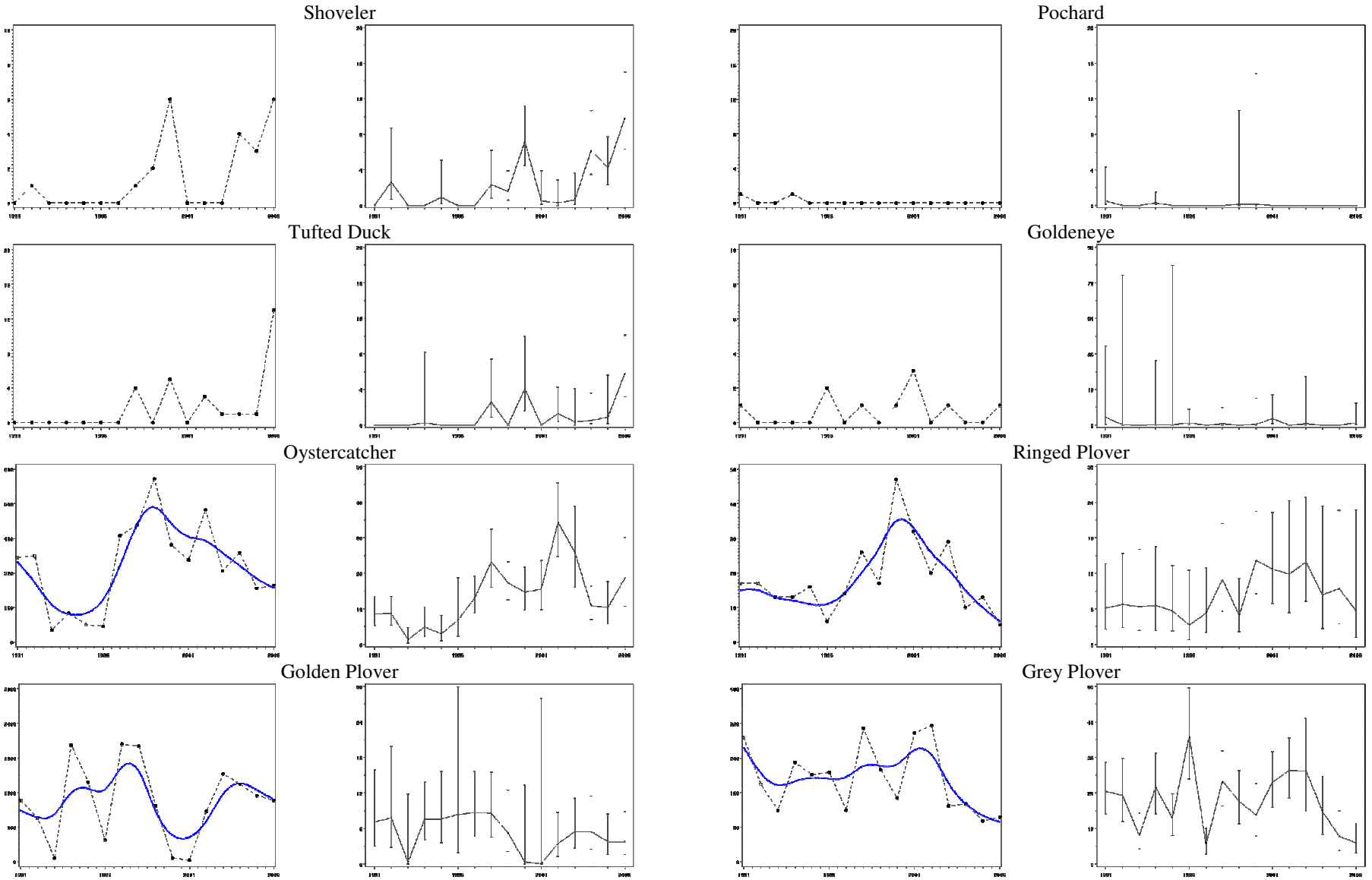


Figure B.35983 Population trends of each species in sector 35983 (Humber - Theddlethorpe to Grainthorpe Marsh) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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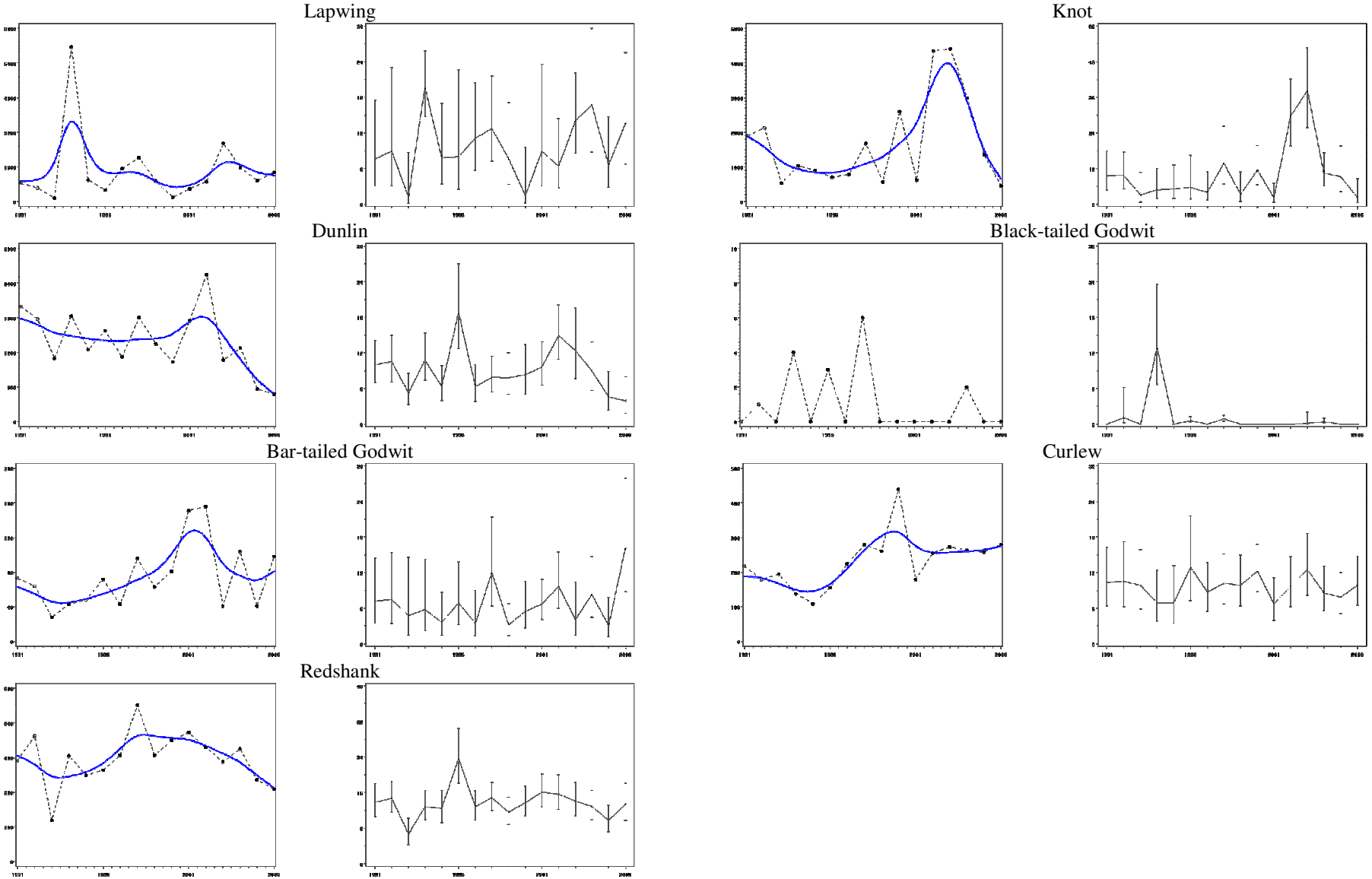

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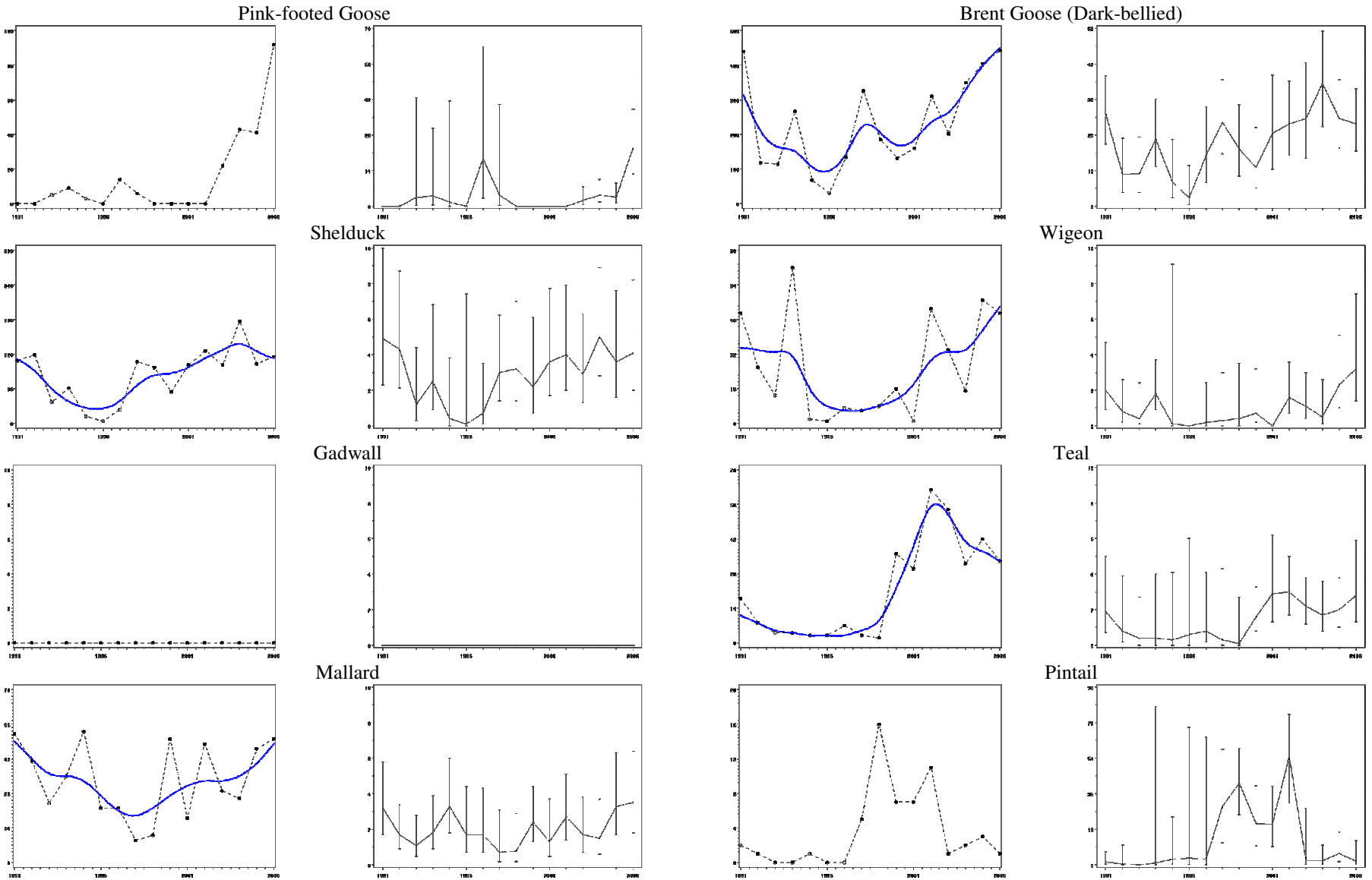
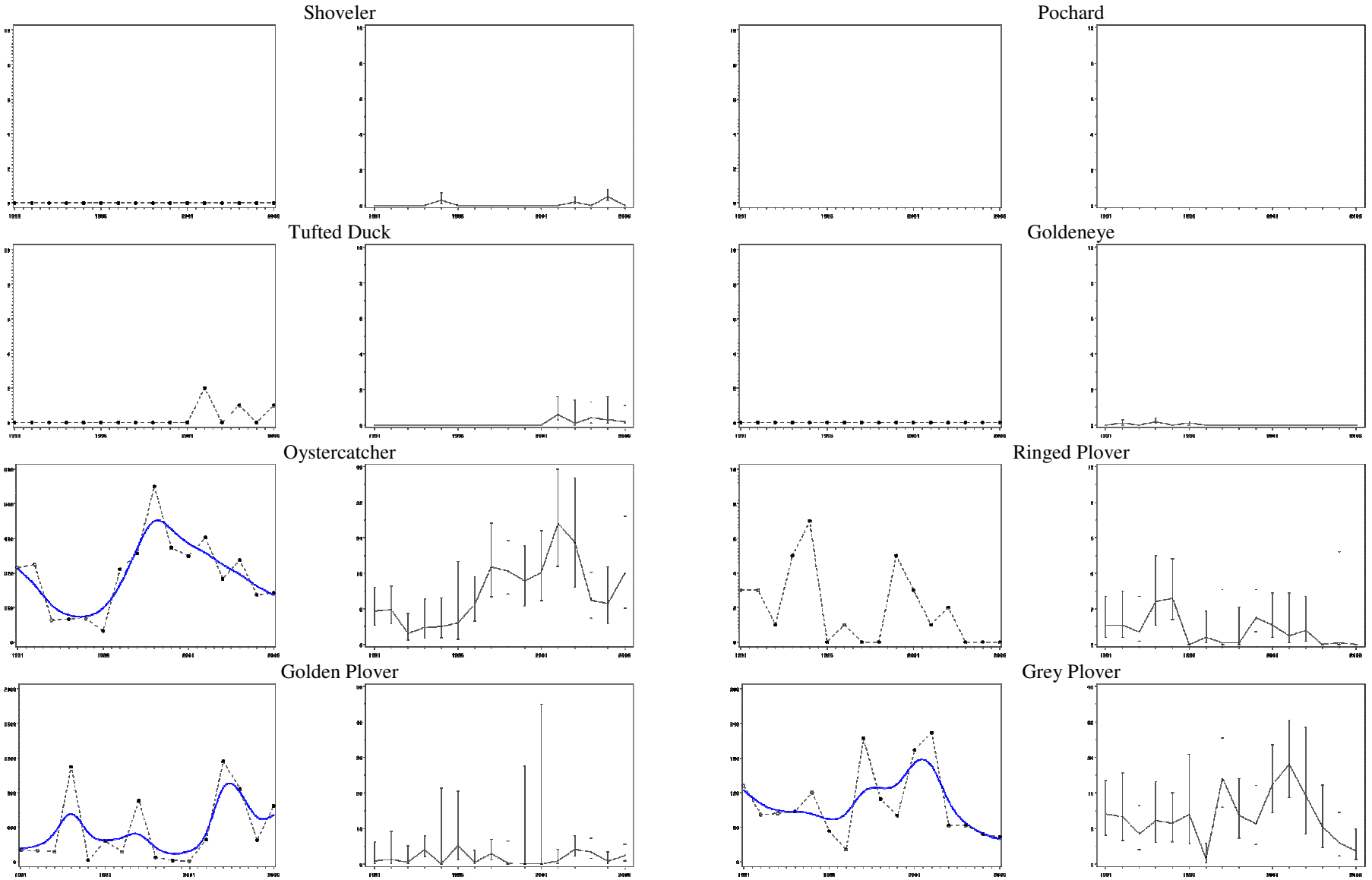


Figure B.35984 Population trends of each species in sector 35984 (Donna Nook to Horseshoe Point (Humber)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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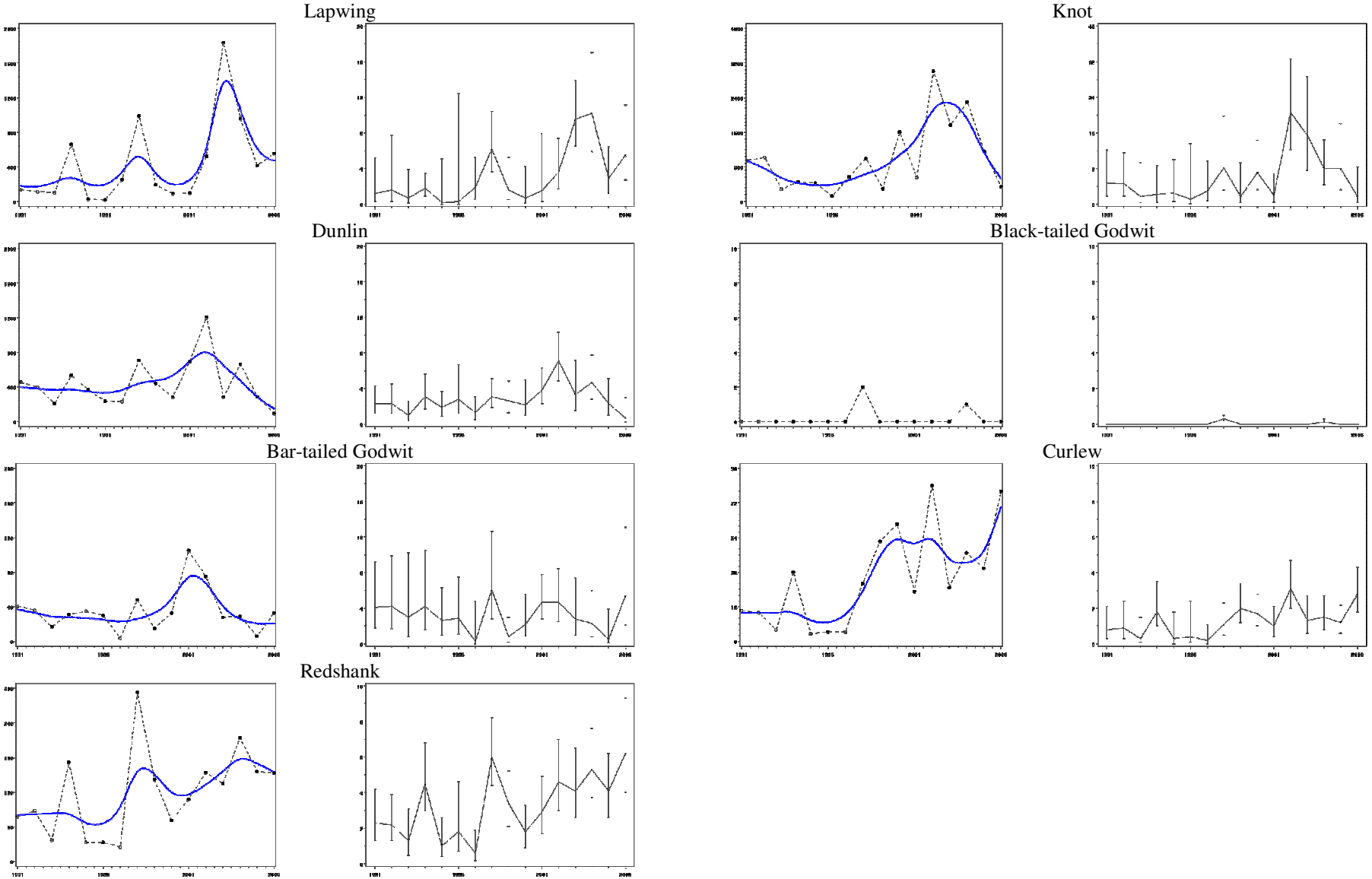


Figure B.35984 Continued.

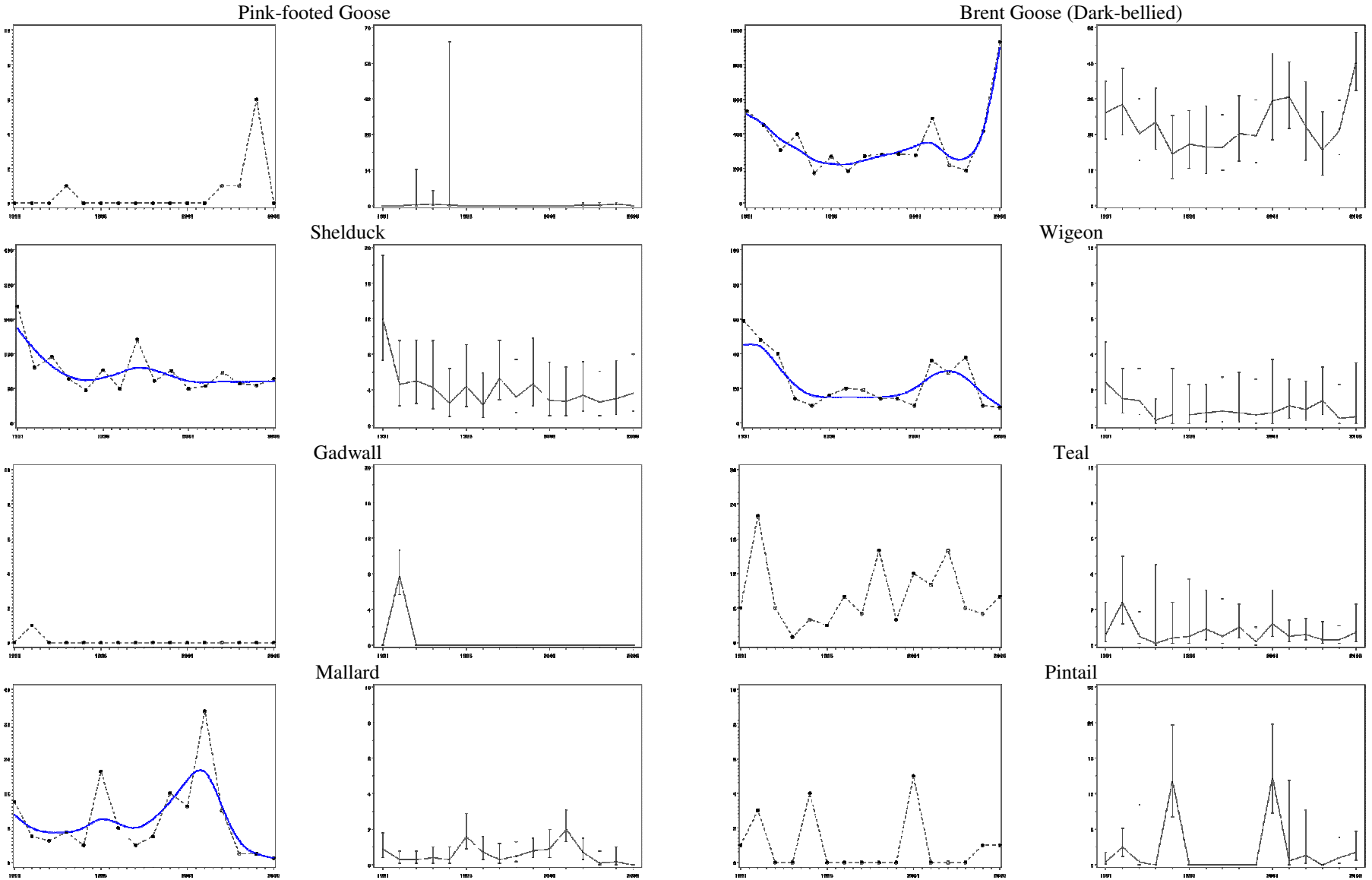


Figure B.35986 Population trends of each species in sector 35986 (Horseshoe Point to Humberston Fitties (Humber)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).

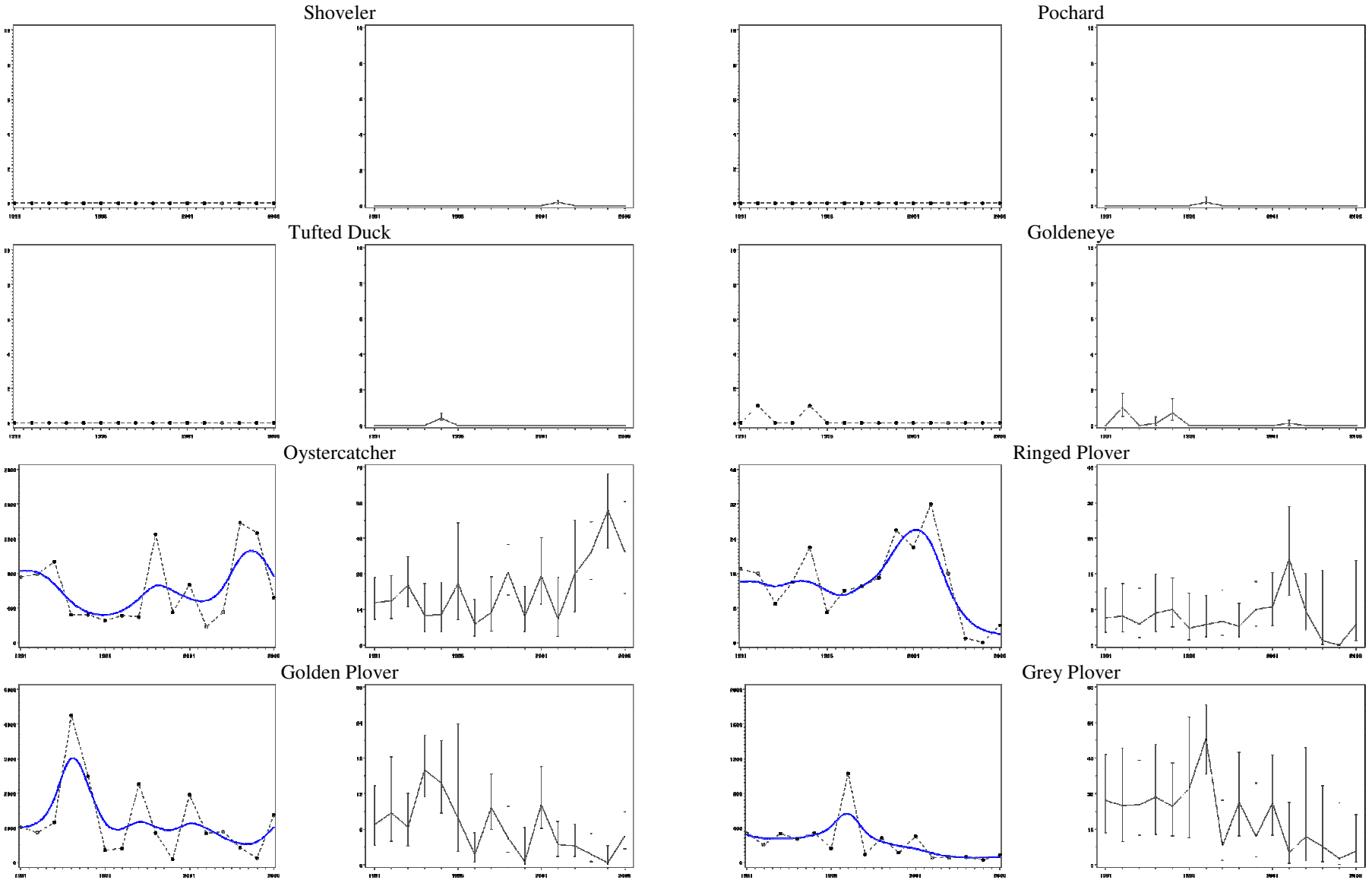


Figure B.35986 Continued.

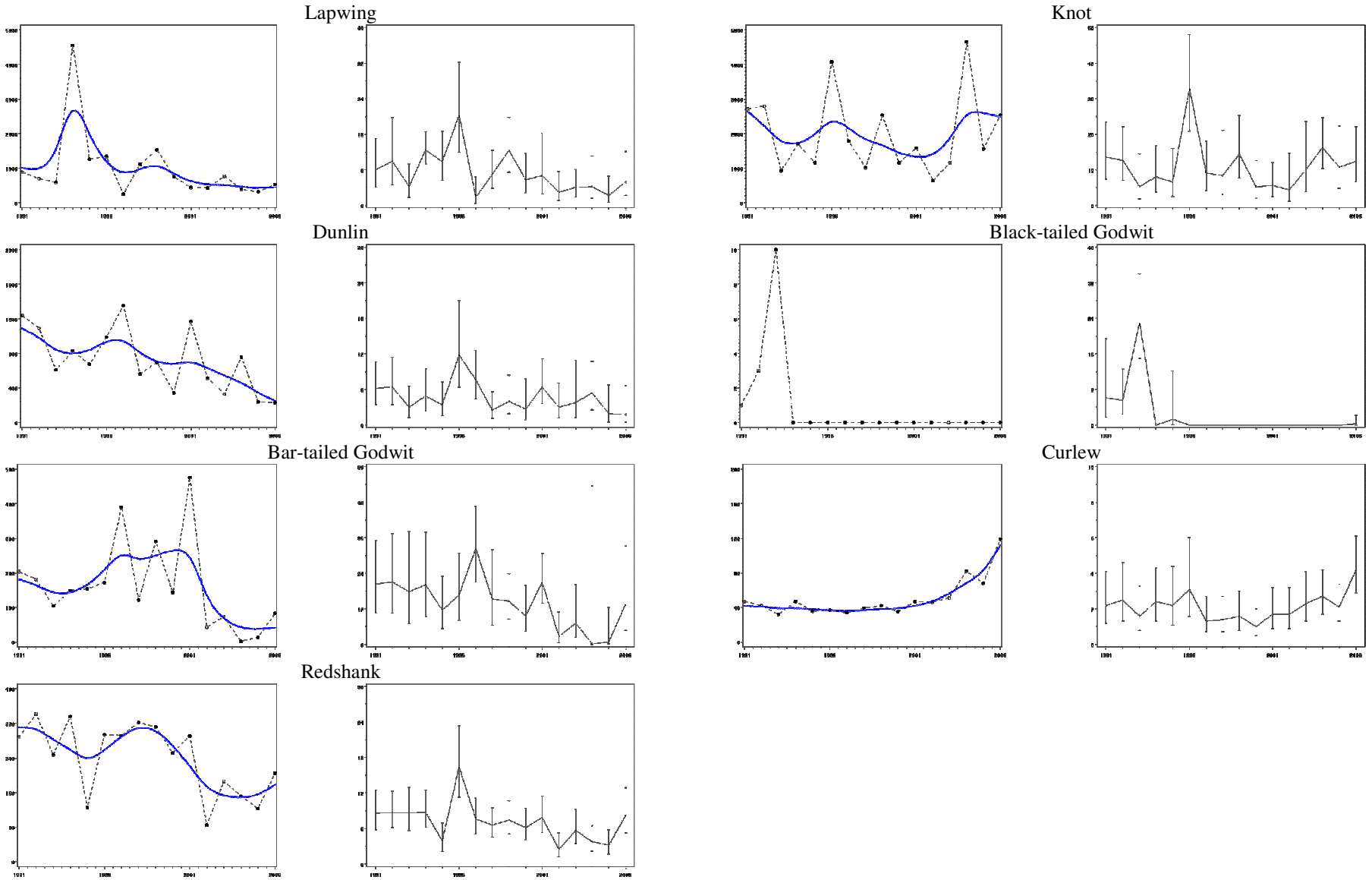


Figure B.35986 Continued.

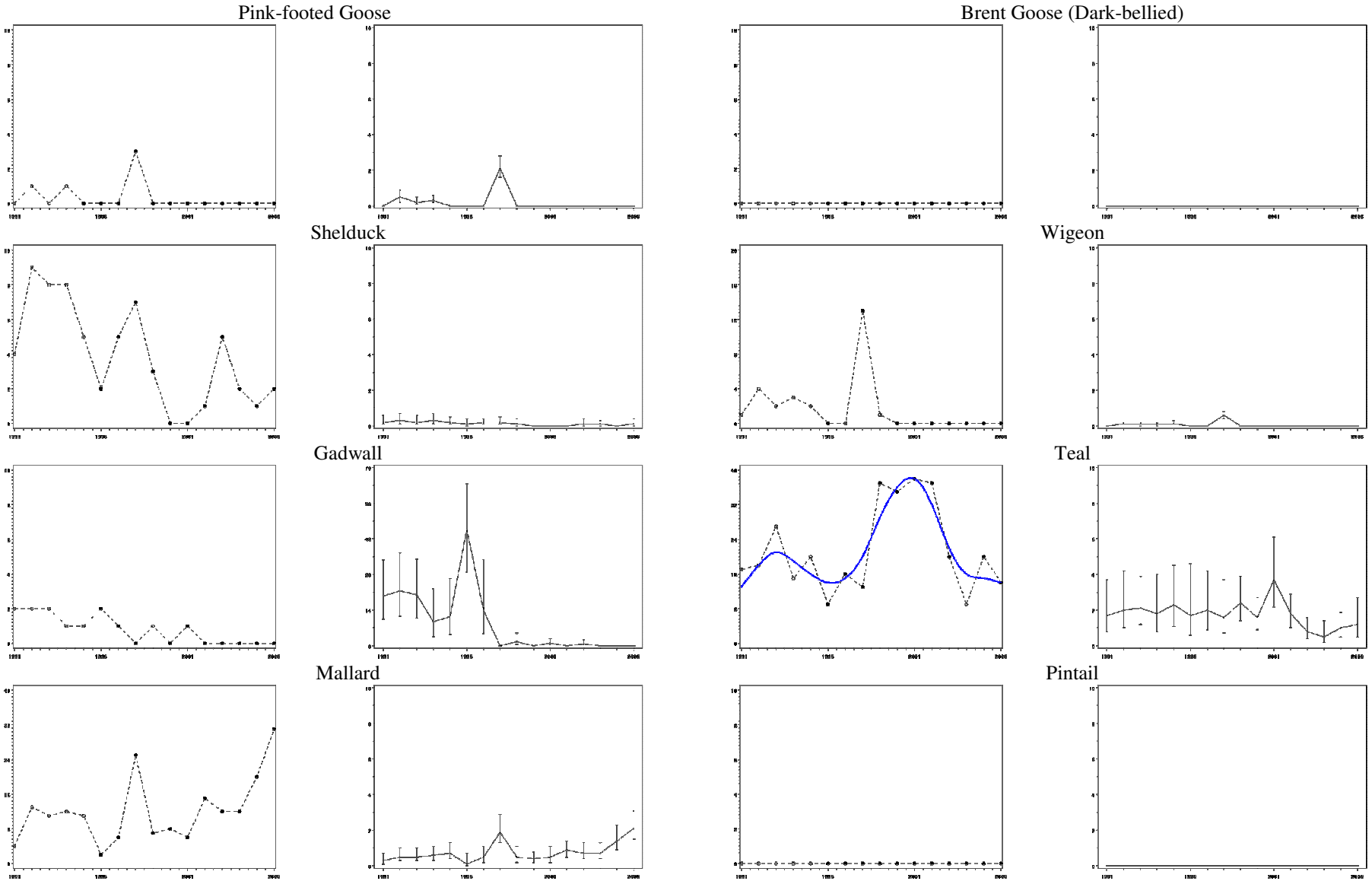
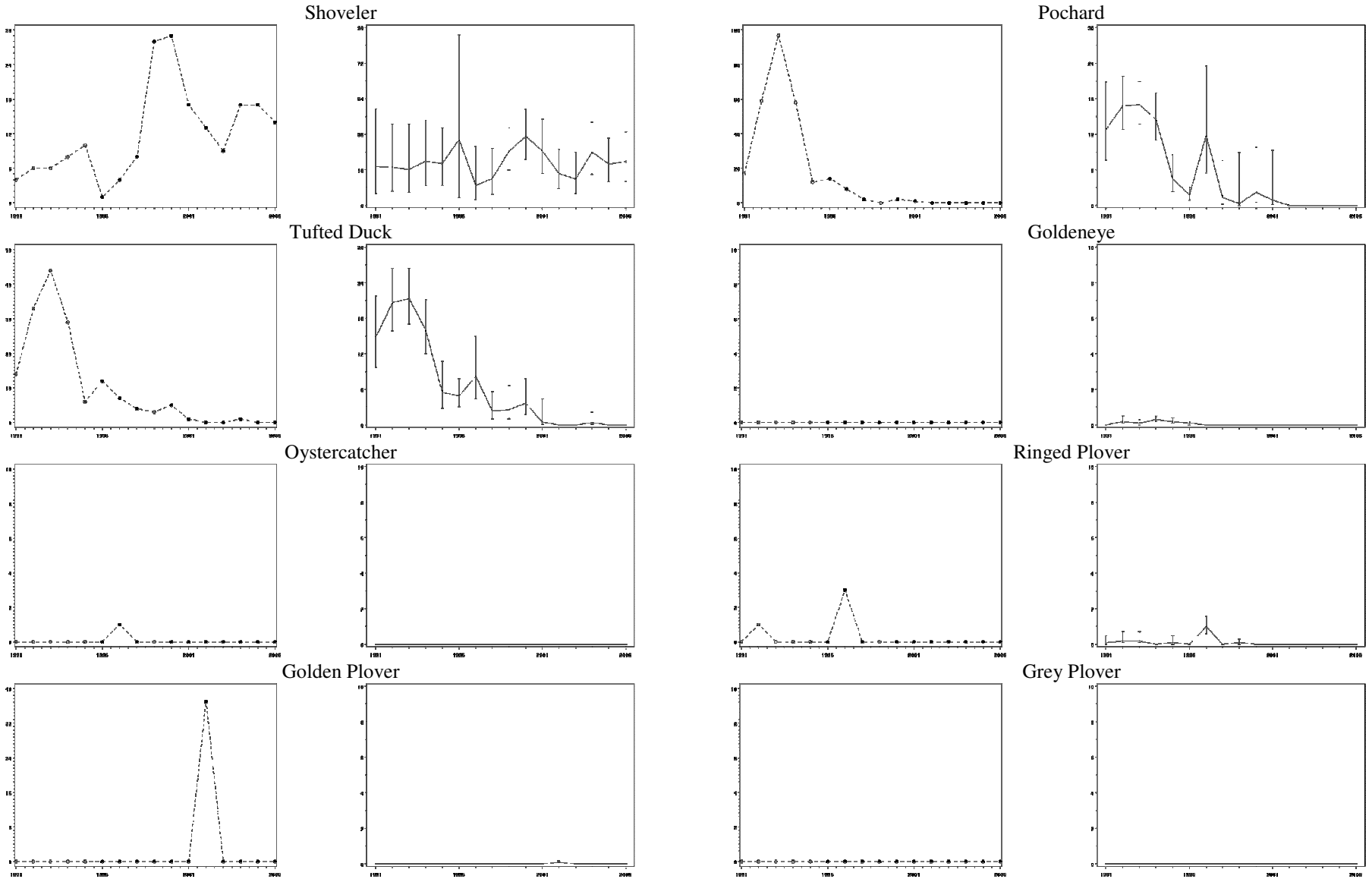


Figure B.38201 Population trends of each species in sector 38201 (North Killingholme Haven Pits) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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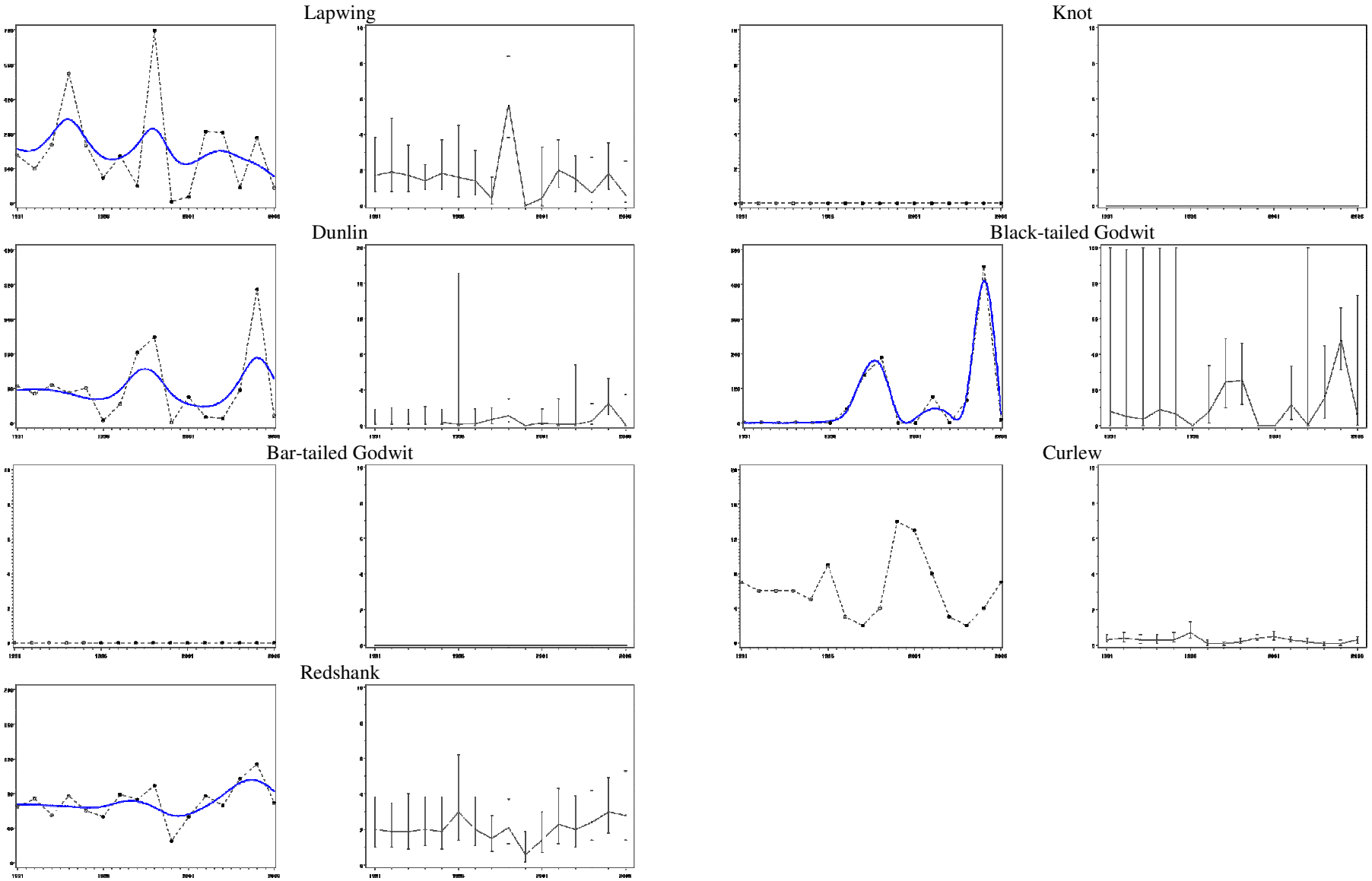

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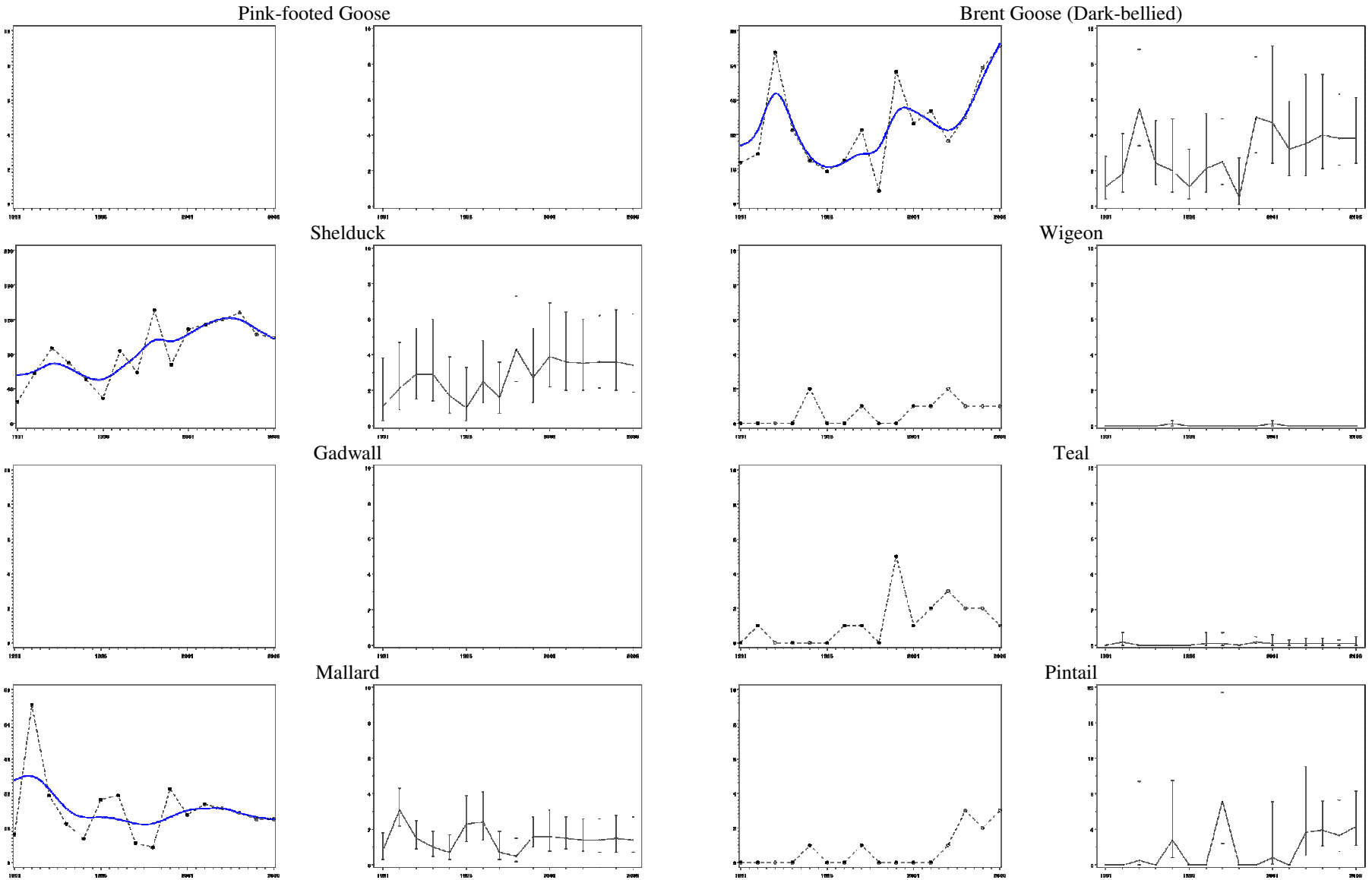
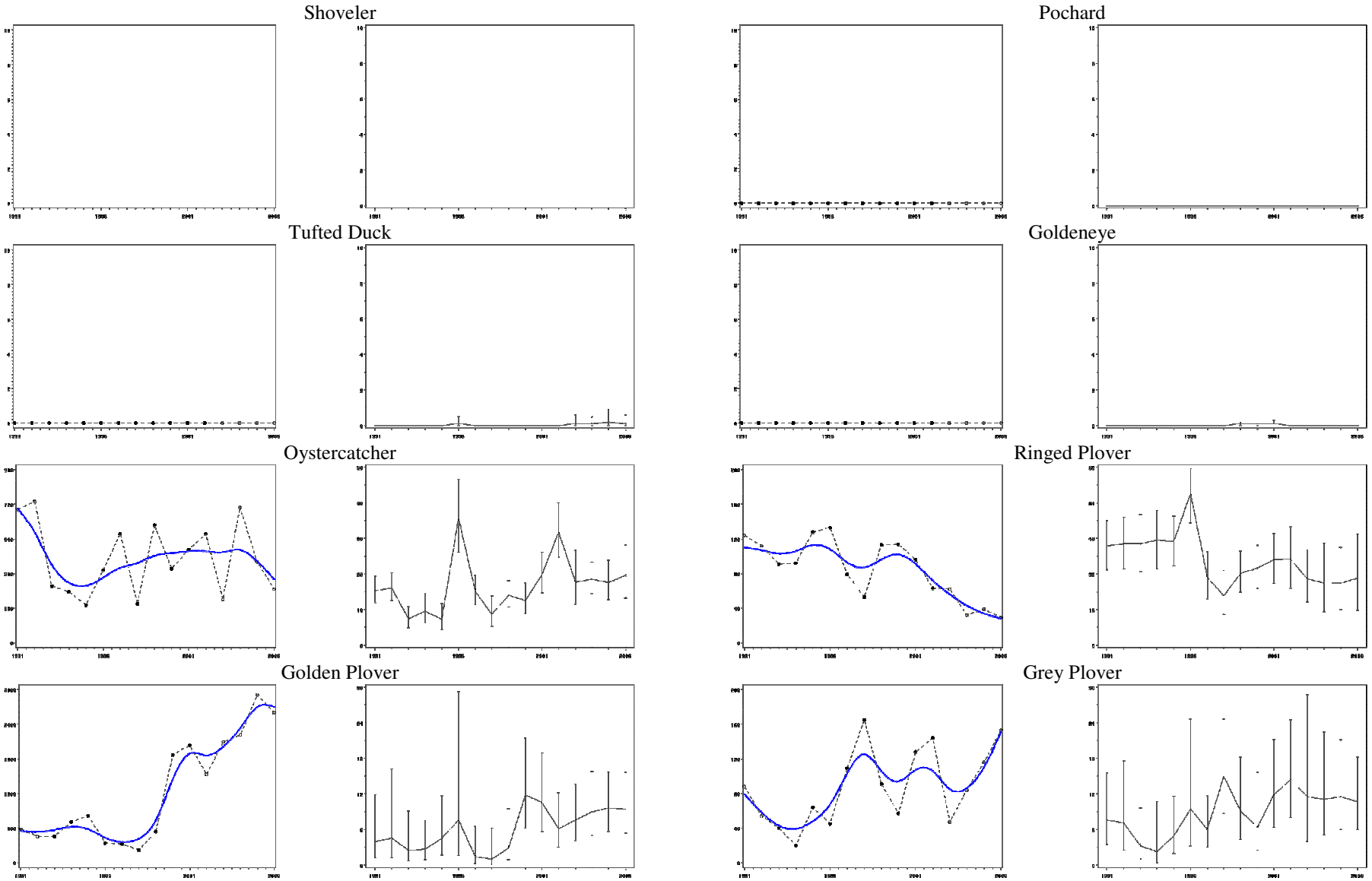


Figure B.38401 Population trends of each species in sector 38401 (Cleethorpes - North Promenade to Anthony`s Bank) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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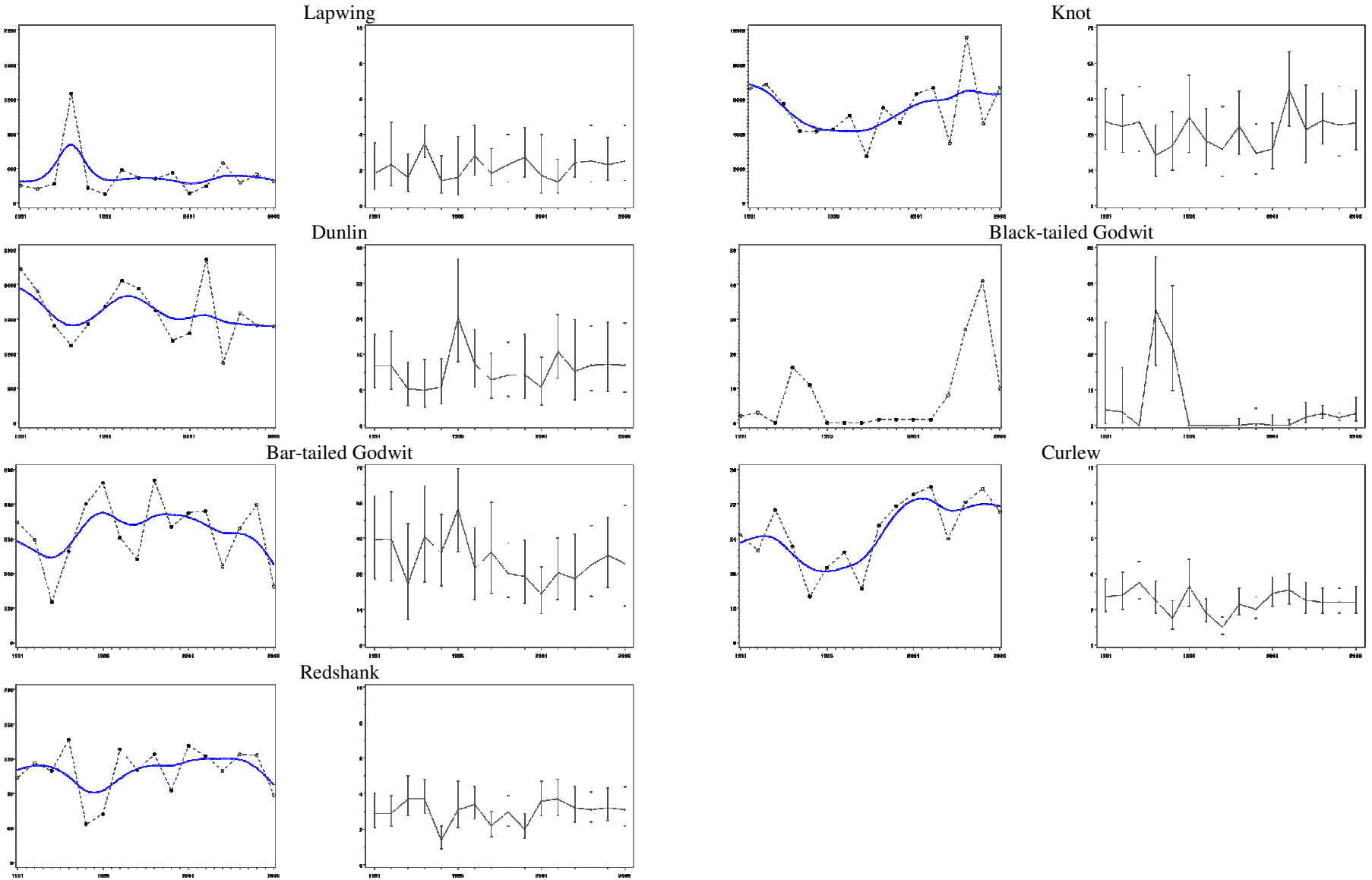

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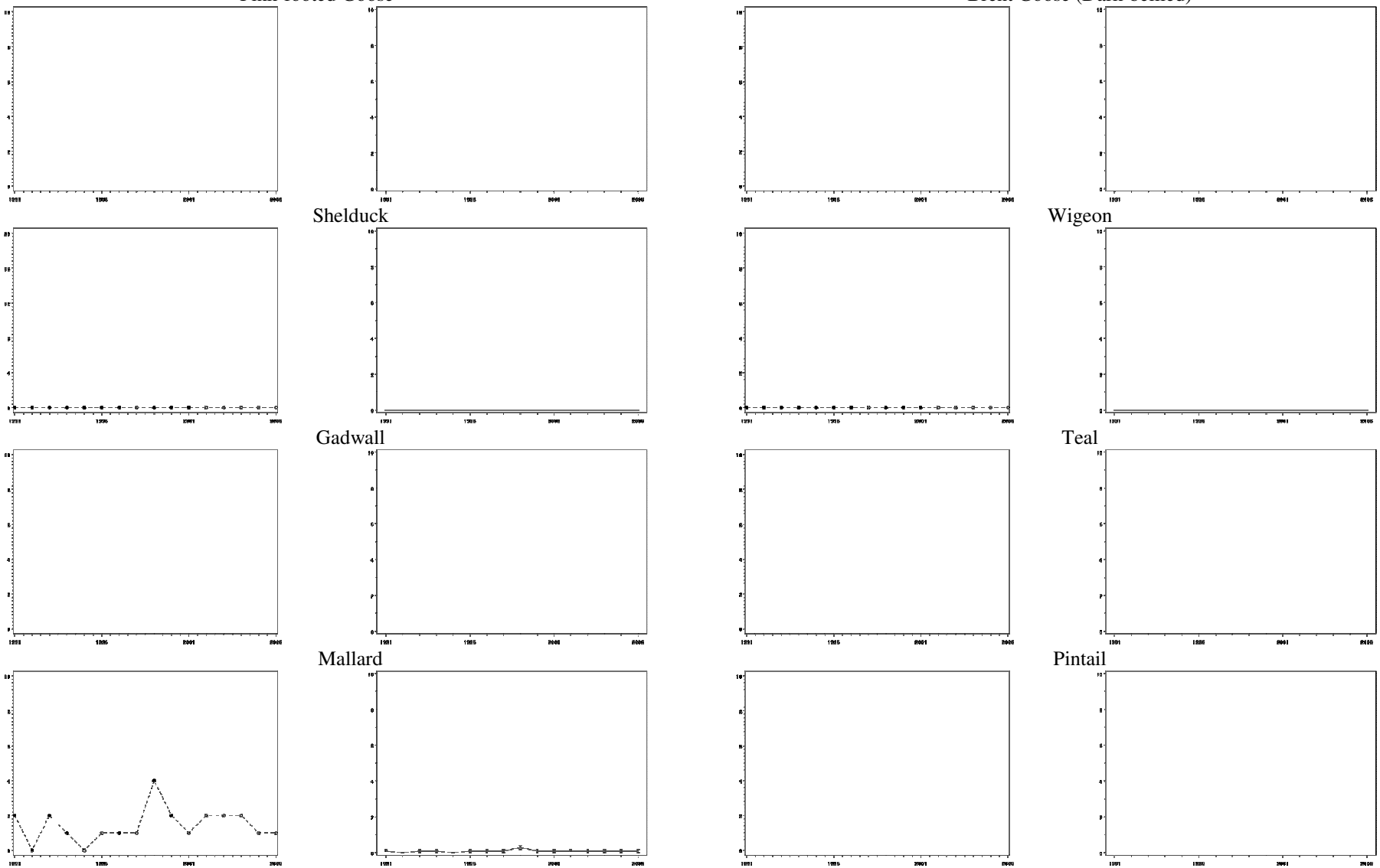
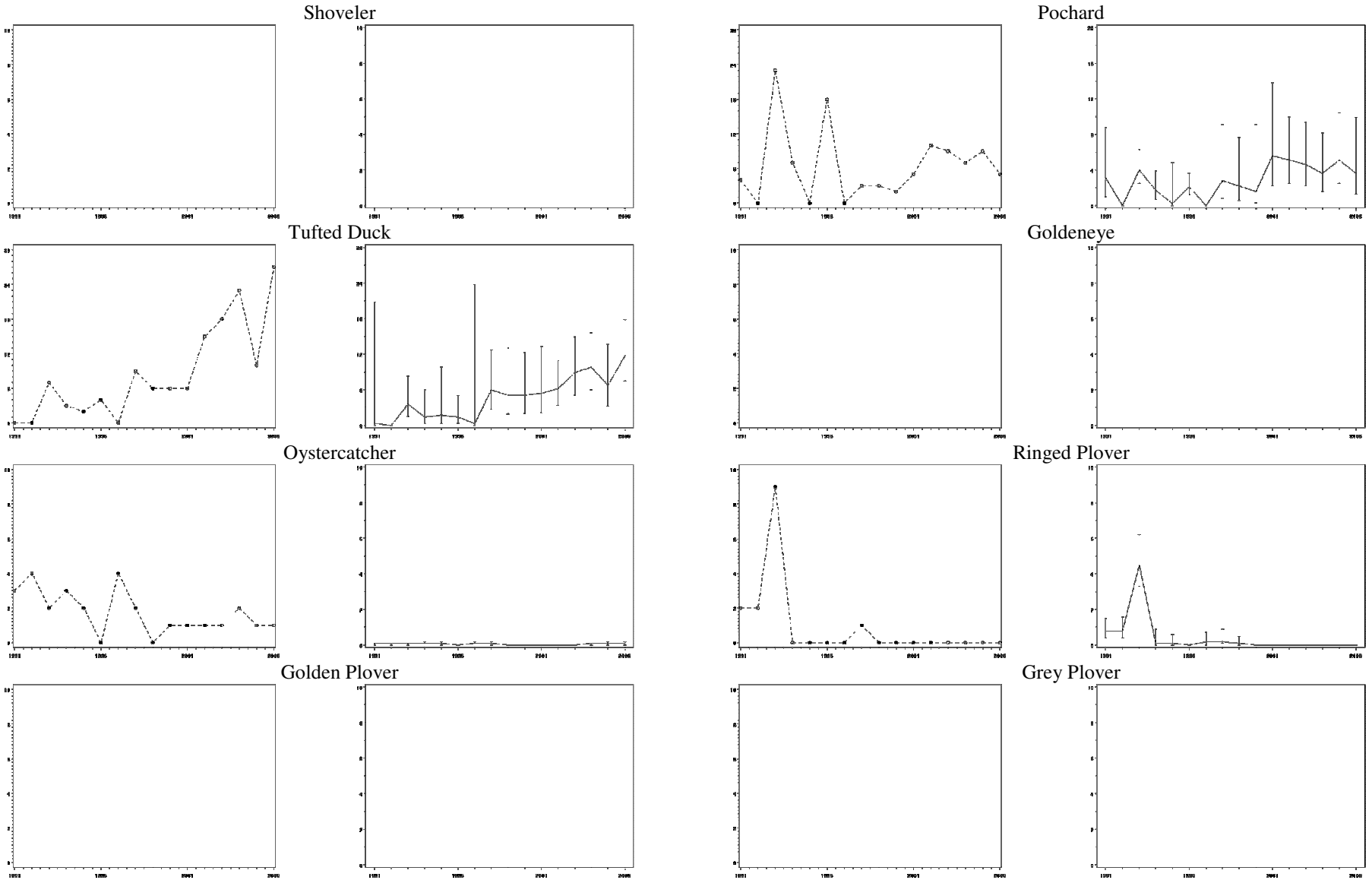


Figure B.38403 Population trends of each species in sector 38403 (Cleethorpes North Wall to Grimsby) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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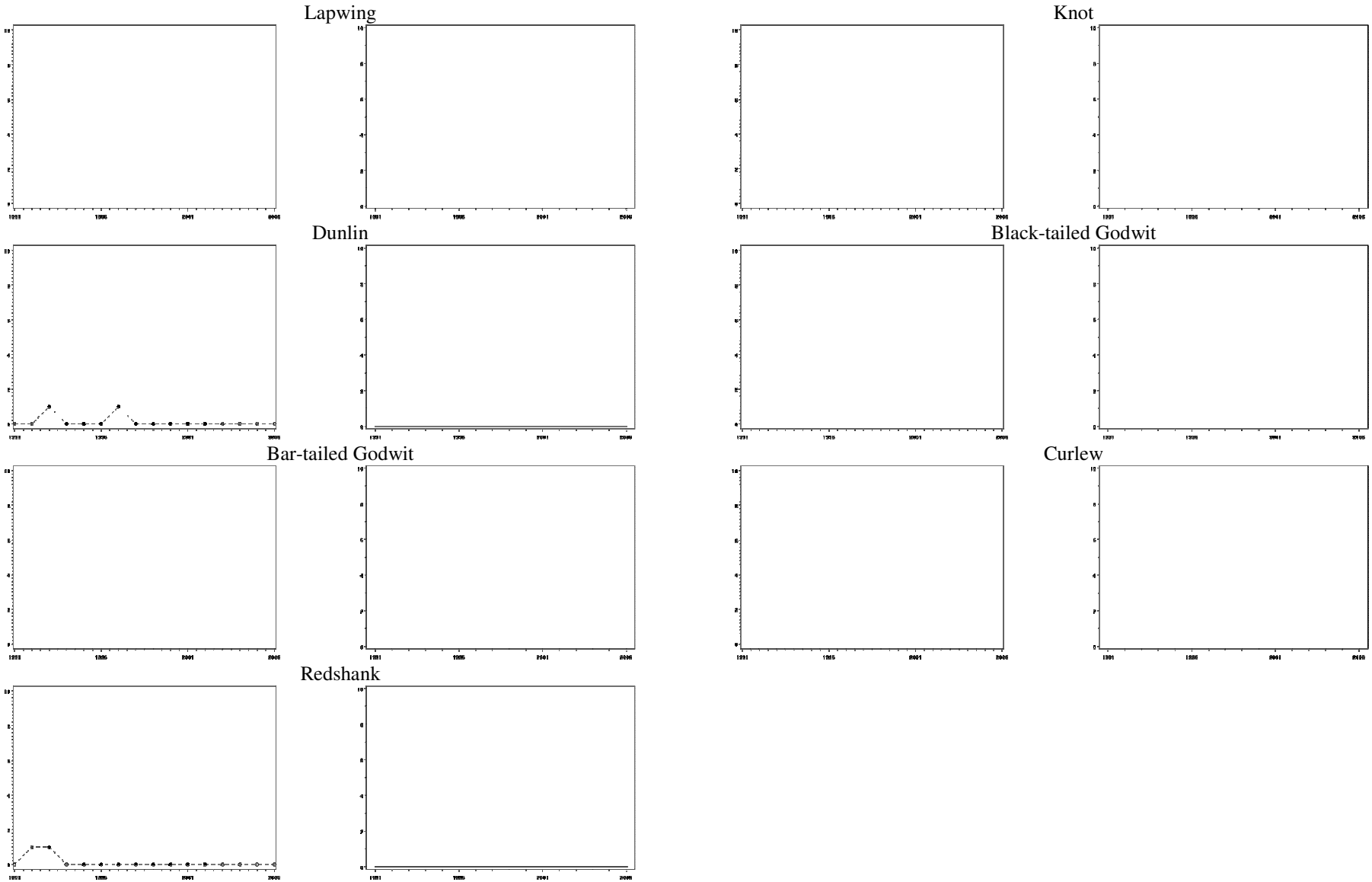

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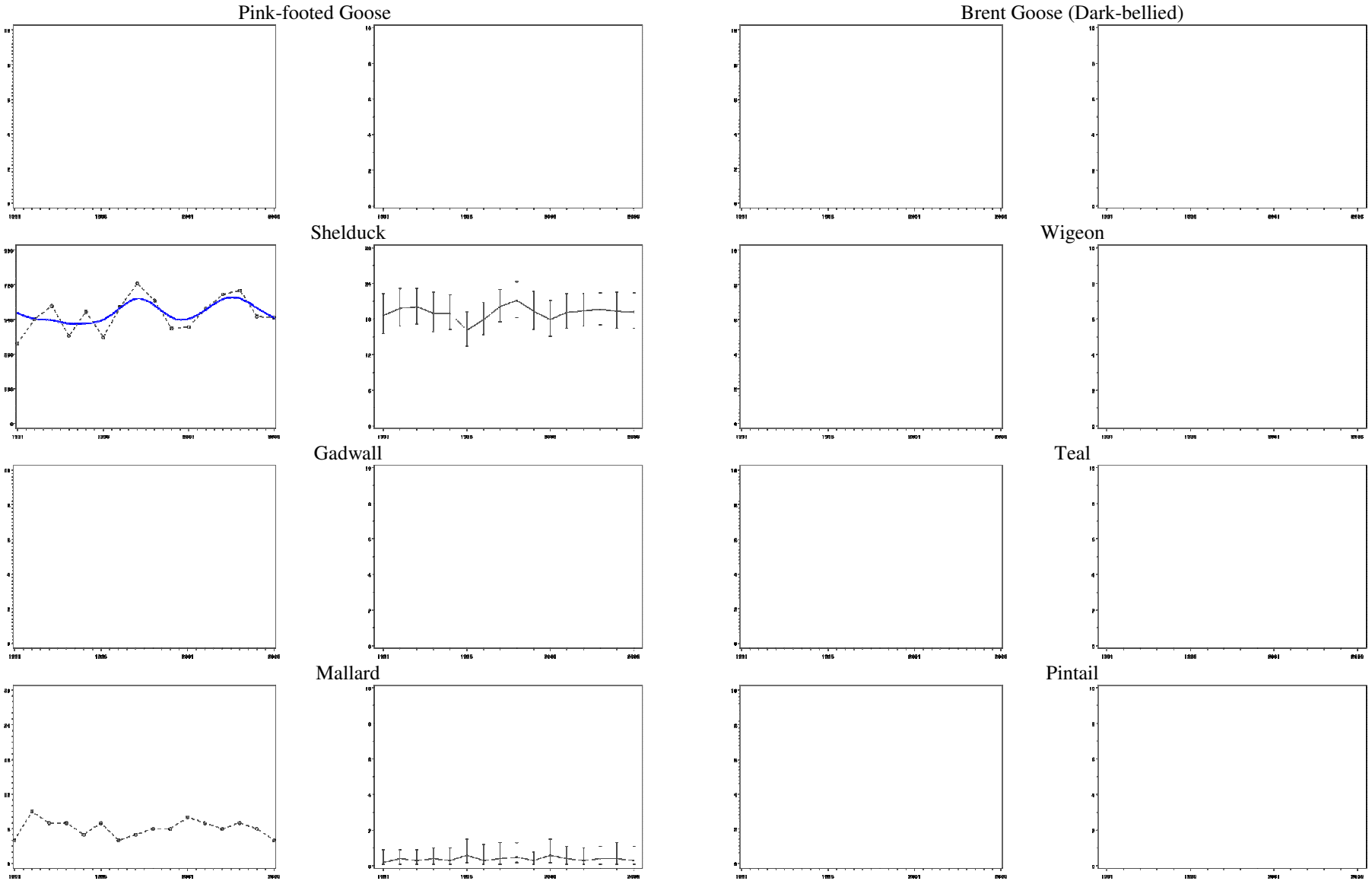
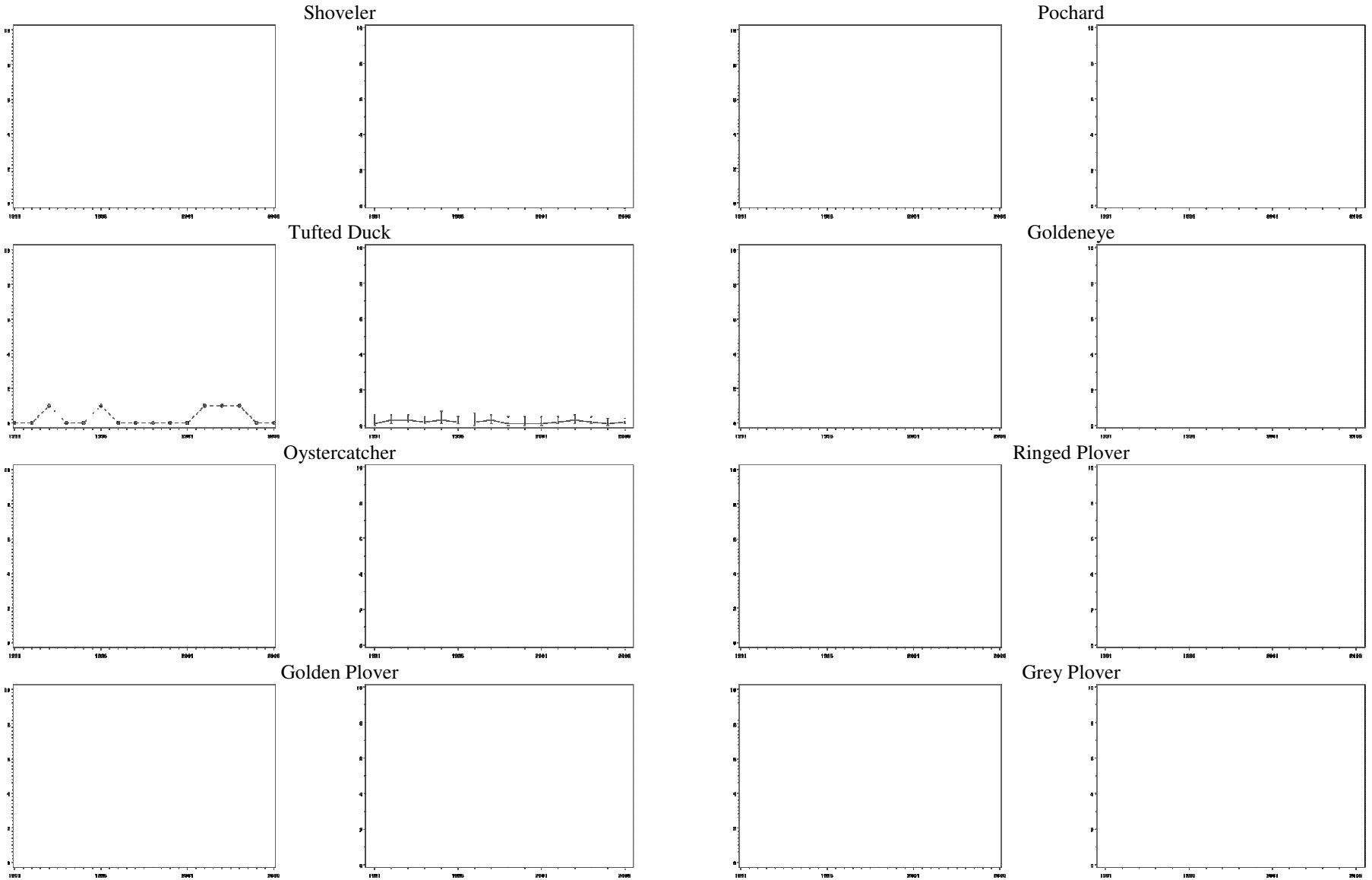


Figure B.38404 Population trends of each species in sector 38404 (Grimsby Commercial Docks) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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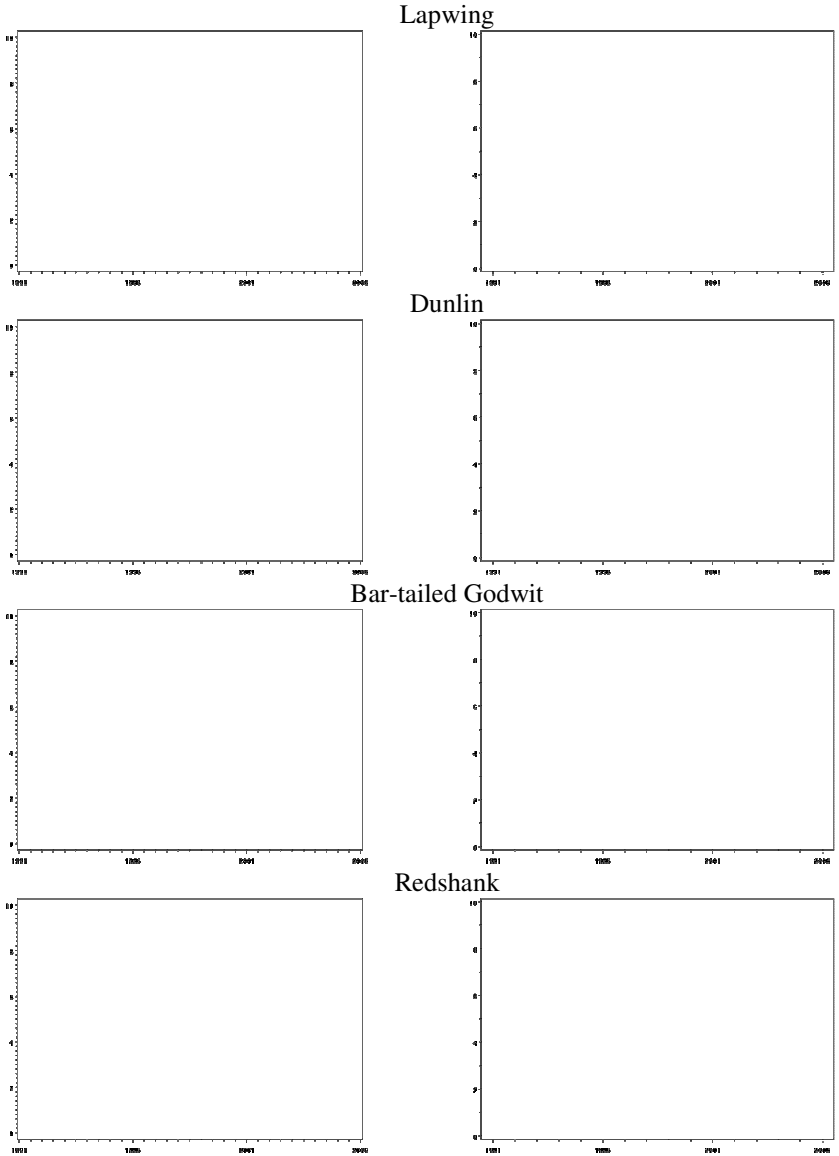

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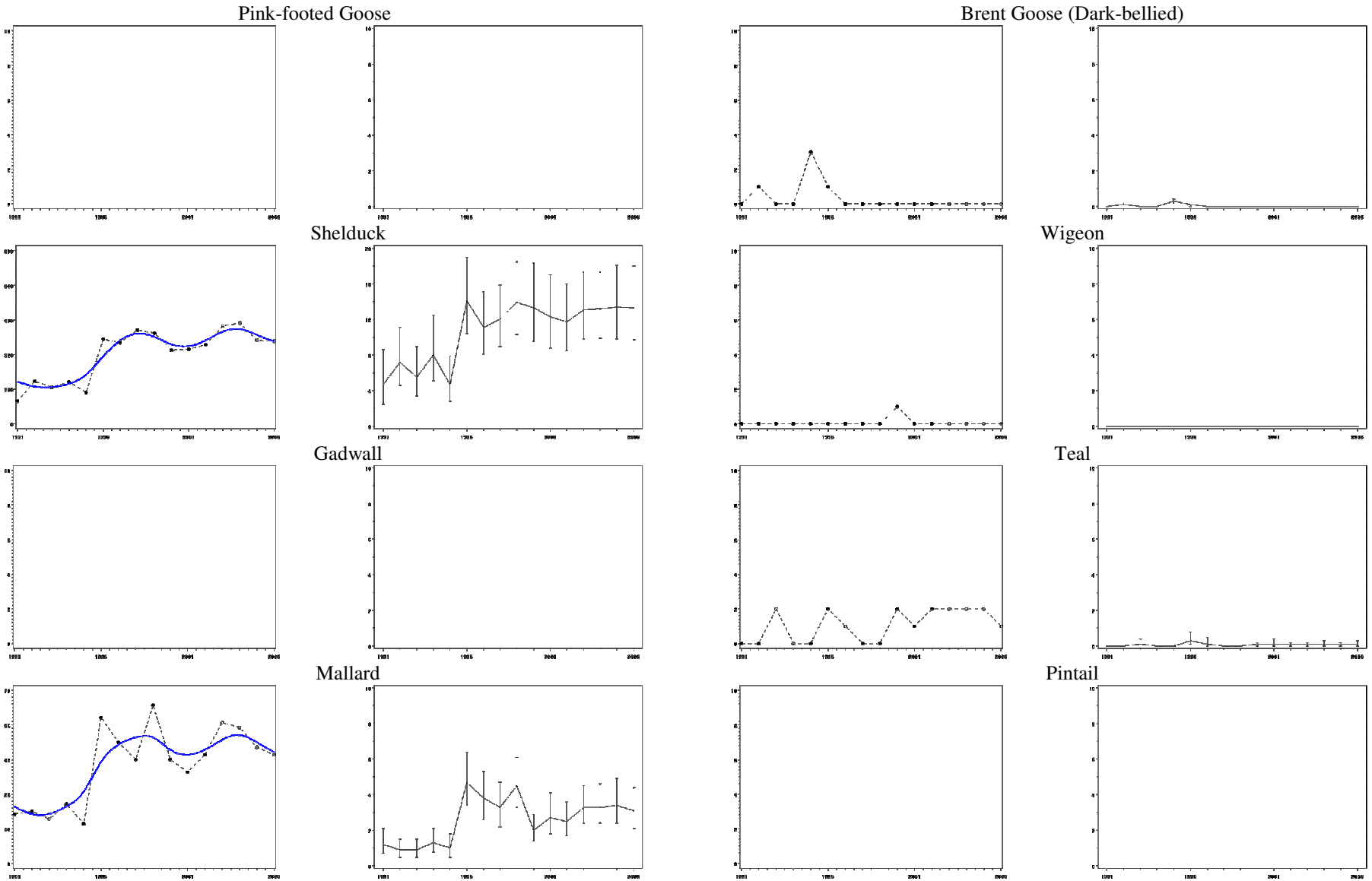
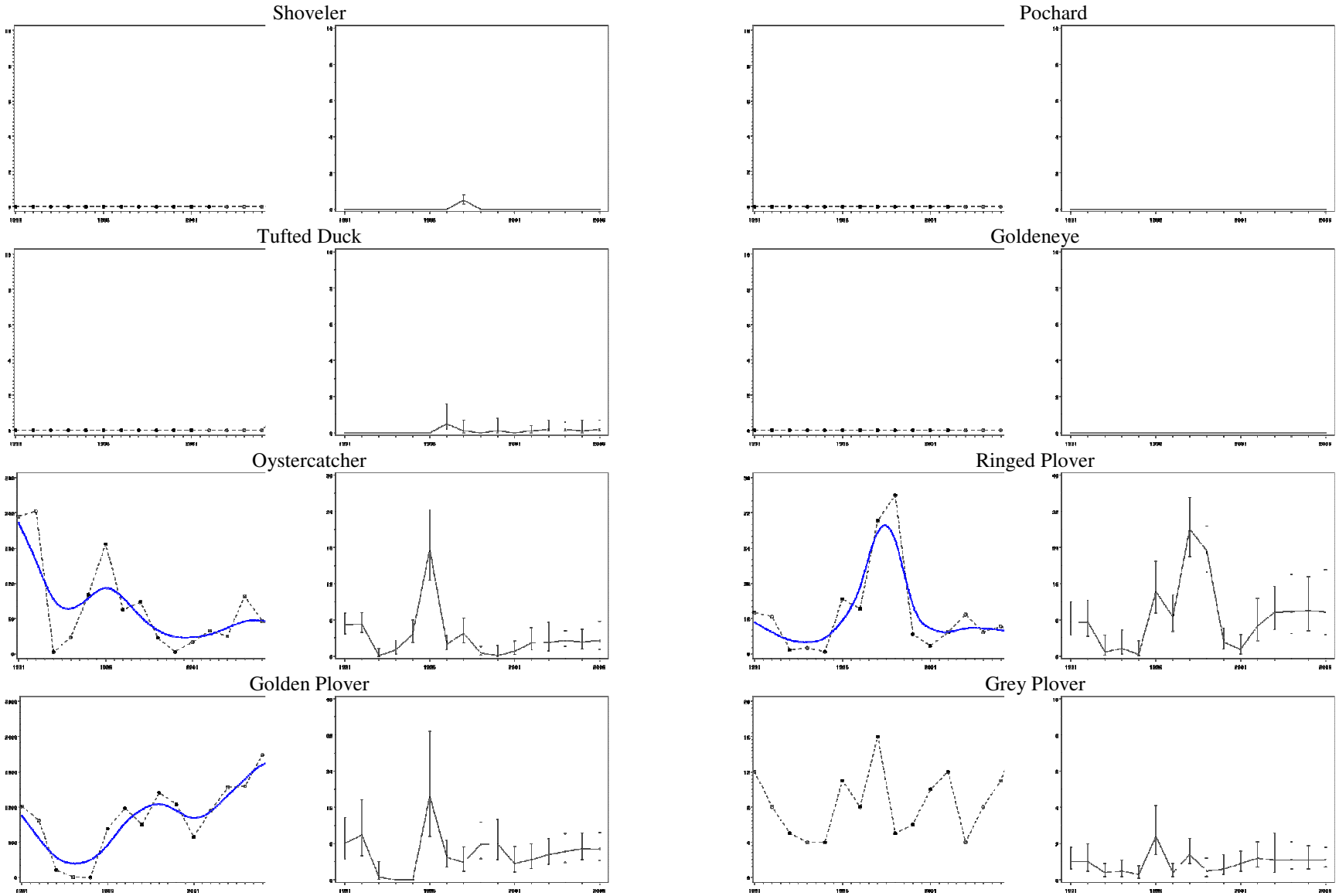


Figure B.38405 Population trends of each species in sector 38405 (Pyewipe) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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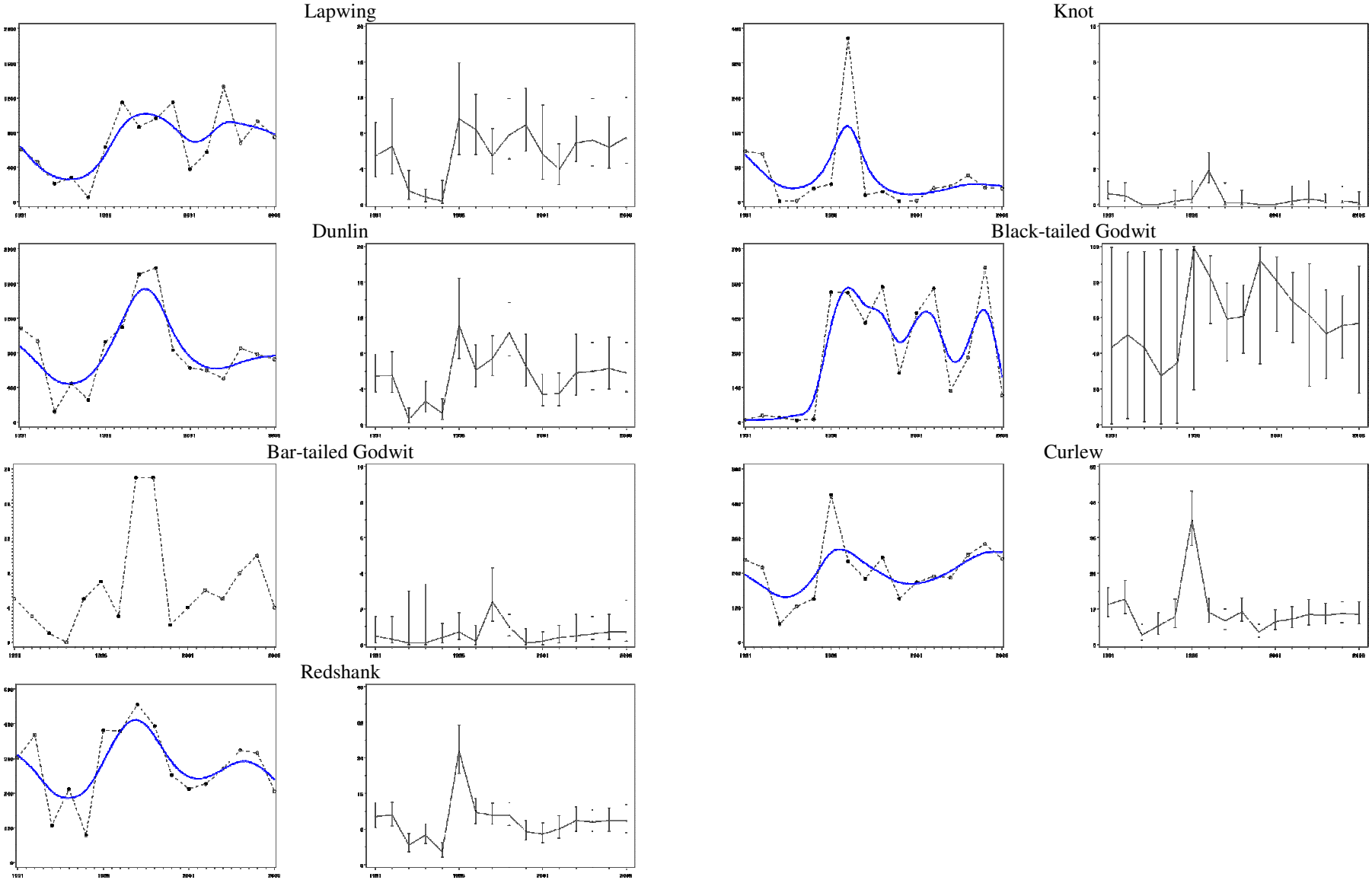

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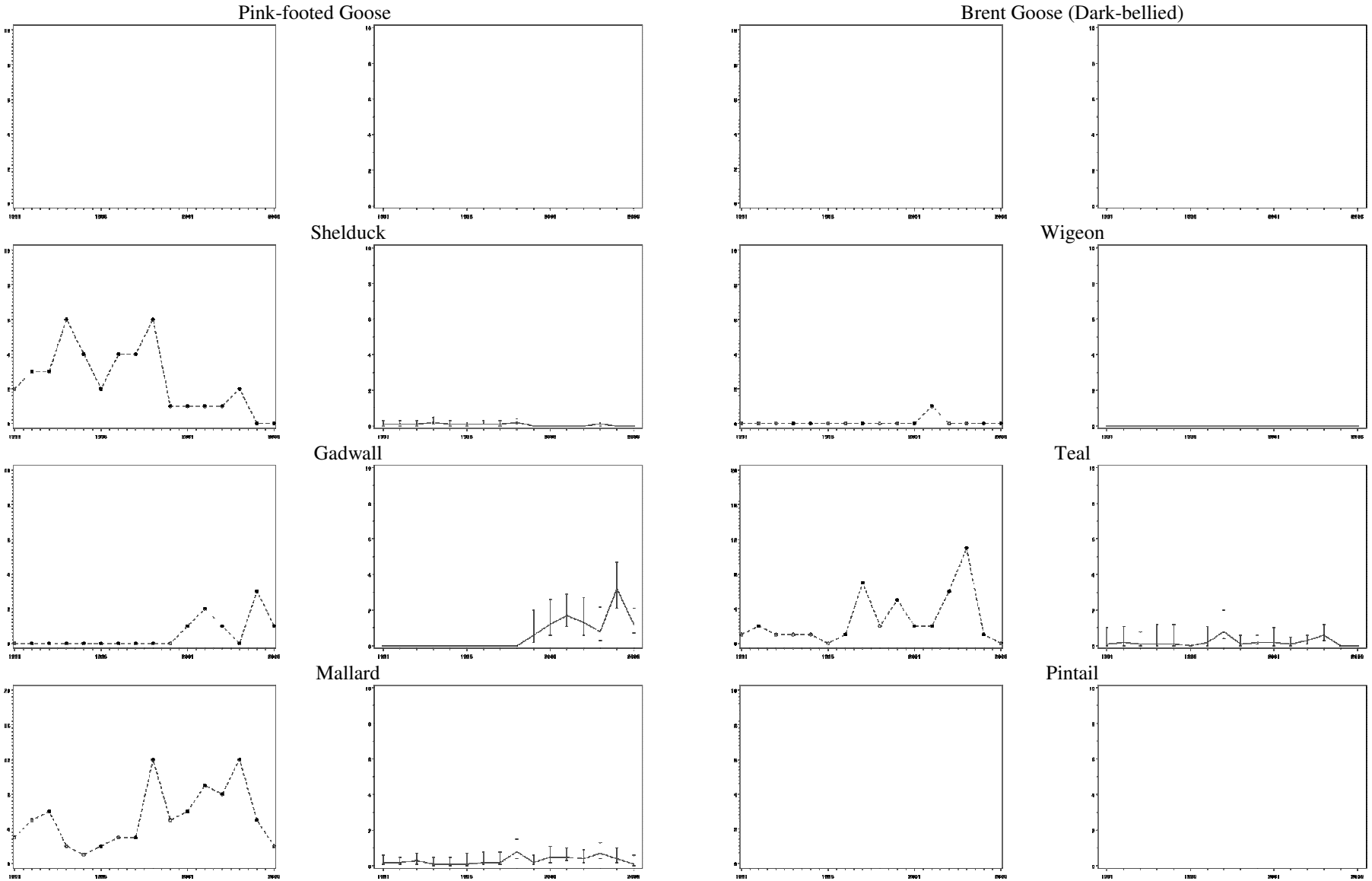
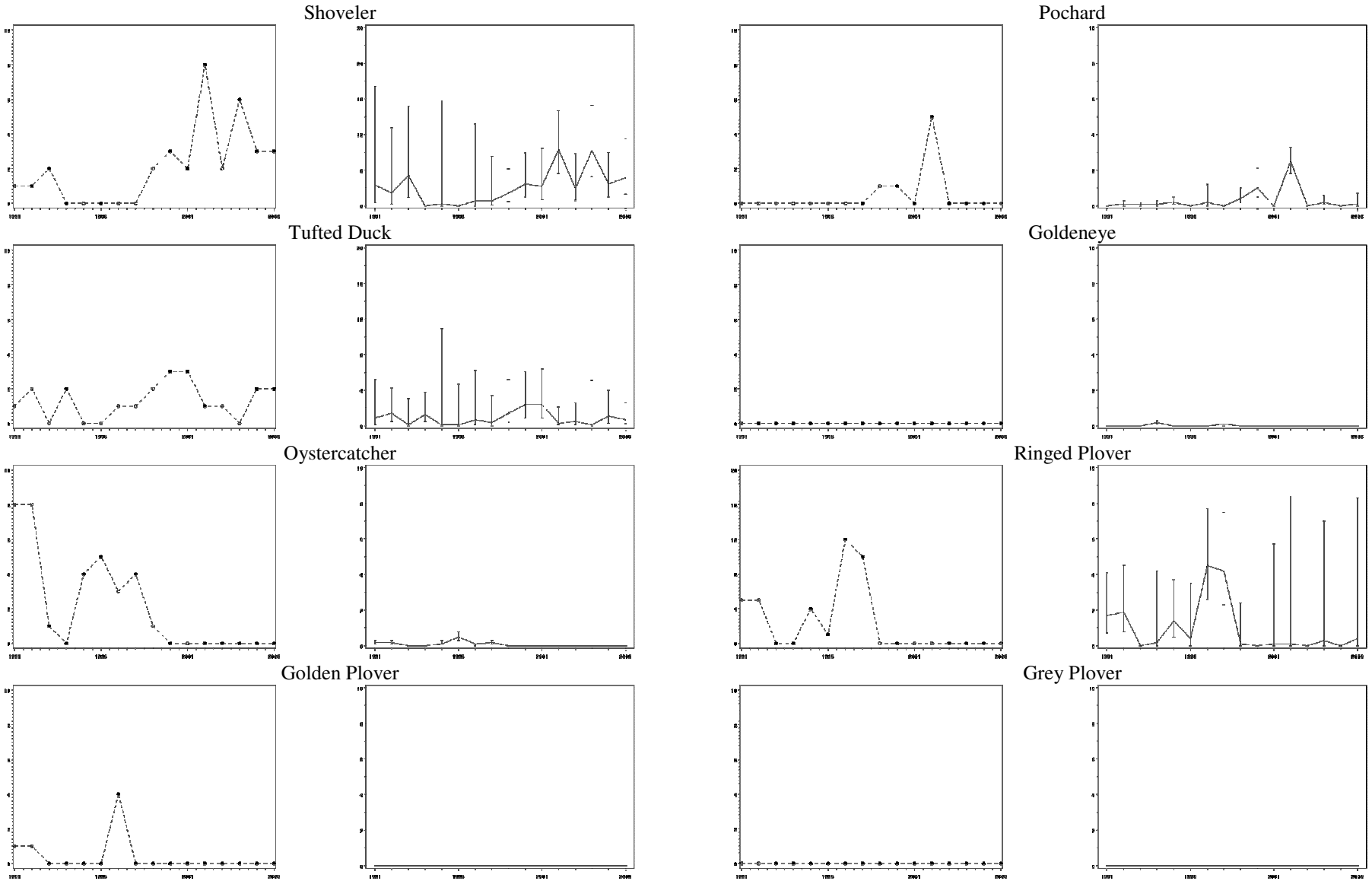


Figure B.38406 Population trends of each species in sector 38406 (Killingholme Marshes) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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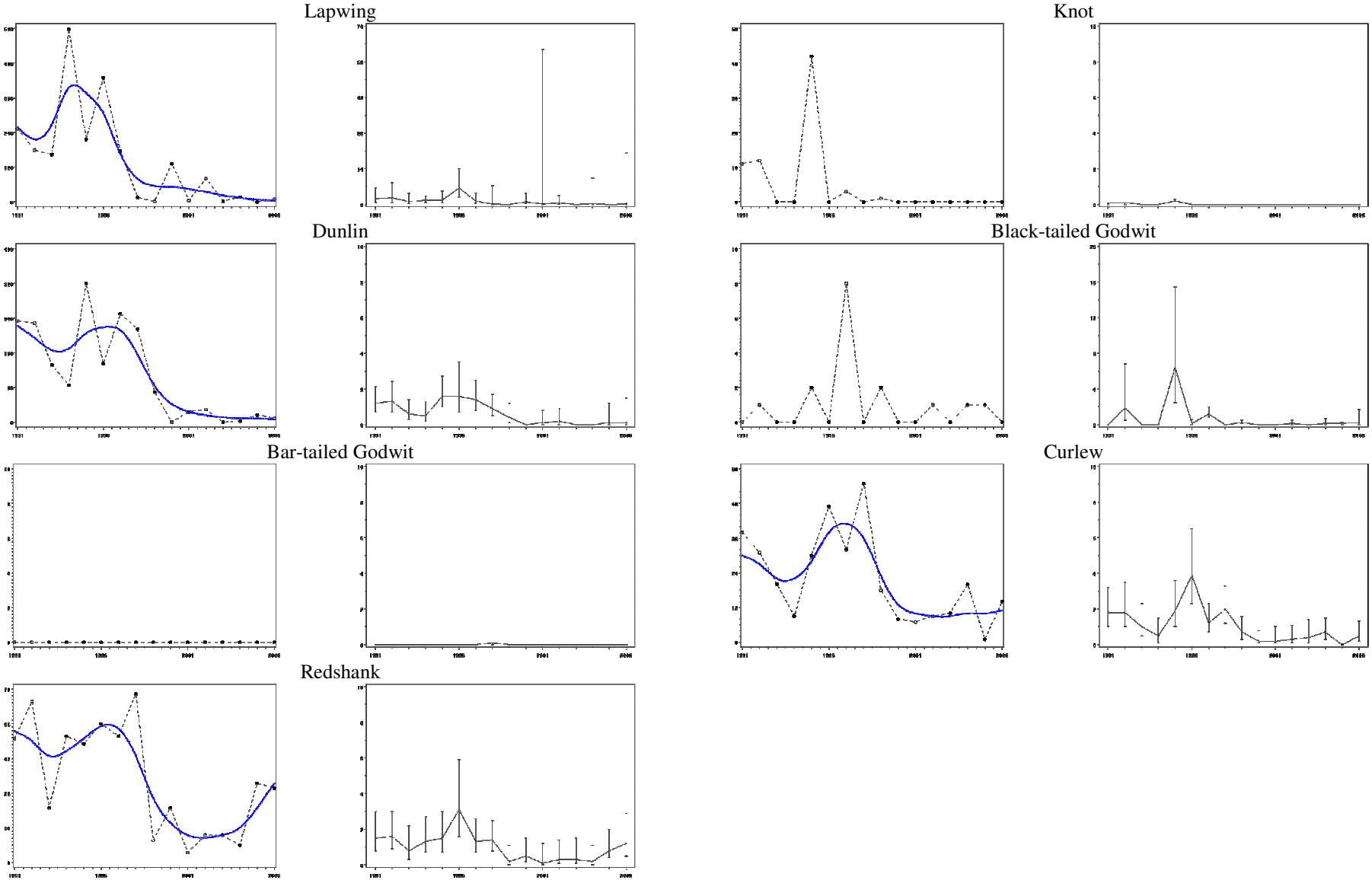

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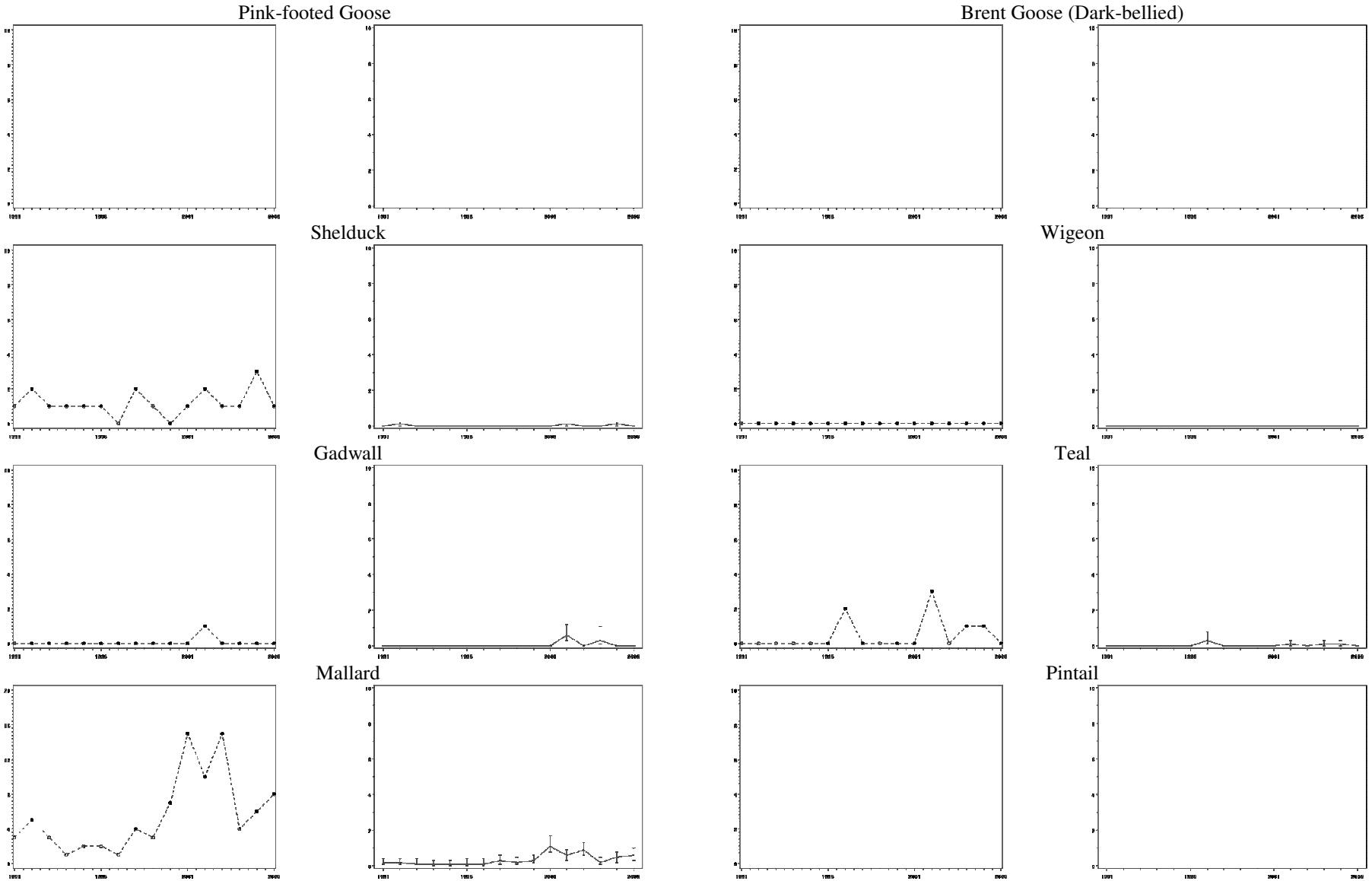
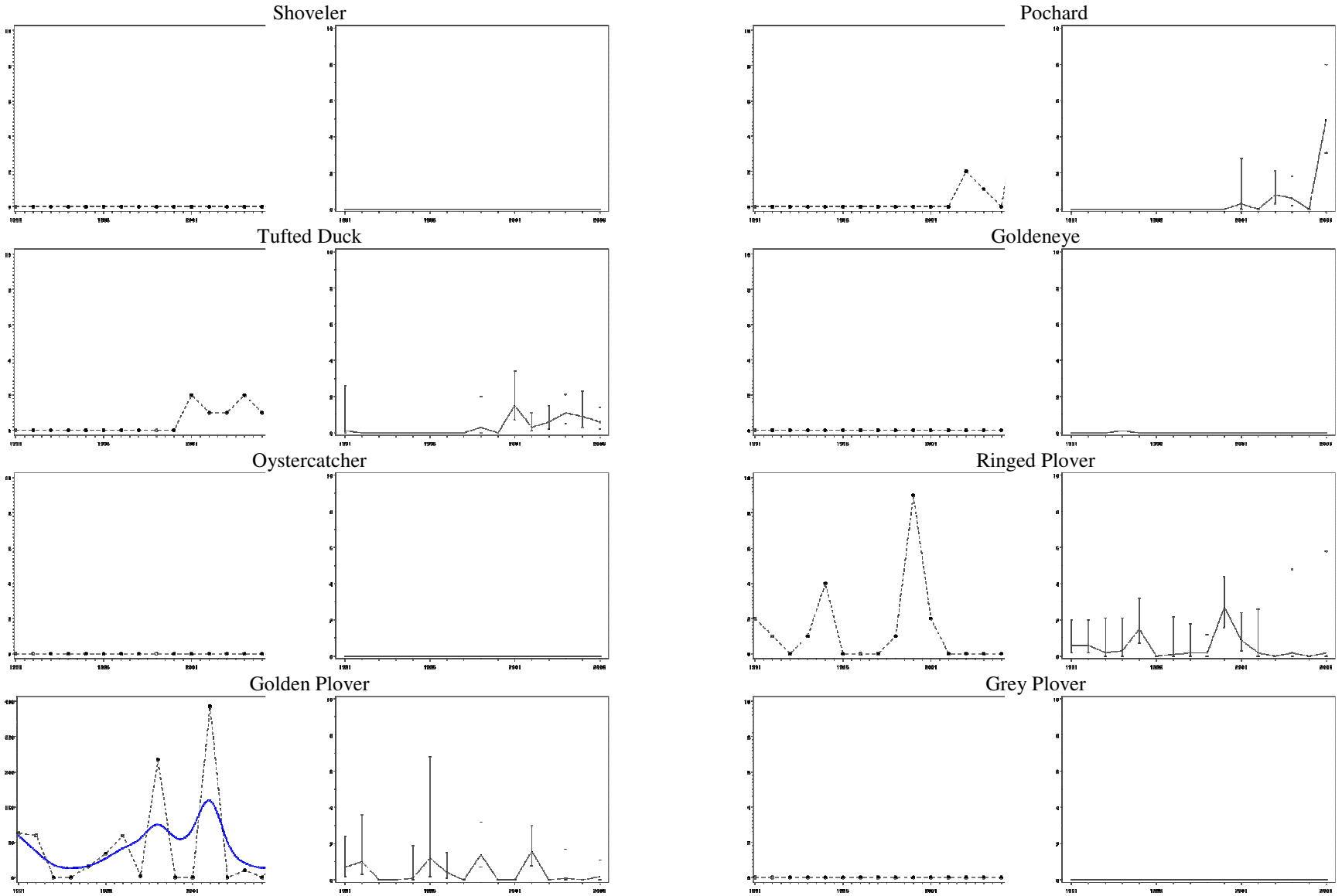


Figure B.38407 Population trends of each species in sector 38407 (Halton Marshes) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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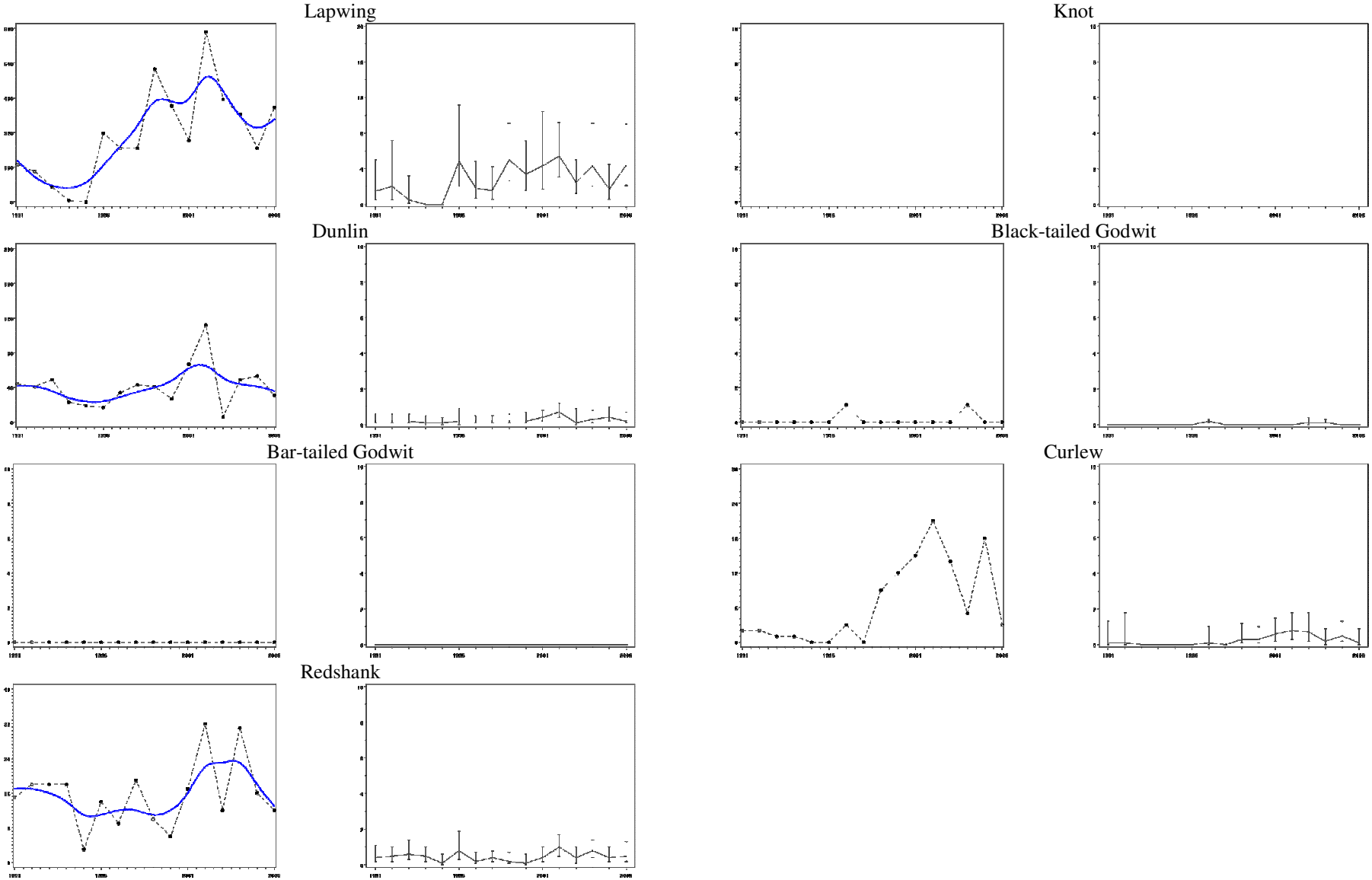

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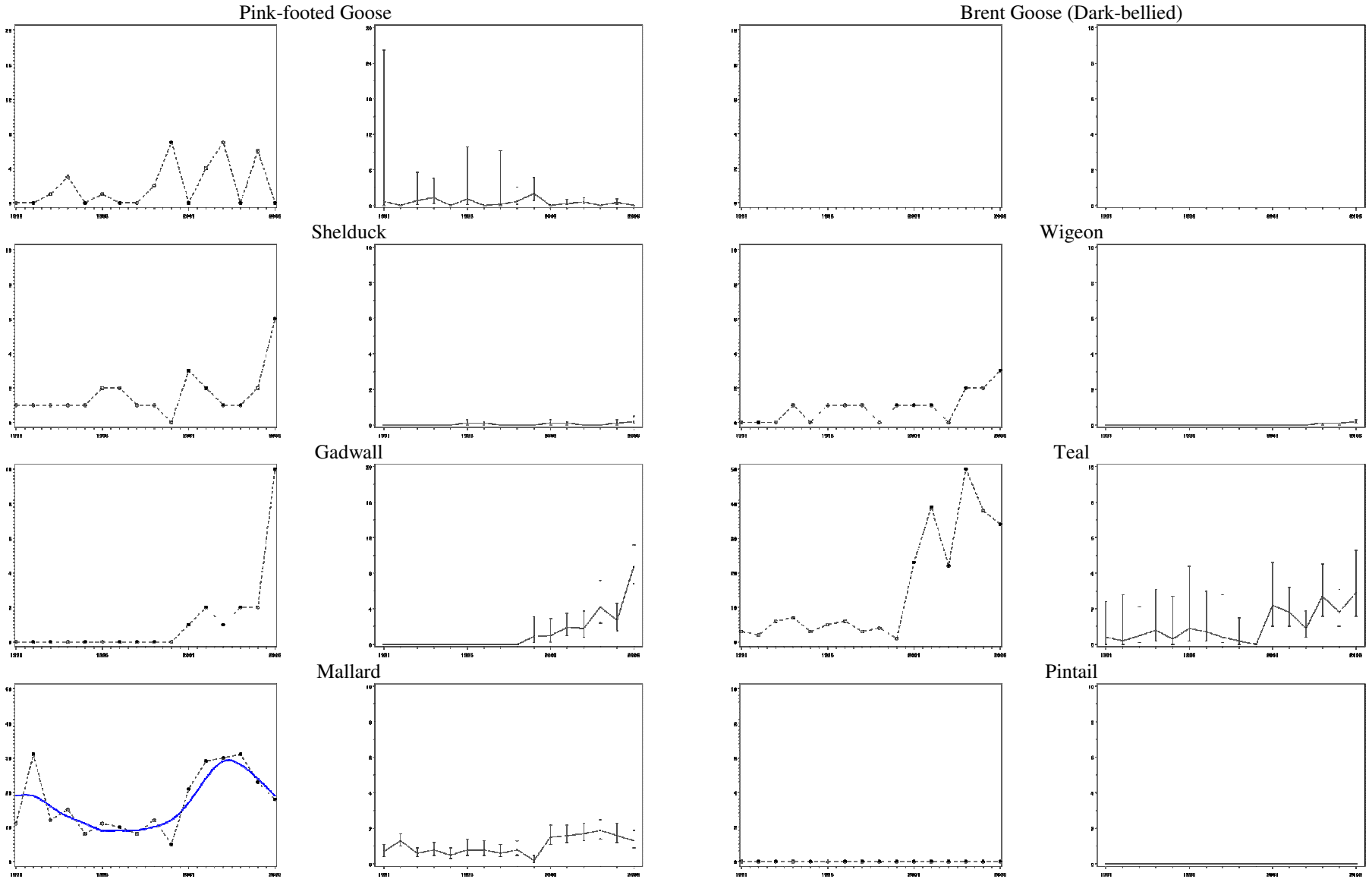
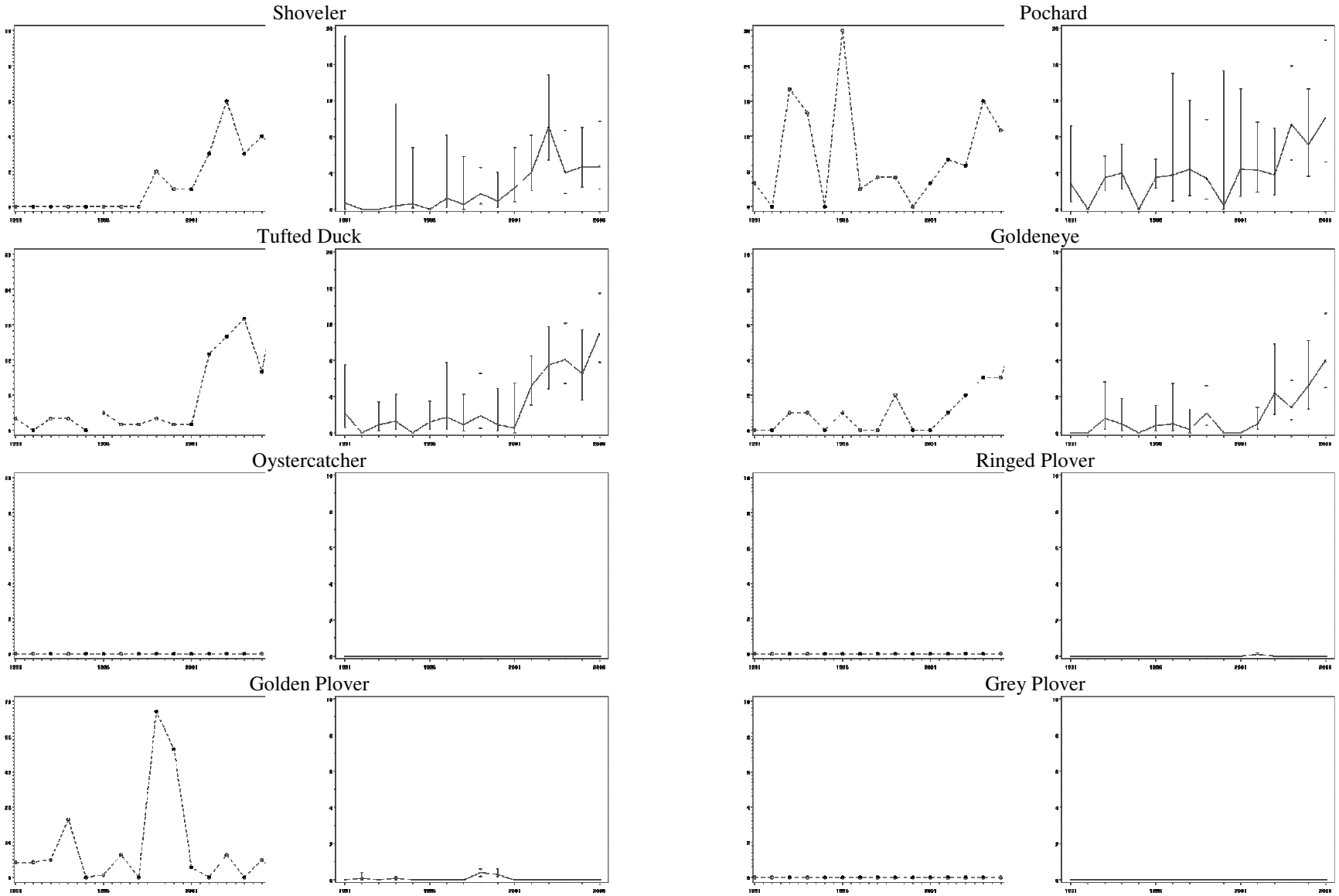


Figure B.38409 Population trends of each species in sector 38409 (Barton Cliff) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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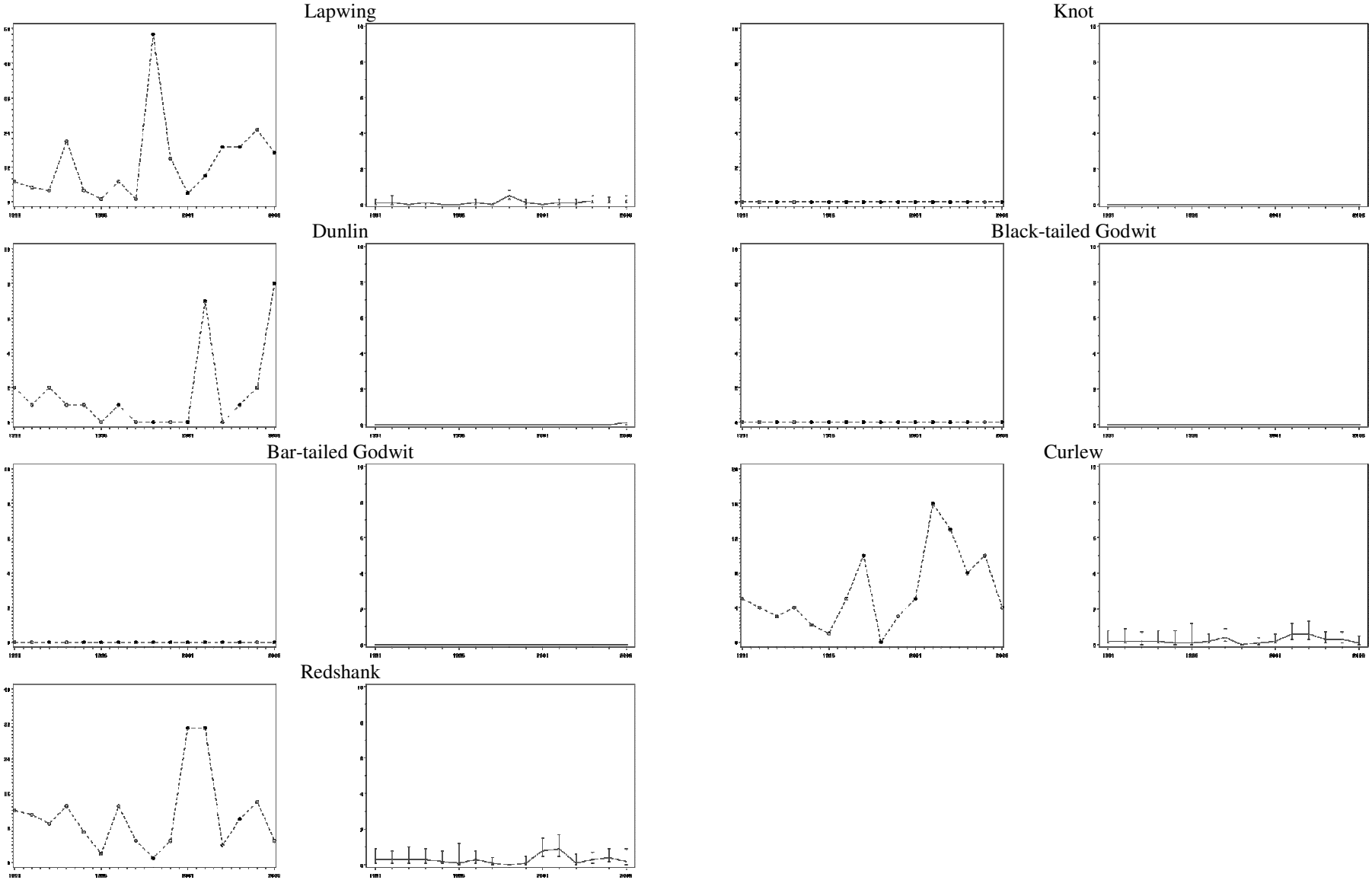

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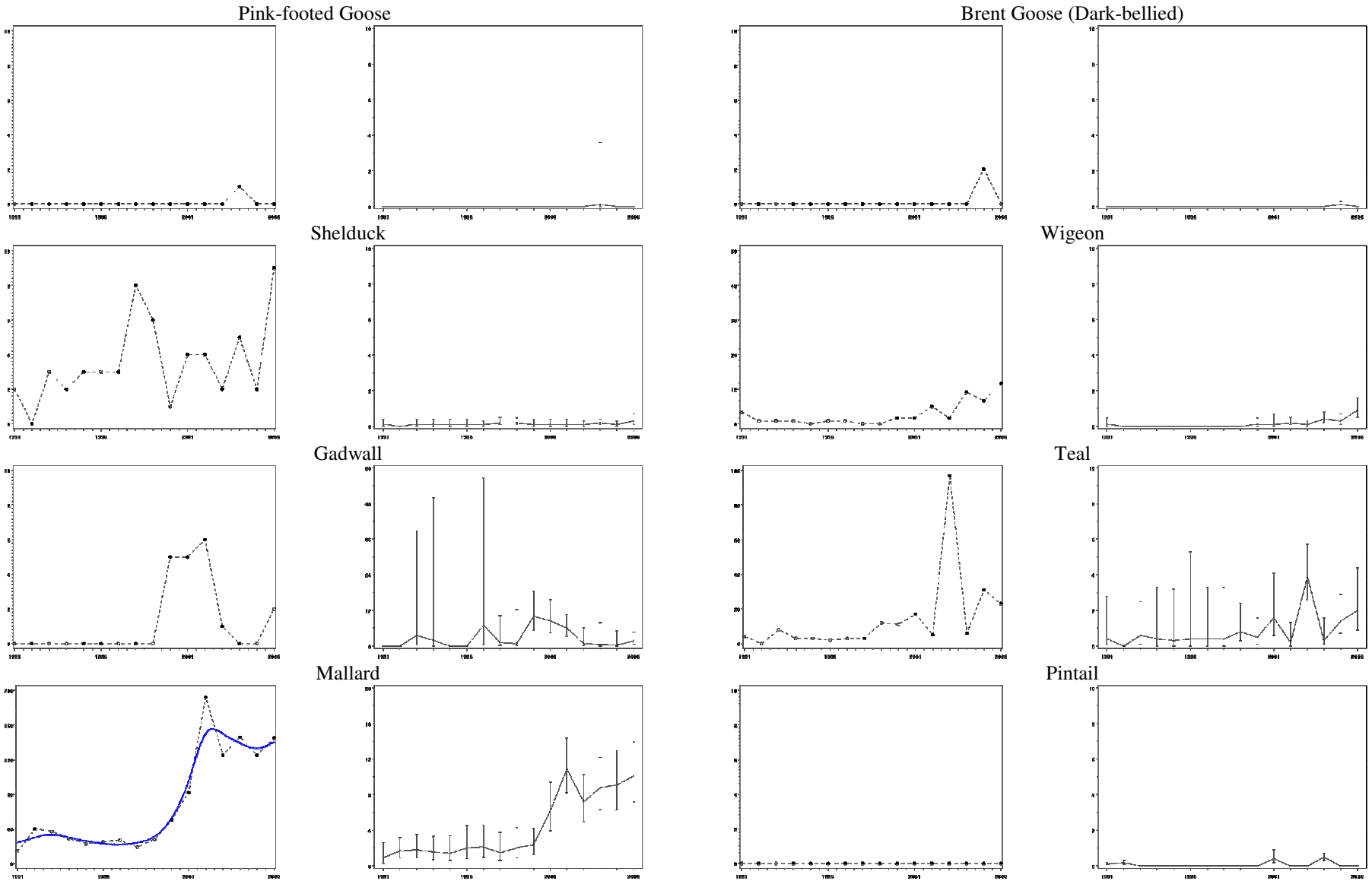
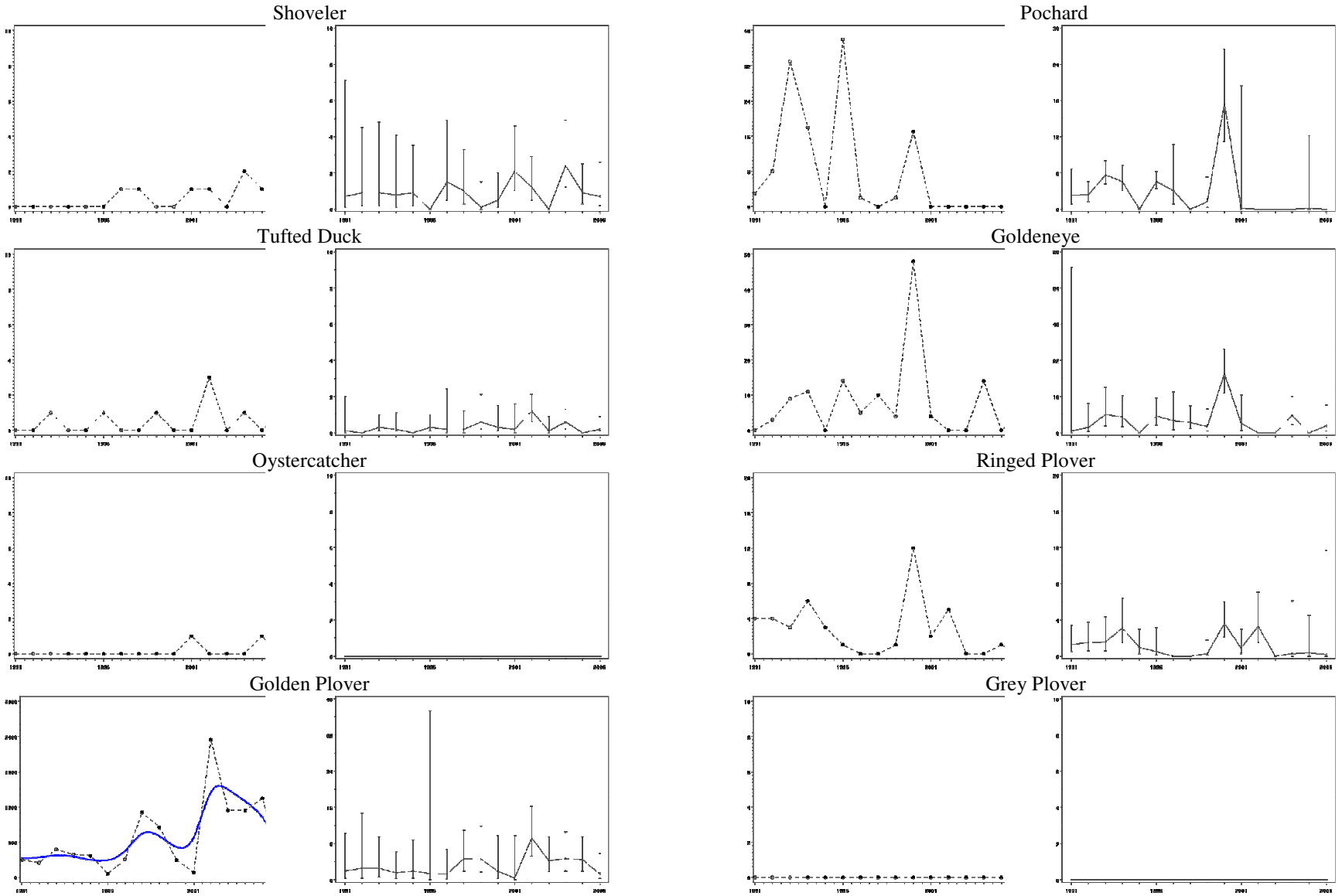


Figure B.38411 Population trends of each species in sector 38411 (Goxhill Marsh) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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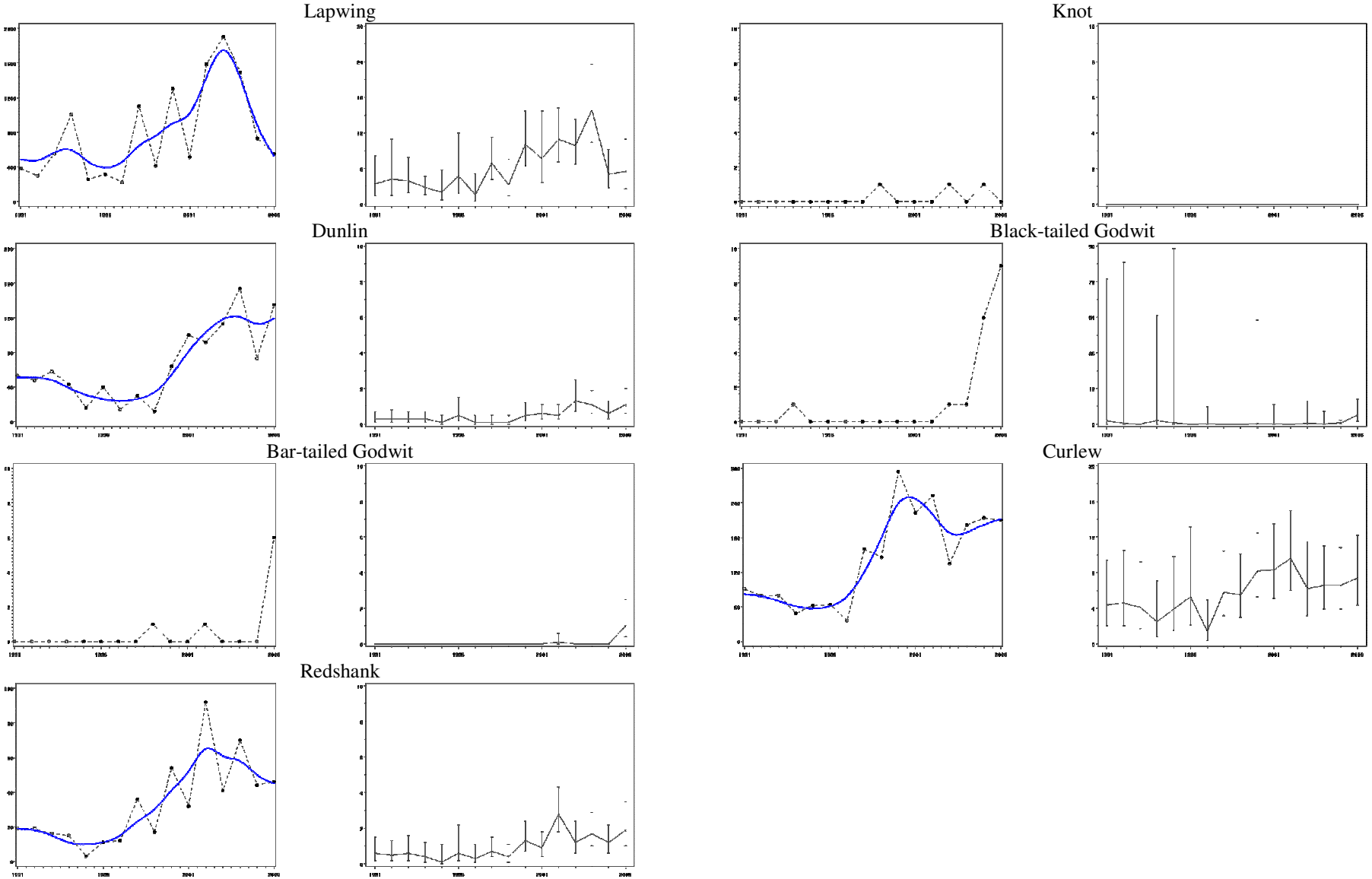


Figure B.38411 Continued.

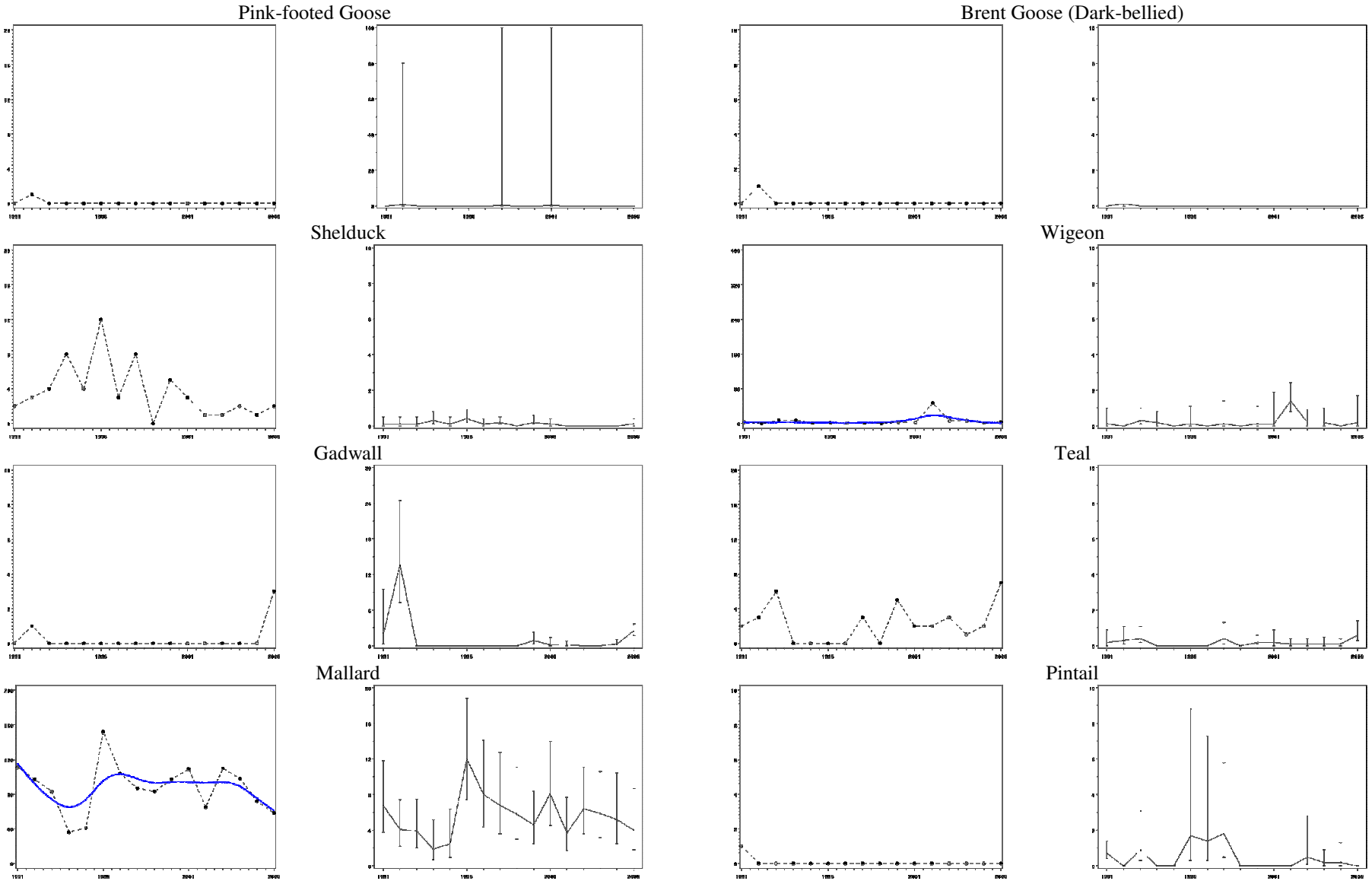
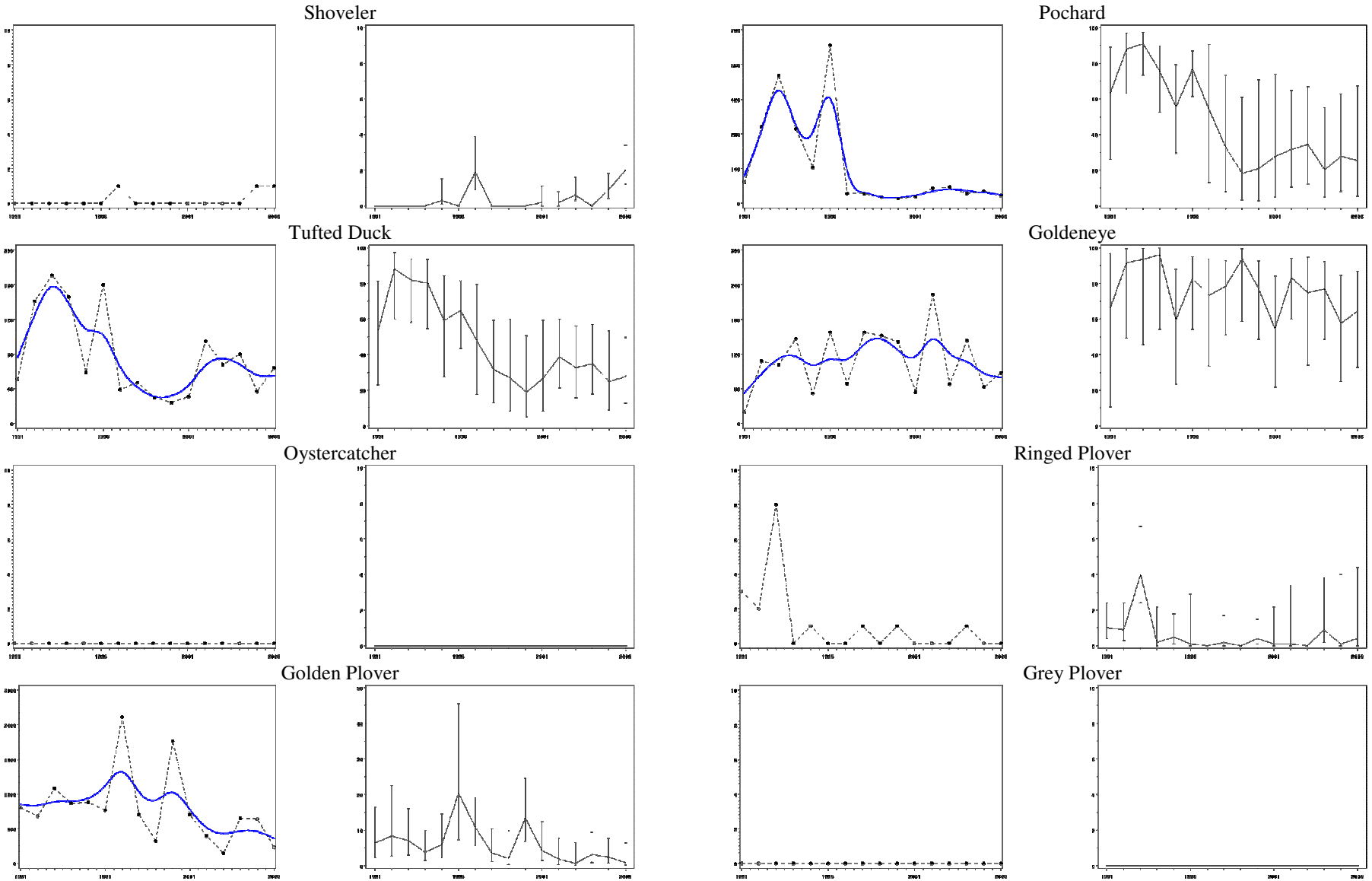


Figure B.38412 Population trends of each species in sector 38412 (Goxhill to New Holland) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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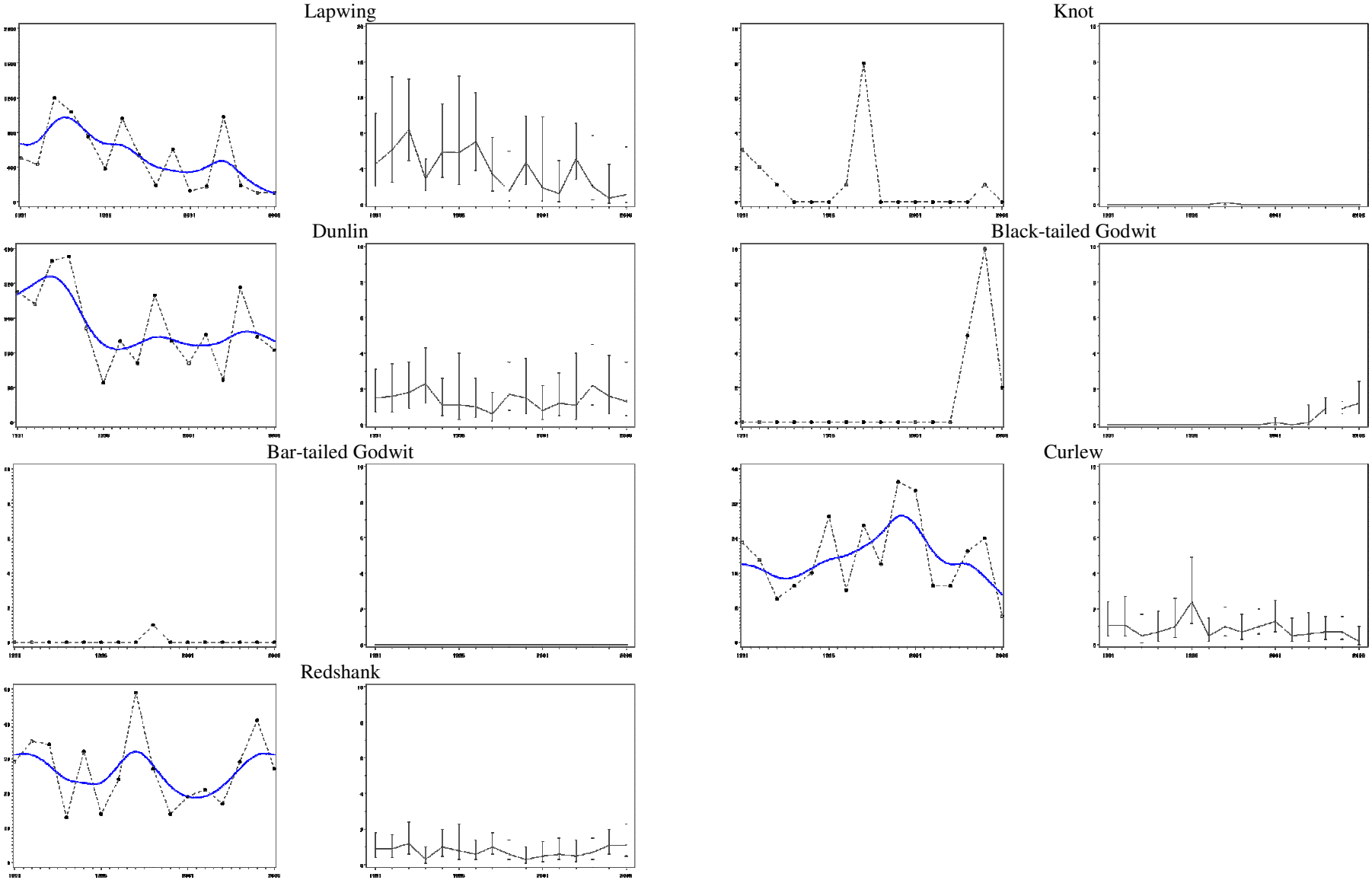

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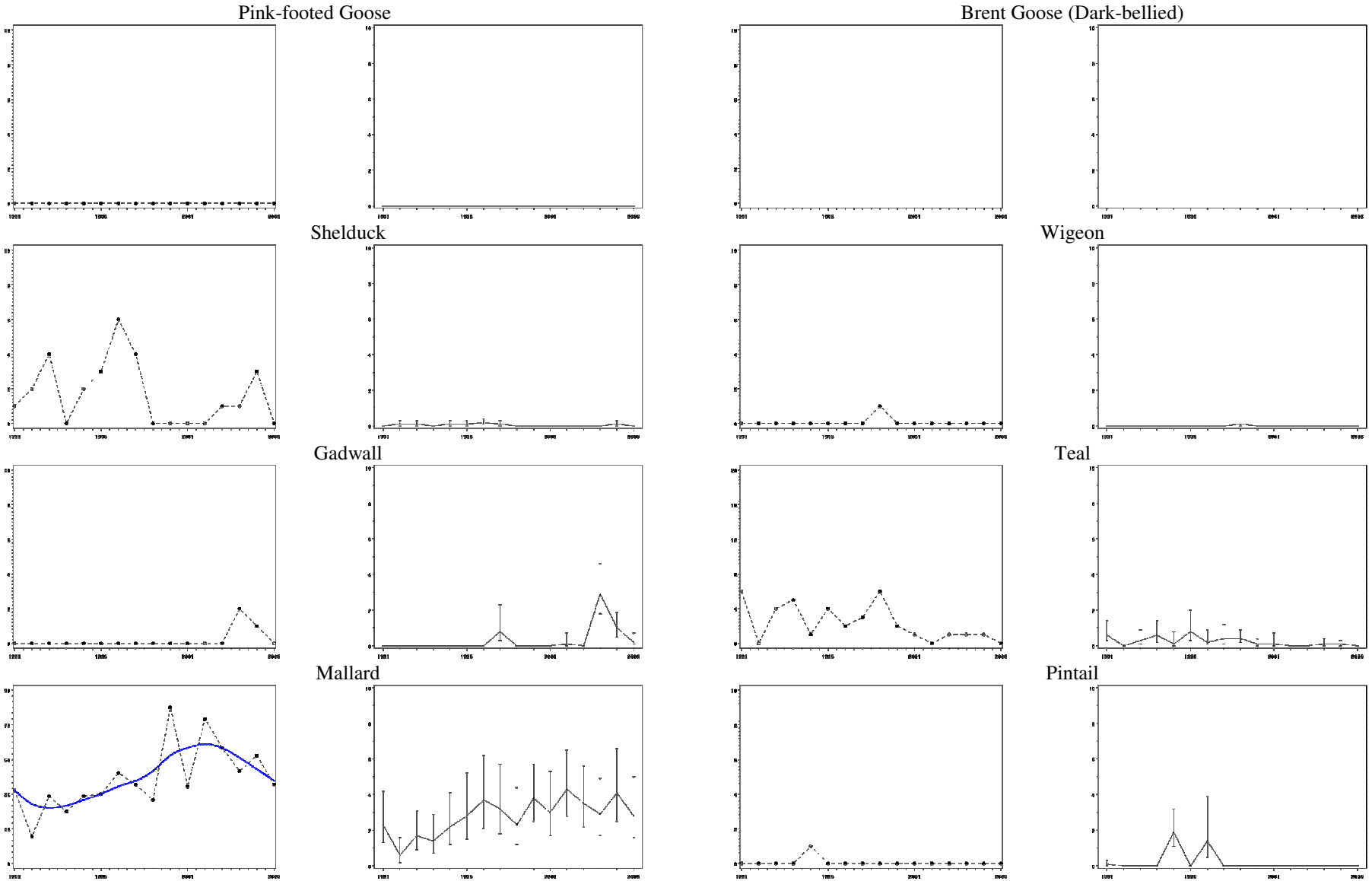
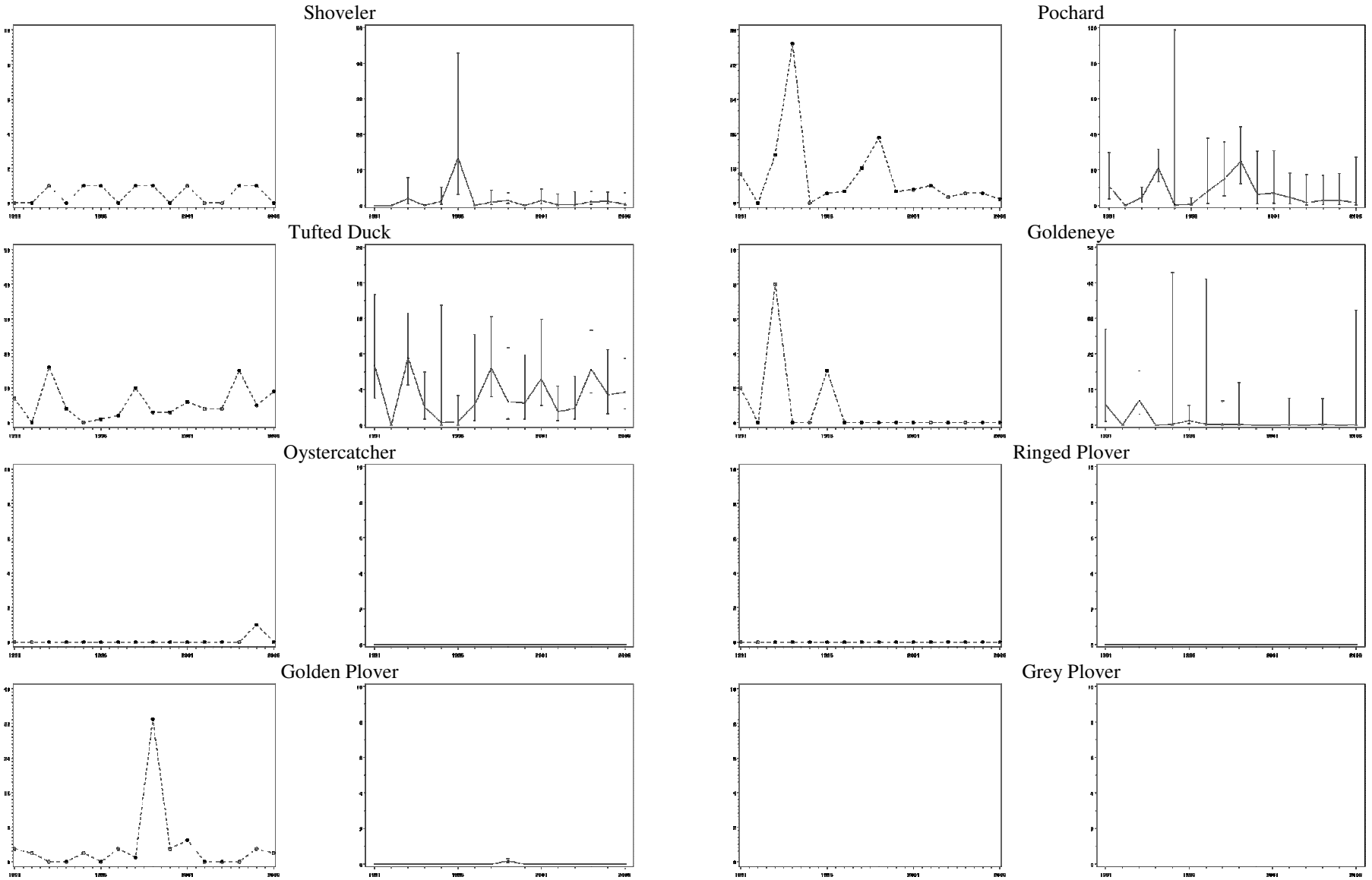


Figure B.38413 Population trends of each species in sector 38413 (New Holland to Barrow) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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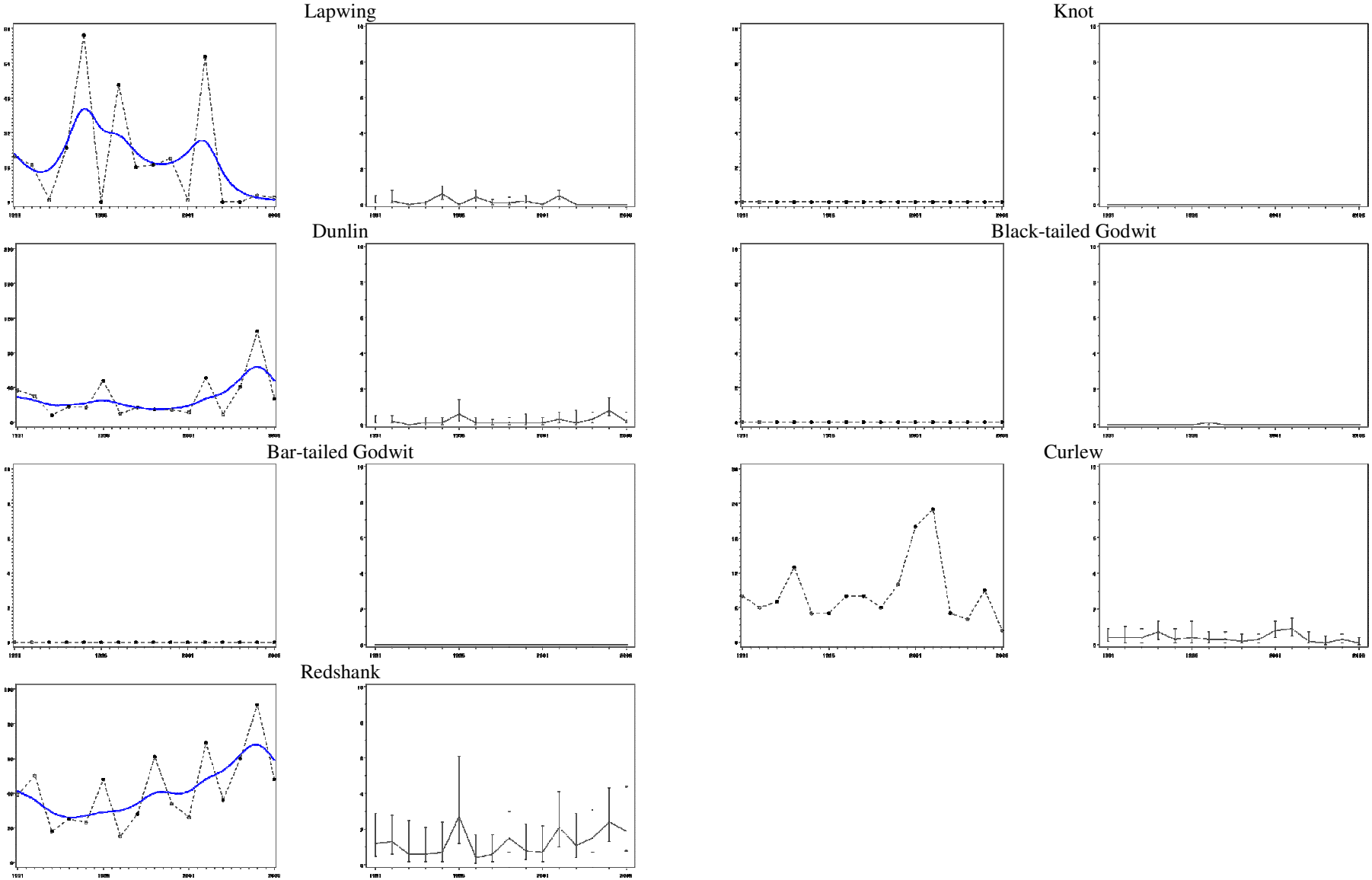

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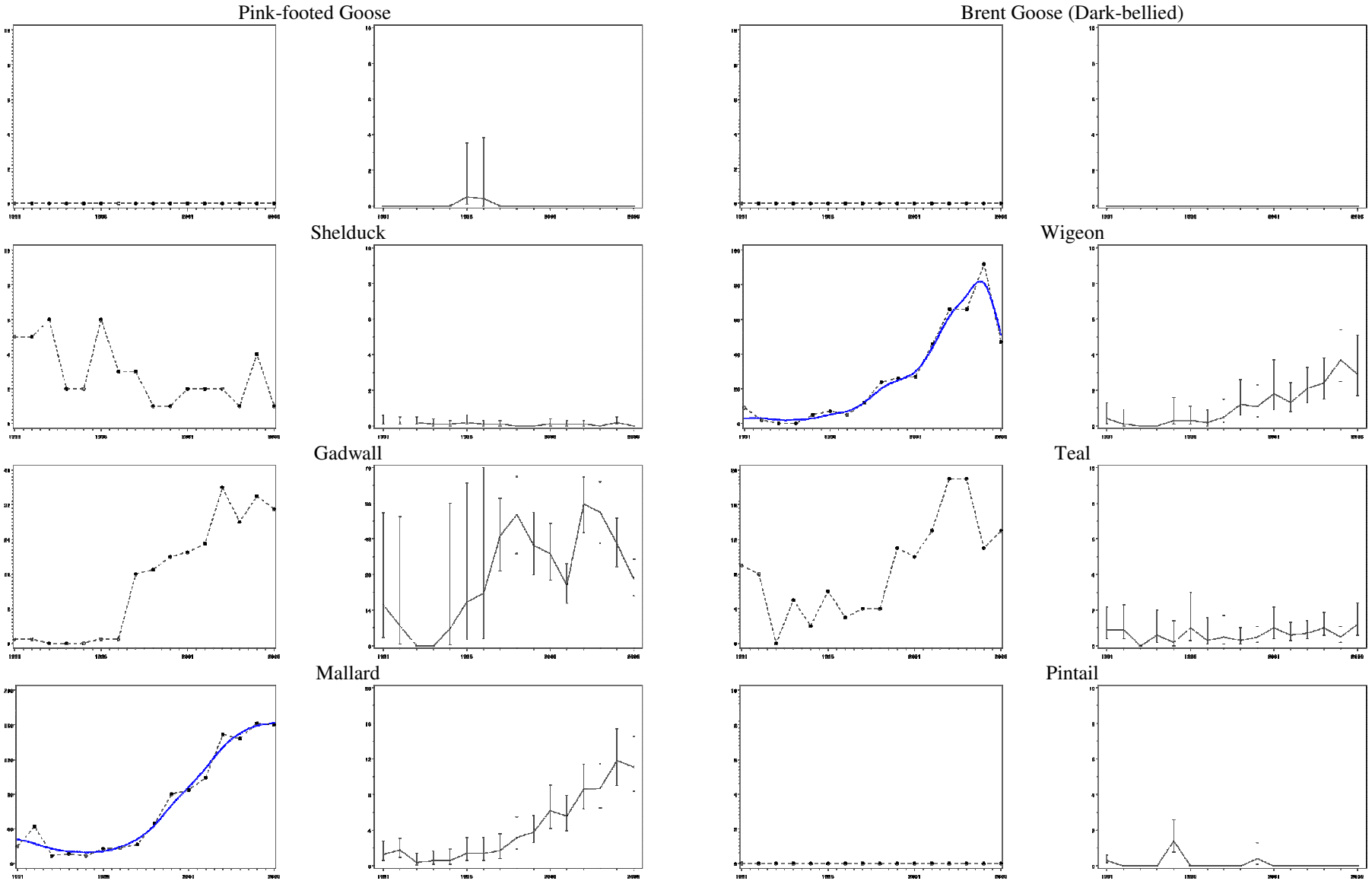
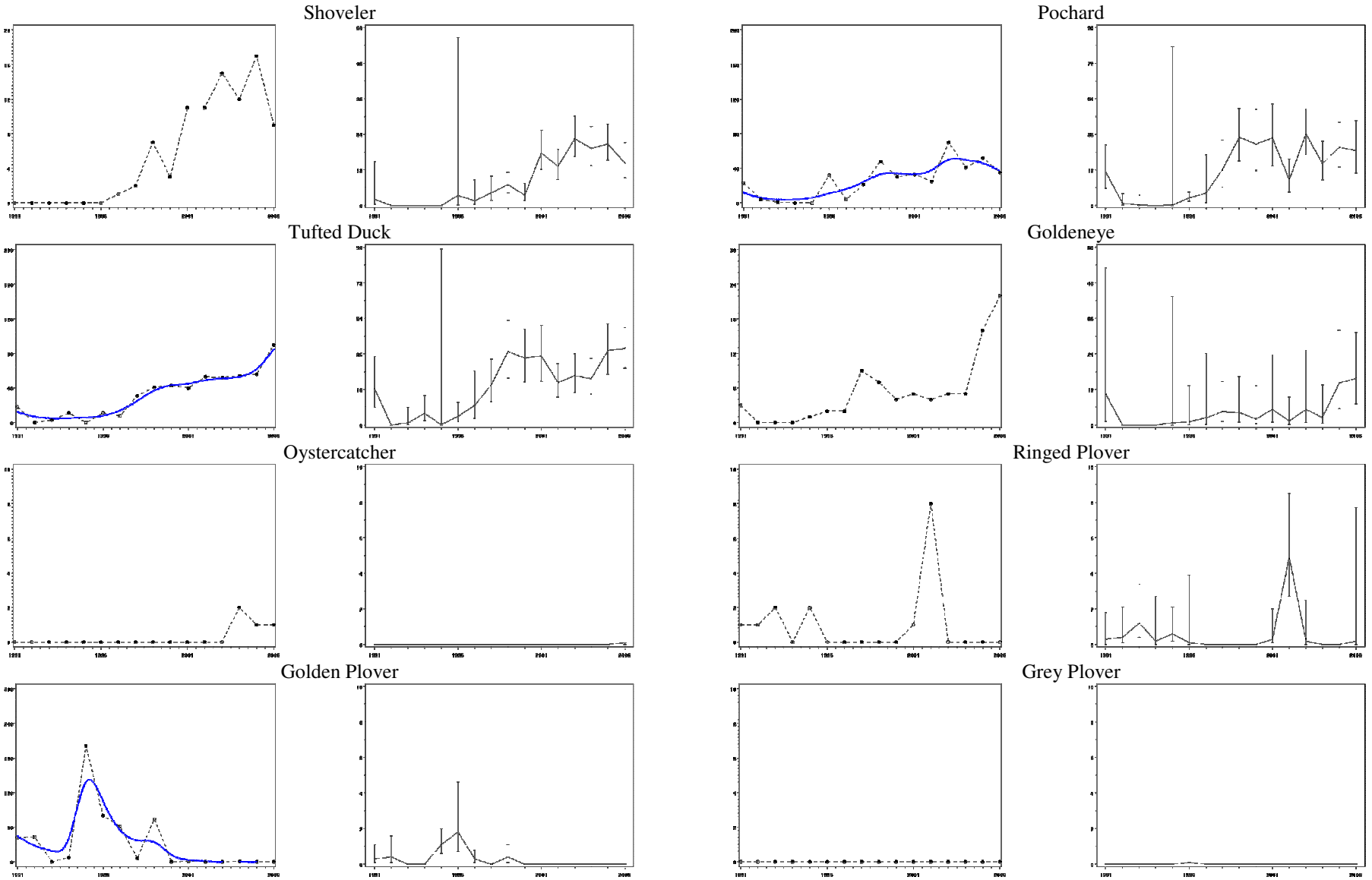


Figure B.38414 Population trends of each species in sector 38414 (Barrow to Barton (including Pits) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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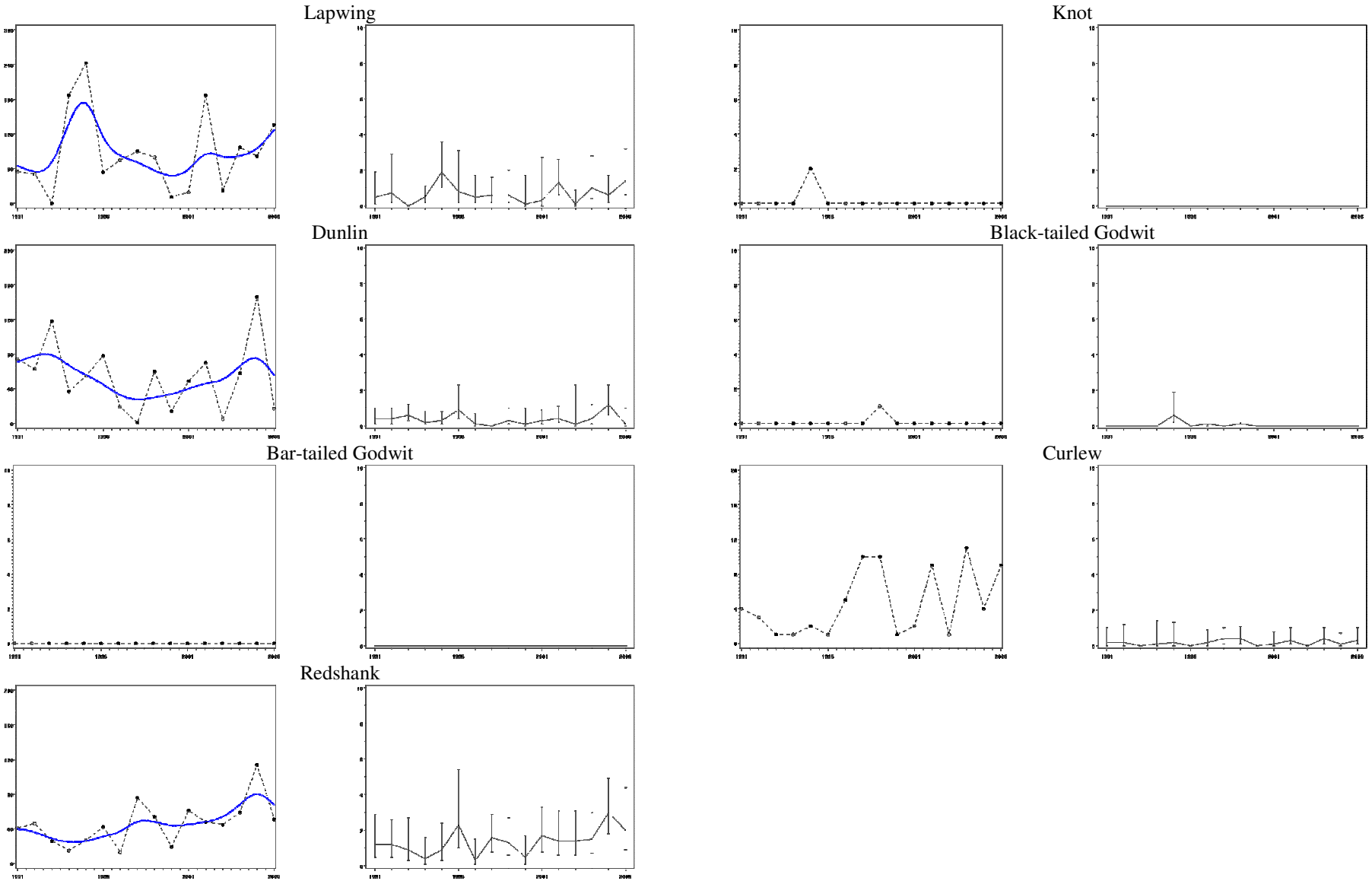

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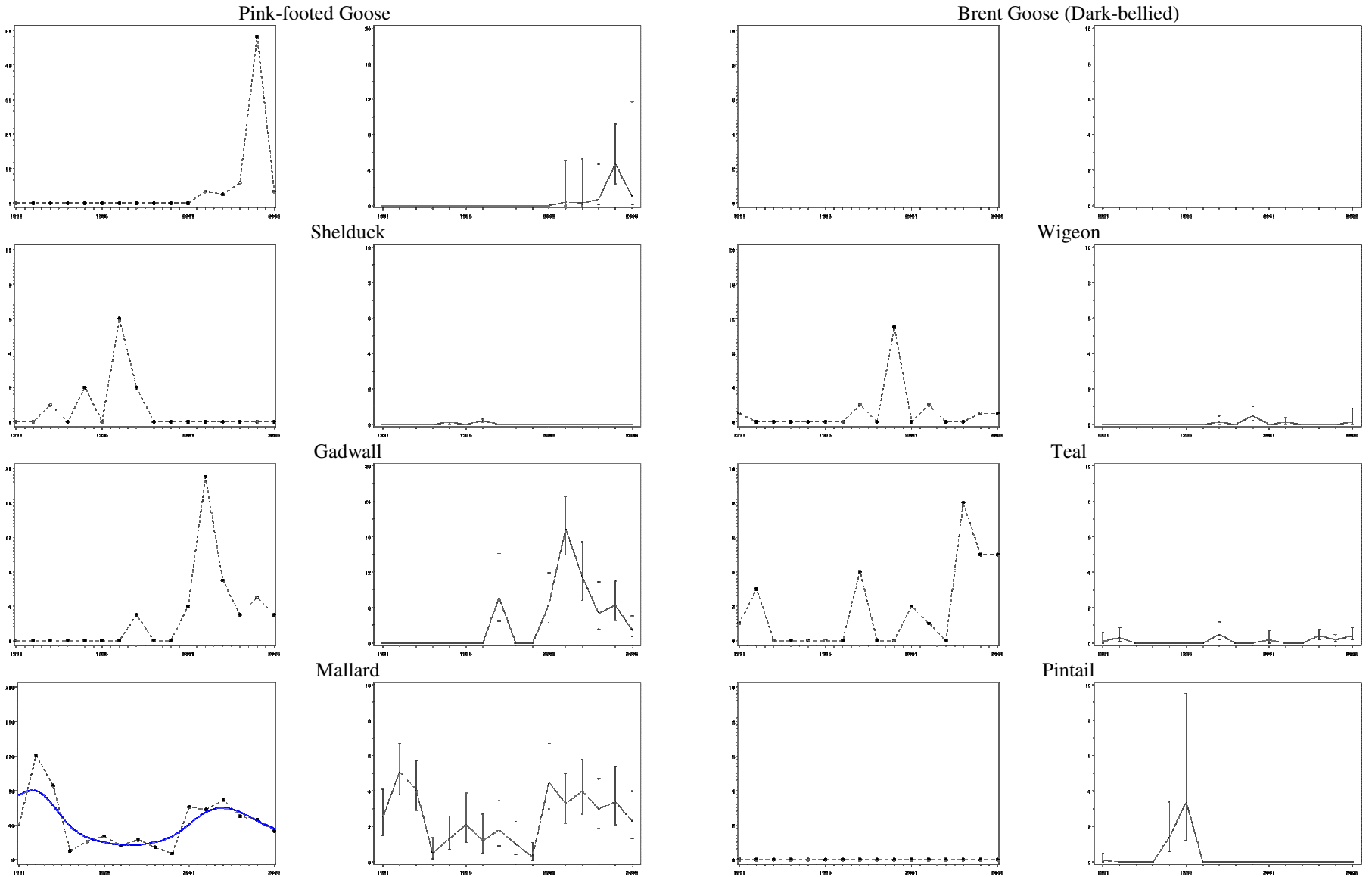
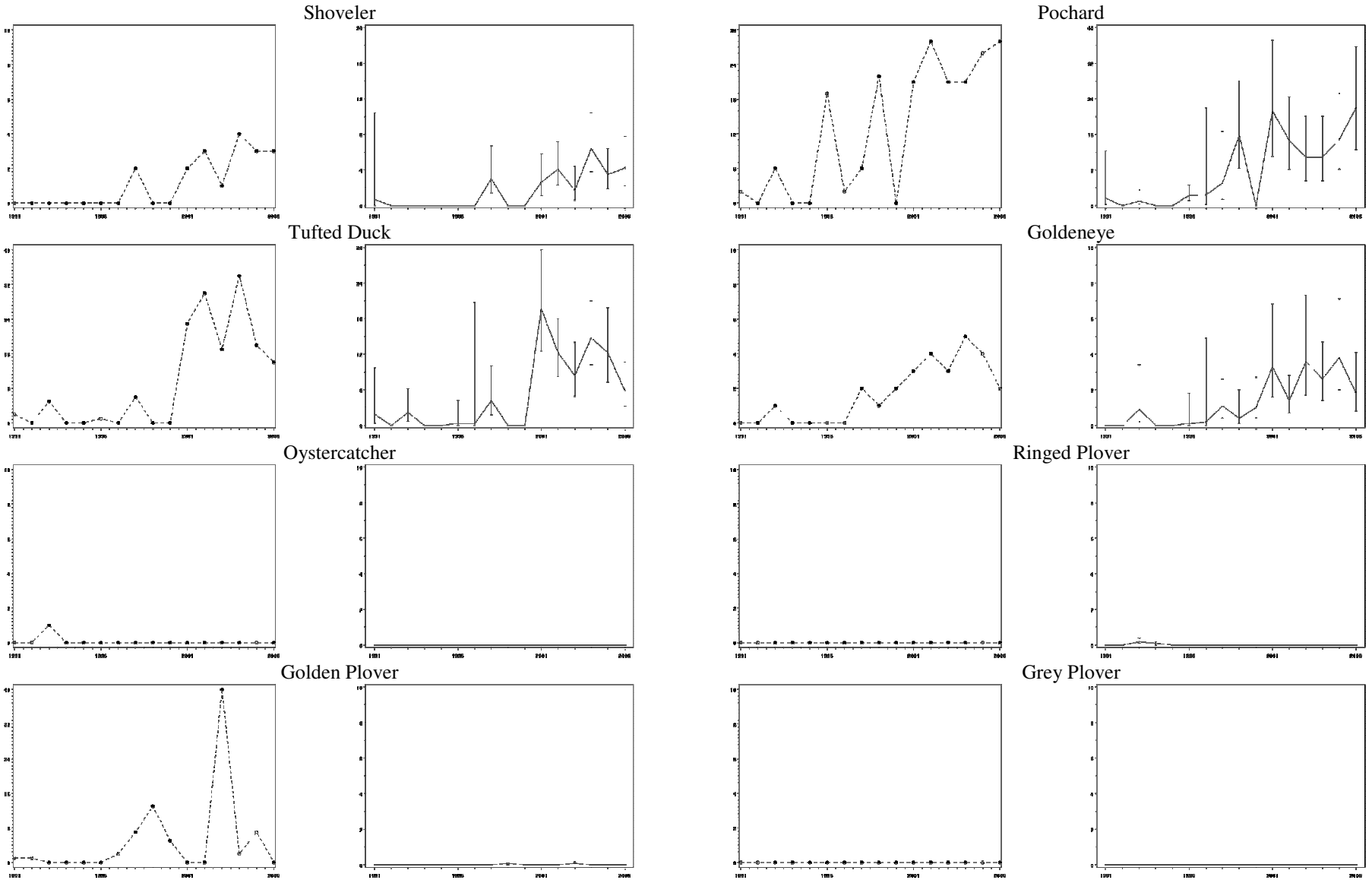


Figure B.38415 Population trends of each species in sector 38415 (Barton to Chowder Ness) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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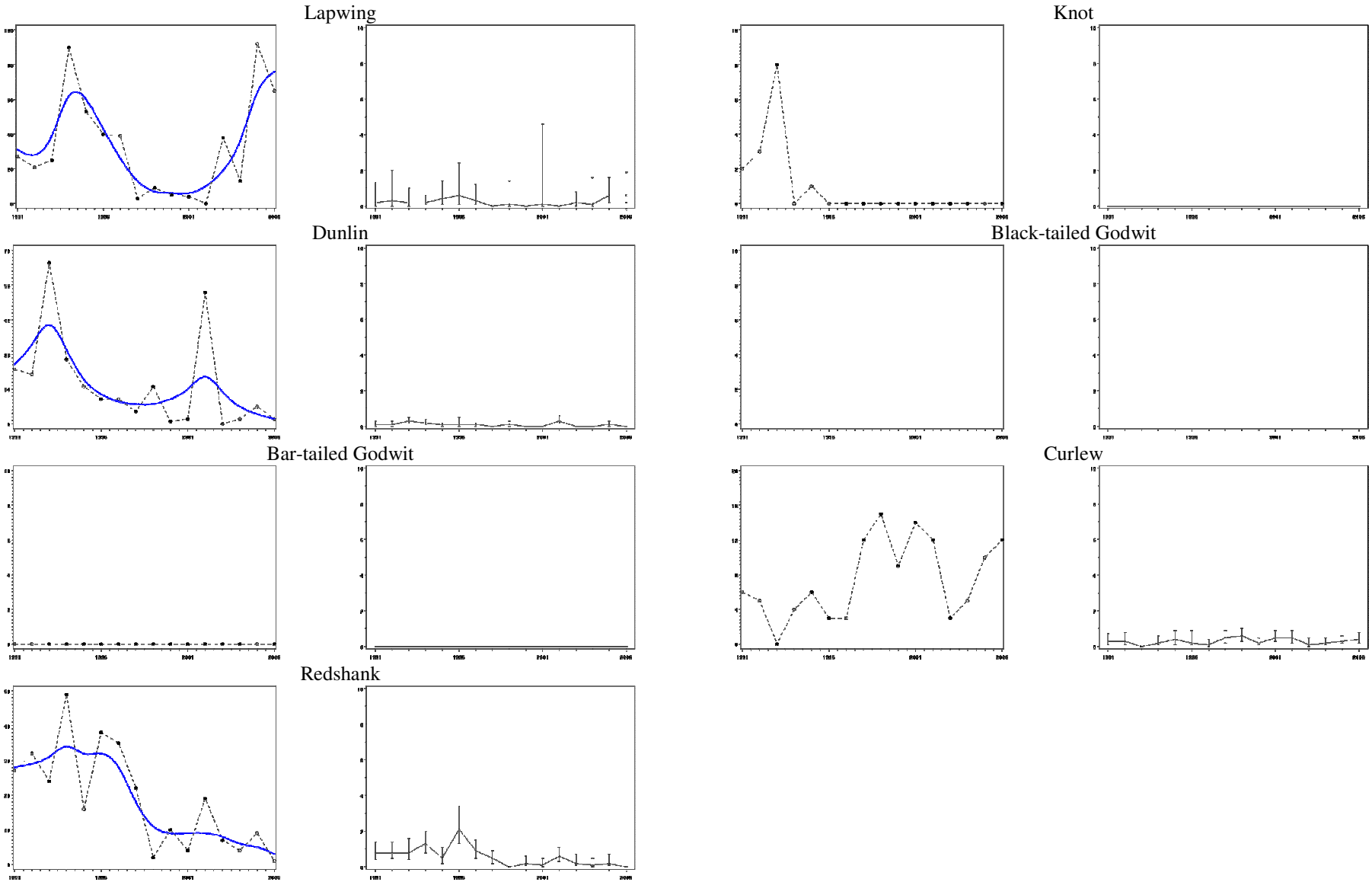

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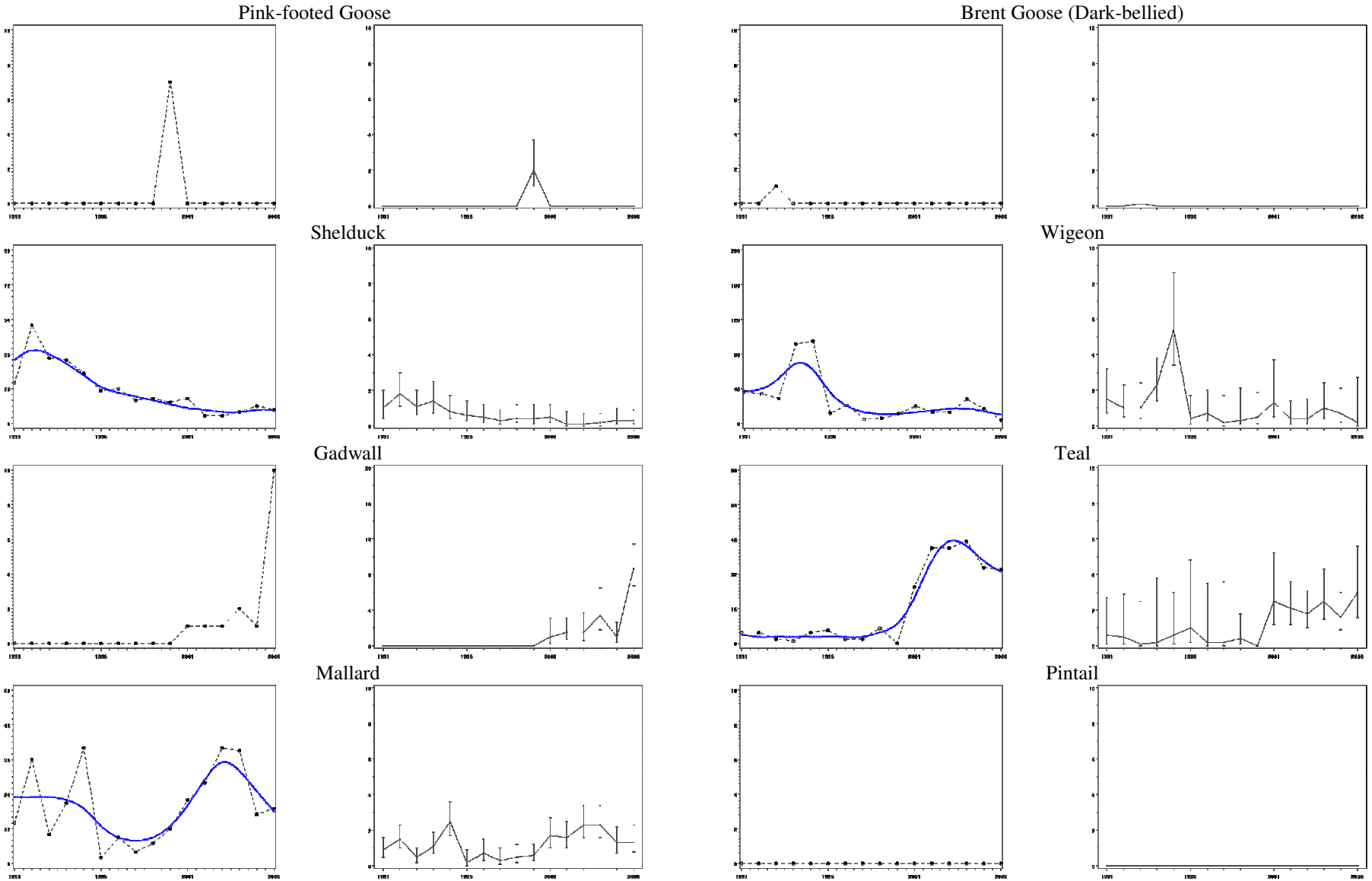
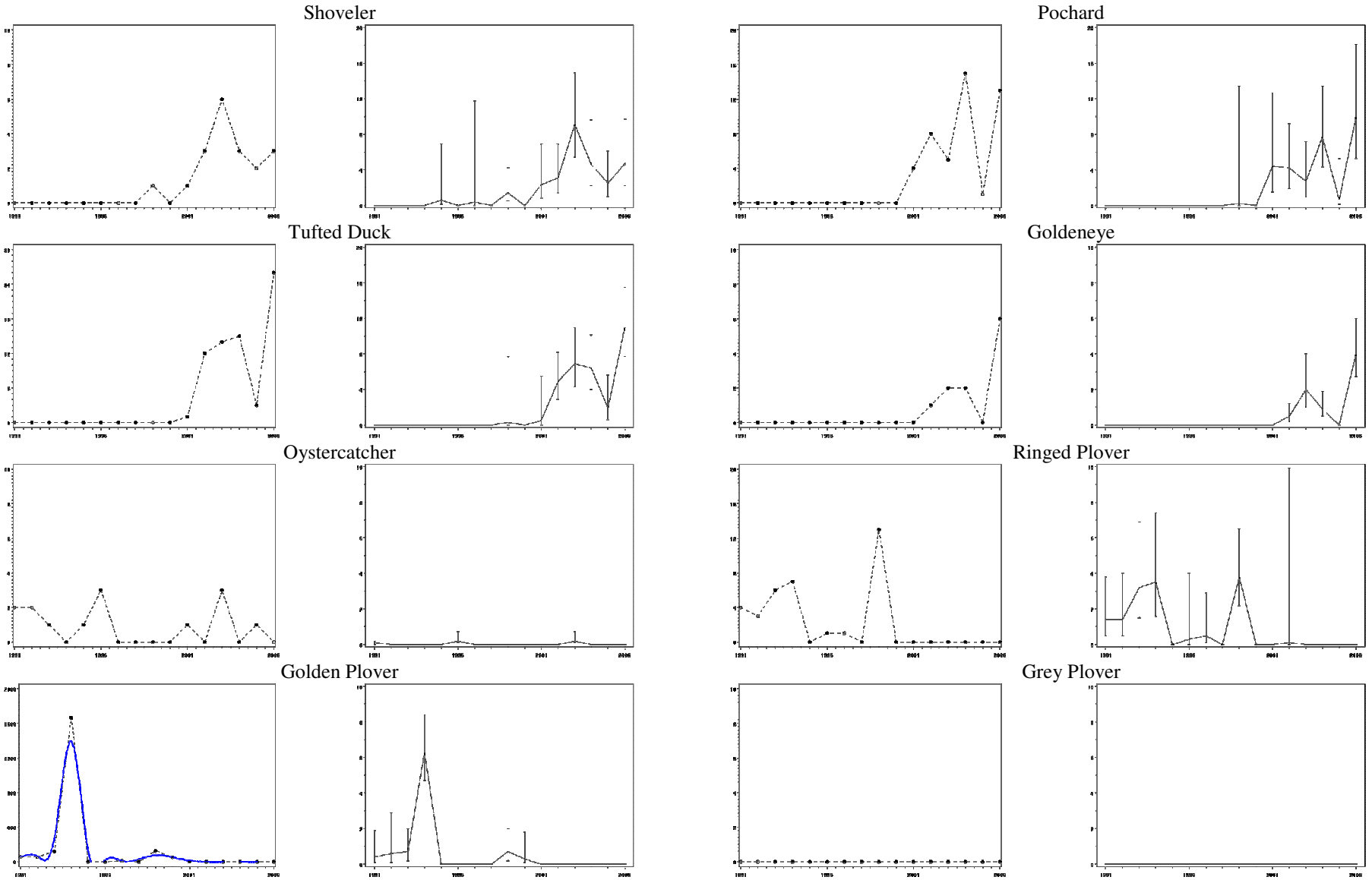


Figure B.38416 Population trends of each species in sector 38416 (Chowder Neww to South Ferriby Sluice) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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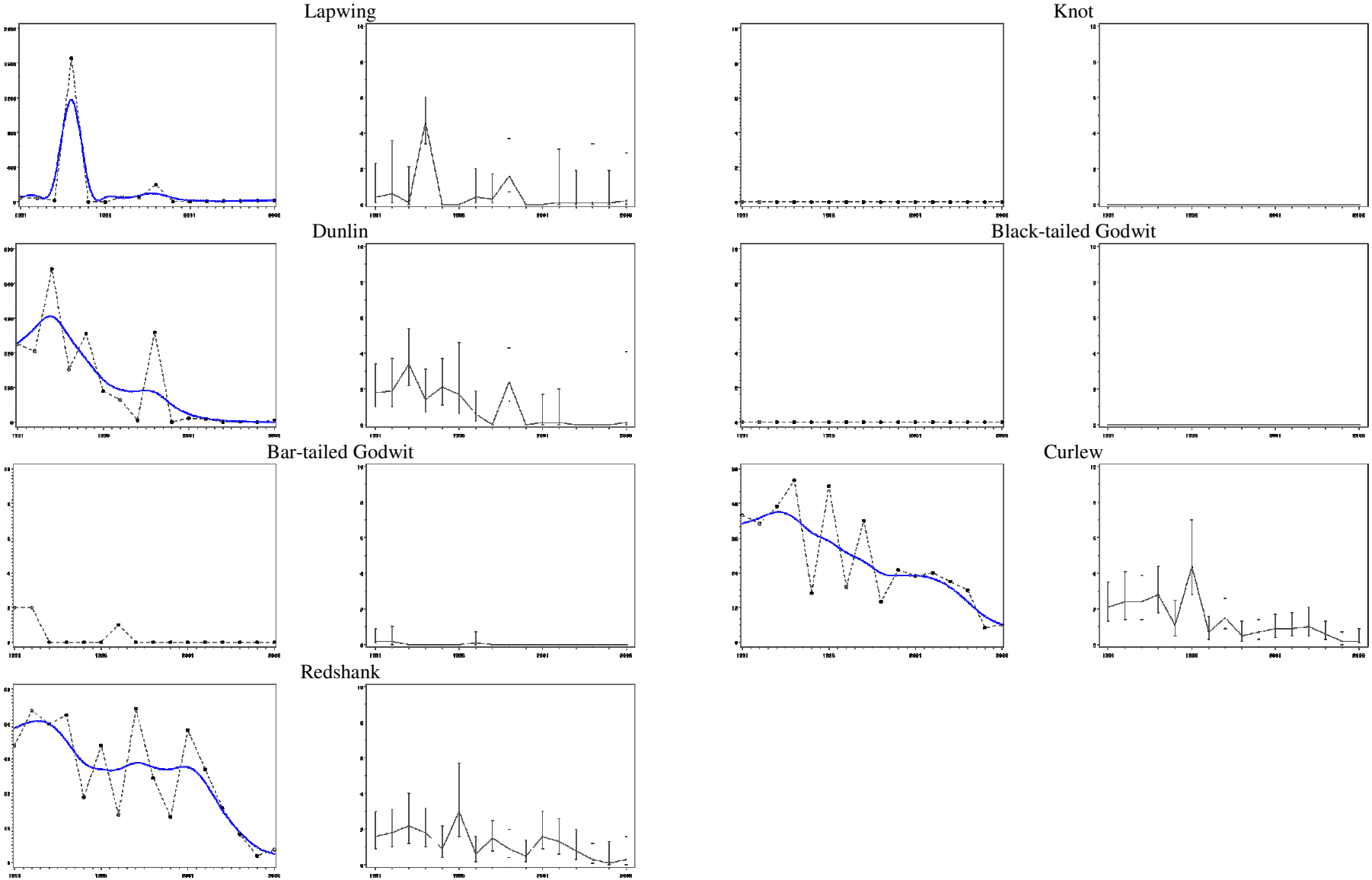

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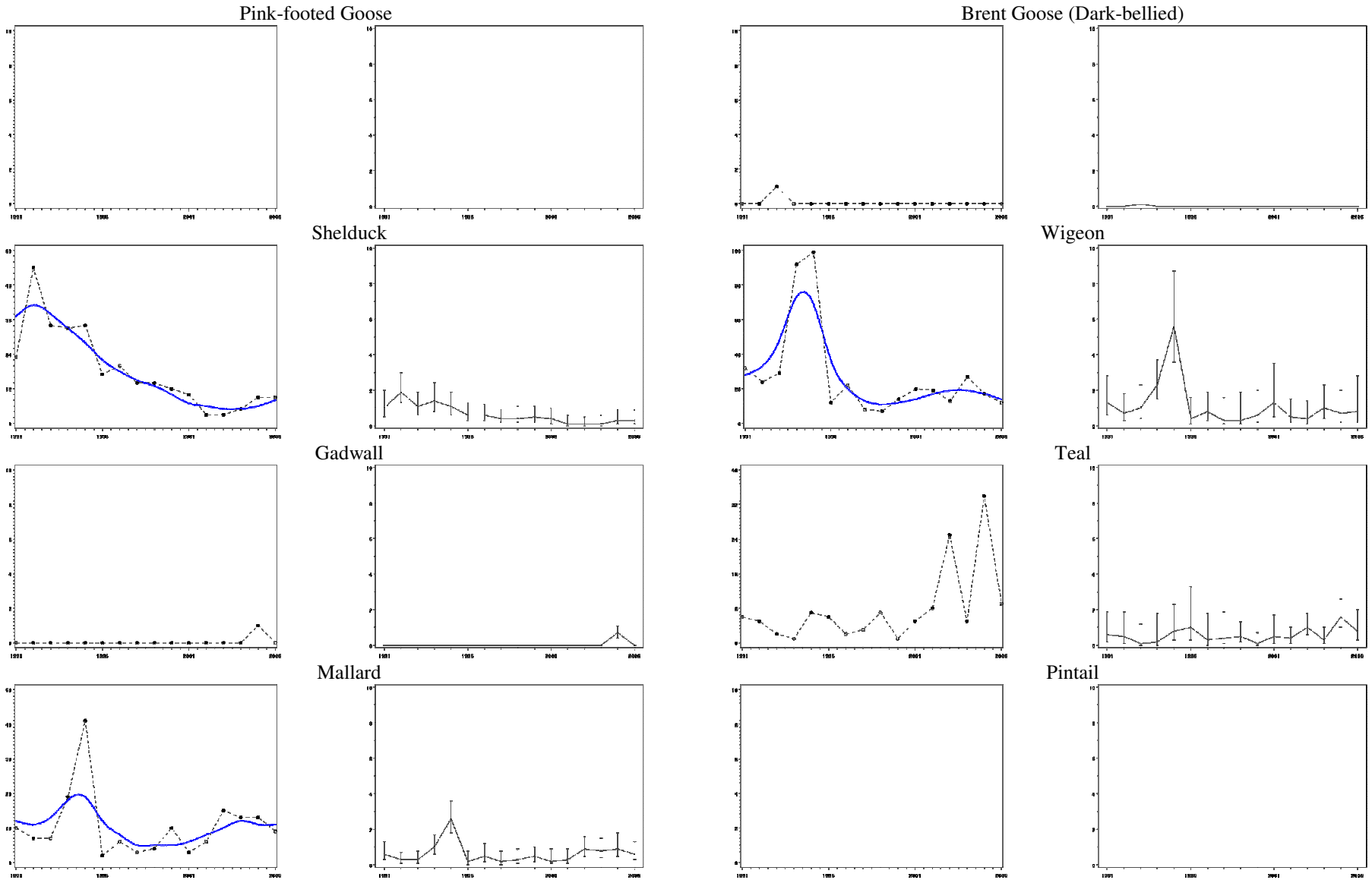
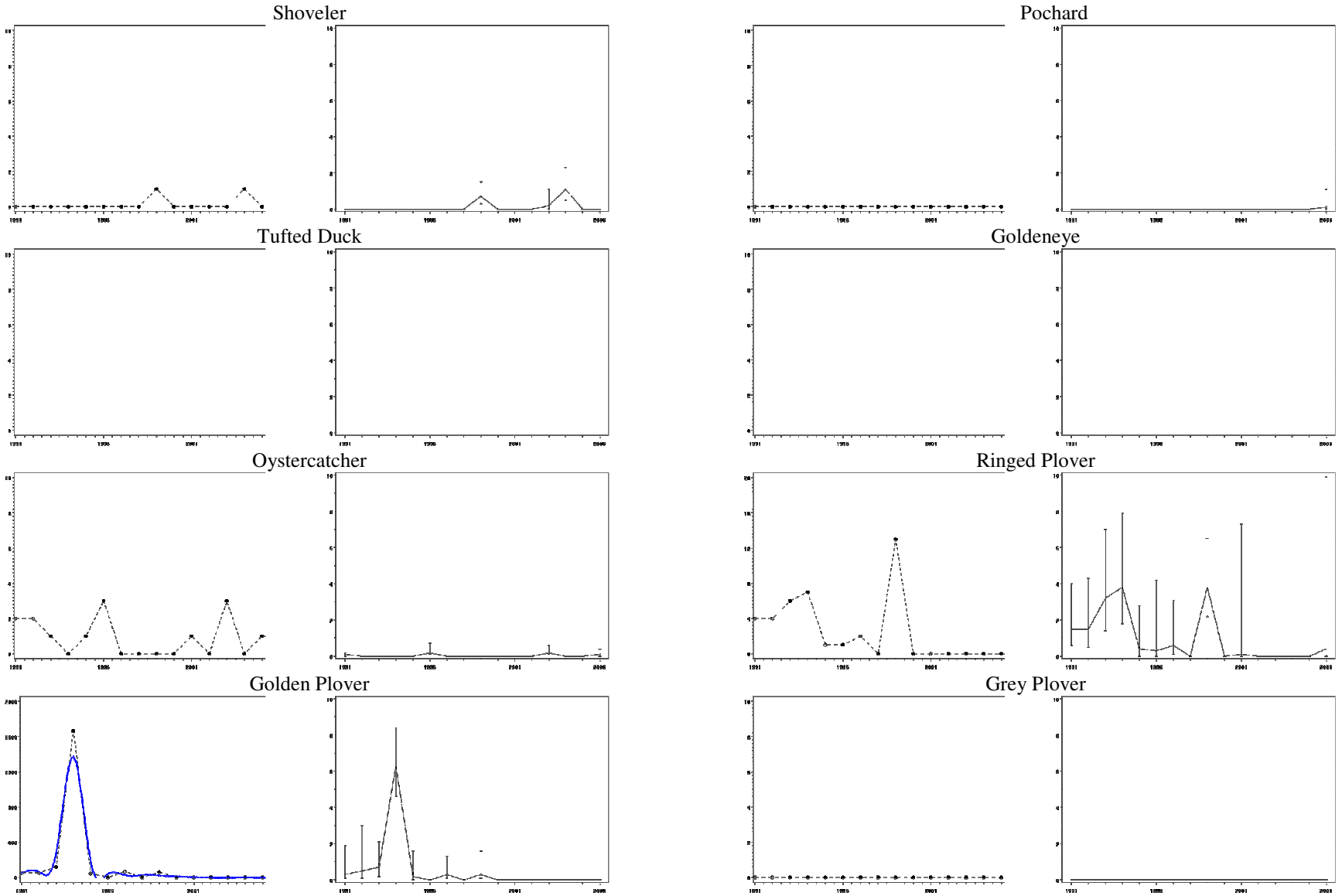


Figure B.38417 Population trends of each species in sector 38417 (South Ferriby) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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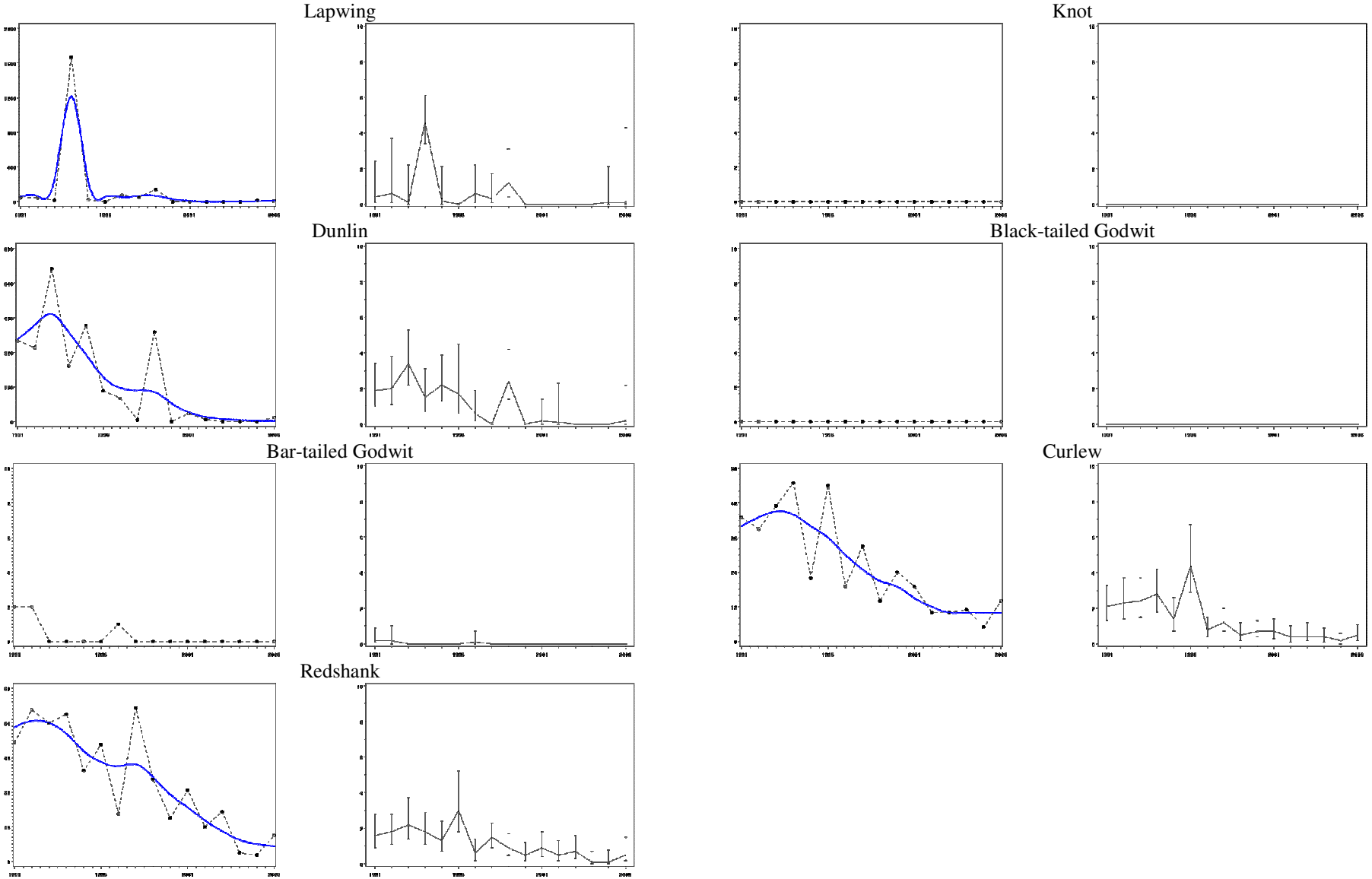

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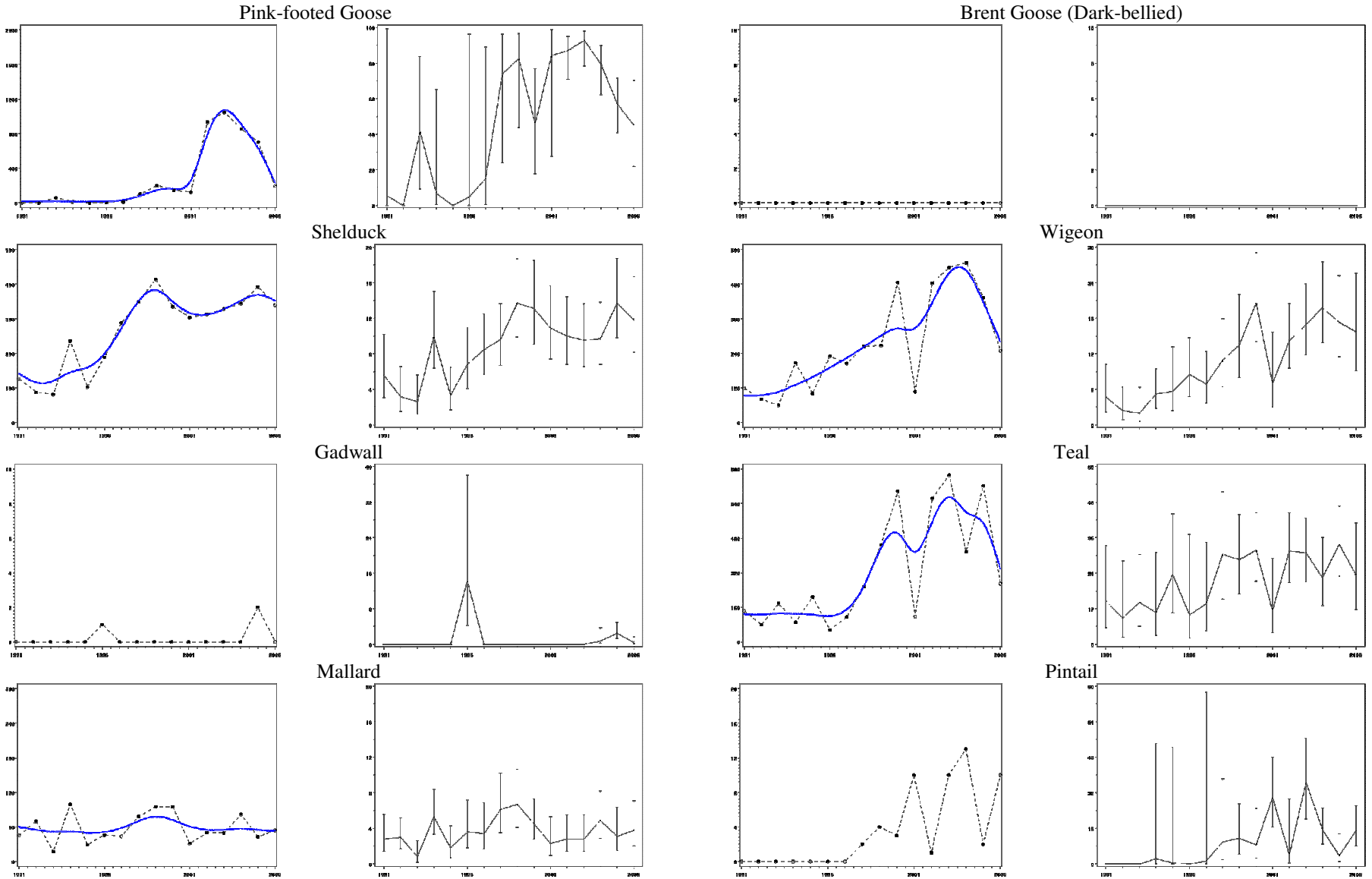
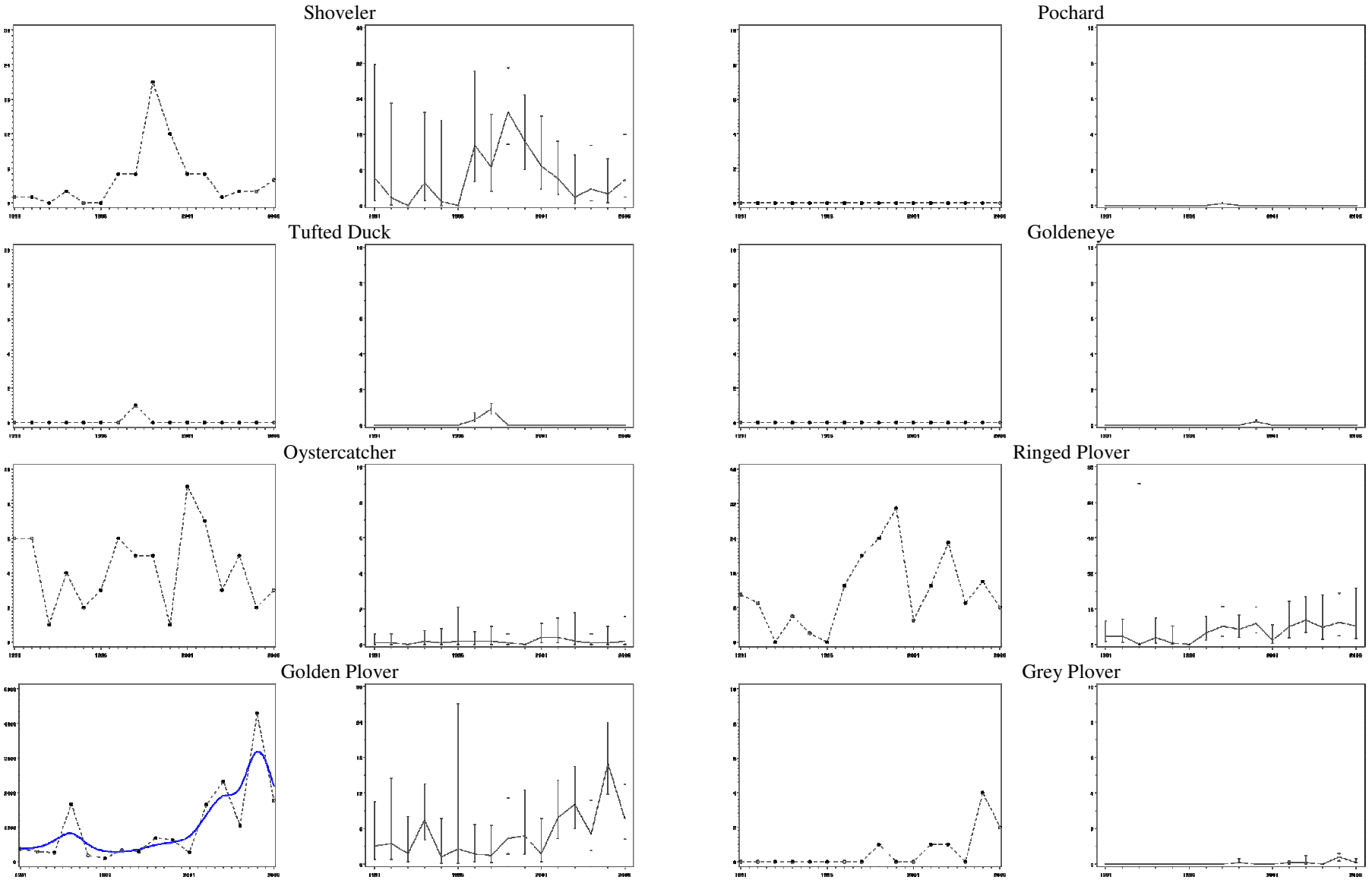


Figure B.38418 Population trends of each species in sector 38418 (Read`s Island Flats) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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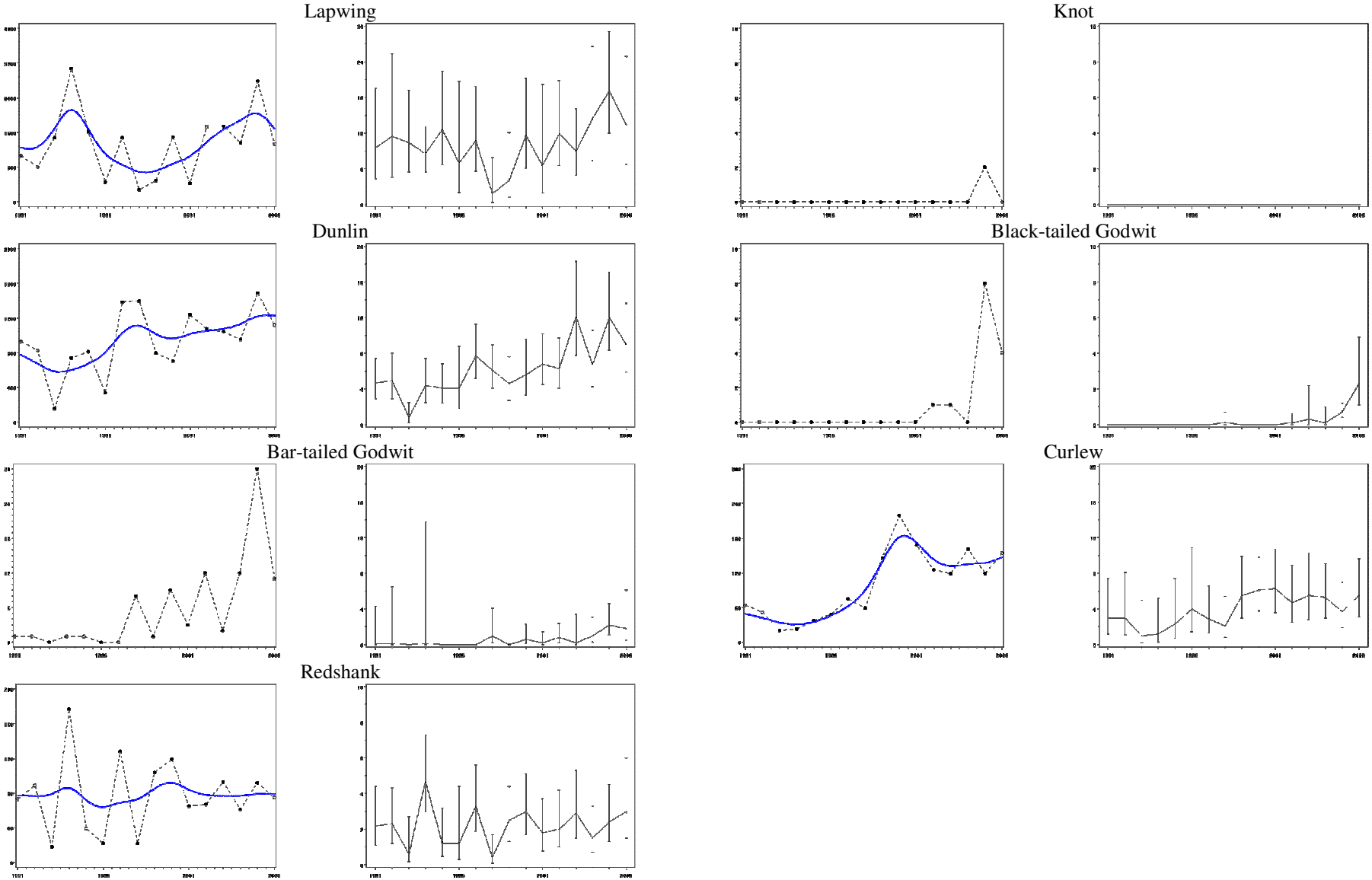

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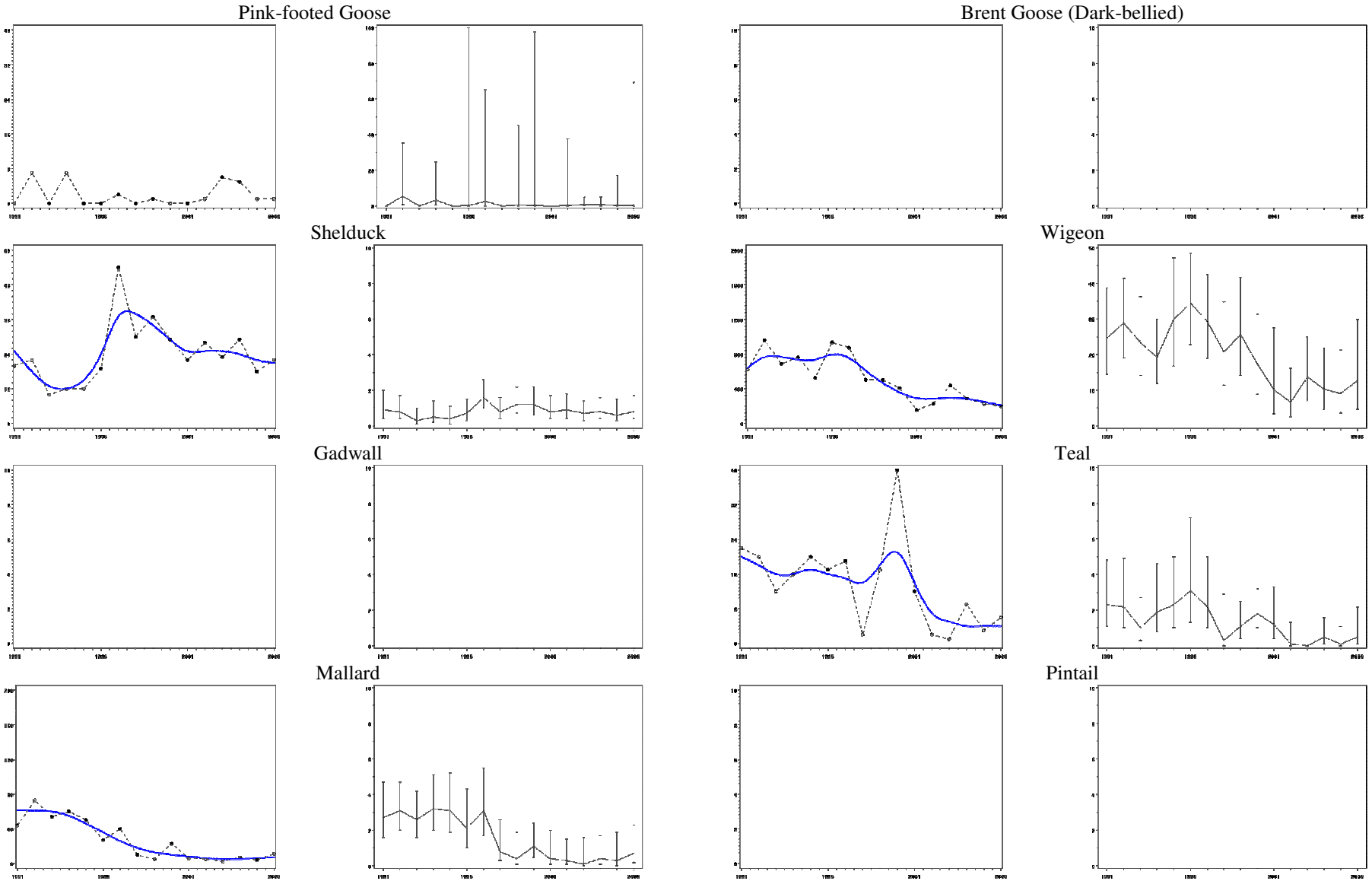


Figure B.38419 Population trends of each species in sector 38419 (Humber Estuary (South Inner) Sector B3) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).

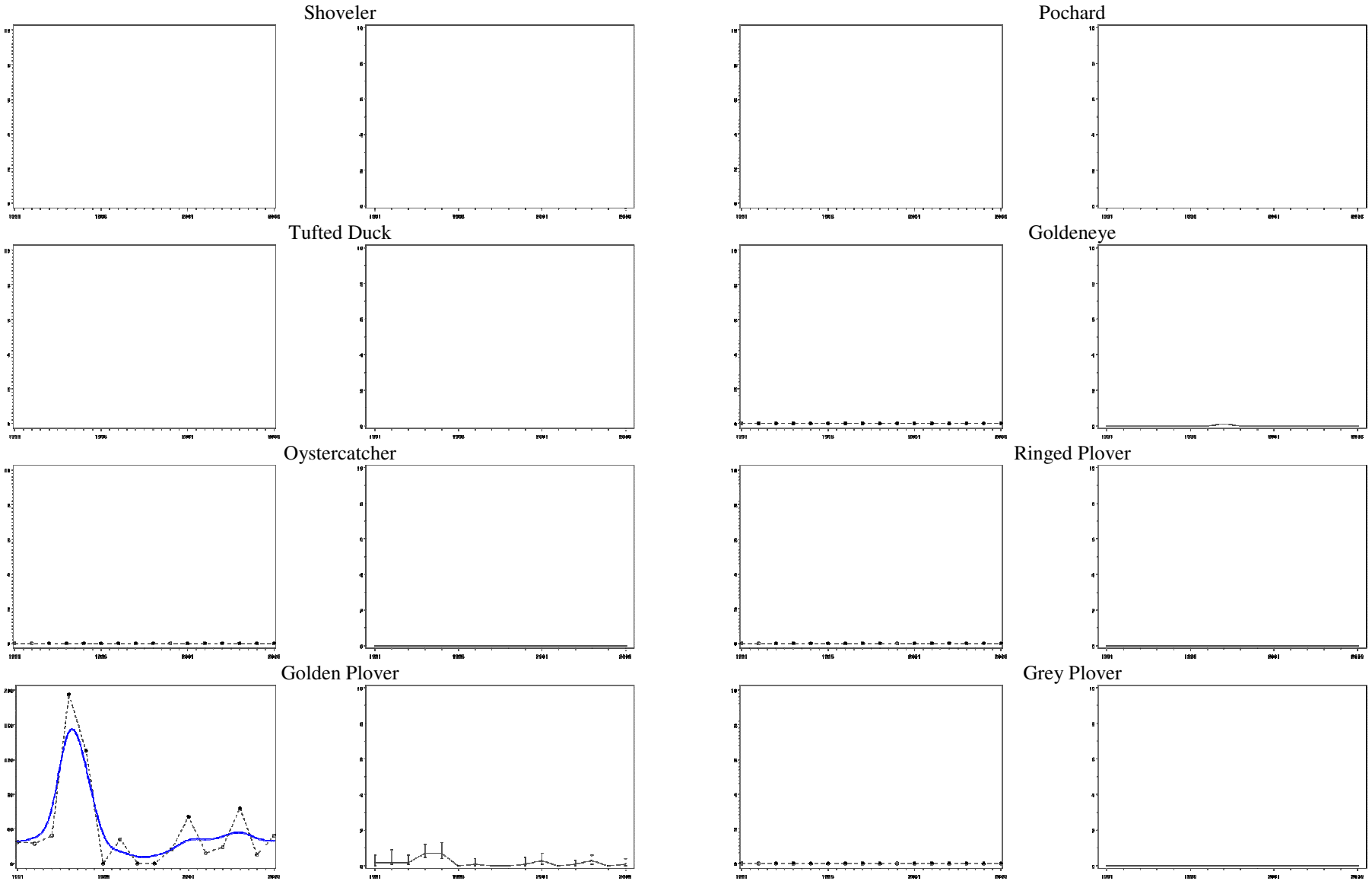
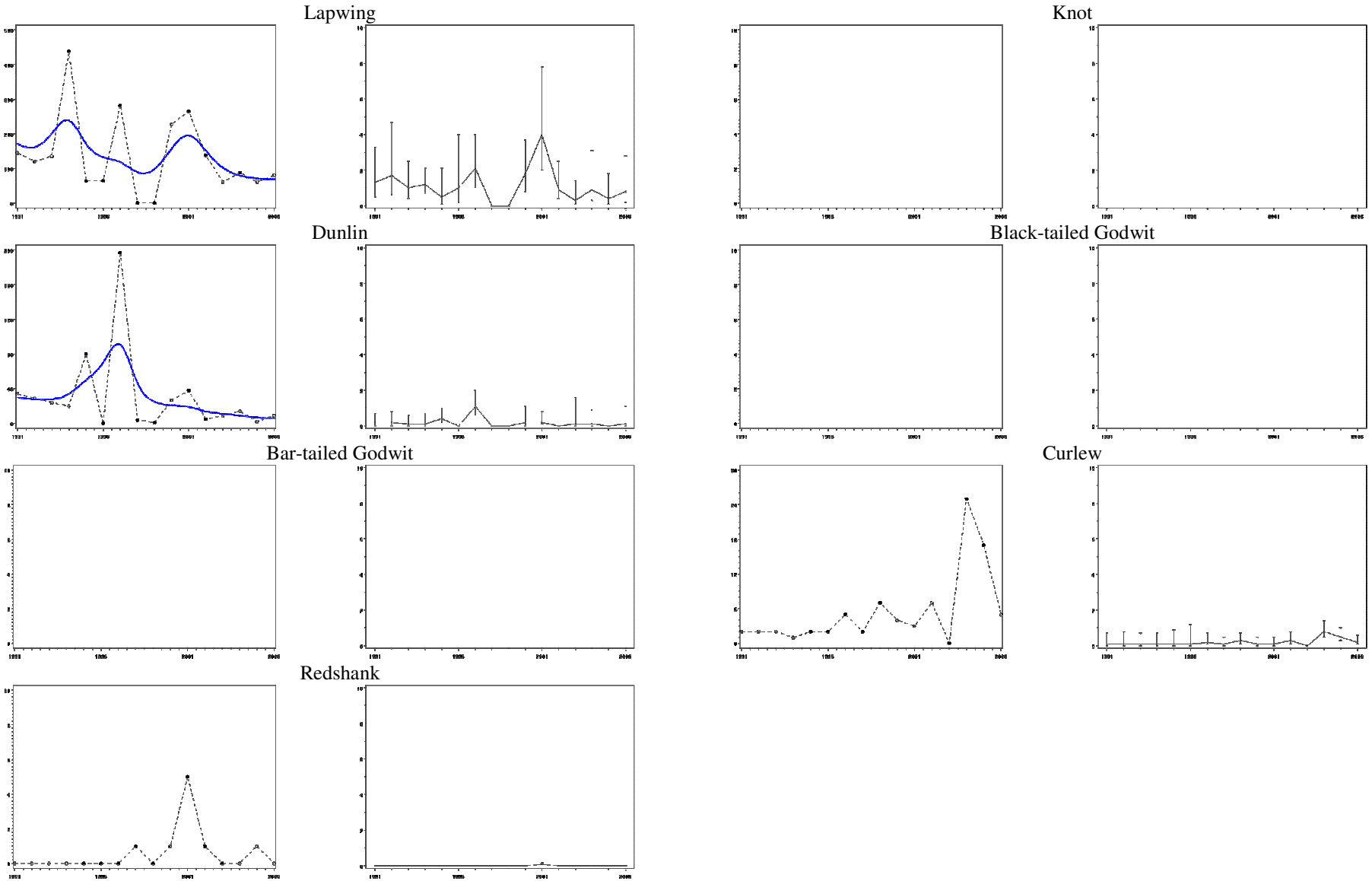


Figure B.38419 Continued.



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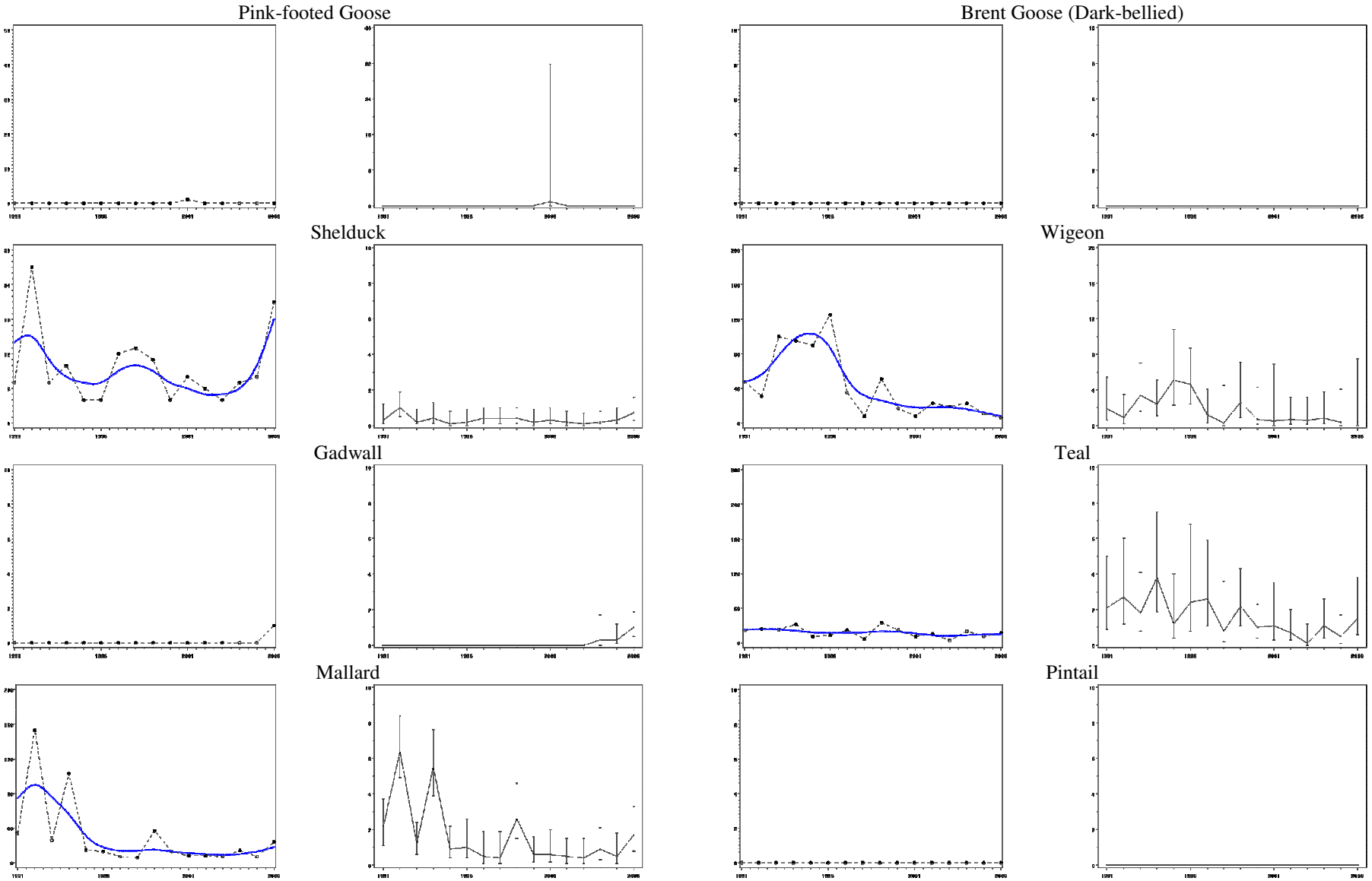
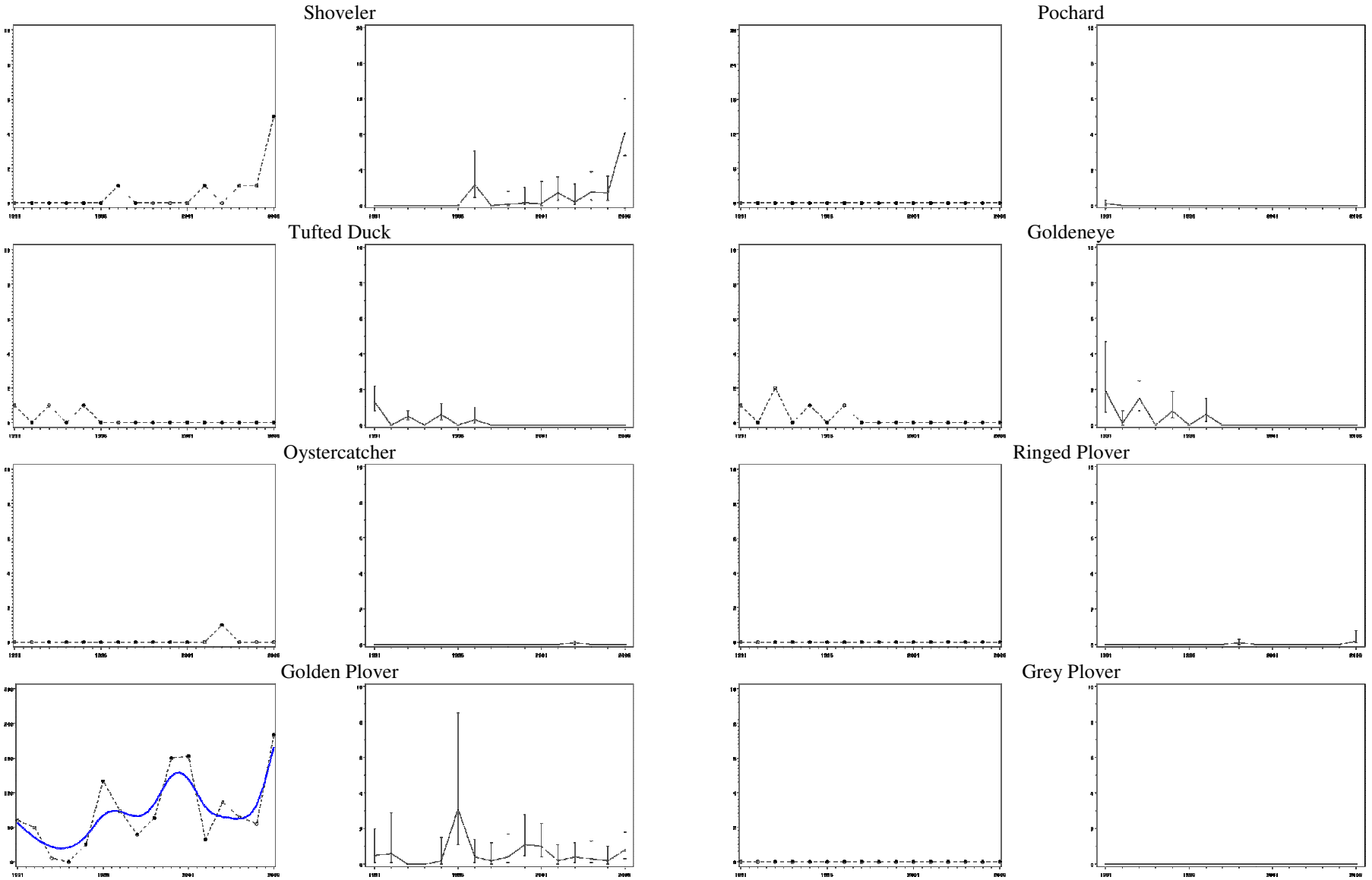


Figure B.38423 Population trends of each species in sector 38423 (Alkborough Flats) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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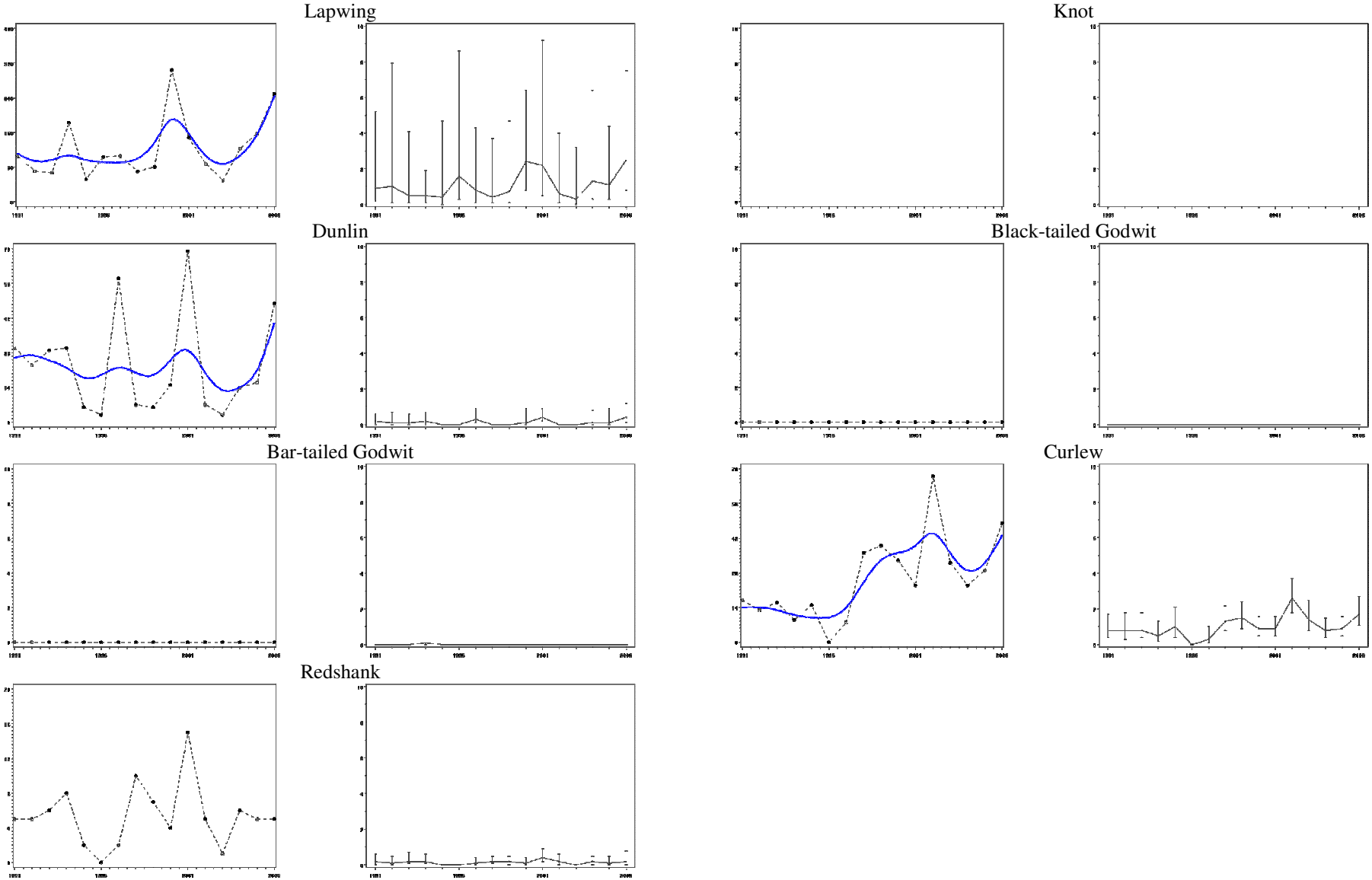

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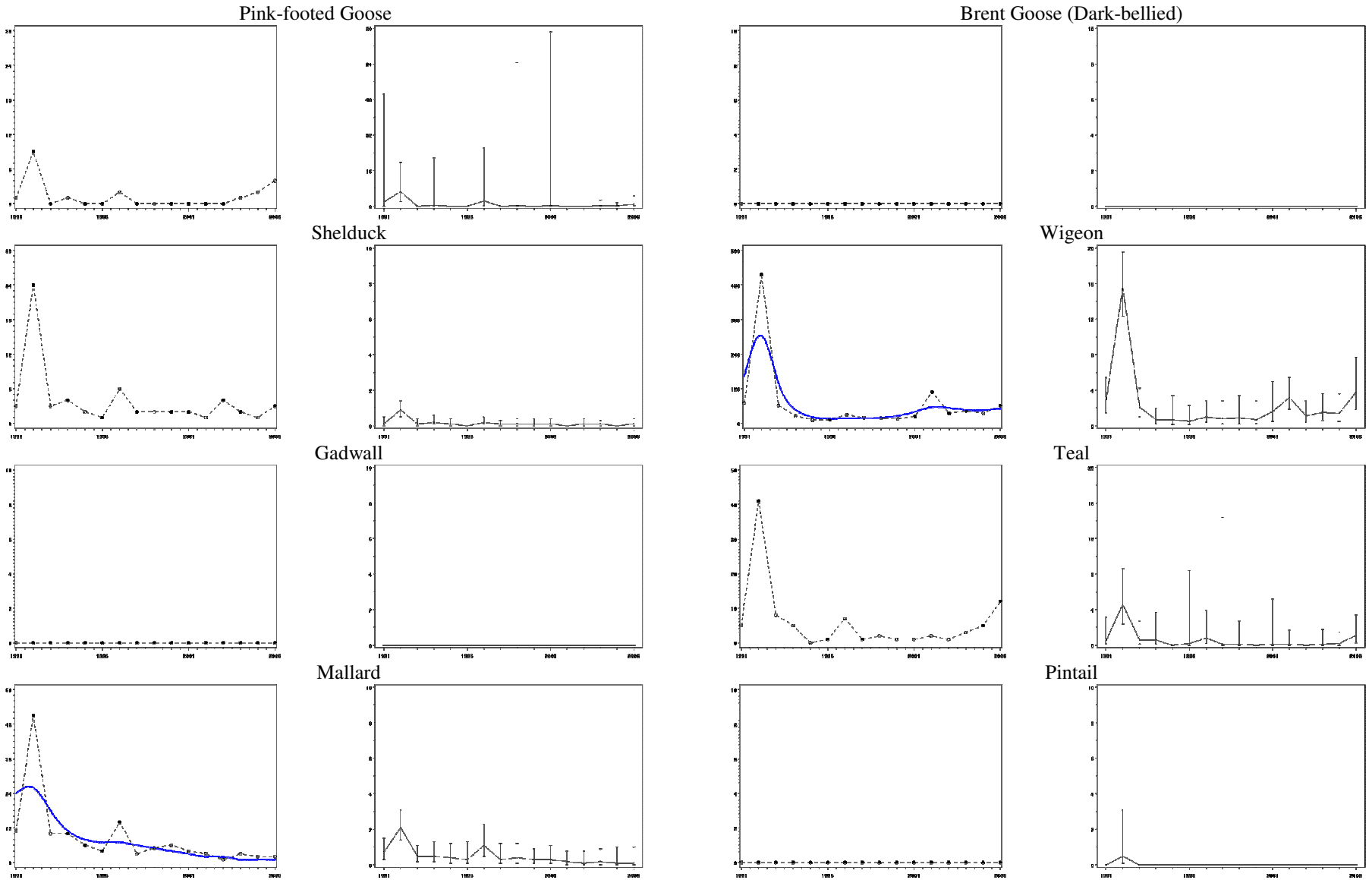
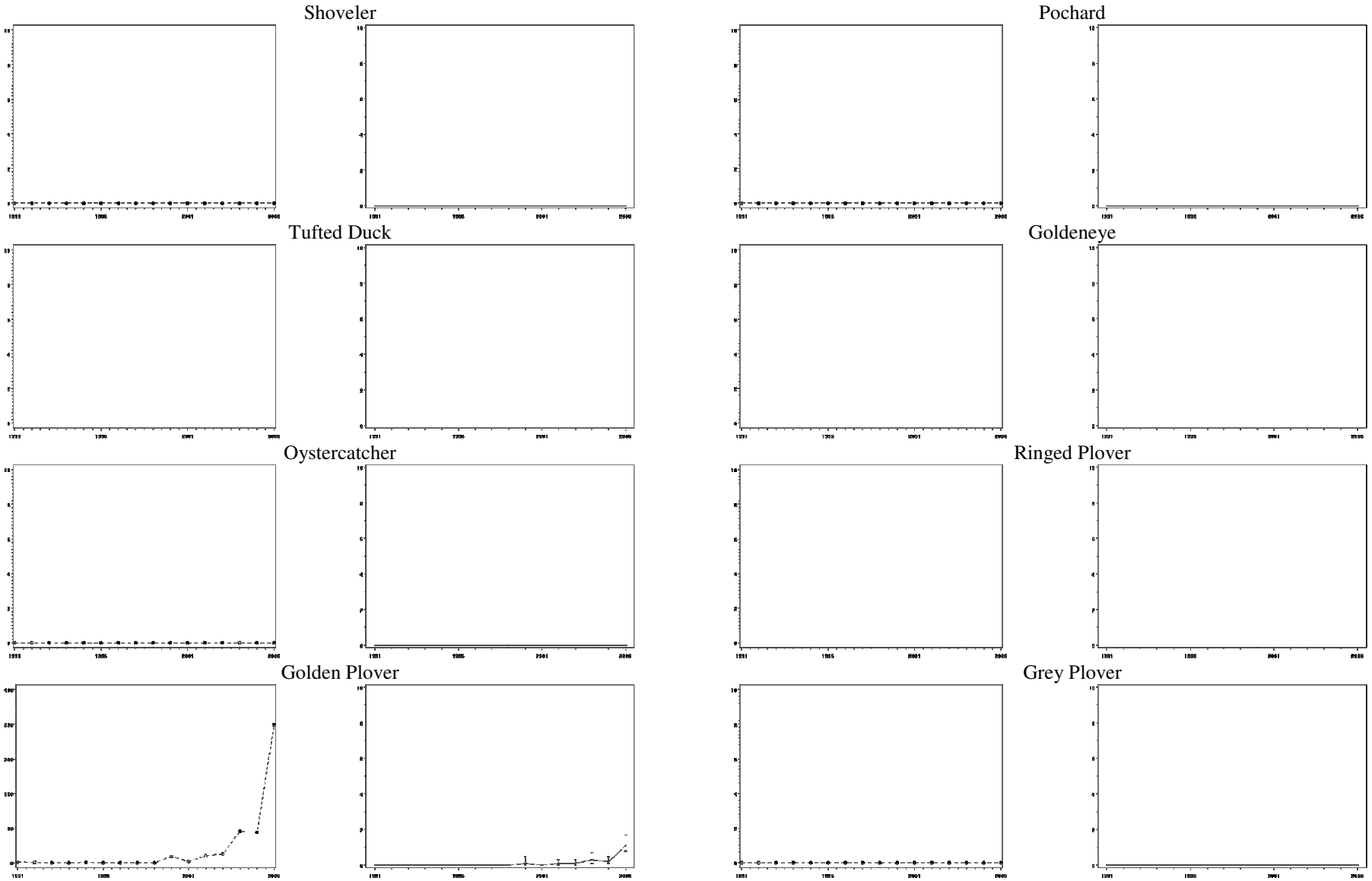


Figure B.38424 Population trends of each species in sector 38424 (Humber Estuary (South Inner) Sector B1) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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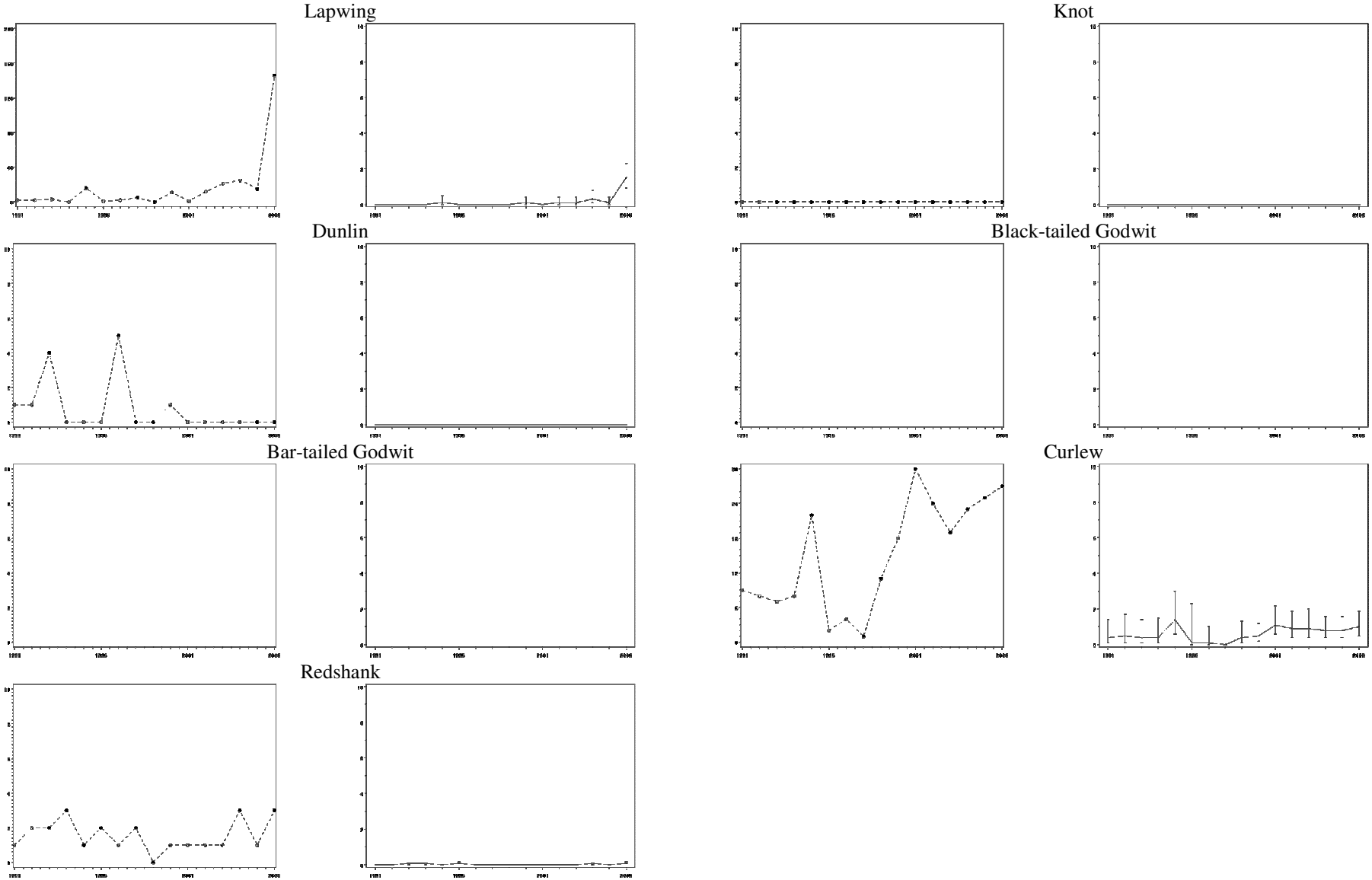

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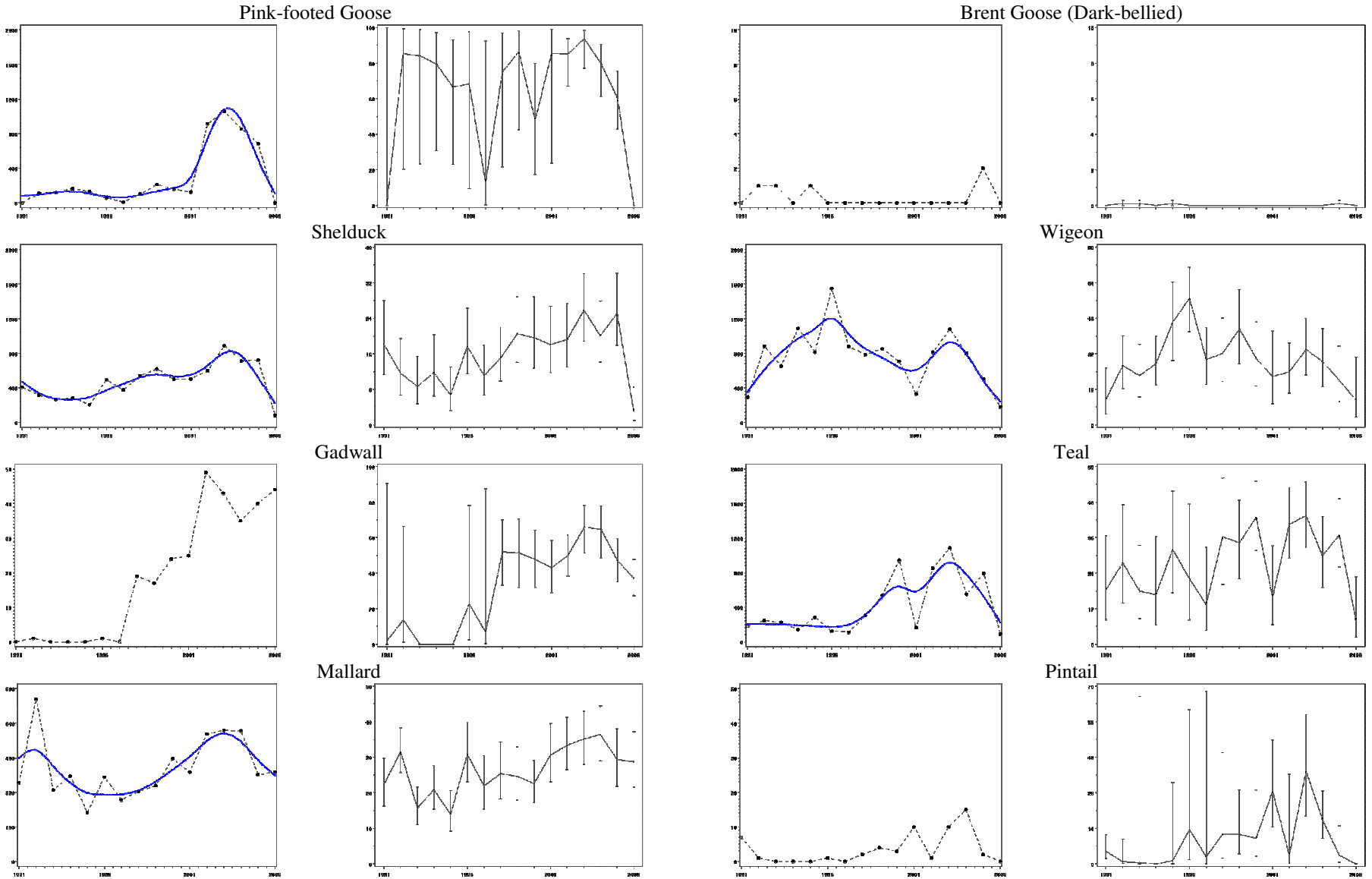
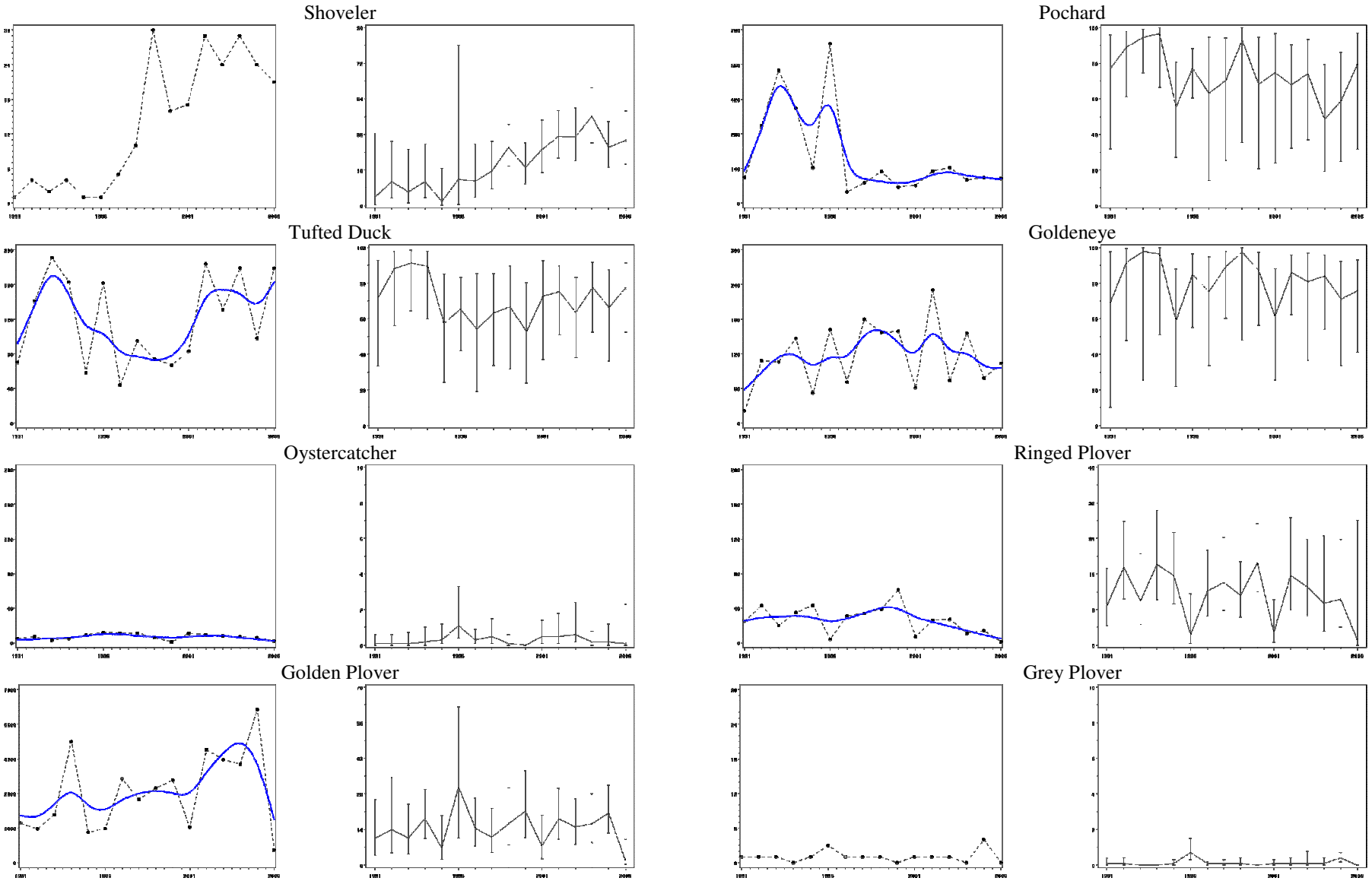


Figure B.38425 Population trends of each species in sector 38425 (Humber South (Inner)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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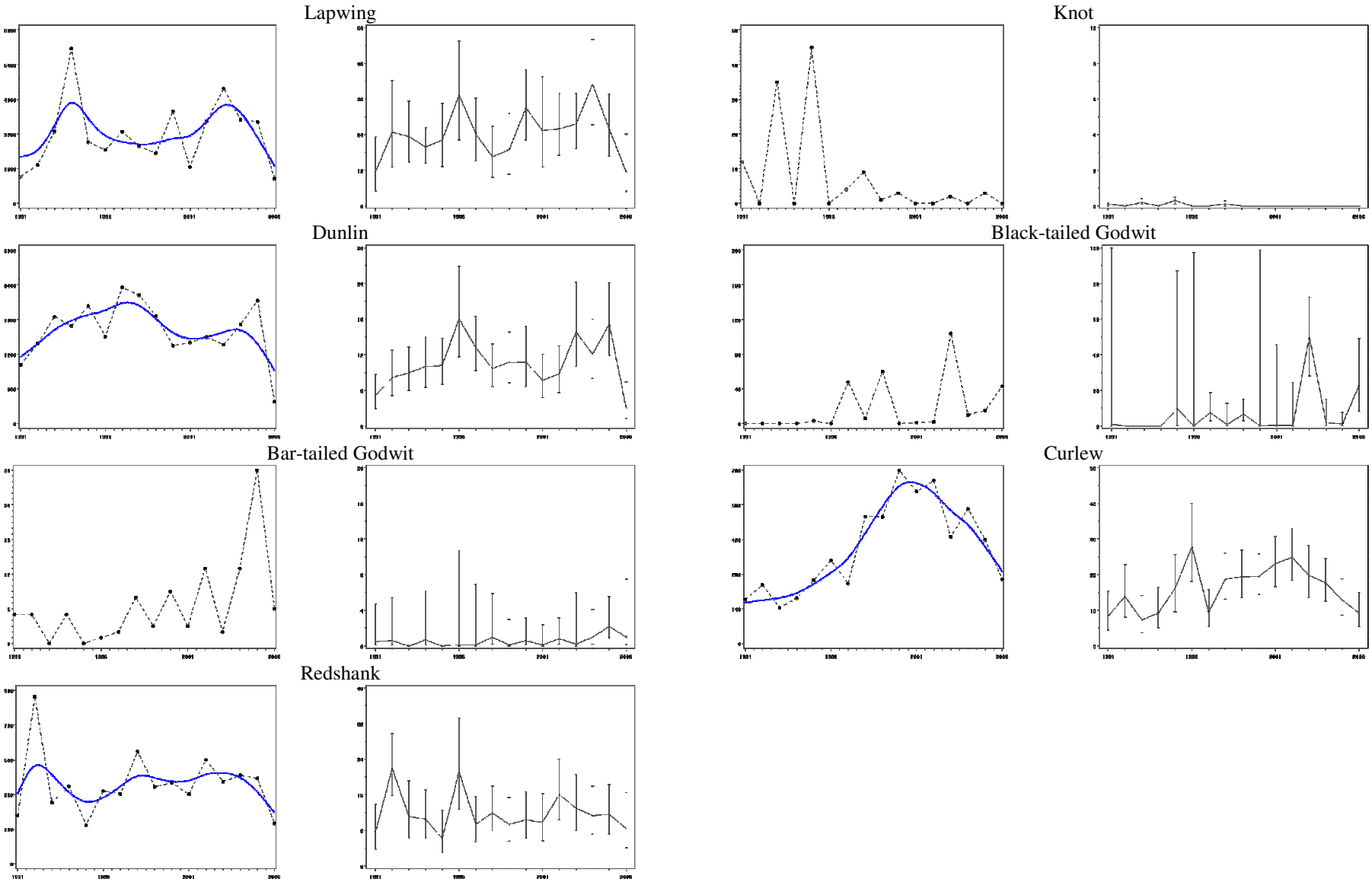

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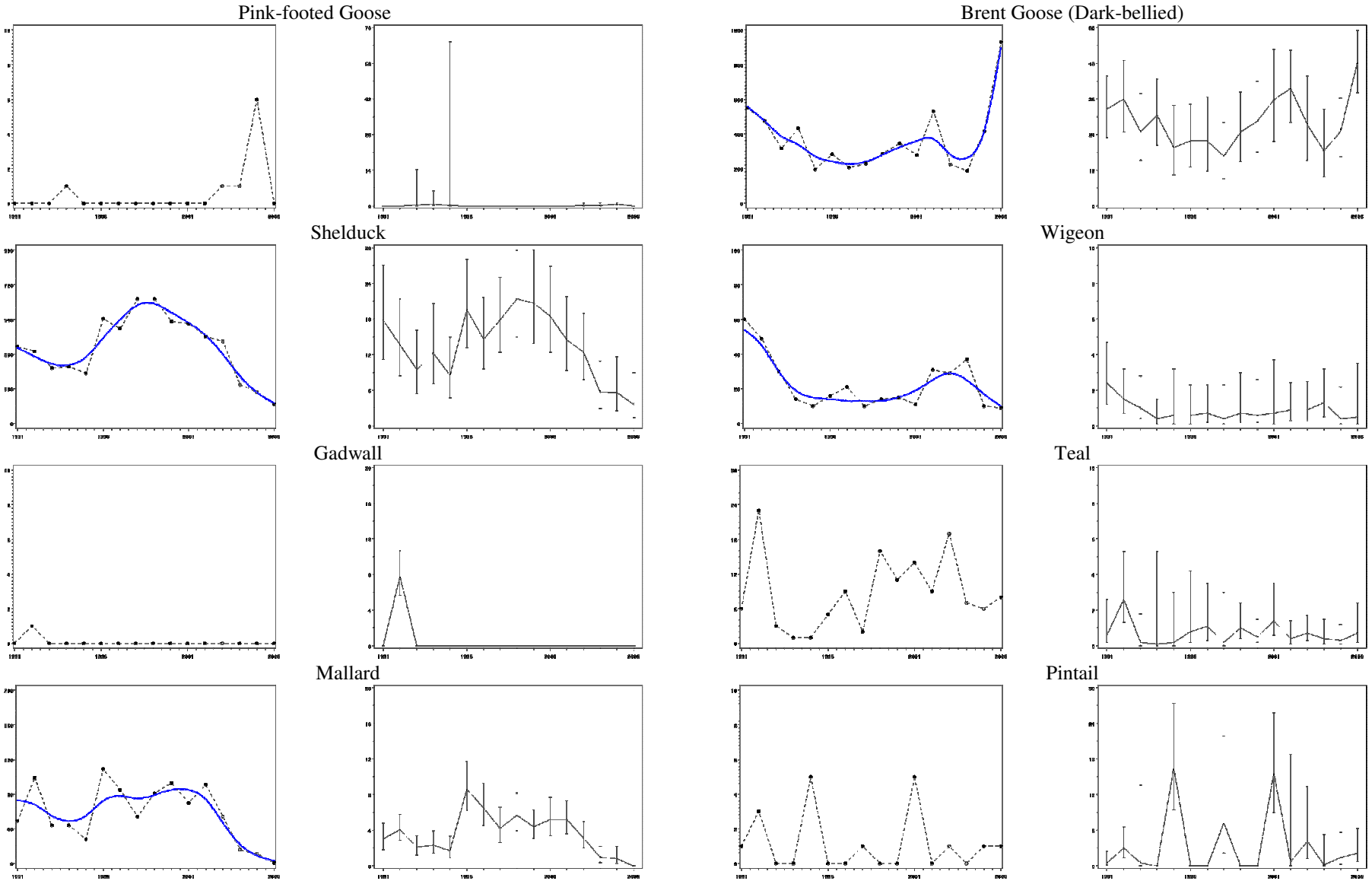
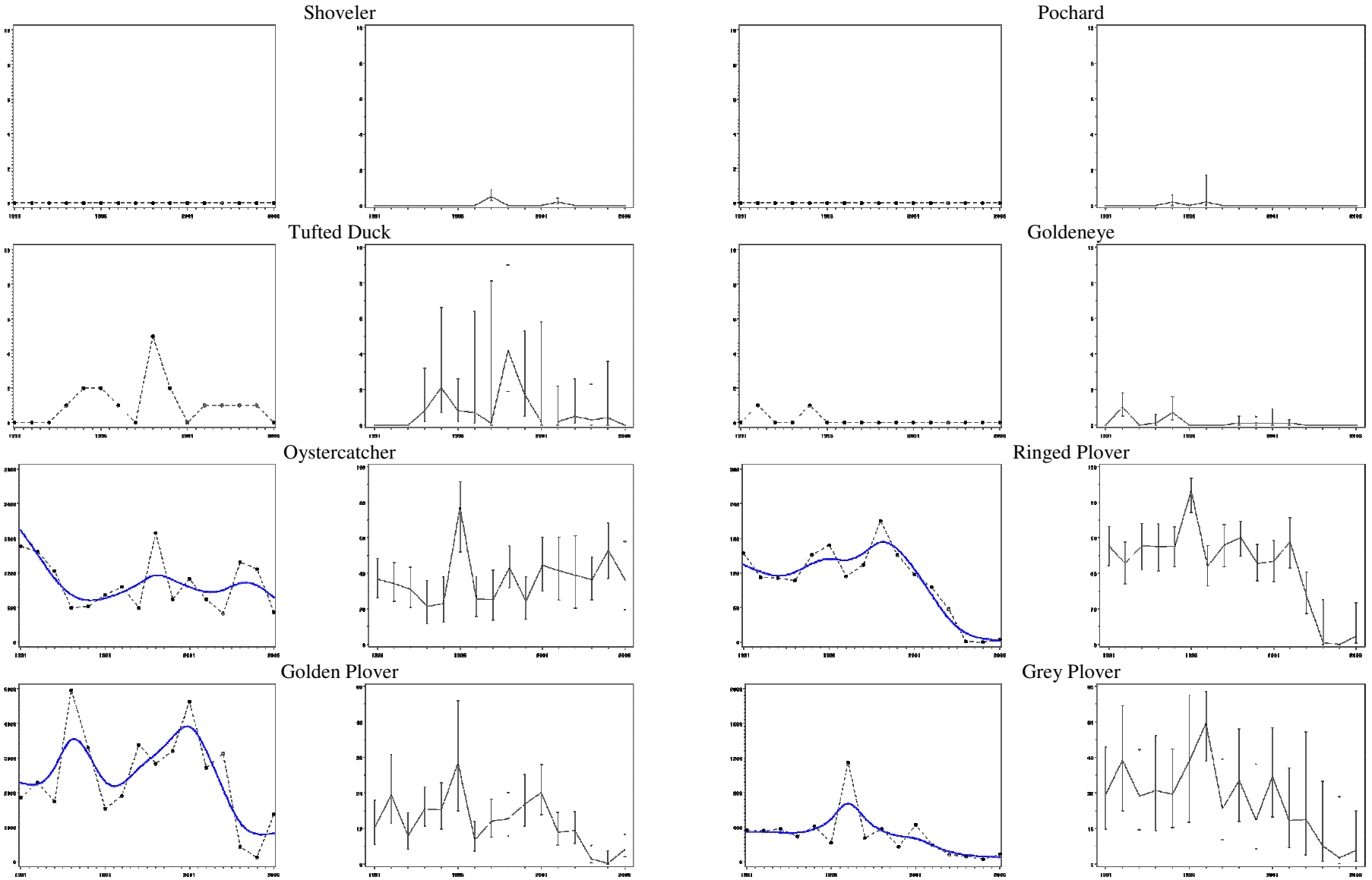


Figure B.38427 Population trends of each species in sector 38427 (Humber South (Mid)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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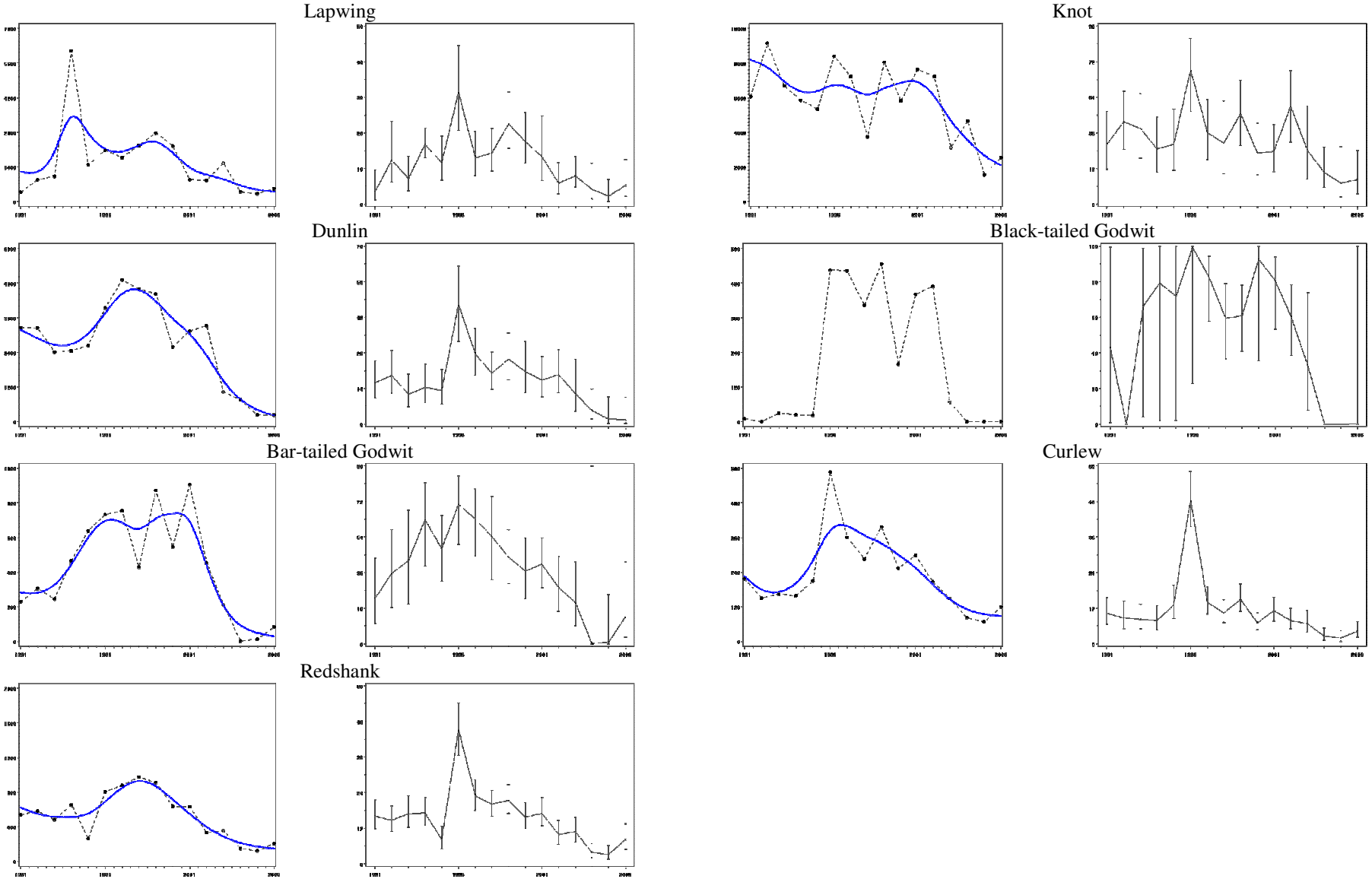

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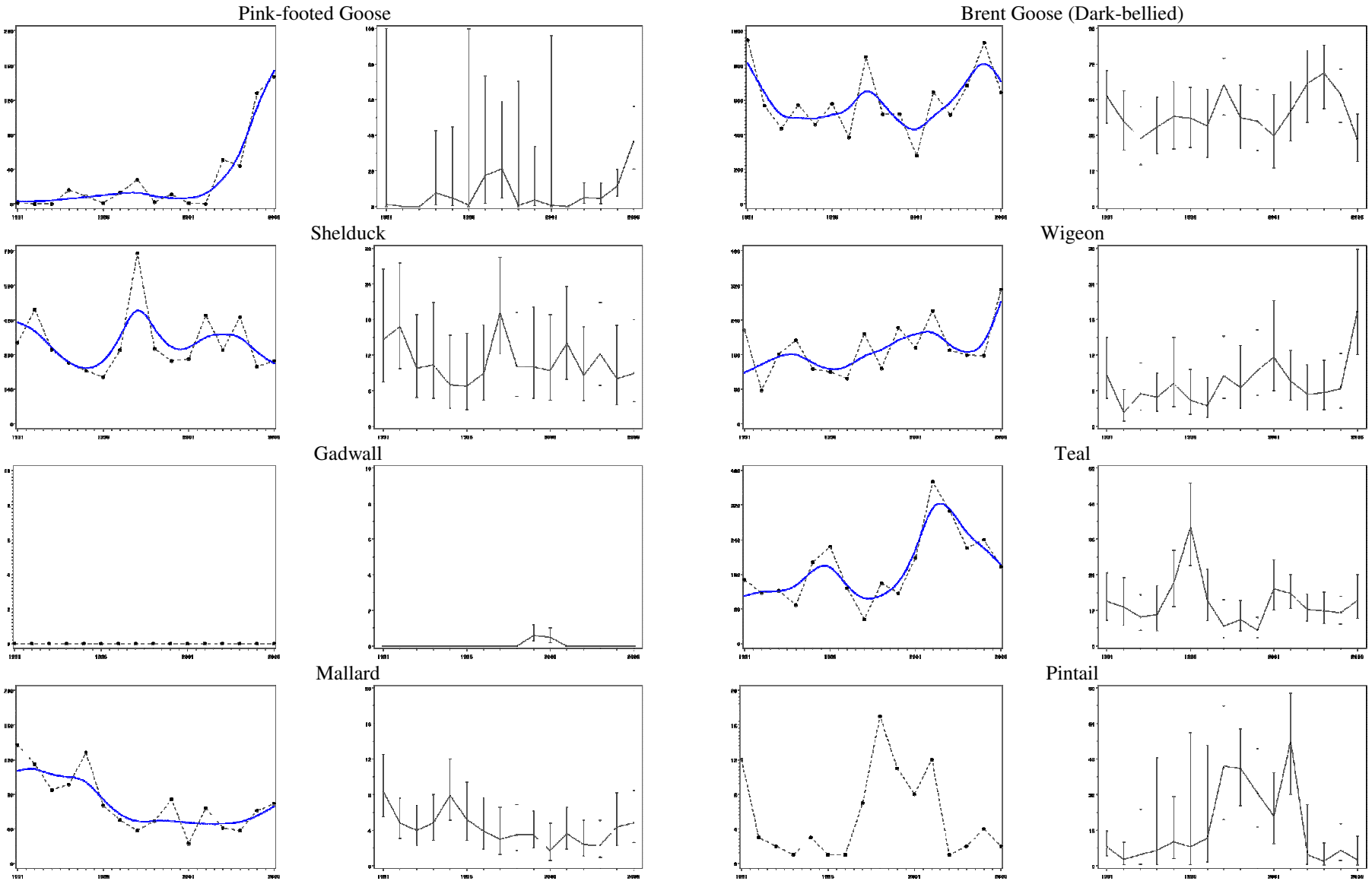
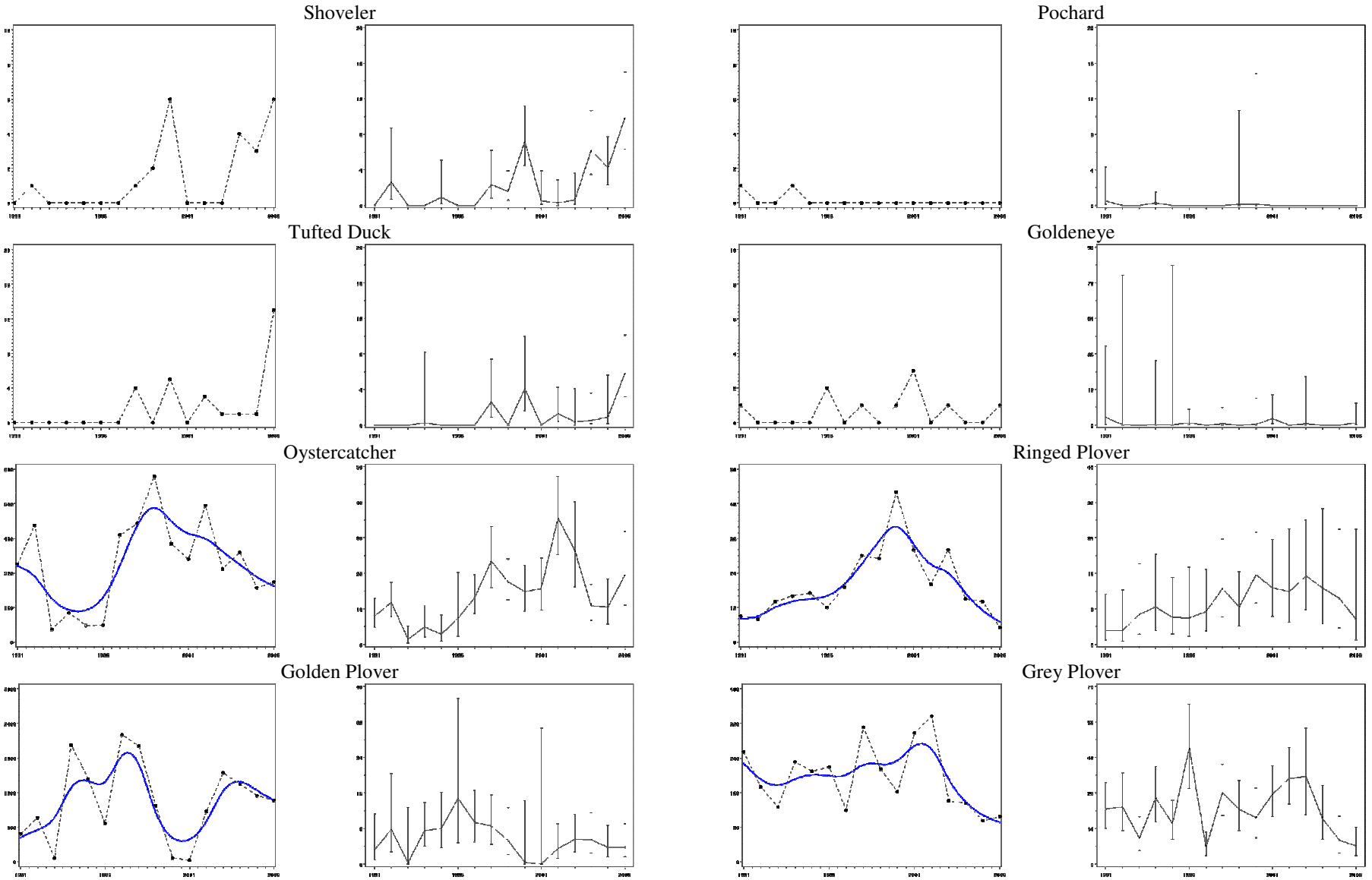


Figure B.38429 Population trends of each species in sector 38429 (Humber South (Outer)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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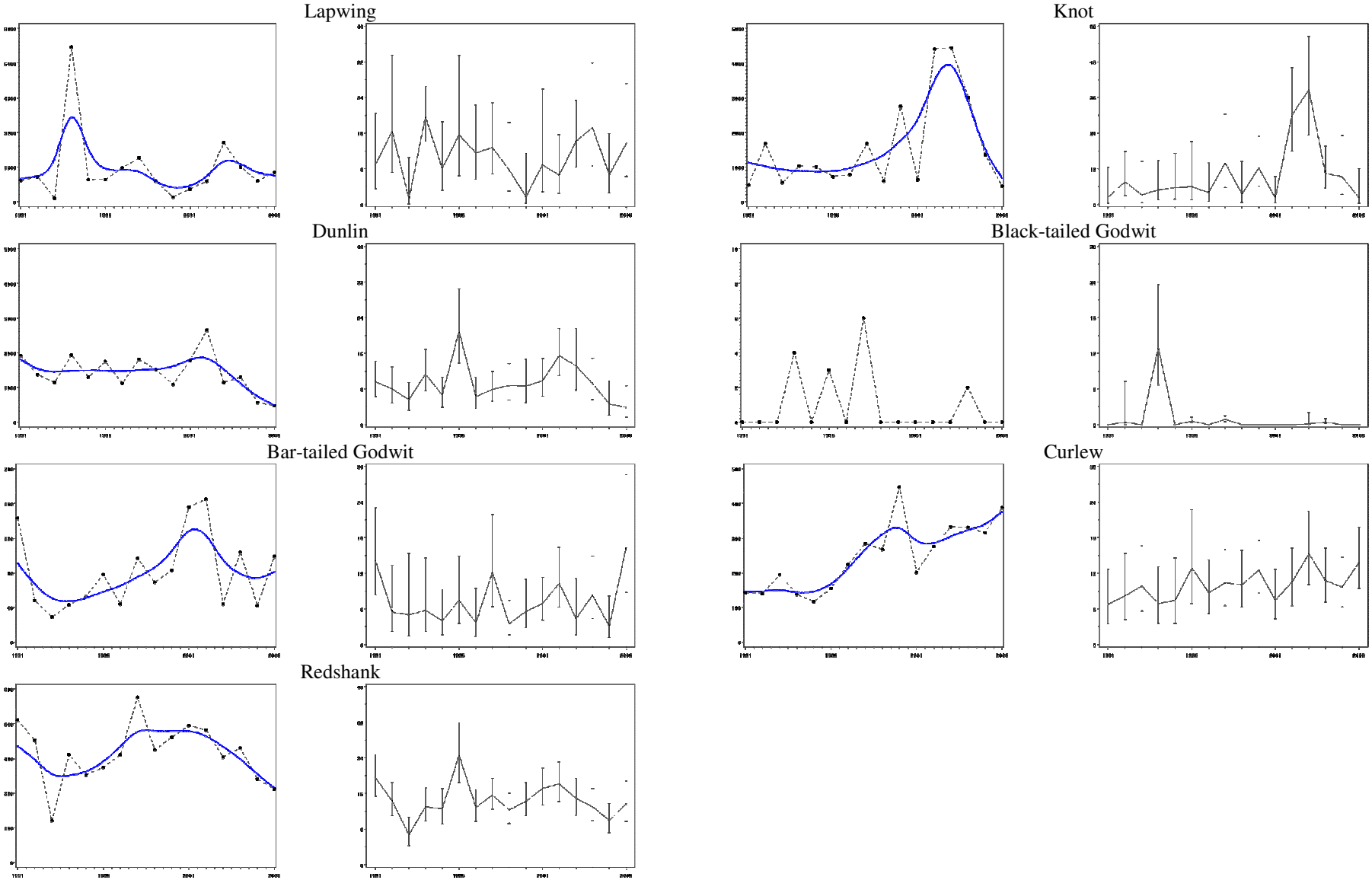

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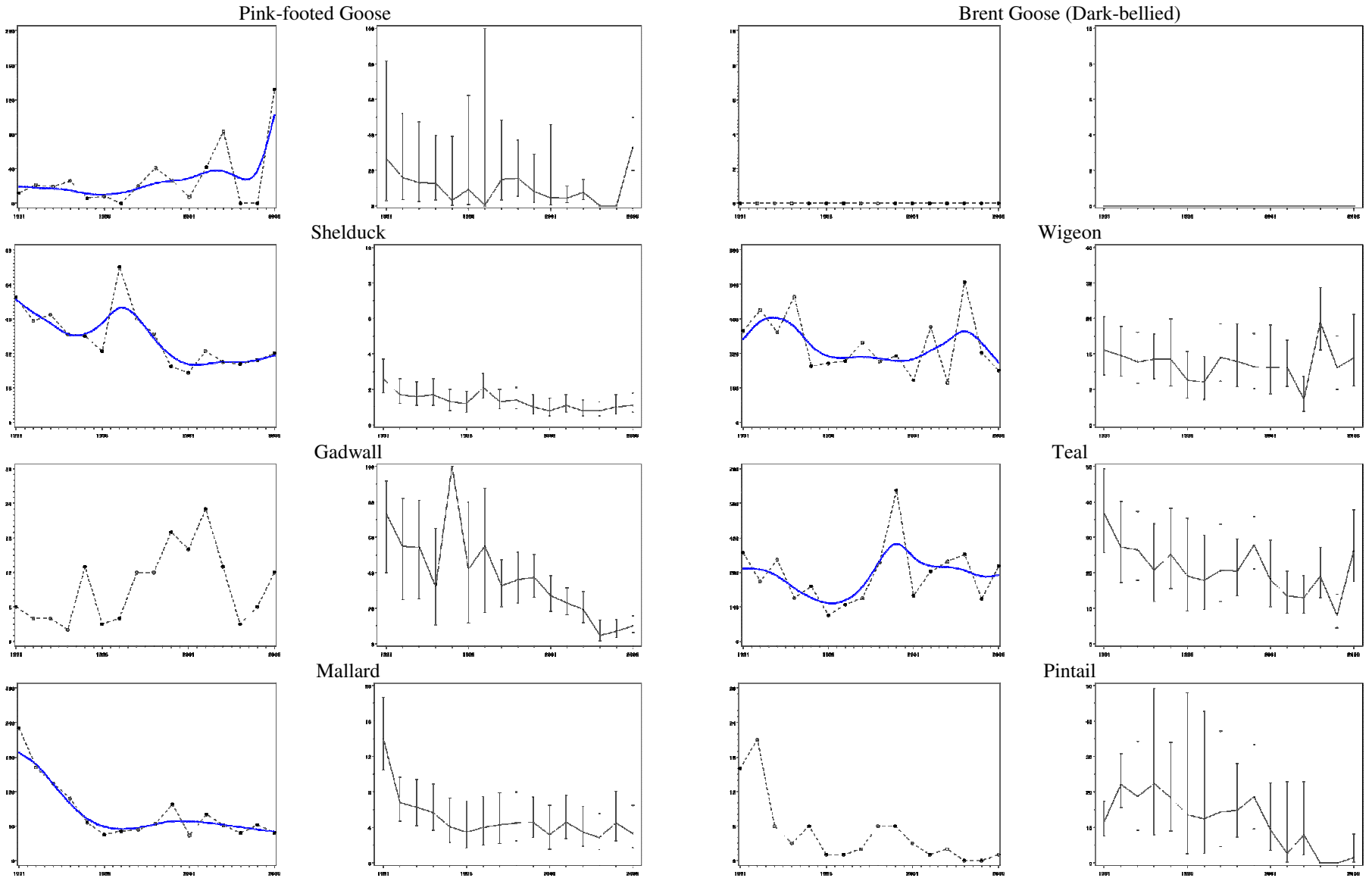
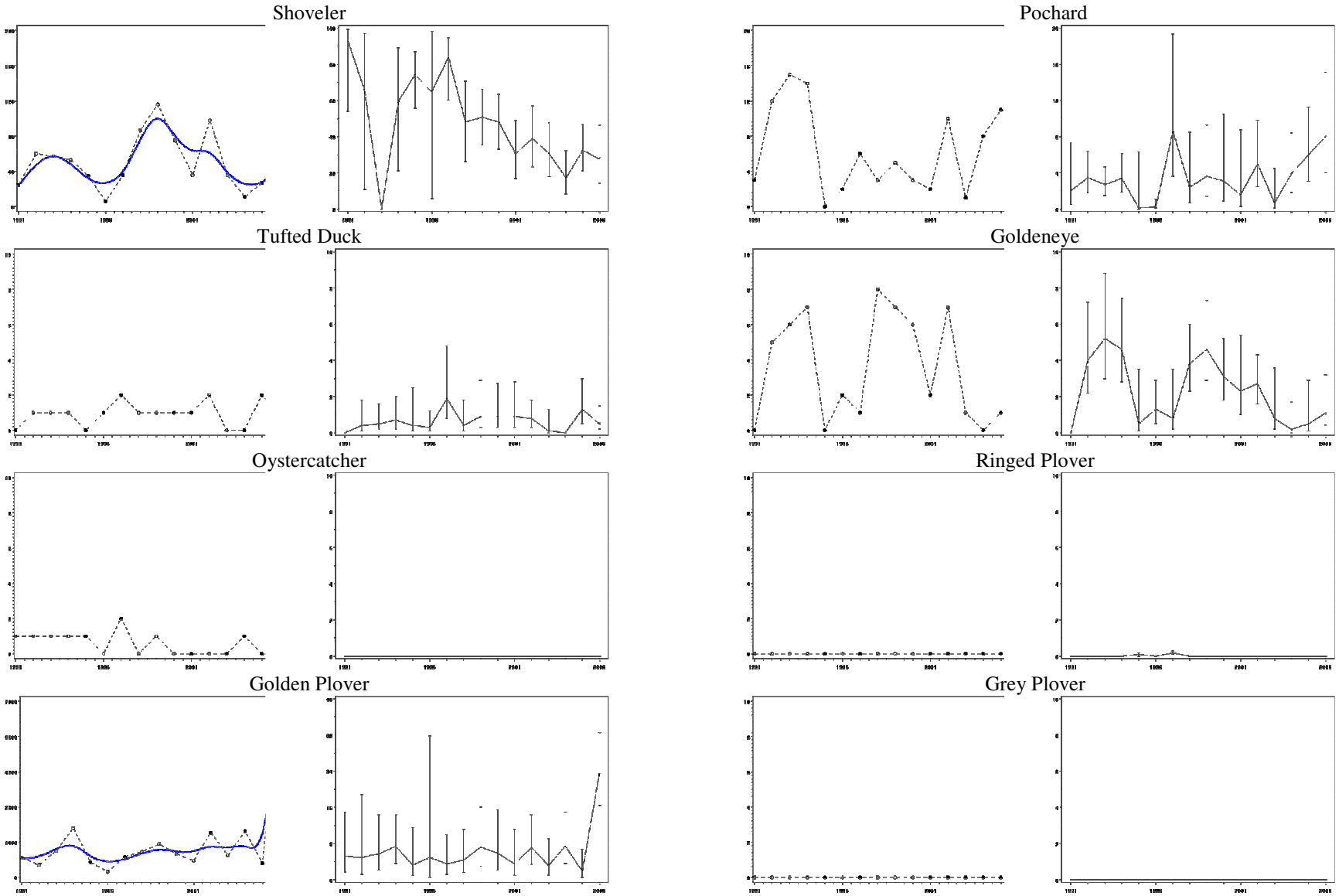


Figure B.38430 Population trends of each species in sector 38430 (Blacktoft Sands) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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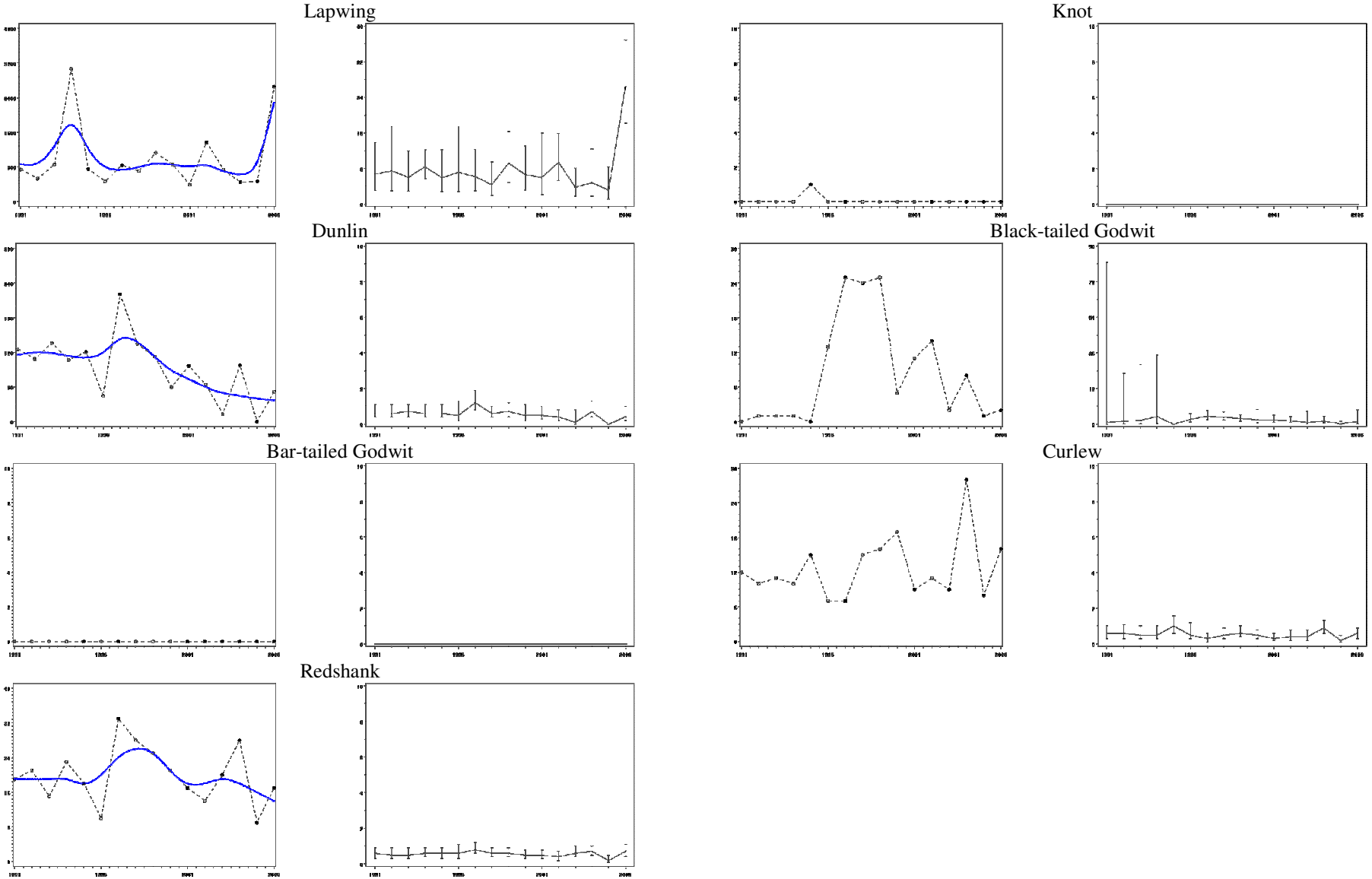


Figure B.38430 Continued.

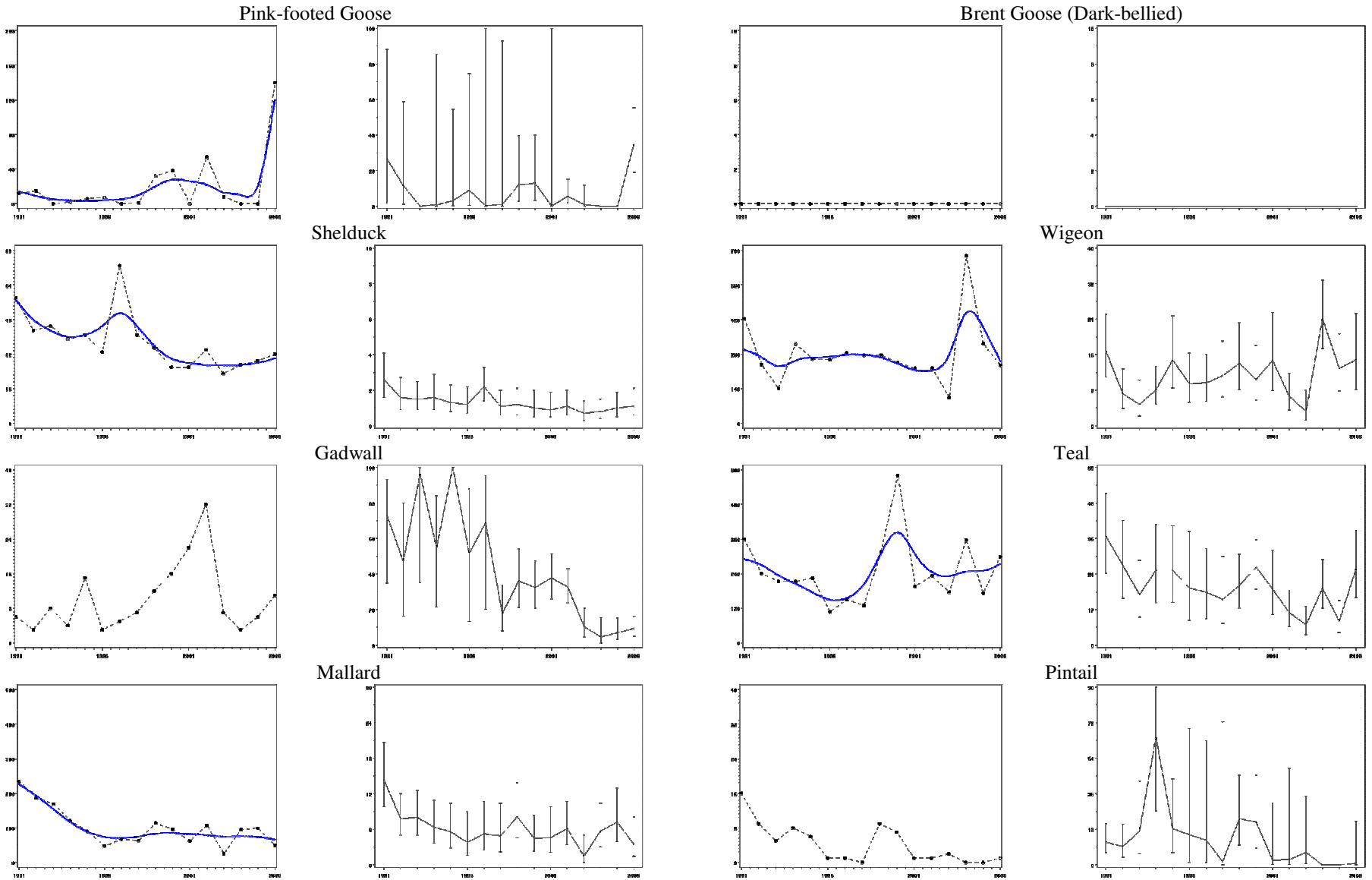
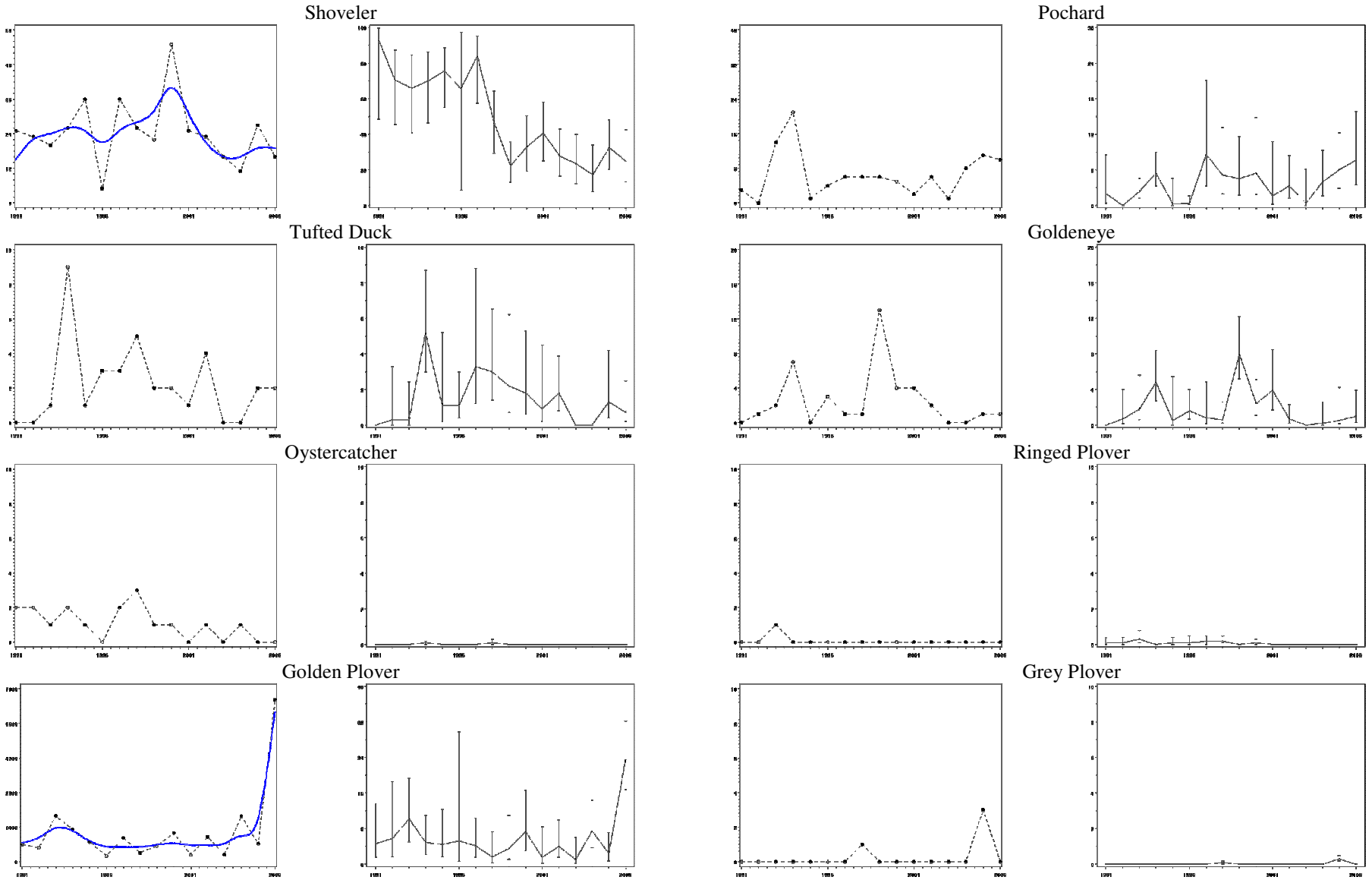


Figure B.38431 Population trends of each species in sector 38431 (Goole to Faxfleet) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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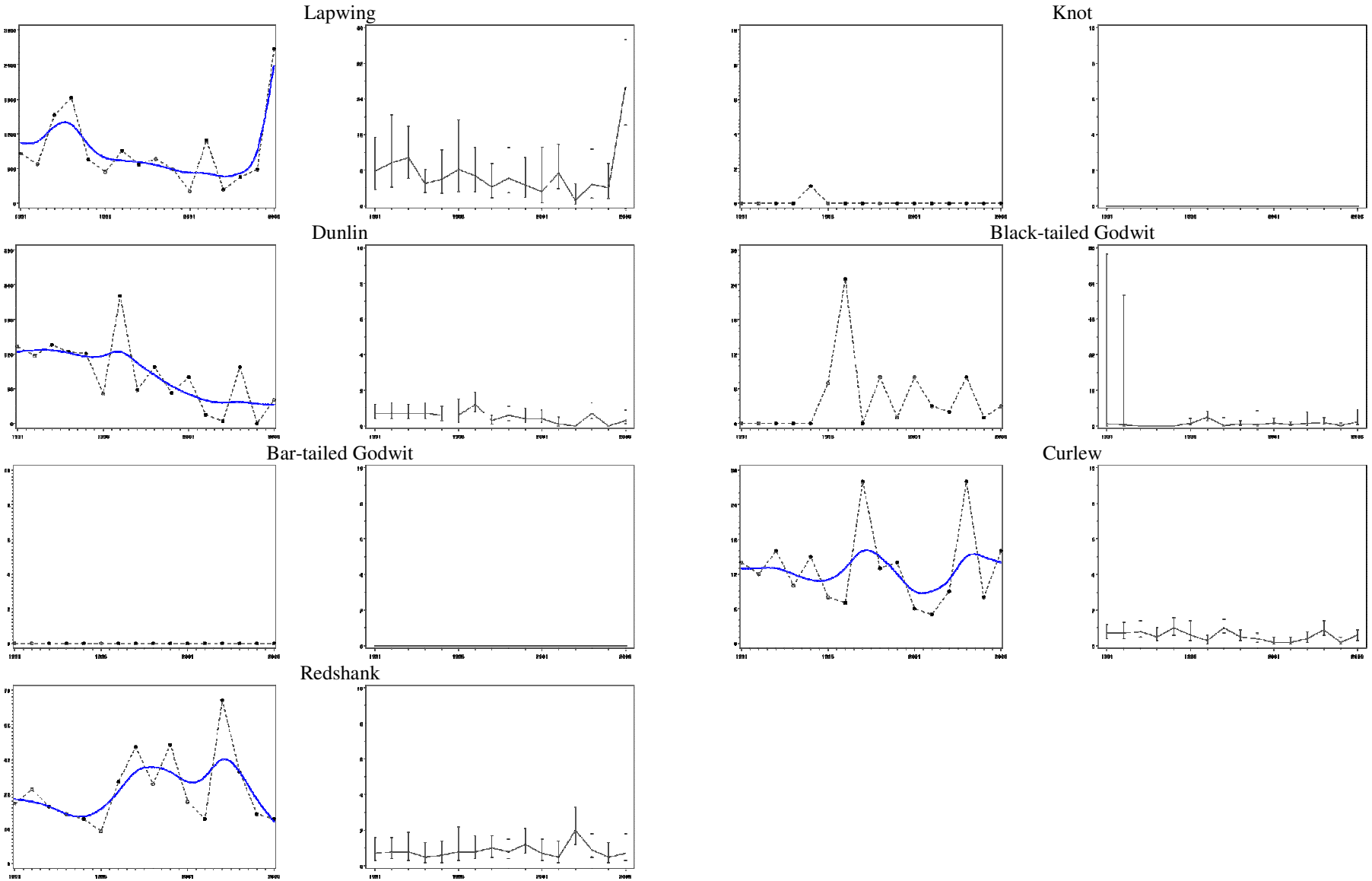

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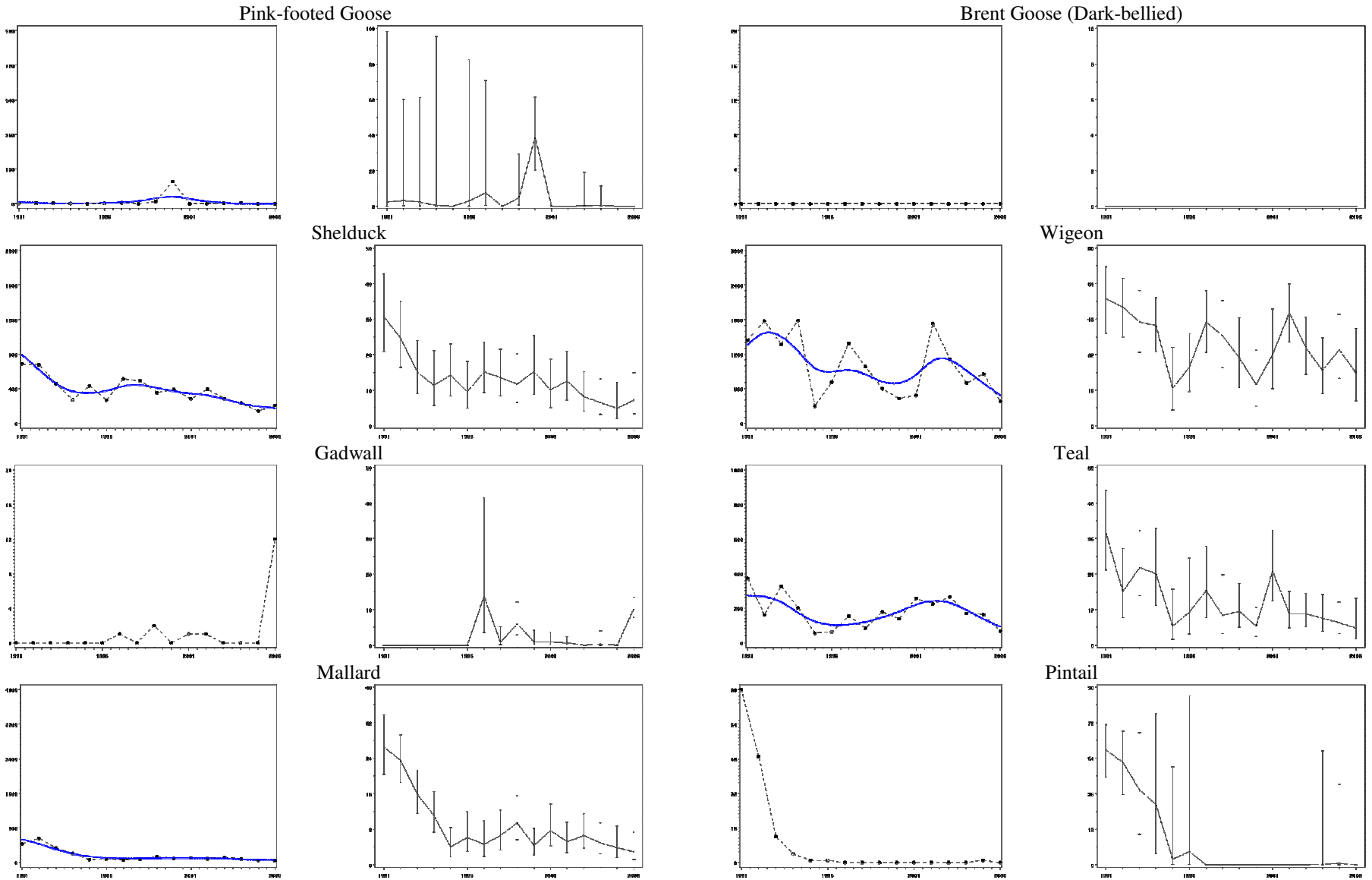
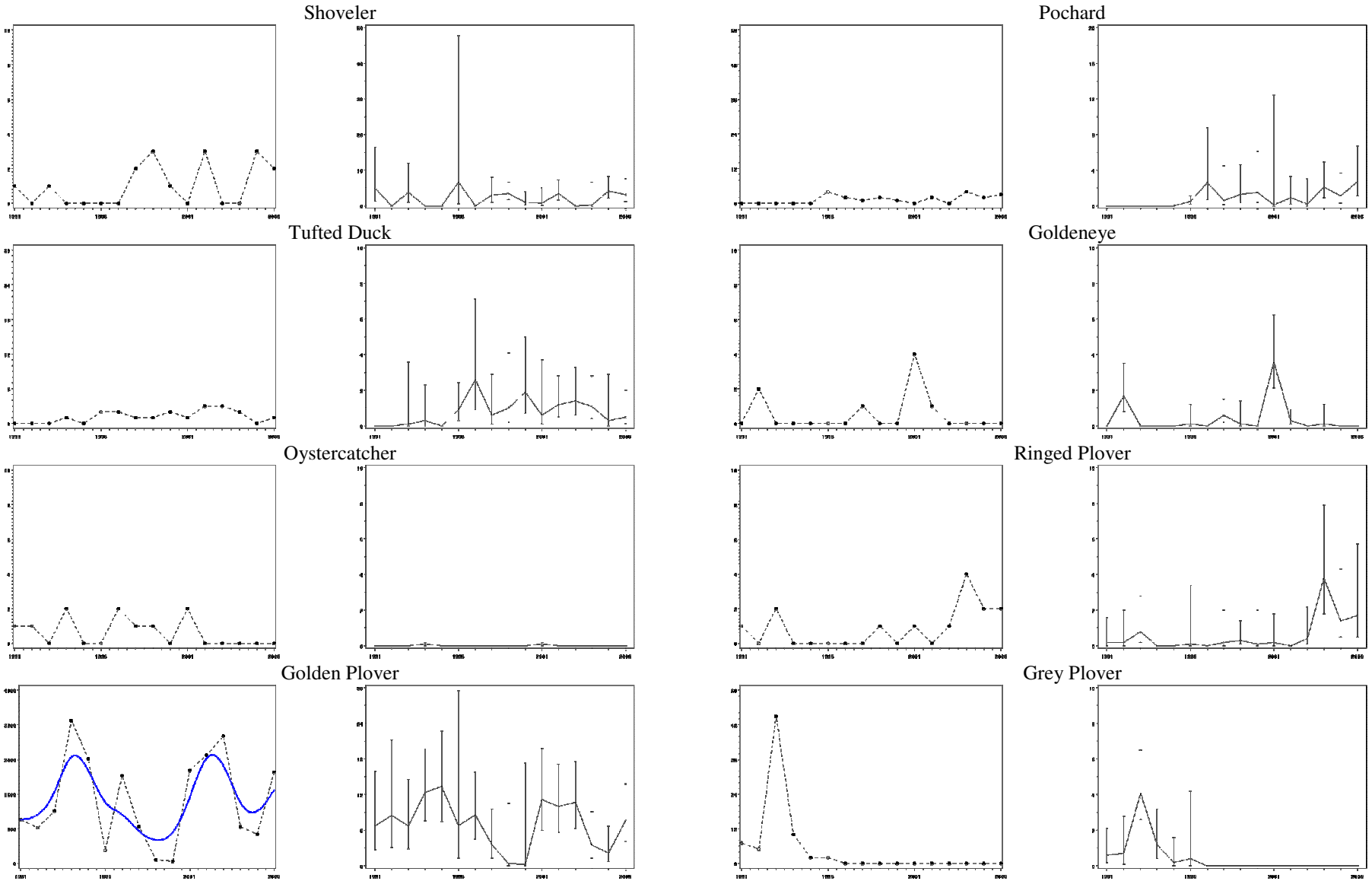


Figure B.38432 Population trends of each species in sector 38432 (Faxfleet to Brough Haven) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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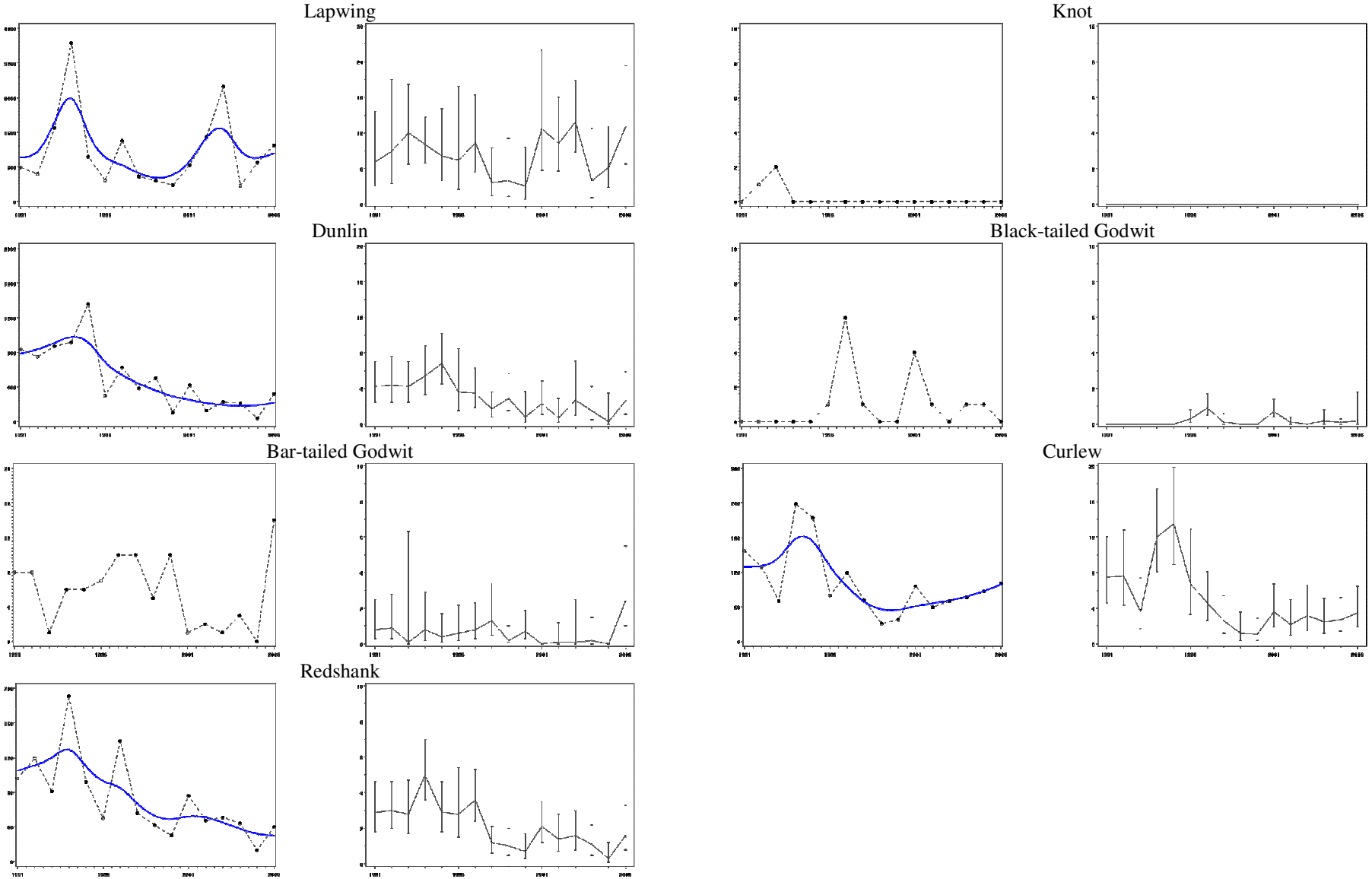

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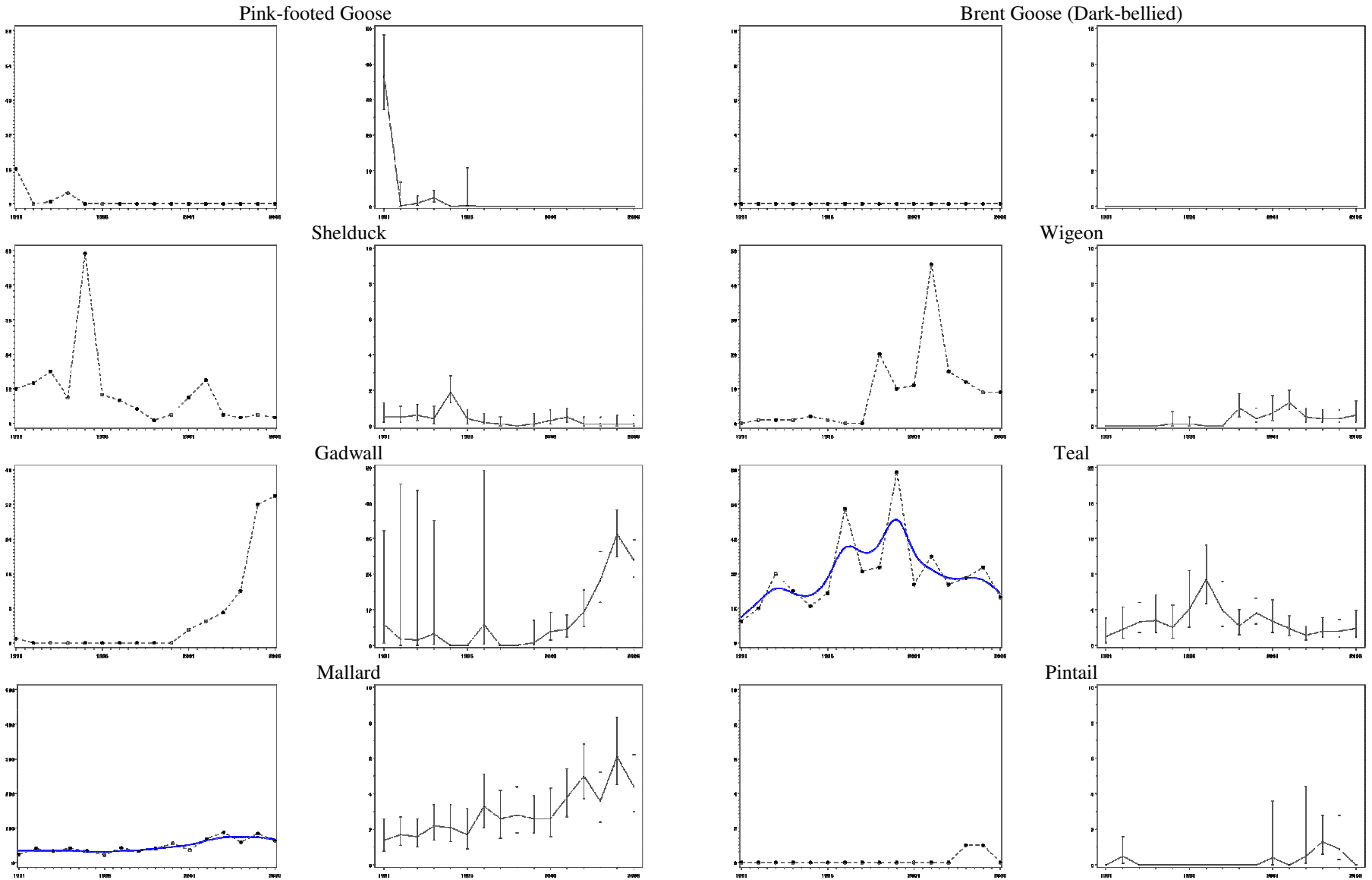
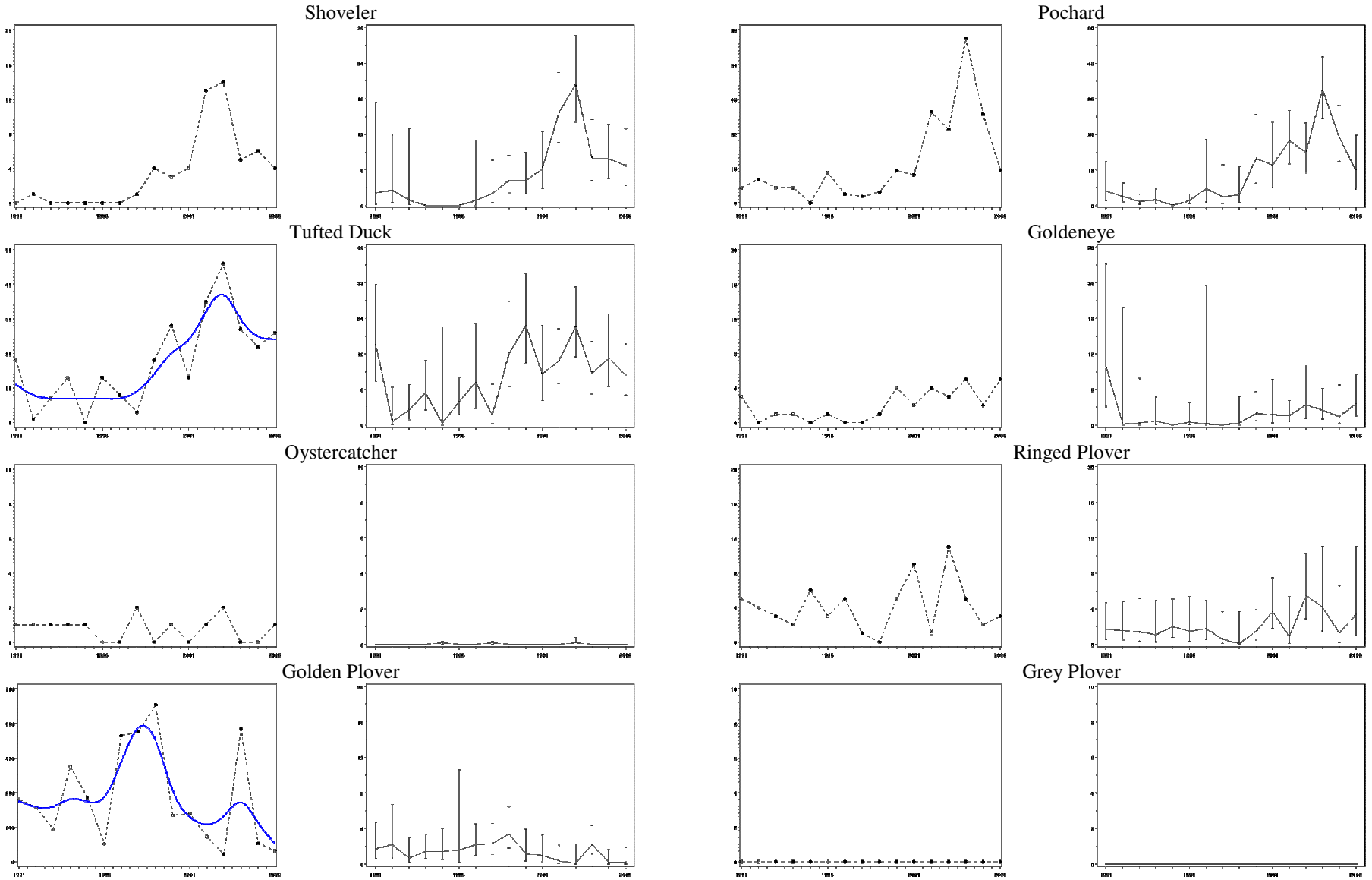


Figure B.38433 Population trends of each species in sector 38433 (Brough Haven to North Ferriby) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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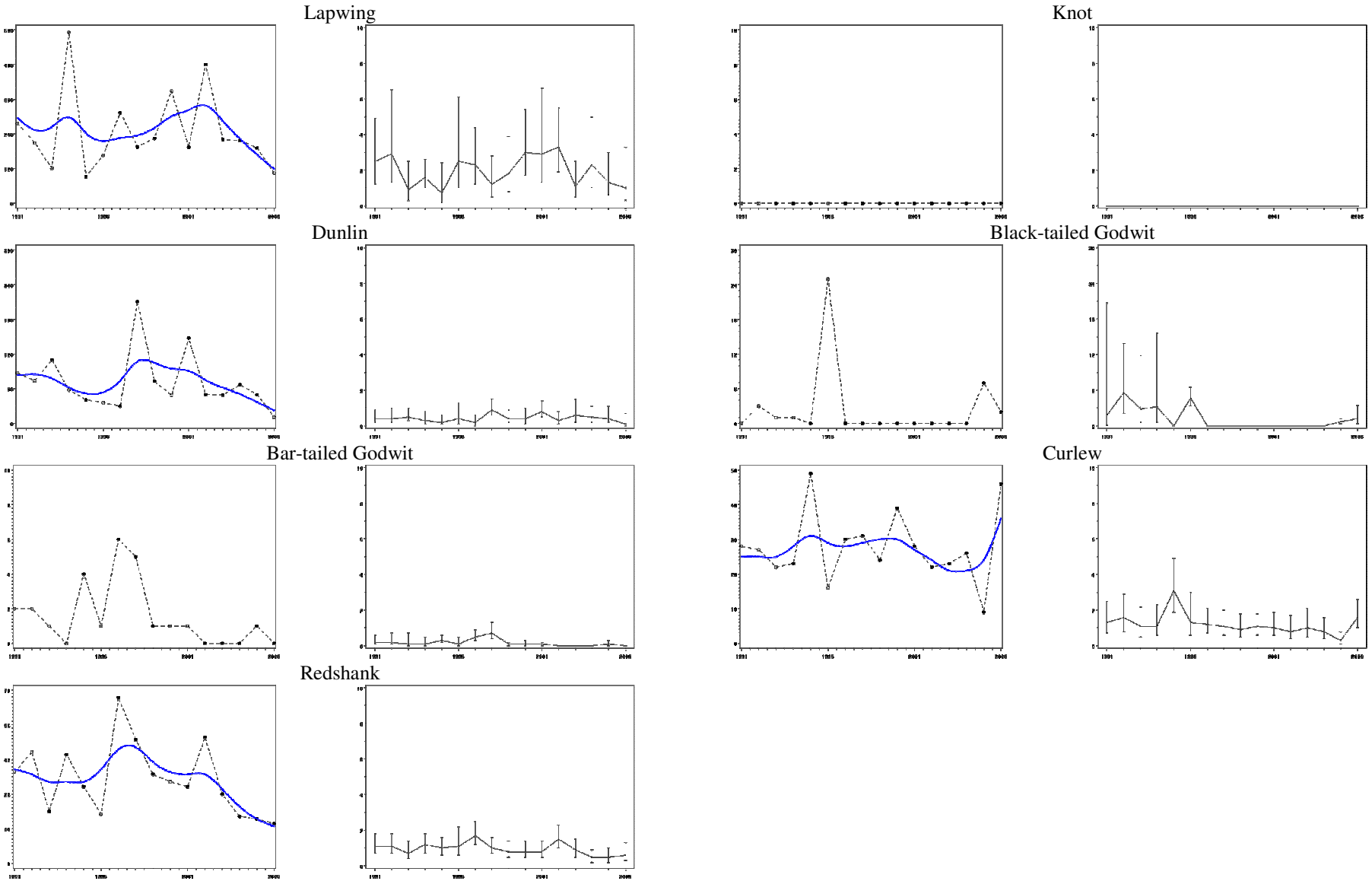

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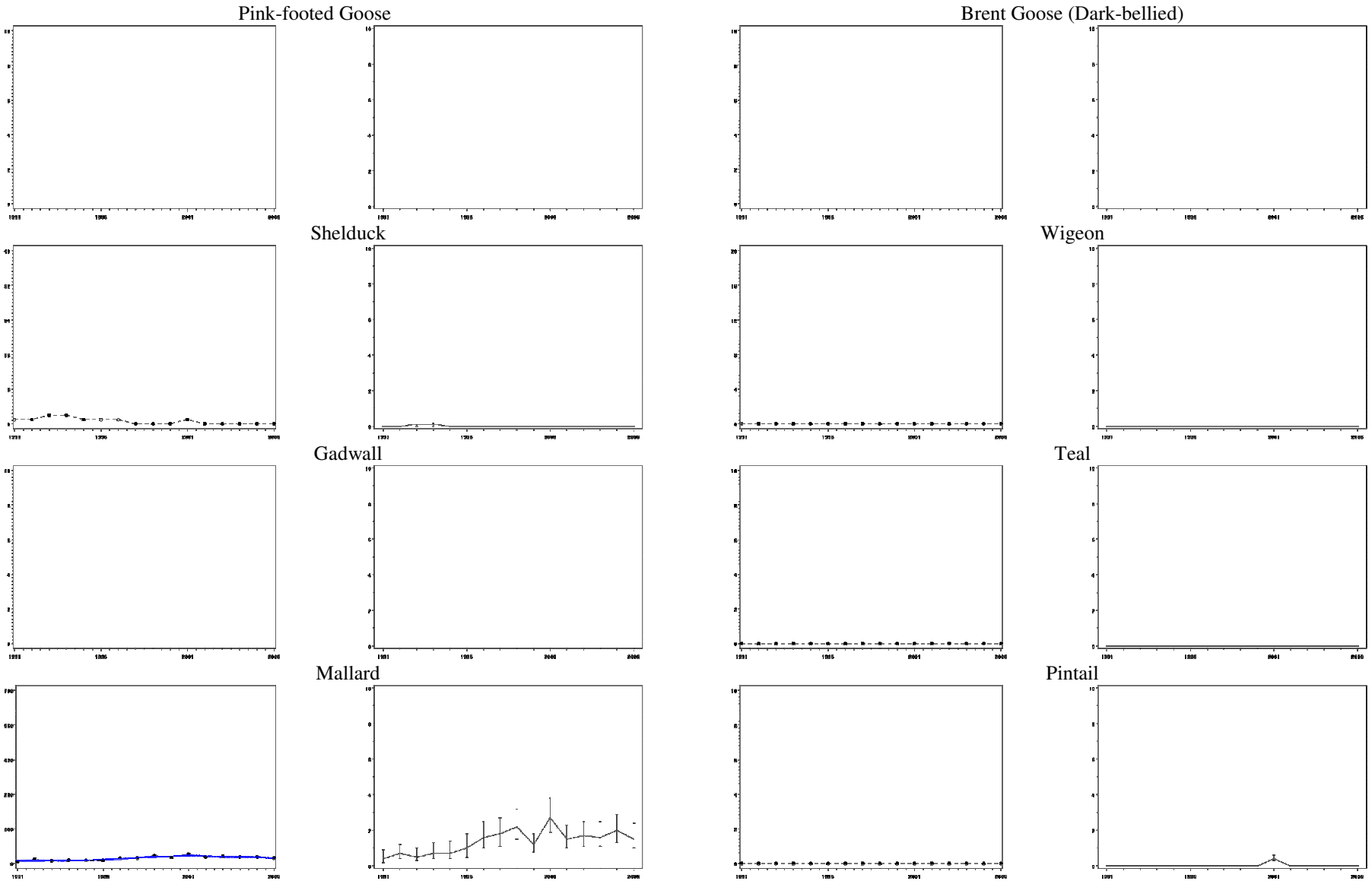
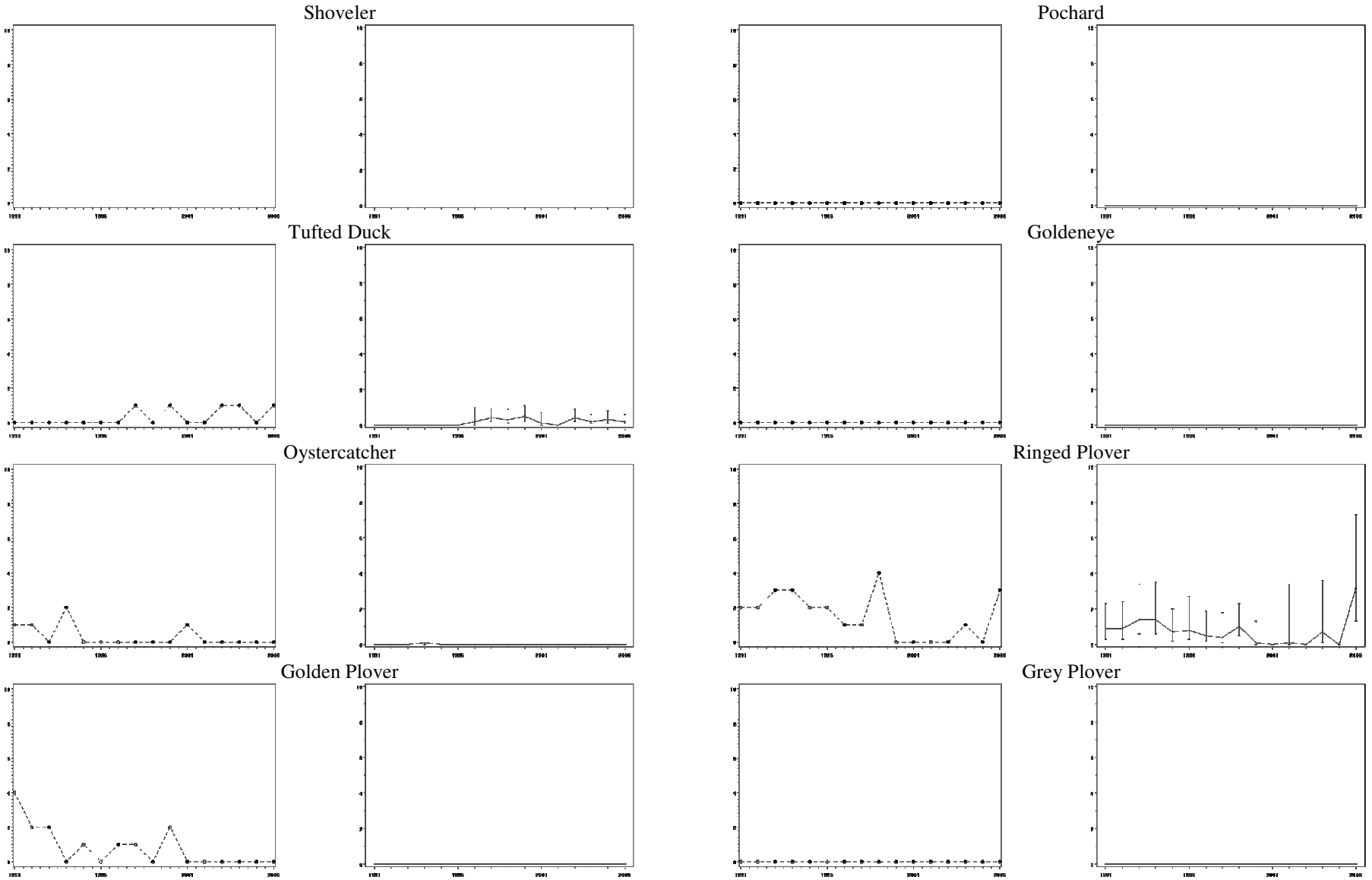


Figure B.38434 Population trends of each species in sector 38434 (North Ferriby to Hessle Haven) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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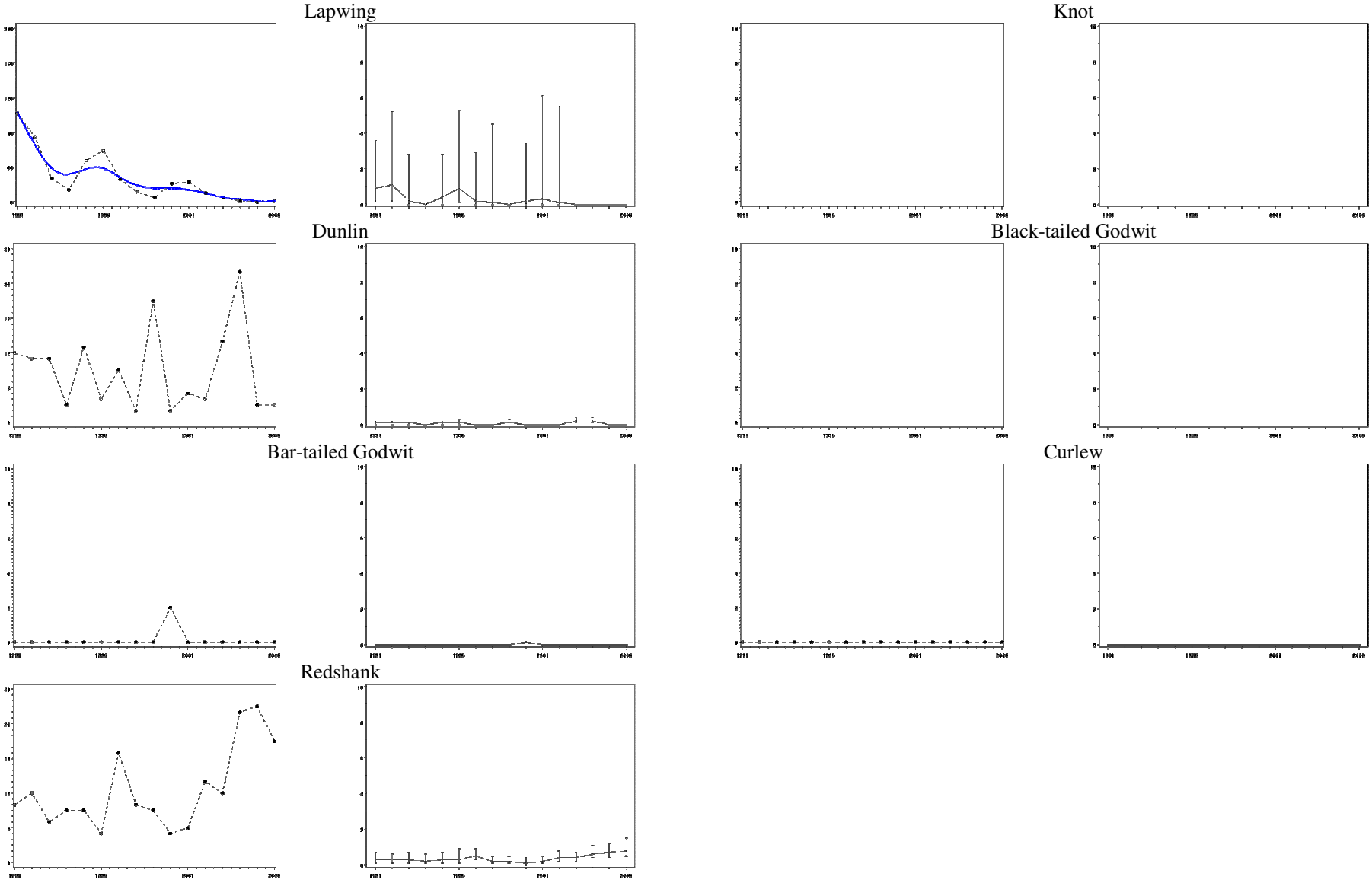


Figure B.38434 Continued.

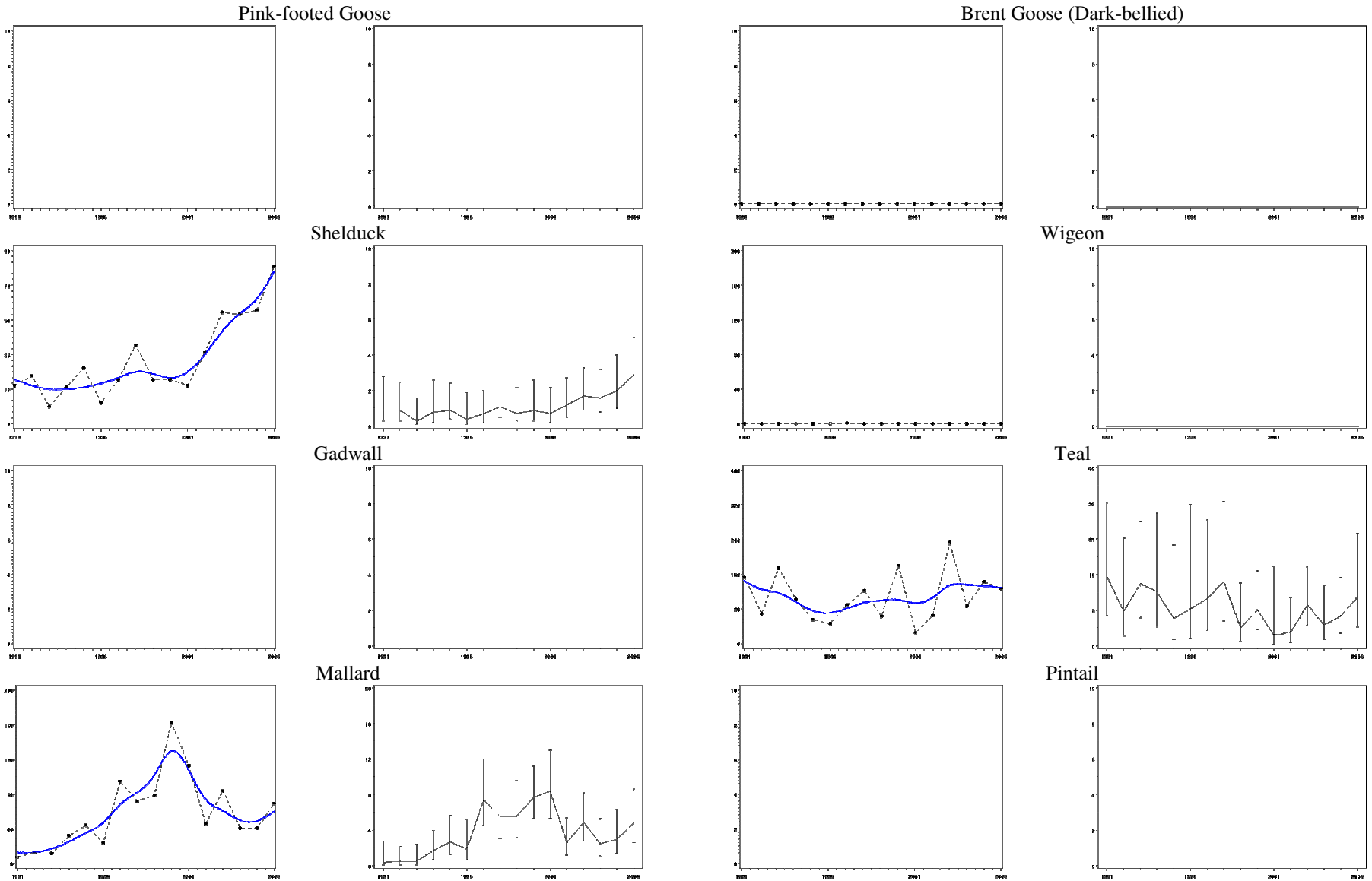
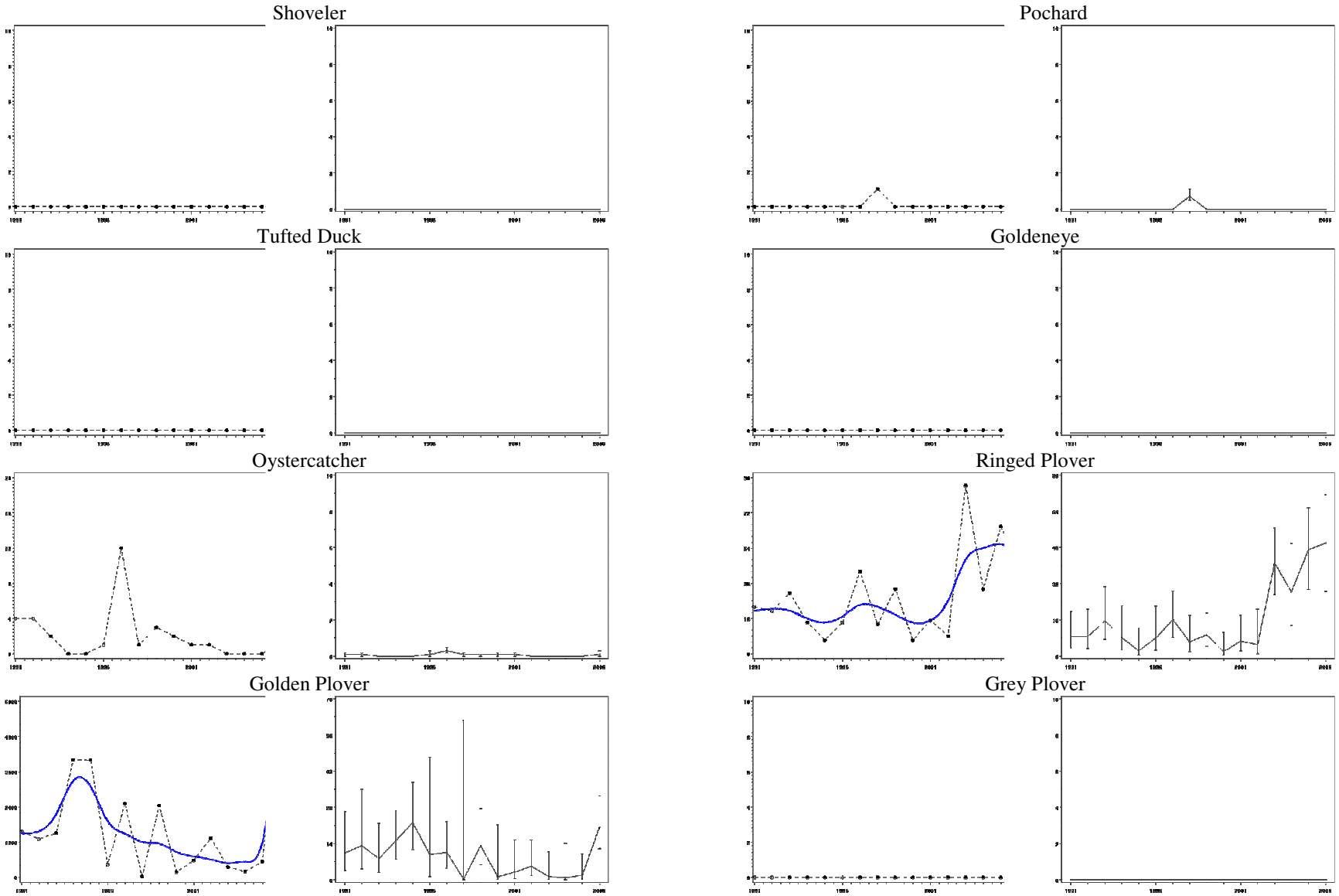


Figure B.38435 Population trends of each species in sector 38435 (Hessle to Paull) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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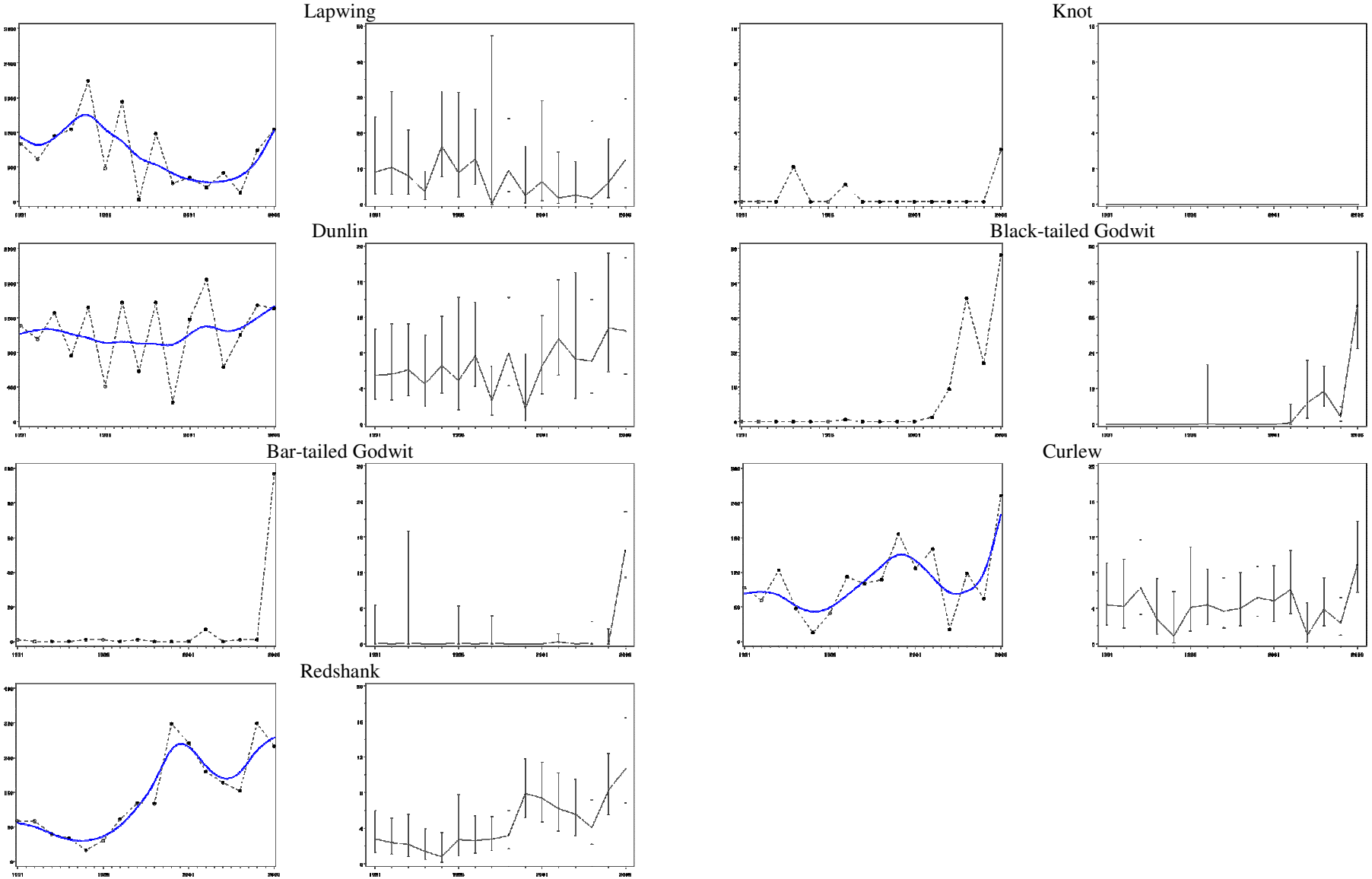

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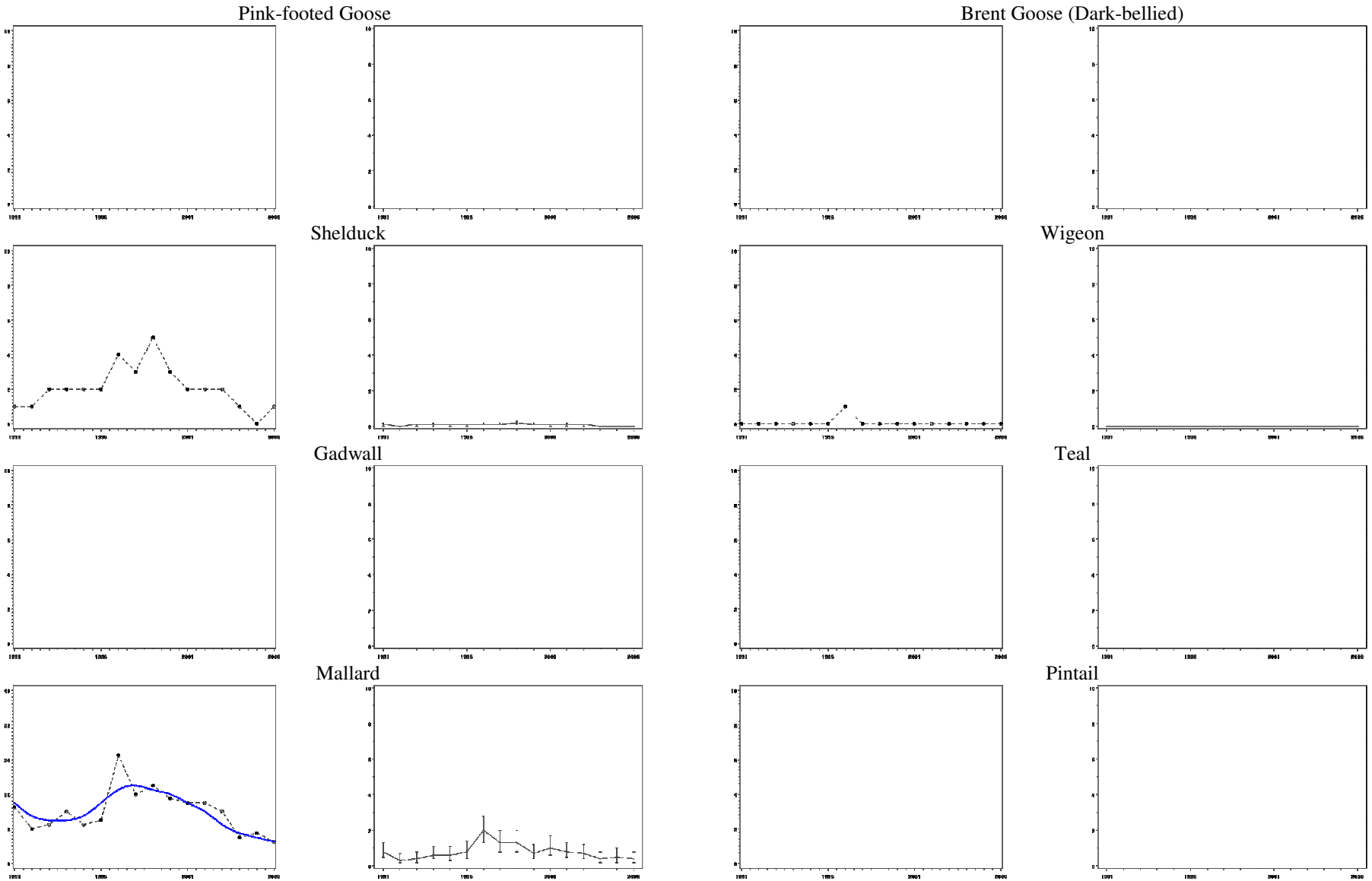
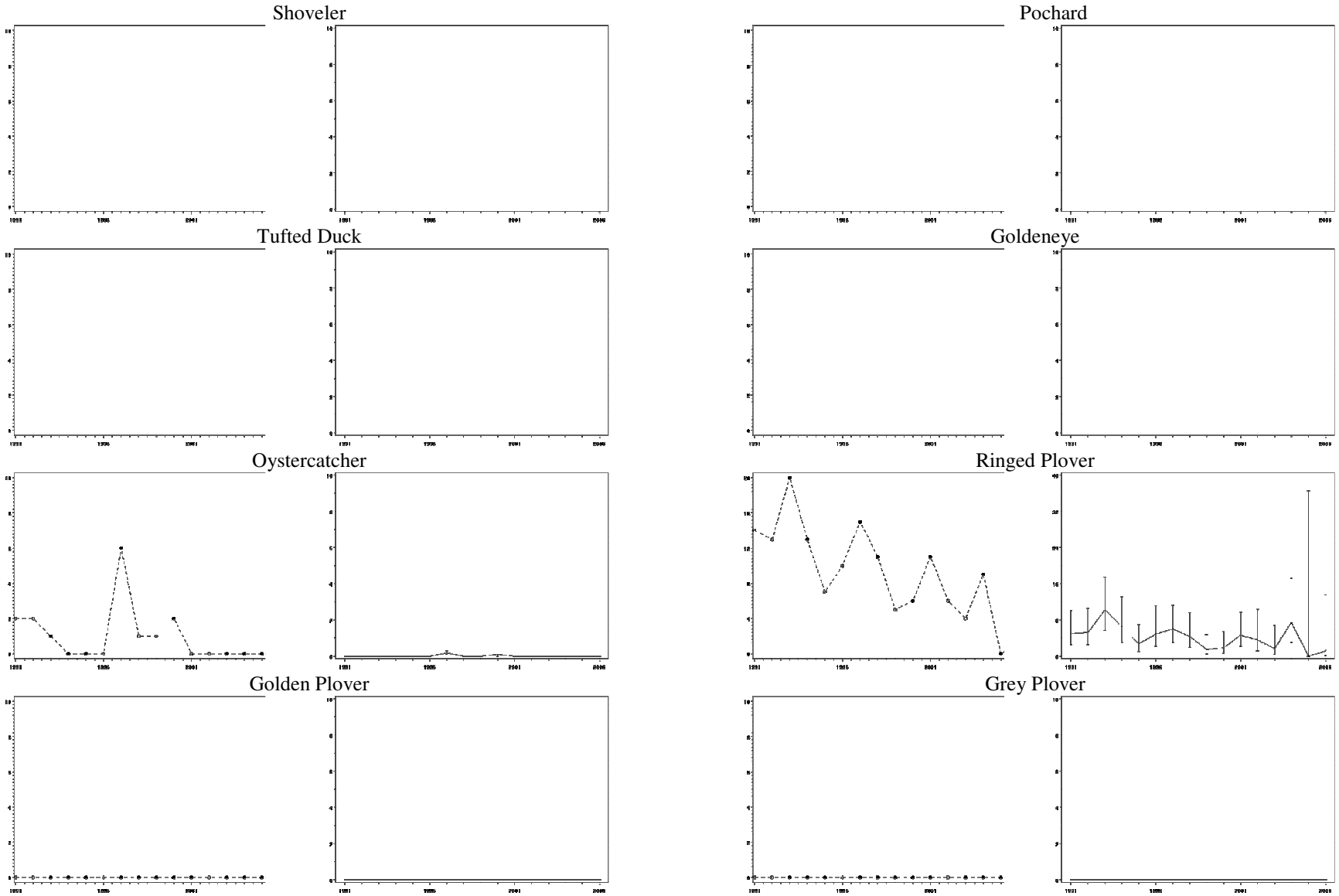


Figure B.38436 Population trends of each species in sector 38436 (Hessle to Hull) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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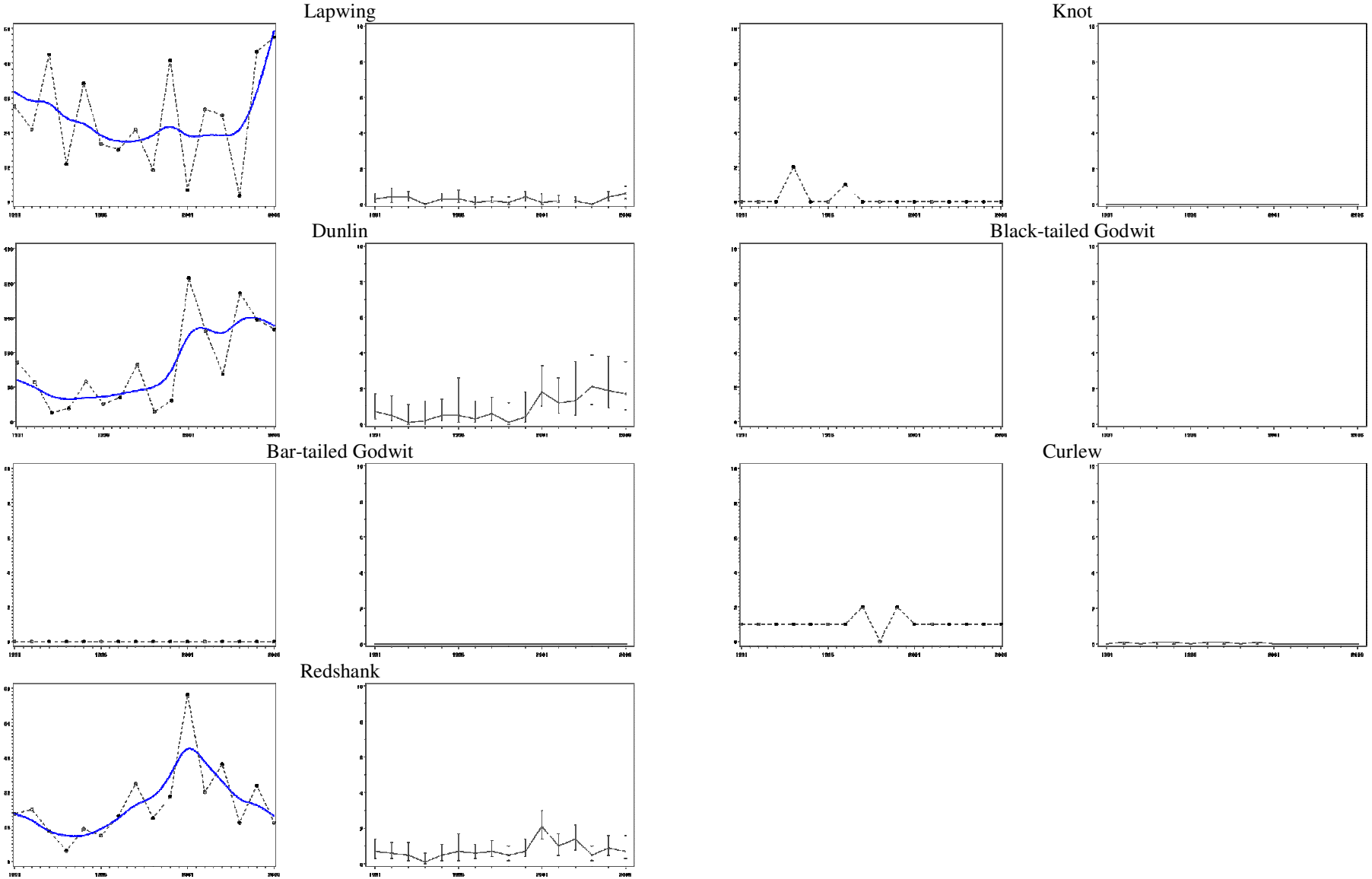

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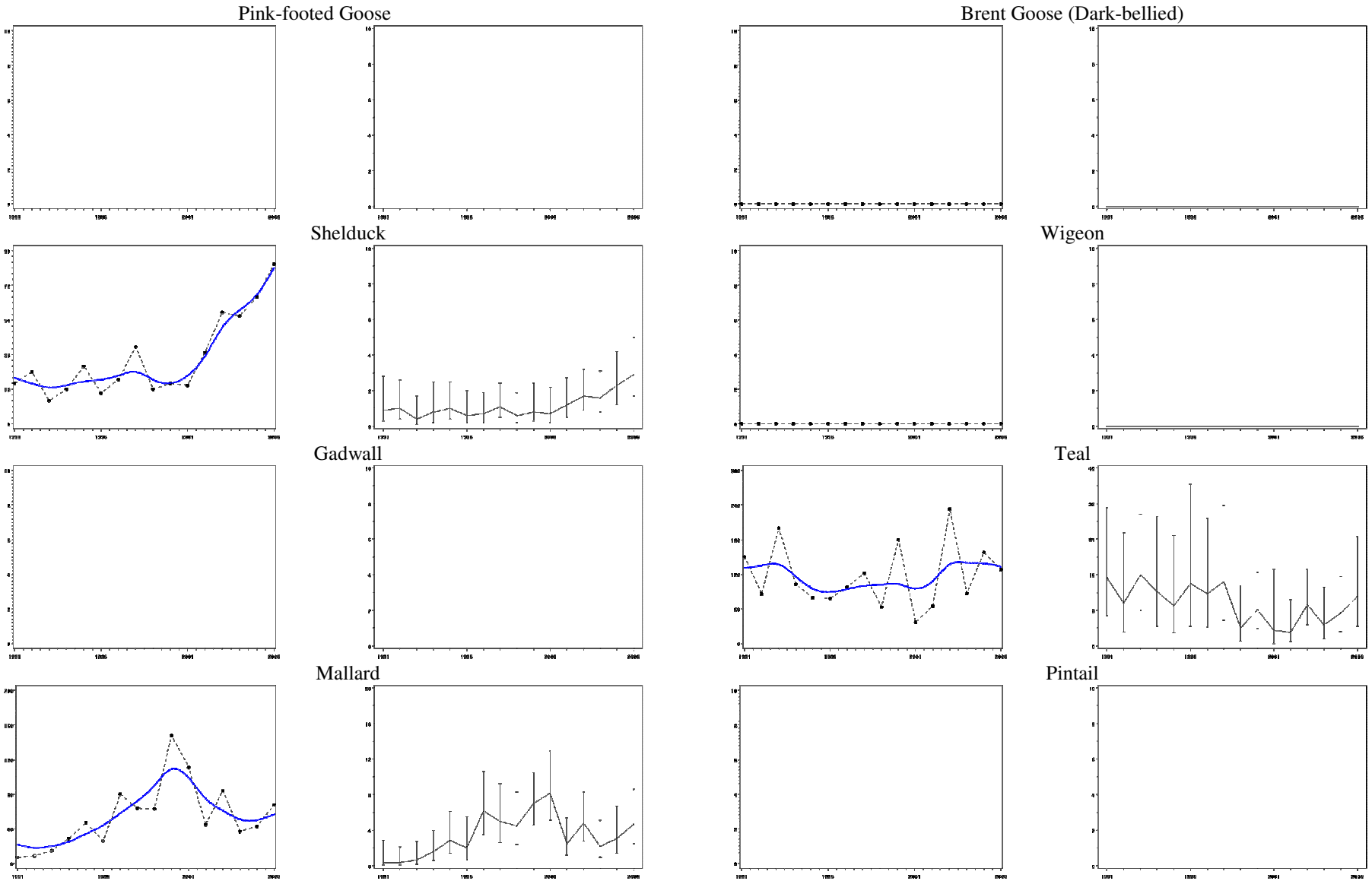
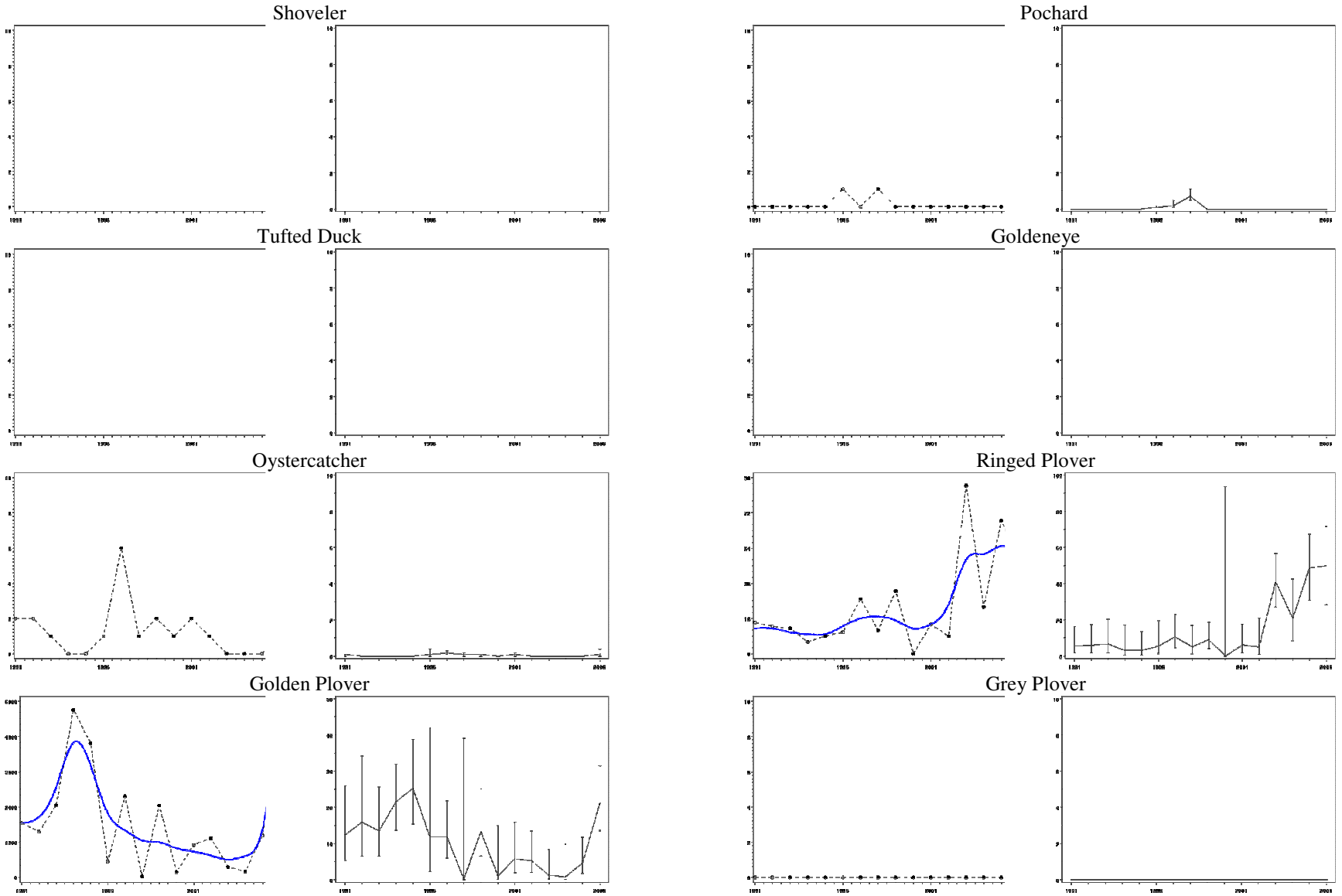


Figure B.38440 Population trends of each species in sector 38440 (Hull to Paull) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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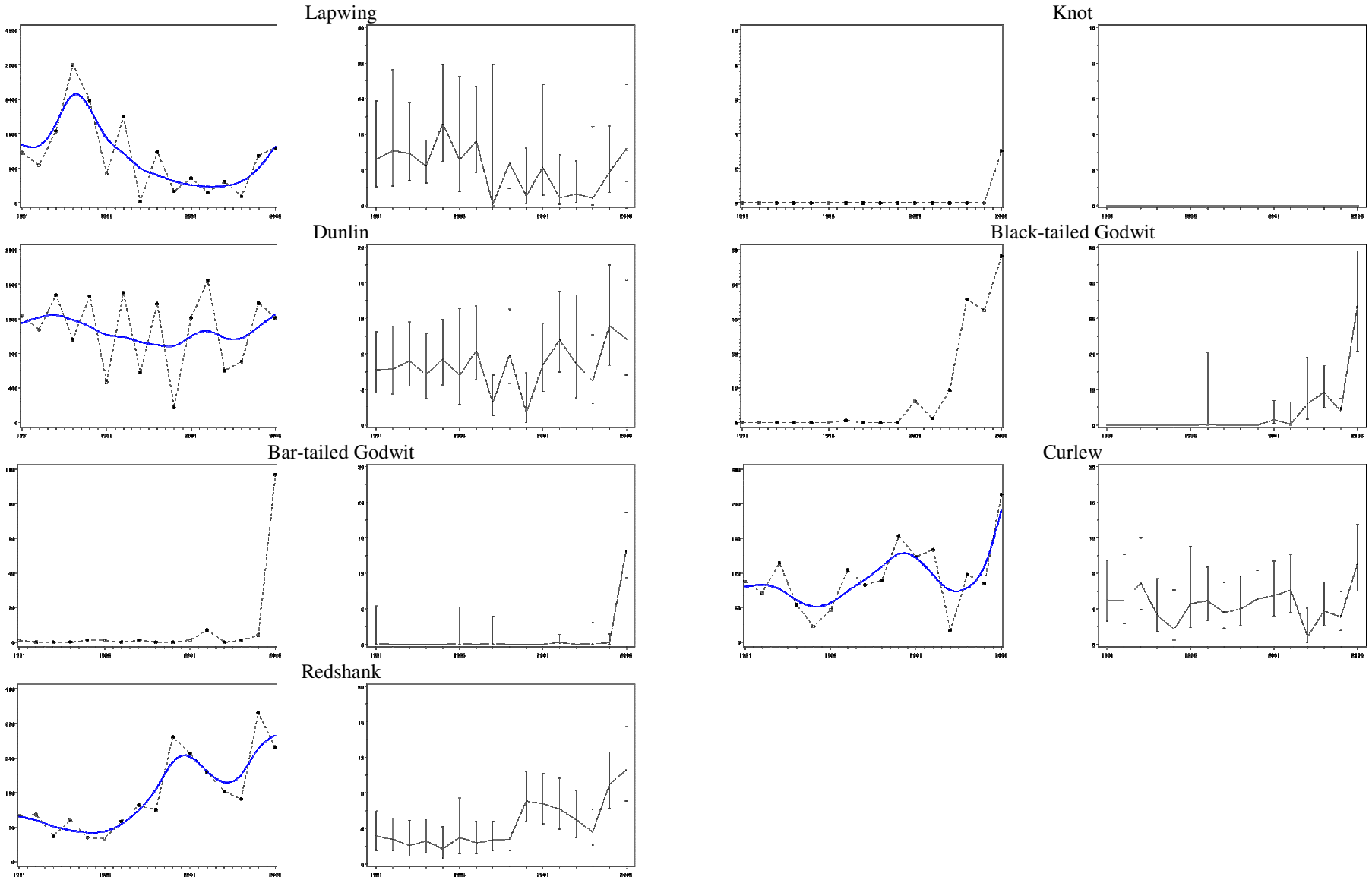

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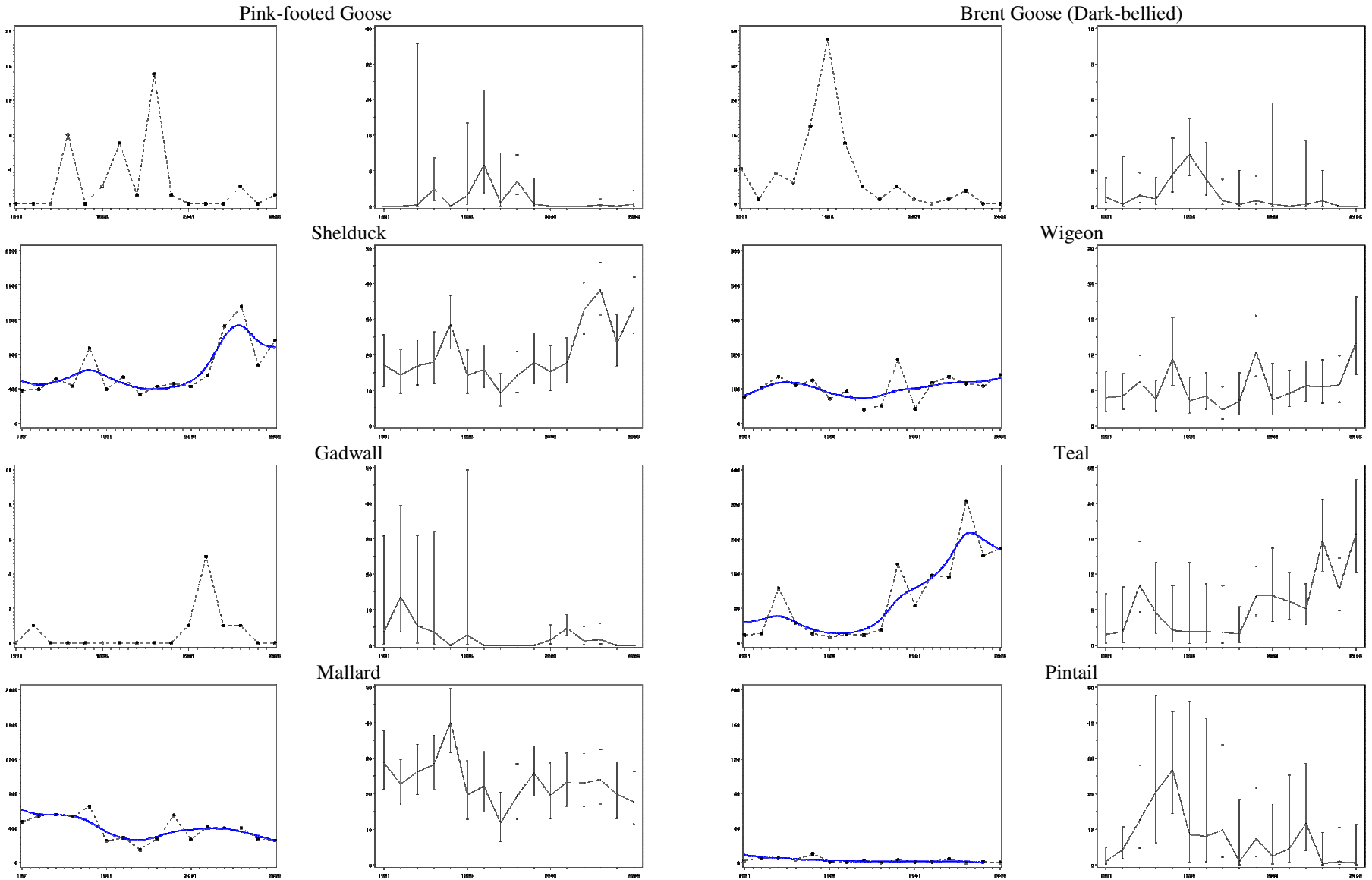
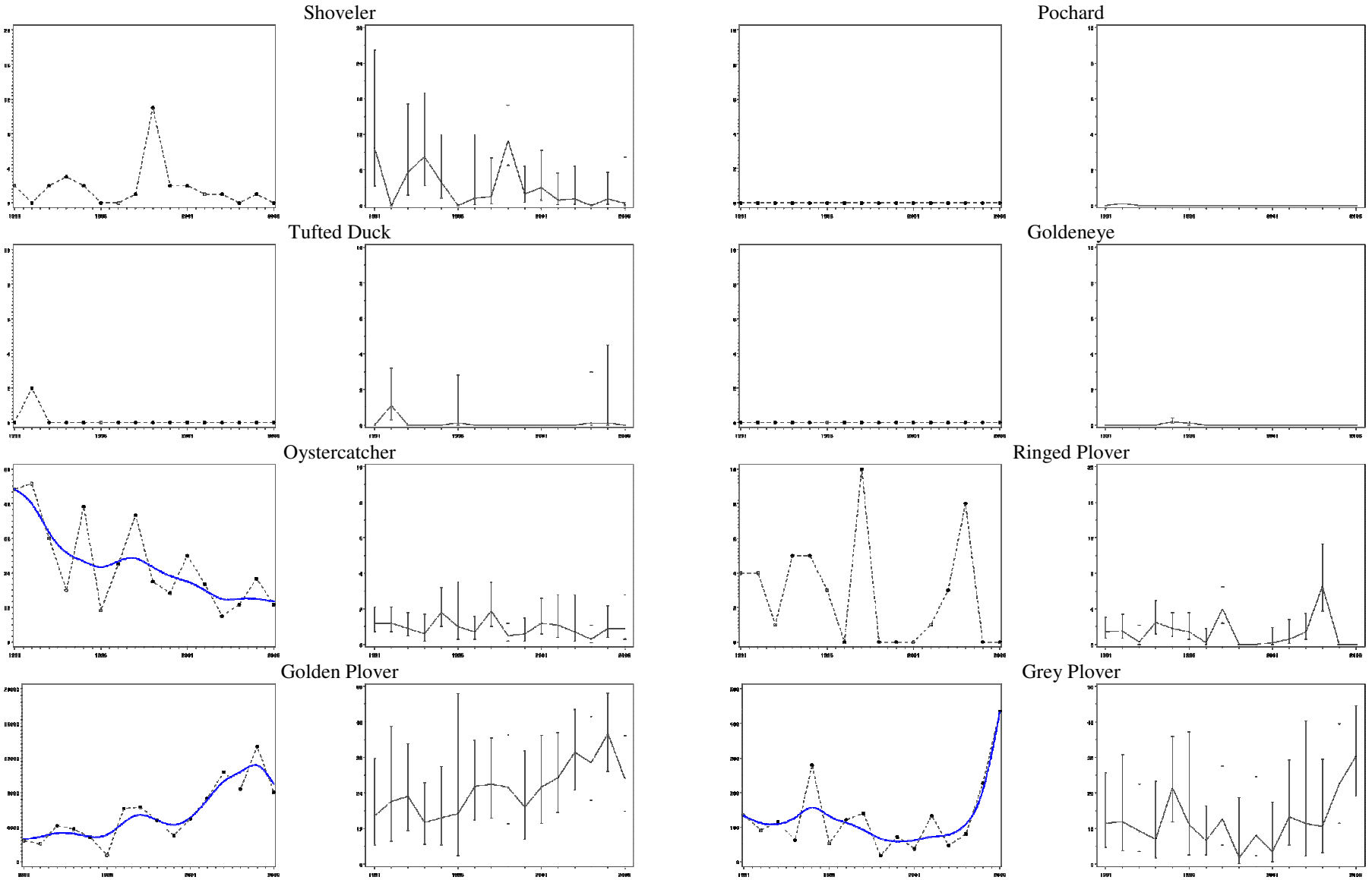


Figure B.38441 Population trends of each species in sector 38441 (Paull to Stone Creek (Cherry Cobb Sands)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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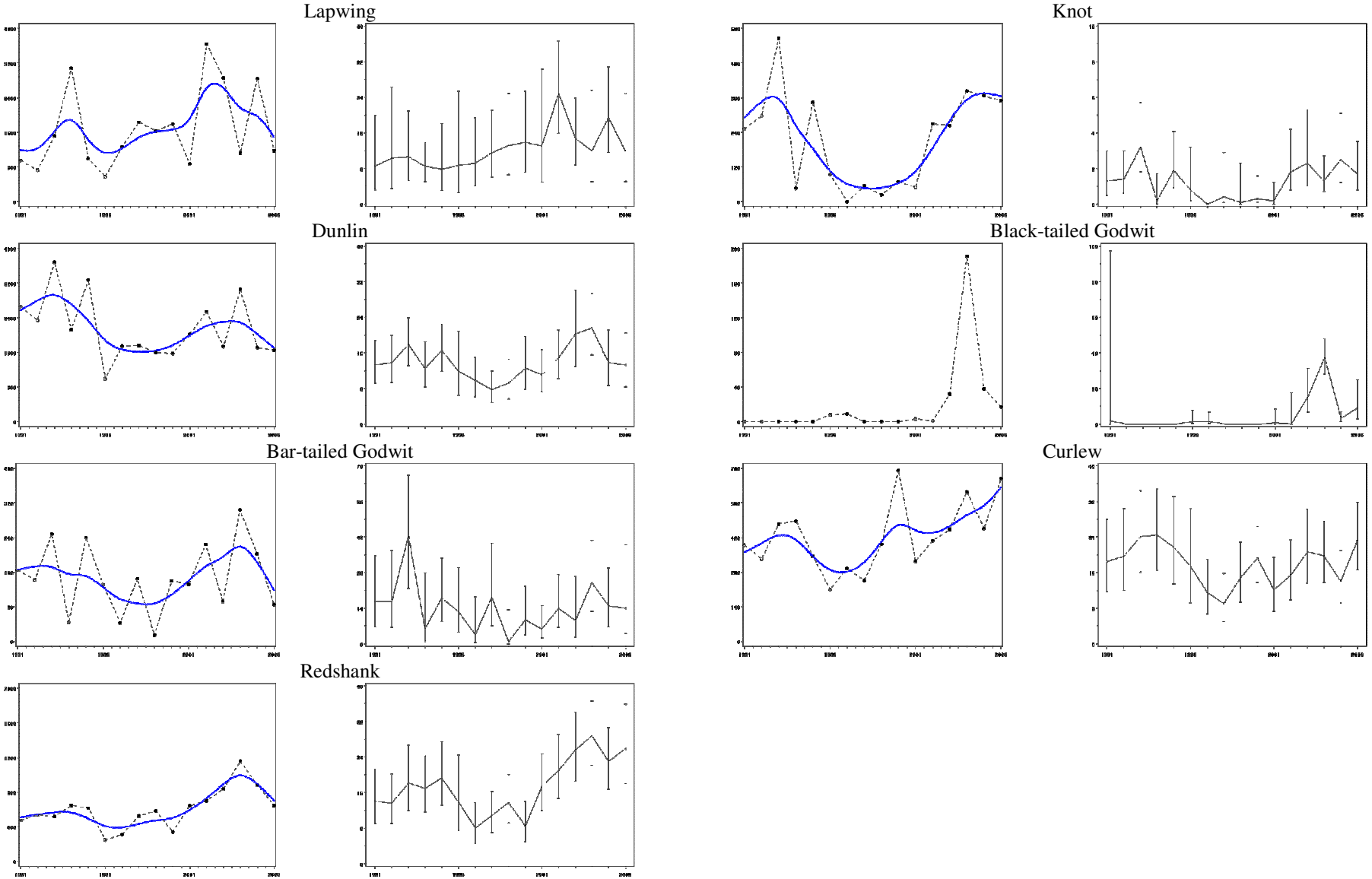

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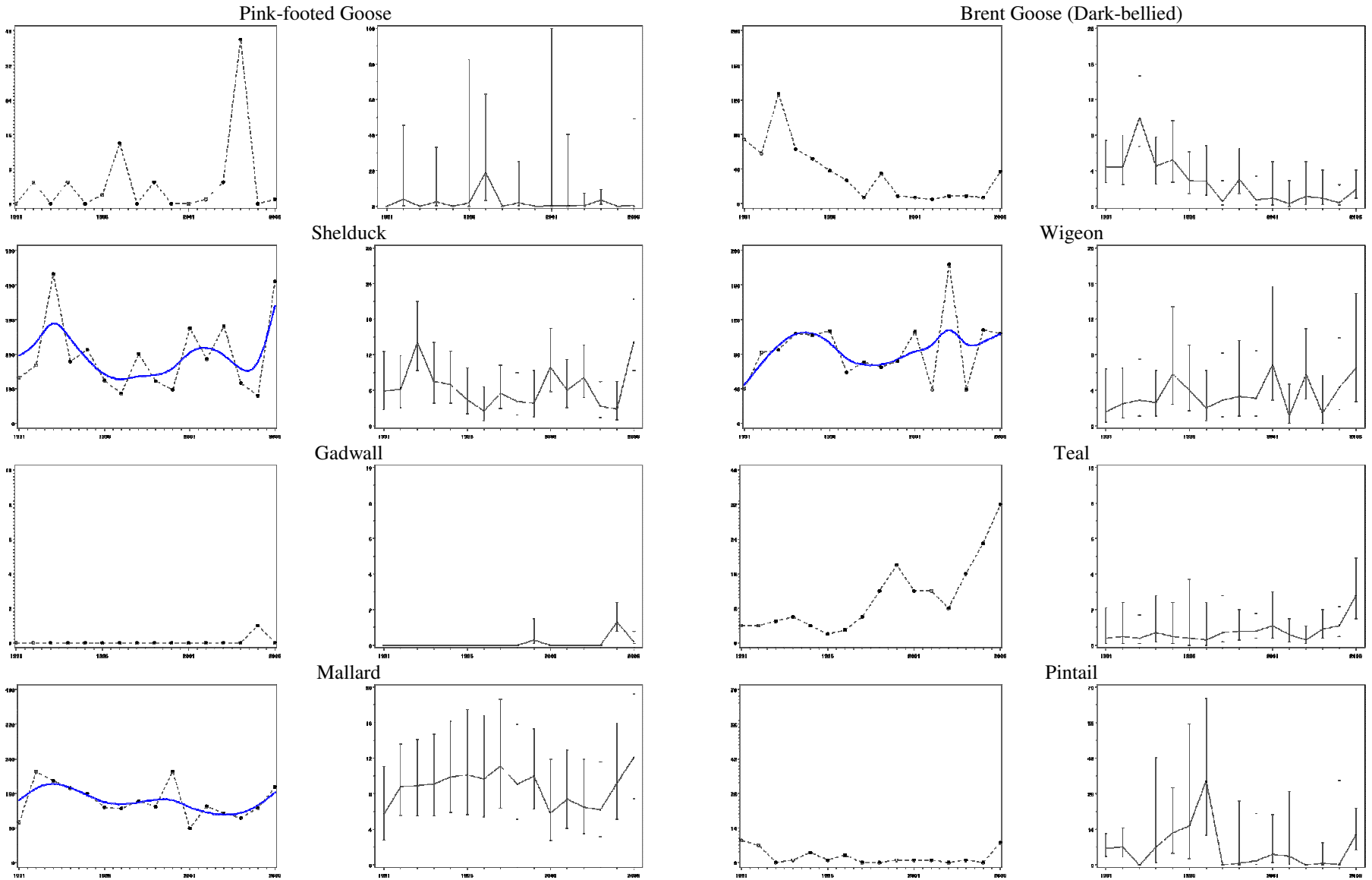
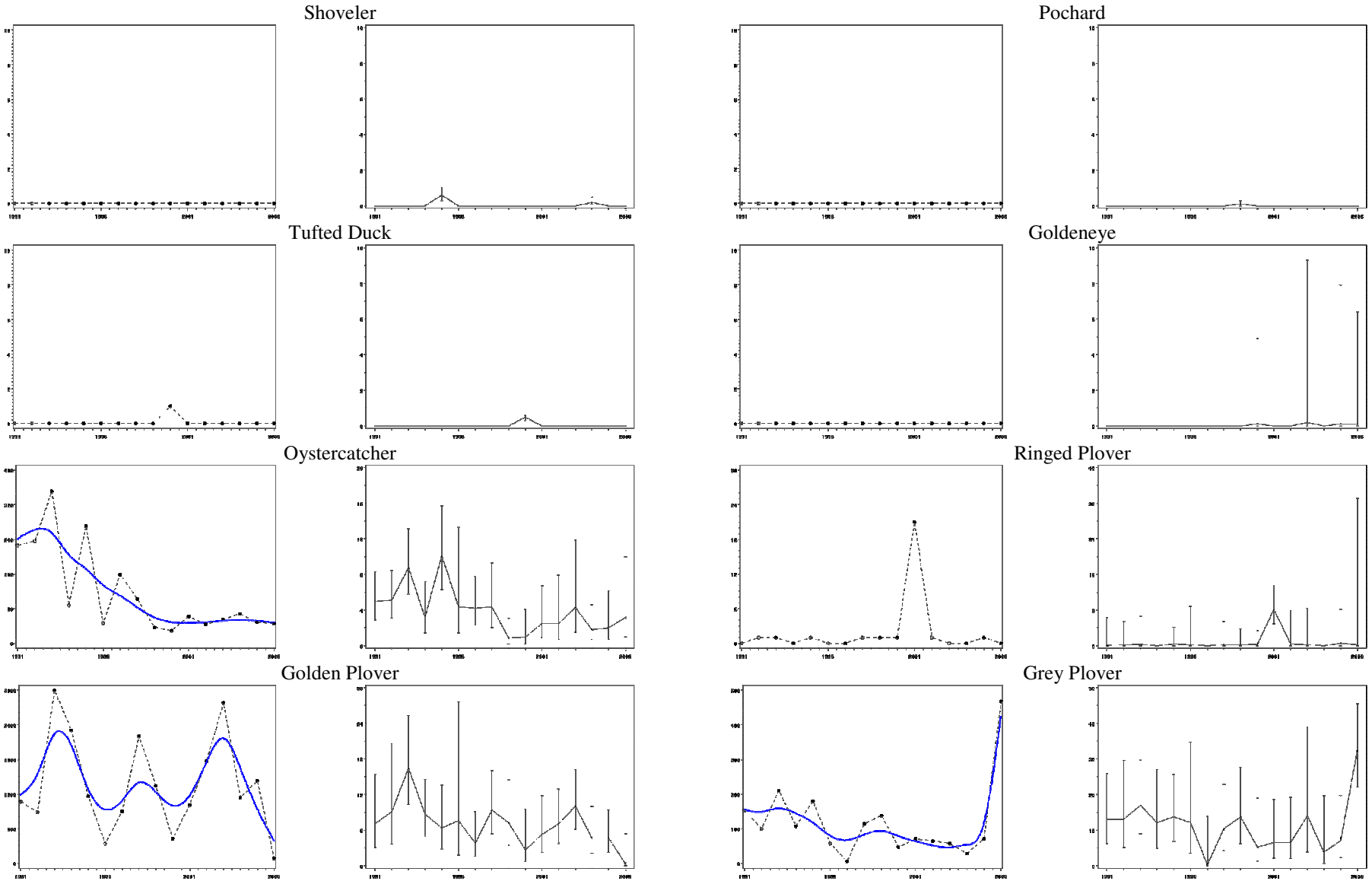


Figure B.38442 Population trends of each species in sector 38442 (Stone Creek to Patrington) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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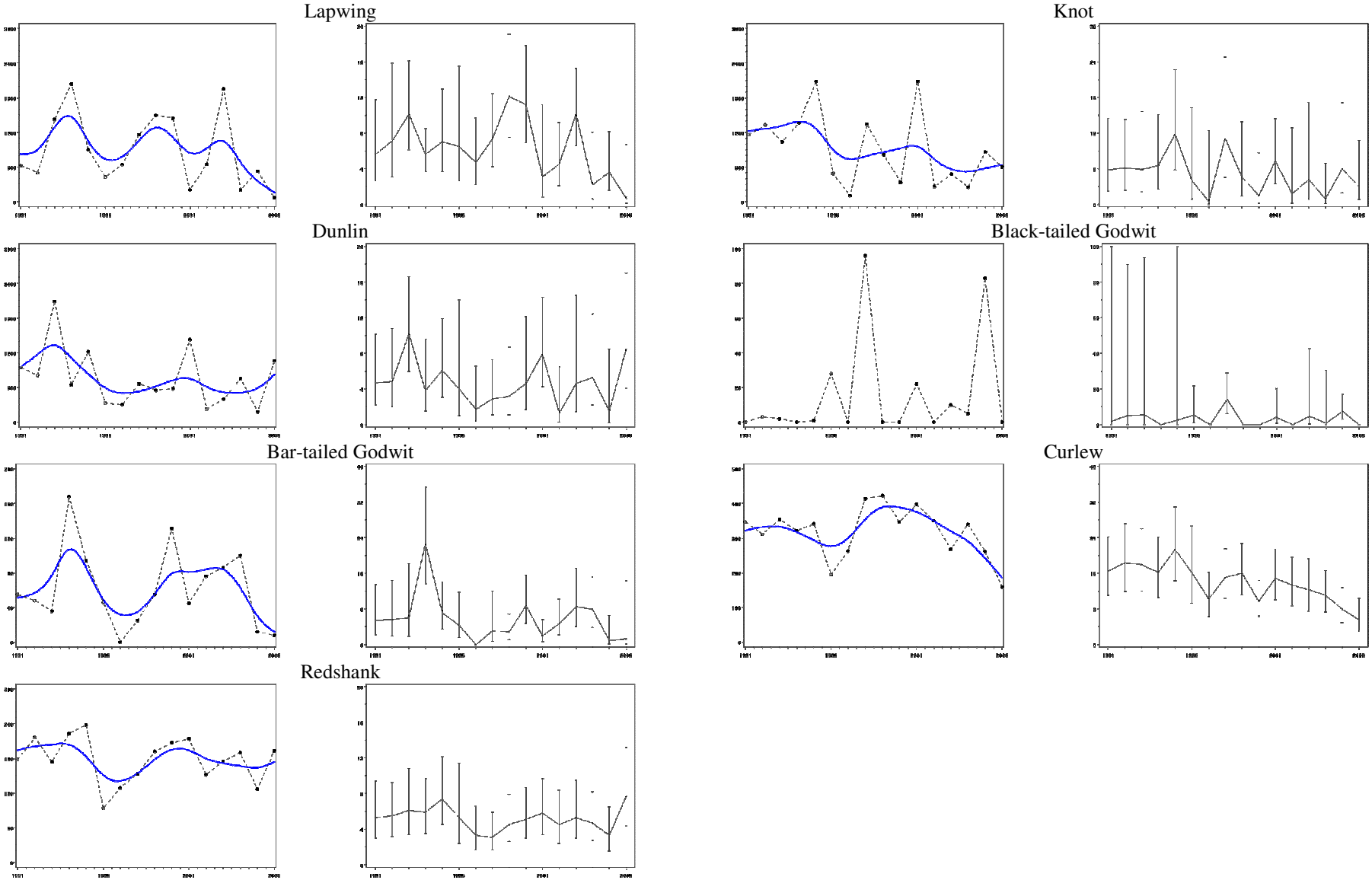

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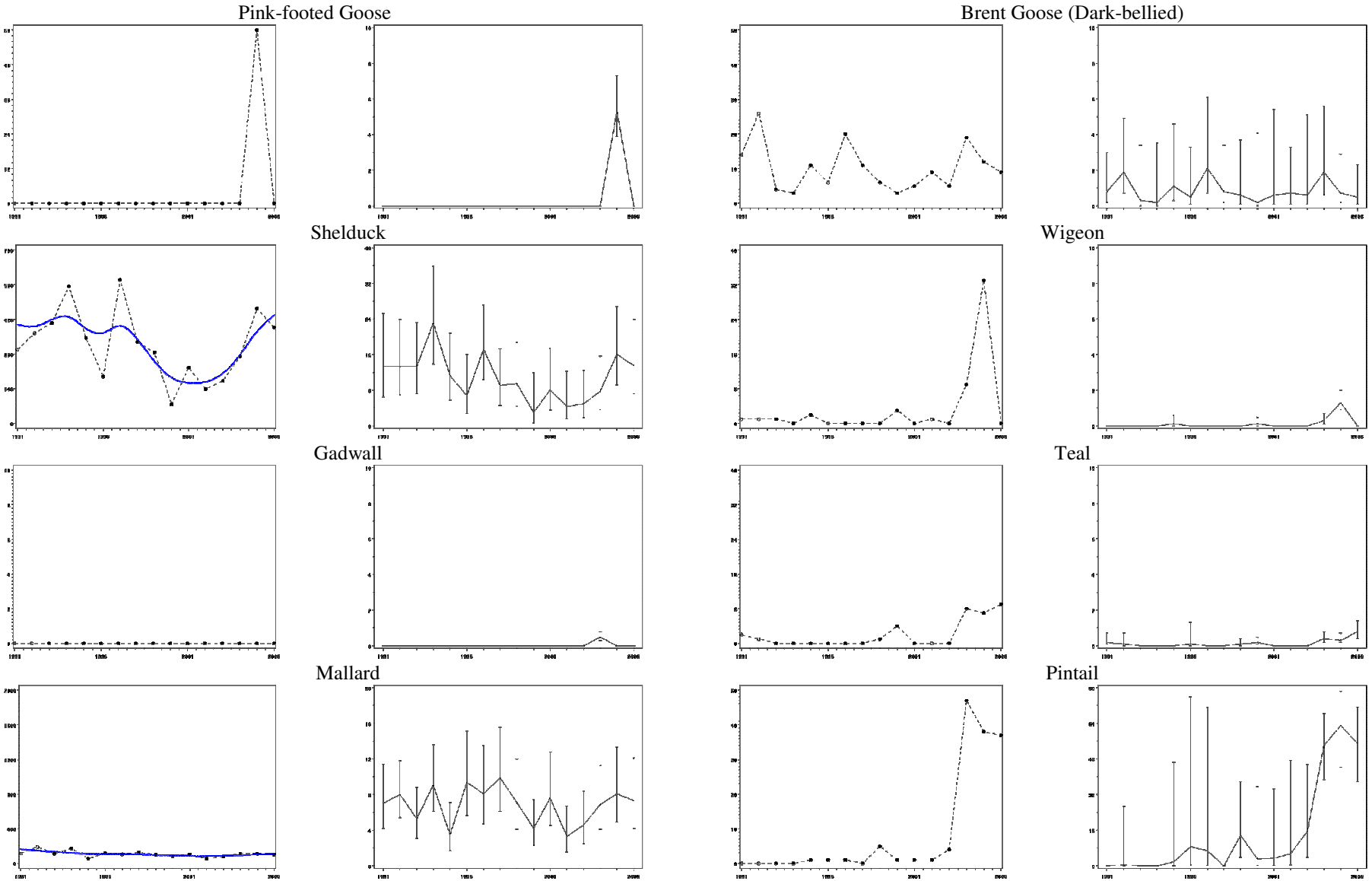
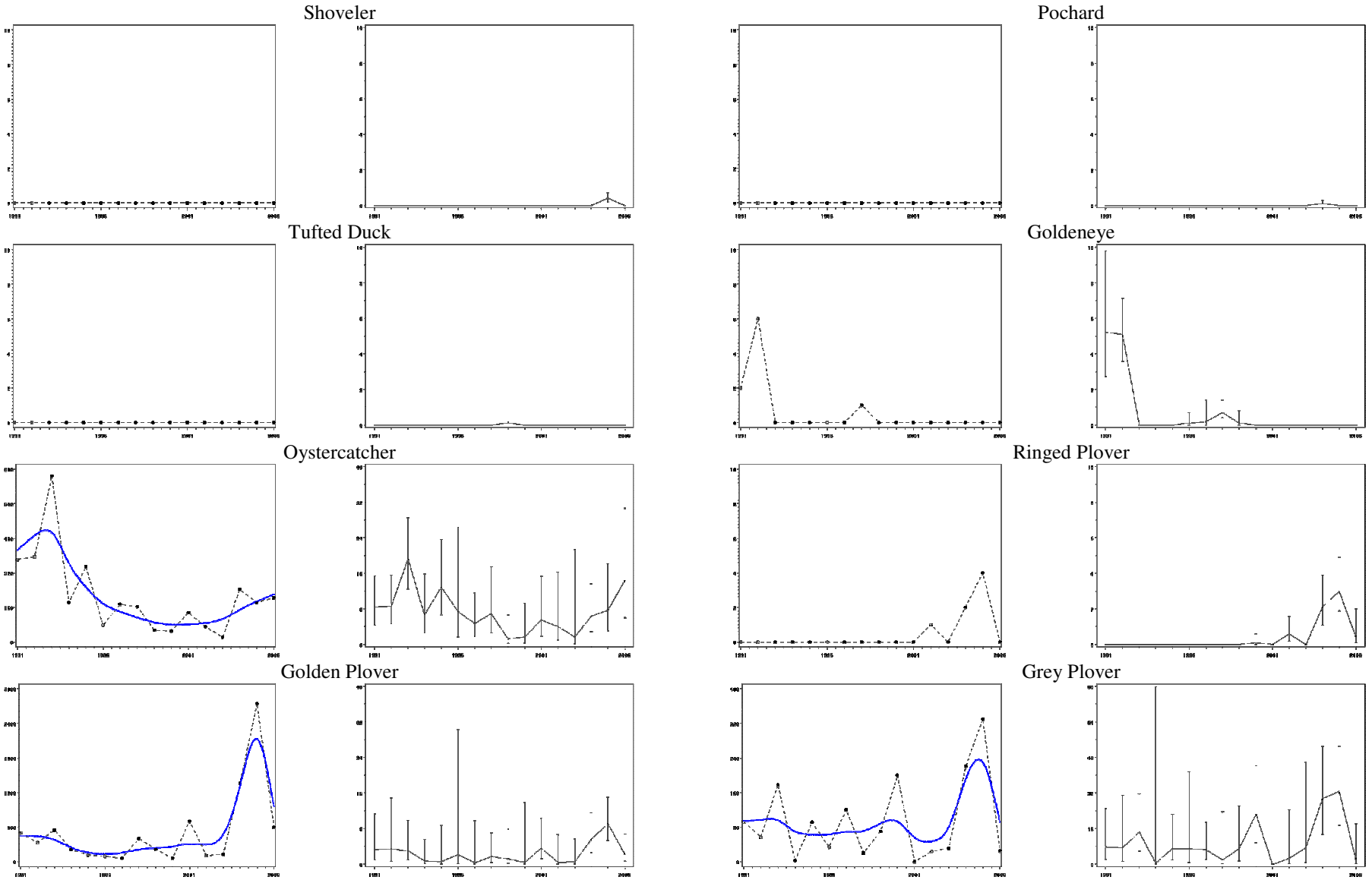


Figure B.38443 Population trends of each species in sector 38443 (Patrington to Easington) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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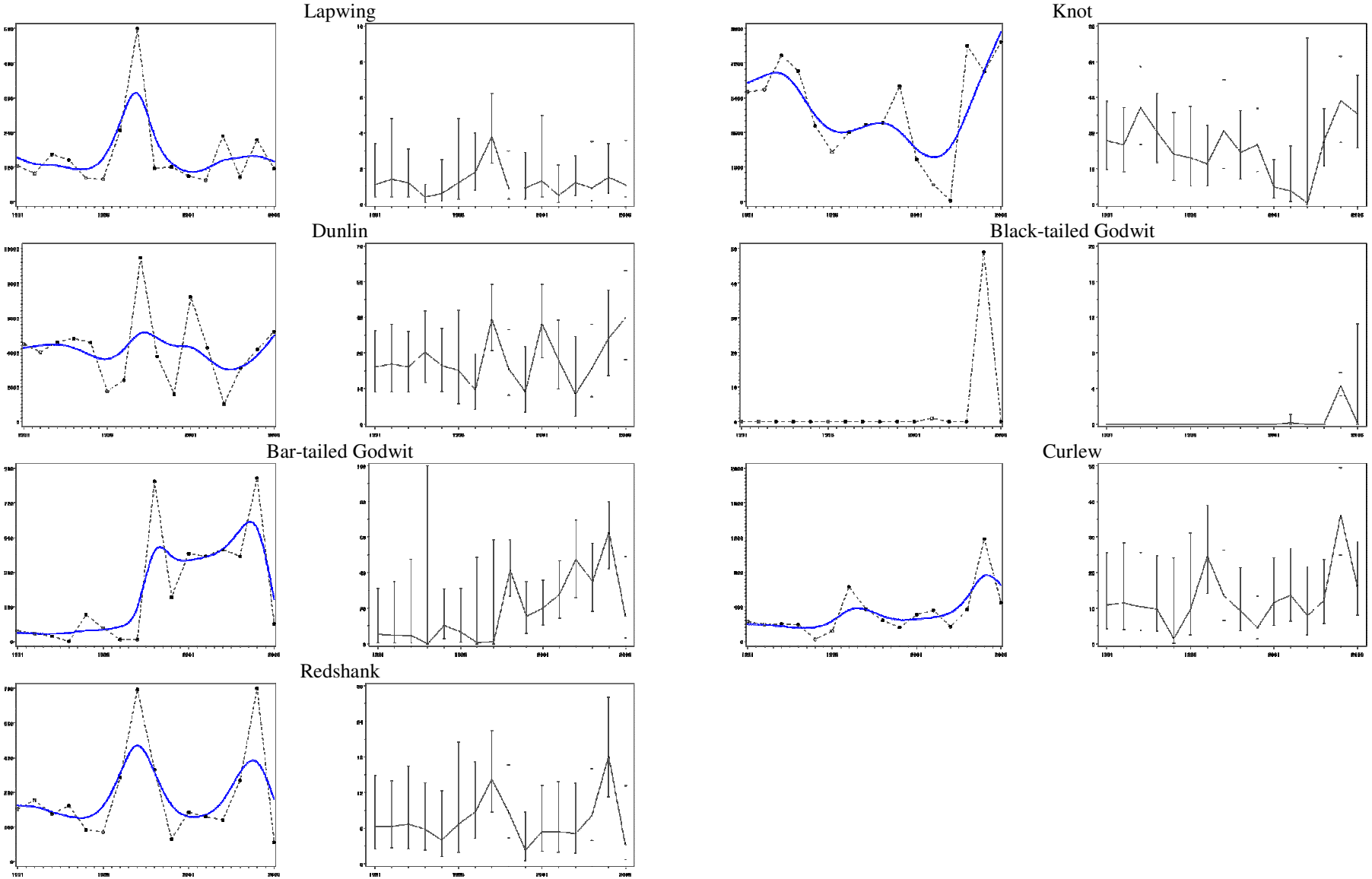

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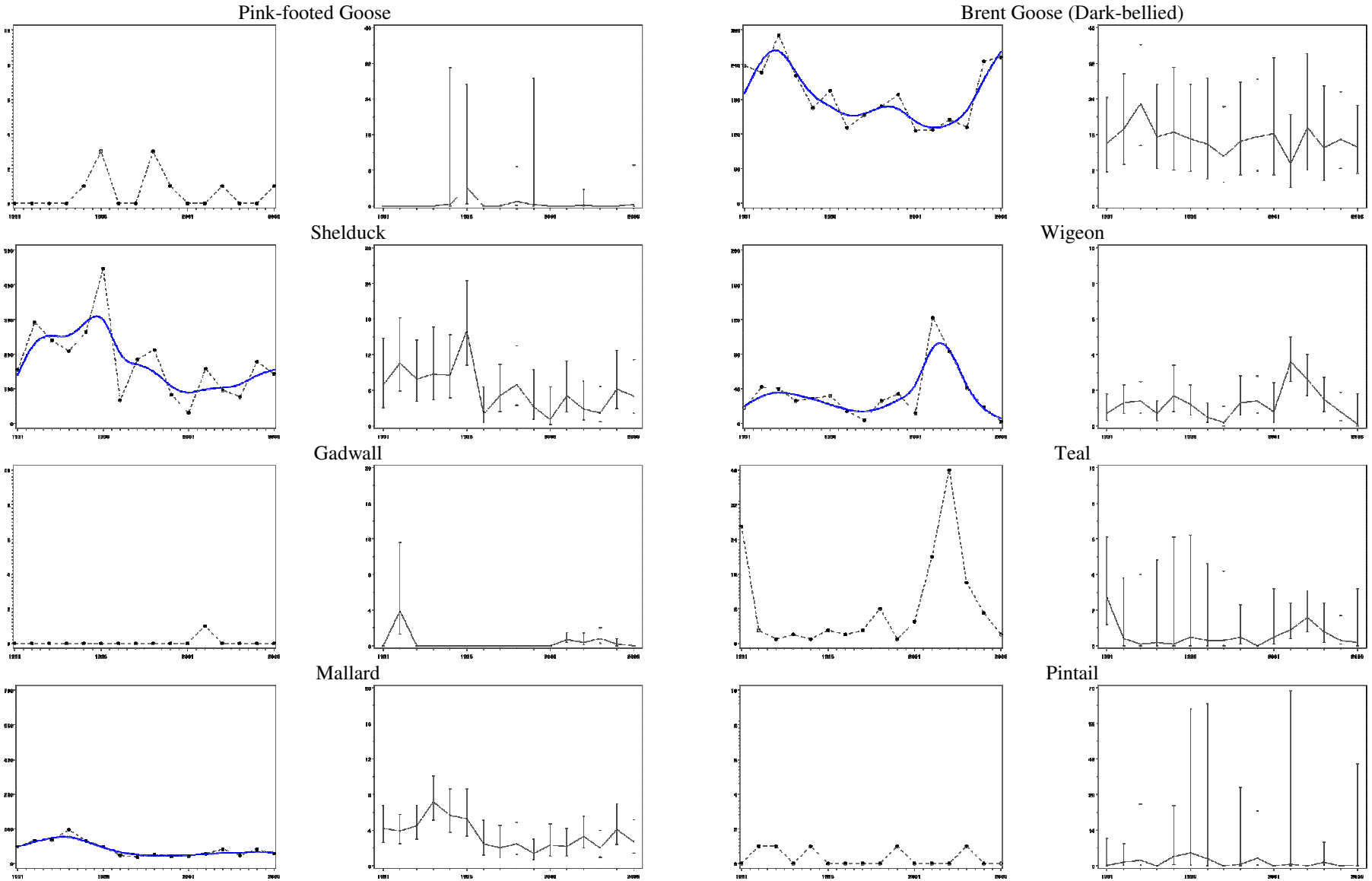


Figure B.38444 Population trends of each species in sector 38444 (Spurn Head) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).

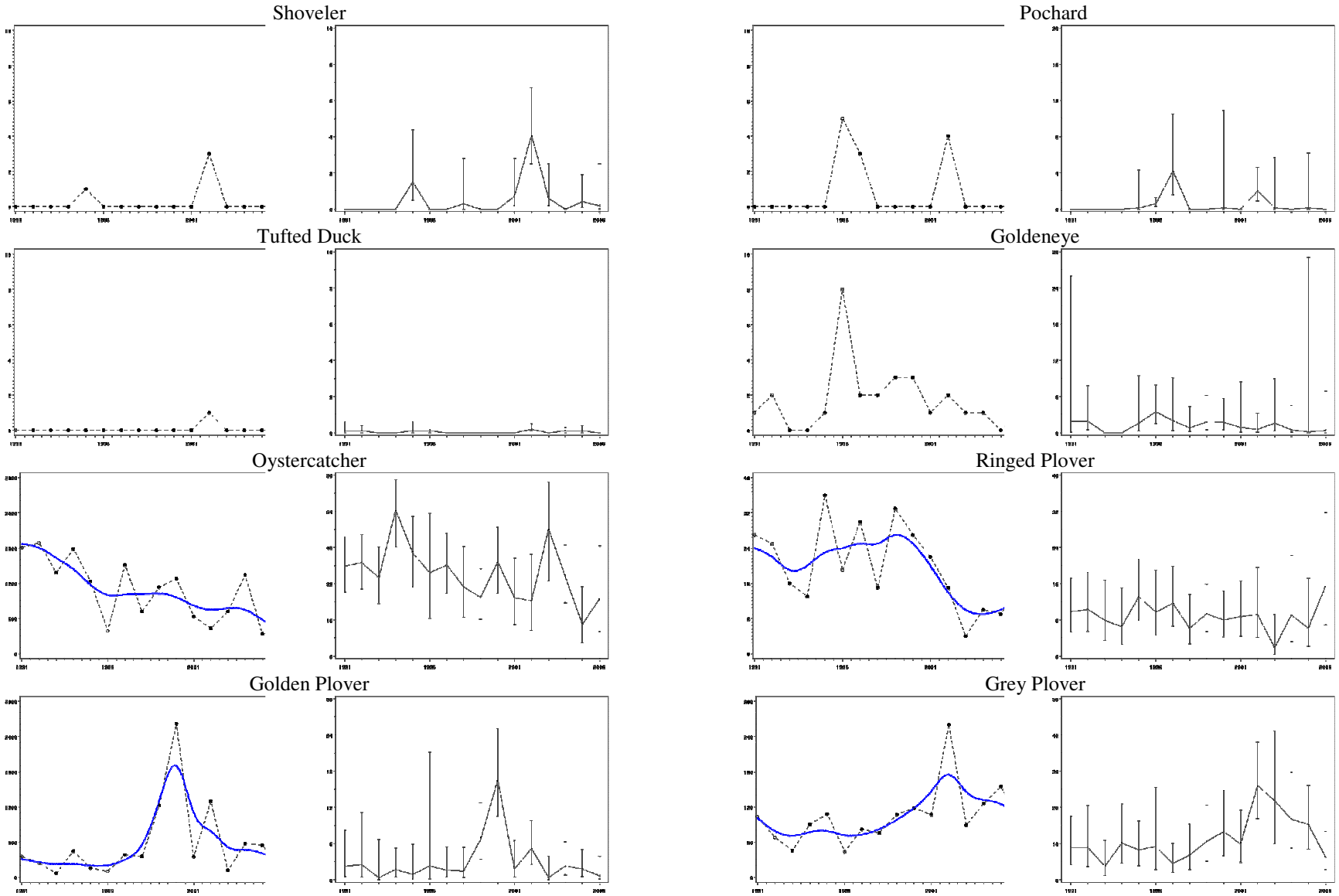
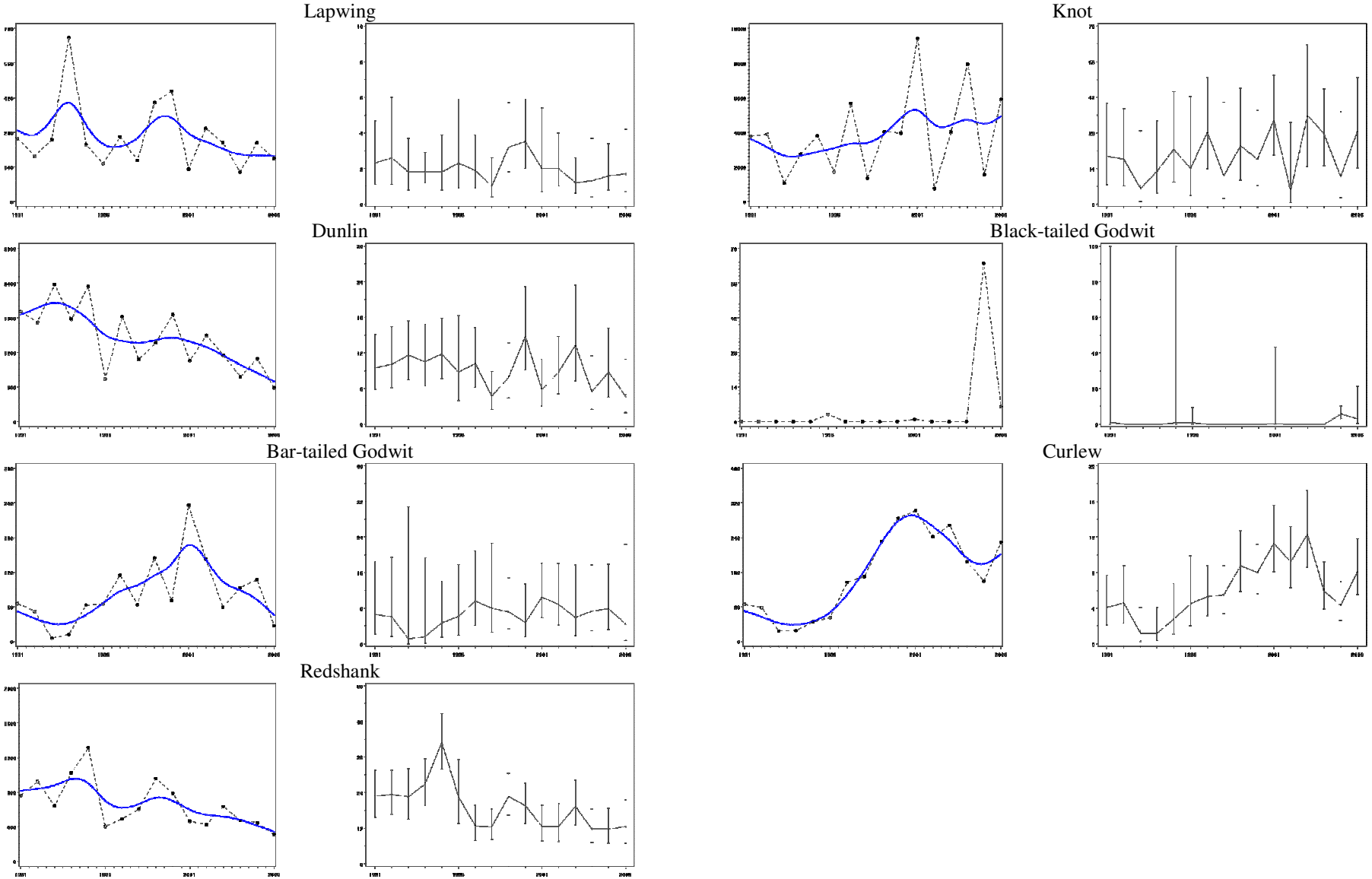


Figure B.38444 Continued.



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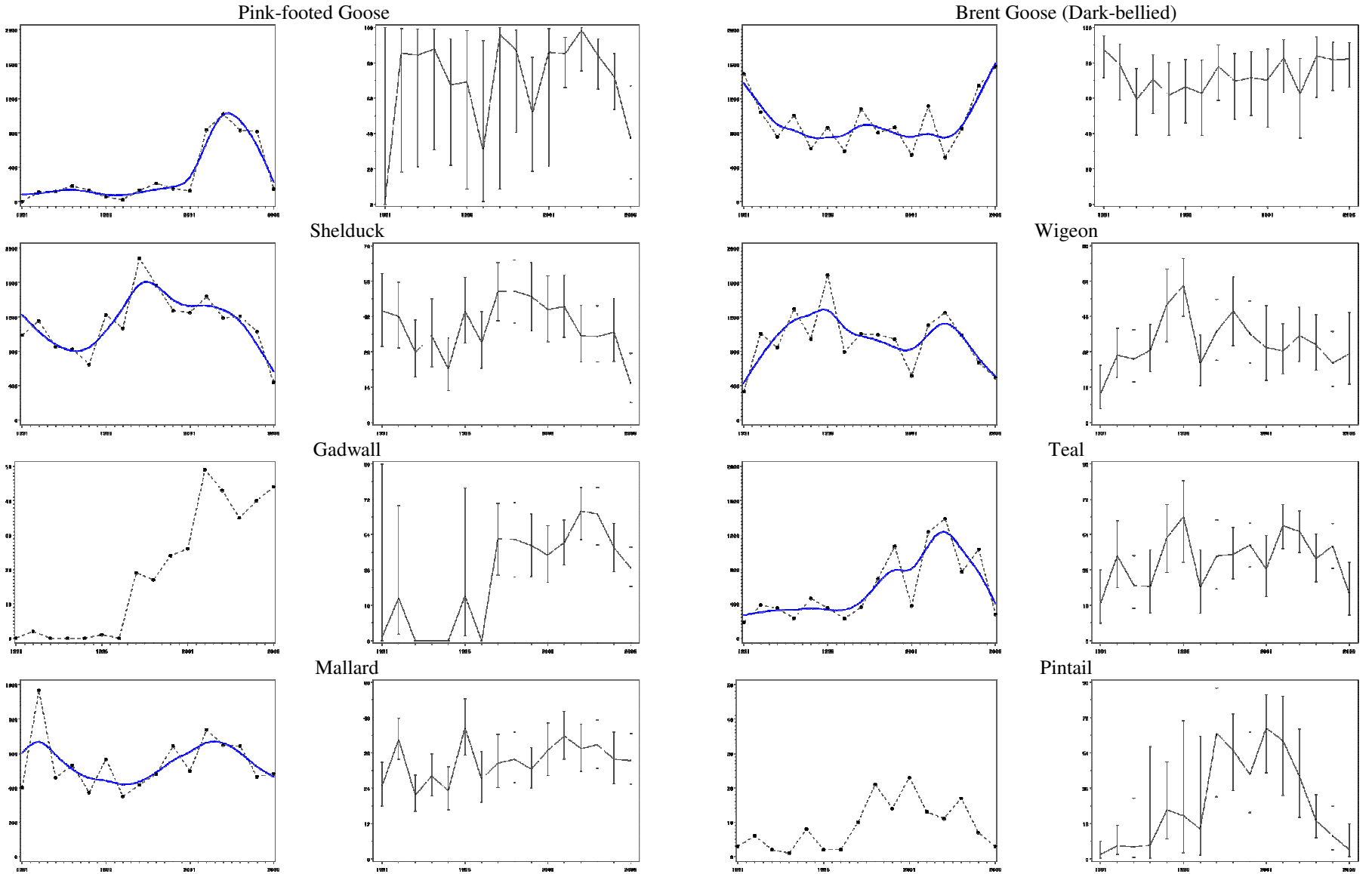
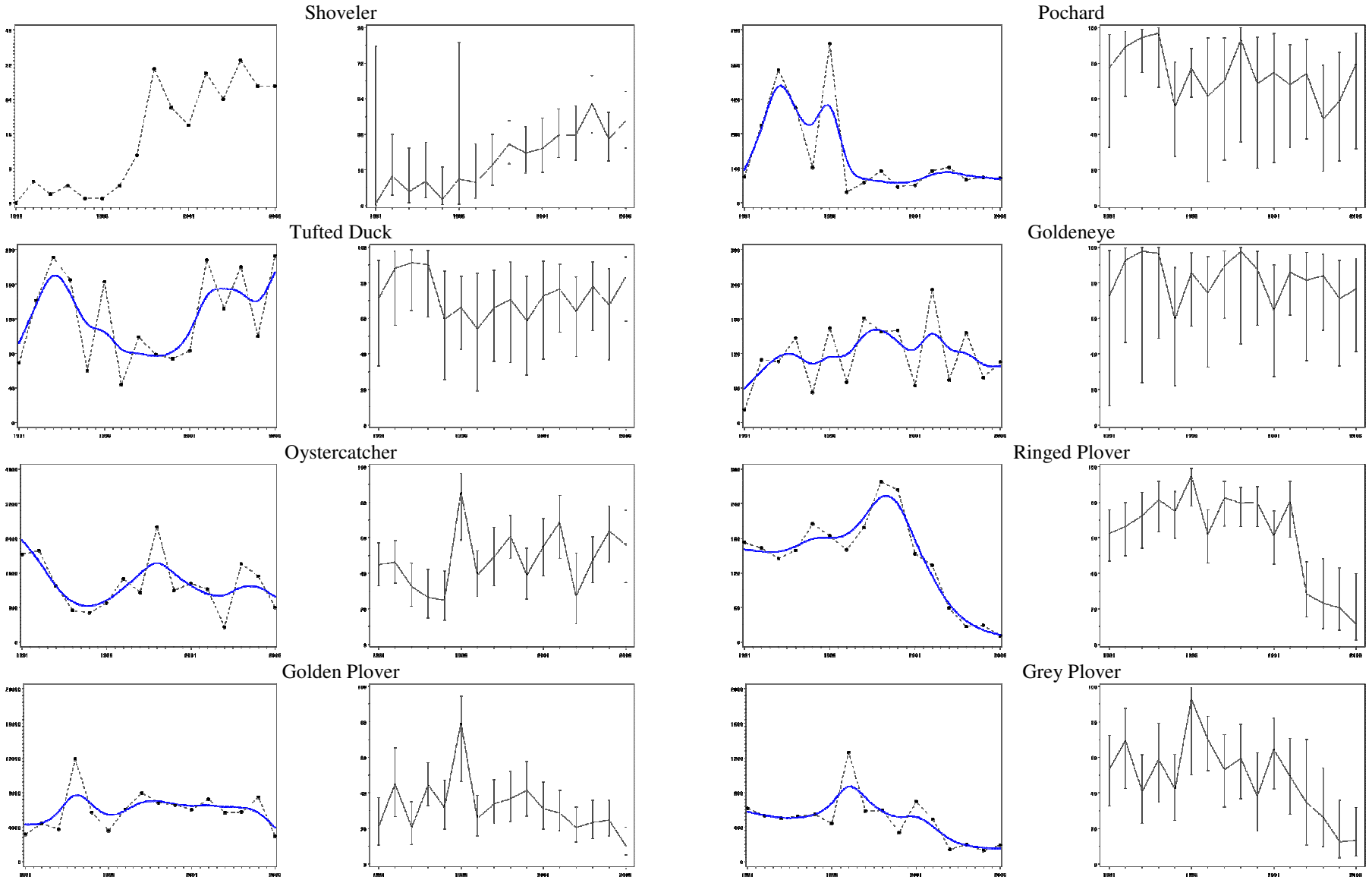


Figure B.38901 Population trends of each species in sector 38901 (Humber Estuary (South)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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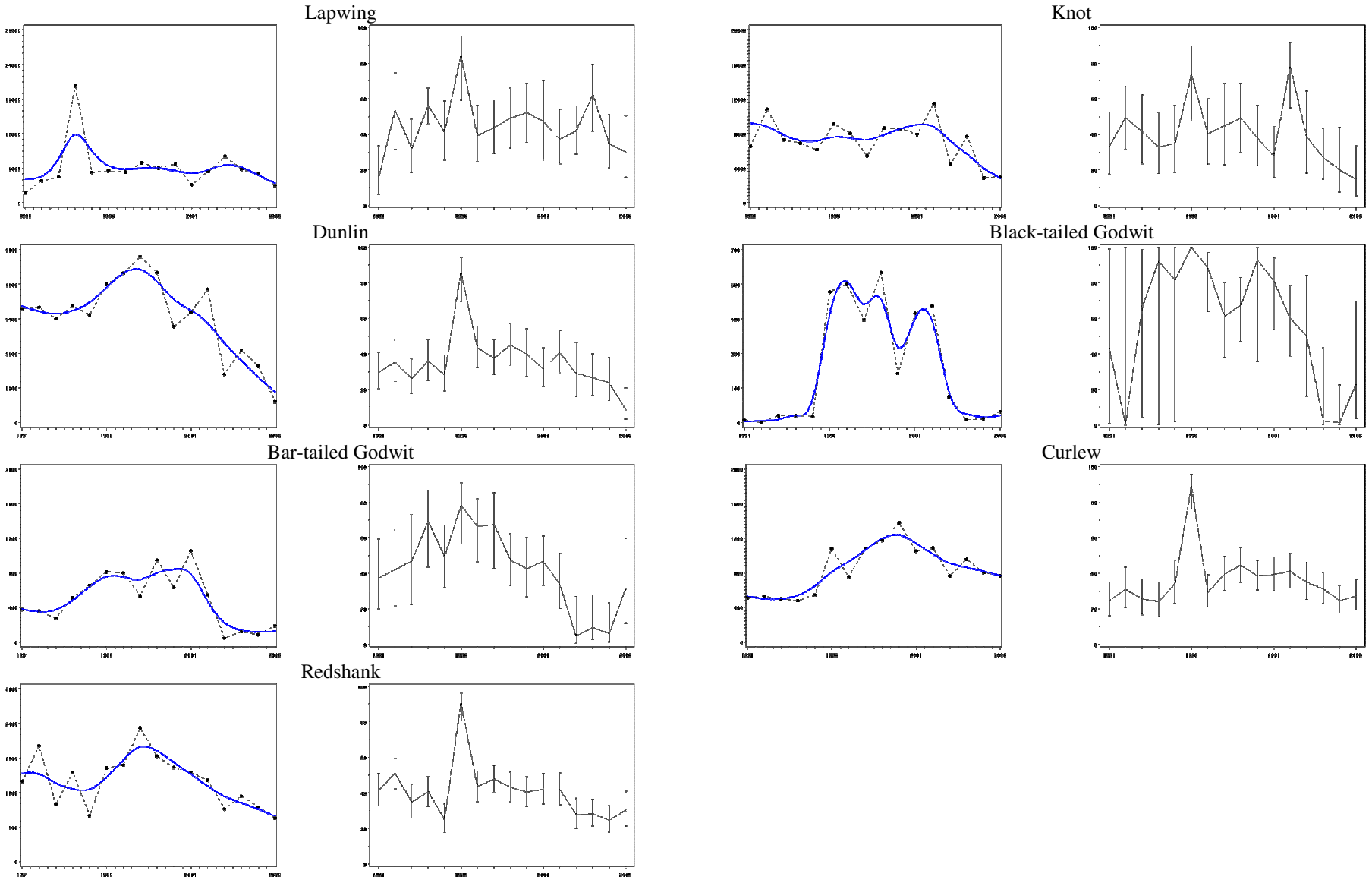

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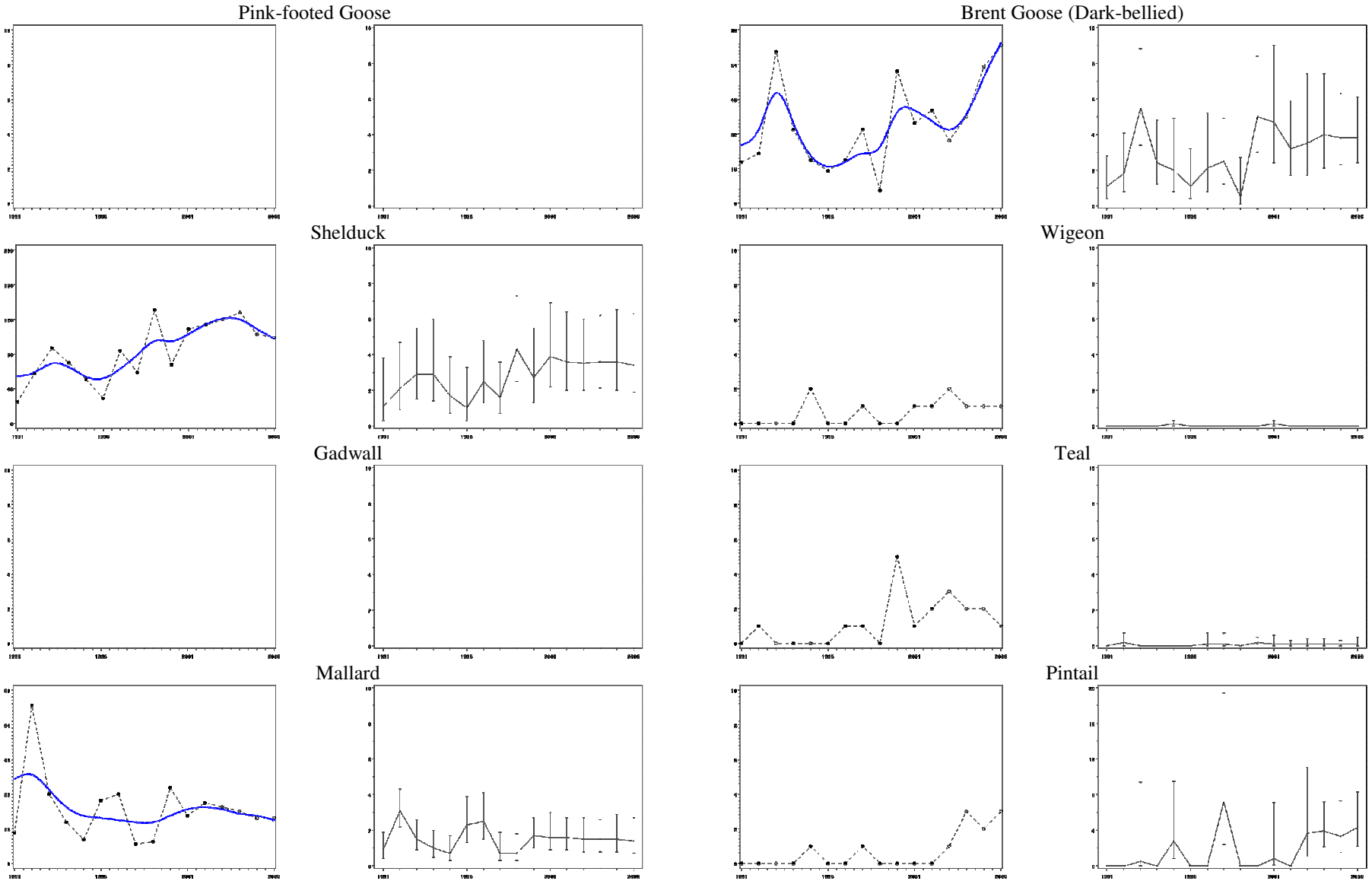
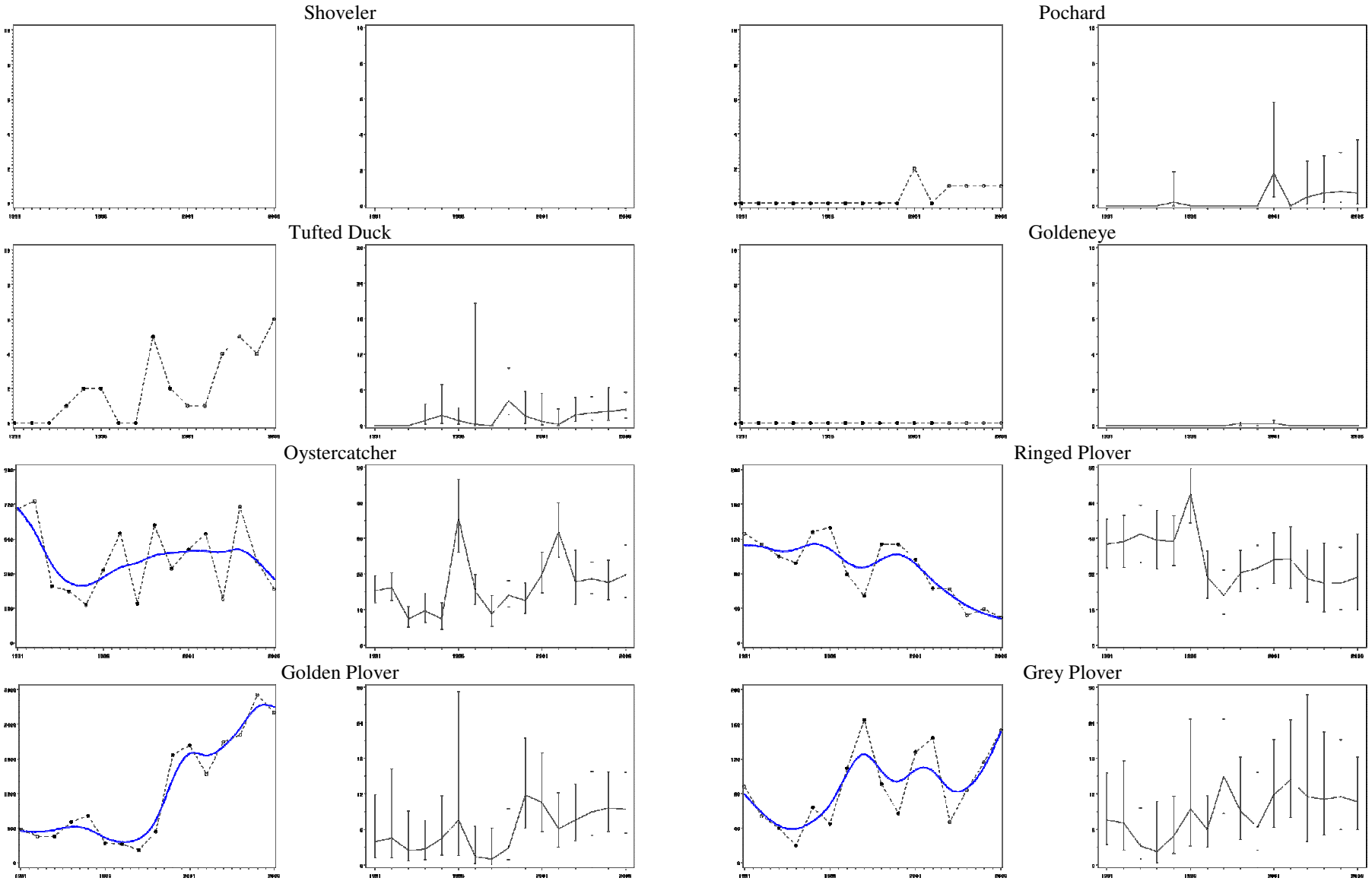


Figure B.38902 Population trends of each species in sector 38902 (Humberston Fitties to Grimsby (Dock Tower)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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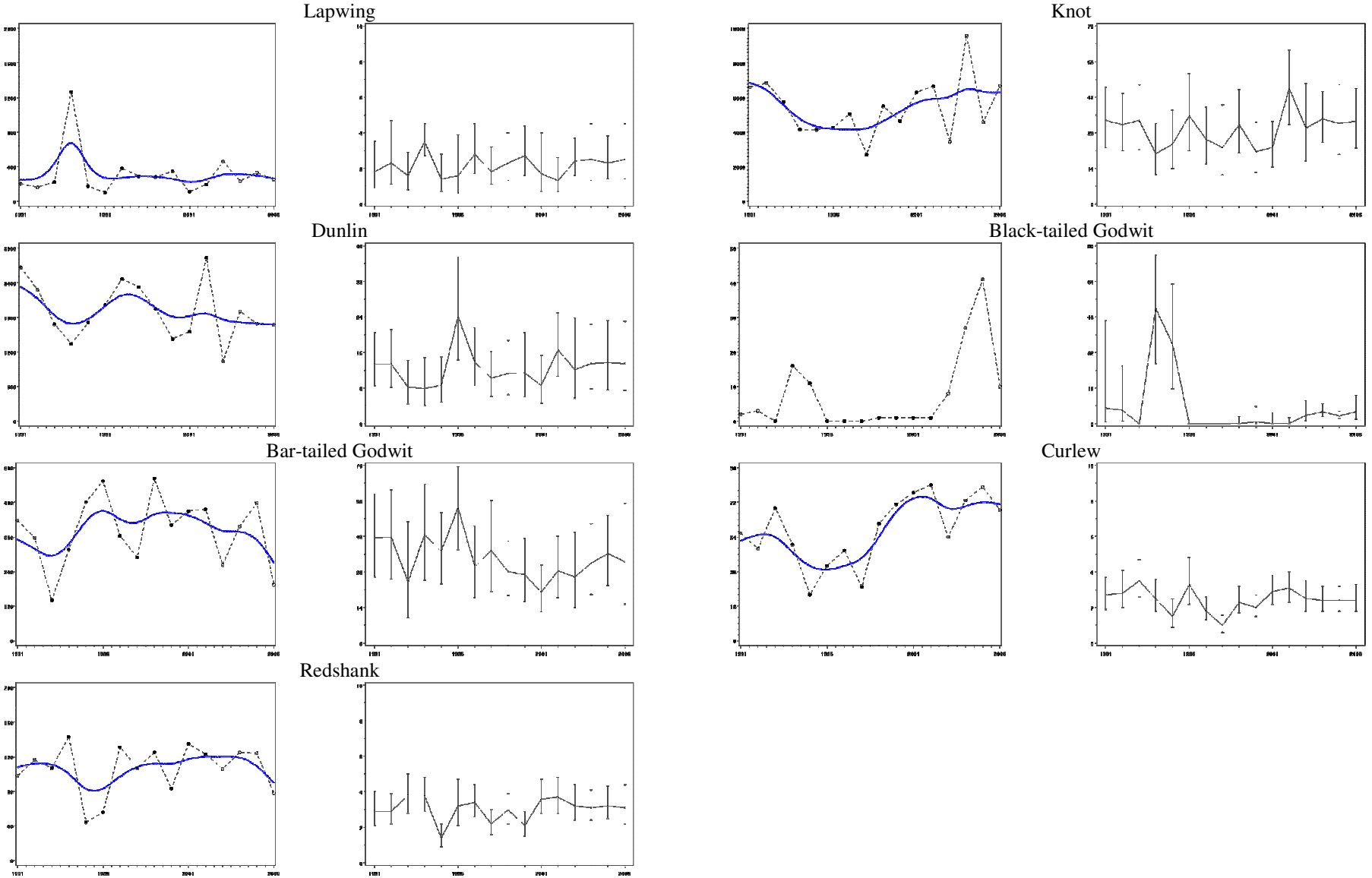

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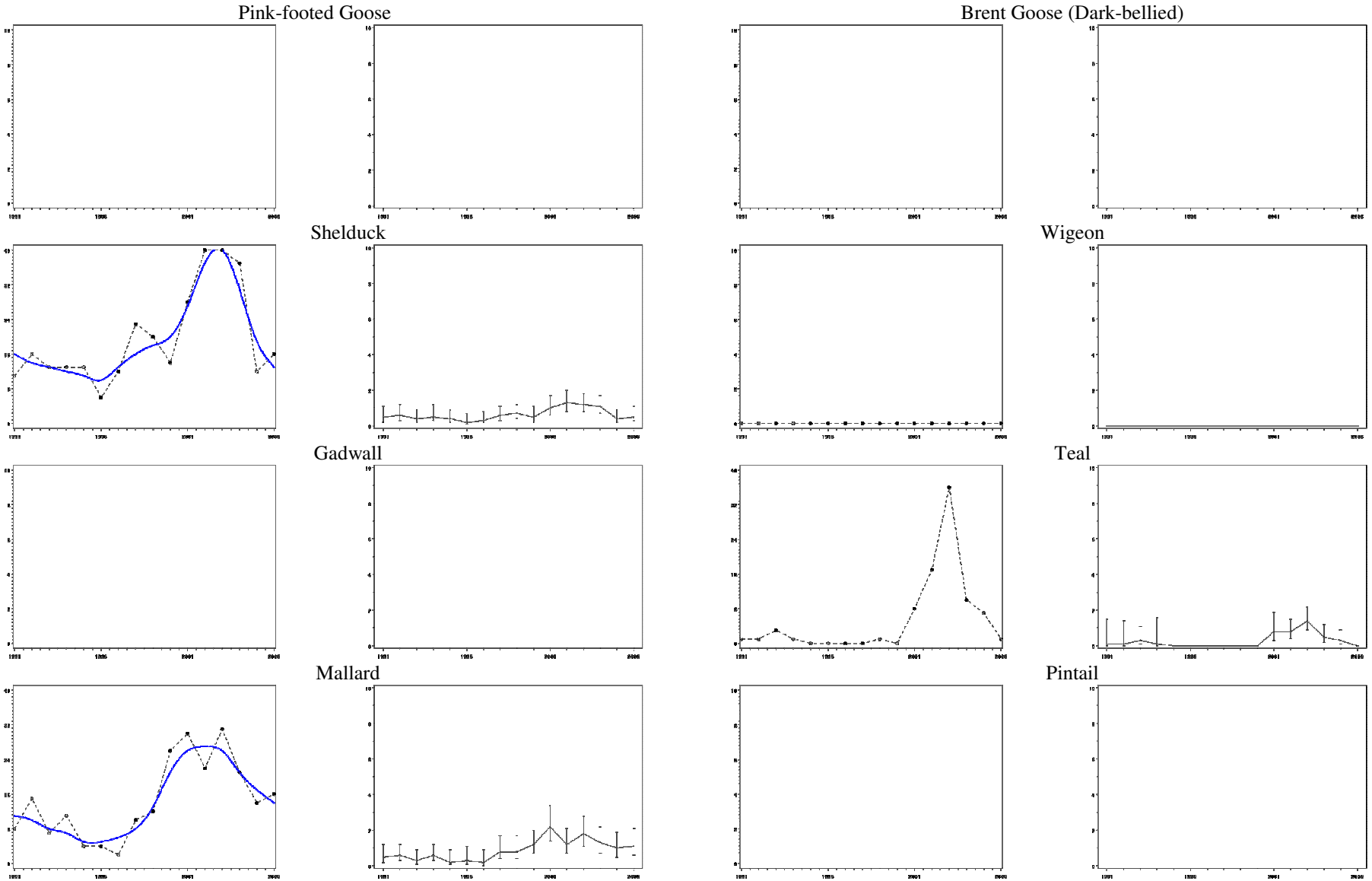
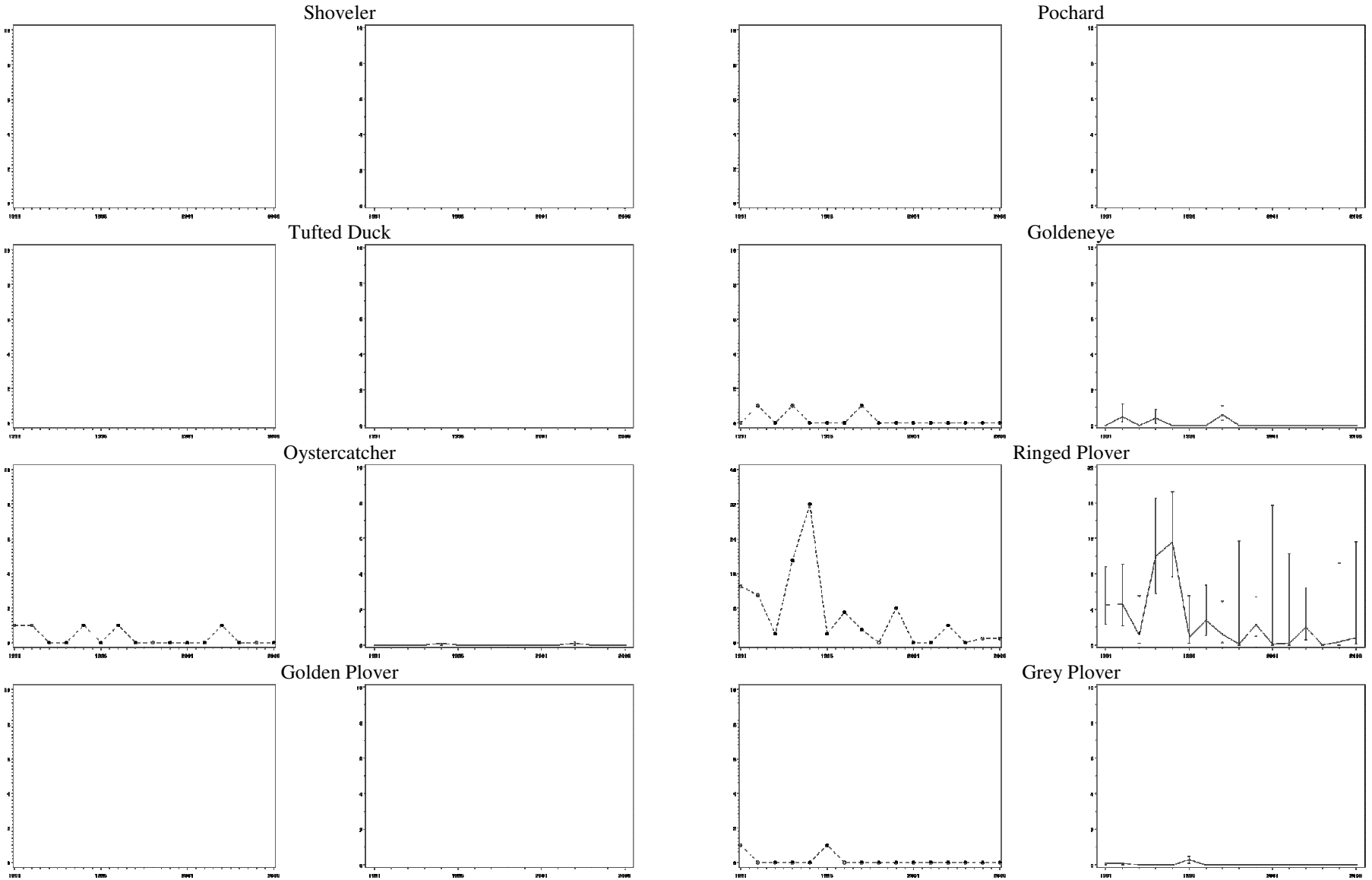


Figure B.38905 Population trends of each species in sector 38905 (Immingham Docks) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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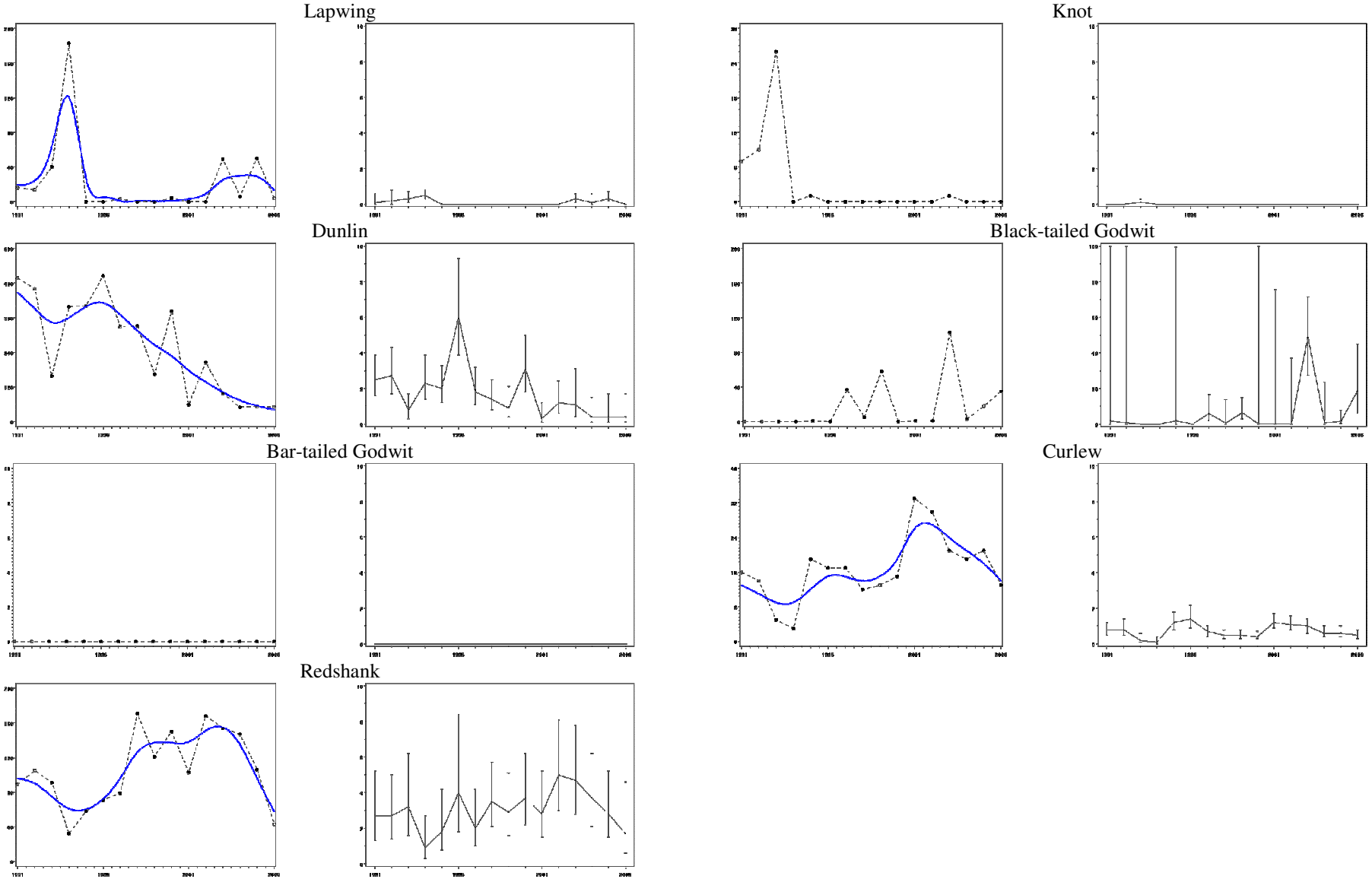

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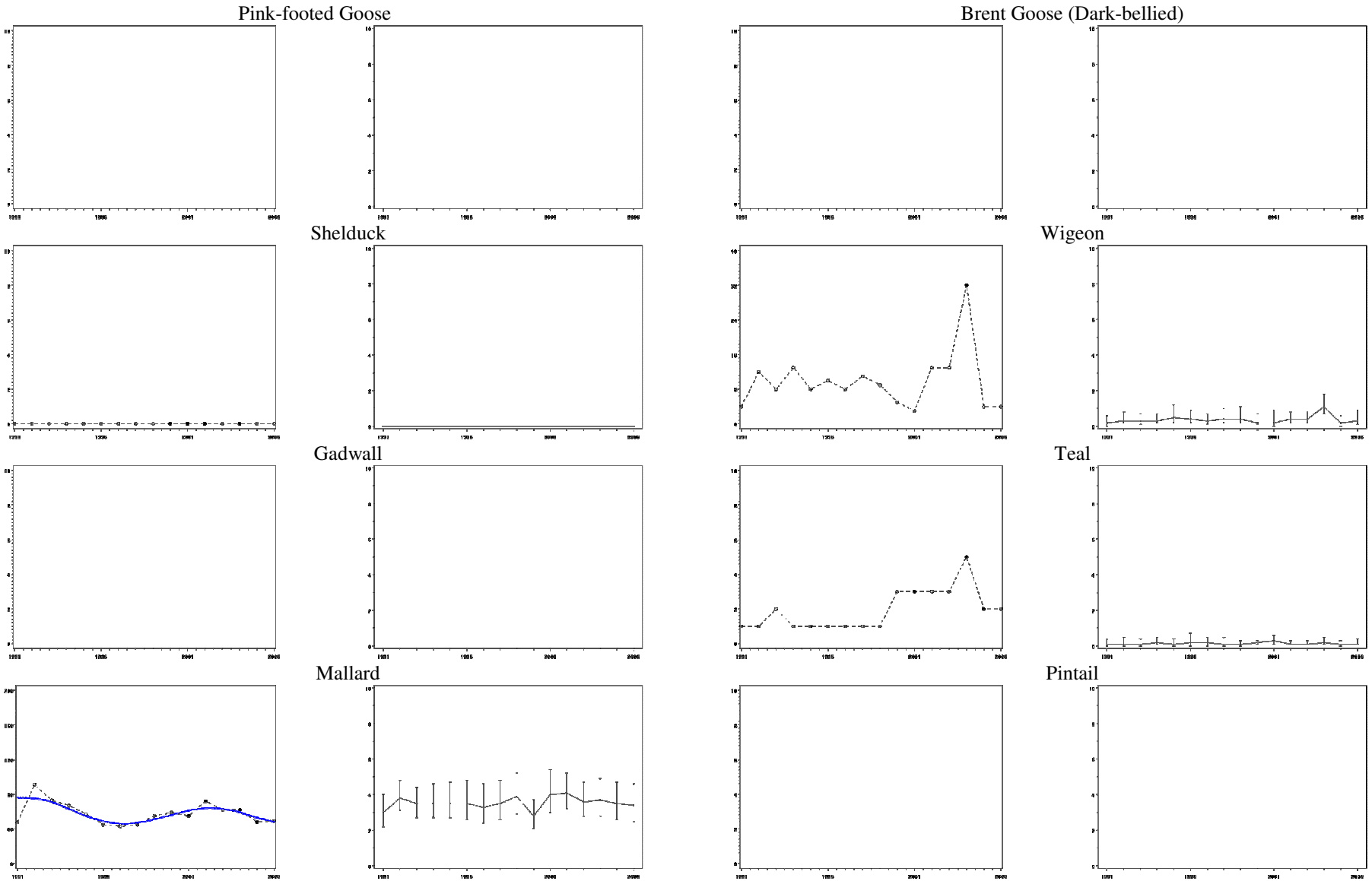
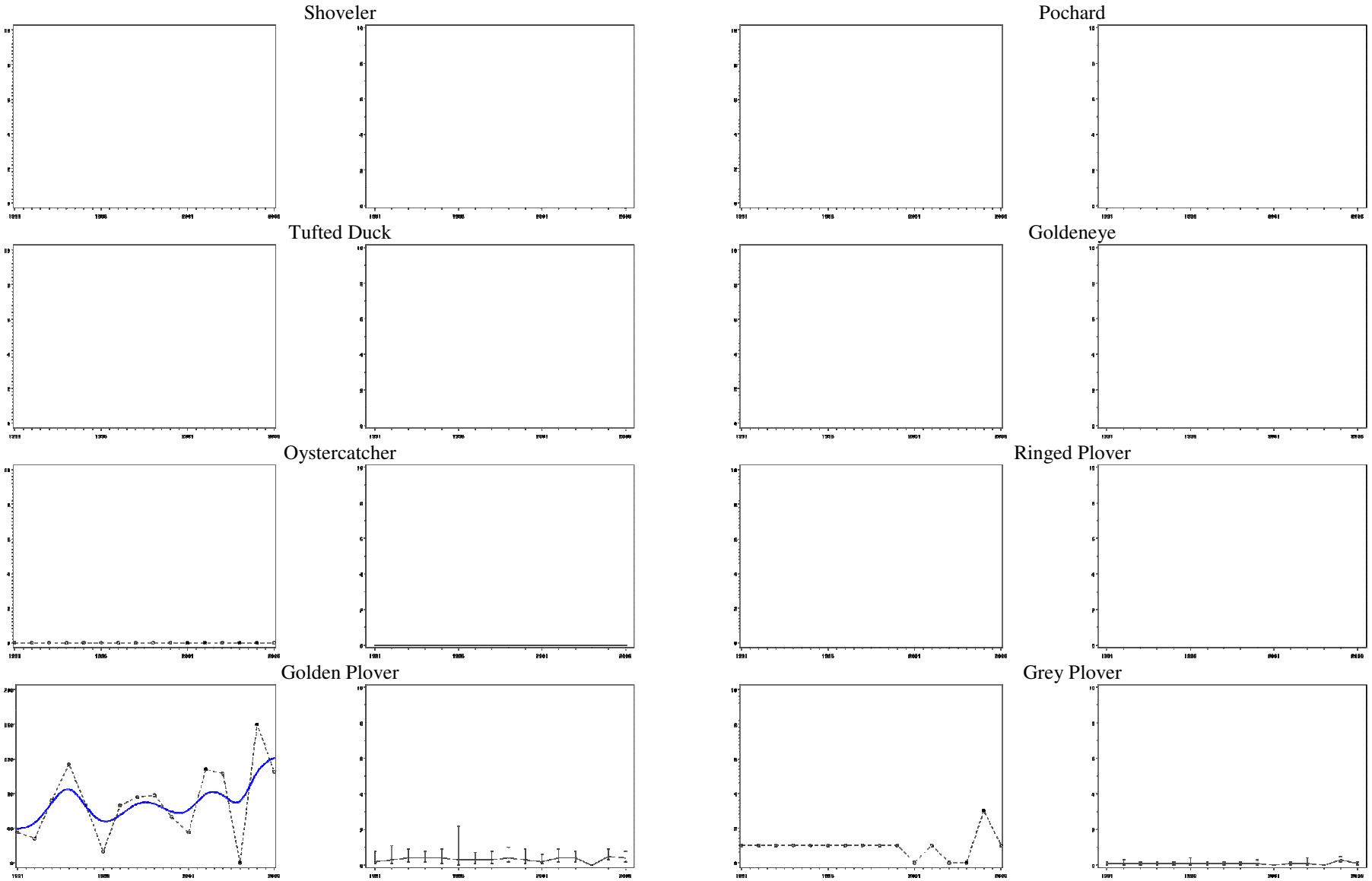


Figure B.38907 Population trends of each species in sector 38907 (River Humber - Howdendyke to Whitgift) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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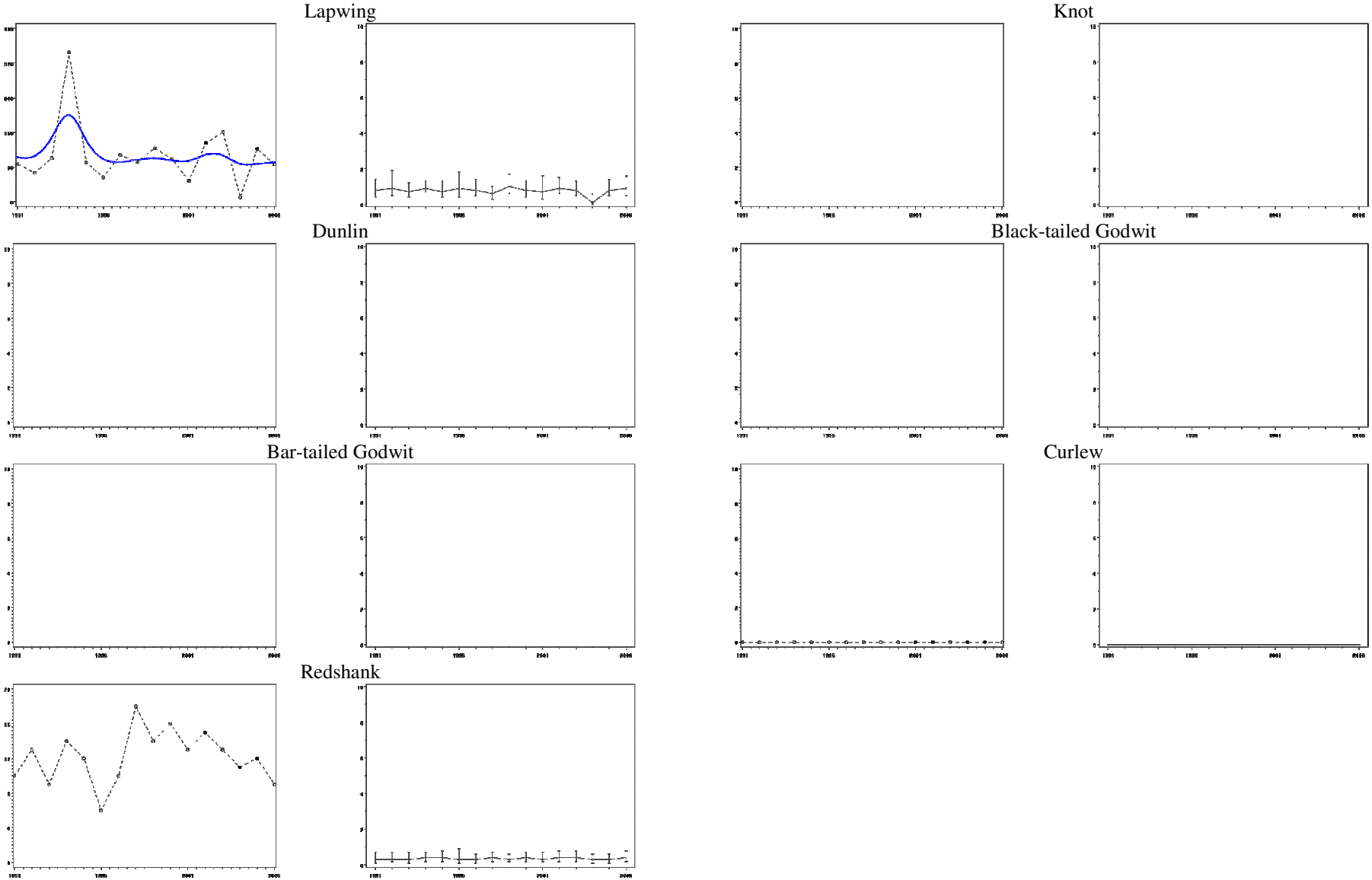

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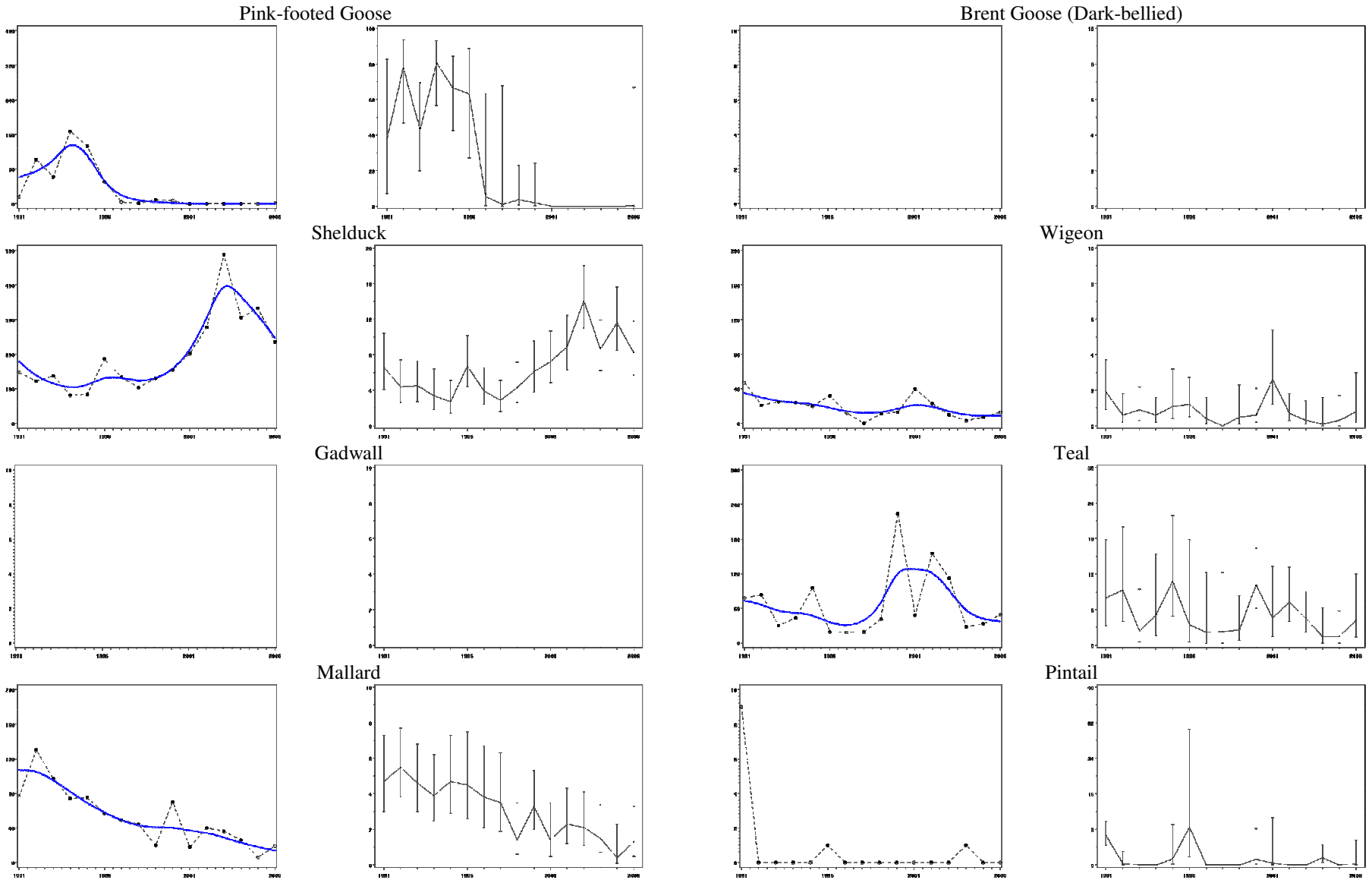
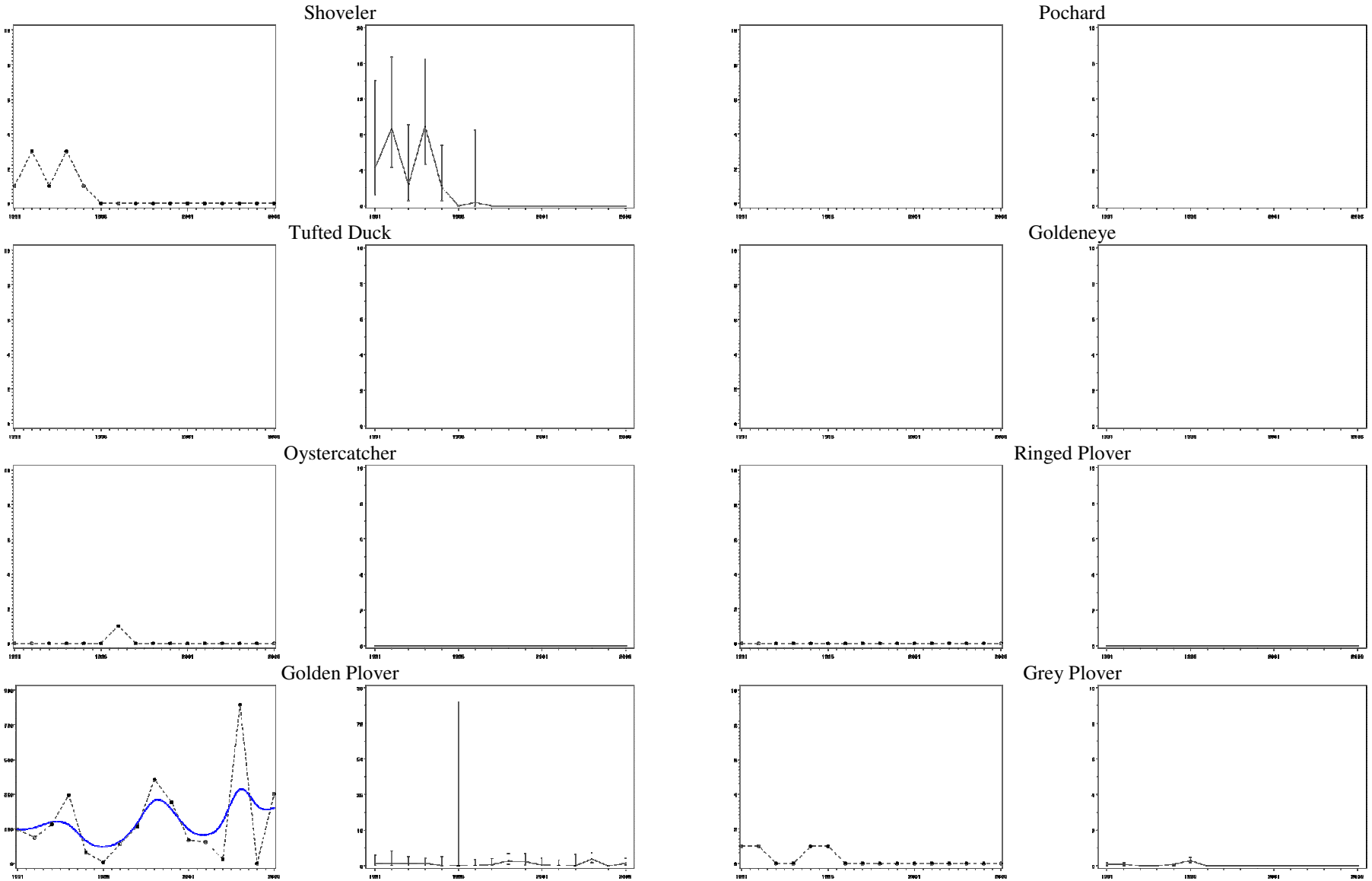


Figure B.38921 Population trends of each species in sector 38921 (Winteringham Haven) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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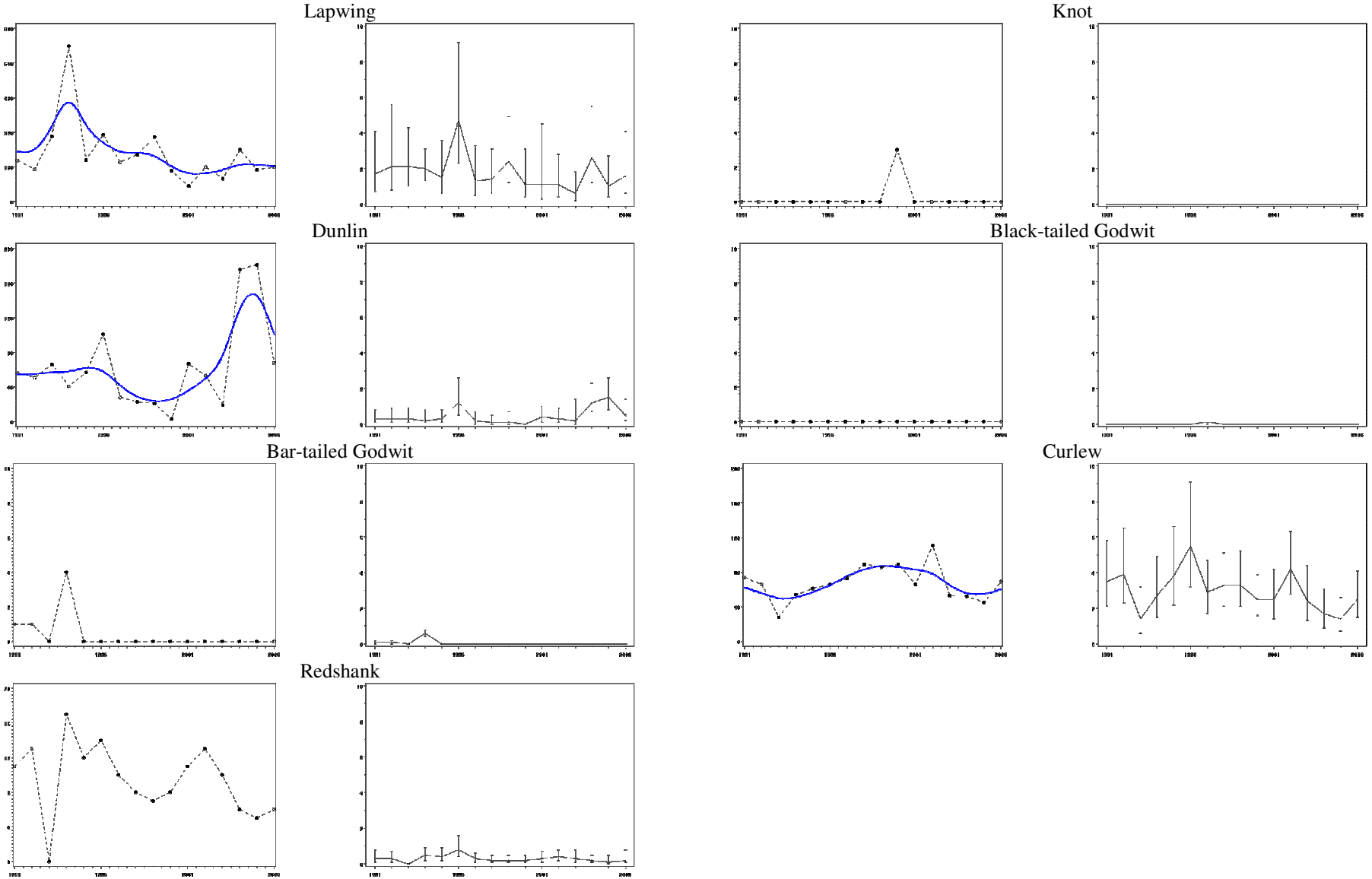

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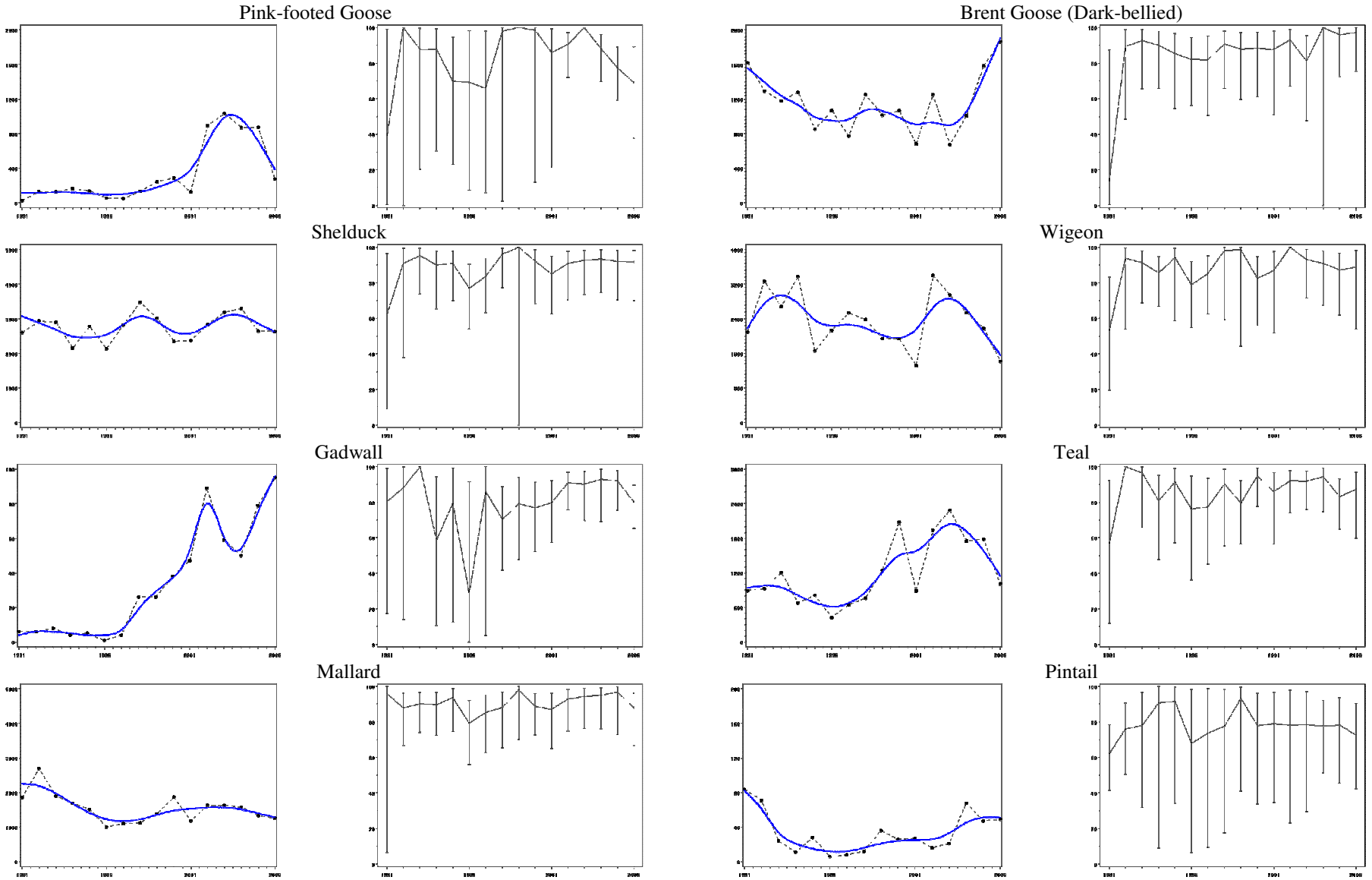
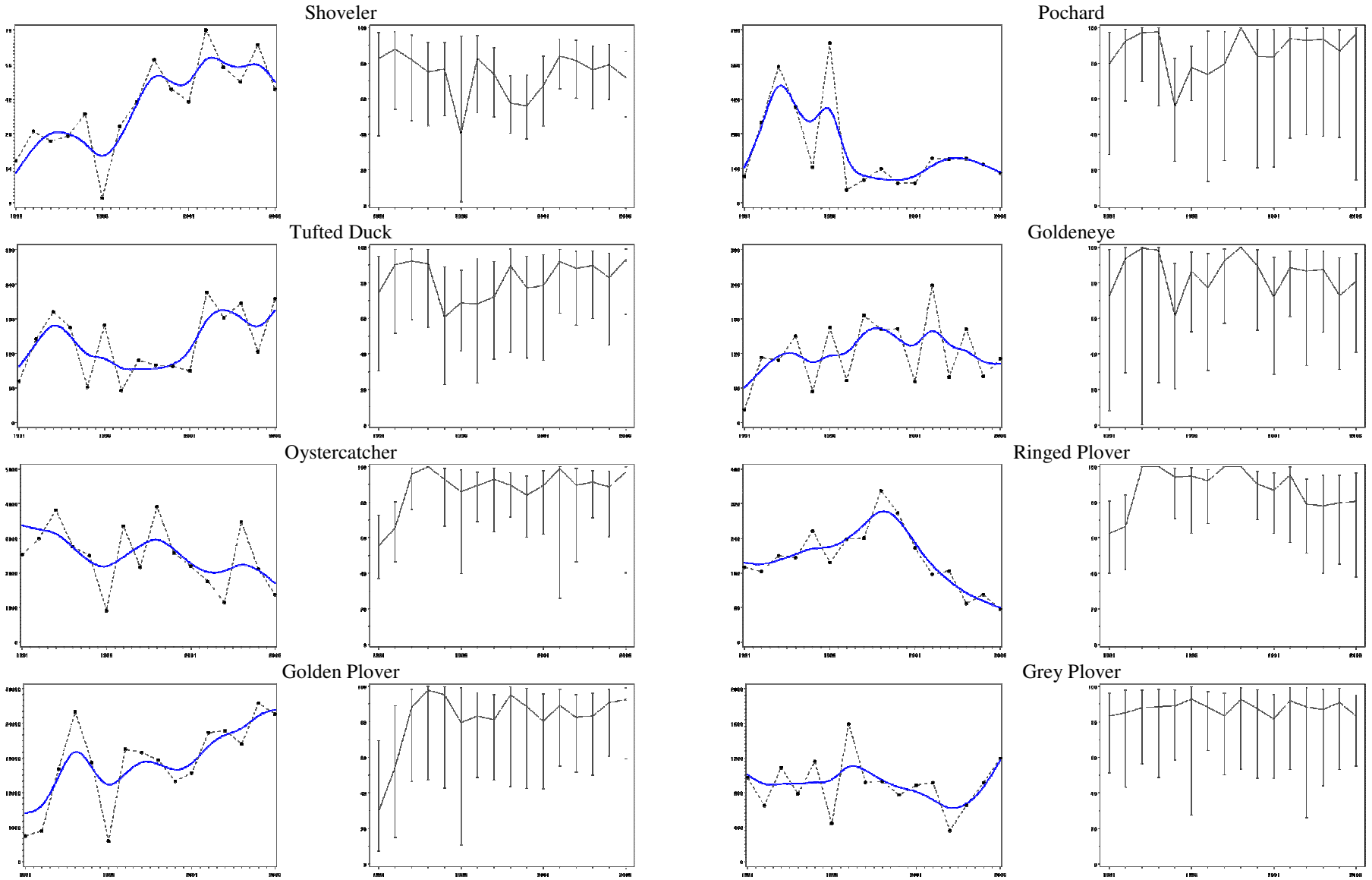


Figure B.38930 Population trends of each species in sector 38930 (Humber Estuary (North and South)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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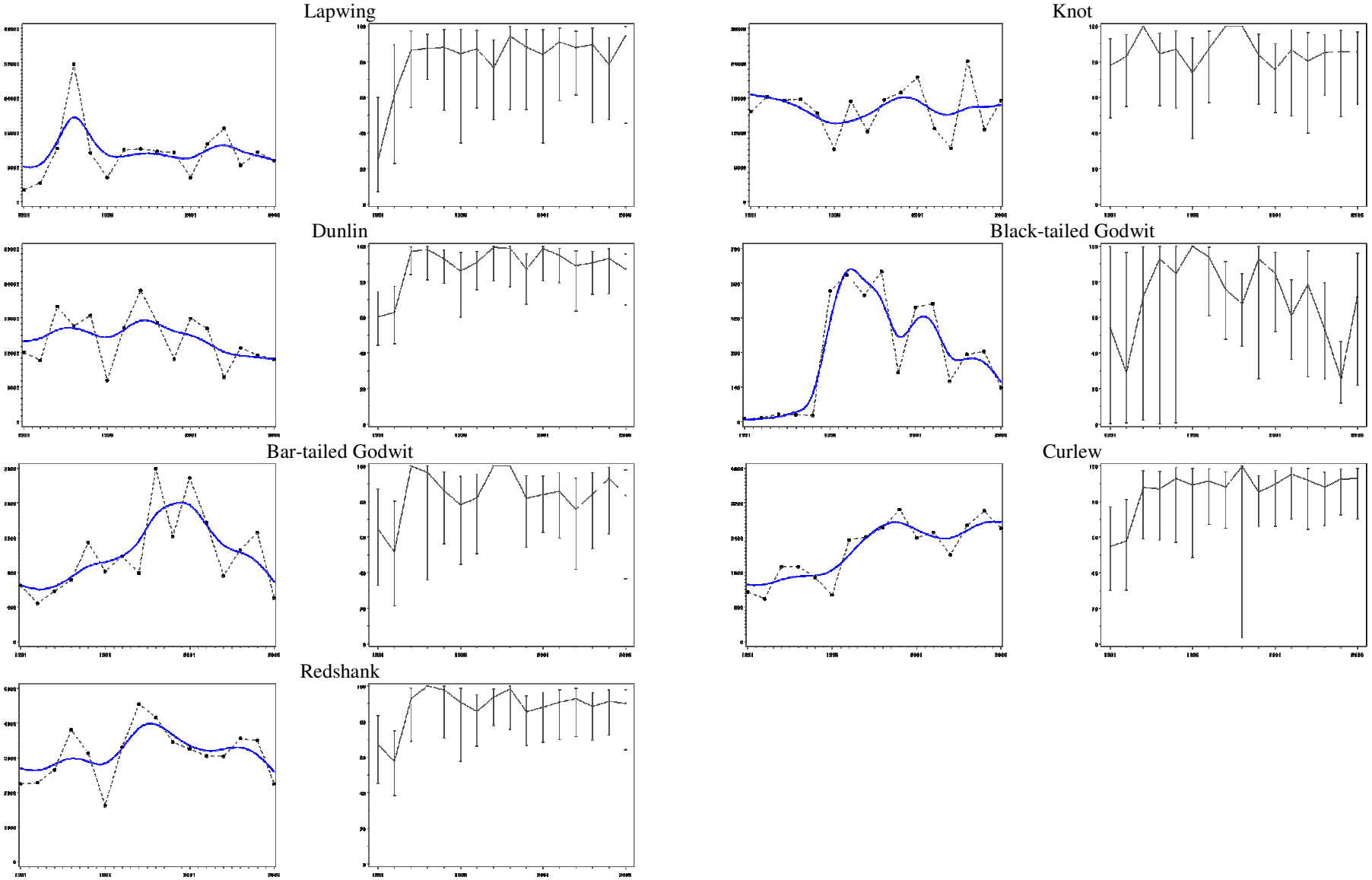

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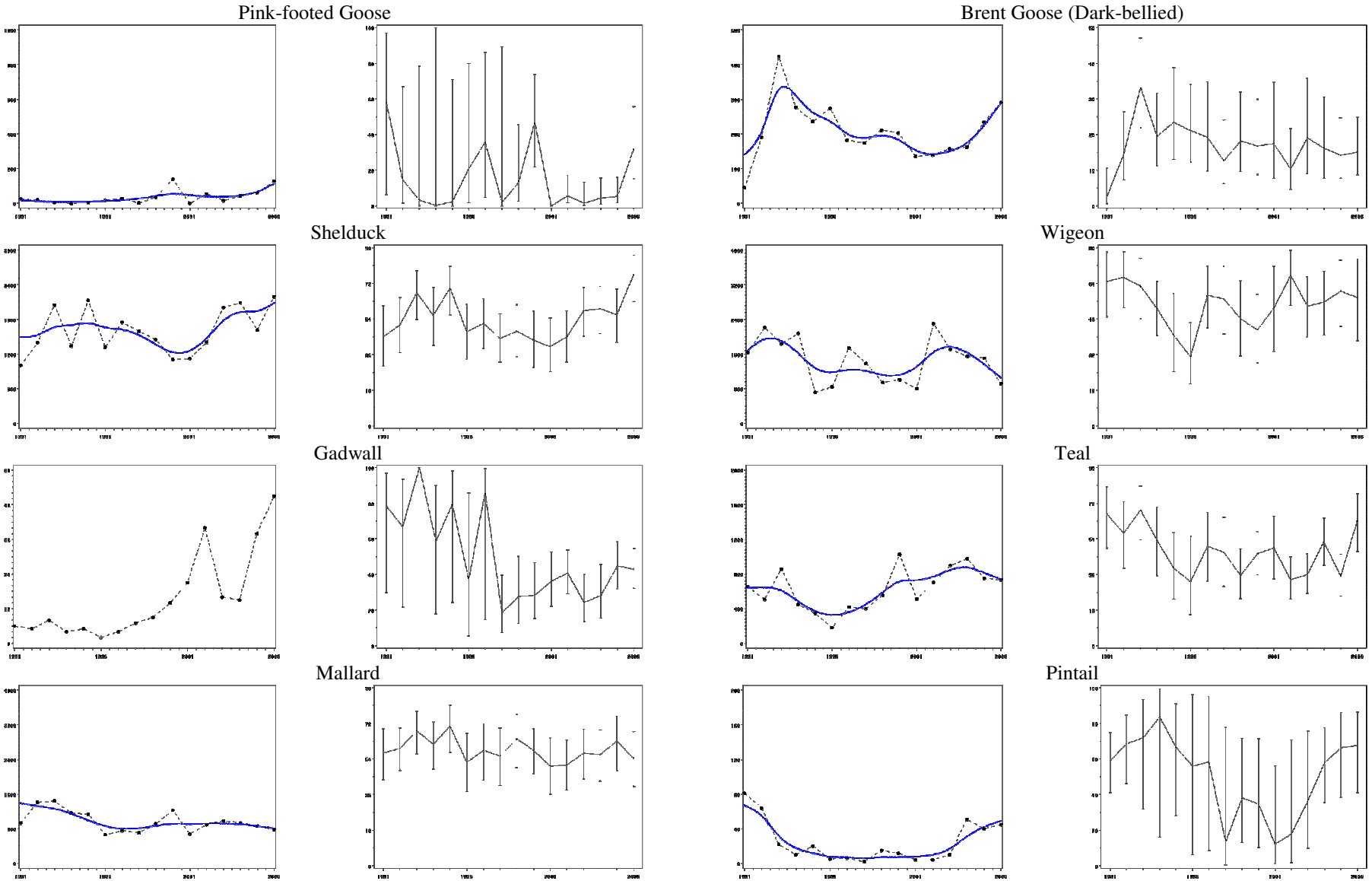


Figure B.38931 Population trends of each species in sector 38931 (Humber Estuary (North)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).

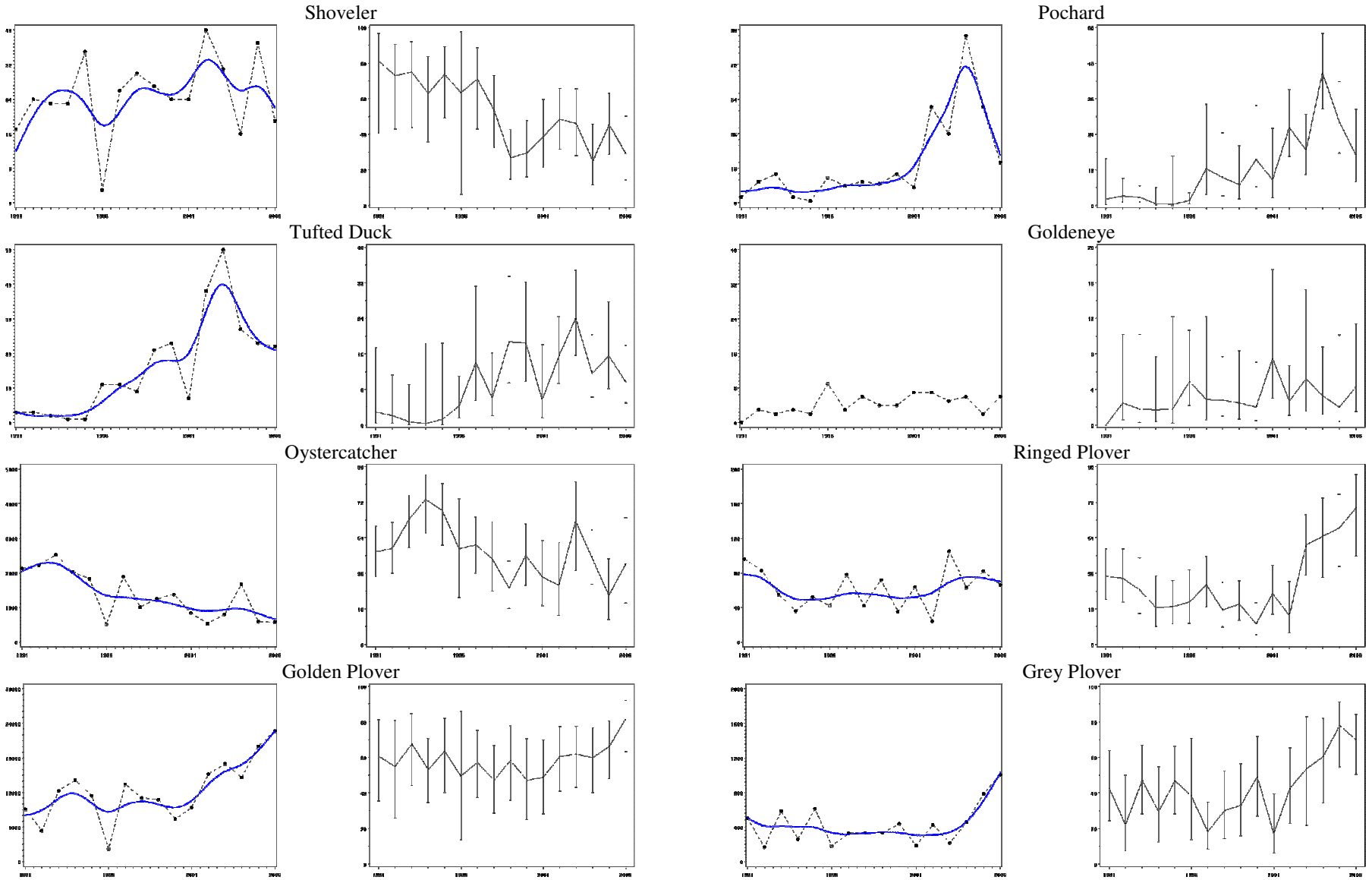
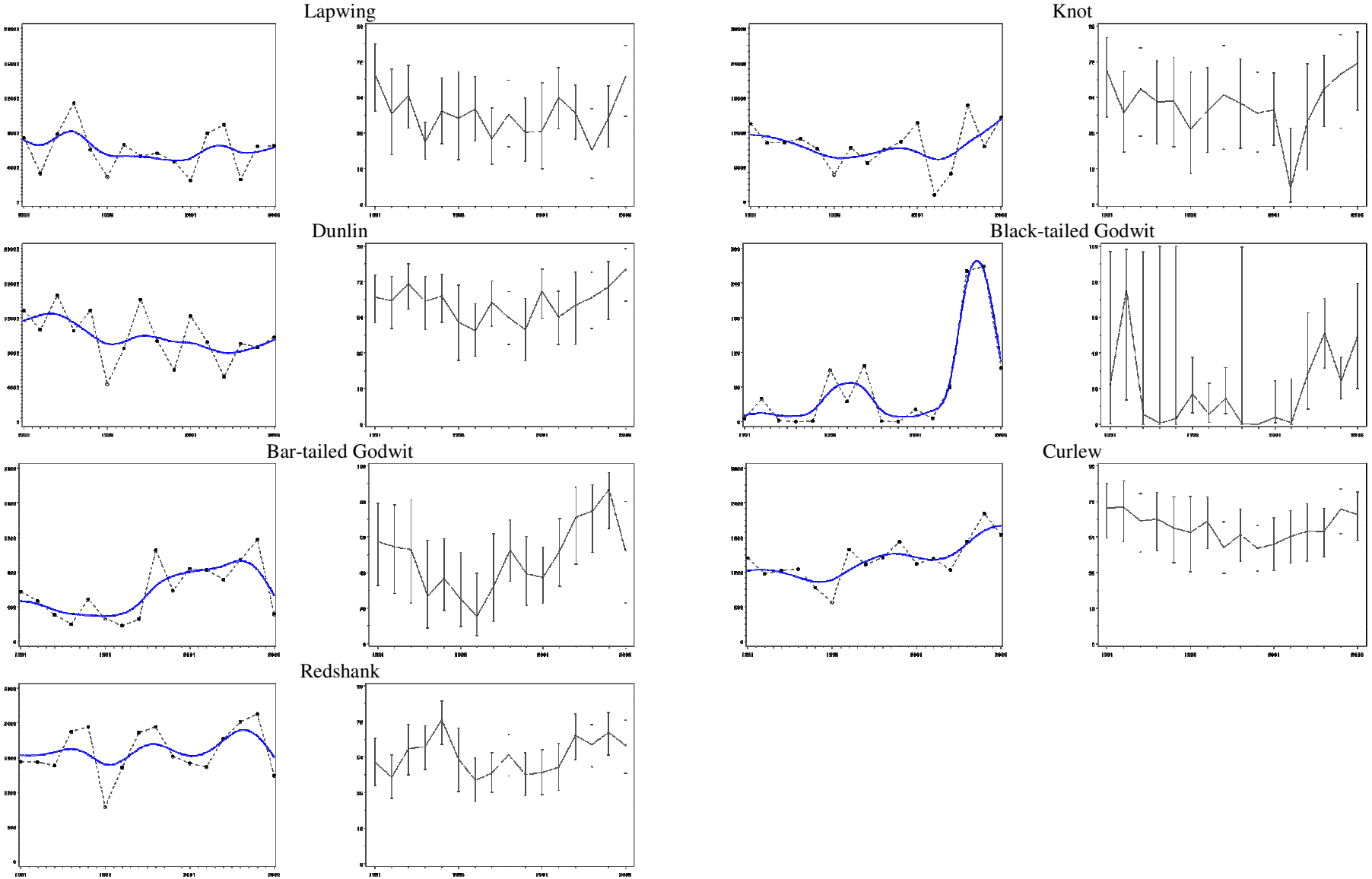


Figure B.38931 Continued.



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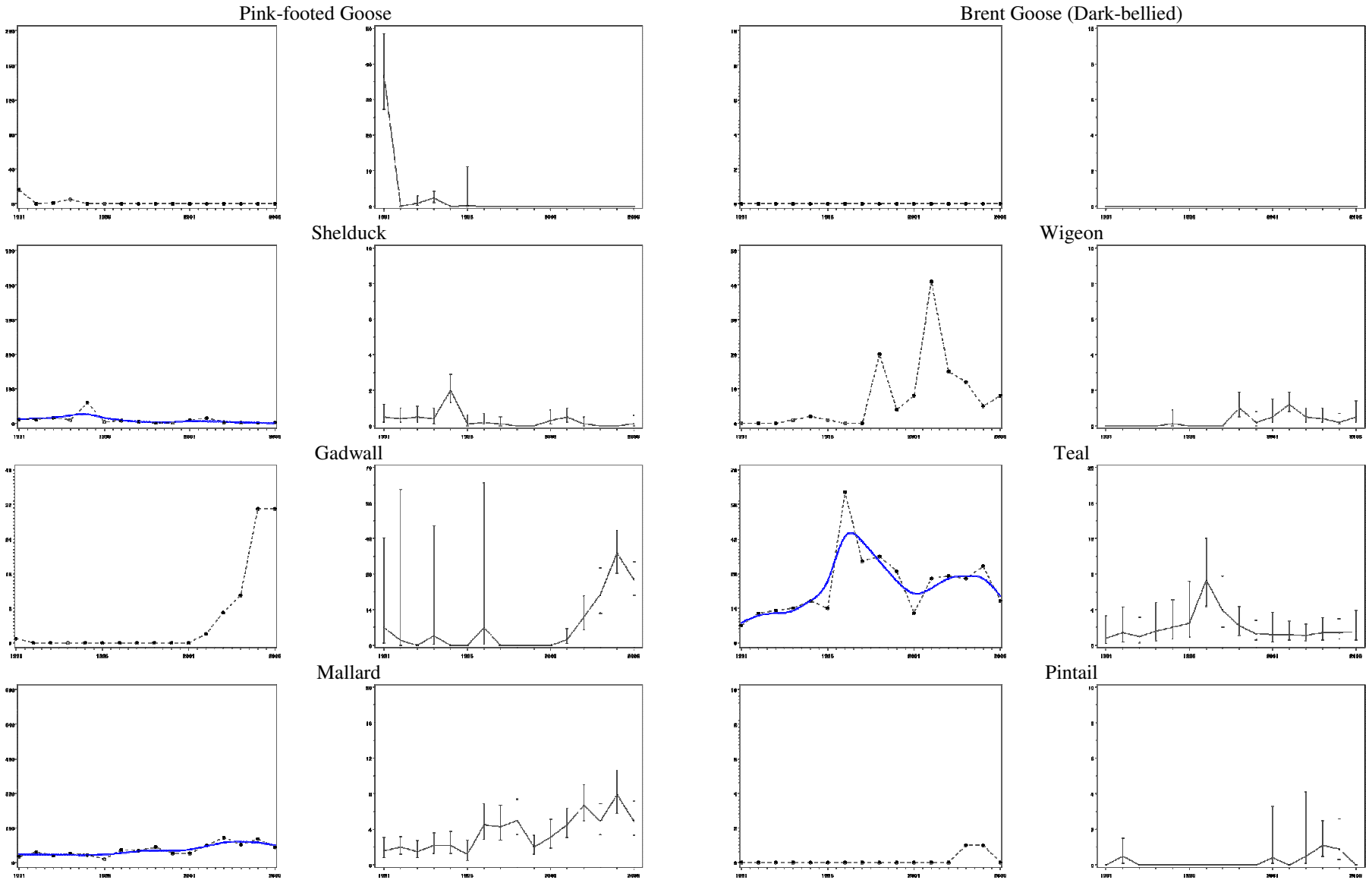
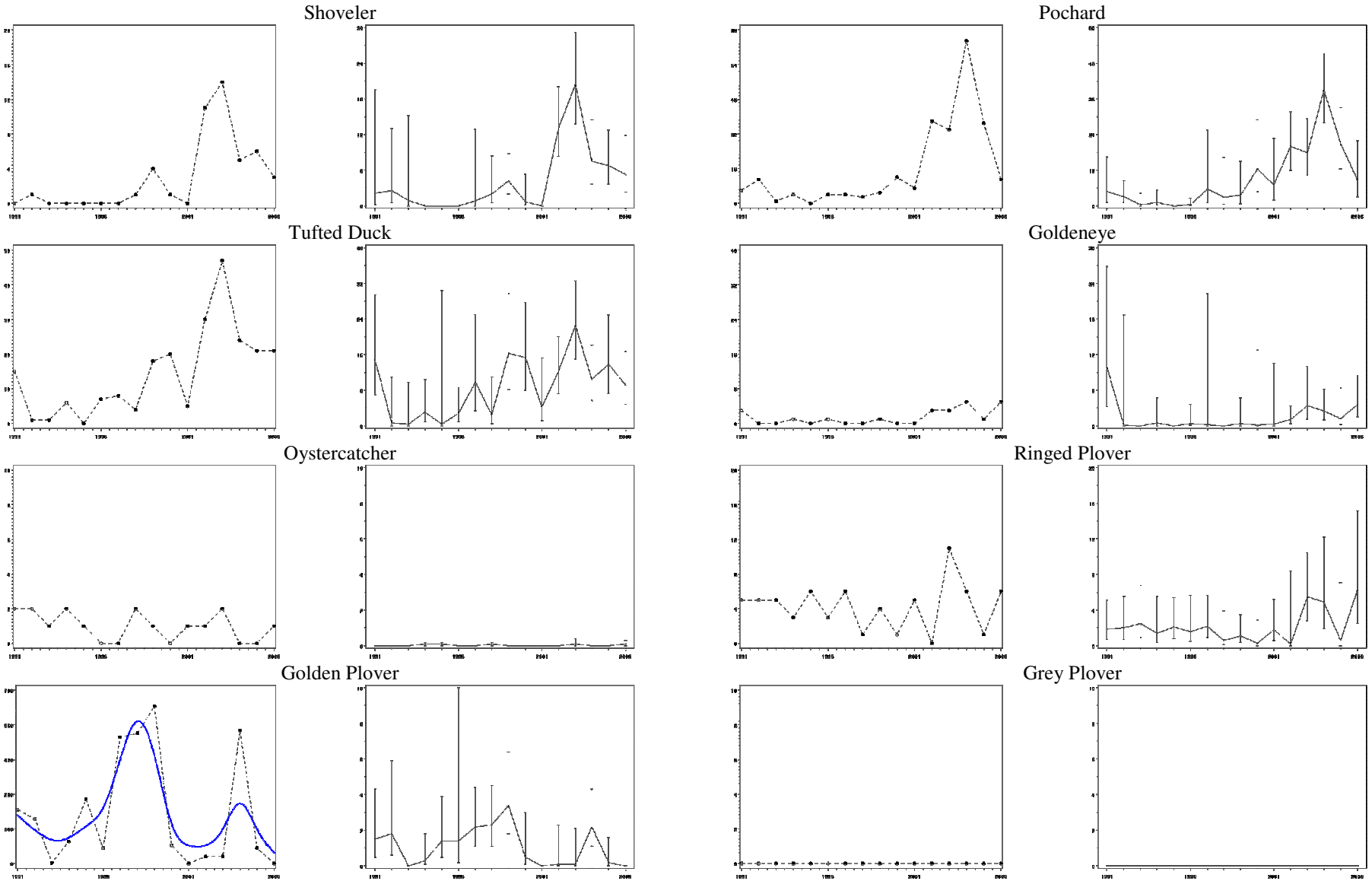


Figure B.38934 Population trends of each species in sector 38934 (Brough Haven to Hessle Haven) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).



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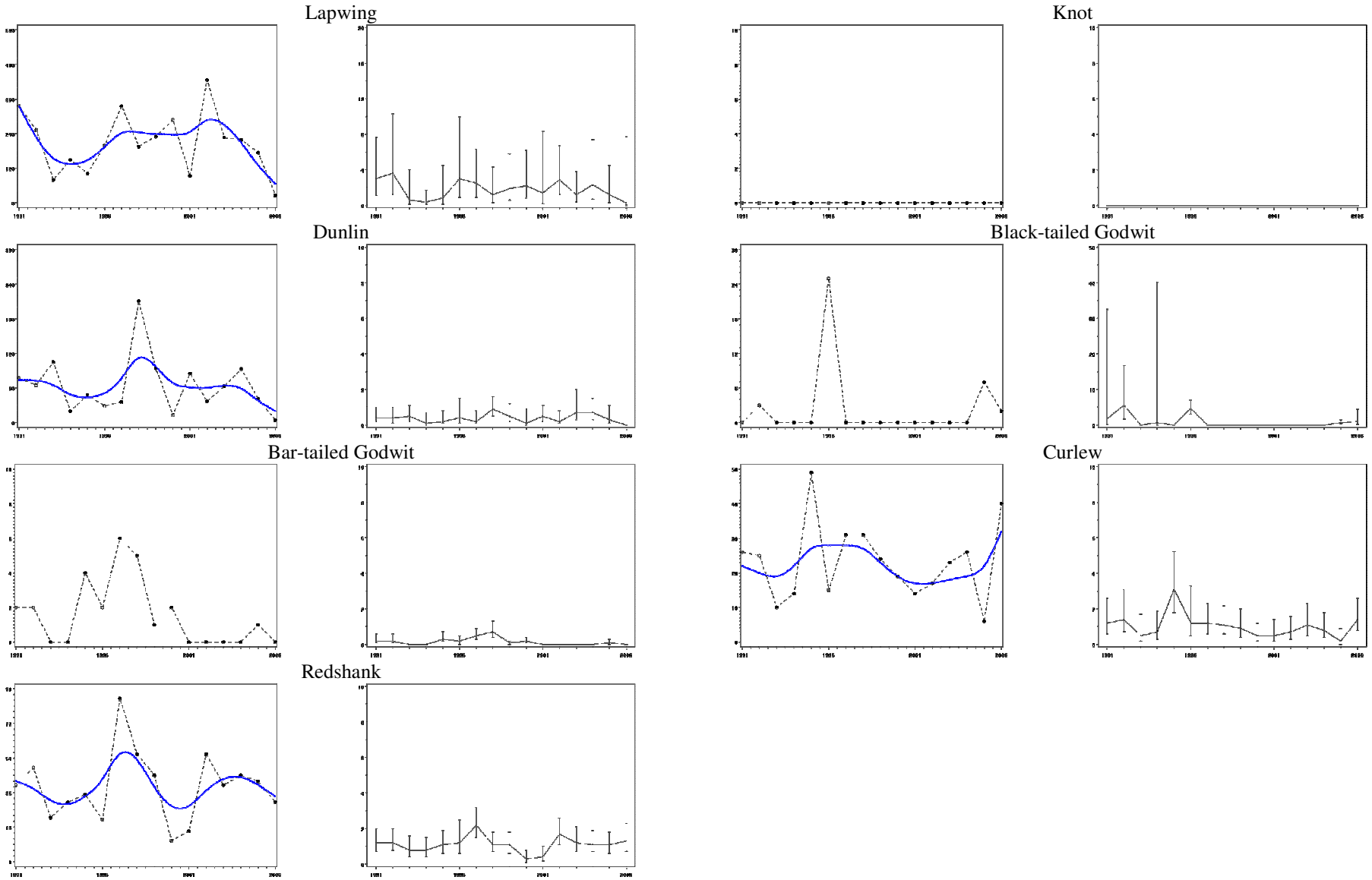

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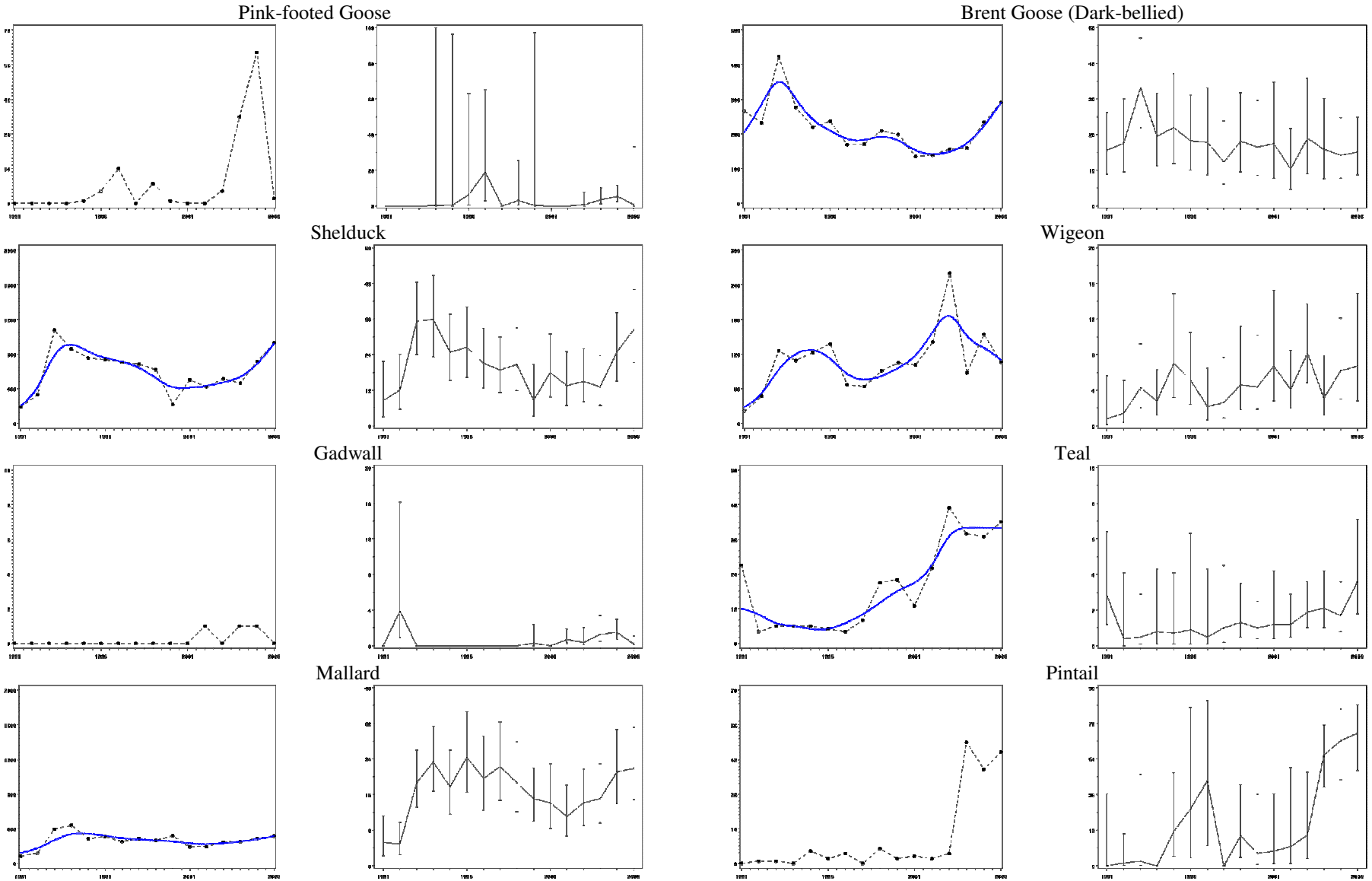

Figure B.CC234 Population trends of each species in sector CC234 (Stone Creek to Spurn Head (custom lumping)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).

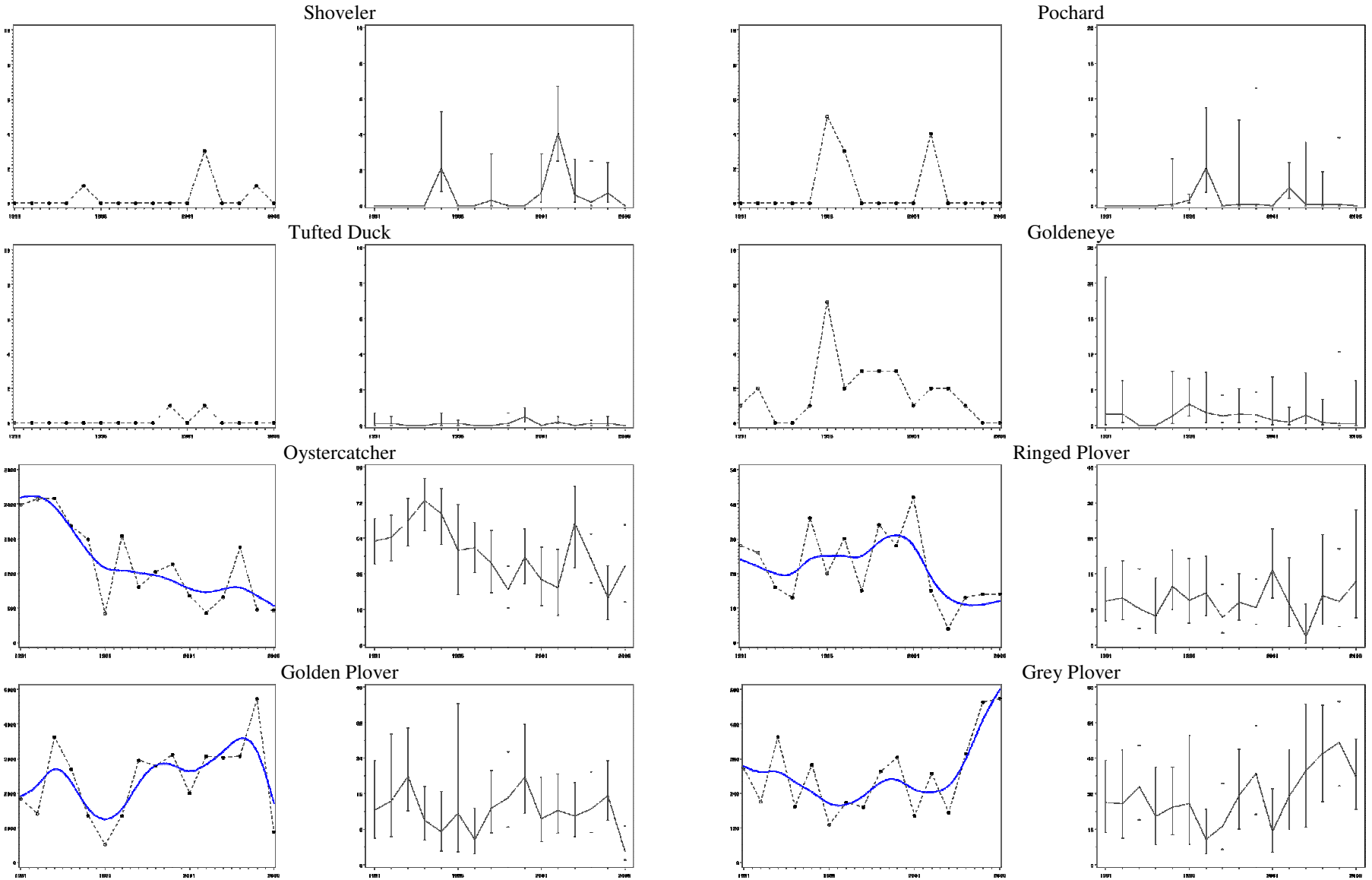

Figure B.CC234 Continued.

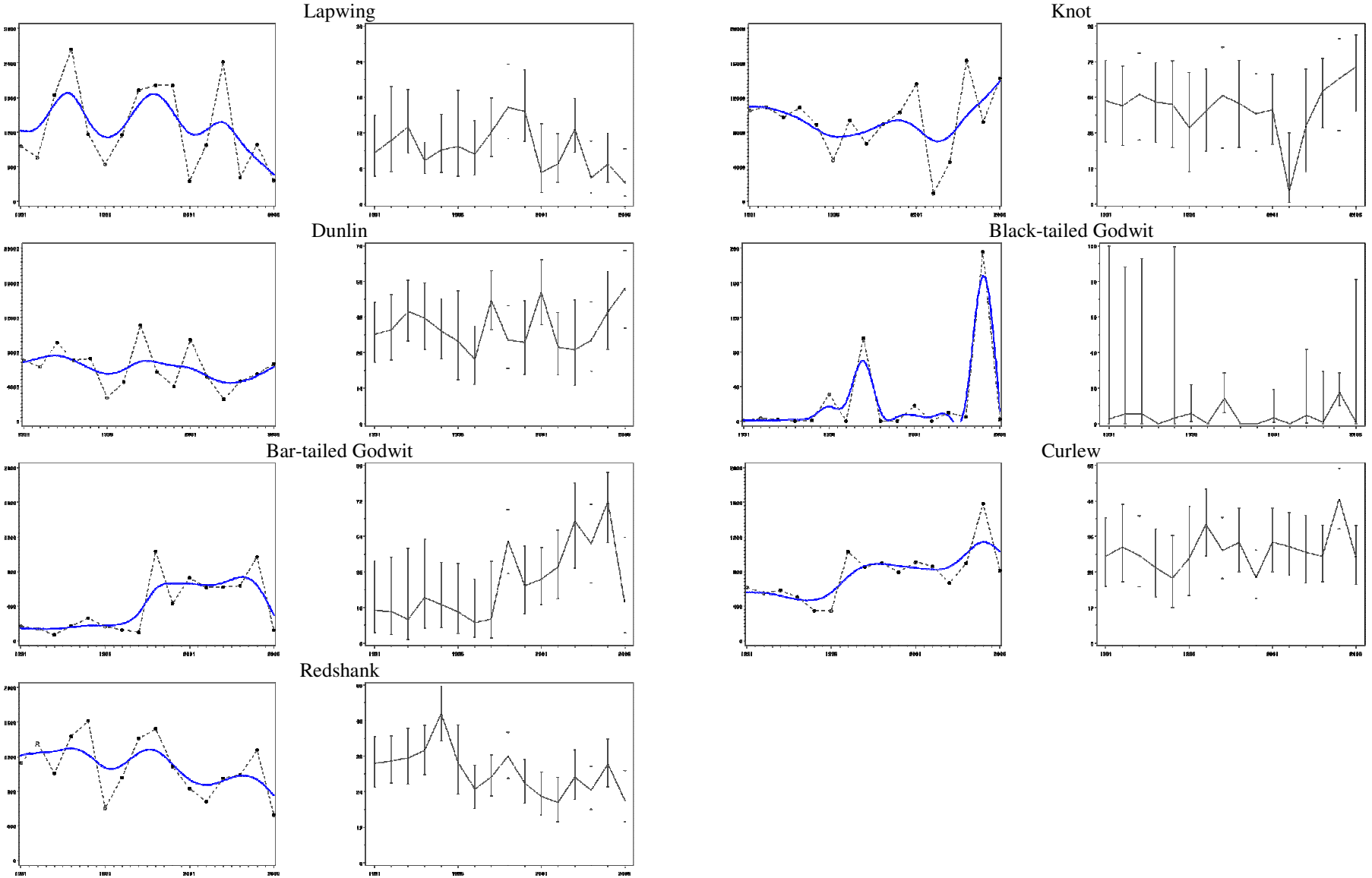

Figure B.CC234 Continued.

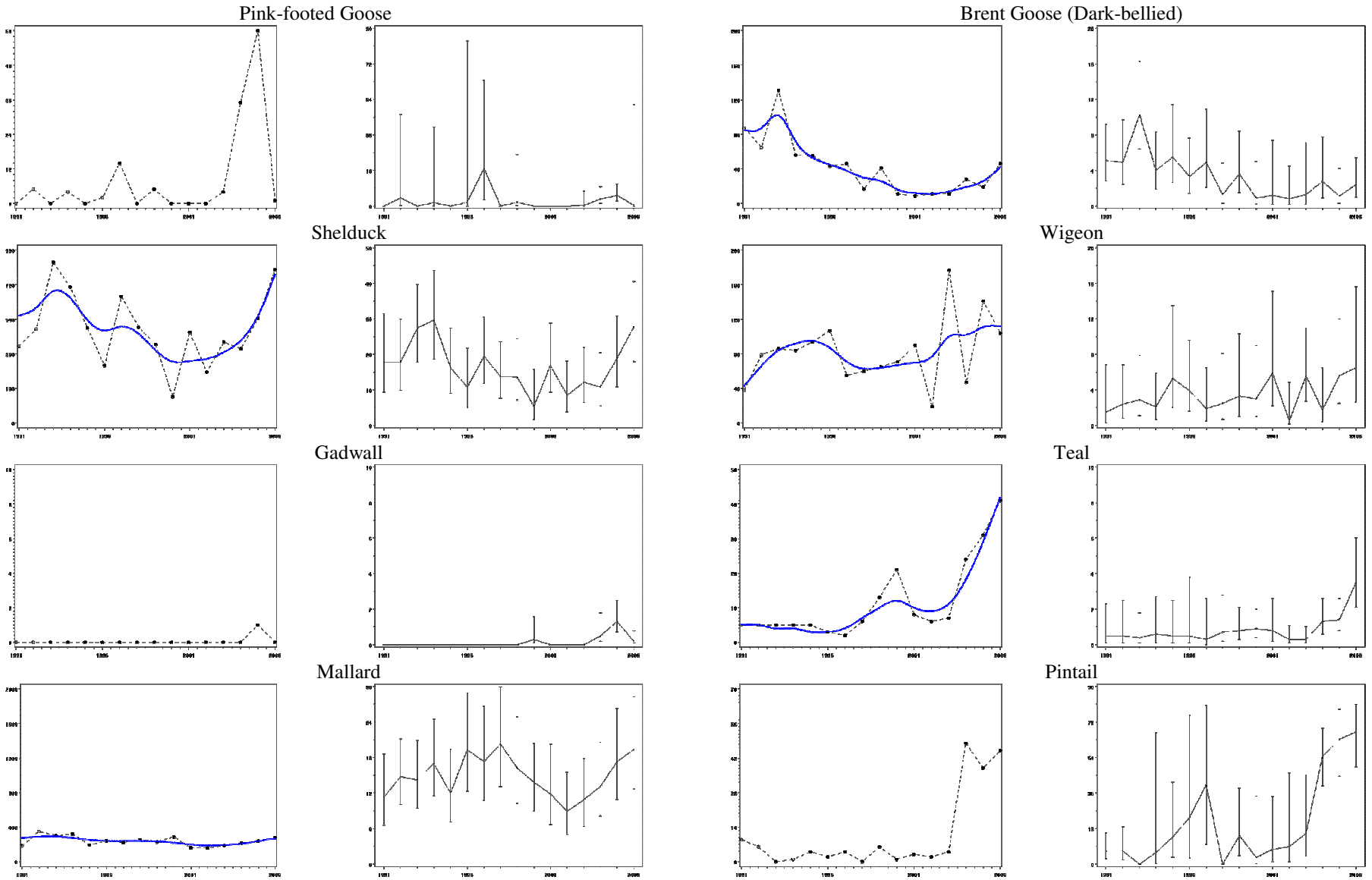

Figure B.CCC23 Population trends of each species in sector CCC23 (Stone Creek to Easington (custom lumping)) (left-hand graphs), and the proportion of the Humber population found in this sector per year (right-hand graphs).

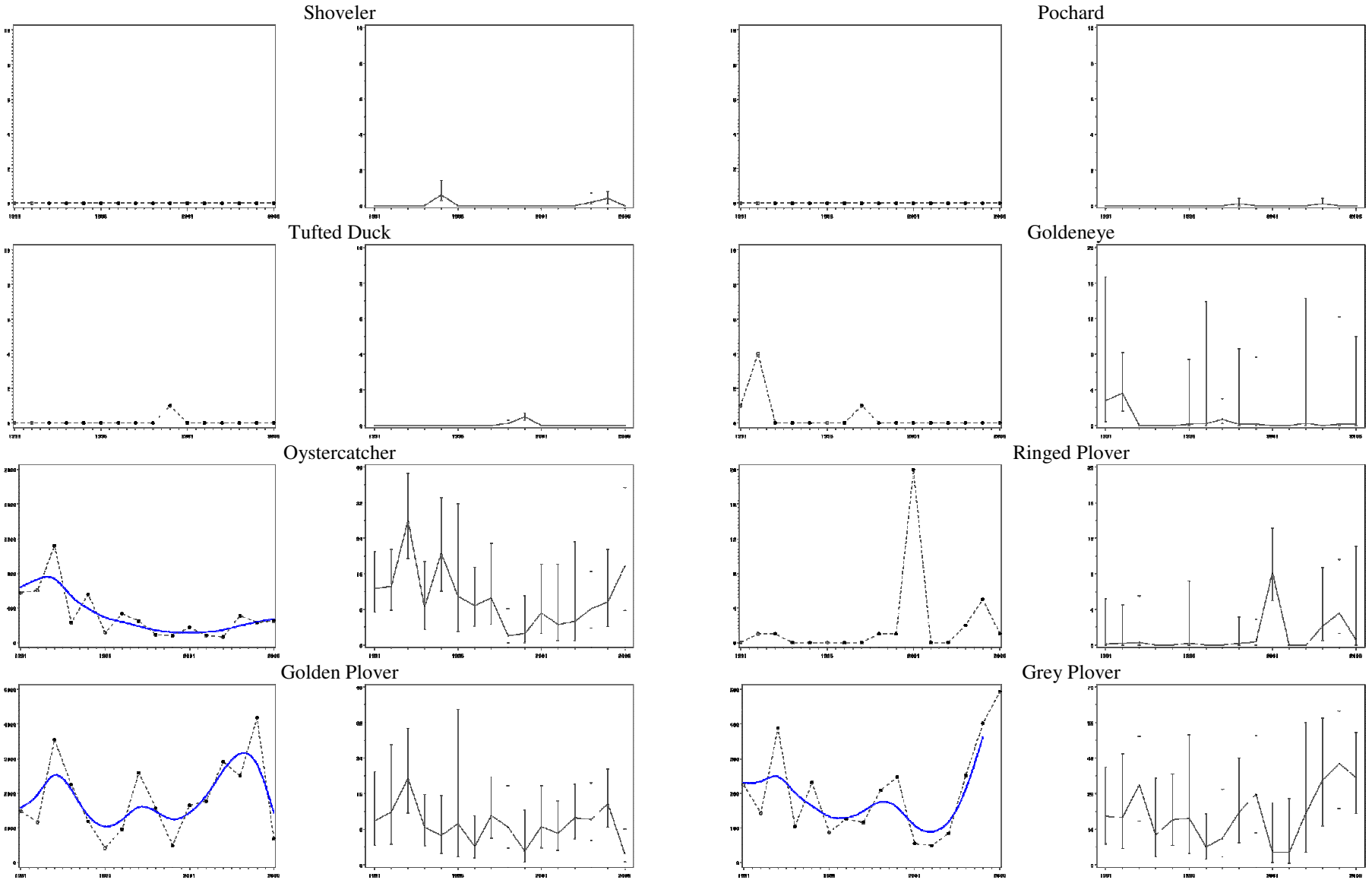

Figure B.CCC23 Continued.

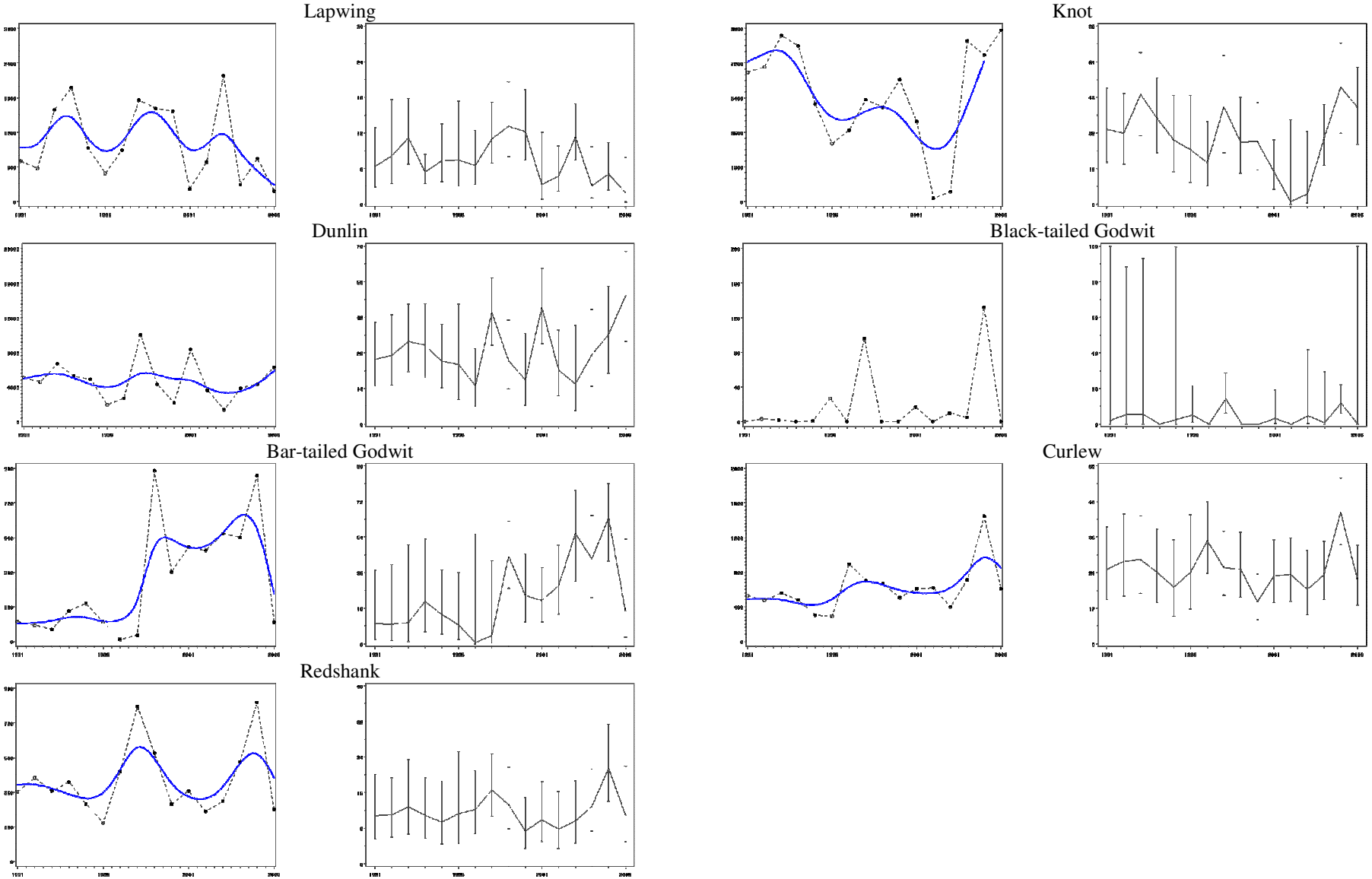

Figure B.CCC23 Continued.

Appendix C

Population trends of each species on the Humber Estuary SPA. Two plots are presented for each species / sector 1) the mean winter count (Sep to Mar) with the smoothed trend and 2) the proportional contribution of the Humber SPA towards numbers on the east coast of England.

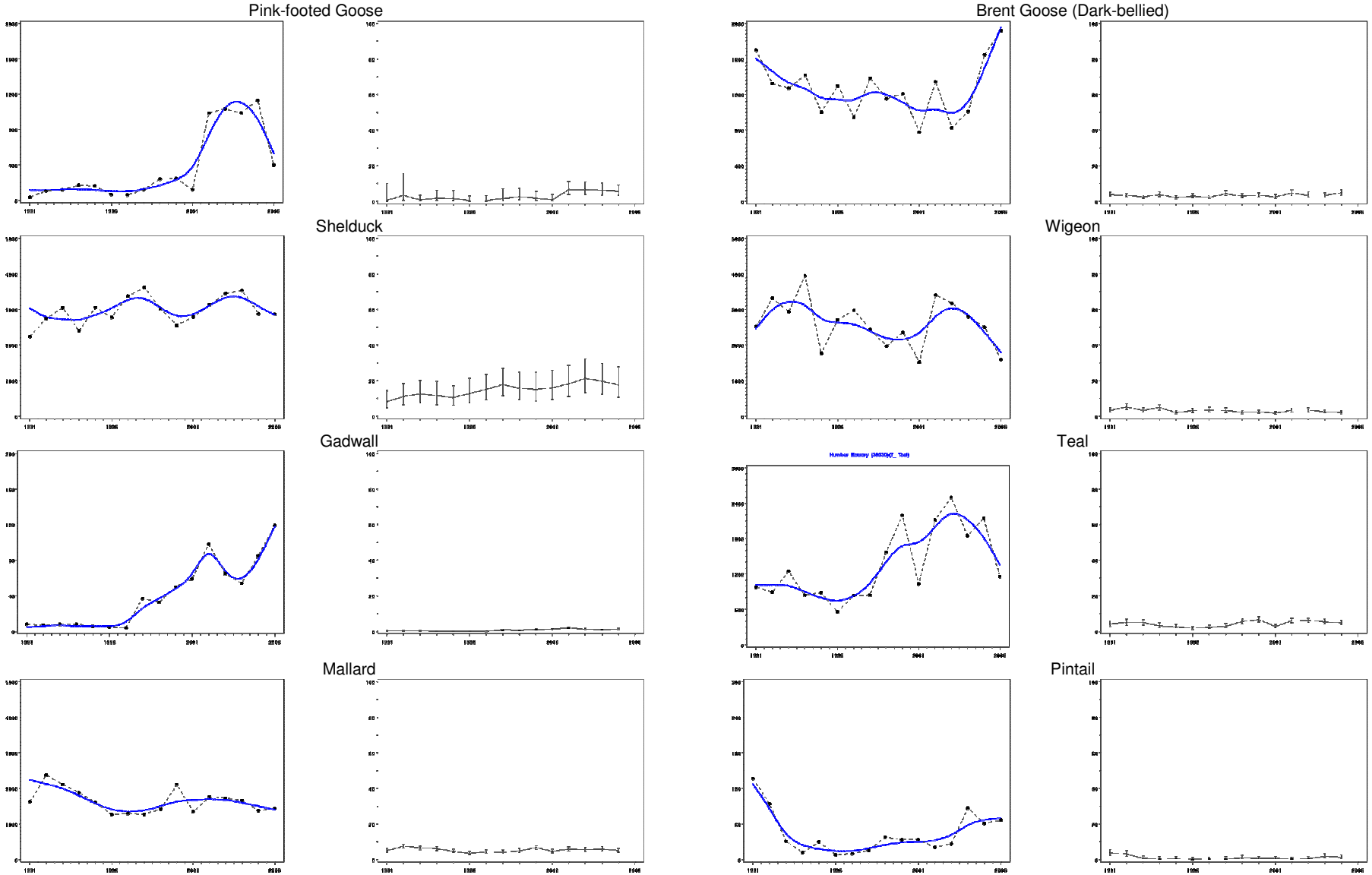

Figure C.38950 Population trends of each species in on the Humber Estuary (left-hand graphs), and the proportion of the East of England population by year that this represents (right-hand graphs).

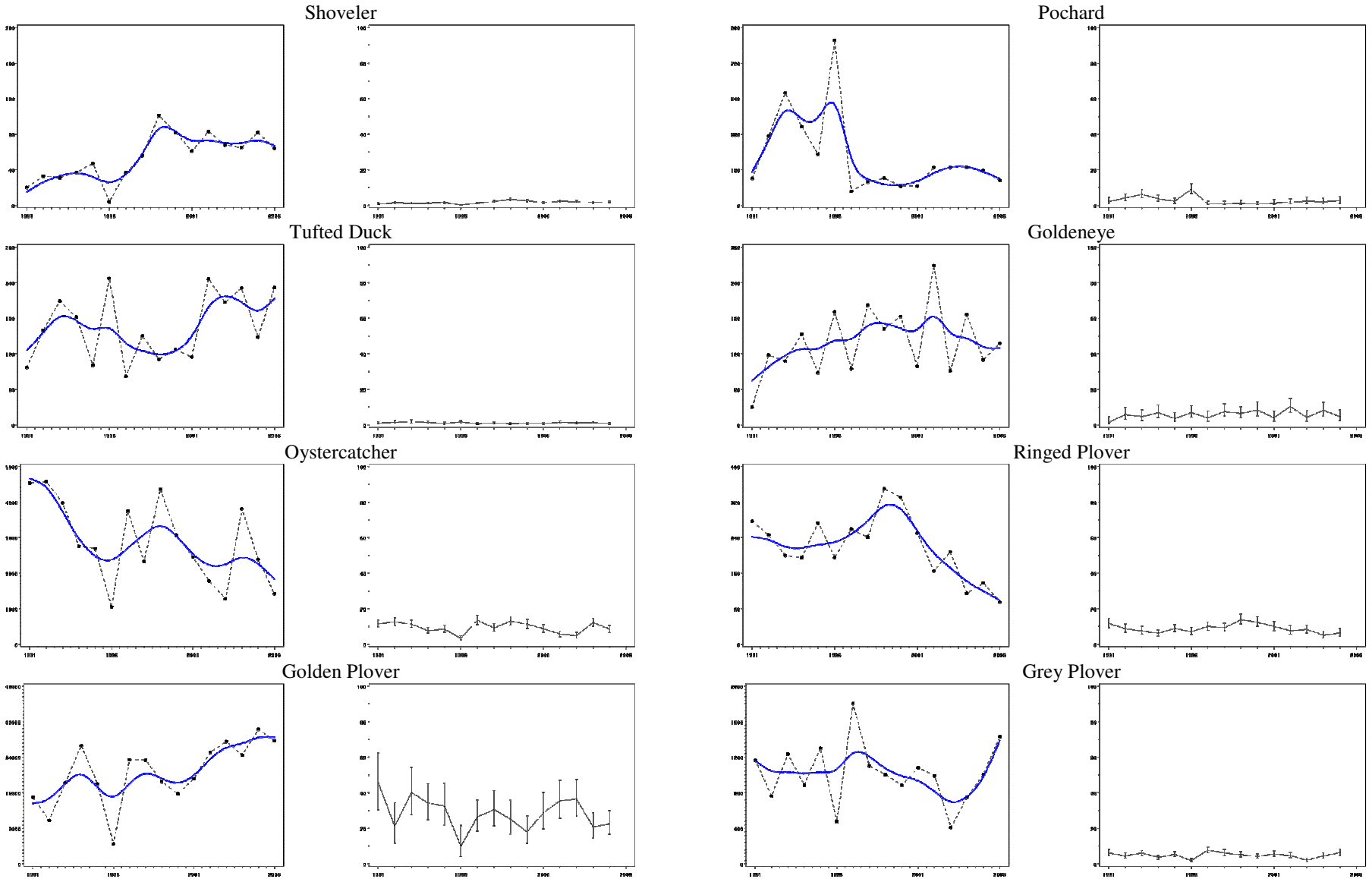

Figure C.38950 Continued

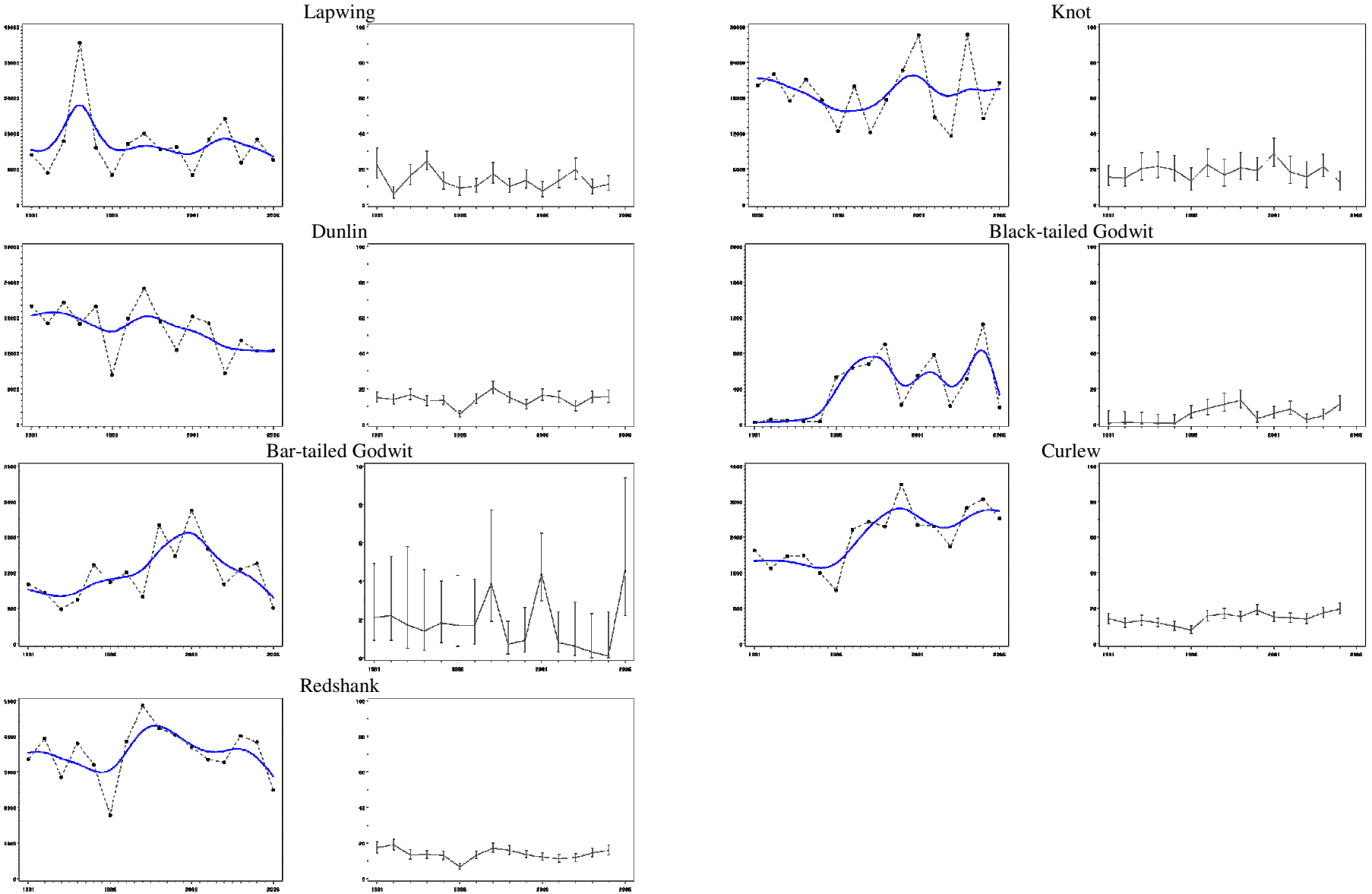

Figure C.38950 Continued.

Appendix D

Table D.i Population trends of each species by sector assessed over three timescales: short- (5-year), medium- (10-year) and long-term (15 year). For each sector, declines are given precedence over increases as the former are of primary concern. Cells are coloured to indicate trend status as follows: Red - a maximum decline in numbers of at least 50% over at least one timescale; Orange - a maximum decline in numbers of at least 25% but less than 50% over at least one timescale; Light green – a maximum increased of at least 33% but less than 100% over at least one timescale; Dark green - a maximum increase of at least 100% on at least one timescale; White - a maximum decline less than 25% and a maximum increase less than 33% on all three timescales. Grey - insufficient data for or too few individuals (arbitrarily taken as an average of ten or less) of, a given species to allow meaningful smoothed trends to be generated. This information is summarised without the underlying values in the main body of the report (Table 3.1.i).

Note: These data are also available in the MS Excel® file 'Humber Results Matrices.xls' sheet 'MatrixOfChange' accompanying this report.

Table D.ii Changes in the proportion of the total site population of each species supported by each sector, assessed over the most recent 15 year period. Cells are coloured to indicate a sector's proportional contribution to numbers on the Humber estuary as a whole, as follows: Red - a highly significant decline ($P < 0.01$); Orange - a significant decline ($P < 0.05$); Light green – a significant increase ($P < 0.05$); Dark green - a highly significant increase ($P < 0.01$); White – no significant trend over the period. Grey - insufficient data for or too few individuals (arbitrarily taken as an average of ten or less) of, a given species to allow a meaningful Logit model to be fitted. This information is summarised without the underlying values in the main body of the report (Table 3.1.ii).

Note: These data are also available in the MS Excel® file 'Humber Results Matrices.xls' sheet 'MatrixOfProportions' accompanying this report.