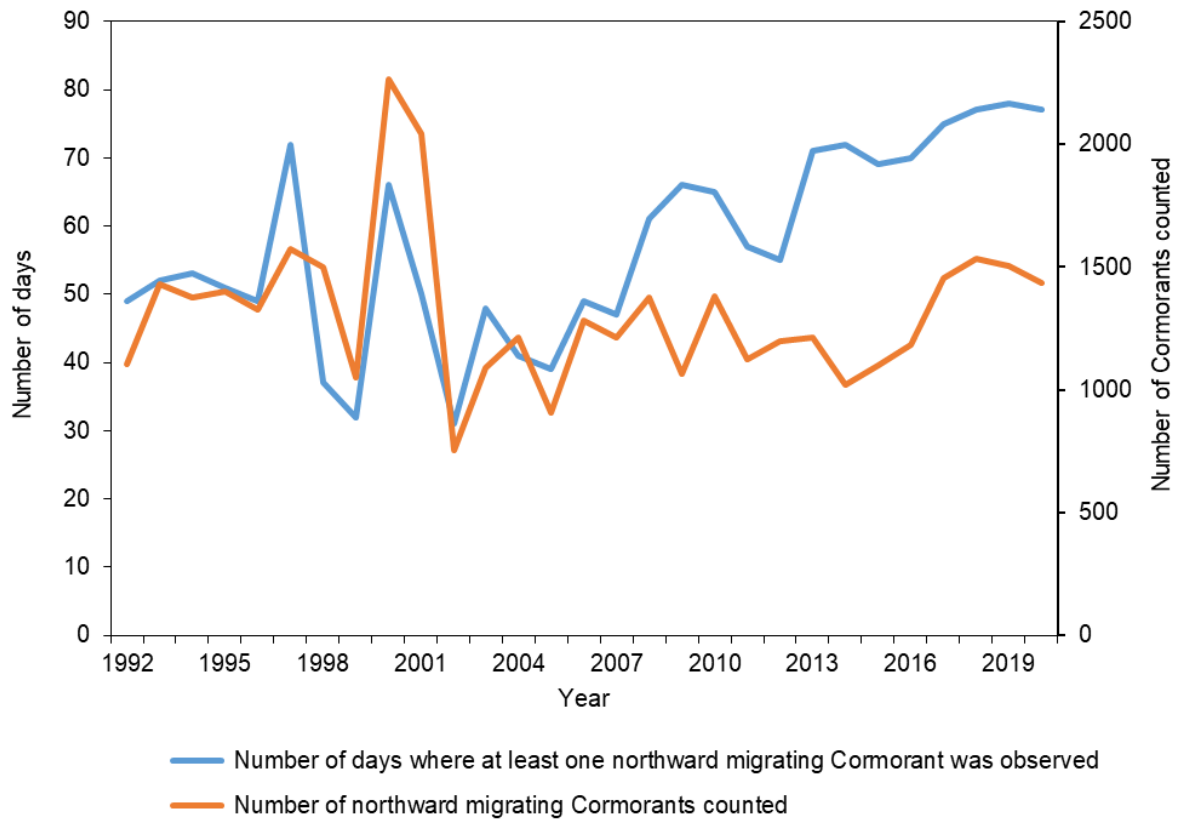


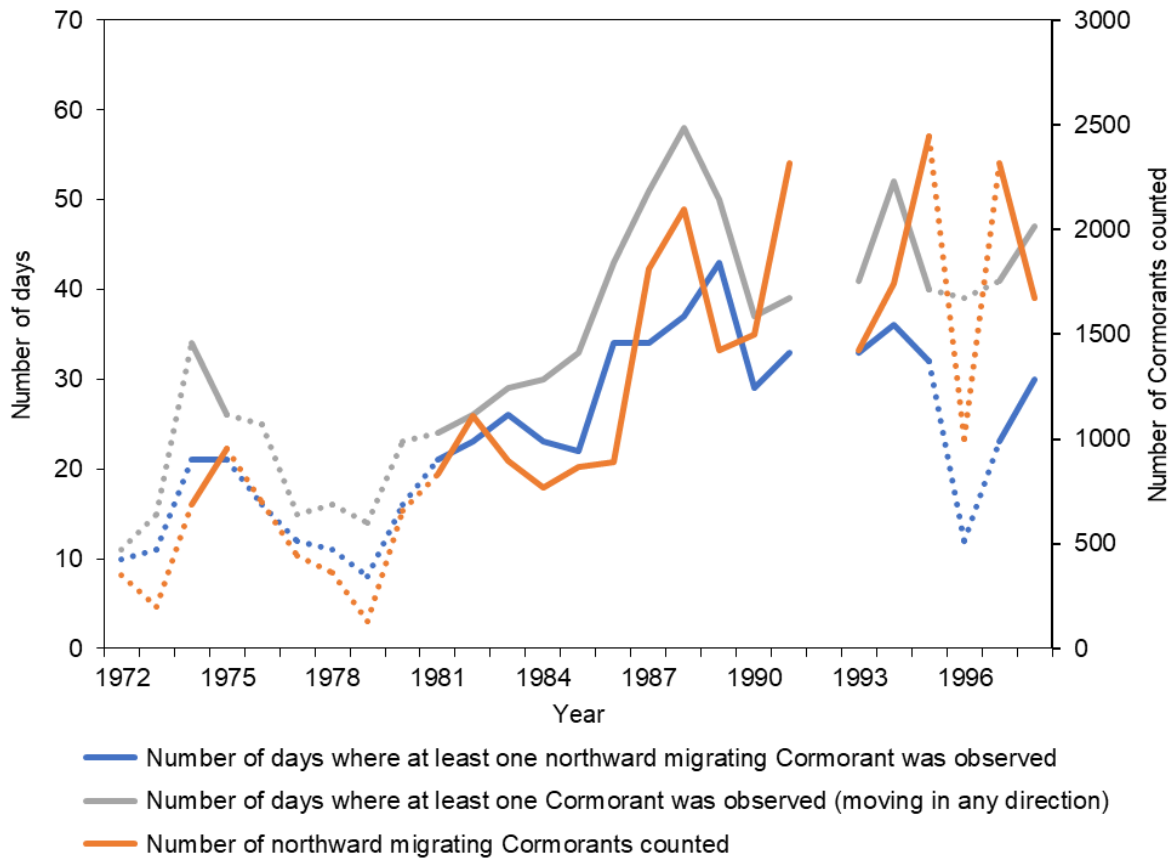
## Appendices

**Table A1.** Summary statistics of the number of days when northward migrating Cormorants *Phalacrocorax carbo* was observed, the number of migrating Cormorants counted per year, and the number of migrating cormorants counted per day at Lista Bird Observatory in Norway and Skagen in Denmark. For both sites, the data was restricted to observations made during 15 March to 31 May each year (totalling 78 days per year). For Skagen, only years that had a minimum of 20 days between 15 March to 31 May where at least one northward migrating Cormorant was observed were included (see Methods).

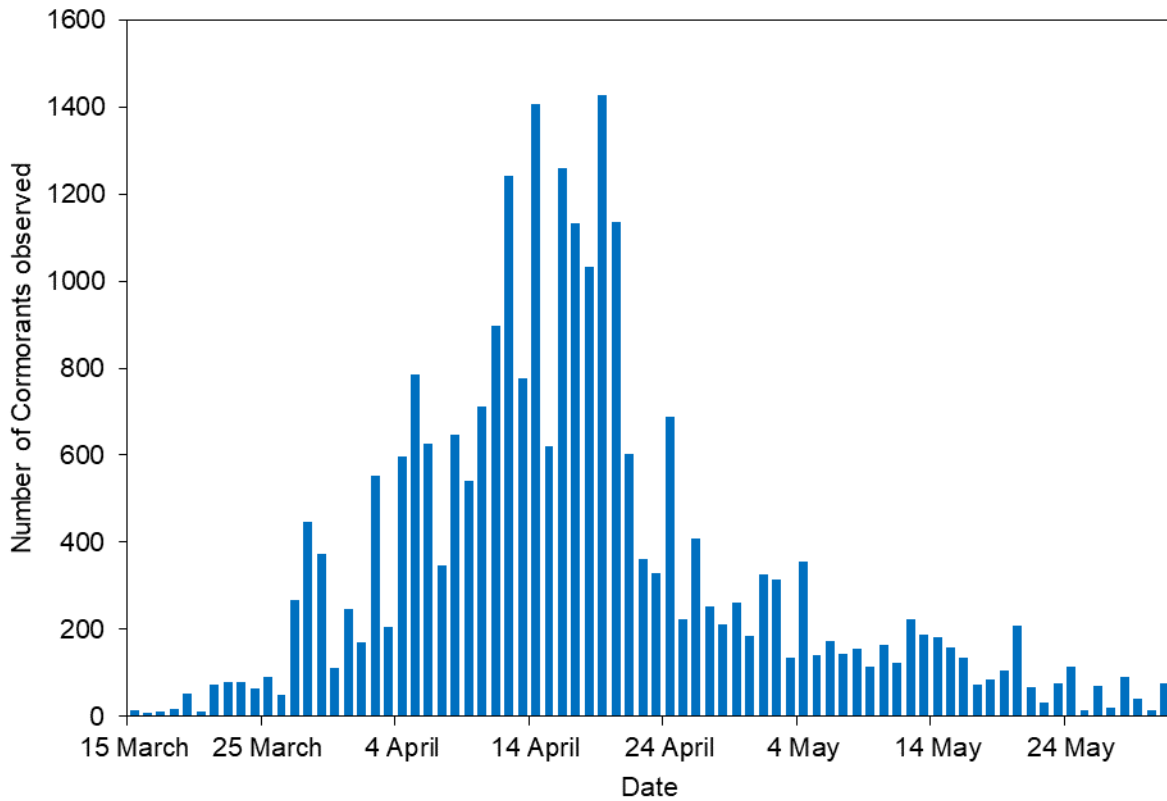
	Lista (N <sub>years</sub> = 29)				Skagen (N <sub>years</sub> = 18)			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Days per year where at least one migrating Cormorants was observed	57	14	31	78	29	7	21	43
Migrating Cormorants counted per year	1,314	306	752	2,264	1,430	590	688	2,446
Migrating Cormorants counted per day (excluding days where no northward migrating Cormorants were observed)	23	28	1	423	49	80	1	665



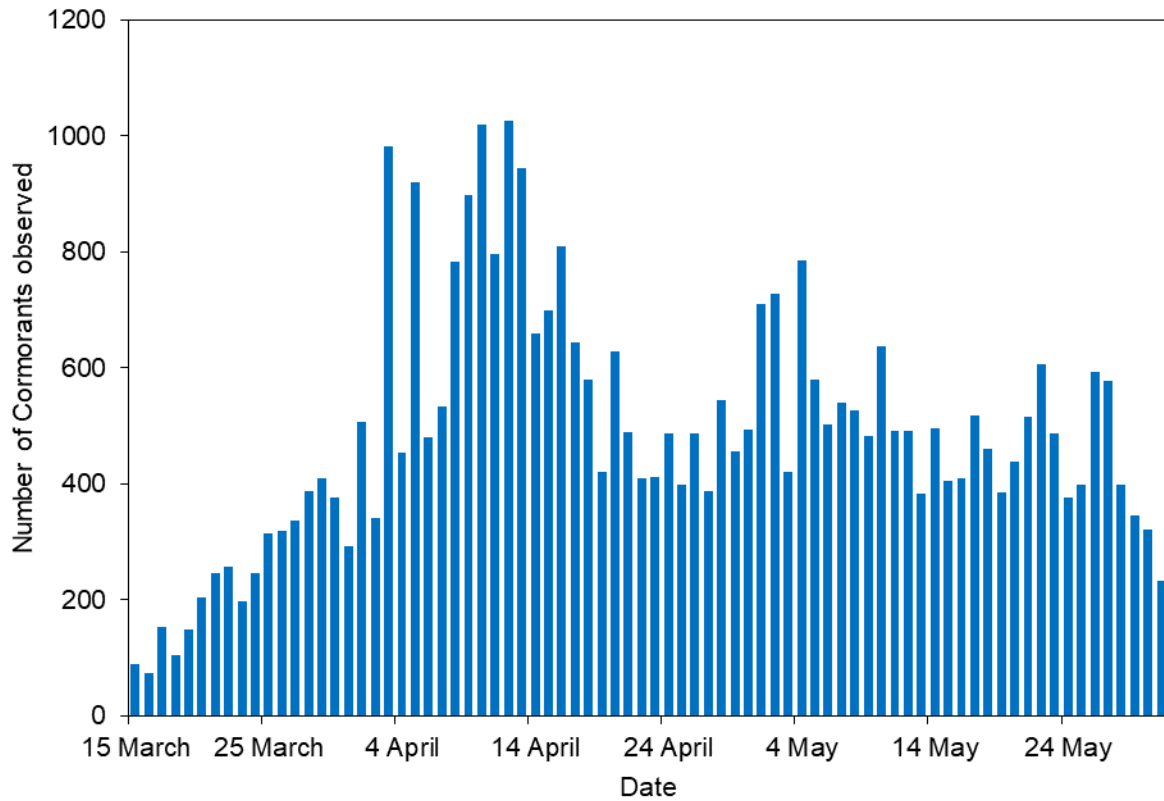
**Figure A1.** The number of days where at least one northward migrating Cormorant *Phalacrocorax carbo* was observed, and the number of northward migrating Cormorants observed, each year between 15 March and 31 May at Lista (Norway).



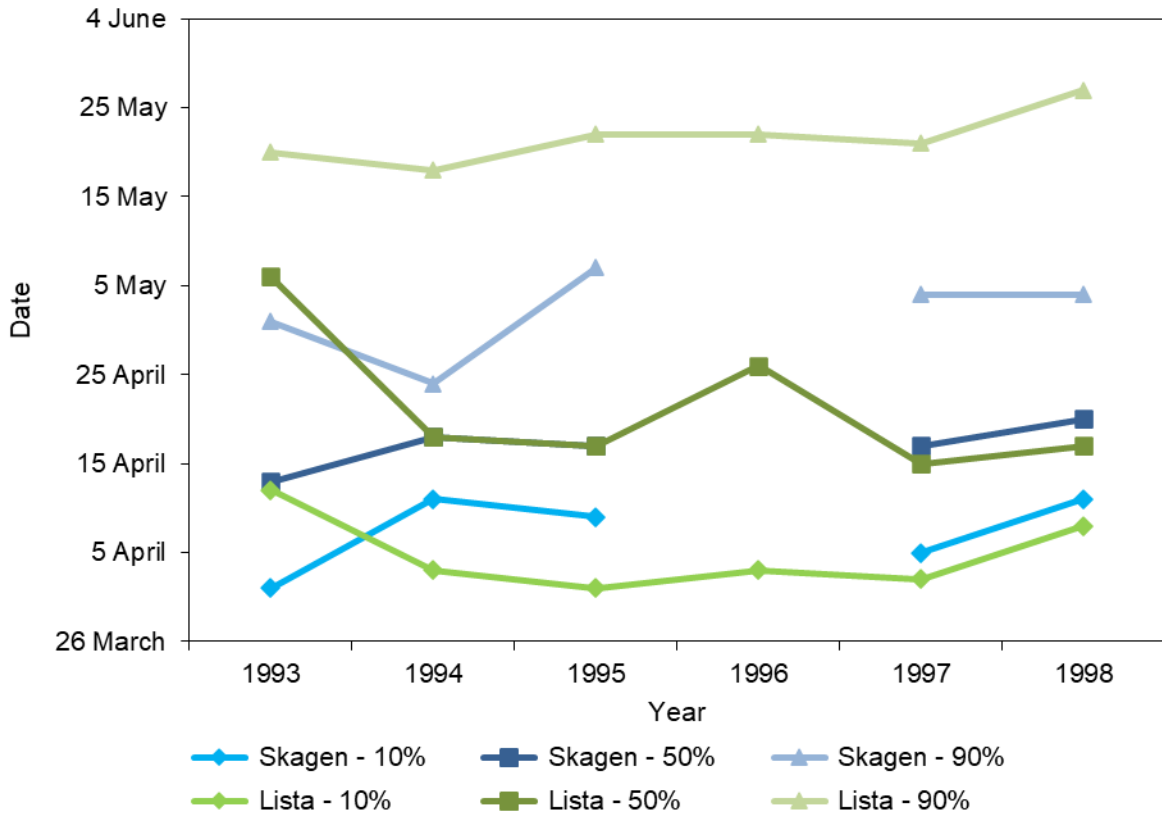
**Figure A2.** The number of days where at least one Cormorant *Phalacrocorax carbo* was observed (migrating either northward, or moving in any direction), and the number of northward migrating Cormorants observed each year between 15 March and 31 May at Skagen (Denmark). Years where there were less than 20 days where at least one northward migrating Cormorant was observed between 15 March and 31 May are shown with dotted lines.



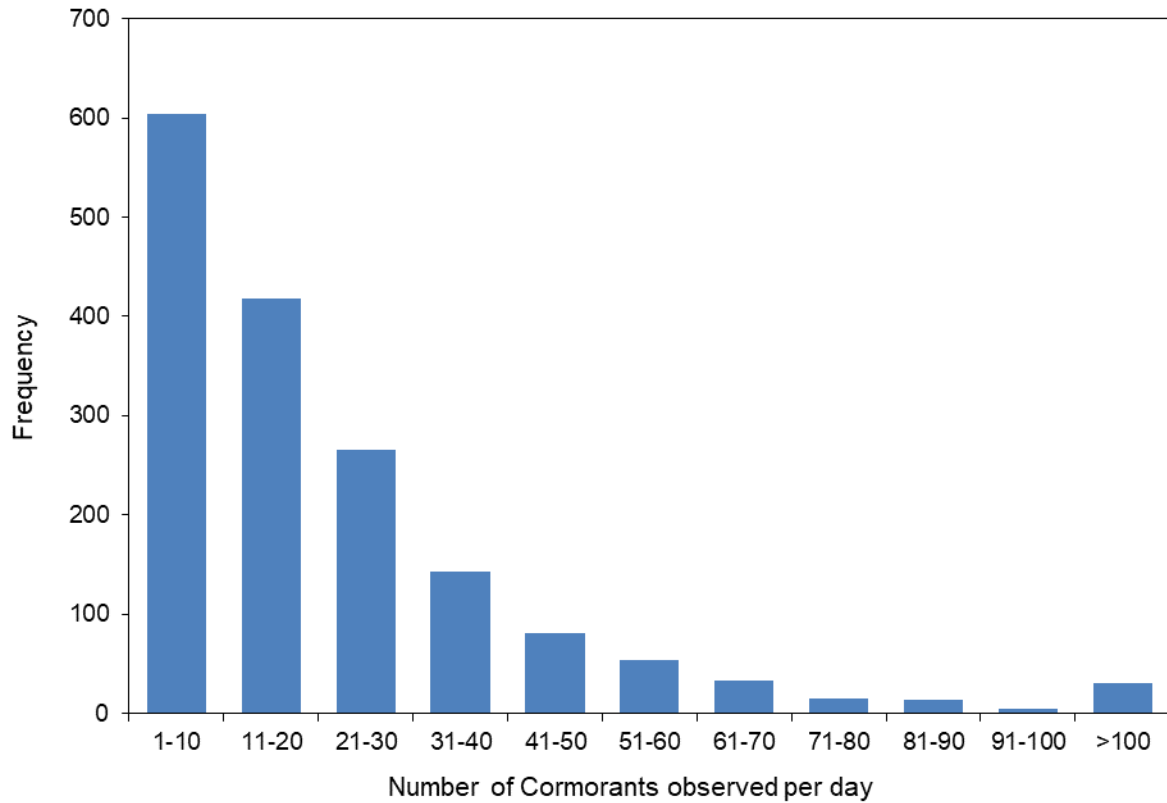
**Figure A3.** The total number of northward migrating Cormorants *Phalacrocorax carbo* observed on each date at Skagen (Denmark), summed across the whole study period (1972–98). Only years with a minimum of 20 days where at least one northward migrating Cormorant was observed between 15 March and 31 May were included. This criterion excluded the years 1972–73, 1976–80, 1992 and 1996.



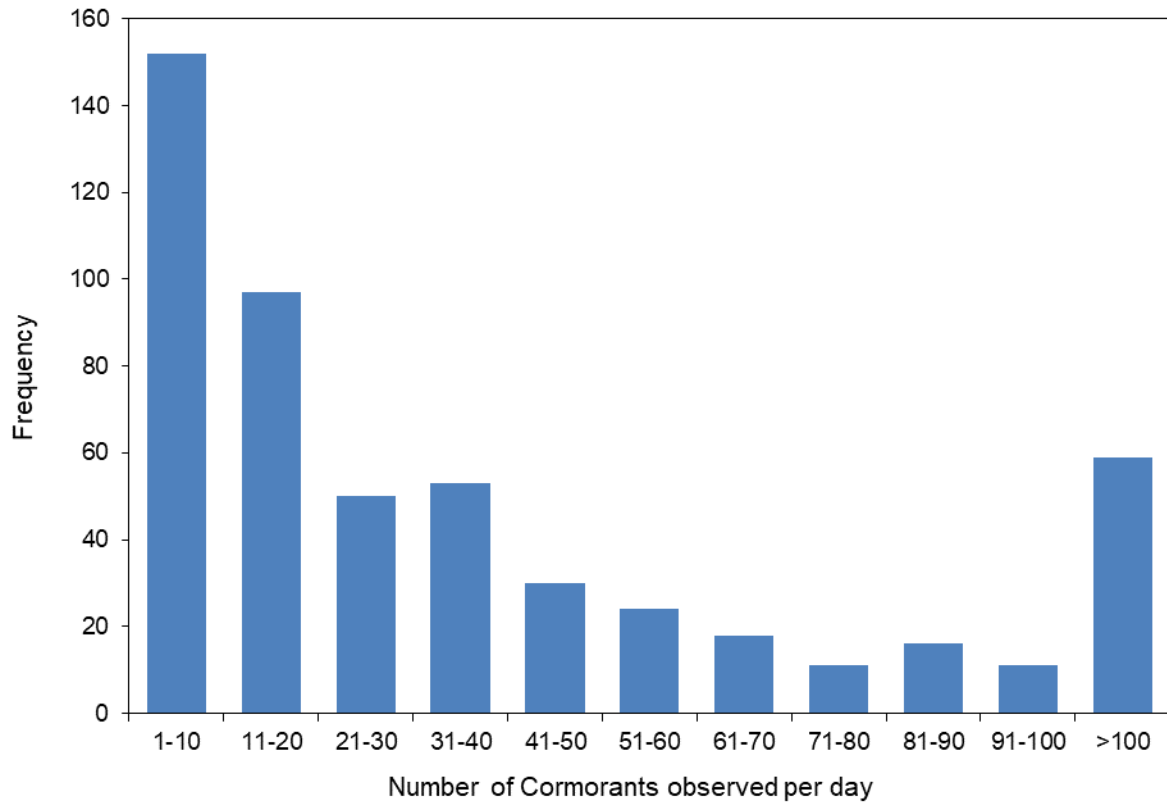
**Figure A4.** The total number of northward migrating Cormorants *Phalacrocorax carbo* observed on each date at Lista (Norway), summed across the whole study period (1992–2020).



**Figure A5.** Comparison of the dates of passage of the first 10%, 50% and 90% (representing the early, middle and late phases of the spring migration, respectively) of all the northward migrating Cormorants *Phalacrocorax carbo* observed between 15 March and 31 May at Skagen (Denmark) and Lista (Norway), respectively. The year 1996 is not included from Skagen since it did not fulfil the criterion of having a minimum of 20 days where at least one northward migrating Cormorant was observed between 15 March and 31 May.

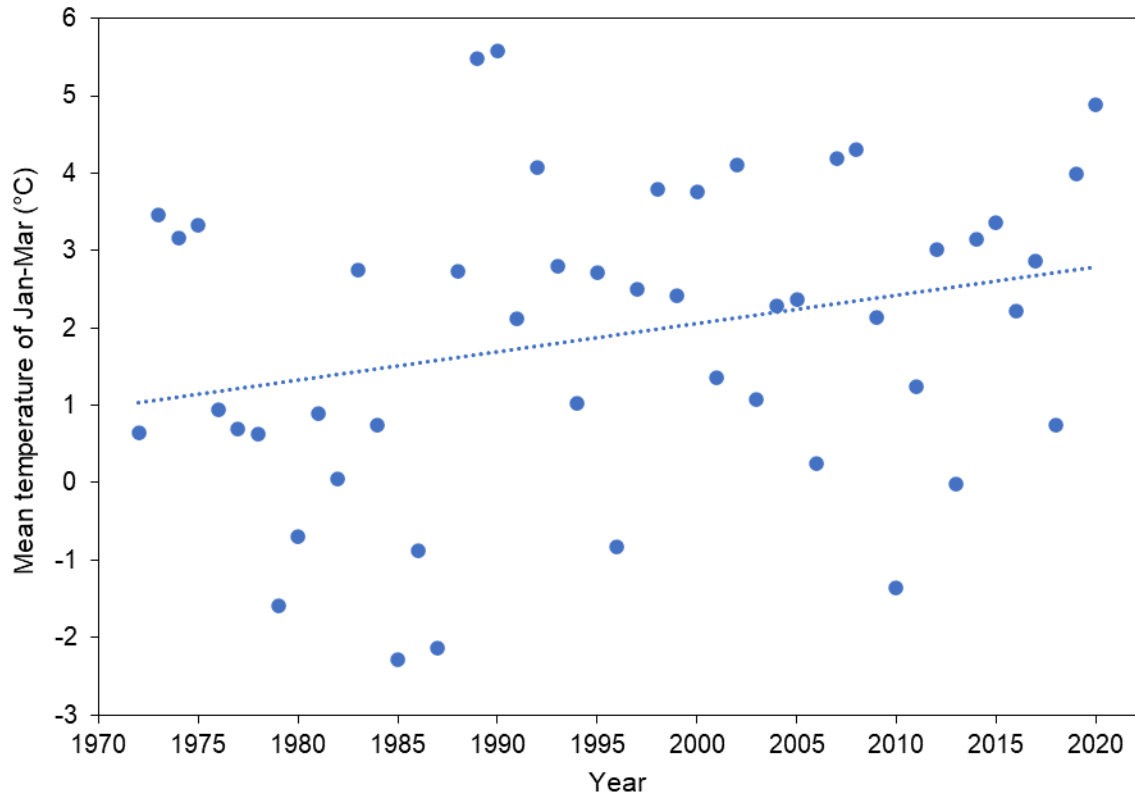


**Figure A6.** The number of days (frequency) when northward migrating Cormorants *Phalacrocorax carbo* were observed at Lista, Norway. The observations cover the period 15 March to 31 May in the years 1992–2020. Days where no northward migrating Cormorants were observed are excluded.



**Figure A7.** The number of days (frequency) when northward migrating Cormorants *Phalacrocorax carbo* were observed at Skagen, Denmark. The observations cover the period 15 March to 31 May in the years between 1972–98 that had a minimum of 20 days where at least one northward migrating Cormorant was observed. Days where no northward migrating Cormorants were observed are excluded.





**Figure A8.** Mean air temperature of January to March each year at Skagen. The temperature parameter was close to showing a significant long-term trend over the study period, 1972–2020 ( $P = 0.064$ ,  $N = 49$ ).