

Preliminary analysis of the Icelandic Gyrfalcon CMR

dataset - v2

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Here I attempt to explore the CMR dataset, before we go to inferential models to estimate survival and perhaps link this to an integrated pop. model.

Basic statistics

How many birds have been ringed?

```
dringed<-read.csv("data/Gyrs_ringed.csv")
head(dringed) # What's in the data table
```

##	Ring_No	Ringed_date	Ringed_day	Ringed_month	Ringed_year	EurAgeCode
## 1	15551	7/12/1975	12	7	1975	1
## 2	15552	7/12/1975	12	7	1975	1
## 3	15553	7/12/1975	12	7	1975	1
## 4	15554	6/20/1976	20	6	1976	1
## 5	15555	6/20/1976	20	6	1976	1
## 6	15556	6/20/1976	20	6	1976	1
##	EurAgeText	SEX				
## 1	Pullus	0				
## 2	Pullus	0				
## 3	Pullus	0				
## 4	Pullus	0				
## 5	Pullus	0				
## 6	Pullus	0				

```
length(unique(dringed$Ring_No)) #How many unique bird IDs
```

```
## [1] 1653
```

OK, so we have 1653 unique IDs. Let's compare to how many gyrs have been recovered.

```
drecov<-read.csv("data/Gyrs_recovered.csv")
head(drecov)
```

```
##   Ring_No Date_recovered Day_recorded Month_recorded Year_recorded
## 1   15554   10/15/1976         15             10         1976
## 2   15556    9/18/1980         18             9         1980
## 3   15559    6/18/1980         18             6         1980
## 4   15560    4/15/1979         15             4         1979
## 5   15562    8/20/1987         20             8         1987
## 6   15567    5/13/1995         13             5         1995

##   Accuracy_of_date_Euring_code Condition_Euring_code
## 1                             5                     3
## 2                             9                     3
## 3                             9                     3
## 4                             9                     3
## 5                             0                     3
## 6                             9                     3

##   Circumstances_Euring_code      Circumstances_Euring_text
## 1                             1      Bird found dead
## 2                             1      Bird found long dead
## 3                             1      Bird found long dead
## 4                             1      Bird found long dead
## 5                             1 Bird found dead (less than month)
## 6                             1      Bird found long dead

##           When.dead Date_reported
## 1                             14.09.1985
## 2      Died summer 1980    22.09.1980
```

```

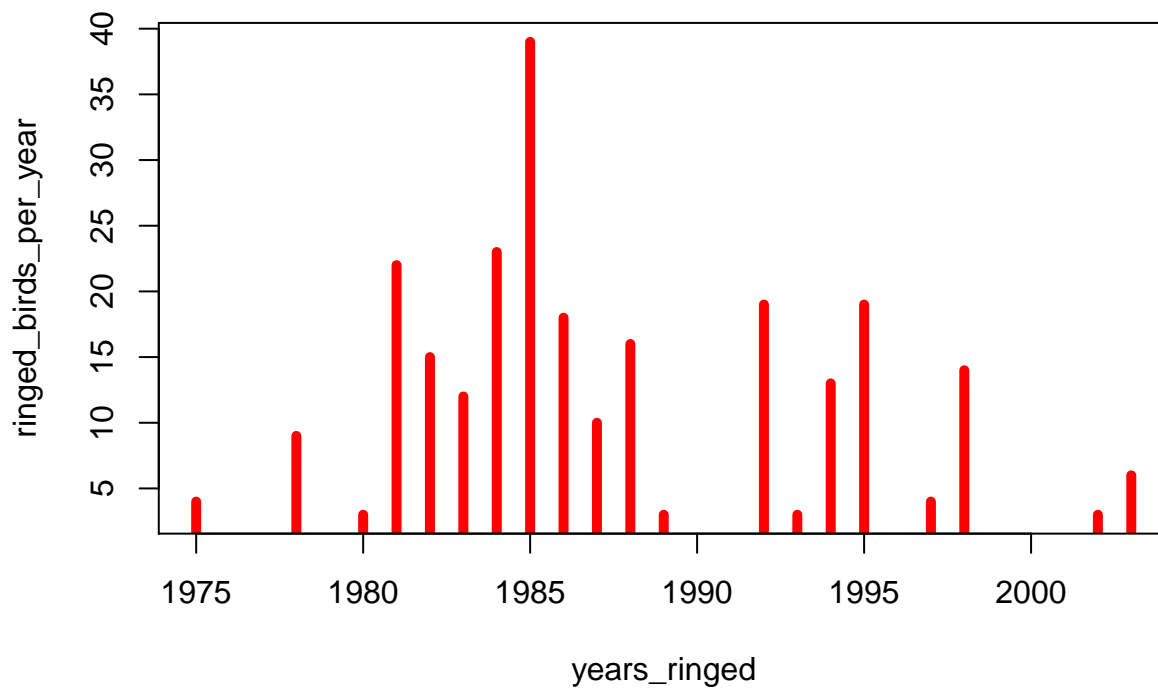
49 ## 3 18.12.1980
50 ## 4 Died winter 1978-1979 29.06.1984
51 ## 5 Died summer 1987 25.08.1987
52 ## 6 26.05.1995

```

```
length(unique(drecov$Ring_No)) #How many unique bird IDs in Gyrs_recovered.csv
```

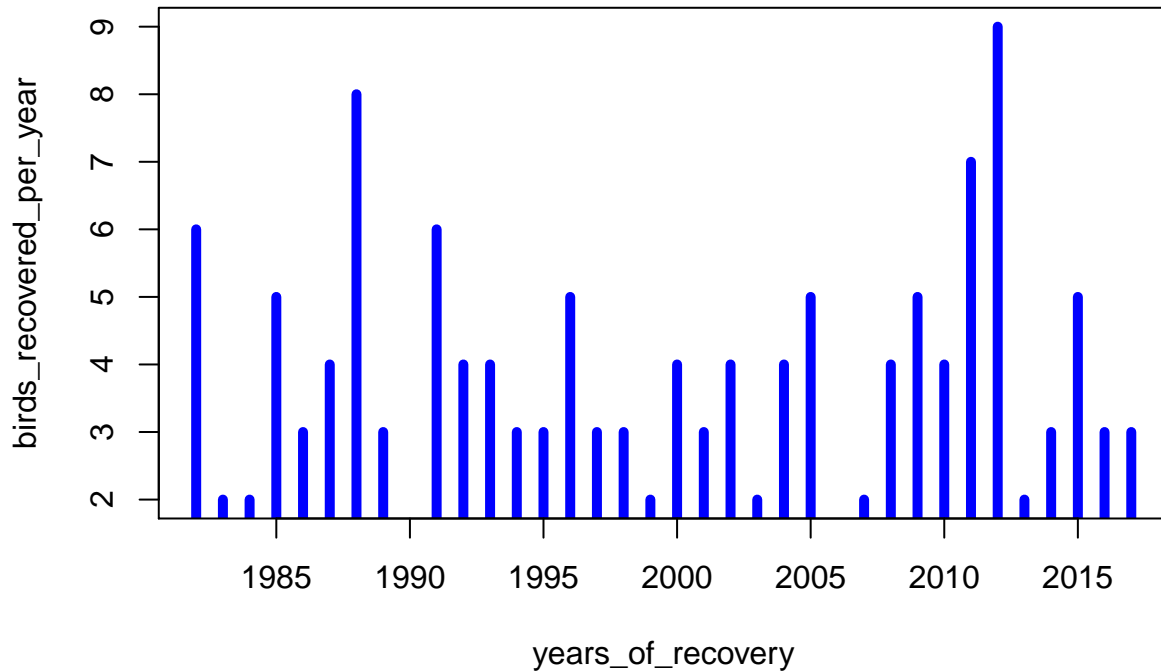
```
53 ## [1] 270
```

54 Let's now analyse the number of birds that have been ringed as a function of the year



55

56 We now analyse the patterns of recovery (and resighting)



57

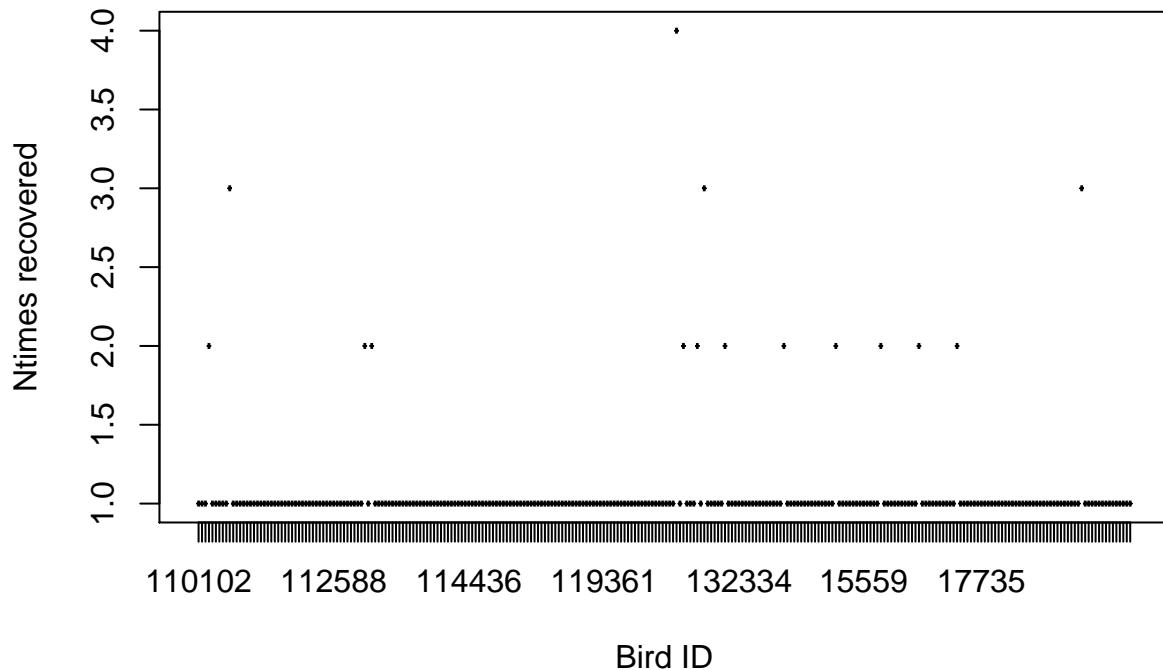
58 — Problem here with the definition of a year —

59 Now how many birds have been seen several times? We see below that very few birds have been recovered
 60 more than once (also this tends to be recent?).

Question: when did the change from recovery of dead birds to resighting of live birds occur?

61 I can infer the earliest date at which a bird has been resighted a second time, but given few birds have been
 62 resighted, but it might be preferable to allow later for a change in protocol (in the CMR models) using a
 63 predefined time (we can use several if unsure). I have noted 2006 earlier but I am unsure.

64



65

```
66 ## ntimes_recovered
67 ##    1    2    3    4
68 ## 255  11    3    1
```

69 This is coherent with the info given by Oli – 1 bird recovered 4 times, 3 birds 3 times, 11 birds two times and
70 the rest 1 time.

71 Thus for all practical purposes, we can consider that such data consists mainly of individual that are either
72 recovered or not recovered/resighted. We'll now turn to whether the individuals have been found live or dead,
73 and how this varies in time.

74 Also whether the recoveries of dead birds are of young vs. adult birds (which may provide quick and dirty
75 estimates of survival rates, at least for the youngs...)

```
## these are all the recovery codes that we have (top row), and how many of those we have in the dataset
```

```
table(drecov$Condition_Euring_code)
```

```
76 ##
77 ##    1    2    3    4    5    7    8
78 ##    2   66 136    8   26   31   21
```

```
### [previous comment: For instance, we can see 15 read colourmarks.
### We need to simplify this complexity to some extent by aggregating some values. ]
```

79 *Now we need some more info on the codes*

80 These are defined according to The EURING EXCHANGE Code 2000+ [https://euring.org/files/documents/](https://euring.org/files/documents/E2000PLUSExchangeCodeV117.pdf)
81 [E2000PLUSExchangeCodeV117.pdf](https://euring.org/files/documents/E2000PLUSExchangeCodeV117.pdf)

Condition Code	Meaning
0	Condition completely unknown
1	Dead but no information on how recently died/killed
2	Freshly dead – within about a week
3	dead for > a week. If >>, use 9 in Accuracy of Date, and 3 here
4	Found sick/wounded and released afterwards
5	Found sick/wounded and NOT released afterwards
6	Alive and probably healthy but taken into captivity.
7	Alive and probably healthy and certainly released (ring seen without the bird having being caught).
8	Alive and probably healthy and released by a ringer
9	Alive and probably healthy but ultimate fate of bird is not known

82 Thus categories 4, 7 and 8 (respectively 8, 31 and 21 birds) correspond to cases where the bird is ‘released’
83 alive, i.e. effectively resighted rather than recovered (when dead).

```
drecov$Date_recovered[drecov$Condition_Euring_code %in% c(4,7,8)]
```

```
84 ## [1] 7/16/1986 5/16/1985 5/17/1987 5/14/1987 4/22/1985 2/4/1988
85 ## [7] 5/6/1988 5/6/1987 5/21/1988 6/3/1982 5/15/1985 5/16/1987
86 ## [13] 5/10/1985 3/17/1984 5/28/1984 5/15/1987 10/30/1985 11/29/1986
87 ## [19] 5/9/1988 7/28/1988 1/4/1988 9/13/1990 6/9/2009 8/27/2000
88 ## [25] 3/6/2005 12/12/2001 6/5/2011 6/30/2007 10/23/2008 6/14/2014
89 ## [31] 6/14/2015 6/5/2016 6/17/2017 5/4/2012 11/1/2011 10/1/2012
90 ## [37] 1/2/2013 6/17/2010 6/16/2011 6/13/2012 6/16/2016 3/7/2015
91 ## [43] 6/19/2017 6/17/2017 5/5/2012 2/26/2012 7/21/2012 6/11/2014
92 ## [49] 1/22/2018 3/14/2016 1/5/2017 3/10/2017 6/9/2015 11/11/2014
```

```
93 ## [55] 2/6/2016 3/10/2017 8/28/2015 8/13/2015 8/17/2016 10/19/2017
```

```
94 ## 269 Levels: 10/10/2008 10/1/2012 10/15/1976 10/15/1981 ... 9/8/1982
```

```
drecov$Date_recovered[drecov$Condition_Euring_code %in% c(7,8)]
```

```
95 ## [1] 5/16/1985 5/17/1987 5/14/1987 2/4/1988 5/6/1988 5/6/1987
```

```
96 ## [7] 5/21/1988 6/3/1982 5/15/1985 5/16/1987 5/10/1985 3/17/1984
```

```
97 ## [13] 5/15/1987 10/30/1985 11/29/1986 5/9/1988 6/9/2009 8/27/2000
```

```
98 ## [19] 3/6/2005 12/12/2001 6/5/2011 6/30/2007 10/23/2008 6/14/2014
```

```
99 ## [25] 6/14/2015 6/5/2016 6/17/2017 5/4/2012 11/1/2011 10/1/2012
```

```
100 ## [31] 1/2/2013 6/17/2010 6/16/2011 6/13/2012 6/16/2016 3/7/2015
```

```
101 ## [37] 6/19/2017 6/17/2017 5/5/2012 2/26/2012 7/21/2012 6/11/2014
```

```
102 ## [43] 1/22/2018 3/14/2016 1/5/2017 3/10/2017 11/11/2014 2/6/2016
```

```
103 ## [49] 3/10/2017 8/13/2015 8/17/2016 10/19/2017
```

```
104 ## 269 Levels: 10/10/2008 10/1/2012 10/15/1976 10/15/1981 ... 9/8/1982
```

```
table(drecov$Accuracy_of_date_Euring_code)
```

```
105 ##
```

```
106 ## 0 1 2 3 4 5 9
```

```
107 ## 212 8 5 9 6 5 45
```

Accuracy of date Code	Meaning
0	Accurate to the day
1	Accurate to within 1 day either side of date coded.
2	Accurate to within 3 days either side of date coded.
3	Accurate to within 1 week either side of date coded.
4	Accurate to within 2 weeks either side of date coded.
5	Accurate to within 6 weeks either side of date coded.
6	Accurate to within 3 months either side of date coded.
7	Accurate to within 6 months either side of date coded.
8	Accurate to within some years only
9	Date of earliest possible use of ring (EURING for details)

108 For the circumstances, see the EURING pdf. Here are the numbers for the various categories

```
109 table(drecov$Circumstances_Euring_code)
```

```
110 ##
111 ## 1 2 11 20 28 29 32 35 40 43 46 48 50 58 62 63
112 ## 110 2 7 14 7 25 3 1 23 17 5 1 23 50 1 1
```

112 ————— Old codes —————

113 I'm attempting below to fill this gap but may need some help

AGE Code	Meaning
100	unfledged young
101	unfledged young at the nest
501	adult at the nest

RECOVERY Code	Meaning
100	found dead
120	found dead for a long time
121	found dead with one tag only?
146	found dead just outside the nest
5700	read colourmark
981,996	found injured and had to kill it