Thornback ray life-history parameters for MYAS project

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26 November 2018

MYDAS

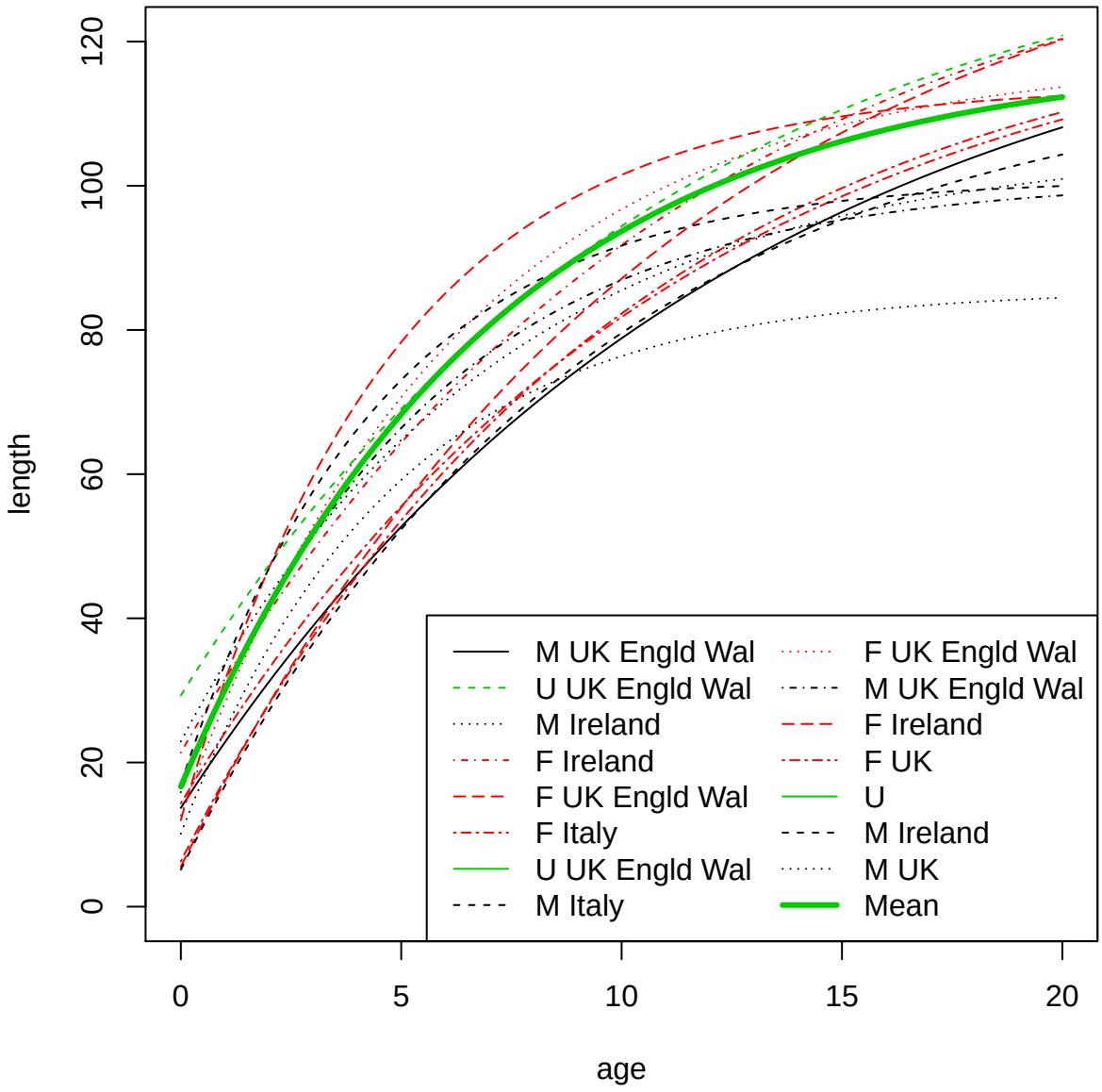
The MYDAS project https://github.com/laurieKell/mydas requires realistic life-history parameters for each of the case-study stocks. By default these are obtained from http://www.fishbase.org but the quality of these parameters is difficult to judge. For thornback the MI has a reasonable amount of biological data available from surveys, observer trips and port sampling. However no age data is available. Fisbase has some growth parameters and there is a recent working document to the ICES Working Group on Elasmobranch Fishes (WGEF) summarising the available data (Walker et al 2018)

Fishbase has records of biological parameters, the mean values are given below.

```
##          linf             k            t0             a             b
## 118.253333333   0.142000000  -1.068461538   0.003603333   3.218666667
##           a50           l50
##   5.880000000  68.844444444
```

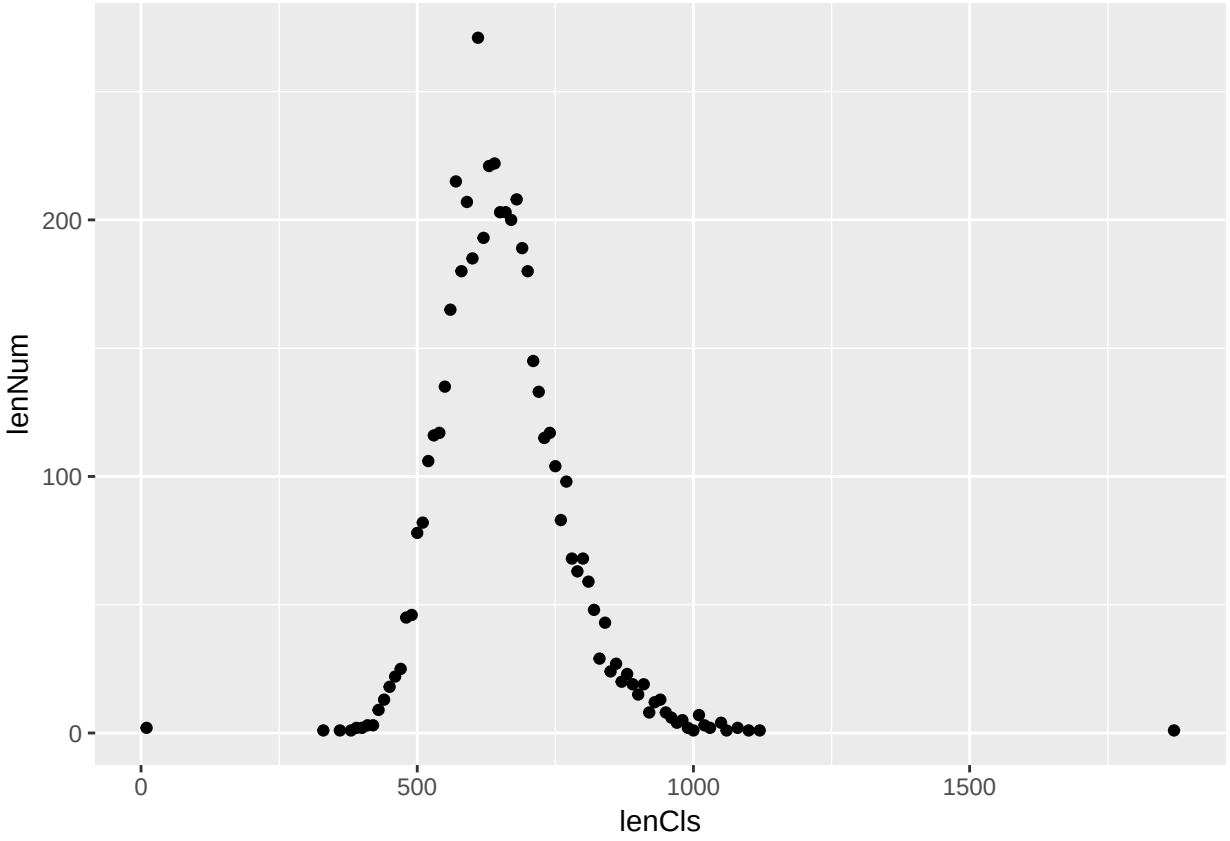
Growth

The MI have no age data for thornback rays. The fishbase data are quite variable but some of that can be explained by differences in growth between males and females



The working documment to WGEF by walker (2018) has three additional sets of growth parameters but provides no values for t0. Linf = 118, 107 and 115.25; k = 0.14, 0.13 and 0.185. Those parameters are well within the range of fishbase. Conclusion: the average growth parameters from fishbase appear to be appropriate.

Length frequency of the landings



The largest fish is 187 cm. However this is quite a bit of an outlier and could be a mistake. The second-largest fish is 112 cm. This can tell us something about Linf. If growth levels off in the older fish, you would expect the largest fish to be a couple of standard deviations above Linf, so you wouldnt expect Linf to be less than, say 90cm.

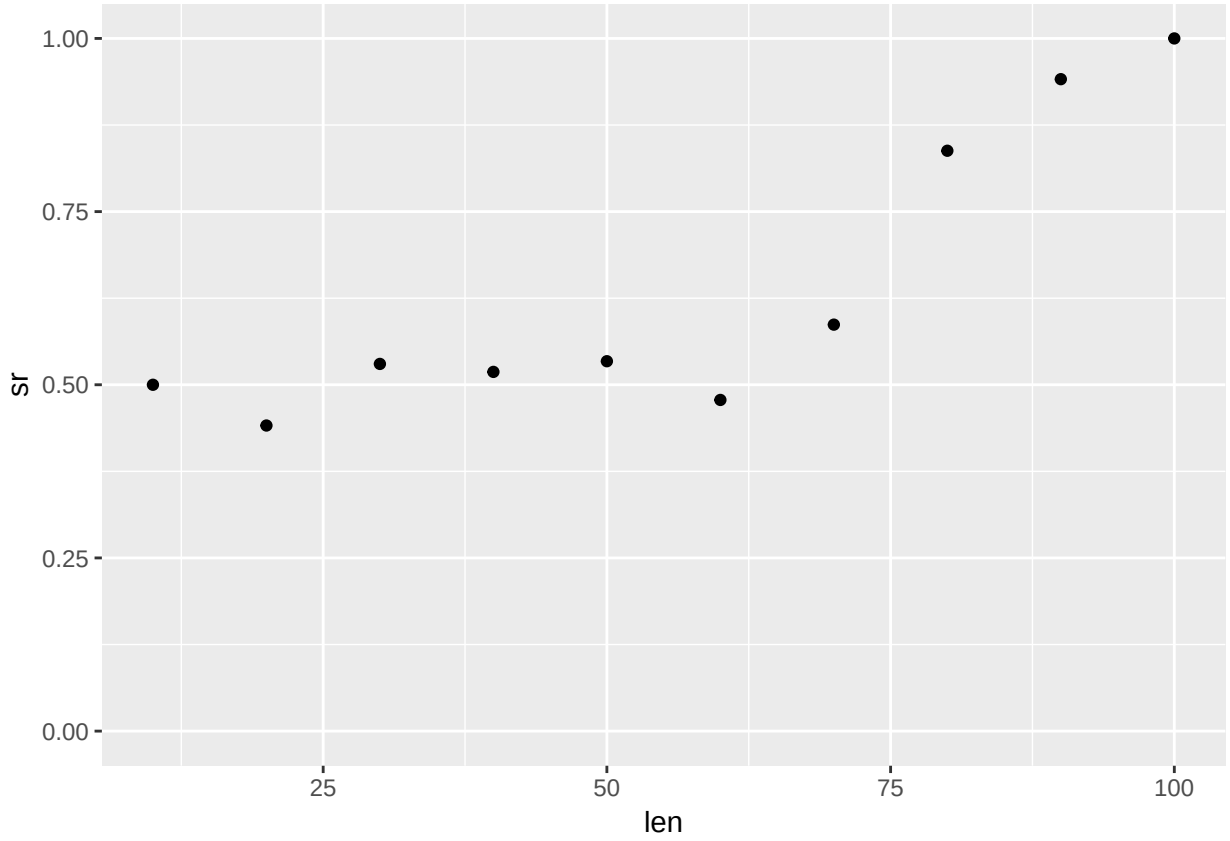
Biological data

The MI has no age data but quite a few observations of sex, maturity and individual weight:

```
## # A tibble: 27 x 7
## # Groups:   dataType [?]
##    dataType dataSource total  aged   sex   mat    wt
##    <fct>    <fct>      <int> <int> <int> <int> <int>
##  1 Discards Dis1993       10     0     0    NA    10
##  2 Discards Dis2013        2     0     2     2     2
##  3 Landings Lan2018        1     0     1    NA    NA
##  4 Survey   BSS 2004      47     0    47    47    47
##  5 Survey   BSS 2005      44     0    44    44    44
##  6 Survey   BSS 2006      29     0    29    29    29
##  7 Survey   BSS 2007       2     0     2     2     2
##  8 Survey   BSS 2008      33     0    33    33    33
##  9 Survey   BSS 2009       3     0     3     3     3
## 10 Survey   IAMS2016     292     0   292   292   292
## # ... with 17 more rows
```

Growth by sex

We have seen from the fishbase data that females grow faster and tend to have higher Linf. The sex ratio in the landings should confitm this:



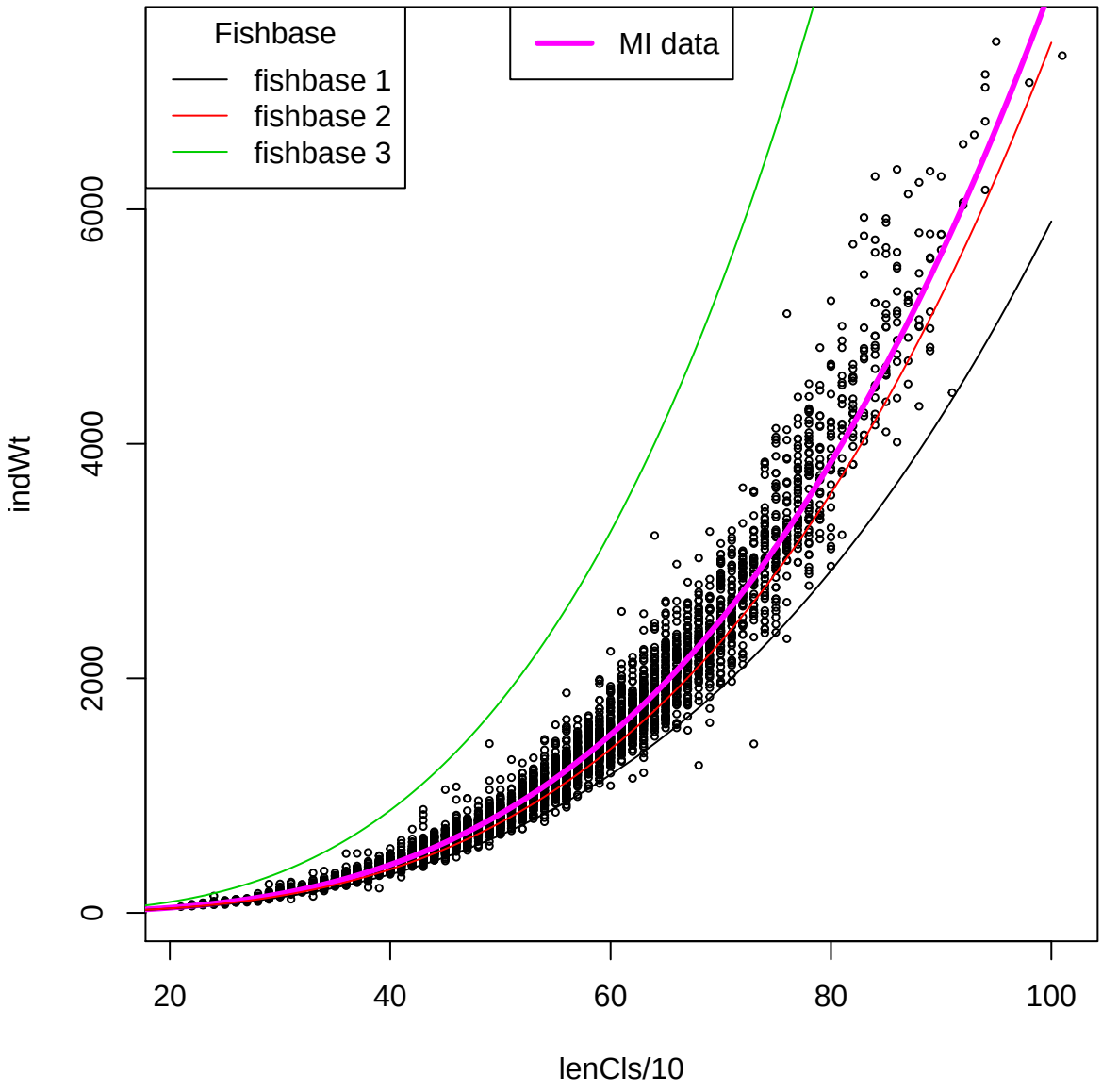
Yes. All large rays are females, that means that either the males die before they get big or that they grow slower or stop growing sooner. It looks to me that the last explanation is most likely as the sex ratio is very close to 0.5 up to 60 cm.

Length-weight

Fit a linear model

```
##
## Call:
## lm(formula = log(indWt) ~ log(lenCls/10))
##
## Coefficients:
##    (Intercept)  log(lenCls/10)
##         -5.881           3.226
```

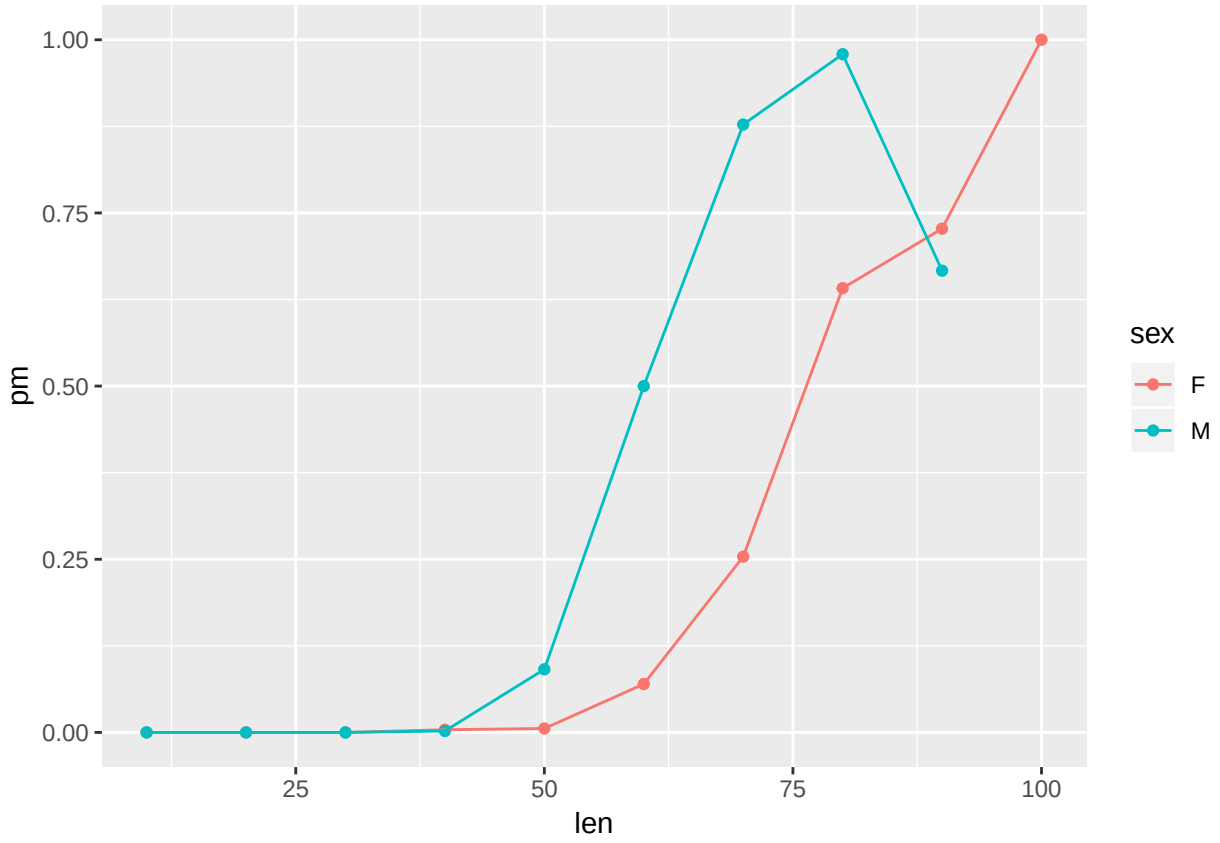
Compare this to fishbase



Two of the parameters sets in fishbase look badly off. Lets just use the MI data..

Conclusion: the suggested final length-weight parameters are: a = 0.00279; b = 3.23

Maturity



Conclusion: Males mature around 60cm; femalesa around 75cm

Summary

Growth parameters: Average from fishbase seems reasonable but note difference between male and female

Length-weight parameters: a = 0.00279; b = 3.23

Maturity: Males mature around 60cm; females around 75cm