

Summary of growth rate data and analyses available for the Tristan da Cunha group of islands

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Growth data available

Pollock and Roscoe 1977: Provide regressions to moult increment data for

- a) Tristan males
- b) Nightingale males
- c) Tristan females

Pollock 1981 (repeated in Pollock 1991): provides moult increment summary data for 10mm grouped lobsters for all four islands, males and females separate. No regression analyses.

Anon. source (island biologist?) 1988: Tristan tagging study. Provides a regression to the Tristan males (note fit is poor, $R^2=0.2$).

James Glass (pers. comm., 2010). Von Bertalanffy fits to tagging data from Inaccessible and Nightingale males. No raw data available nor sample size, sex etc.

Growth analyses/plots

Fits to the growth increment data are in two forms:

- i) Chapman Peterson plots – where the growth increments $\left(\frac{\Delta l}{\Delta t}\right)$ are plotted against length (l_t) before moult and a linear regression fitted to the data. Pollock and Roscoe 1977, and the Anon. source provide these plots.

$$\frac{\Delta l}{\Delta t} = A - \kappa l_t$$

$$A = \kappa l_\infty$$

i.e. the slope is the “ κ ” and the x-intercept is the l_∞ of the van Bertalanffy equation below.

- ii) Von Bertalanffy growth curves: these fit the data to provide length at age plots.

$$l_t = l_\infty(1 - e^{-\kappa(t-t_0)})$$

Results and Discussion

Tristan males

From Figure 1 it is evident that the Pollock and Roscoe (1977) growth curve for Tristan is more suitable than that from the Anon (1998) source. The Pollock and Roscoe plot compares well with the Pollock 1981 summary data available. It is suggested that the Pollock and Roscoe (1977) Tristan analysis is used for the Tristan reference case assessment. No sensitivity is suggested.

Nightingale males

From Figure 2 it is clear that there is inconsistency between the Pollock and Roscoe (1977) analysis for Nightingale males, and the summary data for Nightingale males reported in Pollock 1981. The James Glass fit would appear to link a little better to the Pollock 1981 summary data, which are based on a much larger sample size (n=108) than the Pollock and Roscoe analysis (n=13). It is suggested that the James Glass analysis is used for the Nightingale reference case assessment (though noting that the absence of the raw data or details of their analysis renders this open to question). The Pollock and Roscoe 1977 analysis will be used as a sensitivity.

Inaccessible males

From Figure 3a it is evident that the James Glass growth curve is rather different to the summary data provided by Pollock 1981 (n=130). In Figure 3b the Pollock and Roscoe 1977 analysis for Tristan males is added for comparison. It would appear that this provides a better comparison to the Pollock 1981 summary data and it is thus suggested that the Pollock and Roscoe 1977 Tristan growth is used for Inaccessible males for the reference case assessment. The James Glass Inaccessible growth will be used as the sensitivity.

Gough males

Figure 4a shows the Pollock 1981 summary data. Figure 4b compares these data with growth curves from three different sources (for other islands) to see if there may be a sensible substitute. From Figure 4b it would appear the James Glass Nightingale growth provides the best comparison to the Gough summary data available. It is thus suggested that the James Glass Nightingale growth is used for Gough males for the reference case assessment, and that the Pollock and Roscoe 1977 Nightingale growth is used as a sensitivity.

Females

Figure 5 shows the Pollock and Roscoe 1977 growth curve for Tristan females. It is suggested that this is used for females for all four islands, due to lack of alternate female growth data.

Figure 6 compares the reference case growth curves for Nightingale/Gough compared with Tristan/Inaccessible. It is evident the former is associated with faster growing lobster which is supported by several comments in the literature.

References

- Pollock, D.E. and Roscoe, M.J. 1977. The growth at moulting of crawfish *Jasus tristani* at Tristan da Cunha, South Atlantic. *J. Cons. Int. Explor. Mer*, 37(2): 144-146.
- Pollock, D.E. 1981. Population dynamics of rock lobster *Jasus tristani* at the Tristan da Cunha group of islands. *Fish. Bull. S. Afr.* 15:49-66.

Table 1: Summary of growth rate analyses and their parameter values and sample sizes where available. The bolded values indicate the original reported values. Units are yr^{-1} for κ and mm for l_{∞} .

	Data source	Chapman Peterson plot	Von Bertalanffy parameters	Sample size
Tristan males	Pollock and Roscoe 1977	$y=14.56-0.11x$	$\kappa =0.11$ $l_{\infty}=132$	74
	Pollock 1981	Only summary data provided		51
	Anon. 1998	$y=28.735-0.2456x$	$\kappa =0.2456$ $l_{\infty}=117$	360
Nightingale males	Pollock and Roscoe 1977	$y=10.33-0.066x^*$	$\kappa =0.066$ $l_{\infty}=157$	13
	Pollock 1981	Only summary data provided		108
	James Glass	$y=17.052-0.116x$	$\kappa =0.116$ $l_{\infty}=147$?
Inaccessible males	Pollock 1981			130
	James Glass	$y=12.72-0.08x$	$\kappa =0.08$ $l_{\infty}=159$?
Gough males	Pollock 1981	Only summary data provided		114
Tristan females	Pollock and Roscoe 1977	$y=5.99-0.06x$	$\kappa =0.06$ $l_{\infty}=99.8$	34

*a typo exists in the published paper reporting the slope as 0.66, but from the resultant fit to data provided in the paper one can determine that this should be 0.066.

Table 2: Suggested choices of data sources for use in the reference case assessment as well as a sensitivity choice. The @ indicates the choice made in initial assessment runs.

	Reference case choice	Sensitivity choice
Tristan males	Pollock and Roscoe 1977 Tristan @	
Nightingale males	James Glass Nightingale	Pollock and Roscoe 1977 Nightingale@
Inaccessible males	Pollock and Roscoe 1977 Tristan@	James Glass Inaccessible
Gough males	James Glass Nightingale	Pollock and Roscoe 1977 Nightingale@
Females	Pollock and Roscoe 1977 Tristan females@	

Figure 1: Growth data and analyses available for Tristan males.

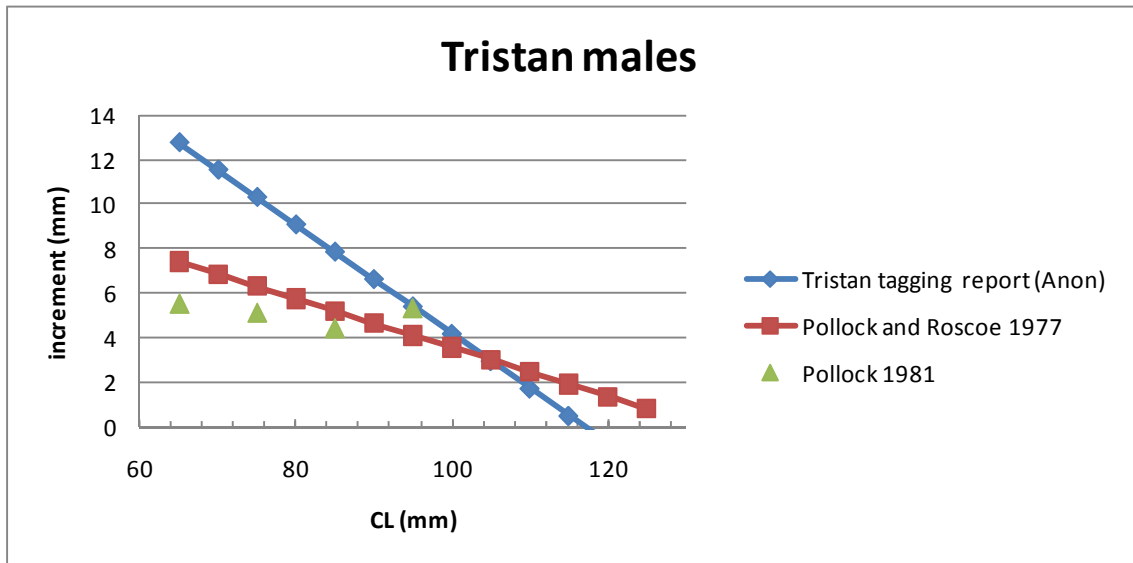


Figure 2: Growth data and analyses available for Nightingale males.

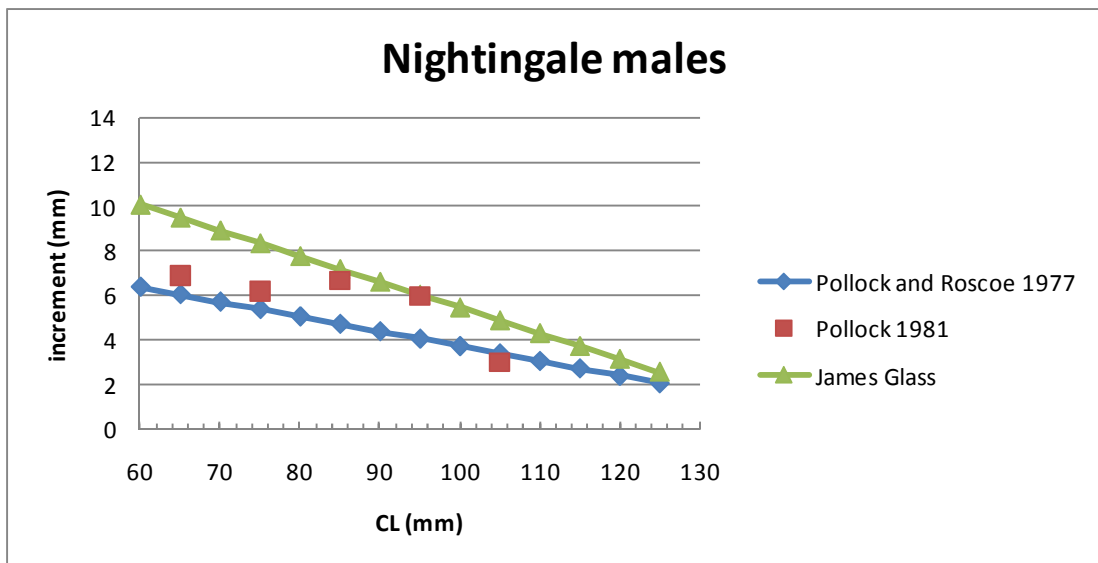


Figure 3: Growth data and analyses available for Inaccessible males.

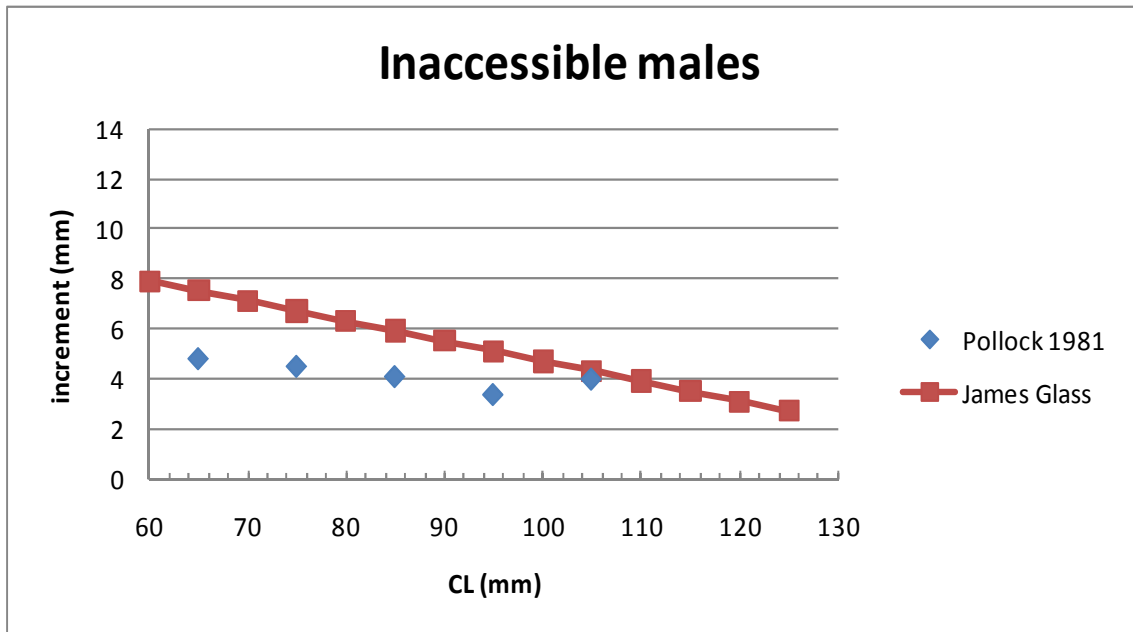


Figure 3b: Growth data and analyses available for Inaccessible males, along with the growth plot for Tristan males available from Pollock and Roscoe (1977).

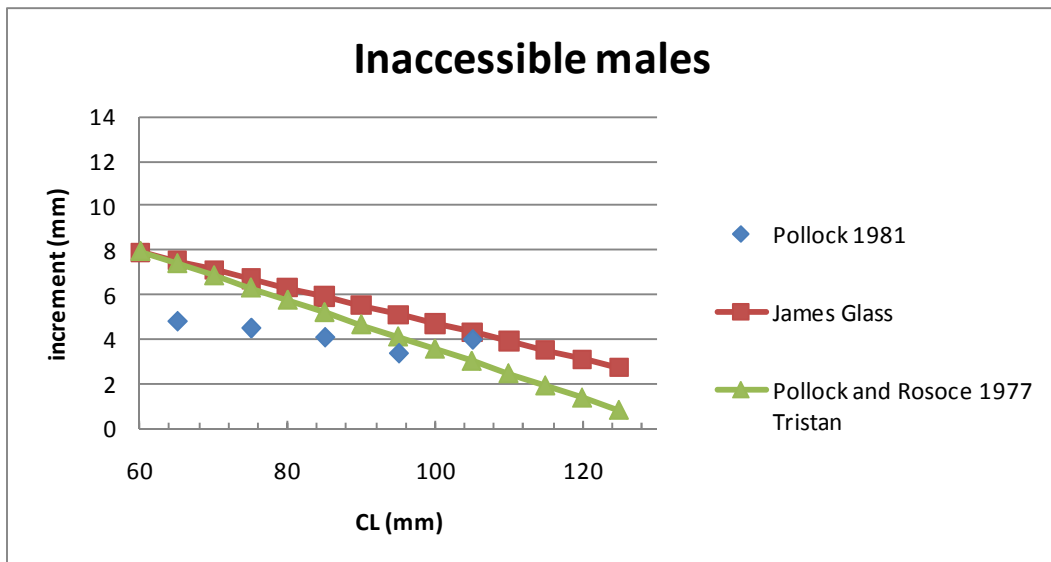


Figure 4a: Growth data available for Gough males.

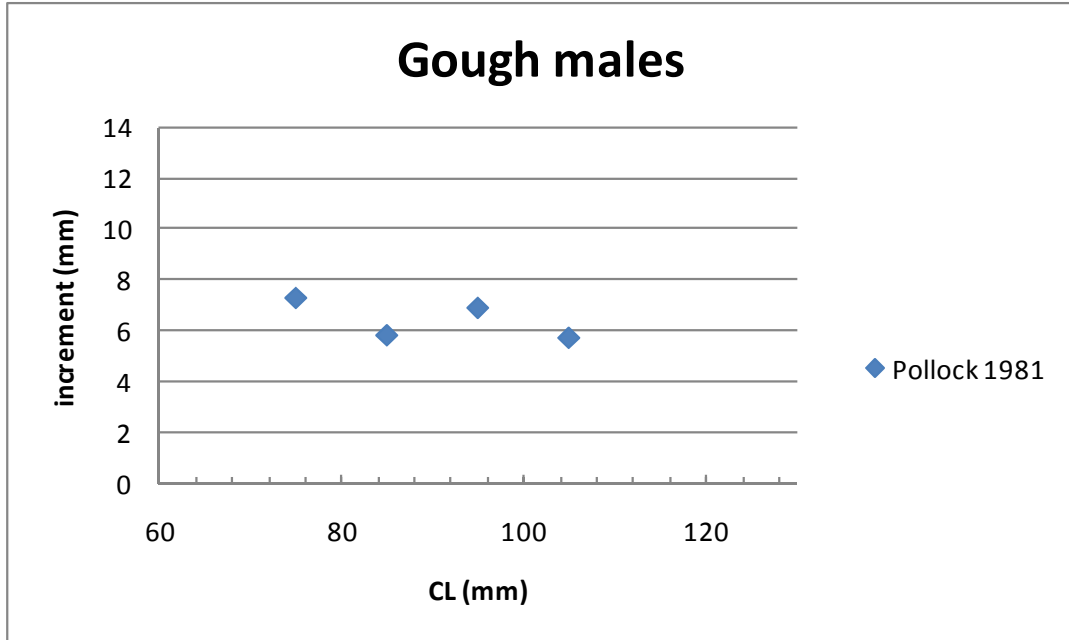


Figure 4b: Growth data available for Gough males along with two growth plots available for Nightingale and one for Tristan.

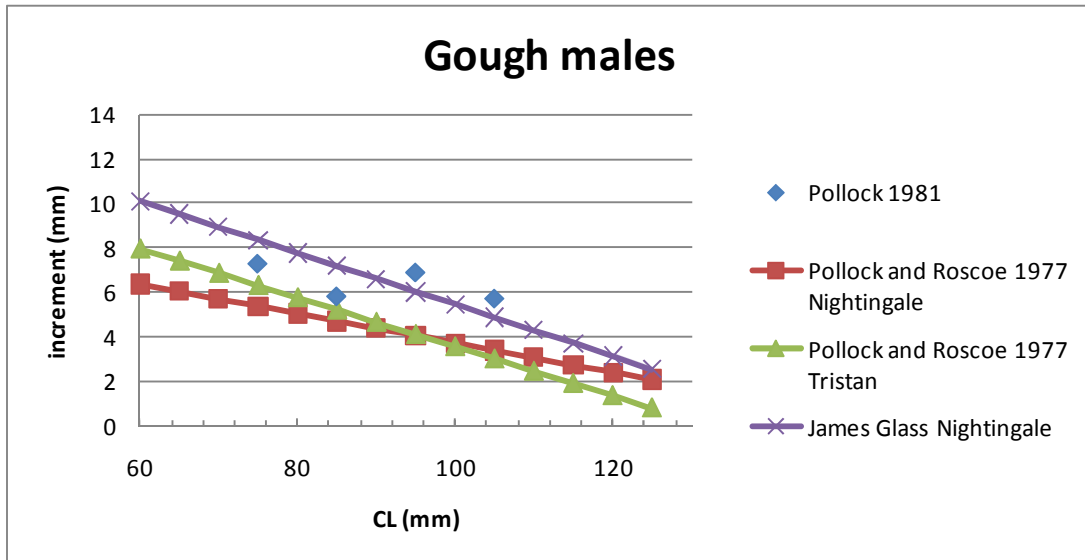


Figure 5: Growth analysis available for Tristan females (from Pollock and Roscoe 1977).

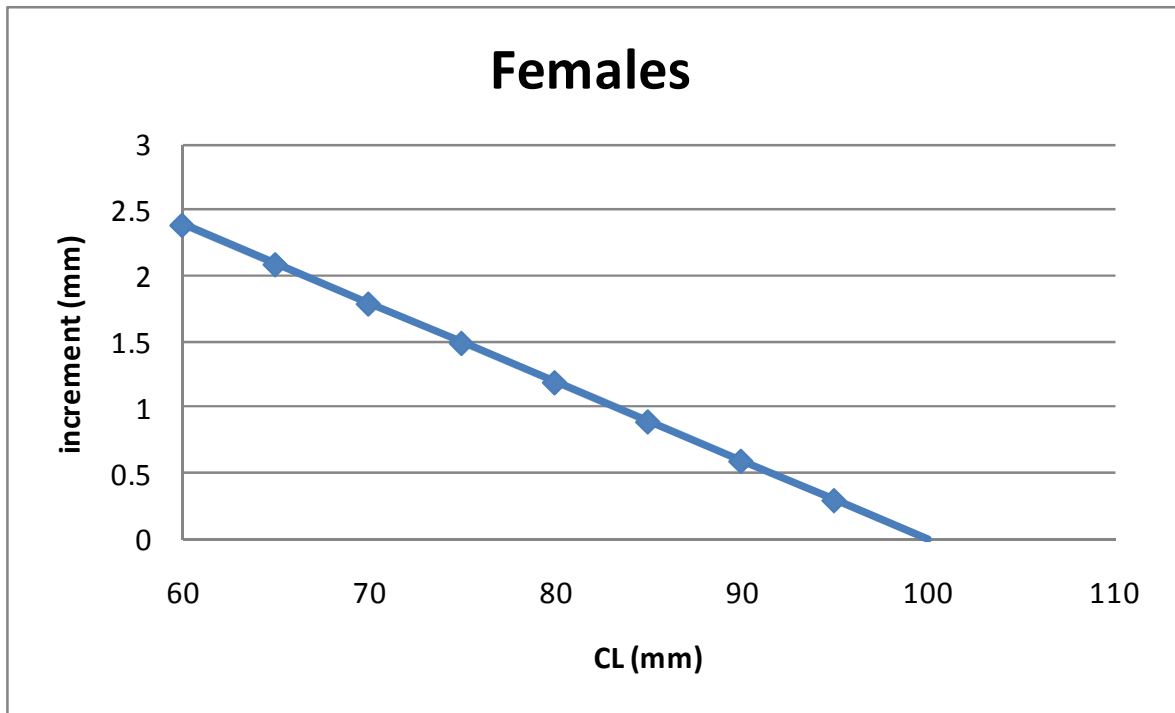


Figure 6: Growth rate choices for the reference case assessments. Here one can see that the Nightingale/Gough growth increments are larger than for comparatively sized lobsters at Tristan/Inaccessible.

