



# Hatching failure – student worksheet

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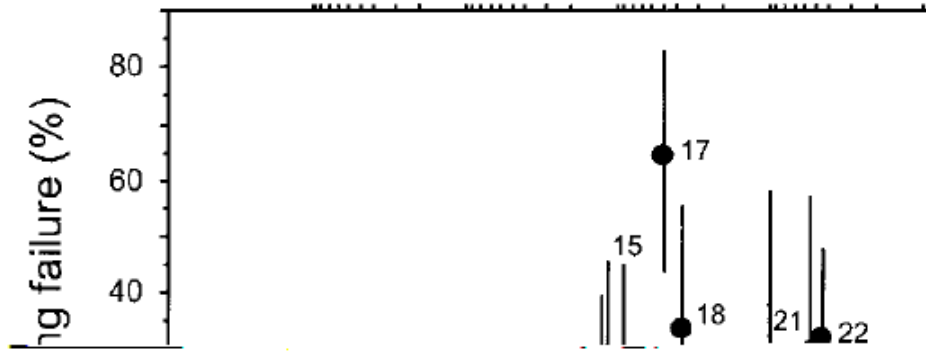


Fig. 1. Increase in hatching failure with increasing severity of population bottleneck in **Native New Zealand birds** (n=22). Circles are means  $\pm$ 95% confidence intervals. Open circle shows mean hatching failure in 15 species that did not pass through a bottleneck. Hatching failure increased when bottlenecks dropped below  $\sim$ 150 individuals.

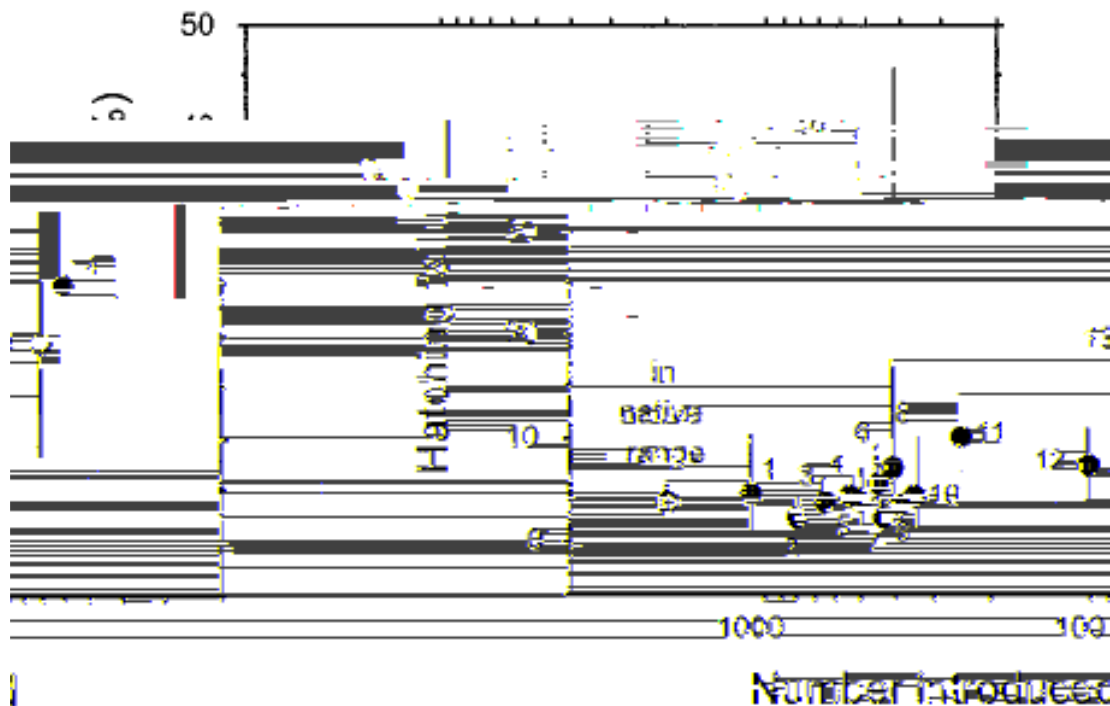


Fig. 2. Increase in hatching failure of **introduced species** (n=15) with decreased numbers of individuals released by the 19<sup>th</sup> century New Zealand acclimatization societies. Circles are means  $\pm$ 95% confidence intervals. Open circle shows mean hatching failure in the same species in their native range.



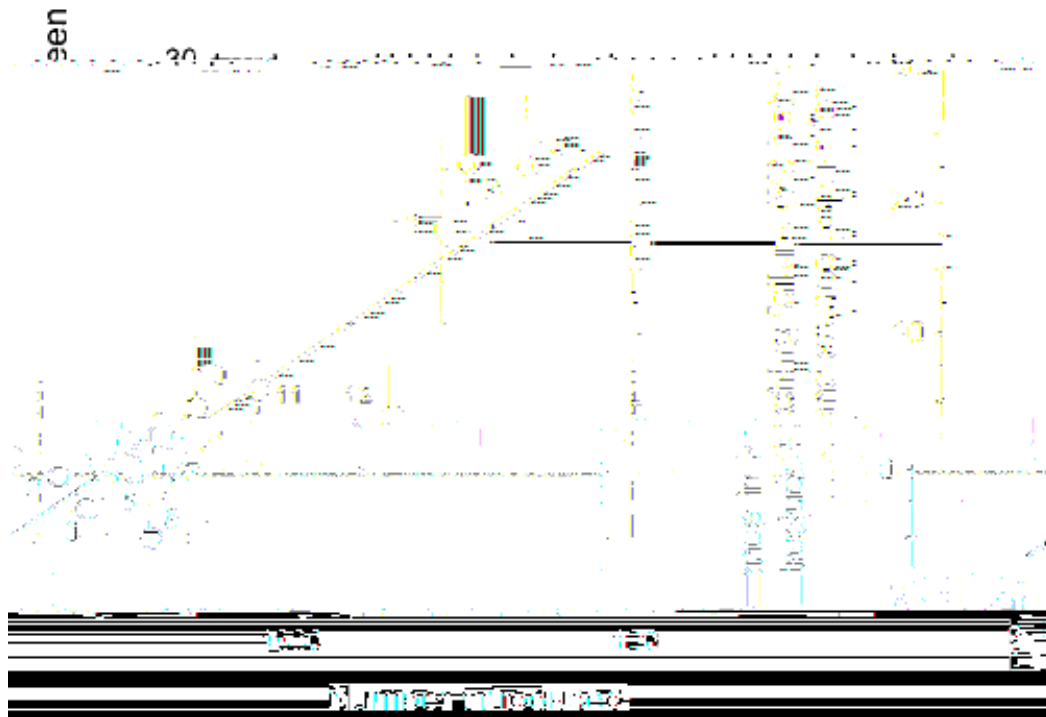


Fig. 3. Increase in differences in rate of hatching failure between each introduced population in New Zealand (postbottleneck) and their source (prebottleneck) for 15 species of introduced birds with data in both localities. Circles are differences  $\pm 95\%$  confidence intervals. Positive values indicate that hatching failure is greater in the introduced populations.

Our comparison of introduced species between their native and introduced ranges suggests that as many as 600 individuals may be needed to avoid increased hatching failure when found-

**Questions:**

1. Explain how the “bottleneck” occurred in the Black Robin population of New Zealand.

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- 2.



3. Explain the trend shown in figure 3.

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4. Why would this study be useful to conservationists in New Zealand and worldwide?

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Q	Achievement	Achievement with Merit	Achievement with Excellence
1	Black Robin population decreased due to introduced predators to NZ or the Chatham Islands (or examples such as cats & rats).	(Achieved plus) A smaller population means a smaller or decreased gene pool / less genetic diversity for the future / breeding population/s.	
2	The smaller the bottleneck size or introduced population size, the greater the % hatching failure. OR As the population bottleneck size (in fig. 1) decreases, % hatching failure increases. AND As the size of the introduced population (in fig. 2) decreases, % hatching failure increases.	(Achieved plus) A smaller population	

