A minimum estimate of population size is given by the lower 2-unit support limit[3] found by solving $P = 1/e^2 = 0.1353$ for N. By the very nature of the problem there can be no upper limit, and likelihood theory prescribes none.

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1 Bell, G., *Nature*, **248**, 616 (1974).
2 Fisher, R. A., *Statistical Methods and Scientific Inference* (Oliver and Boyd, Edinburgh, 1956).
3 Edwards, A. W. F., *Likelihood* (Cambridge University Press, 1972).

DR BELL REPLIES—Edwards makes two major points: first, that my estimate[1] of population size is strictly invalid; and secondly, that it is of no practical value in situations where its use might be considered.

Although no statistician, I have satisfied myself that Edwards' first point is correct, and that the closing sentences of my original communication must be revised. If no recaptures are made, then clearly $P = 1$ when the population is assumed to be infinitely large. This does not mean that it is absolutely certain that the population is infinitely large; on the contrary, we may be quite sure that it is not. It means that if the population were infinitely large, we could be quite certain that no recaptures would be made. At some finite value of N, say N^*, the value of P will be 0.5; that is, if we performed many recapture surveys, obtaining the same sample size on each occasion, we would fail to make any recaptures on about half the total number of occasions. If, therefore, we perform a recapture survey and obtain no recaptures, we still have no evidence that the population is really larger than N^*; and it is in this sense that N^* is a minimum estimate of N. The value of P chosen depends on how certain we wish to be in setting an upper limit to N^*.

Edwards' second point seems less fully justifiable. The example that he gives involves the very smallest sample that can yield any information whatsoever concerning the size of the population, and it is not surprising that only the most tentative conclusions can be formed. With larger samples, useful information can be obtained which is not utilised by standard recapture techniques: in a study of the distribution of population size in newts (G.B., unpublished), the results obtained from the nil-recapture method were found to be entirely consistent with those obtained from two other techniques; stochastic and deterministic recapture surveys, and trap-ratio estimates (Fig. 1). Statistical analysis is primarily a means of interpreting observations of nature, rather than an independent academic discipline, and it is to be hoped that the nil-recapture method will be useful, in some circumstances, to biologists working in the field. It may be that its rationale is less rigorous than that of the higher reaches of likelihood theory, but it is at least comprehensible to field biologists without specialised mathematical training. To accept mathematical conclusions whose truth one is unable to establish personally, is to accept the argument from authority—against which all scientific enquiry is a revolt.

University of York

1 Bell, G., *Nature*, **248**, 616 (1974).
2 Harding, J. P., *J. mar. biol. Ass., U.K.*, **28**, 141–153 (1949).

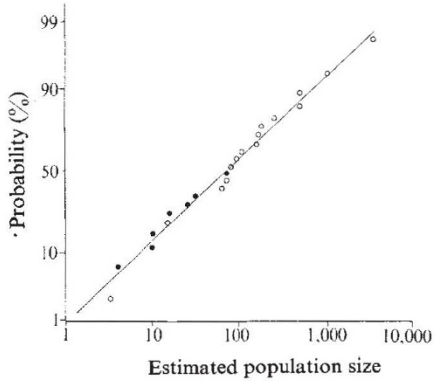

Fig. 1 The distribution of population size in the smooth newt (*Triturus vulgaris* (Linn)) near Oxford (G.B. unpublished). Each point represents the estimate of the size of a single population. The data are plotted according to the method of Harding[2] for small samples; population size can be seen to be log-normally distributed. ●, Estimates due to the nil-recapture method, using $P = 0.5$; ○, estimates from standard recapture techniques, or from a known relationship between the rate of trap-captures and the total population size.

Protein phosphorylation during oocyte maturation

Morrill and Murphy[1] suggested that "the release of prophase block at ovulation is associated with intense protein phosphorylation" coinciding with "the activation of a protein kinase (possibly *via* cyclic AMP)". They further found that "the principal protein species phosphorylated between meiotic prophase and the second metaphase appears to be the phosphoprotein phosvitin". But proper controls for their experiments seem to have been missing. It was not determined whether oocytes that remained in prophase block but were exposed to the same amount of $^{32}P_i$ for the same time as those undergoing maturation would also have phosphorylated endogenous protein, as our experience indicates[2,3]. Nor is it clear that their phosvitin was authentic.

We have repeated their experiments, using an *in vitro* system. Approximately 120 fully grown oocytes from *Xenopus laevis* (injected with 1,000 U of human chorionic gonadotrophin 3 weeks preciously to flush out over-ripe oocytes) were dissected manually from their follicles and placed for 2 h in 10 ml of solution O-R2 (ref. 4) containing 1 mCi $^{32}P_i$ (carrier-free, Schwarz/Mann). After 2 h they were washed, and half were placed in 15 ml of solution O-R2 containing 10 μg progesterone ml^{-1} to induce maturation[5]. Remaining oocytes were placed in progesterone-free medium (zero time). After 30 min both groups were transferred to medium lacking progesterone. At 6 h, approximately 60% of progesterone-treated oocytes had a diffuse white area centred at the animal pole, indicative of germinal vesicle breakdown[5]. By 9 h, virtually all treated oocytes had the white area, while untreated oocytes were negative. Dissection of boiled oocytes indicated that the appearance of a white area corresponded with the vesicle breakdown in every case examined ($N = 24$). Sterile technique was used, 10 μl of antibiotic–antimycotic solution (Grand Island Biological Co.) was added per ml of incubation medium, and the temperature was 20° C.

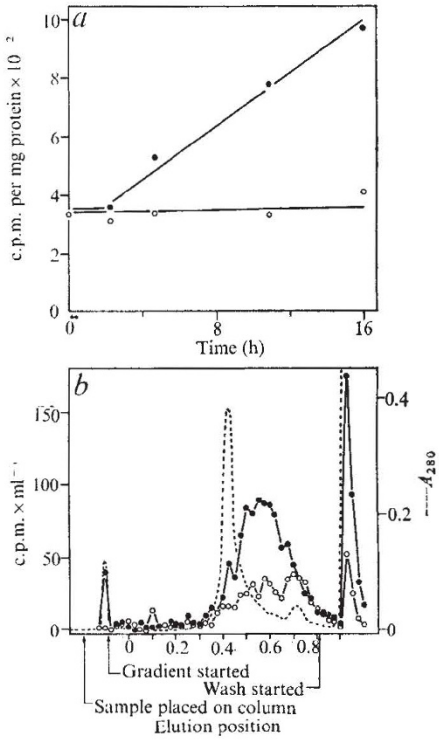

Fig. 1 *a*, Specific activity of ^{32}P-protein in progesterone-treated oocytes (●) undergoing maturation and control oocytes (○). Oocytes were preincubated for 2 h before zero time in ^{32}Pi. Each point represents the average of three determinations. The arrow indicates the time of progesterone treatment. *b*, DEAE-cellulose chromatography of extracts from oocytes taken at the end of the 16-h period indicated in (*a*). The dashed line is the absorbance trace; other symbols are as above.