

## Figures

Fig. 1. Females which experienced parturition in the laboratory. Scale =

1 cm. A: Female with first instar juveniles on her back. B:

Female with newly molted second instar juveniles on her back.



**A**

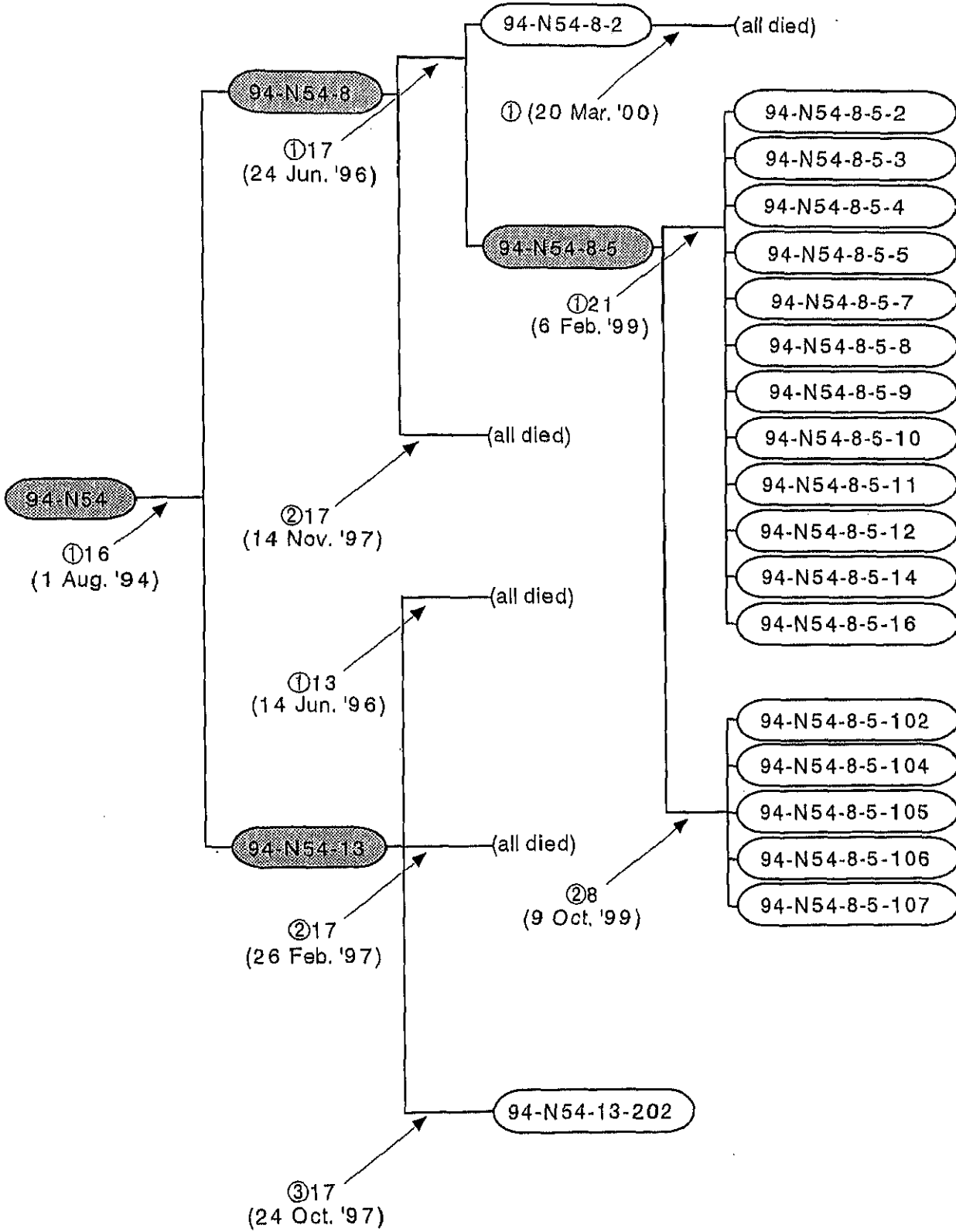
**B**

1



Fig. 2. Pedigree of four successive generations derived from a female numbered 94-N54. Females shown by shadowed elliptic circles have been dead or dissected and those shown by open elliptic circles now alive. Circled number with arrow shows the order of parturitions repeated, followed by the date of parturition and the number of neonates.

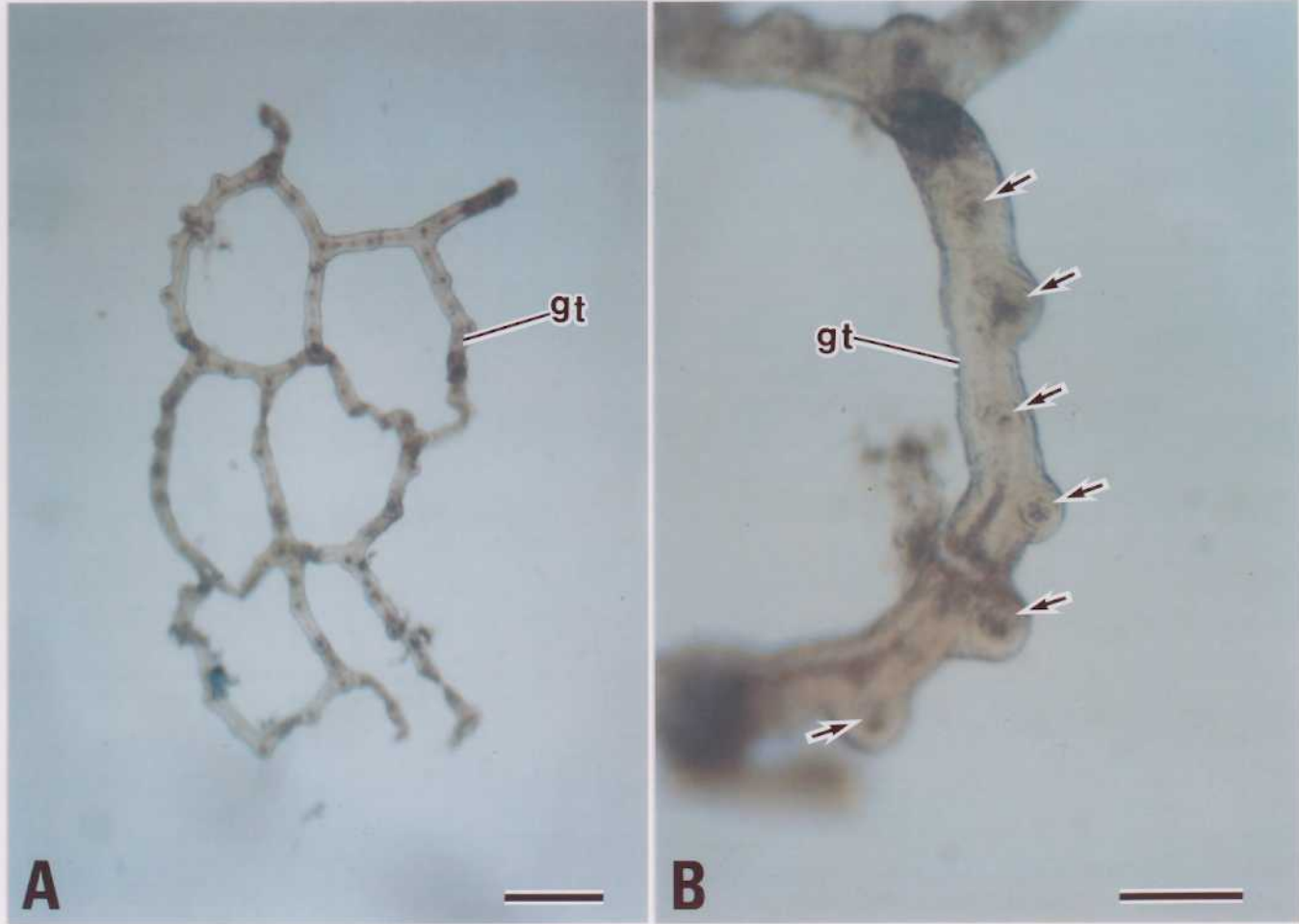
1st generation ← 2nd generation → ← 3rd generation → ← 4th generation →



2

Fig. 3. A: Subadult gonadal network. gt, gonadal tube. Scale = 0.5 mm.

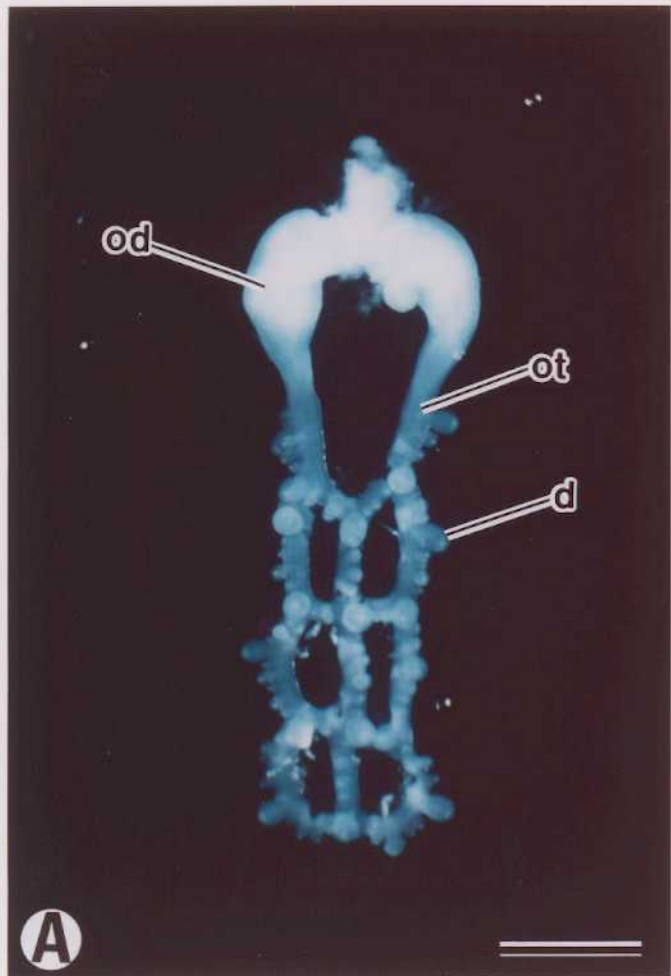
B: Oocytes (arrows) in gonadal tube (gt). Scale = 0.2 mm



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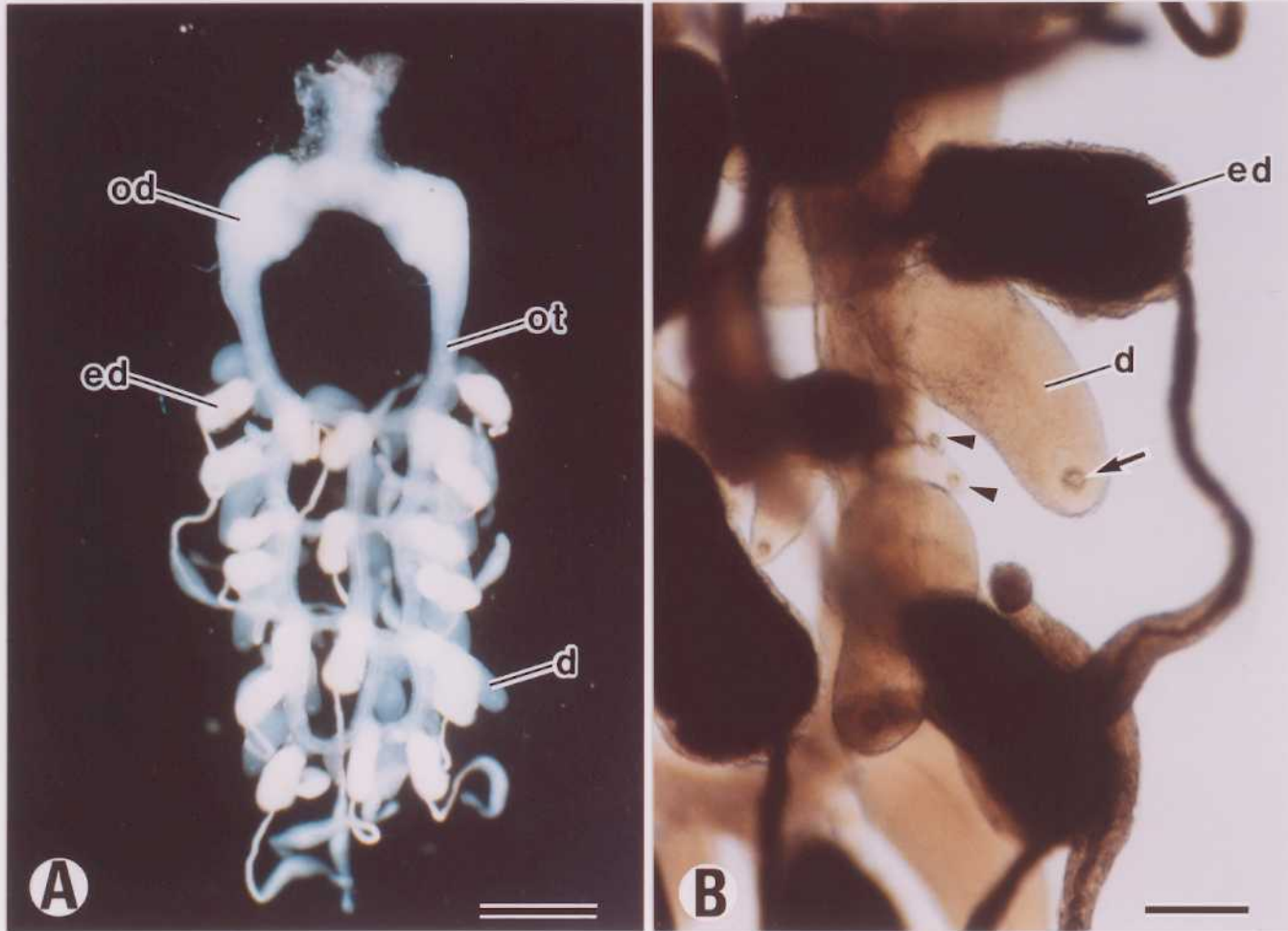
Fig. 4. A: Adult ovary just after the final molt. d, ovarian diverticulum containing oocyte; od, oviduct; ot, ovarian tube. Scale = 1 mm. B: Ovarian diverticula containing oocytes (arrowheads), protruding from the ovarian tube. Scale = 0.2 mm





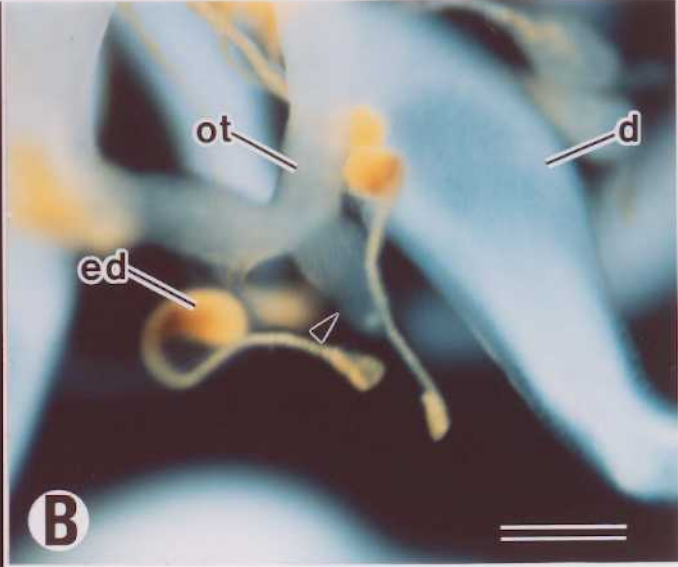
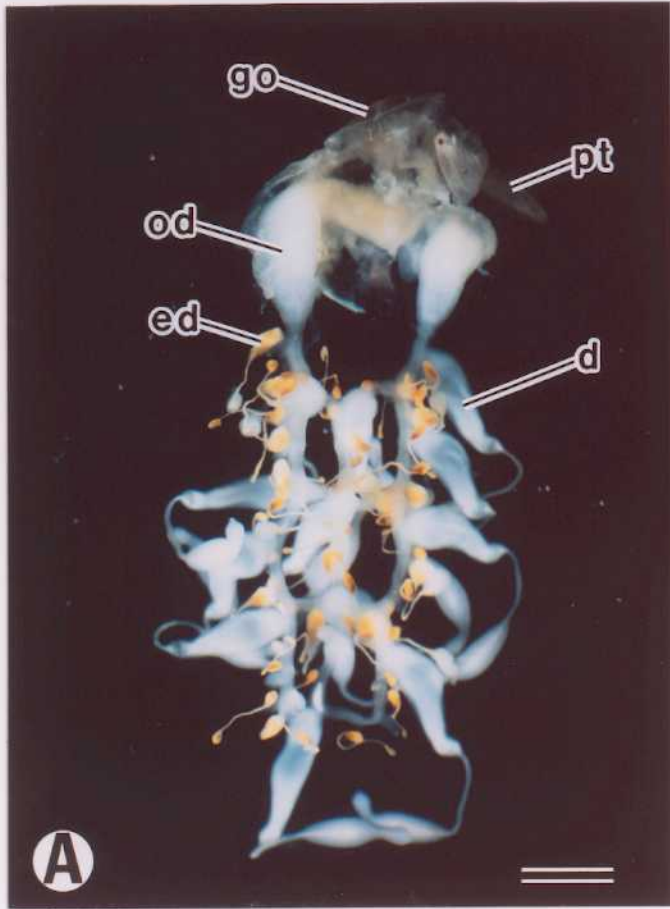
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Fig. 5. A: Ovary after the first parturition. d, ovarian diverticulum containing oocyte or embryo; ed, empty ovarian diverticulum; od, oviduct; ot, ovarian tube. Scale = 1 mm. B: Small ovarian diverticula containing oocyte (arrowheads), growing ovarian diverticulum (d) containing fully grown oocyte or early embryo (arrow), and an empty ovarian diverticulum (ed). Scale = 0.2 mm.



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Fig. 6. A: Ovary after the third parturition. d, ovarian diverticulum containing embryo; ed, empty ovarian diverticulum; go, genital operculum with gonopore; od, oviduct; pt, pecten. Scale = 1 mm. B: Showing small ovarian diverticulum containing oocyte (arrowhead), ovarian diverticulum (d) containing embryo, and old empty ovarian diverticulum (ed). ot, ovarian tube. Scale = 0.5 mm.



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Fig. 7. Sections of ovaries after the third parturition. Hematoxyline and eosin staining. A: Ovarian diverticula of various stages, small one (arrow) containing oocyte, large ones containing embryo (d), and empty ones (arrowheads). Scale = 500  $\mu$ m. B: Small ovarian diverticulum containing an oocyte (oc) and empty ovarian diverticulum (ed). f, follicle epithelium; ie, inner epithelium; oe, outer epithelium. Scale = 100  $\mu$ m. C: Empty ovarian diverticulum (ed) older than shown in figure 7B. Scale = 100  $\mu$ m.



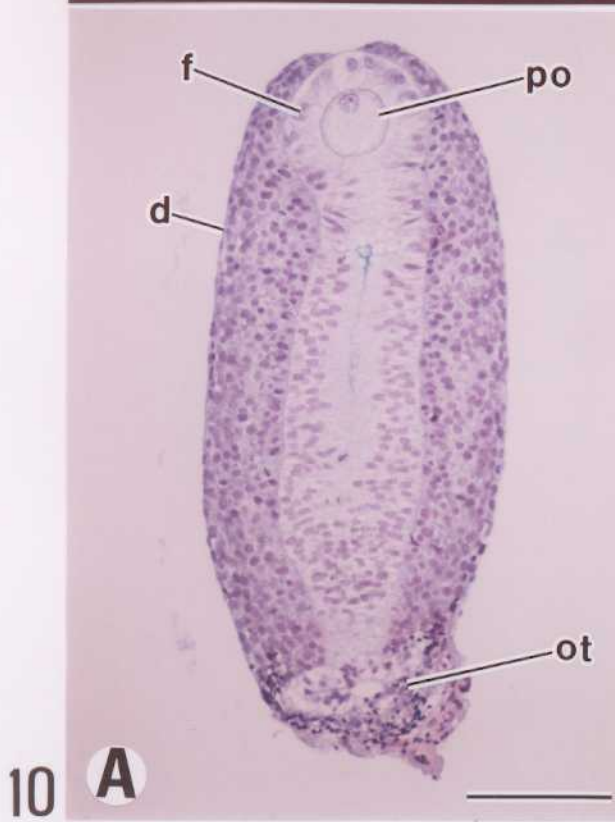
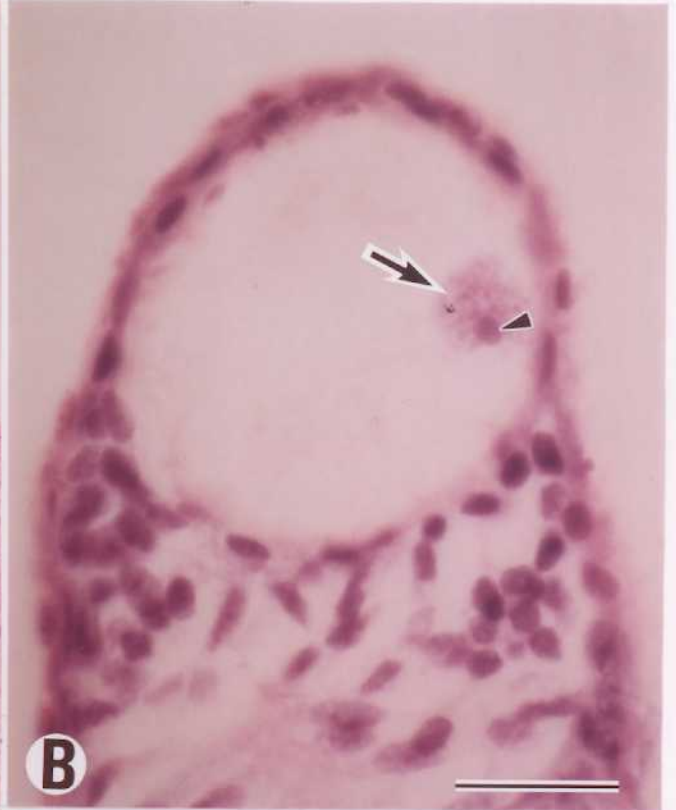
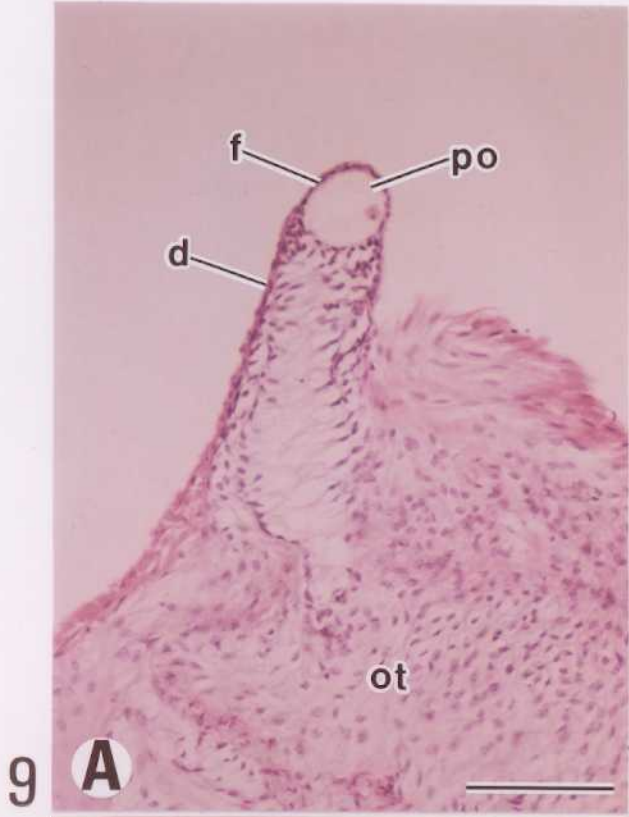
Fig. 8. Sections of ovaries after the fourth parturition. Hematoxyline and eosin staining. A: Ovarian diverticula of various stages, small one (arrow) containing oocyte, large one containing embryo (d), empty ones (arrowheads), and degenerating embryo failed to be born (de). Scale = 500  $\mu\text{m}$ . B: Small ovarian diverticulum containing an oocyte (oc) and empty ovaian diverticula (ed). f, follicle epithelium; ie, inner epithelium; oe, outer epithelium. Scale = 100  $\mu\text{m}$ . C: Large ovarian diverticulum containing embryo (em). Scale = 100  $\mu\text{m}$ .





Fig. 9. A: Small ovarian diverticulum (d) containing growing primary oocyte (po) in the ovary a day after the last parturition. Hematoxyline and eosin staining. f, follicle epithelium; ot, ovarian tube. Scale = 100  $\mu\text{m}$ . B: Enlargement of the primary oocyte. Arrow shows germinal vesicle with a nucleolus (arrowhead). Scale = 20  $\mu\text{m}$ .

Fig. 10. A: Growing ovarian diverticulum (d) containing fully grown primary oocyte (po) in the ovary 16 days after the last parturition. Alcian blue-PAS-hematoxyline staining. f, follicle epithelium; ot, ovarian tube. Scale = 100  $\mu\text{m}$ . B: Enlargement of the primary oocyte. Arrow shows germinal vesicle with a nucleolus (arrowhead). Scale = 20  $\mu\text{m}$ .



**Figs. 11-16. Prophase to telophase of the first maturation division. Hematoxyline and eosin staining. Scale = 20  $\mu$ m.**

Fig. 11. Primary oocyte in resting stage. Arrow shows germinal vesicle with a nucleolus (arrowhead).

Fig. 12. Pachytene stage. Arrow shows germinal vesicle with pachynemas and without nucleolus.

Fig. 13. Prometaphase. Arrow shows bivalent chromosomes assembling in a plane.

Fig. 14. Metaphase. Arrow shows bivalent chromosomes arranged in a plane.

Fig. 15. Equatorial view of metaphase. Arrowheads show spindle fibers.

Fig. 16. Telophase. fpb, first polar body; so, secondary oocyte.

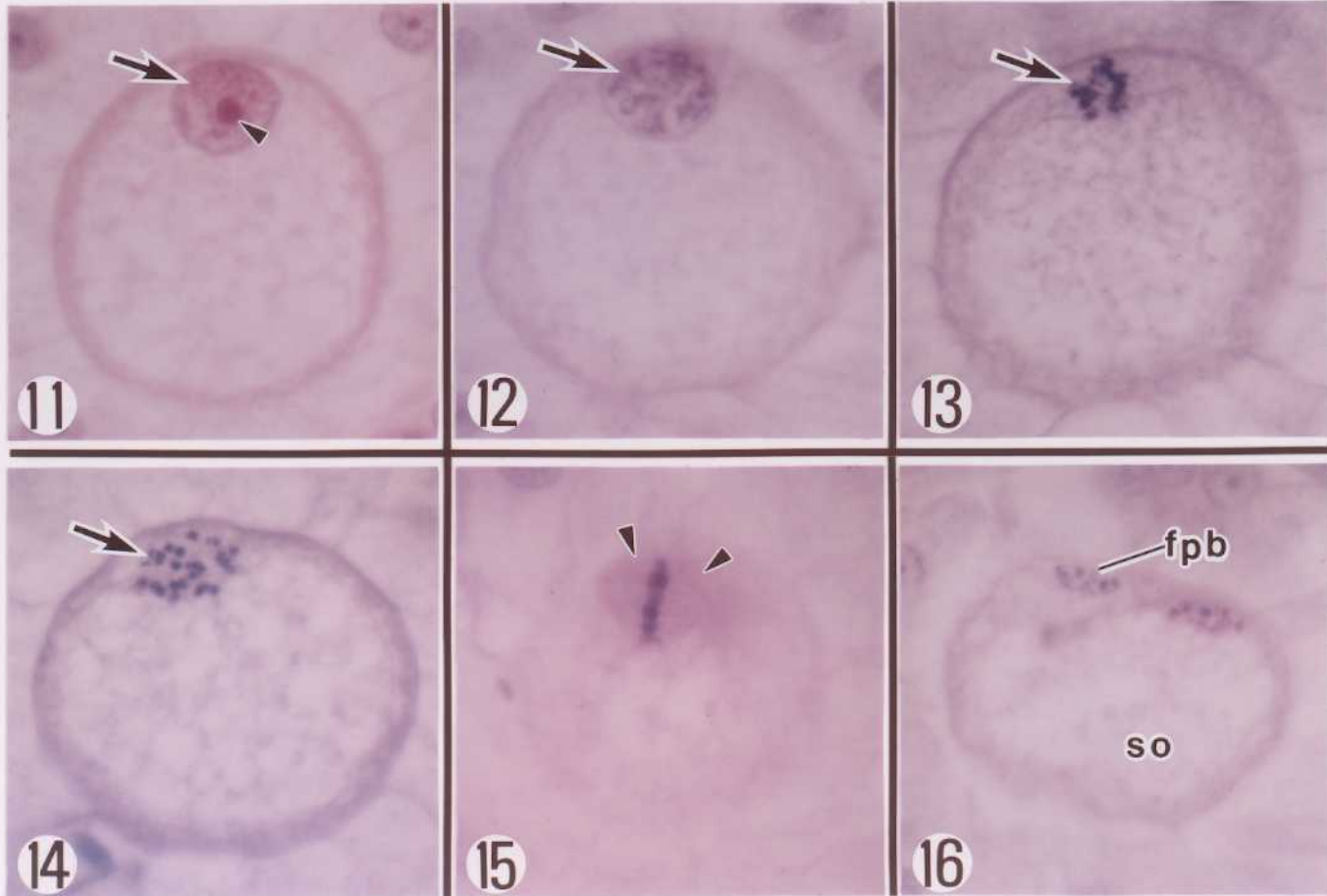


Fig. 17. Three serial sections of a secondary oocyte in prophase of the second maturation division. Hematoxyline and eosin staining. Scale = 20  $\mu$ m. A: Secondary oocyte (so) with first polar body (fpb), the polar body nucleus shown here. B: Secondary oocyte (so). C: Secondary oocyte (so), its nucleus including condensed chromatin (arrow).

Fig. 18. Four serial sections of a secondary oocyte in prometaphase of the second maturation division. Hematoxyline and eosin staining. Scale = 20  $\mu$ m. A: Secondary oocyte (so) with first polar body (fpb). B: Secondary oocyte (so). C and D: Secondary oocyte (so), its chromatin (arrow) becoming condensed.

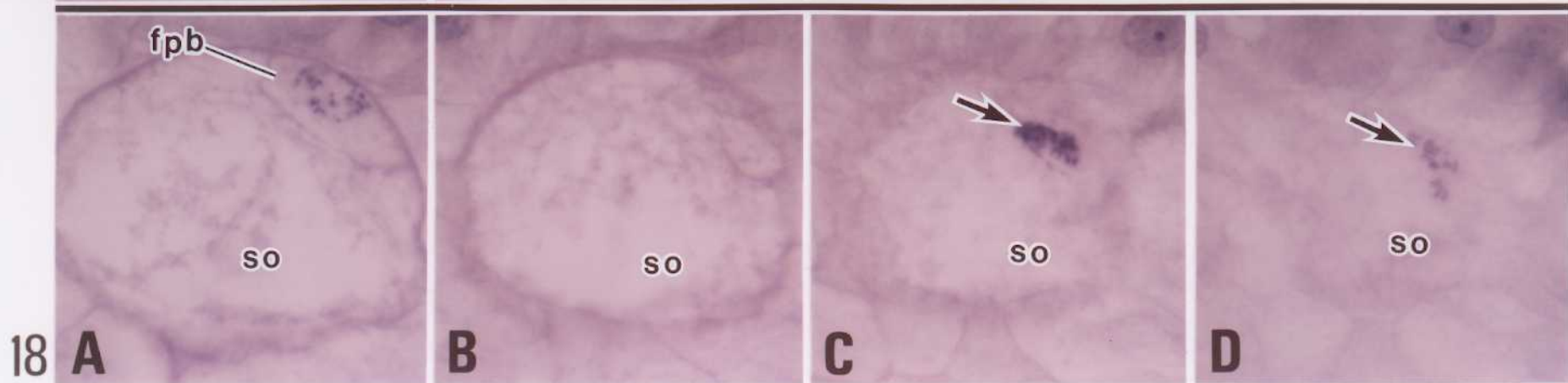
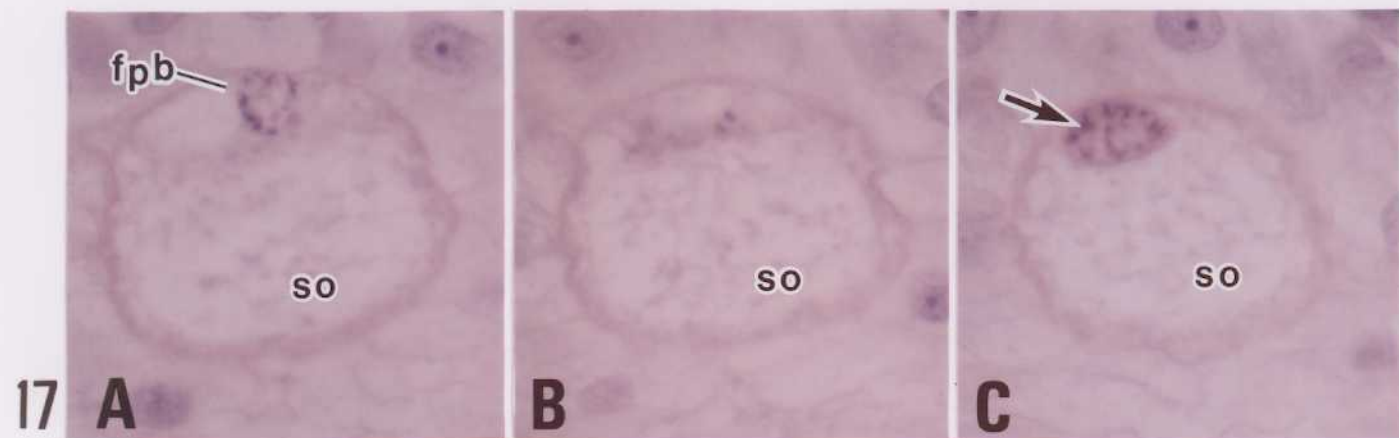
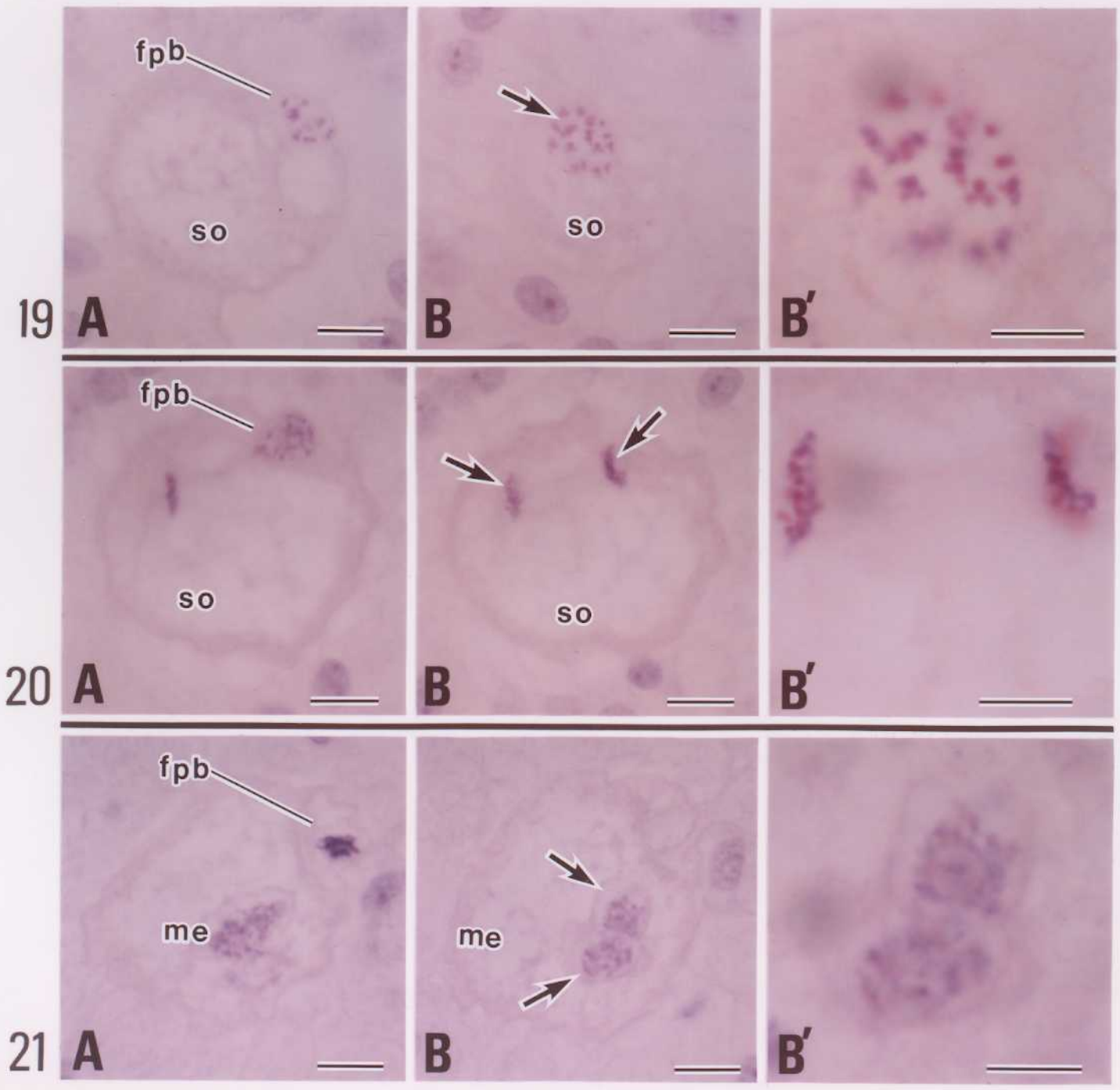


Fig. 19. Two serial sections of a secondary oocyte in metaphase of the second maturation division. Hematoxyline and eosin staining. Scales = 10  $\mu$ m. A: Secondary oocyte (so) with first polar body (fpb). B: Chromosomes of secondary oocyte (so) arranged in a plane (arrow). B': Enlargement of metaphase figure.

Fig. 20. Two serial sections of a secondary oocyte in anaphase of the second maturation division. Hematoxyline and eosin staining. Scales = 10  $\mu$ m. A: Secondary oocyte (so) with first polar body (fpb). B: Two sets of chromosomes separated (arrow) in secondary oocyte. B': Enlargement of separated chromosome sets.

Fig. 21. Two serial sections of a mature egg with both egg nucleus and sister second polar body nucleus. Hematoxyline and eosin staining. Scales = 10  $\mu$ m. A: Mature egg (me) with first polar body (fpb). B: Mature egg (me) with two nuclei contacting each other (arrows). B': Enlargement of B, showing both nuclei in contact, but not fused with each other.





**Figs. 22-25. Second maturation division in the first polar body.**

**Hematoxyline and eosin staining. Scales = 10  $\mu$ m.**

**Fig. 22. A: Prophase.** Arrow shows nucleus of the first polar body. so, secondary oocyte. **B: Enlargement of the first polar body.**

**Fig. 23. A: Prometaphase.** Arrow shows condensed chromatin of the first polar body. so, secondary oocyte. **B: Enlargement of chromatin.**

**Fig. 24. A: Metaphase.** Arrow shows chromosomes arranged in a plane. so, secondary oocyte. **B: Enlargement of chromosomes.**

**Fig. 25. A: Telophase.** Arrows show nuclei of the second polar bodies.

Cytoplasmic fission is completed. Two new second polar bodies lies adjacent to embryo in the first cleavage (em). **B: Enlargement of two second polar bodies.**

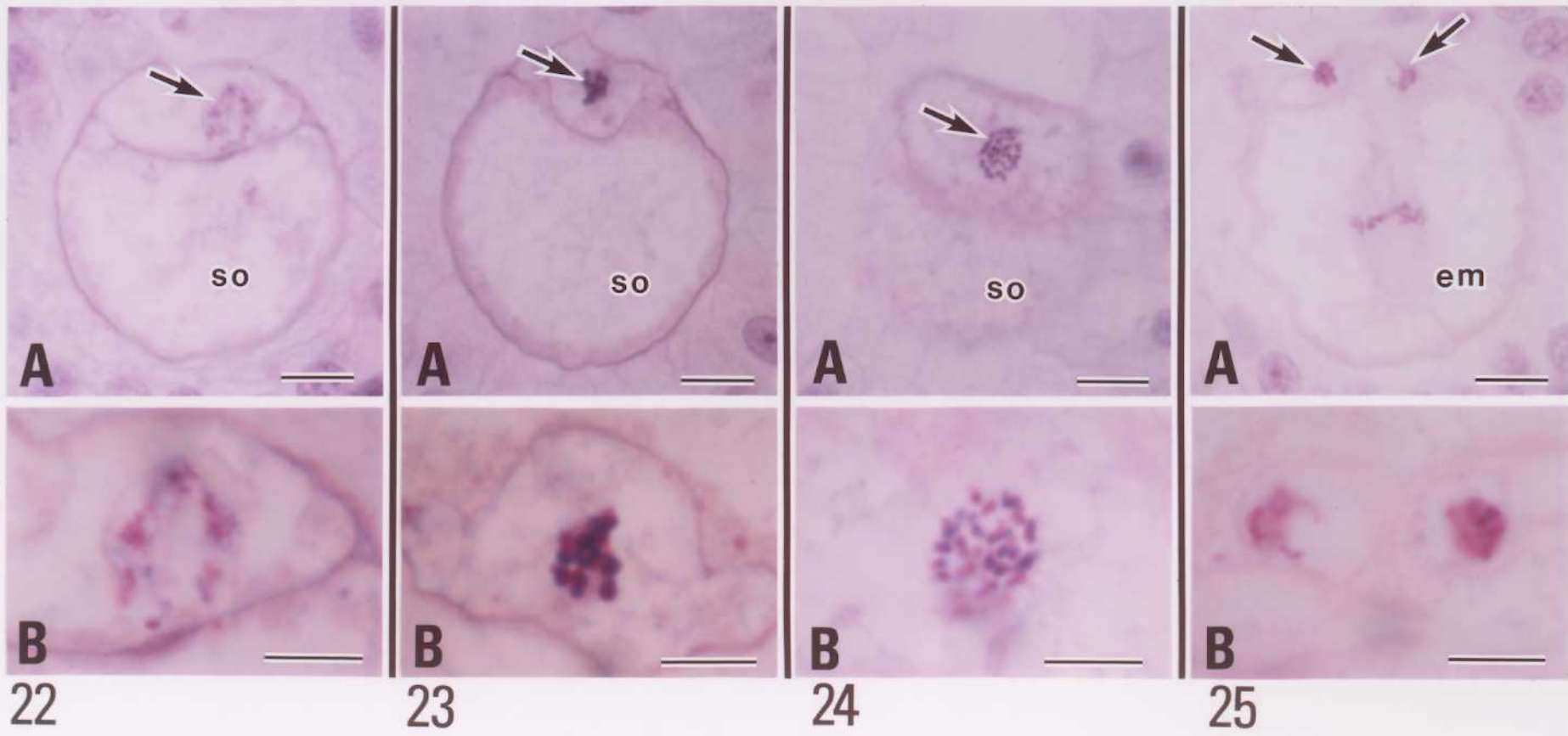
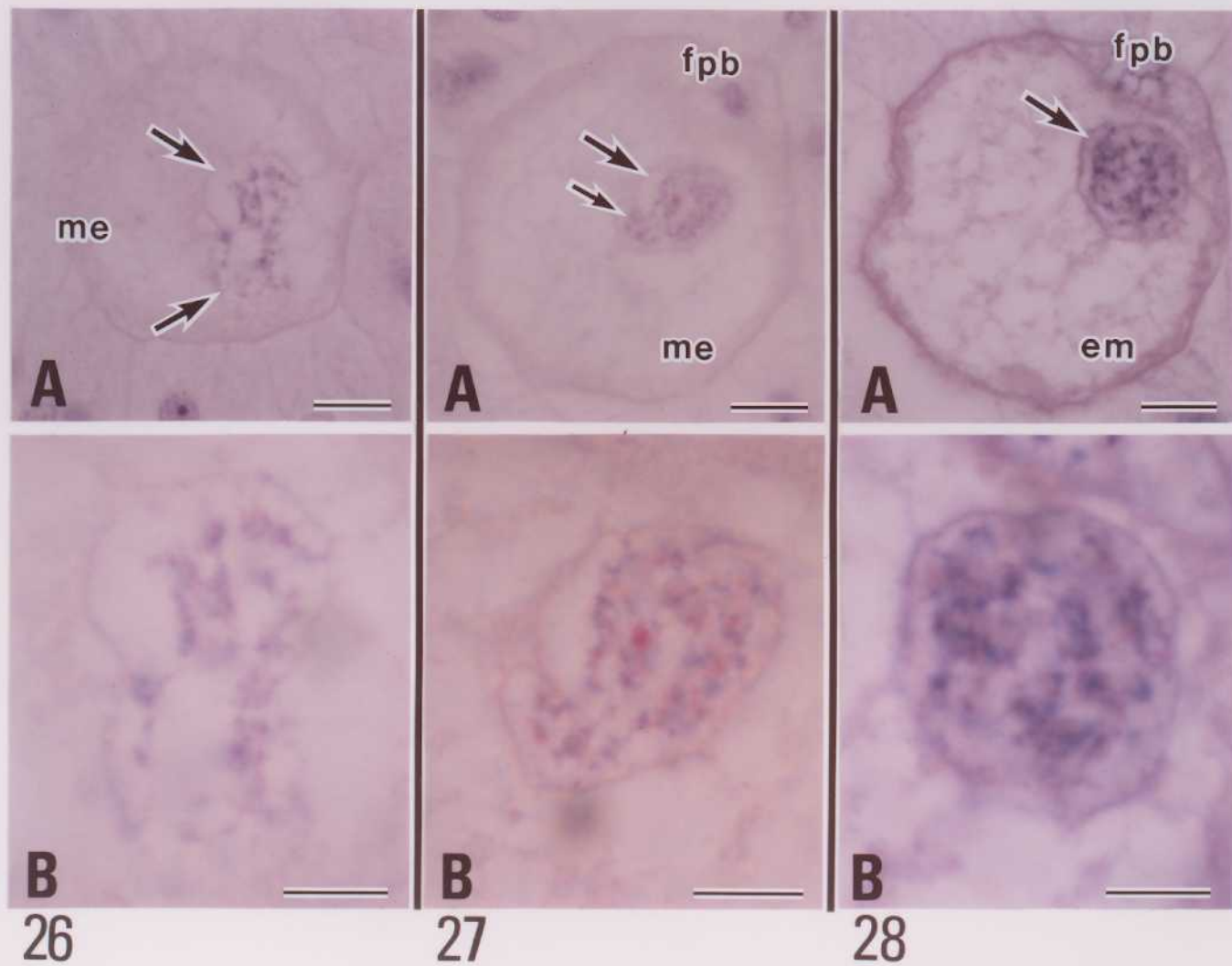


Fig. 26-28. Fusion of egg nucleus with sister second polar body nucleus. Hematoxyline and eosin staining. Scales = 10  $\mu$ m.

Fig. 26. A: A mature egg (me) with an egg nucleus and a second polar body nucleus (arrows) making an approach each other. B: Enlargement of both nuclei in partial contact but separated by their nuclear membranes.

Fig. 27. A: A mature egg (me) with an egg nucleus and a second polar body nucleus (arrows) in tight contact with each other. fpb, first polar body. B: Enlargement of both nuclei between which their nuclear membranes partly disappear.

Fig. 28. A: Both nuclei are completely fused into a single embryonic nucleus (arrow). em, embryo; fpb, first polar body. B: Enlargement of a single embryonic nucleus.



**Figs. 29-36. First cleavage. Hematoxyline and eosin staining.**

Scale = 20  $\mu$ m.

Fig. 29. A single-cell embryo with a nucleus (arrow) after fusion.

Arrowhead shows a nucleolus. fpb, first polar body.

Fig. 30. Prophase of the first cleavage. Nucleolus has disappeared in the nucleus (arrow). fpb, first polar body.

Fig. 31. Prophase. Chromosomes appear in the nucleus (arrow).

Fig. 32. Metaphase (polar view). Nuclear membrane has disappeared.

Chromosomes (arrow) are arranged in a plane. fpb, first polar body.

Fig. 33. Metaphase (equatorial view), showing chromosomes and spindle fibers (arrowheads). fpb, first polar body.

Fig. 34. Anaphase, showing two daughter chromosomes separated (arrows). fpb, first polar body.

Fig. 35. A two-cell embryo and a first polar body (fpb). b, blastomere.

Fig. 36. A two-cell embryo with two second polar bodies (arrows) derived from a first polar body at the second maturation division. b, blastomere.

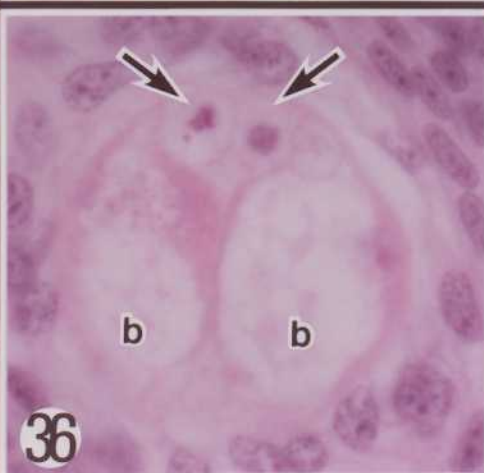
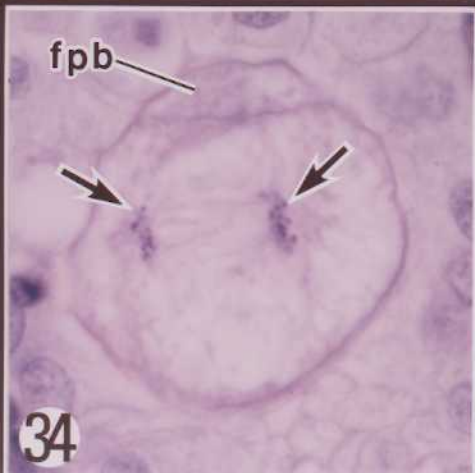
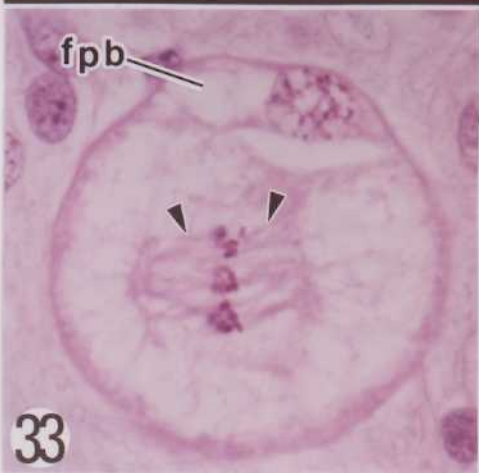
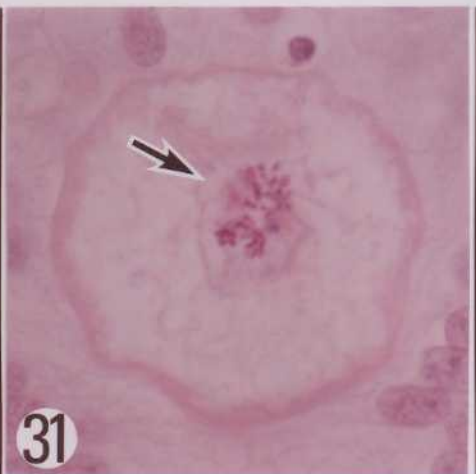
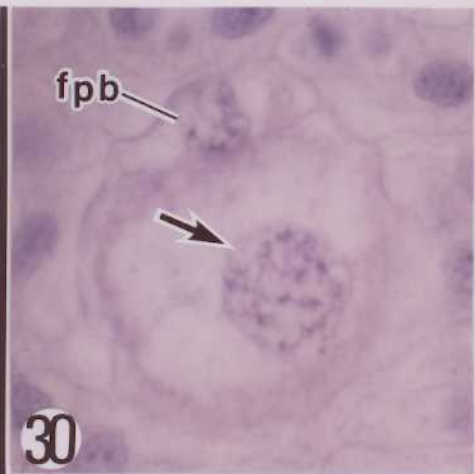
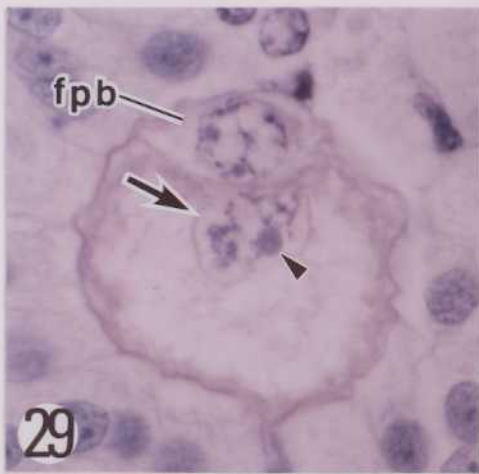


Fig. 37. Distributions of chromosome numbers in ovarian diverticula from ten females.



No. of meiotic and mitotic figures observed

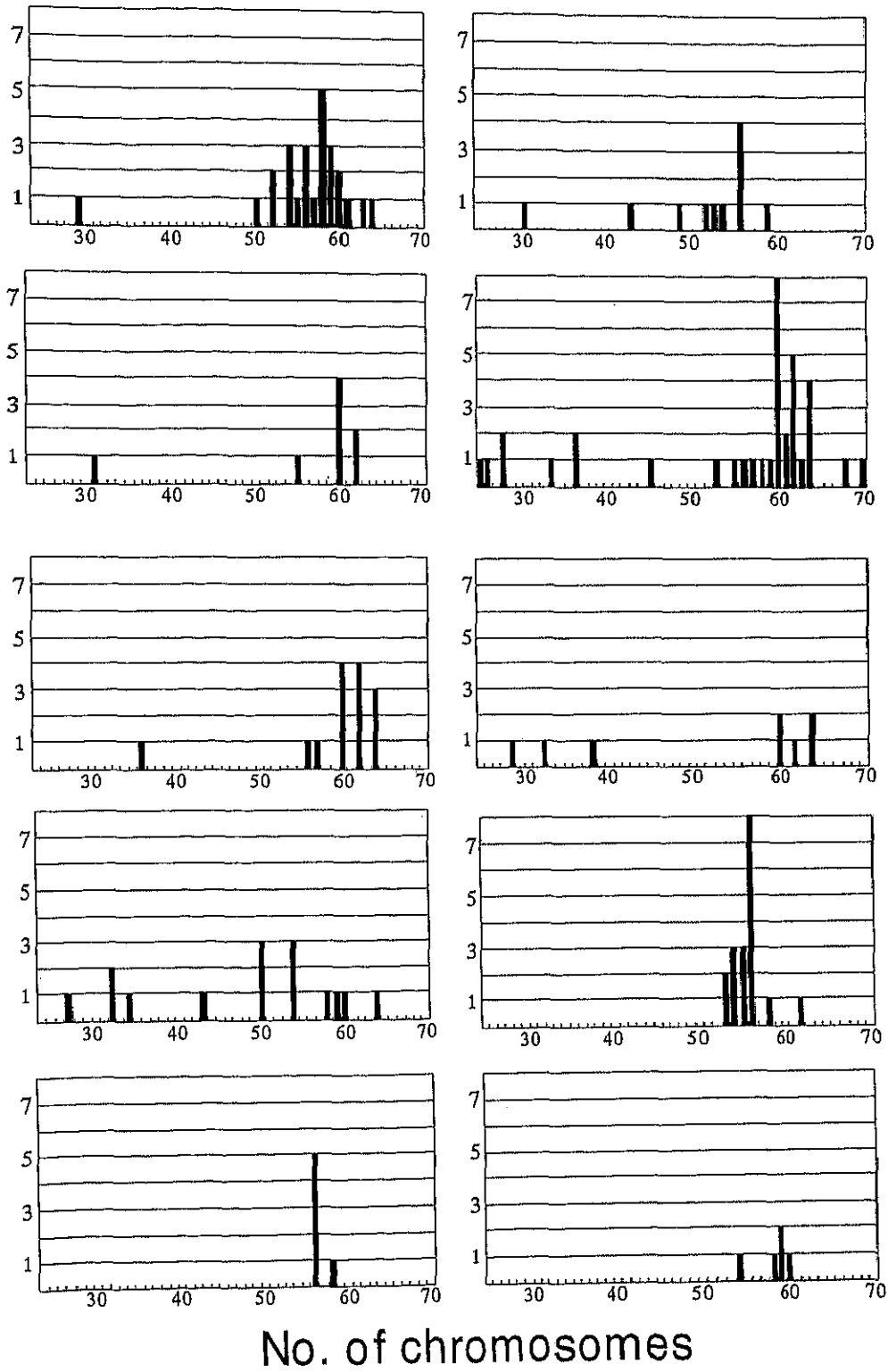


Fig. 38. A: Metaphase of maturation division with 30 chromosomes. B:  
Metaphase of mitotic division with 60 chromosomes. Scale = 10  
 $\mu\text{m}$ .

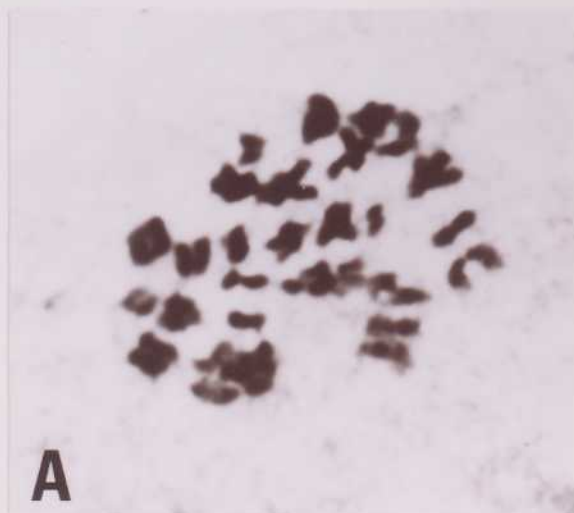
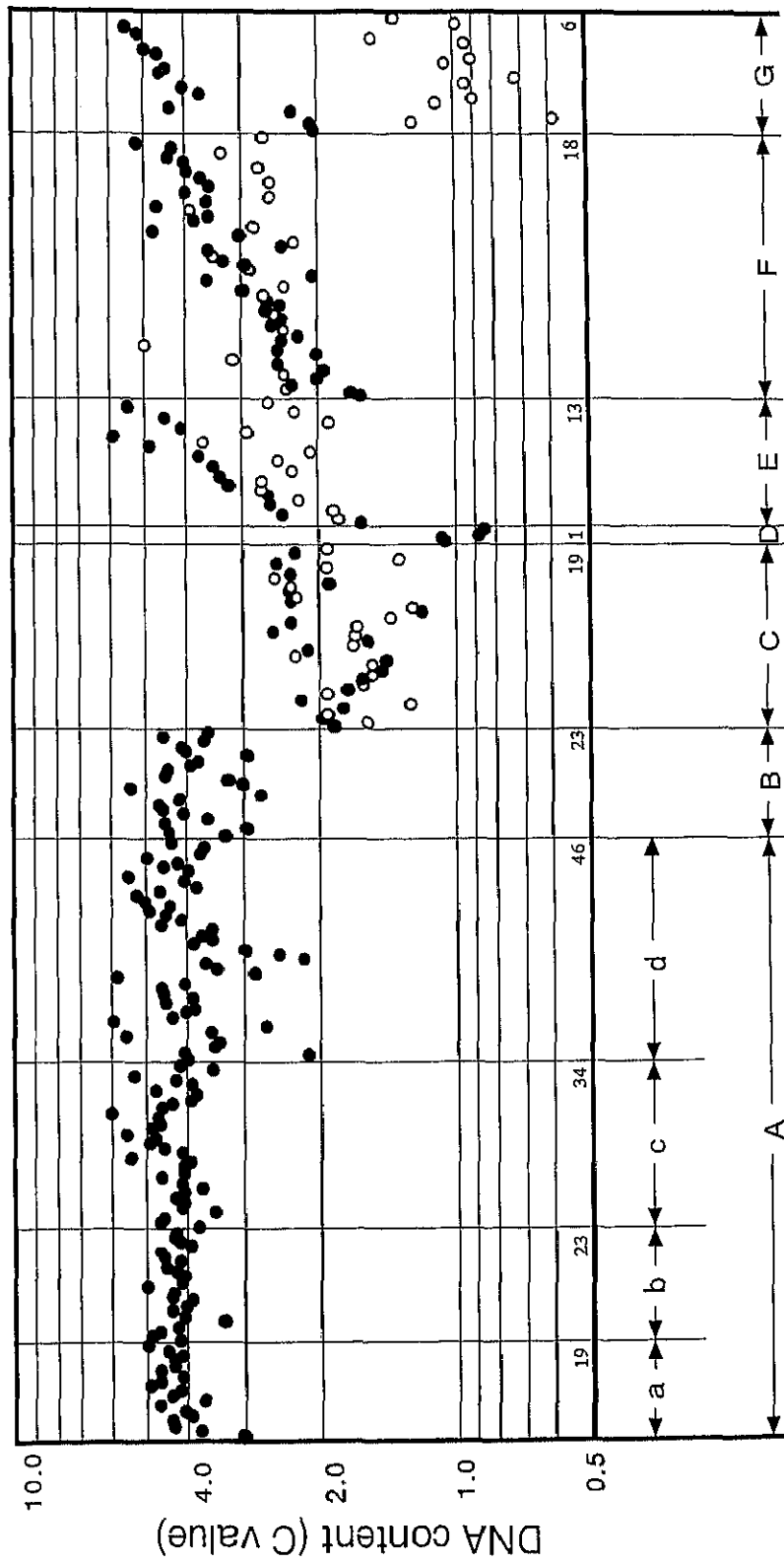


Fig. 39. Nuclear DNA contents of female germ cells, polar bodies, and embryonic cells. A: Prophase nuclei in oocytes not followed by polar bodies; a: nuclei of the largest primary oocytes in females just before the final molt, b: nuclei of the largest primary oocytes in adult females just after the final molt, c: nuclei of younger primary oocytes in adult females, d: nuclei of the largest oocytes (most are the primary and a few possibly may be the secondary) in females several days or just before the next pregnancy. B: Oocyte nuclei in metaphase of the first maturation division. C: Oocyte (solid circle) and 1st polar body (open circle) nuclei in telophase of the first maturation division. D: An egg nucleus and three 2nd polar body nuclei just after the second maturation division. E: Nuclei of embryos before the first cleavage (solid circles) and of 1st polar bodies (open circles). F: Nuclei of two cell-stage embryos and of 1st polar bodies. G: Nuclei of two cell-stage embryos and of 2nd polar bodies derived from 1st polar bodies. The number of samples used for each division is shown in each column of the divisions.



Cell types and nuclear conditions