SHORT NOTES

A DYEING TECHNIQUE FOR OTOLITH AGE READING

The alternating transparent and opaque zones in otoliths are accompanied by a system of rings which are often as obviously annual as the zones themselves. Annual rings in otoliths can be made visible by burning the otolith lightly in a flame (CHRISTENSEN, 1964) or by means of surface microscopy (WIEDEMANN SMITH, (1968)). The rings are assumed to represent thin membranes of organic material deposited between concentric layers of calcareous deposits, and some of the dyes traditionally used in histological techniques react to the membranes. A technique using "Methyl violet B", gives satisfactory results, showing these membranes as dark-violet rings.

Figure 1 shows two photographs of the same turbot otolith mounted and transversely cut as described by WIEDEMANN SMITH (1968). In (A) the undyed otolith is seen in surface illumination, the light being transmitted through one tube of an ordinary low-power binocular. In (B) the same otolith is dyed and illuminated in the usual way from all directions. Both methods produce a ring pattern and the parallel lines drawn in the figure do not leave much doubt that the rings are the same. Figure 2 shows a sole otolith treated in the same manner.

There might be a suspicion, however, that the dye was only mechanically deposited in depressions in the otolith surface. Therefore it should be noted that the surface picture (A) shows some scratches due to imperfect polishing. Far from being filled with dye these scratches are invisible in the dyed specimen (B). Obviously careful polishing of the otolith, necessary in surface microscopy, can be omitted when the rings are made visible by means of a dye.

The dye is prepared as follows. Add 0·05 g "Methyl violet B" to 30 ml distilled water and stir until the dye is dissolved. Add 1 ml concentrated HCl, 38 %, while stirring again. The solution must be used within a few hours.

With one stroke of a soft brush a thin covering of dye is applied to the cut otolith surface which will effervesce and leave the organic membranes slightly protruding. After 20–40 seconds, the acid is neutralized by calcium carbonate from the otolith. The fluid changes from almost colourless to a light violet, dyeing of the membranes begins and continues until the water has evaporated. If the result is unsatisfactory more dye can be applied with the brush by touching the edge of the otolith. The surface with the protruding membranes must not be touched. The specimen should be cleaned by dipping it in water for a short time. The dyed specimen can be protected by a small piece of glass glued on with "Canada balsam".

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J. Cons. perm. int. Explor. Mer | 32 | No. 2 | 278–80 | Copenhague, Novembre 1968

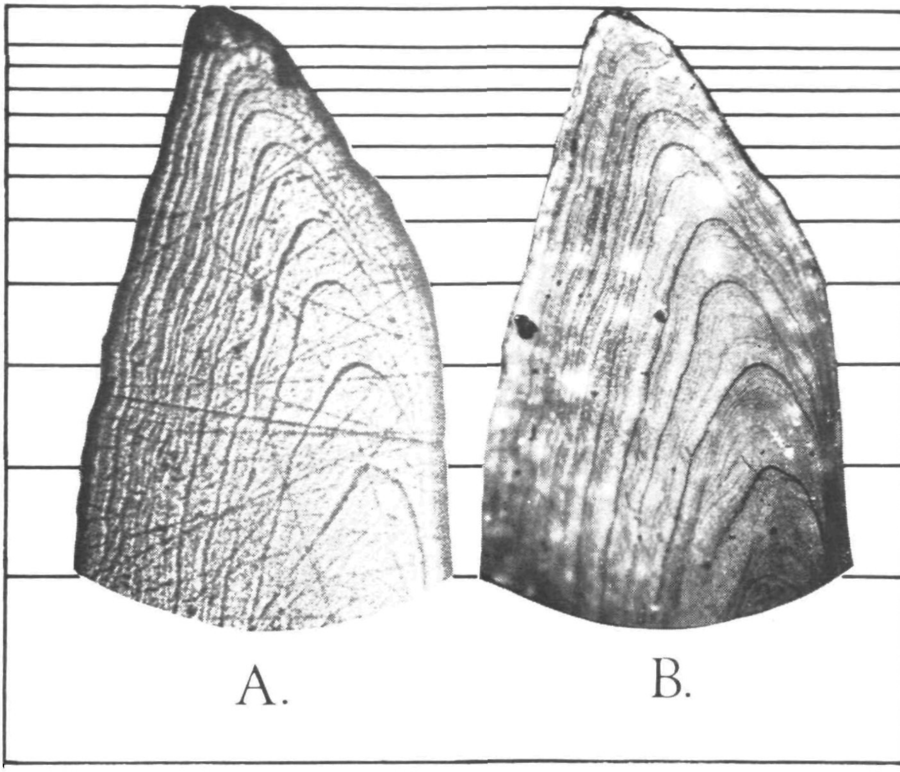

Figure 1. A turbot (*Psetta maxima*) otolith as seen in a surface microscope (A), and after dyeing, in an ordinary microscope (B).

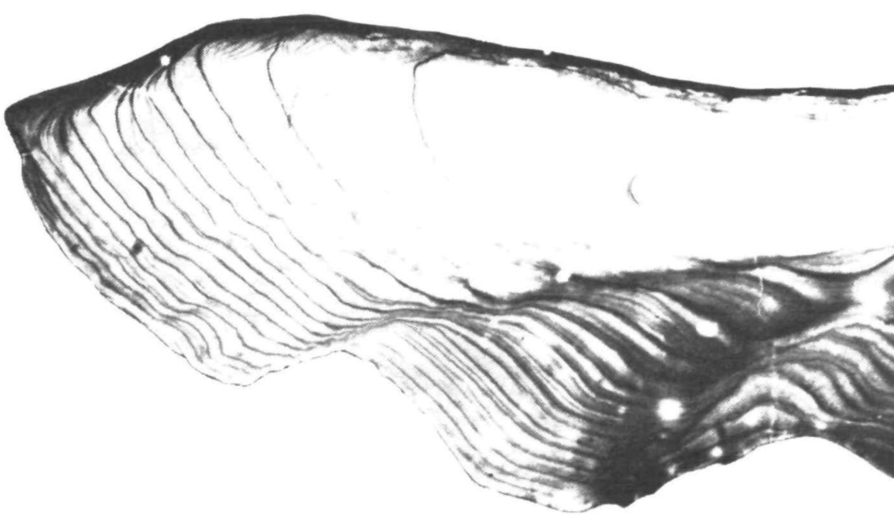

Figure 2. A sole (*Solea solea*) otolith after dyeing, viewed in an ordinary microscope.

REFERENCES

CHRISTENSEN, J. MØLLER, 1964. "Burning of otholiths, a technique for age determination of soles and other fish". J. cons. perm. int. Explor. Mer, **29**: 73–81.

WIEDEMANN SMITH, S., 1968. "Otholith age reading by means of surface structure examination". J. cons. perm. int. Explor. Mer, **32**: 270–7.

AN ELECTRONIC FISH SCALE PROPORTIONING SYSTEM

The back calculation of growth using the annular rings on scales is a routine standard procedure in fisheries research. To increase the speed and accuracy of this operation an electrical proportioning system was devised (Figure 1).

If a set voltage is applied to the extremities of a potentiometer wire, the voltage between the slider contact and one end is directly proportional to the distance between the slider and that end. If the potentiometer wire is superimposed on a projected, and magnified, image of a fish scale in such a way that the scale radius corresponds to the potentiometer wire length, and if the slider is positioned against one of the growth rings, the voltage at the slider, relative to the applied voltage, will have the same proportions as those of the growth ring to the full fish scale radius.

This voltage can be unambiguously read on a digital voltmeter, and by applying a suitable voltage across the measuring potentiometer (RV1) the units displayed can correspond to length measurements.

In the equipment developed we have used a multi-turn potentiometer as our measuring potentiometer, this being driven by a rack and pinion system mounted on the fish-scale image projector.

A zener stabilized voltage is applied across RV1, and the fish length scaling factor is obtained by shunting some of the slider current through R5, R6, RV2, this being found to give better stability than changing the voltage across RV1. R3 and RV3 set the system slightly positive of Ov to allow some adjustment for zero drift (Figure 2).

The accuracy of the system depends on the linearity of the measuring potentiometer, the accuracy of the digital voltmeter, and the stability of the other components. Checking the system against a centimetre rule, the following figures were obtained.

12 cm traverse, set f.s.d. at 240

	1	2	3	4	5	6	7	8	9	10	11	12	
reading.....	19	39	59	80	100	120	140	160	181	201	221	240	rising
reading.....	19	39	59·5	80	100	119	140	160	181	200	221	240	falling
reading.....	20	40	60	80	100	120	140	160	180	200	220	240	theoretical

resolution is 0·5 mm per digit
drift over the period of one measurement is negligible
drift over five hours is ± 1 digit from the set point.
hysteresis (see table) is negligible.