their containers in alcohol to which solid carbon dioxide was added in such quantities as to give a cooling rate of 1 deg. C./min. Rapid cooling was resorted to when the temperature reached about -30°C . The eggs were found to die, but the spermatozoa remained alive when kept under these conditions. In early September, ripe autumn-spawning herring became available. The stored milt was thawed in water at 40°C . and the eggs from a ripe autumn-spawning herring were fertilized. The rapidly-frozen sperm gave a fertilization of 85 per cent, the slowly-frozen sperm one of 80 per cent. The eggs were placed in a constant-temperature tank at 11.5°C . and 5 per cent of the total number of eggs hatched. This percentage hatching was the same as that of another batch of eggs in the same tank for which both parents were autumn spawners.

This storage technique opens up possibilities for testing the interfertility of closely related fish species and other animals with different spawning times or places. Reproductive isolation is one of the criteria used in defining a species, and experiments such as that described above might be of value to the systematist. It is proposed to extend these experiments to other 'types' of herring and to other species of Clupeoids.

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Naras Seed Protein

THE naras (*Acanthosicyos horrida*, Hook) is a cucurbitaceous plant, which occurs particularly near Walvis Bay in South-West Africa. The fruit is a small melon consisting of an outer rind and six segments which contain numerous seeds. The fruits and the seeds derived from them were extensively used as foods by the desert dwellers of the area in earlier days, and are still used to some extent in this way. More recently, the seeds have been collected and exported to South Africa, where they have found use in the confectionery industry. Versfeld and Britten¹ found that the seed kernels consist mainly of protein (35 per cent) and fat (53 per cent).

The proteins of oil-free naras seed meal were extracted with 10 per cent sodium chloride and then four volumes of water were added to each volume of the extract, causing precipitation of the extracted protein. The protein obtained resembles edestin² in being soluble only in buffers of relatively high salt concentration. Measurements on a Brice-Phoenix light-scattering photometer³, using the ultrafiltration method of Goring and Johnson⁴ for the clarification of the solutions, gave a molecular weight of 343,000 at ionic strength (I) 1.0 and pH 7.8 for this preparation.

In a second preparation the proteins extracted with 10 per cent sodium chloride were precipitated by saturating the extract to 45 per cent with ammonium sulphate. This preparation gave a light-scattering molecular weight of 341,000 at $I = 1.0$ and $pH = 7.9$. Thus, the two preparations probably

Fig. 1. Electrophoresis diagrams of naras seed protein-sodium dodecyl sulphate complexes

represent the same protein fraction, and have a molecular weight comparable with values reported for other seed globulins⁵.

Whereas naras seed protein is only soluble in buffers of high salt content ($I = 1.0$), it is rendered soluble in buffers of low ionic strength ($I = 0.1$) by the addition of 1 per cent sodium dodecyl sulphate. This fact alone seems to indicate that a detergent-protein complex is formed. The electrophoretic diagrams (shown in Fig. 1) obtained for complexes prepared at $I = 0.1$ and 0.2 at $pH = 7.8$ indicate that these are electrophoretically homogeneous. The light-scattering molecular weights of these complexes are shown in the table.

Preparation	$\frac{dn}{dc}$	Molecular weight	Uptake of sod. dodecyl sulph. (gm./gm. protein)
Original protein $I = 1.0$ $pH = 7.8$	0.188	342,000	—
Complex at $I = 0.1$ $pH = 7.8$	0.164	98,000	0.47
Complex at $I = 0.2$ $pH = 7.8$	0.164	163,000	0.47

The molecular weights of the complexes are very much lower than that for the original protein, due to a breakdown of the protein in complex formation. Although the detergent uptake for the two complexes is the same, nevertheless there is a considerable difference in the respective molecular weights. Calculations from the known composition of the complexes have shown that complexes with sodium dodecyl sulphate have been formed in which the weight of protein per molecule of complex is about 56,000 and 110,000 for preparations at $I = 0.1$ and $I = 0.2$ respectively. This suggests breakdown of the original protein molecule into sixths at $I = 0.1$ and thirds at $I = 0.2$.

When arachin was treated with sodium dodecyl sulphate under similar conditions⁶, an extensive breakdown of the protein occurred, but the sedimentation constants, and hence molecular weights, at $I = 0.1$ and 0.2 were of the same order.

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