

Seasonal cycles of two species of scallop (*Bivalvia: Pectinidae*) on an inshore and an offshore fishing ground.

W.M.T.B. Wanninayake

ABSTRACT

Seasonal cycles of reproduction, energy storage and energy utilisation were investigated over a period of two years (May 1991 to April 1993) in two commercially exploited species of scallop: the queen scallop *Aequipecten opercularis* and the great scallop *Pecten maximus*. Population of each species from two areas with differing environmental conditions were selected for comparative study, namely an inshore (Laxey Bay) and an offshore (10 nautical miles (18.5 km) south east of Port St. Mary) fishing ground. Three aspects relating to the reproductive biology were studied. Firstly, the annual spawning cycle of both species was assessed more precisely than in previous studies. Secondly, changes in somatic tissues were observed, in relation to reproductive events, in order to describe the fate of each body component during gametogenesis. Finally, seasonal cycles of energy storage and utilisation in different somatic tissues were investigated.

For *Aequipecten opercularis* there were three more-or-less distinct peaks of spawning each year in the Laxey Bay population (winter, summer, autumn) but only two in the Port St. Mary population (winter, summer). For *Pecten maximus* there were two peaks in the Laxey Bay population (summer, autumn) but only a single summer peak in the Port St. Mary population. The most important spawning period of both species was in the summer but there was probably also some continuous low-level release of gametes throughout the spring and summer. In the smaller number of annual spawning peaks and the absence of an autumn spawning, the offshore Port St. Mary populations resembled other populations further north in the geographical range, for both species. In contrast, the spawning patterns of the Laxey Bay populations were generally similar to those described for other Irish Sea and more southerly populations.

There were distinct seasonal cycles in the dry weight of the somatic tissues (adductor muscle, mantle tissue, digestive gland, gonads) and in their biochemical composition (protein, lipid, glycogen) for both species. The dry weight of the adductor muscle was lowest in spring but increased during the summer to a maximum in autumn. This was due primarily to an increase in protein and glycogen. The digestive gland followed a similar seasonal pattern but changes in weight also involved large changes in lipid. Mantle tissue varied little seasonally but followed the same pattern. Seasonal cycles of dry weight and biochemical composition of the gonads were the inverse of the cycles in the other tissues, rising through autumn and winter to a high level in spring, then falling through the summer. Major variations in biochemical composition of the gonads were due mainly to protein and lipid, these being the major constituents of the gametes.

Gametogenesis of both scallops and queens took place mainly during the winter, when food availability is low. It was supported by reserves of protein and glycogen stored mainly in the adductor muscle, and lipids stored mainly in the digestive gland. These nutrient reserves also supply maintenance energy demands during the winter. The quantity of lipid lost from the digestive gland was adequate to account for that built up in the gonads but specific amino acids may be synthesised from glycogen.

The seasonal cycles of both species differed in magnitude and timing on the two grounds. Nutrients built up to higher levels in the Port St. Mary populations and with no autumn spawning in either species on this ground, gametogenesis and the depletion of stored reserves proceeded 1-3 months earlier than in the Laxey Bay populations.

The synchronisation of seasonal cycles, and the differences noted between the two species and between the two grounds, are discussed in relation to various environmental factors including phytoplankton productivity, temperature, depth, water currents and other hydrographic features. The genetic regulation of spawning cycles is also discussed and areas for future research are highlighted.