or night, and that the fish were present in small shoals of twelve to twenty fish. A local population density of about 2,000,000 fish per square mile was estimated from the known lens angle and limits of visibility.

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Influence of the Organic Matrix on Crystal Type in Molluscs

The calcium carbonate of mollusc shells occurs as calcite in some species, as aragonite in others, and certain species deposit calcite in one portion of the shell and aragonite in another portion. Various explanations have been suggested for the formation of aragonite, which is significantly less stable. Participation of the enzyme carbonic anhydrase and the influence of the protein matrix on which the crystals are deposited have both been suggested[1]. We have investigated the capacity of pieces of decalcified matrix to induce aragonite formation when inserted into a mollusc which normally forms only calcite, and also under *in vitro* conditions in which calcium carbonate is normally precipitated as calcite.

Protein matrix was prepared from shells of the fresh-water clam *Elliptio complanatus*, from the marine fan shell *Atrina rigida*, and from the nacreous layer of the Japanese pearl oyster *Pinctada martensii* by decalcifying with 1 per cent sodium ethylenediamine tetraacetate at *p*H 5·0. In each case the shell from which the matrix was taken was aragonite. Microscopic examination of each piece of matrix showed that all crystalline material had been removed. To make certain that submicroscopic crystals did not remain, some pieces of matrix were treated further with 0·01 *N* hydrochloric acid. For *in vivo* studies a single piece of decalcified matrix was wrapped around a fragment of glass cover-slip and inserted between the mantle and shell of the oyster *Crassostrea virginica*, which deposits a calcite shell. The temperature of the water was 19–25° C. The inserted pieces of matrix were removed after various intervals, usually 24 hr., washed thoroughly in deionized water, and the crystals identified under the polarizing microscope. *In vitro* calcification of matrix was carried out at 25 ± 2° C. in 100 ml. of a calcium bicarbonate solution prepared from reagent grade calcium carbonate in deionized water[2]. Pieces of decalcified matrix were placed in this solution for 25–44 hr., during which time the *p*H rose from 6·4 to 8·3.

Both *in vivo* and *in vitro*, aragonite crystals formed on protein matrix from aragonite shells (Table 1). Calcite crystals were also deposited on the matrix in both cases. The forms of calcite and aragonite crystals were distinct, the former being rhombic or rosette-shaped, and the latter irregular, spherulitic or hexagonal elongate. Aragonite was never found on substrates other than aragonite matrix. Tested substrates and conditions included: (1) glass cover-slip fragments inserted in *Crassostrea* (25 cases); (2) 'Formvar' plastic inserted in *Crassostrea* (4 cases); (3) decalcified calcite matrix from prismatic layer of *Pinctada* inserted in *Crassostrea* (3 cases); and (4) decalcified calcite matrix from prismatic layer of *Pinctada* tested *in vitro* (10 cases). Calcite crystals only were deposited in each of these instances.

Table 1

Test system	Source of protein matrix	Total No. of matrix pieces analysed	No. of matrix pieces with aragonite crystals
In vivo	*Pinctada martensii*	4	2
	Elliptio complanatus	8	1
	Atrina rigida	5	1* (?)
In vitro	*Pinctada martensii*	5	2†
	Elliptio complanatus	3	1‡
	Total	25	6 or 7

* The crystals were clustered and could not be analysed. Their form was irregular and different from calcite crystals.
† Final *p*H 8·3.
‡ Final *p*H 7·3.

Even though freshly secreted matrix might normally induce aragonite formation in aragonite-forming molluscs, aragonite induction might well have been prevented in the present experiments by at least three conditions: (1) alteration of the original state of the aragonite matrix; (2) conversion of small aragonite crystals to calcite after deposition; (3) presence of freshly secreted matrix by the calcite-forming host mollusc. The finding of aragonite in approximately one-quarter of the cases (Table 1) is accordingly of a higher frequency than might have been anticipated.

The results point to the protein matrix as a factor determining the crystal type in molluscs. At present we have no information on molecular spacing of protein matrix of calcite and aragonite shells which might permit profitable speculation as to possible mechanisms.

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The Skipper (*Scomberesox saurus*) in the Southern North Sea and the Thames Estuary

The skipper or saury pike is a pelagic fish of the open Atlantic and Mediterranean, ranging from Tristan da Cunha[1] northwards to the Gulf of Maine and the Bay of Fundy[2] in the western Atlantic, and to Christiana Fjord and Gjesvaer, near the North Cape, in the European Atlantic[3]. On the southern and south-western British coast it is of frequent, if not annual, occurrence, and catches of up to 100,000 have been reported at Mevagissey, Cornwall[4]. Farther north it has often been recorded from the Hebrides, the western Scottish coast and the Shetland and Orkney Islands[5], but the number of records decreases noticeably on the eastern coast of Scotland. Rae (personal communication) has found a specimen off Buchan Ness, Aberdeenshire (November 21, 1957); one in the Moray Firth (December 18, 1958); a shoal at Saltburn, Cromarty Firth (December 21, 1958); one at May Island, Firth of Forth (December 1, 1958); and one from a cod stomach 12′ N. St. Abbs, Berwick (February 18, 1959).