NOTE

Haddock Melanogrammus aeglefinus (L.) with atypical orange-red flesh

D. T. G. Quigley

Sea Fisheries Protection Authority, Eastern Region, Howth, Co Dublin, Republic of Ireland

Abstract
The author describes a case of an abnormal Haddock Melanogrammus aeglefinus (L.) with atypical orange-red flesh from Irish waters and summarises previous reports of similar abnormal flesh colouration in haddock, Atlantic Cod Gadus morhua L., Saithe Pollachius virens (L.), Golden Redfish Sebastes norvegicus (Ascanius, 1772), Beaked Redfish Sebastes mentella Travin, 1951, and Dab Limanda limanda (L.).

Abnormal orange-red flesh colouration has rarely been reported in M. aeglefinus. In Canadian waters (NW Atlantic), Templeman and Sandeman (1958) described two unusual haddock with pale red flesh resembling that of Atlantic salmon (Salmo salar L.) which were found at a fish processing plant in Fortune (SW Newfoundland) during 1955. Bligh and Dyre (1959) subsequently detected levels of zeaxanthin in another haddock with ‘slightly pink’ flesh captured in the same region. In Scottish waters, Rae and Johnson (1963) reported 4 pink-fleshed haddock, one from Fraserburgh during September 1955, one from Shetland during September 1957, and two from Aberdeen, the first during March 1959 and the second during November 1962. They reported minute traces of astaxanthin and taraxanthin in the abnormally coloured flesh.

Abnormal orange-red flesh has also been recorded, albeit rarely, in other species of fish.

* Corresponding author’s e-mail: declan.quigley@sfpa.ie
During September 1956, Baalsrud (1956) recorded unusually high levels of astaxanthin in the muscle of an atypical pink-fleshed Atlantic cod *Gadus morhua* L. found at a fish market in Drammen, near Oslo, Norway. Bligh and Dyre (1959) recorded 5 cod with atypical orange-red flesh and detected high levels of both astaxanthin and zeaxanthin in one intensely pigmented specimen measuring 63.5 cm captured off Devil’s Island in the mouth of Halifax Harbour (Nova Scotia) during June 1958. They noted that the entire fish exhibited pronounced orange-red pigmentation throughout the muscle tissue, including the head, fins and the lining of the visceral cavity. During June 1957, Templeman and Sandeman (1958) reported a single

![Figure 1. Haddock *Melanogrammus aeglefinus* fillets. (A) Haddock with normal flesh colour, (B) Haddock with discoloured flesh colour.](image-url)
specimen of Golden Redfish *Sebastes norvegicus* (Ascanius, 1772) [S. marinus] with abnormally coloured red flesh which was taken at Ramea, on the south coast of Newfoundland. During August 1957, the same authors detected high levels of astaxanthin in 4 abnormally coloured ‘salmon-pink’ fillets of beaked redfish *Sebastes mentella* Travin, 1951 from Canadian waters (Anticosti Channel, Gulf of St. Lawrence), and noted that a red-fleshed saithe *Pollachius virens* (L.) had also been taken in Norwegian waters. In Scottish waters, Rae and Johnson (1963) reported an unusual pink-fleshed dab *Limanda limanda* (L.) from Arbroath during July 1960. In Canadian waters (Georges Bank, Bay of Fundy, and Gulf of St. Lawrence), Bourne and Bligh (1965) discovered unusually high levels of zeaxanthin in abnormally coloured orange-red adductor muscle of Atlantic deep-sea scallops *Placopecten magellanicus* (Gmelin, 1791).

Although atypical orange-red-yellow external skin colouration (xanthochromism) has occasionally been observed in haddock (Quigley et al., 2015) and other gadoids e.g. *G. morhua* (Kijewska et al., 2012), Alaska pollack *Theragra chalcogramma* (Pallas, 1814) (Honma, 1959), burbot *Lota lota* (L.) (Wilson, 2015), pollack *Pollachius pollachius* (L.), and Three-bearded rockling *Gaidropsarus vulgaris* (Cloquet, 1824) (Quigley et al., in press), their flesh colour was invariably reported as normal (white). Xanthochromism is generally considered to be caused by a genetic mutation.

Saha et al. (2006) remarked that fish, like all other animals, are unable to synthesize carotenoid pigments *de novo* and must obtain these from dietary sources. They noted that among fish species, adult salmonids have the unique ability to deposit dietary carotenoids (e.g. astaxanthin) in their muscle tissues, which results in their distinctive red flesh colouration. Saha et al. (2006) discovered that although the astaxanthin binding capacity of Atlantic salmon solubilized muscle proteins was similar to those of haddock and Atlantic halibut *Hippoglossus hippoglossus* L., the pigment was only deposited in salmon flesh. They hypothesized that the lack of pigment deposition in haddock and halibut may be related to their reduced ability to either metabolise or transport carotenoids across membrane barriers from the blood to the muscle. Perhaps haddock and other species exhibiting atypical orange-red flesh may represent genetic mutants with the necessary receptors and/or transport proteins to overcome these barriers?

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References


