FISH FEED & NUTRITION

The Yellow Fat Problem In Fish Flesh

BY TOM LOVELL, Ph.D.

Editor’s Note: Dr. Lovell, a regular columnist for this magazine, is professor of fisheries and allied aquaculture at Auburn University, Auburn, Alabama.

Pigment is highly desirable in the flesh of some food fish while in others it is highly undesirable. For example, a deep pink color improves the marketability of salmon. Additives to enhance pigmentation in the flesh are put into feeds of cultured salmon. However, in fish which are recognized for white flesh, such as channel catfish, any amount of pigmentation usually reduces marketability.

"Yellow fat" has recently became recognized as a problem in the marketing of processed channel catfish. This atypical condition is characterized by an area of intense yellow pig-ment in the anterior, dorsal part of the fish near the backbone. When the muscle is removed from the backbone in the filleting process, this is exposed. Although the pigment does not affect the flavor or keeping quality of the flesh, buyers are prejudiced against it and many will refuse to accept catfish fillets with visible yellow pigment.

Occurrence of yellow pigment in catfish flesh is variable. Some processors claim that it has been more frequent in the past year than in previous years. However, this may be because of the increase in sale of filleted catfish which exposes the inside of the flesh. There is consensus among processors that catfish from the Mississippi River delta, where most of the fish are produced, usually have no yellow pigment, whereas catfish from Alabama often have it. Some reports indicate that catfish processed in winter or early spring are more likely to have the yellow pigment than fish processed during or immediately following the growing season.

Source of pigments in the flesh of animals (fish, poultry, beef) is from a group of fat-soluble compounds, originally of plant origin, called carotenoids. Yellow-orange pigments are usually carotenes and xanthophylls, and pink-red pigments are astaxanthin and canthaxanthin. Animals obtain these pigments through the food chain. Various species have a propensity to deposit certain types of pigment compounds or to deposit none. Poultry readily deposit xanthophylls in their body fat, but not carotenes. The yellow color in beef fat, however, is from beta-carotene; beef deposit very little xanthophyll even when fed large amounts. Salmon deposit astaxanthin in their flesh which produces a pink color. White fleshed fish store carotenoids mostly in the ovaries and skin. The composition and source of the yellow pigment that sometimes occur in catfish flesh are unknown, but can be assumed to be carotenoids of diet origin.

Cause of occurrence of the yellow pigment in catfish flesh has not been established. Several theories are proposed. The most plausible is a concentrated pigment source in the feed. Ingredients like corn gluten meal or alfalfa meal, which are sometimes used in fish feeds, are concentrated xanthophyll sources and could possibly influence the color of the fat in the fed fish. Most of the catfish produced in Mississippi are fed an open-formula feed produced by farmer-owned feed mills. The formula contains approximately 30% corn, a low source of xanthophyll (20 mg/kg), but no concentrated pigment sources such as corn gluten meal (300-400 mg xanthophyll/kg). Another source of the yellow pigment could be pond organisms; however, intensively stocked catfish eat very little natural food when heavily fed. Possibly during cool weather or other periods when catfish are on a restricted feeding regime, the fish consume more food from the ponds. Green algae, including filamentous types, are concentrated sources of carotenoids. A third suggested explanation for the yellow pigment in catfish is that when fish are fasted, the body fat is consumed for energy but the pigments are not; as the fat disappears, the color becomes more concentrated. This would be supported by the claim that yellow fat in catfish is more prevalent in the winter, but not by the observation that yellow fat favors geographic areas.

Studies have been proposed to examine the pigment problem in channel catfish. These include laboratory feeding trials to evaluate dietary sources and concentrations of pigments, and pond experiments to evaluate effects of management, season, fish size, sex, and pond environment. A survey is planned through processing plants to determine seasonal and geographic effects.

The magnitude of the yellow fat problem in the catfish industry has not been clearly defined. Although yellow fat does not affect taste or quality of the flesh and is probably not repulsive to most consumers, if it presents a significant economic deterrent to the growth of the industry as some officials claim, the cause should be determined and corrected even though this may mean increases in feed or other production costs.