



FEEDING STUDY WITH MENHADEN PRESS CAKE

In order to obtain information on the nutritive value of menhaden press cake, five successive filial generations of albino rats have been fed (free-choice) menhaden press cake, fresh cabbage, and a high-calorie diet composed of starch, vegetable shortening, and cod-liver oil in the proportion of 80, 16, and 4 parts, by weight, respectively.

The results and the conclusions from the feeding study for the first four generations, as well as the preparation and composition of press cake, have previously been reported (Nilson and Snyder 1955). These results showed that all the litters that were raised grew satisfactorily without abnormal mortality and were generally very healthy. None of the rats died from mechanical obstruction by bones. Two male rats of the third generation had seizures apparently of nervous origin, but it was not known whether these were due to a deficiency of the diet or were of genetic origin. It was concluded that press cake seemed to be a satisfactory source of protein and possibly some vitamins for normal growth and reproduction. This is a report on the continuation and conclusion of the feeding study.

All the six first-generation rats, originally allotted to the experiment during September 1953, had died from natural causes by December 1955. The rats lived more than 2 years, which is a normal span of life for the breeding rats of the stock colony in the Service's College Park Fishery Technological Laboratory. At that time two cages containing mixed litters of fourth-generation rats, two males and two females in each cage, were kept for continuation of the experiment while the rest of the rats--second, third, and fourth generations--were sacrificed as surplus.

Two litters were born to these fourth-generation rats during February 1956, but both of these litters were found dead within 3 days following birth. Two litters were also born during March. The first was found dead the day following birth, and the second was lost when the mother died during parturition. A litter of four rats, three males and one female, was born during April. This fifth filial generation grew normally and was sleek and healthy looking. No more litters were born to the fourth generation rats during the remaining 9 months the experiment was continued.

Three litters of three rats each were born during August, September, and October 1956, to the fifth-generation rats. All litters were found dead within 3 days following their birth. In November, a litter of two was born, but these young were found dead within 2 days following their birth. No more litters were born to the fifth-generation rats, and on February 2, 1957, the feeding study was concluded.

The death of the young soon after birth and the reduced number of litters from the fourth-generation rats, as well as from the preceding generations, probably indicates that the diet did not supply sufficient amounts of accessory food factors needed by the rats for maximum breeding and maternal care. Some lack of maternal care is experienced with the breeding rats of the stock colony in the Laboratory, but the incidence is not as great as was noted with these experimental animals. No accessory food factors alone or feeds that contain large concentrations of these fac-

tors that could be responsible for this lack of maternal care and reduced number of litters were added to the press cake, cabbage, and high-calorie diet, so this might be expected. The diet must contain a limited supply of these factors, however, since some litters were successfully raised. Those litters that were raised in all cases grew normally and were healthy.

SUMMARY

Menhaden press cake, a high-calorie diet, and fresh cabbage have been fed free-choice to five successive filial generations of albino rats for nearly $3\frac{1}{2}$ years. No difficulty has been experienced due to palatability or the numerous bones in the press cake. The rats have been generally very healthy, with the exception of two male third-generation rats that apparently had nervous seizures of unknown origin. The press cake seems to be a satisfactory source of protein for growth and maintenance, and possibly a limited source of some accessory food factors for reproduction and maternal care.

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LITERATURE CITED

Nilson, Hugo W., and Snyder, Donald G.

1955. Feeding Studies with Menhaden Press Cake. Commercial Fisheries Review, vol. 17, no. 11, pp. 17-18 (also Separate No. 421).

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CAUSE OF KING CRAB MEAT SPOILAGE INDICATED

Studies on the protein and nonprotein nitrogen fractions as well as on the proximate composition of king crab meat, now under way at the Service's Fishery Products Laboratory, Ketchikan, Alaska, have yielded information that may be directly related to the short iced storage life and to the comparatively high rate of spoilage of this product. Confirmatory experimentation is being conducted.

Samples of raw frozen king crab have been separated into their component physical parts, and the meat in these parts has been subjected to proximate analyses. In addition, preliminary studies have been carried out in an attempt to partition the total nitrogen of king crab meat into its various protein and nonprotein fractions. It was observed that in king crab meat, the nonprotein nitrogen fraction was more abundant than in any known species of commercially-edible fish. This observation suggests that there is a high free-amino-acid content in king crab meat, which could help to explain the high rate of spoilage that generally occurs in crab meat. This unexpected finding, illustrating the value of fundamental studies, is of tremendous interest to the crab meat industry because, if substantiated by further research, it makes possible application of preventive measures.



OIL CONTENT OF FISH VARIES

The oil content of many species of fish can vary tremendously, depending upon many factors such as the area of capture and the season. A striking example of this variation is shown by the work of the Service's Seattle Technological Laboratory in their studies on the composition of sheephead, a common species of fresh-water

fish. In a sample of 16 sheepshead from Clearwater Lake, Minn., the oil content ranged from 0.7 to 1.7 percent and averaged 1.0 percent. In a sample from Kegonsa, Wis., the oil content ranged from 2.0 to 8.8 percent and averaged 4.9 percent. And in a sample from the Mississippi River, the oil content ranged from 3.6 to 14.2 percent and averaged 8.8 percent. Thus, depending upon where the sample was taken, sheepshead would be considered as a non-oily fish, an intermediately oily fish, or as an oily fish. Accurate knowledge of the oil content of fish is vital in certain fields, such as medicine, where patients may require a rigidly specified diet. By proper choice of fish, a diet with any desired level of oil content can be obtained.

METHODS USED TO HARVEST SEAWEEDS

Many different methods are employed in collecting the various seaweeds, each species presenting specific problems. Although few seaweeds are cultivated for harvest this is true for species of *Porphyra* in Japan. The Japanese provide surface attachment for the *Porphyra* spores. The method is to place bamboo rush or rope nets tied to stakes in the water about mid-September. They harvest this crop as growth permits, from November through April.

Gloiopeltis furcata, a red alga also found in Japan, grows on rocks in shallow water. Collection is either by long-handled rakes, or divers gather the seaweed by hand.

Along our North Atlantic shores gathering of the Irish Moss, *Chondrus crispus*, is also accomplished by rakes. The men go out before low tide and usually return to port on the flood tide. From their boats they manipulate special rakes to wedge bunches of moss between the tines and tear the plants from the rocks.

In certain countries of Europe the fucoids are systematically harvested twice a year. They are found above the low-tide marks which makes cutting easier than for the lamenia which grow at greater depth. Here long-handled sickles and reaping hooks are employed with the problem of finding more efficient methods of collection rendered difficult where the sea bed is irregular.

However, along the California coast the giant kelp, *Macrocystis pyrifera*, is harvested by means of underwater mowing machines and chain conveyors which carry the seaweed onto a barge. Only the tips of the plants are harvested, and these soon grow back again.

In North Carolina and Florida, where we formally had a seaweed industry, collecting is simpler. The commercial species accumulate in masses on shallow flats where they may be raked into a skiff at low tide. Where the currents are strong and deeper waters prevent this method of collection, a net may be set to accomplish the task. The seaweed is then removed before each change of tide.

These and other likely methods employing grapples, tubes and pumps, and other devices are being used or considered for this job.

--"Sea Secrets, August 21, 1956,
The Marine Laboratory,
University of Miami,
Coral Gables, Fla.