See Also: Beef Shortage, 1973; Food Waste Behavior; Garbage Project; Garbology; Sugar Shortage, 1975.

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Fish

Fish remains are readily identifiable components of garbage worldwide, if for no other reason than their smell, yet the contribution they make to the amount of garbage that accumulates is difficult to calculate. Fish bones are relatively delicate compared to those of land animals and do not stand up as well to post-depositional chemical and mechanical processes.

If one were to excavate, for example, a five-year-old garbage dump and tally up the number of fish bones recovered, they would be underrepresentative of the original number. In addition, an unknown—but large—percentage of fish never make it to land but are dumped dead back into the waters from which they were caught. Likewise, fish are often processed on or near the water, with the by-products never reaching land.

Calculating Waste

Perhaps the only method available for calculating the contribution of fish remains to garbage is to use catch figures as a baseline and then examine those figures against known or suspected patterns of human consumption. Annual worldwide fish production, including wild capture and aquaculture (farm) production (excluding shellfish) averages around 140–150 million tons. This figure is susceptible to the vagaries of any number of variables, including price and ecosystem disruptions, especially climate anomalies such as El Niño. Although precise production figures from China are unreliable, that country accounts for approximately 30 percent of the world's fish production, followed distantly by Peru, the United States, and Japan. Of the total tonnage of fish processed each year, 70–75 percent are for human consumption and 25–30 percent are for reduction into fishmeal and fish oil. Fishmeal, which is a coarsely ground powder made from cooked fish, was once important as a fertilizer but is used primarily in pet food in the 21st century. Peru is the leader in fishmeal production, using the Peruvian anchoveta, which is the leading fish caught in the world in terms of tonnage.

Worldwide, annual per capita fish consumption is about 35–40 pounds. In some Asian and African countries, where fish provide 50 percent or more of the animal protein, annual per capita consumption can run as high as 45–50 pounds. In some small island states, such as Seychelles, the annual per capita consumption can exceed 165 pounds. In other countries, especially meat-exporting countries such as the United States and Argentina, annual per capita consumption of fish is under 20 pounds. Based on these figures, one can roughly estimate that annual per capita fish waste worldwide is about 10 pounds.

Fish Smell and Its Effects on Garbage

Rotting fish produce one of the most noxious smells imaginable, in large part a result of adaptations that fish have made to aquatic environments over millions of years—adaptations that are vastly different than those made by land-living animals. Fish contain an odorless chemical called trimethylamine oxide (C_3H_9NO). Once a fish dies, bacteria in the body begin breaking down the compound into two foul-smelling compounds, putrescine ($C_4H_{12}N_2$) and cadaverine ($C_5H_{14}N_2$). The meat of land animals contains far less trimethylamine oxide than that of fish and hence does not smell as putrid when decaying. There is considerable variation in trimethylamine oxide levels even in fish, with cold-water species, especially those that feed near the surface, having the highest levels.

The presence of noxious compounds plays a role in the contribution of fish remains to garbage regarding two variables: (1) changes in human dietary preference and (2) how fish are handled immediately upon and after death. It is becoming increasingly clear that omega-3 fatty acids, found

Fishmongers are selective in determining the quality of their catch and discarding fish that lack freshness. Improper disposal, such as tossing on beaches, can negatively impact tourism. For this reason, the United Kingdom requires complete incineration of fish waste.

in fish oil, have medical benefits, including prevention of psychotic disorders in high-risk children and heart disease in adults through a reduction in blood-triglyceride levels. What is not clear is the range of health problems that omega-3 fatty acids prevent or ameliorate—although if one were to believe the hundreds of claims made in television and magazine ads, they prevent everything from male-pattern baldness to impotence. Not surprisingly, given Westerners newly found emphasis on eating supposedly healthy foods, cold-water fatty fish such as herring, sardines, and salmon have assumed a more important part of their diet. Salmon, for example, contains roughly five times the amount of omega-3 fatty acids as either cod or catfish and only slightly less than that amount compared to either mahi-mahi or canned light tuna. Oily fish also often contain heavy metals, such as mercury, and fat-soluble compounds, such as dioxin and PCBs, but Westerners tend to accept the risk in the quest for the much-heralded omega-3 fatty acids.

But Westerners, for the most part, also have a natural avoidance of any "fishy" smell and taste. Freshly killed fish lack any odor other than what normally is thought of as a "sea" smell. If prepared and consumed immediately—or if kept on ice or refrigerated for a short period—bacteria do not have time to break down the trimethylamine oxide into putrescine and cadaverine. Fishmongers tend to be highly selective in determining the quality of the fish they sell and are constantly culling their offerings and tossing out fish that are beginning to decay. In many nonindustrialized areas, the remains are either collected for disposal in a garbage dump or simply cast aside. Some Caribbean countries are becoming concerned over the negative impact on tourism caused by improper disposal of fish remains on beaches.

In contrast, many developed countries prohibit meat and fish from being dumped, even in landfills. In the United Kingdom, for example, which has stringent disposal laws, all raw meat and fish trimmings, including bones, heads, scales, and skin, must be disposed of in accordance with what are called "Category 3" requirements, which means complete incineration within an approved incinerator or processing for pet food at an approved plant.

Archaeology

Fish remains might be problematic for modern health concerns and aesthetic reasons, but they are excellent tools for discovering more about what went on in the past. Fish bones from archaeological sites, for example, indicate not only what past peoples ate but also what kinds of fish were common in a region at a particular time. Ecologists can use archaeological fish bones to examine how the diversity, distribution, and abundance of marine life has changed over time. For example, fish bones from the Mesolithic levels of Franchthi Cave in southern Greece show that the bluefin caught in the Aegean Sea in the 21st century pale in size compared to those caught some 8,000 years ago—a result of modern overharvesting of larger fish.

Conclusion

Fish will always be an integral part of the human diet and their remains will remain a component of garbage. The goal is to minimize the impact they have

on the social and natural environment by disposing of them in ecofriendly ways. One area with considerable potential is the biodiesel industry, which is beginning to use fish remains as a renewable energy source. With some fish-processing plants in southeast Asia producing over 250,000 pounds of waste daily, there is no present shortage of raw material.

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See Also: Dating of Garbage Deposition; Food Waste Behavior; Meat; Ocean Disposal.

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Floor and Wall Coverings

The first hand-knotted pile carpets were woven in prehistoric central Asia, probably for protecting nomadic tribes from the cold, temperate-zone nights. Following the Crusades, carpets and rugs entered Europe as luxury items and were only used as floor coverings in royal and ecclesiastical settings, often being hung or covering furniture. By the end of the medieval period, carpets were woven in Europe "in the Turkish manner." Being woollen, these carpets generally remained in use for around 200 years and are mainly studied via depictions in paintings.

In the 21st century, carpets are usually nylon or polypropylene. The vacuum cleaner was first marketed to clean carpets in the late 19th century. This was a luxury item until after World War II; they are ubiquitous in the 21st-century Western world.

Floorcloth

Stone and timber floors in larger houses were artisan-created works, intended to be seen. Painted and stencilled floors were augmented by floorcloths, hard-wearing painted canvas. Floorcloth (also known as floor oilcloth or painted floorcloth) first appeared in the early 18th century, but there are 15th- and 16th-century references to a similar material.

Floorcloth became popular despite its expensiveness and tendency for patterns to wear off. It was used in high-traffic areas, such as entrance halls and stairways, where easy cleaning was important. It was also favored in ground-level rooms in the summer, although it became malodorous and tacky when hot. Manufacturing was labor intensive and dangerous, using painting frames six storys high on which workers balanced to coat the canvas. The processes of drying and curing meant that production took several months. By the close of the 19th century, floorcloth had fallen in price enough to be available to the working classes.

Linoleum

The next significant development in flooring was Linoleum, which developed from a product called Kamptulicon. In 1855, Frederick Walton peeled the skin from the top of a can of oil paint and used this skin, produced by oxidation of linseed oil, to develop a product he called Kampticon, but later rebranded as Linoleum. Walton started the Linoleum Manufacturing Co., Ltd., in 1864. At first, the company ran at a loss as the fierce competition between floorcloth and Kamptulicon continued. A large advertising campaign and the opening of two Linoleum shops in London reversed the situation and sales skyrocketed.

The success of Linoleum spawned its imitation by floorcloth companies. Walton began legal action against Nairns of Kirkcaldy in 1877, but lost, having never registered the trade name. The word *linoleum* became the first product name to be ruled a generic trademark in court.

Linoleum's heyday was from the 1860s until after World War II, when the do it yourself (DIY) boom saw other hard floorings overtake linoleum, which was seen as old-fashioned and vulnerable to damage from the fashionable high-heeled shoes of the time. The "poor man's carpet" was undermined by