



The Various Uses of Cephalopods

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Cephalopods were used to be treated often as part of discardable bycatches until recently, but it is no longer so. They now have an upgraded status because of their export potential, and their place as an important part of Indian marine products exports. In India over 80% of the landings of cephalopods take place along its west coast. The Northwest region comprising the States of Gujarat and Maharashtra in particular, account for the bulk of cephalopod landings (Meiyappan and Mohamed, 2003). During the last few years, with the establishment of processing plants in Saurashtra, the export of cephalopods has gone up considerably from Gujarat (Sarvaiya, 1989). While the global cephalopod catch went up from 0.58 million tonnes in 1950 to 3.512 million tonnes in 2003, the Indian cephalopod catches increased from 400 tonnes in 1957 to 89,353 tonnes by 2003 (ISHSTAT 2004). According to the latest estimate, cephalopod landings in India for the year 2007 were 94,804 t (CMFRI, 2007).

Proximate Composition: Cephalopods have high commercial value, for the reason that they constitute a good source of quality aquaproductions. The flesh of Cephalopods is firm and it blends to provide a variety of processed and preserved products owing to absence of bones, ease of cleaning and leaving behind a marginal quantity of wastage. They have also a high food value. The meat content in cephalopods is much higher than fish, containing 40-70% consumable fraction (Takshashi, 1965). Studies on cuttlefish by Dious and Kasinathan (1993) revealed high protein, a low carbohydrate and lipid content. Edible portion in squid is about 76% and that in cuttlefish is about 65%, with a higher value of protein (18-20%) than many fishes and the protein is composed of 20 amino acids, eight of which belong to a group of essential amino acids. According to Lakshmanan and Balachandran (2000), proximate composition of the cephalopod flesh shows moisture at 75-80%, crude protein (TN x 6.25) at 16-21%, crude fat (1.0-1.5%) and ash (1-2%). Due to high nutritive value and better taste, cephalopods are widely accepted as a choice food in various parts of the world (Takasashi, 1974; Roper *et al.*, 1984 and Sarvaiya, 1990).

Cephalopods as Food: Cephalopods have been used by man as food from times immemorial, as exemplified by their consumption particularly among Greeks, Egyptians etc. The cephalopod meat is prepared in many ways for food. These are by adopting methods such as cutting them into slices and treating them with spices and frying or cooking into curries, cutlets and soups. In India, cephalopods were initially used in dried form (Rao 1954 and Vijayakunaran, 1984). In Japan, dried products are a luxury food item and the most popular among them are fish products (Hotta, 1982). According to Voss (1963) in the Philippines the meat of cephalopods is first boiled in vinegar with crushed garlic and then fried in oil and spices. In East Asian countries baby octopus is consumed live. Considered as a delicacy, it is highly relished. In Britain, squids are incorporated into fish stews to enhance the taste (Cornell and Handy, 1982). The Japanese have mastered a large variety of culinary preparations out of squids, cuttlefishes and octopods (Silas *et al.*, 1985). In Korea, they are mainly salted and fermented (Ron, 1992). Of late, products such as cephalopod pickles etc. have also been developed and these are gaining in popularity.

Export of Cephalopods: In the global market, Japanese squids are preferred because they are considered to be of high nutritive value and tasty (Tanikawa and Suno, 1952). Frozen cephalopods form the second largest export item among the marine products exported from India. In India, in the Indo-Norwegian Project period, squids and cuttle fishes used to be cut into uniform strips, each measuring about 2 to 25 cm called 'fingers' and exported. This activity was initiated as part of the Indo-Norwegian Project (Padmanabhan, 1970). There are about 80 cephalopod products exported from India and the quantity of cephalopods exported from India during 2006-2007 was 1,02,953 t contributing 17% to the total marine exports from India, worth Rs. 1,368 crores (www.mpeda.com). The main markets for these items are Spain, Italy, Greece, France, U.K., Belgium and the Netherlands. The other major markets are Japan, Singapore, Thailand and Hong Kong (Jagadees, 1988; Lakshmanan and Balachandran, 2000). Presently, only few

countries such as Korea, Thailand, Singapore, Philippines and Canada are involved in the export of dried and salted cephalopods.

Form of Exported Cephalopod Products: These consist of those frozen whole by IQF (Individually Quick Frozen) or peeled and frozen in the form of slabs of different commercial grades. Various high value products are made out of cephalopods. Some of these are: whole squids, stuffed tubes, squid rings, frozen tentacles, fillets, roe, squid rings-battered and frozen. Some of the other products are: seasoned squid 'Ika-sniokara', fermented squid 'Ika-kunsei', smoked squid 'Tka-kunsei' and pickled squid meat 'Sui-ika' (Shenoy, 1987; Lakshmanan and Balachandran, 2000 and Badonia *et al.*, 2006). Cephalopods are sometimes consumed in raw form, known as 'Sashimi'. The salted or dried cephalopods are known as 'Surumi', highly esteemed on ceremonial occasions like weddings and festivals (Ramalingam, 1978 and Silas *et al.* 1985). According to Jagadees (1988), cephalopod products, in forms such as canned, dried, salted, smoked and fermented, are also produced.

Products from Non-edible Parts: The non-edible parts of the squid i.e., viscera, skin, pen, beak and eyes comprise about 30% of the total weight of the animal. These can be converted into meal, similar to fish meal and prawn meal. Skin as well as damaged or low-grade raw materials can be ensilaged and sold as high-protein feed. Viscera of the squid are rich in amino acids, minerals, vitamin-B etc. and therefore it forms a good constituent for poultry feed (Kawata *et al.*, 1955). Sometimes it is also used as manure (Clarke, 1963; Jagadees, 1988 and Sarvaiya, 1990). In Korea, the demand for squid meal has been increasing in recent years because its nutritive value has come to be recognised. Squid meal is also sold to fodder-producing plants where it is mixed with ordinary fodder to make synthetic high-value components of fodder for use in animal husbandry and aquaculture (Ron, 1992). According to Nair *et al.* (2004), the pH of the cephalopod waste is lowered by addition of formic acid and allowing it to liquefy by the action of proteolytic enzymes present in the flesh. This broth is then mixed





with deoiled rice bran or wheat bran and sun-dried for easy transportation. This finished product, which is rich in calcium and phosphorous, enhances the efficiency of feed prepared for poultry, ducks, quails, pigs and calf. Squid-meal is considered superior to fish-meal because of high content of lysine, methionine and most importantly, omega 3 polyunsaturated fatty acids, especially C20:5 and C22:6.

Uses of Cuttlebone: In Japan, a variety of fancy articles are made from cuttlebone (Boycott, 1957). The Cuttlebone is commercially used in preparing fine abrasives and dentifrices (Dees, 1961). Powdered cuttlebone is a good source of food for poultry and cage birds, as it is a rich source of calcium. Cuttlebone is also used as a grinding stone for the beaks of cage birds. Pulverised cuttlebones are used for cleaning the surface of woodwork and of motor vehicles before they are painted. Powdered cuttlebone is also a good cleaning agent for glass and other smooth surfaces, besides being of medicinal value. Finely ground cuttlebones are used as a cosmetic in Italy. These are also used now in jewellery making and for moulding purposes (Sarvesan, 1974). Among the cephalopod products, cuttlebone was the first item to be exported from India and in 1986 about 17.3 t worth Rs.50,348 were exported (Silas *et al.*, 1985). In India cuttlebone powder is made in processing units situated at Okha in Gujarat (Sarvaiya, 1989). Traditionally cuttlebone powder is used as medicine for some ear ailments (Trivedi and Sarvaiya, 1976, Raje and Singh, 1992).

Uses of Cephalopod Ink: Artists have used the ink of cuttlefish as a natural 'sepia' pigment. Medicinal value of cuttle fish is attributed to the ink (Boycott, 1957). Mochizuki (1979) has reported antibacterial effect of cuttlefish ink. In Japan, squid ink is traditionally applied in food products (Nishimoto *et al.*, 1980). According to Takia *et al.* (1983), cuttlefish ink is believed to exhibit antiseptic properties. It has also been proved that stored fishes treated with cuttlefish ink, have extended shelf life than the untreated ones. The contents of the ink sac are used in manufacturing dyes and ink (Jagadees, 1988). Aqueous extracts of ink from *S. inermis* were tested against Moloney murine leukaemia virus reverse transcriptase, and the ink showed strong inhibition of MMLVRT (Rajaganapathi *et al.* 2000). Nirmale *et al.* (2002) also recorded that squid ink had an antibacterial effect. The latest development is the preparation of imitation caviar, named 'Cavianne', which is made up of an unimaginable mix of

ingredients such as squid ink, pectin from apples, extract of sea urchin, oyster and scallop as well as a type of gum derived from kelp.

Uses of Other Organs: Ambergris, (obtained from sperm whales, which is used as a fixative in perfumery), is formed around beaks of squids, consumed as food (Lane, 1962). Squid liver extracts are used for human consumption and in dehydrated form they are used as food for livestock (Takshashi, 1965). In Japan high-grade oils are extracted from squid liver for use in paints and the offal is converted into squid manure (Bal and Rao, 1984). The cephalopod eyes are used in the paint and cosmetic industries, as well as in the production of luminous dials. The pen or quill of the squid is a valuable source of high quality chitin and chitosan. In Japan, squid pens are collected and used by the contact lens industry (Jagadees, 1988). According to Ron (1992), squid liver is used to make squid oil and squid liver powder, which have been found to have superior value for the growth of seaweeds and in aquaculture. 'Maricream', an ice cream like product from squid muscle is being developed successfully and may be launched in the consumer market (CIFT, 2008) soon.

Other Uses of Cephalopods: Live cephalopods are good experimental animals in the field of research and education (Silas *et al.*, 1985). Of late, they are also gaining popularity in aquarium market. Cephalopods are also used in fish hooks, as these have, out of experience, come to be a favourite bait used by long line fishermen engaged in catching tunas, billfishes and other pelagic fishes (Silas and Pillai, 1982; Alagaraswami and Meiyappan, 1994). A lot of breeding and hatchery experiments have been carried out on cephalopods, especially on cuttlefish, laying focus on it as a potential candidate for Mariculture (Nabrtabhata, 1994, Sivalingam, 1999 and Anil *et al.* 2005). According to Sujit Sundaram (2007), *Sepiella inermis* is an excellent species for aquaculture due to its fast growth and short life cycle. Annually four crops could be harvested.

Conclusion

According to Jereb *et al.* (2005) the utilisation of cephalopods for human consumption is extensive and diverse. The high protein and low fat content of cephalopods make them an important and healthy element in the human diet. With the increasing demand of food for human consumption, cephalopod resources are

expected to receive even more of attention in the future. According to Nair *et al.* (2004), the minimum quantity of cephalopod waste available in India from processing units is over 30,000 t and when tapped to its potential a net revenue of about Rs.100 million can be generated. For the expansion and betterment of cephalopod fishing, processing and marketing industry, it is felt that Indian fishery enterprises should have joint ventures with major cephalopod producing and consuming countries.

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