

VẤN ĐỀ TRAO ĐỔI

**UTILIZATION OF FISH WASTE IN SRI LANKA:  
AN OVERVIEW**

**TỔNG QUAN VỀ TÌNH HÌNH SỬ DỤNG PHẾ LIỆU TỪ CÁ Ở SRI LANKA**

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**ABSTRACT**

*In Sri Lanka fish wastes are currently underutilized and therefore, there is ample amount of opportunity to develop value added products. The wastes are generated when the fish is gutted, headed and further processed. Today most of the fish waste is used as raw materials for fish meal production in Sri Lanka. None of the fish processing plants in Sri Lanka are producing silage from the off cuts, offal and inedible portions. The majority of factories contacted informed that they convert fish waste into fish meal, dispose these to contractors or to individuals who purchase at the gate or they dispose through the municipal garbage collection. It has been reported that high quality processing discards from export tuna industry are estimated to be 6000 metric tonnes (MT) annually. From our preliminary studies it has been found that tuna head, is an excellent source of oil rich in unsaturated fatty acids and the yield of oil extraction was 4%. Central fish market in Colombo Sri Lanka is a place where about 4 MT of waste is being generated daily. Fish discards from this site is being converted to fish meal daily. It is hoped that the manufacture of value added products from fish and crustacean byproducts will minimize waste in the light of Sri Lanka catching 486170 MT of fish of which 40-60% is used and the balance being considered waste.*

**Key words:** Fish waste, fish meal, fish oil

**TÓM TẮT**

*Hiện nay ở Sri Lanka, phế liệu trong chế biến cá không được tận dụng một cách đúng mức, do đó có nhiều cơ hội cho việc phát triển các sản phẩm giá trị gia tăng. Phế liệu được tạo ra trong quá trình chế biến cá ở các công đoạn bỏ nội tạng, bỏ đầu và các quá trình chế biến tiếp theo. Hầu hết phế liệu ngày nay được sử dụng làm nguyên liệu trong sản xuất bột cá, không có nhà máy chế biến nào ở Sri Lanka sử dụng phế liệu để sản xuất các sản phẩm ủ xi-lô làm thức ăn gia súc. Hầu hết các nhà máy chế biến thủy sản được khảo sát đều cho biết phế liệu được bán cho các đầu mối thu mua hoặc cá nhân để sử dụng làm nguyên liệu sản xuất bột cá, hoặc là được xử lý thông qua hệ thống thu gom rác thải của thành phố. Theo ước lượng, lượng phế liệu trong chế biến cá ngư xuất khẩu hàng năm là 6.000 tấn. Kết quả nghiên cứu bước đầu của chúng tôi cho thấy đầu cá ngư là một nguồn nguyên liệu tuyệt vời cho sản xuất dầu cá giàu axit béo không no và hiệu suất thu hồi khoảng 4%. Tại chợ cá trung tâm ở thủ đô Colombo, hàng ngày có khoảng 4 tấn phế liệu được tạo ra và chủ yếu được dùng để sản xuất bột cá. Thêm vào đó, có rất nhiều cơ hội cho việc sản xuất các sản phẩm giá trị gia tăng từ phụ phẩm trong các nhà máy chế biến cá và các loài giáp xác, từ đó làm giảm đến mức tối thiểu phế liệu tạo ra. Tổng sản lượng cá ở Sri Lanka hàng năm ước đạt 486.170 tấn, trong đó 40-60% được sử dụng để sản xuất các sản phẩm chính, phần còn lại được xem như là phế liệu.*

**Từ khóa:** Phế liệu cá, bột cá, dầu cá

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## I. INTRODUCTION

Currently, fishing industry in Sri Lanka is centralized to cater the domestic food fish supply but it also contributes about 7% growing food fish export market covering mainly tuna and prawn based high value products. The fisheries sector in Sri Lanka accounts for 1.7% of the gross domestic production (GDP) in 2012 from which 1.5% comes from marine fishing. Food fish is major proteinacious food in Sri Lankan consumers and it covers more than 65% of animal protein consumption. Fish has a low calorific value and low fat content but a high protein content. Further, n-3 fatty acids found in fish prevent coronary heart diseases (Wimalasena & Jayasuriya, 1996).

Similar to most food industries, the main way of generating fish wastes is occurred by fish processing operations that produce different form of wastes. The waste can be either in a solid (fish carcasses, viscera, skin, heads) or liquid form (washing and cleaning water discharge, blood water from drained fish storage tanks). During the processing of fin fish, it is generally only about 1/3 of fish is retained as edible portions such as fillets and about remaining two thirds of the whole weight is discarded mainly in the form of guts and frames (lan et al., 2013). Processing of prawns also generate about 20-25% waste depending on the type of final product (Personal communication). Fish waste may generated by spoiling of fish to an unacceptable level for consumption. A number of studies report that the estimate of post harvest losses of food fish materials to be around 25% in terms of deteriorating quality indices due to improper handling of fish in Sri Lanka. However, practically the loss of food fish may be at very low percentage due to utilization of even low quality fish for other fish productions such as salted-dried fish. Different byproduct and value added products can be prepared from fish wastes including food supplements (proteins, gelatin, sharkfin soup), feed, pharmaceuticals (chitin, liver oil, calcium and Isinglass) and other products such as fish leather etc. (Ioannis et al., 2007).

### 1. Annual production of fish and fish wastes in Sri Lanka

There is an increasing trend in fish production in Sri Lanka (Table 1) and of which about 40-50% goes as waste. It is hoped that the manufacture of value added products from fish and crustacean byproducts will minimize waste in the light of Sri Lanka catching 486170 metric tonnes (MT) of fish in 2012 of which 40-60% is actually used and the balance being considered waste.

**Table 1. Annual fish production in Sri Lanka (Metric tonnes)**

Year	Total Marine	Inland and Aquaculture	Total fish production
2006	215,980	35,290	251,270
2007	252,670	38,380	291,050
2008	274,630	44,490	319,120
2009	293,170	46,560	339,730
2010	332,260	52,410	384,670
2011	385,270	59,560	444,830
2012	417,220	68,950	486,170
2013 <sup>(1)</sup>	590,900	94,800	685,700

<sup>(1)</sup>-Target. Source: Statistics Unit, Ministry of Fisheries and Aquatic Resources Development

Fish waste management has been one of the problems having the greatest impact on the environment (Ioannis & Aikaterini, 2006). Disposal of fish-waste from marine fishery industry, without causing an environmental impact is a major concern to Sri Lanka. This waste must be stored so as to prevent the contamination to the processing environment, and should be disposed of in a manner



that is not detrimental to the receiving environment. The magnitude of the problem of waste management in the fish industry depends on the waste volume, its polluting charge, rate of discharge and the assimilatory capacity of the receiving medium.

Fish waste may be sources of proteins of high biological value, unsaturated essential fatty acids, vitamins and antioxidants, minerals or trace metals and physiological beneficial amino acids and peptides (Elvevoll, 2013).

**2. Industrial uses of fish waste in Sri Lanka**

*Fish meal and silage*

Fish processing, shrimp processing and tuna processing plants would be ideal to harvest surplus material as they worked under more hygienic conditions due to strict export regulations imposed on them (Table 2). It has been reported that high quality processing discards from export tuna industry are estimated to be 6000 MT annually. From our preliminary studies it has been found that tuna head, is an excellent source of oil rich in unsaturated fatty acids and the yield of oil extraction was 4%.

**Table 2. Fish waste generate in three fish processing plants in Sri Lanka**

Factory	Fish species processed	Annual Intake (MT)	Total annual waste (MT)
Factory 1	Yellow Fin tuna ( <i>Thunnus albacores</i> ) Big Eye Tuna ( <i>Thunnus obesus</i> ) Sword Fish ( <i>Xiphias gladius</i> )	1885	897
Factory 2	Shrimp, Squid, Cuttle fish and crabs	2160	612
Factory 3	Yellow Fin tuna ( <i>Thunnus albacores</i> ) Sword Fish ( <i>Xiphias gladius</i> )	1588	746

The majority of factories contacted informed that the fish wastes from processing plants were disposed to contractors, to individuals who purchased at the gate or through the municipal garbage collection. In some instances this fish processing wastes are dumped to landfill at a cost to the processor. In a few processing factories solid waste is recycled into fish meal.

Central fish market in Colombo in Sri Lanka is a place where about 4 MT of fish waste is generated daily (Table 3). In central fish market, the waste is being mixed with 5% of rice bran and dried in a locally fabricated drier and converted into fish meal. There is no oil separation step in this process. Proximate composition of the fish meal produced in central market is mentioned in Table 4. This fish meal is mainly being used for animal feed production.

**Table 3. Utilization of fish waste in Central Fish Market in Colombo in Sri Lanka (over a week)**

Day	Total waste (kg)	Production of fish meal (kg)	
		Input (fish waste)	Output (fish meal)
Monday	3120	800	293
Tues day	3348	1000	445
Wednesday	4183	1540	608
Thursday	4318	1360	636
Friday	5195	1240	568
Saturday	4301	1120	517
Sunday	4820	1360	561



**Table 4. Proximate composition of fish meal produced in central fish market in Colombo in Sri Lanka**

Component	% (mean±SD)
Protein	37.46 ±0.97
Fat	17.75 ±0.27
Salt	0.84±0.05
Ash	19.09±0.69

SD-Standard Deviation

None of the fish processing plants in Sri Lanka are producing silage from the off cuts, offal and inedible portions. Few years back a pilot silage processing plant was established in a fishery harbour. However this required a minimum 500 Kg of inedible material making the plant unsuitable for regular use unless a mechanism is in place for the rapid collection and transport of the raw material under required hygiene and temperature conditions, to reap benefit from the plant.

There are some underutilized fish species eg: *Sardinella longiceps* (yaksalayo), Hilsa kelee (Katugoi), *Pterygoplichthys multiradiatus*, *Puntius dorsalis* (Katupethiya), *Puntius chola* (Binataya), *Puntius filamentosus* (Welankolapethiya), *Amblypharyngodon melettinus* (Wawsalaya) which has no market value. The yaksalayo develop oil in their bodies, thus making the fish stick to each other when dried out in the sun, and as a result cannot be sold in the local market (The Sunday Times, 2013). These oily fish species could be utilized to prepare fish oils.

In processing factories and central fish market liquid waste is treated before discharging. Care must be exercised to ensure that the receiving water body can degrade the biological and chemical constituents of the waste in a manner that is not detrimental to the aquatic fauna and flora.

### 3. Current Research in development of value added products using fish wastes in Sri Lanka

- Fish oil including shark liver oil
- Chitin and chitosan extraction from prawn wastes
- Extraction of gelatin from fish skin
- Calcium supplements from fish bones
- Flavoring agents from prawn heads

A Sri Lanka-Norway joint project, funded by NORAD is exploring means of turning fish waste into value-added products such as fish oils and fish protein hydrolysate.

### 4. Outlook for further developing of value added products from fish waste in Sri Lanka

Recent surveys and personnel communications with fisheries stakeholders have found that dumping of fish and prawn wastes to the open environments is not occurred significant level. Instead fish waste and prawn wastes are utilized in fish meal or as other form of feed and finally at least a fertilizer. However it would be advantageous to innovate and develop technologies further relevant to the products mentioned in section 3 above and transfer the know-how-technology to the stakeholders. It has been observe that preprocessing of whole fish is not done initially and therefore, fish wastes are generated in scatted location along the fish distribution channels. This practice affects the collection of fish wastes in sufficient quality and quantity.

## II. CONCLUSIONS

Currently fish waste is not fully utilized to produce value added products and byproducts except the production of fish meal from part of the fish wastes in the island. It is reported that about 6000 MT

of fish wastes are generated from tuna processing plants alone in Sri Lanka. Therefore, innovation and development of technologies relevant to selected number of value added products from fish wastes are suggested.

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