UTILIZATION OF TUNA BY-PRODUCTS

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To review the practices in the utilization of tuna processing by-products in different parts of the world.

Thailand, Philippines, Ecuador and Spain, as they are the major producers of tuna products and India as an emerging producer of tuna loins.

This study does not include the process on how to produce a certain product out of tuna by-products.
While processing fish into products that have a high global demand, often the utilization be as low as 30-40%; and the waste could also be an environmental problem.

According to FAO estimates – there will be a gap between demand and supply of over 50 million tonnes of fish to meet the global demand in 2030.

There are important strategies that are used to improve fish utilization, include minimizing post-harvest losses and wastes along the supply chain and utilizing by-products from processing activities for human consumption and indirect usage.
BY-PRODUCTS

In the past, materials that were left over after primary food processing are called “waste”.

However “waste” can be used as the raw materials to make other products, which increase profits and reduce environmental concerns.

There are many examples where yesterdays “waste“ became a valued raw material for further processing.
TUNA PROCESSING INDUSTRY

- Canned
- Non-canned (Fresh/Chilled/Frozen/Pre-cooked)
- Dried/Smoked
TUNA FISH COMPOSITION

TUNA SOLID BY-PRODUCTS – in Tuna Processing

- HEAD – 13%
- MUSCLE – 62%
- VISCERA – 8%
- BONES – 6%
- FINS – 1%
- SKIN – 10%
SOLID BY-PRODUCTS
SOLID BY-PRODUCTS
LIQUID BY-PRODUCTS

TUNA BLOOD

- Food – used as protein supplement, as a textured meat protein, to clarify liquid foods, or as colouring agent for meat items; substitute for egg albumin in food; utilized in making sausage casings and incorporated in into bread flour.

- Feed and fertilizer – add nutritional value to animal and fish feeds, and added to fertilizer to improve soil structure

- Laboratories – as a culture medium, as well as medical uses

- Industrial – range from adhesives to albumin substitutes and cosmetic formulations
LIQUID BY-PRODUCTS

TUNA COOKING JUICE

- Recovering soluble proteins such as gelatin and oil can be utilized as food stuff
- Using commercial enzymes, it is hydrolyze and concentrate the juice
- Hydrolysate used as flavouring agent, as sauce or condiment
- Culture medium for the production of micro-organism – high nutritional value

<table>
<thead>
<tr>
<th>Composition</th>
<th>Range</th>
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<tbody>
<tr>
<td>pH</td>
<td>4.9-6.2</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>2.11-4.81</td>
</tr>
<tr>
<td>Total solid (%)</td>
<td>3.2-8.7</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>0.9-3.2</td>
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<tr>
<td>Chemical Oxygen demand (COD, mg/l)</td>
<td>70 000-157 000</td>
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</tbody>
</table>
Canneries

- Pet food
- Tuna can & pouch
- By-products
  - Liquid (Tuna extract)
  - Solid (Tuna meal)
UTILISATION OF TUNA BY-PRODUCTS

25 – 30 %

FISHMEAL
55 – 60% CP

FISH OIL

EXTRACTION OF ENZYMES
UTILISATION OF TUNA BY-PRODUCTS

RED/DARK MEAT – 10 - 13 %

CANNED TUNA DARK MEAT
PET FOOD

Extraction of Calcium
By-products from the canning industry developed into nutritious products in various categories, including health food and food supplements sector, feed ingredients and additives, as well as biotechnology products.

By-products are converted into tuna meal and tuna liver powder, as well as tuna soluble extract in liquid and powder form – excellent sources for aquaculture feed.

Tuna oil production capacity is 2 000 MT/year of crude tuna oil – livestock and aquaculture feed additive.

Oil is further refined to produce semi-refined tuna oil product – raw material for additional purifying process.

Fully-refined tuna oil enriched with omega-3 fatty acids, highly nutritious health food and infant milk supplement can be produced.

❖ DHA in tuna oil has been found to improve the growth rate and survival rate of young animals, fish and shrimp.
Fresh-Chilled/Frozen Products Processing

By-products

Fresh-Chilled/Frozen Products

Edible products

Further processed (human consumption)

Non-edible products

Liquid (Tuna extract)

Solid (Tuna meal)
UTILISATION OF TUNA BY-PRODUCTS

- FISH SILAGE
- PROTEIN HYDROLYSATE
- EXTRACTION OF ENZYMES
UTILISATION OF TUNA BY-PRODUCTS

CONTRIBUTIONS FROM CENTRAL INSTITUTE OF FISHERIES TECHNOLOGY, COCHIN, INDIA

FISH PROTEIN CONCENTRATE

GELATIN

SILO FEED (FISH FEED)

PIG FEED

TUNA KURE

PET FOOD
UTILISATION OF TUNA BY-PRODUCTS IN THE PHILIPPINES

Local market

HEAD (including eyes)  FINS  FISH SOUP

VISCERAL ORGANS  TUNA SISIG (native delicacy)
UTILISATION OF TUNA BY-PRODUCTS IN THE PHILIPPINES

GONAD  ROE

fresh  frozen

Spicy tuna
gonad/roe

Fried/grilled

Tuna tail
curry

TAIL

Frozen
tuna tail
FRESH-CHILLED/FROZEN TUNA PROCESSING

RM: Gutted, Caudal, Anal and 2nd Dorsal fins removed

TUNA BY-PRODUCTS – 40-45 %

HEAD (inc. eyes)
FINS, finlets (dorsal and pectoral)
BONES
SCRAPS
BLACK MEAT
RIBS

LOCAL MARKET for human consumption
DOMESTIC MARKET

TAIL

Frozen tuna tail

Tuna tail curry

BELLY

Frozen tuna belly

Fried/grilled
DOMESTIC MARKET

PANGA (COLLAR BONE) → FROZEN TUNA PANGA → GRILLED STEW

SKIN → DRIED SKIN → CHICHARON (CRISPY SKIN)

UTILISATION OF TUNA BY-PRODUCTS IN THE PHILIPPINES
UTILISATION OF TUNA BY-PRODUCTS IN THE PHILIPPINES

DOMESTIC MARKET

TRIMMINGS AND WHITE MEAT

GROUND TUNA MEAT

CRAZY CUTS, CUBES, BARS, LOCAL SASHIMI

VALUE ADDITION
UTILITY OF TUNA BY-PRODUCTS IN THE PHILIPPINES

VALUE-ADDED PRODUCTS

Ready-to-eat products

- TUNA AND BEANS
- CORNED TUNA
- CHILI con TUNA
- SAUSAGE
- TUNA ADOBO
- PICADILLO
UTILISATION OF TUNA BY-PRODUCTS IN THE PHILIPPINES
VALUE-ADDED PRODUCTS

Ready-to-prepare

SHANGHAI ROLLS  EMBUTIDO  CHORIZO  SIOMAI  BURGER PATTIES

HOTDOG  NUGGETS  TUNA FINGERS  TUNA ROLLS  TOCINO
BIORIGINAL FOOD SCIENCE & CORP., CANADA
- Offers a full range of essential fatty acid products
- Omega-3, omega-6 and omega-9 oils
- Head of tuna, salmon and cod – major sources of essential fatty acids
- BioPureDHA

AJINIMOTO CO., INC., JAPAN
- HON-DASHI – used as seasoning to complement skipjack stock
- Dried bonito as raw material
- Bones – raw material for calcium food products; refined broth as an extract ingredient in HON-DASHI
- Head and innards – processed for use in seasonings (fish sauce and skipjack soy sauce)

TUNA ADVANCED FUNCTIONAL FOOD CO., LTD., JAPAN
- Extracts oil from tuna heads by unique Hybrid Extraction Method

SOUTH AUSTRALIAN MARINE PRODUCT INDUSTRIES, SOUTH AUSTRALIA
- Waste material recycling from bluefin tuna, kingfish farms and local tuna cannery
- Product – organic tuna hydrolysate prepared from tuna waste
* fish bait – developed from hydrolysate and tuna oil (does not require refrigeration)
THANK YOU