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Utilization Of African Bonytongue (*Heterotis Niloticus* , Cuvier 1829) In The Production And Organoleptic Assessment Of Some Fish Products

H.I. Yakubu[1], J.O. Cheikyula[1], P.A. Annune[1], J.A. Udenyi[1], A. Abdullahi[1] and Z.B. Mohammed[2]

[1]Department of Fisheries and Aquaculture, University of Agriculture Makurdi

[2]Department of fisheries, University of Maiduguri, Borno State Nigeria

Corresponding author: Hadizayakubuisa@gmail.com Phone number: 07036080104

Abstract

Investigations on the use of *Heterotis niloticus* in production of fish sauce noodles and chin-chin was carried out with the view to add value to the fish species. Organoleptic test (before and after storage) were also carried out. The fish sauce, noodle and chin-chin were made using *Heterotis niloticus* flesh and some ingredients such as sweet pepper, sesame, ginger, sugar, table salt, vegetable oil, maggi, wheat flour and baking powder purchased from North-bank market, Markurdi. The fish were weight, descaled, beheaded, degutted and washed. Fish flesh, gut, and bones were weighed separately. Fillets were steamed and mashed after weighing. The products were made and organoleptic assessments were carried out. The data obtained from the assessment were subjected to descriptive statistics. The result revealed that, No significance difference in noodles at both 0 and 3 months. The organoleptic test of fish noodles shows that there is significance difference in appearance, flavor, taste, and texture and general acceptability in 0 and 3 months of storage. No difference in fish chin-chin appearance in fresh and after storage while difference were observed in flavor, taste , general acceptability and texture in 0 and 3 months of storage. General acceptability, texture and taste are significantly different at (0.05) confidence level. However there is no significant difference on flavor and appearance in both 0 and 3 months with P-value each greater than 0.05 confident level. The production of fish sauce, noodles and chin-chin using *Heterotis niloticus* flesh can improve the market value and aquaculture potentials of the fish species which has been discriminated because of its poor taste and bony natures despites its excellent muscle quality.

Key words: utilization, African bonytongue, organoleptic, assessment, fish, product

Introduction

Fish is one of the most diverse group of animals known with more than 20,500 species (Lagler *et al.*, 1977). It is an important animal protein food in the tropics. Developing countries fish capture is 50% of the world's harvest and large proportion of that catch is for human consumption (FAO, 1985). Nigeria is endowed with diverse freshwater fish resources that have contributed greatly to the national economy in the area of employment, means of livelihood, fish processing and marketing, as cheap animal protein source; foreign exchange earner through export of fish and fish products. It is important to ensure optimum utilization of the country's fish and other aquatic resources in order to enhance sustainable production for human consumption and other uses. The ways by which efficient utilization could be achieved include adoption of efficient processing,

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preservation and marketing techniques, diversification and development of new fish products to enhance value addition to fish. Greater utilization of fish can be achieved by improving or developing orthodox methods to reduce spoilage, deterioration and waste (Connell and Hardy, 1982). Value addition is one of the possible approaches to improve the profitability of fish processing and trading in the context of increased competition in domestic and international markets (Ferdouse 1997).Value addition to fish production could be enhanced through processing and development of various fish products. *Heterotis niloticus* belong to the family Osteoglosidae which is a long bodied fish with large scales, long dorsal and anal fins set far back on the body, and a rounded caudal fin. Its body flank is 3.5 to 5 times, standard length (SL). It has been reported to grow to a maximum size of 100cm standard length with corresponding weight of 10.2kg, the fish is gray, brown or bronze in colour. Colouration is uniform in adults but juveniles often have dark longitudinal bands (Froese and Pauly, 2005). In Africa, it is commonly known as African Arowana. *Heterotis niloticus* is a fresh water fish endemic around Pategi in the middle of river Niger in Kwara State (Adekeye, 1993). It is found in Edo, Delta and Ondo State equally abundant in Benue water bodies, and in lakes Chad and Kainji (Reed *et al.* 1967). *Heterotis niloticus* is a native of the Sahel, Sudanese region, Senegal, Gambia, Niger, Benue, Chad and Lake Turkana (Paugy, 1990). It has been successfully introduced to Cote D' Voire, Cross river in Nigeria, the Sanagal and Nyong river in Cameroon, and Ogooue river in Gabon as well as lower and middle Congo river basin, including Ubanji and Kasai river (Cuvier,1829). Fish Sauce is a brown liquid extracted from fermented fish with sea salt (Amano 1962; Beddows 1985). It is widely used as a condiment and seasoning in Southeast Asia. Fish sauce is marketed using various names by different countries depending on the type of fish used. Such as nampla in Thailand, nouc-mam in Vietnam, patis in the Philippines, shottsuru in Japan, and aek-jeot in Korea. Different countries have different recipes for making fish sauce. Nampla (Thai fish sauce), which is the most dominant in the world market, is mainly produced from anchovies (*Stolephorus spp.*), mackerel (*Ristrelliger spp*.), and herring (*Clupea spp*.). The high salt content prevents growth of pathogenic and putrefactive bacteria and so the shelf life is enhanced (Eyo, 2001). It is usually made from small fish that would otherwise have little value for consumption. Fish sauce serves as salt in western cooking and most important flavoring in Thai cooking by adding distinct aroma and flavor this differs from fish sauce prepared in this study where different ingredients and *Heterotis niloticus* were used to produced fish sauce. Noodles are narrow ribbon like strip of dough made from different flour like wheat, rice, buckwheat, starches derived from potato, and from pulses often served in soup or with sauce. At present, noodles are prepared from wheat flour, water and salt. The inadequacy of cereal proteins particularly that of wheat protein in meeting nutritional need for humans is well established, therefore there is a need of addition of fish protein which will increase the protein content, improves nutritional value and also add value to the fish species (Bin, 2008). Egg is usually used as fortifying agents in noodles. Chin-chin is a fried snack popular in West Africa. It is a sweet, cookie-like product made from wheat flour and egg (Akubor, 2004). It is usually kneaded and cut into small sizes prior to frying. Wheat flour is the main raw material and therefore there is need to enrich it with adequate protein and fiber sources. Organoleptic assessment utilizes the sense of touch, smell, sight and taste for quality assessment of fish. Tests are used simply or in combination with each other to assess the appearance of the fish (FAO, 1986). Flavour is used to determine the degree of freshness of the fish and the texture confirms the state of the muscles (Burt *et al*., 1976). Tarr (1952) reported a brown discoloration in white-fleshed fish upon heating. Moss (1971) distinguished different ways in quality of noodles. First, the whiteness or

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brightness of the dried noodle decreases with increasing protein level. Second, the color varies with textural changes during boiling and quality may be affected by the quality of the wheat from which they are prepared. As protein content increases, the eating quality becomes more attractive, yet the colour becomes more objectionable (Baik *et al*. 1994). A bright and light yellow color is desirable for instant noodles. Several researches had been conducted to reduced post harvest loses in fish especially though value addition to the product such as; fish ball, fish fingers (Whittle, 1984), minced fish cake (Zain 1980) and fish meal (Windson, 1971). Despite the effort to minimized the post harvest loses in fish, *Heterotis niloticus* still has some challenges of been less patronize by consumers due to its taste and bony natures especially when fresh. This paper is therefore aims at converting this fish species into fishery products that can be a better technique of preservation such as fish sauce, noodles and chin-chin as well as to assess the organoleptic quality of the products.

MATERIALS AND METHODS

Study Area

The study was conducted in fish nutrition laboratory of the Department of fisheries and aquaculture, University of Agriculture Makurdi situated

Collection of ingredients

Heterotis niloticus and other ingredients such as sweet pepper, sesame, ginger, sugar, table salt, vegetable oil, maggi, wheat flour and baking powder were purchased from North-bank market, Markurdi. Six fish were used and all fish weighed 1kg each. The fish were weight, descaled, beheaded, degutted and washed. Fish flesh, gut, and bones were weighed separately. Fillets were steamed and mashed after weighing.

Production of fish Sauce

Fish sauce was made using *Heterotics niloticus* flesh. One thousand grams (1000g) of the fish flesh were mixed with one hundred and forty grams (140g) of sweet pepper, one hundred and fifty grams (150g) of sesame, twenty grams (20g) of ginger, two hundred grams (200g) of sugar, five grams (5g) of table salt, five grams (5g) of cloves, 0.5g of cinnamon, 1.6litre of vegetable oil and thirty grams 30g of maggi to produce the fish sauce. This is shown on Table 1 which contains recipe formulation of fish sauce production abducted from Pork and Chow (1980). Fish flesh was steamed using stove and pot for twenty minutes. The flesh was allowed to cool to enable the removal of tiny bones that were not visible during filleting, this aid in smoothing appearance and texture of fish sauce. Flesh was mashed with help of pestle and mortar. Mashed fish flesh was added to the dry ingredients which were earlier mixed and placed in a bowl. Hot vegetable oil at boiling point was added onto the mixture and stirred. Fish sauce was carefully stirred and allowed to cool before been packaged in bottles for storage.

Table 1: Recipe formulation for fish sauce production

Ingredients	Inclusion
Heterotis niloticus Flesh	1000g
Sweet pepper	140g
Ginger	20g
Sesame	240g

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Sugar	200g
Salt	5g
Cinnamon	0.5g
Cloves	0.5g
Vegetable	1.6 litre
Maggi	30g

Production of fish Noodle

One thousand five hundred (1500) grams of wheat flour was weighed into plastic basin. One thousand (1000) grams of *H. niloticus* flesh was steamed and added to the flour. Other ingredients were added at a proportion of; twenty mils (20ml) of vegetable oil, 1g of nutmeg, 5g of baking powder, and 0.5g of cinnamon. Five grams (5g) of table salt, ginger, cinnamon, cloves and 5 pieces of eggs were also added respectively and mixed to make dough. Recipe formulation of fish noodles production is shown on Table 2 as abducted from (Hong-Zhuo *et al*., 2009). The prepared dough made earlier from wheat flour was flattened using a chopping board and a rolling pin. The flattened dough was passed through a small noodle machine with the rollers gap reduce gradually to get dough sheet to produce noodles. The dimensions of the resultant noodle strands were 2mm in width and 1mm in thickness and this was spread under the sun for 48 hours to dry (2days) before packaging.

Table 2: Recipe formulation for fish noodles production

Ingredients	**Inclusion Level**
Heterotis niloticus Flesh	1000g
Wheat flour	1500g
Ginger	5g
Egg	5 pieces
Nutmeg	1g
Salt	5g
Cinnamon	0.5g
Cloves	0.5g
Vegetable Oil	20 ml
Baking powder	5g

Production of fish Chin-chin

Wheat flour (1500g) was mixed with one thousand grams (1000g) of *H. niloticus* flesh to produce fish chin-chin. Two hundred grams (250g) of Butter, three (3) pieces of eggs, ten grams 10g of baking powder, two gram (2g) of snutmeg, five grams (5g) of salt, cinnamon and cloves, one gram (1g) of ginger and two hundred grams (200g) of sugar were also mixed to make dough and were placed in a plastic basin to rest for 10 minutes. This is also shown on Table 3 which contains recipe formulation of fish chin-chin production abducted from (Adebayo-Oyetoro *et al.*, 2017). Wheat flour and fish flesh (steamed) were mixed to make chin-chin snack this was mixed with hands to help both ingredients blend together. First the blended mixture was put in a bowl followed by the addition of salt, ground nutmeg, after this margarine was mixed with it evenly. Eggs, sugar and other ingredients (cloves, cinnamon, ginger, baking powder) were added to make fairly stiff dough. The thick dough was rolled tightly on a board and cut into cubes followed by frying in deep hot vegetable oil until golden brown color was obtained. The oil was then drained and allowed to cool and finally packaged in plastic containers for storage.

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Table 3: Recipe formulation for fish chin-chin production

Ingredients	Inclusion Level
Heterotis niloticus Flesh	1000g
Wheat flour	1500g
Ginger	1g
Egg	5 pieces
Sugar	200g
Salt	5g
Cinnamon	0.5g
Cloves	0.5g
Vegetable Oil	1.6 litre
Baking powder	10g
Nutmeg	2g

Packaging and labeling of packaging bottles

Fish products were packaged in glass bottles, plastic containers and white polythene for storage. The bottles, containers and polythene were labeled in the following way; Production date, Ingredients percentages, Product weight and researcher.

Organoleptic assessment of the fish products

Organoleptic assessment of the products was carried out immediately after production and stored for three months. The products were presented to respondents for organoleptic based on test appearance, flavour, texture, and General acceptability on a 1-7 Hedonic scale following the method of Ihekoronye and Ngoddy, (1985).1 excellent, 2 very good, 3 good. 4 fair, 5 poor, 6 very poor, 7 extremely poor.

Data analysis

Data obtained from the questioners were subjected to descriptive statistic; the descriptive statistics used include percentage and frequency. SPSS version 16 was used as a package.

Results and Discussions

Organoleptic Assessment of processed Fish products

The organoleptic assessment of the processed fish products (Noodles, Chin-chin and sauce) using *Heterotis niloticus* and preserved for three months is presented in Table 1. The results shows that storage period significantly affected the organoleptic quality of fish noodles with flavour having the highest rating (5.10) with a percentage change of 35% while texture had the least rating (4.40) with a percentage of 15.9 %. The highest percentage change in rating was observed in appearance (36.2 %) while texture had the least (15.9 %). There were significant differences ($P<0.05$) in all the organoleptic assessment. The higher rating observed in flavour and texture as well as the best appearance and teste in the noodle were all higher than the values reported by Isaac (2014) as 4.64, 4.70, 4.62 and 4.71 respectively.

The organoleptic assessment of fish chin-chin using *Heterotis niloticus* shows significant difference ($P<0.05$) in the flavour, texture and general acceptability. The results showed that general acceptability had the highest rating of 6.10 while Texture had the least (5.20). After 3 months of storage, flavour (5.60-4.50) had the highest change in rating (22.2 %) and appearance (5.40-5.00) had the least rating of 8 %. There were significant difference ($P<0.05$) in the flavour,

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testure, taste and general acceptability. The values of the general acceptability and texture of the fresh chin-chin product presented in this research were higher than the values documented by Aishatu (2010) as 4.80 and 4.35 respectively. For the values of the stored chin-chin for three (3) months, the flavor, texture, taste and general acceptability were greater than the values presented by Aishatu (2010) after working on the comparative study on the efficiency of traditional steel drum smoking kiln and modified steel drum smoking kiln as 3.40, 3.90, 1.302.0.

The result of the organoleptic assessment of fish sauces shows significant difference in the taste, texture and general acceptability ($P<0.05$). The results shows that taste had the highest initial rating of 5.50 while flavor had the least (5.00). After three months of storage, there was a reduction in the organoleptic ratings with taste having the highest percentage change in rating of 18.2 % (5.50-4.50) while appearance had the least percentage rating of 5.6 % (5.40-5.10). The initial (fresh) value of the fish sauce in terms of taste and flavor were in divergent with the findings of Doramola *et al*. (2007) with each having the value 4.60. Consequently, the values of the organoleptic rating of the fish sauce after 3 month presented different values as documented by Doramola *et al*. (2007) for taste, appearance, texture, flavor and general acceptability as 5.00, 4.60, 4.60, 4.80 and 4.60 respectively for smoked-dried *Clarias gariepinus*.

Table 4; organoleptic assessment of processed fish products using *Heterotis niloticus* and preserved for 3months

Fish Products	Time (3months)	Appearance	Flavour	Taste	Texture	Gen. Acceptability
Noodles	0	4.70±0.15	5.10±0.23	4.60±0.22	4.40±0.16	4.70±0.15
	3	3.00±0.00	3.30±0.15	3.20±0.13	3.70±0.15	3.10±0.10
	% Change	36.2	35.3	30.4	15.9	34.0
	P-Value	0.000*	0.000*	0.000*	0.006*	0.000*
Chinchin	0	5.40±0.16	5.60±0.16	6.00±0.00	5.20±0.20	6.10±0.23
	3	5.00±0.21	4.50±0.22	4.80±0.20	4.50±0.17	5.00±0.15
	% Change	8.0	22.2	20.0	13.5	18.0
	P-Value	0.151	0.001*	0.000*	0.015*	0.001*
Fish sauce	0	5.40±0.16	5.00±0.21	5.50±0.17	5.10±0.18	5.40±0.16
	3	5.10±0.10	4.70±0.21	4.50±0.17	4.40±0.16	5.00±0.00
	% Change	5.6	6.0	18.2	13.7	8.0
	P-Value	0.135	0.331	0.000*	0.010*	0.025*

* Significantly at 0.05 Confidence Limit ($P<0.05$)

The mean organoleptic assessment of the fish products (table 2) shows that fish sauces had the highest rating in appearance (5.25) while fish noodles had the least (3.85). Fish chin-chin had the highest rating for flavour (5.05), taste (5.40), texture (4.85) and general acceptability (5.55) while fish noodles had the least flavour (4.20), taste (3.90), texture (4.05) and general acceptability (3.90). There were significant differences ($P<0.05$) in all the organoleptic attributes. The mean values of the organoleptic assessment of the fresh fish noodle, chin-chin and sauce presented in this work were all closed to the mean value laid down Doramola *et al*. (2007) for taste, general acceptability, flavor, texture and appearance as 3,53,3.49.3.62, 3.64 and 3.64 respectively. After three months of storage of the fish products, Fish noodles shows the highest % change in appearance (36.2%), flavour (35.3 %), taste (30.4 %), texture (15.9 %) and general acceptability (34.0 %). Fish sauce had the least percentage change in appearance (5.6 %), flavour

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(6.0 %) taste (18.2 %) and general acceptability (8.0). The mean values of the organoleptic assessment of the stored products for three (3) months gave lower values when compare with the values as 5.68, 6.43, 6.06,5.66 and 5.93 for flovor, texture, appearance, acceptability and taste.

Table 5; Mean organoleptic assessment of processed fish products using *Heterotis niloticus*

Fish Products	Appearance	Flavour	Taste	Texture	Gen. Acceptability
Noodles	3.85 ± 0.21^{a}	4.20 ± 0.25^{a}	3.90 ± 0.20^{a}	4.05 ± 0.14^{a}	3.90 ± 0.20^{a}
Chinchin	5.20 ± 0.14^{b}	5.05 ± 0.18^{b}	5.40 ± 0.17^{b}	4.85 ± 0.15^{b}	5.55 ± 0.18^{b}
Fish Sauces	5.25 ± 0.10^{b}	4.85 ± 0.15^{b}	5.00 ± 0.16^{b}	4.75 ± 0.14^{b}	5.20 ± 0.09^{b}
P-Value	0.000	0.010	0.000	0.000	0.000

Mean in the same column with different superscript differ significantly ($P<0.05$)

Conclusion

In conclusion, fresh fish chin-chin, noodles and sauce have a good organoleptic assessment. After three months of storage under laboratory conditions, the level of reduction of organoleptic assessment rating was high for fish noodles and fish chin-chin but minimal for fish sauce. The utilization of *Heterotis niloticus* can be improved through value addition.

Recommendation

Heterotis niloticus should be use to produced different fish products to boast its market value.
The storage period should be also extended in further studies and the sensory plus Nutritional stability of the products should be determined at regular intervals during the storage period.

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