International Journal of Fisheries and Aquatic Studies 2017; 5(2): 06-09

E-ISSN: 2347-5129
P-ISSN: 2394-0506
(ICV-Poland) Impact Value: 5.62
(GIF) Impact Factor: 0.549
IJFAS 2017; 5(2): 06-09

www.fisheriesjournal.com
Received: 02-01-2017
Accepted: 03-02-2017

Binod Bihari Sahu
ICAR-Central Institute of Freshwater Aquaculture (CIFA) Kausalyaganga, Bhubaneswar, Odisha, India

Nagesh Kumar Barik
ICAR-Central Institute of Freshwater Aquaculture (CIFA) Kausalyaganga, Bhubaneswar, Odisha, India

Padmanav Routray
ICAR-Central Institute of Freshwater Aquaculture (CIFA) Kausalyaganga, Bhubaneswar, Odisha, India

Aloka Agnibesh
ICAR-Central Institute of Freshwater Aquaculture (CIFA) Kausalyaganga, Bhubaneswar, Odisha, India

Ambarish Paikaray
ICAR-Central Institute of Freshwater Aquaculture (CIFA) Kausalyaganga, Bhubaneswar, Odisha, India

Satyapriya Mohapatra
ICAR-Central Institute of Freshwater Aquaculture (CIFA) Kausalyaganga, Bhubaneswar, Odisha, India

Jitendra Kumar Sundaray
ICAR-Central Institute of Freshwater Aquaculture (CIFA) Kausalyaganga, Bhubaneswar, Odisha, India

Correspondence
Binod Bihari Sahu
ICAR-Central Institute of Freshwater Aquaculture (CIFA) Kausalyaganga, Bhubaneswar, Odisha, India

Comparative studies on carcass characteristics of marketable size farmed tilapia (*Oreochromis niloticus*) and silver barb (*Puntius gonionotus*)

Binod Bihari Sahu, Nagesh Kumar Barik, Padmanav Routray, Aloka Agnibesh, Ambarish Paikaray, Satyapriya Mohapatra and Jitendra Kumar Sundaray

Abstract
The carcass traits and commercial characteristics of farmed freshwater *Oreochromis niloticus* and *Puntius gonionotus* were investigated to calculate yield data useful for programming semi- automated processing units. Specimens with average weight of 819.5±42.3 and 2108±38.2 were collected from both tilapia and puntius respectively. Samples were taken from culture pond of the Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar, Odisha, India. Carcass offal yields as well as carcass curability were evaluated. Head yields were recorded as 27.1 and 10.07% for tilapia and puntius, respectively. The gutted yield, headless yield skinless dressed round percentage were determined as 80.0, 53.0 and 51.6% for tilapia and 62.9, 52.20 and 50.1% for Puntius respectively. The meat: bone ratio in filleting average 2.1 for tilapia and 4.2 for silver carp. The middle cut of tilapia and puntius had both the highest total yield percentage and highest meat yield. The hind cut of tilapia had significantly higher yield percentage and meat yield in comparison to puntius. In both tilapia and puntius dry matter, ether extract and protein percentage were highest in the middle cut followed by fore cut and hind cut. In puntius the percentage of fat content was found to be significantly higher than in tilapia. The omental fatin puntius was significantly higher than tilapia.

Keywords: Carcass traits, commercial traits, carcass evaluation, *Puntius gonionotus*, *Oreochromis niloticus*

1. Introduction
The Nile tilapia (*Oreochromis niloticus*) is one of the main species cultured commercially due to its good growth, its great potentiability for intensive fish farming (Melo *et al.,* 2013) [1] Silver barb (*Puntius gonionotus*) is an important tropical fish species on account of its fast growth rate, portability, easy and year round reproduction, adaptability to a wide range of culture condition (Hussain *et al.,* 1989) [2]. Carcass and flesh quality has gained importance among consumers and is aquaculture industry because it is directly related to human health and nutrition. Genetic improvement for flesh quality utilizing information as quality traits and family selection must be practiced in a breeding programme (Gjedrem, 1997) [3]. The relative changes in morphometric traits during grow- out of carps are not well known but can provide valuable criteria for optimizing processing and carcass yields while determining the relations between bone-muscle development and changes in body proportions (Fauconneau *et al.,* 1995) [4] non-invasive measurements of fillet composition of four freshwater fish species by computer tomography have been described by Romavari *et al.,* (2003) [6] computerized x-ray tompgraphy was used by Hanez *et al.,* (2003) [6] to predict carcass quality traits of common carp. Ujjania and Kohli (2011) [7] employed tuss network as a tool to describe body shape of carps while quantifying the intra species variability.
The present study has been undertaken to compare edible and non-edible processing yield in relation to fish weight using morphometric and carcass traits as indication for edible yield. These indicators are easily measured furthermore, these are good prediction of body composition, growth and carcass fish quality, which are essentially needed for routines analysis in fisheries. (Cui and Wotten, 1988)[19]; (Salam and Davis, 1994) [8]

The objective of present study was to Characterise the carcass traits of marketable sized specimens of two minor carps, *Orepochromics niloticus* and *Puntius gonionotus*.

2. Materials and methods

Samples of farmed *Orepochromics niloticus* and *Puntius gonionotus* were collected from earthen composite culture ponds (laterite lined) of the Central Institute of Freshwater Aquaculture (CIFA) Odisha State, India. These fish were cultured on iso-nitrogenous and iso-caloric formulated diets, twice daily (CIFACA- carp feed). Ten specimens each of tilapia averaging 819.5g and puntius averaging 2108g were collected. Fish were bled on the spot and iced.

Fish carcass weight, yield, offal and Cuttability traits were determined following a standard carcass evaluation technique (Sahu *et al.,* 2014)[10] after evisceration, head and fins removal the cutting and dressing was carried out.

All characters were measured to the nearest Cm using a vernier caliper and weighted with a standard top loading balance with a 0-1g precision.(Kern CB3K-.1N) (Fig.1)

Total fish weight (g) and standard length (SL) were measured in Cm and used to calculate the condition factor.

The gutted tilapia and puntius were segmented into three parts according to the fin location (HPF= from near the head to pectorial fin (front cut), ADF= anterior to dorsal fin (middle cut), AAF= anterior to anal fin (hind cut).) (Fig.2). Samples were weighted separated and homogenized, placed a pre-weighed aluminum foil and dried to constant mass by slow overheat at 70^0c for 12 h. To analyze quantity of water, lipid and dry mater in each section in relation to the weight class of fish, each dried part was powdered and preserved in labeled plastic bottles for analytical use. The different segments were weighed separately. Cross sections of these cuts were used to estimate the total muscle area by taking an impression and drawing the cuts on graph paper in order to express them in cm^2 (Fig.3 and 4).

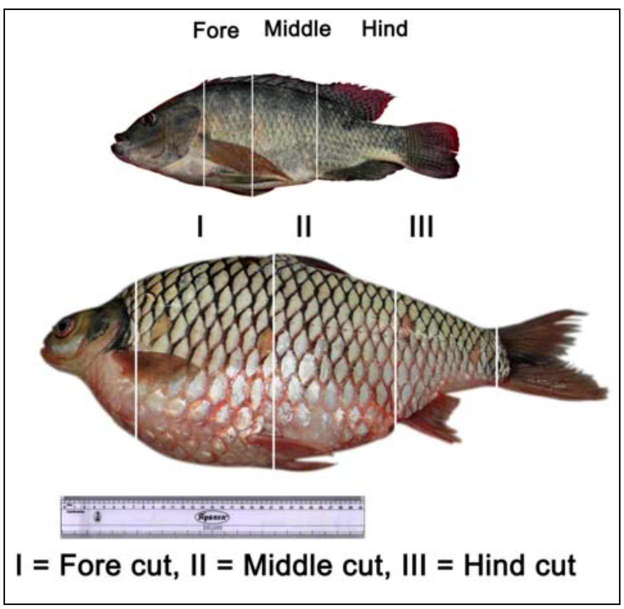

Fig 1: Morphological sites of three cuts, *Oreochromis niloticus* (top) and *Puntius goniotus* (bottom)

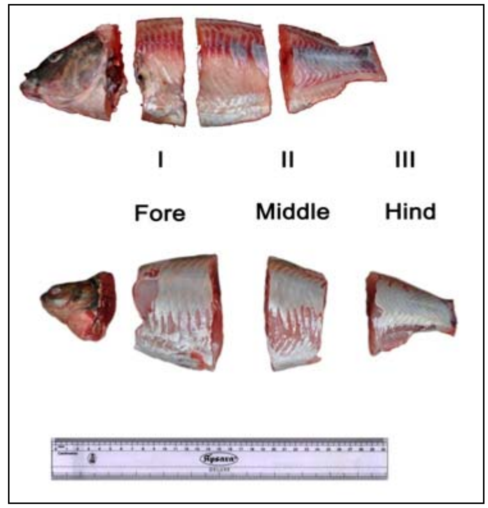

Fig 2: Skinless cuts of *Oreochromis niloticus* (top) and *Puntius goniotus* (bottom)

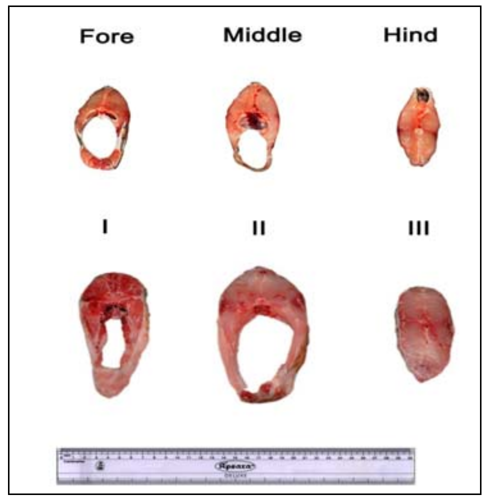

Fig 3: Carcass cross-section of *Oreochromis niloticus* (top) and *Puntius goniotus* (bottom)

3. Results

Table 1 presents the data on morphometries, body weight, and condition factor for both tilapia and puntius species. Girth of the fish was proportional to the muscle area, which appeared to be higher at ADF followed by HPF and AAF. Offal yield of both the carp species are given in Table-2. Head and viscera yield in tilapia reached 27.1 and 11.3 respectively, while the respective values for puntius were 0.7 and 20.9%. The conventional evisceration mass was as much as 80.0% of the total weight in tilapia and 62.9% in puntius (Table 3) Dressed weight without head reached 53.0% in tilapia and 52.2% in puntius. Omental fat in puntius was reached to be 6.8% and 1.9% in tilapia.

Cuttability traits of both the species are presented in Table, 4. *Oreochromis niloticus* middle cut recorded highest 39.2% of carcass weight; however force cut in *Puntius gonionotus* was recorded 52.2%. The hind cut in tilapia recorded 29.55 and 21.0% in puntius species *Oreochromis niloticus* cutability traits indicated that the second cut percentage was highest followed by fore and hind cut. The middle cut has highest percentage of edible fillet followed by the fore and hind cut. The middle cut had the highest relative bone contest followed by the 1st and 3rd cut. Meat bone ratio was highest in the middle cut (2.2) followed by the fore cut (2.1) and hind cut (2.1). On the whole, 819.5g market class *Oreochromis niloticus* has a meat bone ratio of 2.1.

Puntius gonionotus cutability traits indicated that percentage of both fore and middle cut were 52.2% and 48.2% respectively. Fore cut yielded fillet yield (32.7) as well as the bone yield of 8.55. Middle cut of puntius yielded 33.6% fillet and corresponding bone content was 6.5%. Meat: bone ratio was highest in middle cut (5.6) followed by fore cut (3.8) and hind cut (3.2). A 210g market class *puntius gonionotus* has an average meat: bone ratio of 4.2

Results of other parameter such as dry matter, moisture, ether extract and protein content of different cuts for *Oreochromis niloticus* and *puntius gonionotus* are given in Table 5. The relative values for ether extract and protein contact were highest in the middle cut followed by the fore and hind cut.

Table 1: Body morphometric of sampled fish for study of carcass traits in *Oreochromis niloticus* and *Puntius gonionotus* (mean ± standard deviation; n=10)

Traits	*Oreochromis niloticus*	*Puntius gonionotus*
Fresh body weight (g)	819.5 ± 42.3	2108 ± 38.2
Body length (cm)	32.3 ± 6.5	43.4 ± 3.4
Standard length (cm)	27.4 ± 5.2	36.1 ± 2.9
Condition factor (k)	2.4±0.5	2.6±0.8
Head length (cm)	5.2 ± 0.8	4.1 ± 0.5
Mouth length (cm)	3.1 ± 0.3	3.5 ± 0.2
Vertical width of mouth (cm)	3.5 ± 0.4	3.3 ± 0.3
Girth at HPF (cm)	26.1 ± 2.8	27.8 ± 3.8
Girth at ADF (cm)	28.3± 3.2	43.7 ± 4.5
Girth at AAF (cm)	24.2 ± 2.1	28.5 ± 2.9

Table 2: Offal trait yields of *Oreochromis niloticus* and *Puntius gonionotus* (mean ± standard deviation; n=10)

Offal yield traits	*Oreochromis niloticus*	*Puntius gonionotus*
Live weight (g)	819.1 ± 23.8	2108.1 ± 38.2
Head weight (g)	221.7 ± 15.3	225 ± 19.1
Head (%)	27.1	10.7
Fins and tail weight (g)	45.3 ± 1.8	31.1 ± 4.6
Fins and tail (%)	5.5	1.5
Digestive tract weight (g)	92.4 ± 9.2	421.4 ± 34.5
Digestive tract (%)	11.3	20.0
Omental fat (g)	15.8±1.8	142.5±32.5
Omental fat (%)	1.9	6.8
Scales weight (g)	21.5 ± 1.8	74.2 ± 8.6
Scales (%)	2.6	3.5
Gill weight (g)	20.2 ± 1.6	20.8 ± 3.5
Gill (%)	2.5	1.0
Skin weight (g)	11.2 ± 1.2	55.61 ± 2.8
Skin (%)	1.4	2.6

Table 3: Dressed carcass traits for market size *Oreochromis niloticus* and *Puntius gonionotus* (mean ± standard deviation; n=10)

Dressed carcass traits	*Oreochromis niloticus*	*Puntius gonionotus*
Live weight (g)	819.5 ± 42.3	2108 ± 38.2
Dressed body weight (g)	655.5 ± 19.2	1325.5 ± 20.2
Dressing percentage (%)	80.0	62.9
Headless dressed round weight (g)	433.8 ± 11.6	1100.5 ± 30.1
Headless dressing percentage (%)	53.0	52.2
Skinless dressed round weight (g)	422.6 ± 9.8	1044.9 ± 28.5
Skinless dressing round percentage (%)	51.6	50.1

Table 4: Fish filleting traits of *Oreochromis niloticus* and *Puntius gonionotus* (mean ± standard deviation; n=10) Percentage values on skinless round basis

Position of cut	Species	Weight (g)	Yield (% of total weight)	Meat yield (g)	Meat (%)	Bone yield (g)	Bone (%)	Meat : bone ratio
1st Cut	*Oreochromis niloticus*	143.5 ± 18.2	34.0	84.3	19.9	39.8	9.4	2.1
	Puntius gonionotus	545.3 ± 32.2	52.2	341.3	32.7	89.1	8.5	3.8
2nd Cut	*Oreochromis niloticus*	165.6 ± 21.2	39.2	105.3	24.9	47.5	11.2	2.2
	Puntius gonionotus	503.7 ± 30.1	48.2	351.1	33.6	67.9	6.5	5.6
3rd Cut	*Oreochromis niloticus*	124.7 ± 15.1	29.5	77.3	18.3	37.5	8.9	2.1
	Puntius gonionotus	219.8 ± 25.1	21.0	154.1	14.7	48.3	4.6	3.2
Pooled	*Oreochromis niloticus*	433.8±16.2	34.2	266.9	21.0	124.8	9.8	2.1
	Puntius gonionotus	1268.8±30.5	40.5	846.5	27.0	205.3	6.5	4.2

Table 5: Proximate composition of fore, middle and hind cuts of *Oreochromis niloticus* and *Puntius gonionotus* (mean ± standard deviation; n=10)

Traits	Species	I Fore cut	II Middle cut	III Hind cut	Pooled
Dry matter (%)	*Oreochromis niloticus*	24.5 ± 1.8	24.9 ± 1.9	24.7± 1.8	24.7±1.6
	Puntius gonionotus	24.1 ± 1.8	24.3 ± 1.8	21.3 ± 1.5	23.2±1.5
Moisture (%)	*Oreochromis niloticus*	74.1 ± 1.8	75.2 ± 1.3	76.2 ± 1.2	73.4±1.4
	Puntius gonionotus	73.3 ± 1.8	71.2 ± 1.6	70.9 ± 1.5	71.8±1.7
Protein (%) (N x 6.25)	*Oreochromis niloticus*	8.4 ± 1.8	8.8 ± 1.7	7.9 ± 1.6	8.4±1.5
	Puntius gonionotus	12.1 ± 1.6	12.8 ± 1.8	8.5 ± 1.5	11.1±1.8
Ether extract (%)	*Oreochromis niloticus*	10.1 ± 1.3	10.8 ± 1.5	10.6 ± 1.8	10.5±1.5
	Puntius gonionotus	19.1 ± 1.4	14.3 ± 1.5	13.8 ± 1.5	15.7±1.4

4. Discussion

Certainly, the size of the head always influences the overall outcome, which is more pronounced in carps than in catfishes (Jankowska *et al.,* 2007) [11]. The evisceration yields were similar in this investigation compared with earlier studies (Dunham *et al.,* 1983; Sahu *et al.,* 2014) [9, 10]. Diodatti *et al.,* (2008) [12] working some tilapia strains, found a significant correlation coefficient between morphometric measures members and carcass yield measured at the point of insertion of the anal fin. Freato *et al.,* (2005) [13] reported that the highest of the body making the insertoion of gthepectorial fin was the most important measures for determining the yield of carcass.

An increase in body fat content is generally accompanied by reduction in slaughter yield to an increase in the weight of viscera in relation to body weight in Nile tilapia (E1-zaem *et al.,* 2012) [14] In this present study significantly high percentage of omentalk fat has been recorded in *Puntius gonionotus* in comparison to *Oreochromis niloticus.*

The cutability percentage in *Oreochromis niloticus* and *puntius gonionotus* were almost equal for both fore and middle cut. The middle cut has comparatively more percentage of edible fillet yield the fore cuts has the higher relative bone contact. The results of carcass traits of the presence work consistent with the ranges reported by several other investigators (Ei-zaeem *et al.,* 2012; Johnston *et al.,* 2006) [14, 15]

An increase in body fat contain is generally accompanied by reduction in slaughter yield, owing to an increase in the weight of viscera in relation to the body weight. Exclusive fat deposit reduces the quality of the fish. Increase the fat deposit increases waste in processing (Ei-zaeem *et al.,* 2012) [14]

Endinkeau and Tan (1993) [16] indicated that lipid content in *Puntius gonionotus* 14.8% and *Tilapia niloticus* 11.0% of the fish fillet. Tilapia lipid appears to be intermediate in nutritional quality. Rais (2012) [18] extracted fish oil from different parts of *Puntius gonionotus* and found that viscera yielded highest amount of oilfollowed by skin, head and flesh. The correlations between percentage of moisture contents, ether extract, dry matter percentage and percent organic contents were similar to precius studies using *Oreochromis niloticus Catlacatla* (Sahu *et al.,2014*)[10]. They opined these changes are also due to variations in relative fat and waste content during different life cycle stages.

Understandingly the interactions between various products traits will aid in product yield control. (Powell *et al.,* 2008) [17].

The data obtained in this study helps to understand yield and composition of cultured fish in terms of optimal processing approaches of the species of fish under consideration. Addition of studies on tilapia and puntius carcass traits using different size classes could be used to modify carcass composition to meet consumers demand.

5. Acknowledgement

The authors are thankful to Director, ICAR-Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar, Odisha, India for providing the necessary facilities to conduct the experiment also to Siddharth Mahali, technical officer for photography and documentation.

6. References

1. Melo CCV, NETO Neto RVR, Costa AC, Freitas ATf, Freato AA, Desouja UN. Direct and indirect effect of measures and means morphometric on body yield of Nila tilapia, *Oreochromis niloticus* Actascientiarum, Animal sciences. 2013; 35(4):357-363
2. Hussian MG, Akteruzzaman M, Kohinoor AHM, Shah KA. Semi-intensive culture of silver barb. J. Fish. 1989 12:32-38.
3. Gjedrem T. Fresh quality improvement in fish through breeding. Aquaculture int. 1997; 5:197-206.
4. Fauconneau B, Alami-Durante H, Laroche M, Marcel J, Vallot D. Growth and meat quality relations in carp. Aquaculture. 1995; 129:265-297.
5. Romavari R, Hanez CS, Petrasi Z, Molnar T, Horm P. Non-invasive measurement of fillet composition of four freshwater fish species by computer tomography. Aquaculture internet. 2002; 10:231-240.
6. Hanez C, Romavari R, Petrasi Z, Horn P. Prediction of carcass quality traits of common carp by x-ray computerised tomography. Isr. J. Aquaculture. Bamidgeh. 2003; 55:61-68.
7. Ujjania NC, Kohli MPS. Land mark based morphometric analysis for selected species for Indian major carps (*Catlacatla.* Ham., 1822) Internet. J. Food Agriculture. Net. Science. 2011; 1:64-74.
8. Salam, A.; Davies, P.M.C., 1994: Body composition of northern pike. *Esox Lucius* L. in relation to bodysize and condition factor. J. Fish res. 1998; 19:293-304.
9. Dunham RA, Benchakan M, Smitherman RO, Chappel JA. Correlation among morphometric traits of fingerling catfishes and relationship in dressing percentage at harvest. J. World maricutsoc. 1983; 14:668-675.
10. Sahu BB, Raghunath MR, Meher PK, Senapati DK, Das PC, Mishra B *et al.* Comparision studies on carcass characteristics marketable size farmed mrigal cirrhinus mrigala, (Hamilton,1822) and silver carp *Hypophthalmichthys molitrix*, (Val., 1844). J Appl. Icthyol. 2014; 30:195-199.
11. Jankowska B, Zmijewski T, Zakes Z, Ulikowski D, Kowalska A. Slaughter value and flesh characterstics of Evropeeas catfish (silurusglaris) fed natural and formulated feed under different rearing conditions. Eur. Food Res. Technol. 2007; 224:453-459.
12. Diodatti FC, Freitas RTf, Freato TA, Ribeiro PAP, Murgas LDS. Parametros morphometrics en rendimiento de los components corporates de tilapia delnilo (*Oreochromis niloticus*) Anales de Veterinaria de muneia. 2008; 24(4):45-55.
13. Freato TA, Freitas RTF, Santos VB, Logato PVR, Viveiros ATM. Efeito do peso de abate nos rendimentos do process amento da pirakanjuba (Brycmorbignyanus, Valenciennes, 1849) Ciencia Agrotechnologia. 2005; 29(3):676-682.
14. E1-Zaeem SY, Ahmed MMM, Salaman ME, Ei- Kader WNA. Flesh quality differentiation of field and cultured Nile tilapia (*Oreochromis niloticus*) populations African journal of Biotechnology. 2012; 11(17):4086-4089.
15. Johnston IA, Li X, Viera VLA, Nickell D, Dingwall A, Alderson R *et al.* Muscle and flesh quality traits in wild and farmed Atlantic salmn (Salmo salam). Aquaculture. 2006; 256:325-336.
16. Endinkeau K, Tan KK. Profile of fatty acid contents in Malasian freshwater fish. Pertanika J Trop. Agri. Sci. 1993; 16(3):215-221.
17. Powell J, Write I, Guy D, Brother stone S. Genetic parameters of productions traits in Atlantic salmon (Salmo salar) Aquaculture. 2008; 274:225-231.
18. Rais AB. Extraction of oil from different parts of Javanese carp (Puntius gonionotus) and its stability and physiochemical properties project report Degree Bachelor of Science, Food science and Technology. Faculty of Applied Science University Technology, MARA, Malaysia. 2012.
19. Cui Y, Wotten RJ. Bioenergetics of growth of cyprinid *Phoxinus phoxinus* (L.) the effect of ration and temperature on growth rate and efficiency. J, Fishbiol.33, 763-773