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THE MEKONG GIANT CATFISH, CHAO PHRAYA CATFISH AND THEIR HYBRID: MORPHOLOGY, CARCASS COMPOSITION AND DRESS-OUT PERCENTAGES

By

KRIT MONGKONPANYA, *CHOKCHAI SENAWONG, **THUSANEE PUPIPAT and ***TERRENCE TIERSCH

General Science Department, Faculty of Science, Kasetsart University, Bangkok 10903, Thailand

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ABSTRACT:- Morphological comparisons, meristic counts and measurements of the parental species (*Pangasius gigas* and *P. hypopthalmus*) and the hybrid were presented. Gut contents, the gastrointestinal tract (GIT), growth and carcass compositions were also studied. The live weight of the 2.5-year-old farm-raised fishes were significantly different among parental species and hybrid, with *P. gigas* (~8 kg) being the largest, the hybrid (~3.5kg) intermediate and *P. hypopthalmus* (~2 kg) the smallest. *P. gigas* had the he combined weights of the fillets and belly flap roughly the same in percentage (52-53%) as those of the hybrid (49%), but higher than that of *P. hypopthalmus* (47%). There was no significant difference among the fillets of subadults in the percentages of protein and moisture. The fat content of fillets was significantly higher in *P. gigas* (~ 3%) than in the hybrid (0.6 %) and *P. hypopthalmus*

* Department of Zoology, Faculty of Science, Kasetsart University

** Inland Fisheries Research Institute, Department of Fisheries, Bangkok 10900

*** School of Forestry, Wildlife and Fisheries, Louisiana Agricultural Experiment Station, Louisiana State University Agricultural Center, Baton Rouge, LA 70803, U.S.A.

(0.3%). Since there were no stomach contents in the wild adult of *P. gigas* examined within 3 h after capture and the subadult *P. gigas* had remarkedly high fillet fat content, these suggests that wild adult of *P. gigas* could accumulate a large amount of energy reserves and perhaps do not feed regularly prior to the spawning migration.

Key words : *Pangasius (Pangasianodon) gigas, P. hypopthalmus (P. sutchi)* and the hybrid (buk-swai), carcass composition, dress-out percentage

INTRODUCTION

Asian catfishes of the family Pangasiidae are important in captured fisheries (e.g. *Pangasius conchophilus* and *P. krempfi*) and aquaculture (e.g. *P. hypophthalmus;* formerly *P. sutchi* Fowler) in the Mekong region, including Thailand. The Mekong giant catfish, or pla buk (*Pangasius gigas;* formerly *Pangasianodon gigas* Chevey), which can attain the sizes of 300 kg or larger and apparently can reach 100 to 200 kg in 3 years (Roberts and Vidthayanon 1991) is considered to be an endangered species. The Thai Fisheries Department initiated a program in artificial breeding of this species in 1967, and accomplished production of thousands of fry in 1983 (Pholprasith 1983). Yearly since then, this program has involved collection of gametes from wild fish in the Mekong River, production and rearing of fry, and release of seedstock back into the Mekong, many reservoirs, and earthen ponds at the Fisheries Research Centers in Chiengrai and Payao provinces. However, none of the giant catfish artificially produced have reached sexual development to the stage at which hormonal-induced spawning is possible. This situation is similar to that of other large fishes such as the white sturgeon (Acipenser) which takes 10 years or more to reach sexual maturity (Doroshov and Lutes 1984). Thus, development of techniques to identify hasten maturation of culture stocks is necessary.

Methods for cryopreservation of sperm of giant catfish have been developed, although they require improvenent for application to large-scale production (Mongkonpunya et al. 1992). Cryopreserved sperm has been used to fertilize eggs of the Chao Phraya catfish (*P. hypophthalmus*) and has resulted in production of a promising hybrid named "buk sawai". The growth rate of the hybrid is reported to be faster than that of the Chao Phraya catfish (personal communication, T. Jerdnapapun, 1993-4) which is currently used for aquaculture in Thailand. The hybrid, could potentially replace the Chao Phraya catfish in the aquaculture industry in the near future because of its fast growth rate and high flesh quality. The hybrid also benefits from the cultural significance of the Mekong giant catfish, which is highly valued as a foodfish. The purpose of this report is to describe some biological observations on the Mekong giant catfish, the Chao Phraya catfish and their hybrid (*P. hypophthalmus* female x *P. gigas* male).

MATERIALS AND METHODS

The observations reported here are based on a small number of specimens of wild Mekong giant catfish because it is rare and expensive, costing more than $10-12 per kg for live fish. Wild fish can be collected mainly in one location (Chieng Kong, Northern Thailand) and are available for only one month each year (typically in May), naturally during the spawning migration upriver. Other specimens of the parental species and the hybrid were monocultured in approximately 0.5 acres earthen ponds under similar conditions and feeding regimes, and were about 2.5 year-old subadult.

Morphological comparisons were made among the parental species and the hybrid, as well as meristic counts and measurements according to the definitions of Roberts and Vidthayanon (1991), with minor exceptions. For vertebral counts we considered the most anterior rib-bearing vertebrae as the sixth instead of the fifth; counts were made from X-ray films in which the ribs were invariably large and readily visible.

Where possible the gastrointestinal tract (GIT) was studied to aid in identification of feeding habits. Gut contents were collected, and the GIT was measured. The GIT of a wild *P. gigas* captured in May, 1994 (a mature male; 133 kg) was examined. The fish was decapitated 3 h after being captured from the Mekong. The buccal and abdominal cavities were opened and each portion of the GIT (stomach, duodenum, jejunum and ileum, and large intestine) was tied with strings at each end. The whole GIT was removed, mesentery was trimmed off and the length of each portion was measured before laying open to collect the contents which were, then, preserved in 10% formalin until analysis. The same procedure was used to examine the GIT of the farm-raised specimens (n = 2 for each group).

Carcass composition was studied in wild giant catfish (n = 9) and farm-raised catfishes (n = 18) of both sexes. Fillets, belly flap, head and bones, viscera, gonads and processing loss (scraps, blood. etc.) were expressed as a percentage of total body weight. The fillet percentage was determined for wild fish with skin attached (Asian style). Fillet percentages of farm-raised fish were also determined after skin removal (American style fillet) to allow comparisons between the two styles with other studies. A skinless fillet from each farm-raised fish was homogenized to determine its total protein (macro-Kjeldahl method), fat (modified Babcock method) and moisture (oven drying), using standard procedures of the Association of Official Analytical Chemists (AOAC 1984).

RESULTS AND DISCUSSION

The characteristics of the hybrids were almost identical to the paternal species (*P. gigas*), including a truncated snout and a lunate-shaped caudal fin for all sizes <30 cm. The caudal fin shapes of larger fish or adult wild ones were difficult to identify due to damages during the process. The hybrid was different from *P. gigas* in having well-developed gill rakers. Moreover, the hybrid reached its sexual maturity at approximately 40 cm instead of 100 cm or more (Table 1). These characteristics were similar to the maternal species. *P. hypophthalmus*. Some features of the hybrid, such as the position of the mouth (subterminal), were intermediate to those of *P. gigas* (mouth inferior) and *P. hypophthalmus* (mouth terminal). The interspecific cross of channel catfish (*Ictalurus punctatus*) female x blue catfish (*I. furcatus*) male yielded hybrid offspring that most closely resembled the paternal species. This finding was identified as paternal predominance (Dunham et al. 1982) and may be related to the morphology of the Asian catfish hybrid reported herein.

The feeding habits of juvenile, subadult and adult *P. gigas* in the wild are not known. It is evident from the examination of buccal cavity and gill morphology of adult giant catfish captured at Chieng Kong that *P. gigas* does not feed by filtration of food items from the water column. There were no gill rakers or any other structures which normally related to this type of feeding. There were no stomach contents in the giant catfish (captured in May, 1994) examined within 3 h of capture. There was a small amount of zooplankton and phytoplankton and larger amounts of detritus and fragments of filamentous algae found in the jejunum, ilcum and large intestine. This fish was captured in the morning (0600 h) and may not have eaten since the previous day, or prehaps giant catfish, similar to those white sturgeon, do not feed regularly during the spawning migration. This species has been known to accumulate a large amount of energy reserves prior to the spawning migration (Doroshov and Lutes 1984). The GIT contents of the farm-raised catfishes were not different among the parental species and hybrid, and were composed primarily of detritus, plankton and the pelleted feed provided by the farmer.

Table 1. Comparative morphology of Mekong giant catfish, Chao Phraya catfish and the interspecific hybrid (*P. hypophthalmus* female x *P. gigas* male).

Character	*P. gigas*	*P. hypophthalmus*	Hybrid
Vertebral counts:			
total	48	43–45	45–47
abdominal	20	16–17	17–18
caudal	28	25–27	26–28
Caudal fin shape	lunate	forked	lunate
Snout shape	broad, truncate	narrow, rounded	somewhat broad, truncate
Mouth position	inferior	terminal	subterminal*

* Mouth is terminal in specimens < 30 cm.

The live weights (mean ± SD) of the 2.5-year-old farm-raised fishes were significantly different from one another with *P. gigas* (7.9 ± 0.6 kg) being the largest, the hybrid (3.4 ± 0.4 kg) intermediate, and *P. hypophthalmus* (2.1 ± 0.4 kg) the smallest. Accordingly, sections of the GIT were significantly longer ($P < 0.05$) in *P. gigas* and the hybrid than in *P. hypophthalmus*. However, measurements expressed as the percentage of total GIT length were not different ($P > 0.05$) (Table 2).

Data for carcass composition of wild giant catfish are from specimens butchered commercially at Chieng Kong. Because of local practices, the weights of the fillets and belly flap were combined. This prevented direct comparison of fillet

Table 2. Lengths of segments (mean ± SD) if the gastrointestinal tract (GIT) measured in cm and expressed as percentage of total length (%TL) of GIT in 2.5 year-old subadult farm-raised *P. gigas*, *P. hypophthalmus* and the hybrid.

	P. gigas		*P. hypophthalmus*		Hybrid	
	cm	% TL	cm	% TL	cm	% TL
Stomach	13 ± 0	7 ± 6	10 ± 1	10 ± 1	14 ± 2	9 ± 1
Small intestine :						
duodenum	32 ± 2	17 ± 1	14 ± 1	14 ± 0	10 ± 5	7 ± 4
jejunum/ileum	112 ± 9	67 ± 0	64 ± 5	66 ± 0	107 ± 9	72 ± 2
Large intestine	28 ± 5	15 ± 2	10 ± 1	10 ± 0	18 ± 2	12 ± 1

percentages between the adult *P. gigas* and subadult farm-raised fish. When considering the combined weights of the fillets and belly flap, adult *P. gigas* had roughly the same percentage (~ 53%) as subadult *P. gigas*(~ 52%) and the hybrid (~49%),but these were significantly higher ($P < 0.05$) than that of *P. hypophthalmus* (47%) (Table 3).

There was no difference ($P > 0.05$) in combined percentage of fillet and belly flap between sexes within each group. There were no differences among the three groups of farm-raised fishes in percentage weights of head and bone, viscera, gonads, and processing loss. However, the percentage weights of head and bone, and viscera were significantly lower ($P < 0.05$) in adult *P. gigas* than in the three groups of subadults, and the adults possessed markedly higher gonad weights.

The fillet percentages of subadult *P. gigas* and hybrid were significantly higher ($P < 0.05$) than that of *P. hypophthalmus* when the skin was removed, while there were no differences among fillet percentages with skin attached (Table 4). This suggests that the skin of *P. hypophthalmus* was heavier than that of *P. gigas* and the hybrid.

Table 3. Live weights and percentages of carcass compositions (mean ± SD) of adult (wild) and 2.5-year-old subadult (farm-raised) *P. gigas, P. hypophthamus* and the hybrid. Fillets and belly flap were not separated in wild Mekong giant catfish.

	Live weight (kg)	Percentage of total body weight					
		Fillet	Belly flap	Head & bone	Viscera	Gonad	Loss
P. gigas (adult)							
male (n=3)	149 ± 25	53 ± 4		34 ± 0	3 ± 0	6 ± 1	4 ± 2
female (n=6)	184 ± 21	53 ± 4		32 ± 3	3 ± 1	9 ± 2	2 ± 1
P. gigas (subadult)							
male (n=3)	7.8 ± 0.8	41 ± 3	10 ± 1	41 ± 1	5 ± 1	<1	4 ± 1
female (n=3)	7.9 ± 0.3	42 ± 1	10 ± 2	41 ± 2	5 ± 1	<1	11 ± 5
Hybrid (subadult)							
male (n=3)	3.4 ± 0.4	42 ± 3	8 ± 2	38 ± 6	4 ± 2	<1	3 ± 7
female (n=3)	3.4 ± 0.4	42 ± 3	7 ± 1	40 ± 3	8 ± 3	<1	2 ± 1
P. hypophthalmus (subadult)							
male (n=3)	2.0 ± 0.2	40 ± 1	7 ± 1	42 ± 3	9 ± 5	2 ± 1	1 ± 1
female (n=3)	2.1 ± 0.5	38 ± 4	7 ± 1	38 ± 3	12 ± 6	1 ± 1	2 ± 1

There was no significant difference among the fillets of subadults in the percentages of protein and moisture (Table 5). The fat content of fillets was significantly higher ($P < 0.05$) in *P. gigas* (~ 3%) than in the hybrid (~ 0.6%) and *P. hypophthalmus* (0.3%). This suggests that adult wild *P. gigas* could accumulate a large amount of energy reserves prior to the spawning migration as mentioned above.

Table 4. Comparisons of percentage of total body weight between skinless and skin-on fillets of 2.5-year-old subadult farm-raised, *P. gigas*, *P. hypophthalmus* and the hybrid (n = 4 for each group).

Group	Fillet (without skin)	Fillet (with skin)
P. gigas	35 ± 1	43 ± 1
P.hypophthalmus	28 ± 4	37 ± 4
Hybrid	35 ± 3	41 ± 3

Table 5. Fillet composition (mean ± SD) in farm-raised subadult *P. gigas*, *P. hypophthalmus* and the hybrid.

Component	*P. gigas*	*P. hypophthalmus*	Hybrid
Moisture	78.6 ± 1.7%	82.5 ± 1.1%	81.7 ± 1.5%
Protein	17.0 ± 0.3%	16.2 ± 0.7%	17.2 ± 1.2%
Fat	3.1 ± 1.3%	0.3 ± 0.1%	0.6 ± 0.1%

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