

# Snakehead and *Pangasius* Catfish

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## Introduction

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Snakehead and *Pangasius* catfish are found in South Africa, India, Burma, Indonesia, Malaysia, Cambodia and Thailand (Wee, 1982; Chuapohuk, 1994). The popularity of farming these fish is due to their fast growth, resistance to disease and handling and extreme tolerance to inferior water quality. In Thailand, they are two of 27 freshwater species that are cultivated with numerous types of systems, ranging from superintensive farming for commercial production to extensive farming, mainly for household consumption. Both snakehead and *Pangasius* catfish are farmed in cages and ponds. According to the official statistics, production of snakehead and *Pangasius* catfish together represents 15% of total freshwater aquaculture production in Thailand, with an annual value of US\$18 million (Jantrarotai and Jantrarotai, 1994).

## Snakehead

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Snakehead belongs to the family Channidae. It is also known as murrel and serpent-headed fish. Snakehead is a very tasty and popular fish in most southern and south-eastern Asian countries (De Silva, 1989). It has long been regarded as a valuable foodfish and its flesh is claimed to be rejuvenating, particularly during recuperation from serious illness, and is therefore given to elderly people (Ling, 1977). Snakehead farming began around 1955 in Thailand and spread to other countries, including Hong Kong, India, Cambodia, Taiwan and Vietnam. The popular species for farming is *Channa striatus*. However, other species, such as *Channa micropeltes* and *Channa marulius*, are also farmed (De Silva, 1989).

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\*Deceased.

## **Pangasius catfish**

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There are two species of pangasids that are widely cultured in South-east Asian countries: *Pangasius sutchi* (striped catfish) and *Pangasius lamaudii* (black-ear catfish). They are found in rivers of India, Burma, Indonesia, Malaysia, Cambodia and Thailand (Ling, 1977). *Pangasius catfish* is a fast-growing fish and can tolerate poorer water quality than snakehead. It is also popular as a sport-fish. Due to its high dress-out weight percentage, which is comparable to that of channel catfish (*Ictalurus punctatus*), *Pangasius catfish* has great value in food processing.

## **Nutrient Requirements**

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### **Snakehead**

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Little is known about the nutrient requirement for snakehead. Snakehead is strictly carnivorous and is generally fed with diets of animal origin. The protein requirement is relatively high compared with other freshwater species. Boonyaratpalin (1980) reported that snakehead fry fed on 3.1 kcal digestible energy (DE) g<sup>-1</sup> diet required 43% dietary protein, while 1-month-old fish consuming the same energy-containing diet required 36% dietary protein. The dietary lipid requirement of snakehead fingerlings for maximum growth and survival is 6% (Boonyaratpalin, 1981a). No information is available on the essential fatty acid requirements. Lipids rich in the n-6 or n-3 series of fatty acids are well utilized by snakehead. There are no studies on the vitamin requirement, except that of pantothenic acid. Boonyaratpalin (1981b) reported that dietary pantothenate is essential for normal growth and maximum survival of snakehead.

### **Pangasius catfish**

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Nutrient requirements for *Pangasius catfish* are even less known than those for snakehead. *Pangasius catfish* is an omnivore and requires lower dietary protein than snakehead. Jantrarotai *et al.* (1992) indicated that *P. sutchi* fingerlings require 27–29% of dietary protein for normal growth. Chuapohak (1994) conducted a feeding study in *P. sutchi* and found that protein could be reduced to 18% without a reduction in growth performance and feed efficiency if high-quality protein sources were used in diets containing a digestible energy-to-protein ratio of 13 kcal g<sup>-1</sup>. In a more recent study, Chutjareyaves *et al.* (1998) concluded that 35% of dietary protein is required by *P. lamaudii* fingerlings. The protein requirement is reduced to 20% for juvenile *P. lamaudii* (Chutjareyaves *et al.*, 1999). There are no studies on the requirements of other nutrients in *Pangasius catfish*.

## Practical Diets

In general, farm-made diets and manufactured (commercial) diets are used in Thailand and other neighbouring countries. In the case of snakehead, farmers produce diets for their own use. Occasionally, snakehead farmers feed their fish with catfish diet manufactured by commercial feed-mills. Diet formulas used by snakehead farmers are shown in Table 29.1. Catfish diets produced in Thailand for fry, fingerlings, grow-out and finisher contain 40%, 35%, 30% and 25% crude protein, respectively. The diet ingredients used are similar to those of other aquadiets, including fish-meal, soybean meal, groundnut meal, rice bran, maize meal, broken rice, tapioca flour, vitamin and mineral premixes and binder.

The farm-made diet for *Pangasius* sp. is primarily composed of several kinds of locally available by-products. However, farmers occasionally used a formulated fish diet when local by-products are not available. Table 29.2 shows model diet formulae for *Pangasius* sp. Commercial diets for grow-out of *Pangasius* contain crude protein ranging from 15% to 26%.

Information on vitamin and mineral requirements of both snakehead and *Pangasius* catfish is practically unavailable. Therefore, the vitamin and mineral levels established for other tropical freshwater species (NRC, 1993) are recommended.

## Feeding Practices

### Snakehead

Ponds used for snakehead culture generally vary from 1600 to 3200 m<sup>2</sup> in area and 2 to 3 m in depth. A stocking density of 25 fingerlings (50 g each) m<sup>-2</sup> is commonly used. Snakehead culture is totally dependent on animal sources of

**Table 29.1.** Traditional snakehead diet formulations used by farmers in Thailand.

Ingredient	(%)	References
Diet 1		Somseub (1994)
Trash fish	90	
Rice bran	10	
Diet 2		
Trash fish	80	
Rice bran	20	
Diet 3		S. Koonsomboon (personal communication)
Trash fish	50.0	
Fish-meal	17.5	
Soybean meal	7.5	
Broken rice	7.0	
Rice bran	17.0	
Vitamin and mineral premix	1.00	

protein, especially trash fish. In some areas where trash fish is easily obtained, minced trash fish is the sole diet for snakehead and is fed to satiation. The fish are fed three times a day from fry (15 g) to fingerling (50 g) stage. The inclusion of trash fish in a snakehead diet is reduced to 80% by the addition of 20% rice bran or cooked broken rice when the fish reach the fingerling size. The mixture of diet ingredients is minced through a meat mincer and placed on wooden platforms along the pond sides (S. Koonsomboon, personal communication). Fish are grown for 6–7 months to attain a weight of approximately 1 kg, which is the most common marketable size in Thailand.

Two species of snakehead, *C. micropeltes* and *C. striatus*, are customarily cultured in cages. Cages used for snakehead cultures are 15–200 m<sup>3</sup>. Fish weighing approximately 50 g are stocked at a density of 400–500 fish m<sup>-3</sup>. Trash fish are chopped before feeding. Fish grow to more than 1 kg in 8–12 months. Growth is dependent on the availability of diet and stocking density. The feed conversion ratio of pond and cage culture of snakehead is about 4 to 1 (Nuov and Nandeessa, 1994).

### Pangasius catfish

*Pangasius* species are cultured in both ponds and cages. Pond culture is common with *P. sutchi*, whereas cage culture consists of *P. sutchi* and *P. lamarudii*. The ponds used in *Pangasius* culture generally vary from 600 to 2000 m<sup>2</sup> and are about 2–3 m in depth. Fingerlings, weighing approximately 50 g are stocked at a density of 3000 kg ha<sup>-1</sup>. Most ponds have a stagnant water system and are either filled with rainwater or with water pumped from a nearby lake.

The feeding strategy adopted is largely based on the availability of feed-stuffs in the farming area rather than on any scientific consideration. In the first

**Table 29.2.** Model diet formulae for *Pangasius* catfish (P. Rimteerakul, personal communication).

Ingredient	%
Fingerling (30% protein)	
Fish-meal	30
Rice bran	45
Soybean meal	24
Vitamin and mineral premix	1
Grow-out (25% protein)	
Fish-meal	15
Soybean meal	15
Groundnut	24
Rice bran	30
Broken rice	15
Vitamin and mineral premix	1

2 months, fish are fed with rice bran. Some farmers use a mixture of rice bran, broken rice and a small amount of trash fish. From the third month onwards, a number of diet formulations are used in different localities, based on the ingredients that are locally available. For example, vegetable wastes, cooked broken rice, various by-products from fruit-processing factories (such as pineapple wastes, baby maize husk, etc.), trash fish, fish offal and the like are widely used in Thailand, Cambodia and Burma (New *et al.*, 1994). The daily feeding rate with a moist diet is about 10% of body weight from fry to fingerling stages, and this is decreased to 5% in juvenile and adult phases.

Fish are fed three times daily in the pond for 8–12 months and usually attain a weight of 1–1.5 kg. A net production of 25–37.5 tons ha<sup>-1</sup> is very common in Thailand (P. Rimteerakul, personal communication). The feed conversion ratio varies from 4 to 6 : 1.

*Pangasius* sp. is also cultured in ponds for integrated farming (Somsueb, 1994). The stocking ratios of the animals suggested are 1250 chicken or ducks or 30–60 pigs together with 12,500 fish ha<sup>-1</sup>.

Cage culture of *Pangasius* sp. is practised around the lake and river areas. Cage size ranges from 20 to 900 m<sup>3</sup>. The common stocking rate is 5–10 kg m<sup>-3</sup> with fingerlings weighing approximately 75–100 g. The fish are usually fed with trash fish and sometimes a pelleted diet. After 8–12 months, typically 35–65 kg m<sup>-3</sup> is harvested.

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