

# A milestone: snakehead fish culture using extruded feed in India

By Zhang Taoping, Xiao Haidong, Narasimha Rao Tatavarthy, Dong Qiufen, Zhang Song and Yang Yong

A partnership scores a first in India with large scale fry breeding, commercial farming and dedicated extruded feed for the snakehead fish.

The snakehead fish, also known as the murrel in India, constitutes the most common and dominant group of air breathing fishes and is highly regarded as a high value freshwater fish in India. Three murrel species are widely available as food fish in India: giant murrel (*Chana marulius*), striped murrel (*Channa striatus*) and spotted murrel (*Chana punctatus*). Among these, the striped murrel or striped snakehead fish (called koramenu in Telugu) has a high market demand in several states, such as Andhra Pradesh, West Bengal, Telangana, Tamil Nadu and Karnataka.

As the “state fish” of Telangana state, the snakehead fish fetches a high price, ranging from INR 400 to 500/kg (USD 6-8/kg) in different retail markets. There is a price variation depending on markets and season. Snakeheads have a good market value due to their nutritional properties (68-80% crude protein, 7-10% fat), delicate flesh and fewer intramuscular bones, as compared to the Indian carps. As an air breather, the snakehead can survive out of the water for around one week, provided the body is wet.

The snakehead is also believed to play an important role in human health, especially in wound healing, muscle strength and immunity enhancement. In India, snakehead fingerlings are used in giving medicine to asthma patients gathered in Hyderabad on the eve of *Mrigasira Karthi*. A unique and secret herbal medicine is put into the mouth of live snakehead fingerlings, then the patients are made to swallow the fish.

## Snakehead farming in India

Snakehead farming has a long history, more than three decades in India, but currently there is still no specialised farming of this species in India. Wild caught fingerlings and sub-adults are stocked in extensive carp ponds to control populations of low value wild fish like tilapia and provide an additional source of income to carp farmers. However, snakeheads are harvested every two to four years when the carp ponds are dried.

Considering the high market demand and dwindling wild catch, many attempts have been made previously to breed this species in India. Some of the breeding attempts have been successful,



Culture of suitable broodstock for artificial breeding

but commercial quantities of fry have not been raised due to difficulties in rearing and weaning this highly carnivorous species.

The Indian fresh water fish farming sector is predominantly dominated by Indian carps (rohu, catla and mrigal). *Pangasius (Pangasius hypophthalmus)* and *Paku (Colossma brachypomum)* are a few recently introduced species that have been successful. GIFT tilapia has also been introduced, but has yet to catch on. In this scenario, the focus has been to commercially farm more high value species. However, due to the increasing demand for snakehead fish and high profitability in farming the fish, availability of the wild stock is decreasing annually.

The Uno Group, ranks among the top three in the fish feed industry in Andhra Pradesh (where 90% of Indian fresh water fish farming is carried out). Uno Feeds started extruded feed production in 2007. Since inception, Uno Feeds has been trying to introduce the best practices and concepts that are popular in fish farming. In 2015, Uno Feeds signed a strategic co-operation agreement with Guangzhou Nutriera Biotechnology Co. Ltd to develop snakehead fish farming.

Nutriera, a leading aqua feed premix and additives supplier in China, focuses on integrated services for aqua feed enterprises. It has 15 years experience in snakehead farming in China, Vietnam, Myanmar and Bangladesh etc. Prior to entering India, the company successfully helped customers apply and promote snakehead breeding and farming technology in China, Vietnam, Myanmar etc. Over the years, it has published technical articles covering artificial breeding, commercial farming and dietary R&D for the snakehead, such as on extruded snakehead feed in Vietnam, hybrid snakehead fish farming in China and the snakeheads' success in Myanmar.

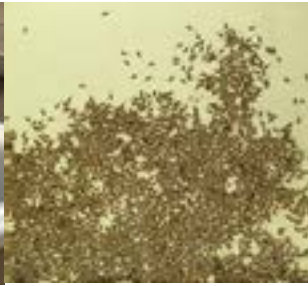
In 2016, the large scale artificial breeding and intensive culture of *C. striatus* was carried out. A special extruded snakehead feed was produced and tested under farming conditions. Through these practices in 2016 and with the help of Nutriera, Uno's technical team accumulated several successful experiences on artificial breeding, commercial farming and extruded snakehead feed production.



Selecting broodstock



Hormone injection



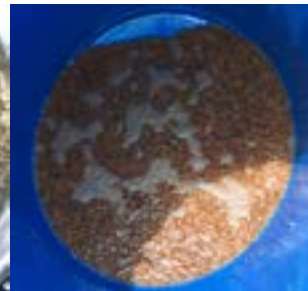
*C. striata* fry, 60-hours old larvae after fertilization



*C. striata*, 25-days old, fed commercial feed



*C. striata*, 2-days old after initial feeding



*C. striata*, 14-days old after initial feeding



Juvenile *C. striata* at 10g

## Broodstock

In 2015, with the local resources of Uno, Nutriera experts designed a special hatchery and carried out broodstock rearing. Broodstock were mainly wild-caught. However, as the wild population of snakehead is very limited, the team searched for suitable broodstock all around the state of Andhra Pradesh. After one year of searching and selection, 2,000 good quality, healthy breeders were collected and stocked for the following year. They were raised on a special diet up to maturation.

## Artificial breeding

From April to September 2016, four breeding trials were successfully carried out and produced 2 million of snakehead fry for the nursery stage. The spawning rate, fertilization rate and hatching rate were around 95%, 60%, 80%, respectively. Within 45 days post hatching, the fish body weight could reach 15-20g/pc.

However, during the breeding stage, there were several difficulties. Due to the extremely high temperatures in May, up to nearly 50°C in Andhra Pradesh, thousands of fingerlings were lost due to heat stress. There were also challenges with the water source and quality. In Andhra Pradesh, the rainy season is also the rice planting season. Fish breeding work had to wait and only use the water source after rice farmland irrigation. That was a major restriction during the breeding in 2016. In addition, frog juveniles, aqua insects, turtles, snakes, crows and other predators would reduce the survival rate of younger snakeheads.

Throughout the last two-years of hard work, Nutriera and Uno gained a major success in the artificial breeding technology of striped snakehead *C. striatus*.

## An exclusive extruded feed

Snakeheads are ferocious carnivorous bottom feeders and require higher levels of dietary protein (38%-50%) and fat (6%-12%) for the different life stages and farming conditions in comparison to the Indian major carps. Presently, except for the low density poly culture with Indian carps (mentioned above), a few wild collected snakehead seed are still fed with live fish, trash fish, and part of by products of poultry processing for the grow-out stage in

some culture areas. The lack of specially formulated feed for the snakehead has been a major constraint for development of its commercial culture for a long time in India.

In June 2016, with the assistance of the Nutriera team, Uno Feeds produced extruded feed for this fish by using local raw materials and Nutriera's special premix for snakehead fish.

## Intensive farming techniques

In 2016, despite the high temperatures, water resource shortage, power supply shortage and predators of fingerlings, but with the careful management and lots of efforts, we finally obtained 150,000 10g juveniles snakehead fish for intensive grow-out farming in earthen ponds. In order to have a higher yield and better price, the farmed fish was sold at large marketable size of 1-1.5kg/pc (The usual marketable size is 0.8-1kg/pc).

In Table 1, we show results of commercial farming practices for the snakehead. The stocking density ranged from 25,000 juveniles/ha to 35,000 juveniles/ha; survival rate was above 98% from 10g juvenile to sampling size. As the result of efforts in artificial breeding and commercial culture in India, we have explored different methods to adapt to local conditions in each fry breeding batch and have accumulated valuable experiences for production in the following year.

## Future plans for the snakehead

Hardy biological traits, fast growth and good market potential make the snakeheads an alternative species for aquaculture, alongside carps and catfish in India. To meet the market demand for snakehead fish and develop intensive commercial farming in India, the target is to produce one million 10 g *C. striatus* juveniles for grow-out in 2017 and henceforth double the annual production for sale to the farmers in the next 2-3 years. It is very likely that striped snakehead will establish itself as an important aquaculture species in India. With the guidance of Nutriera, Uno feeds will continue its efforts to work with this species and also try to evaluate the faster growing giant snakehead *C. maurilius*, as well as look into possible hybrids between *C. striatus* and *C. maurilius*.

Table 1. Some results from commercial snakehead farming of Uno Feeds

| Item   | Pond 1    | Pond 2    | Pond 3    | Pond 4     |
|--|-----------|-----------|-----------|------------|
| Pond area (ha)                               | 1.2       | 1.5       | 1.2       | 0.8        |
| Water depth (m)                              | 1.2       | 1.2       | 1.2       | 1.2        |
| Stocking size (g/juvenile)                   | 11        | 44        | 12        | 32         |
| Stocking density (juveniles/m <sup>2</sup> ) | 3.5       | 2.5       | 3.0       | 3.5        |
| Stocking quantity (numbers)                  | 40,000    | 38,000    | 36,000    | 28,000     |
| Stocking date                                | 23/8/2016 | 28/9/2016 | 28/9/2016 | 13/12/2016 |
| Sampling date                                | 1/3/2017  | 1/3/2017  | 1/3/2017  | 1/3/2017   |
| Sampling size (g/fish)                       | 664       | 612       | 478       | 280        |
| Feed consumption (kg)                        | 34,720    | 25,440    | 20,280    | 8,800      |
| Feed conversion ratio (FCR)                  | 1.33      | 1.18      | 1.21      | 1.27       |



Grading snakehead juvenile



Snakehead of size 600g/fish competing for feed



Zhang Taoping



Xiao Haidong



Narasimha Rao Tatavarthy

Zhang Taoping, Xiao Haidong, Dong Qiufen, Dr Zhang Song and Dr Yang Yong are experts in aqua nutrition and aquaculture from Guangzhou Nutriera Biotechnology Co.,Ltd. Nutriera mainly delivers whole practical solutions for aqua feed mills to help them produce high quality aqua feed and create more value for the farmers. Narasimha Rao Tatavarthy is the Managing Director of Uno Feeds Group, India. Email: qiufendong@gmail.com (Dong Qiufen).



Extruded feed (1.2mm) for C. striata



Extruded feed (6.0mm) for C. striata

# ENHANCE CONSUMER LOYALTY AQUACULTURE WITH GGN

The new consumer label and online portal for certified aquaculture.



*Farming for consumers -  
Talking to consumers*

[WWW.GGN.ORG](http://WWW.GGN.ORG)