

TIRAN SHIPPING IS ENGAGED IN AQUACULTURE SECTOR FOR OVER 20 YEARS WITH TWO MAIN TECHNOLOGIES



I. GIANT PRAWN – MACROBRACHIUM ROSENBERGII

According to FAO, global giant freshwater prawn (*Macrobrachium rosenbergii*) production in 2020 was only eight percent of the prawn production worldwide. In fact, the giant freshwater prawn industry has high potential to grow, but it is limited by several factors.

The scarcity of good quality post-larvae, due to the use of inbred broodstock reared in captivity for generations or wild-caught broodstock, brings negative results on prawn culture. At the same time, post-larvae have a high potential to be infected with viral diseases, resulting in low survival rates. With low growth rates, it takes more than seven or eight months of prawn culture to reach commercial size. Also, existing of female population in the pond (which will not grow more than some 30-40 grams as compare with the male which grows to 70-90 grams in same period) reduced the total harvest quantity per pond.

Furthermore, mixed-sex prawn culture causes male prawns to develop the blue claw morphotype which is an unwanted feature for the market. With the purpose for better yield, better production, culturing the non GMO all male only results with MORE PROFIT since male size is more than double that of the females. Tiran invested in the novel technology of Gene silencing. The technology was developed at the National Institute of Biotechnology at Ben Gurion University of the Negev (BGU) in the laboratory of Prof. Amir Sagi in ISRAEL. It is based on a finding of a new gene encoding

an insulin-like androgenic gland hormone from *Macrobrachium rosenbergii* (termed Mr-LAG and is fully patented).

The patent (IP) is fully licensed to Tiran Shipping (1997) Ltd with exclusive worldwide rights to utilize the IP and to commercialize the licensed products. The IP is also registered in Vietnam and entitle Tiran and New Horizon group only to utilize this IP.

Tiran fully commercialize this IP for over 10 years in own farms/hatcheries/facilities

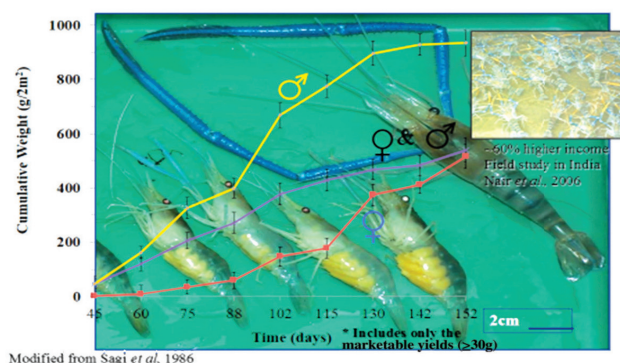


TIRAN - through its fully owned company - New Horizon Vietnam One Member Company Ltd (hereinafter NHV), was established in Long Xuyen City, An Giang province, Vietnam, in 2014.

The company operates and manages a hatchery/farm (BT1) in Long Xuyen city with full support of the Government province breeding center (An Giang Breeding Center - AGBC) and second hatchery/farm in Can Tho (CT2), supported by Can Tho DARD.

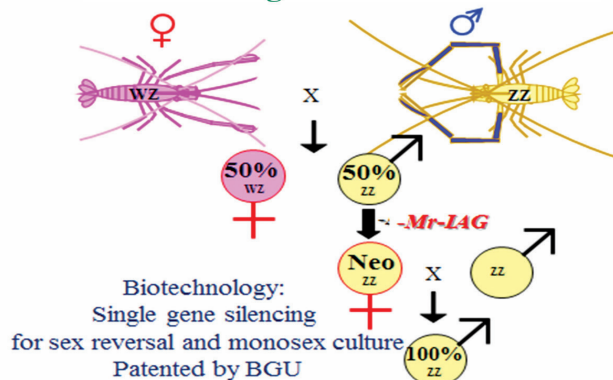
TIRAN also operates fully owned Hatchery/Farm in CHINA and SINGAPORE.

Macrobrachium rosenbergii dimorphic growth in favor of all-male culture and selective harvest



Modified from Sagi et al, 1986

Mr-LAG silencing result in sex reversal



in China, Vietnam and Singapore. Also commercialize the IP and sells the Neo Female and/or the Post Larvae to other companies in Thailand, Taiwan, Malaysia, Cambodia, Bangladesh and others.

THE NOVEL TECHNOLOGY: GENE SILENCING AND THE BGU LINE:

Silencing of this gene could cause complete sex reversal of a male into a functional neo-female. The technology includes the application of gene silencing in males of the fast growing BGU line of *Macrobrachium rosenbergii* prawns. Via the use of specific molecular sex markers, the identified males are transformed through a temporal single gene silencing into neo-females.

The neo-females are grown and bred to produce all-male populations (see chart below). This technology does not use any hormones or chemicals, also do not involve in any genetic modification of the gene. This is completely non-GMO technology. Because it does not involve genetic modification of the organism, thereby bypassing the regulatory pipeline required of genetically-modified crops, this is a boom for monosex biotechnology. The intervention is temporal, it is not transmissible to next generations. Indeed, this approach may be of tremendous applied merit in the aquaculture industry. Moreover, it could also form part of a sustainable solution for the management of invasive and/or pest crustacean species, where the production of non-reproducing male or female populations is sought.

An experiment conducted with *Macrobrachium rosenbergii* monosex

populations resulted in significantly higher yields when all-male populations were cultured. An economic analysis of all-male population culture showed an income increase of ~60% over mixed and all-female populations.

II. ALL MALE AND FAST-GROWING SPEED OF BLACK & RED AND SEAWATER (MARINE) TILAPIA GENETICS STRAINS

Tilapia is one of the most produced fish in the world. As monosex Tilapia brings higher yield to farmer, almost all the industry in using hormones to transform the fry population into all male. While many countries want to ban the use of hormones, until now there is no massive commercial strains that can produce All male without Hormone.

Tiran Black Tilapia line is 100% hormone free thanks to many years of special selective breeding program performed in Kibbutz Nir David. In addition, these lines have excellent growth speed compare to other popular strains and achieve also very low FCR which is improving the commercial results.

In addition, Tiran have a unique Red Tilapia line with exceptional bright red color. This line is favorable in European market with high demand for processed fish.

Red Tilapia line is currently 80% all male and undergo R&D in our Can Tho hatchery to complete developing 100% in recent months.

Genetic All male lines (black & Red) and, fast growth rate, unique Red color and low FCR enable farmers to increase their yield while reducing production cost to be able to bring high quality fish to the market with excellent financial results.