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Tilapia genetic resources in Asia

Aquaculture Department, Southeast Asian Fisheries Development Center

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Tilapia genetic resources in Asia

Given the growing importance of tilapia culture in Asia and renewed interest in aquaculture in Africa, a major program to document, conserve, evaluate and utilize tilapia genetic resources is urgently needed.

Tilapias are all introduced species in Asia (see figure next page). Introductions and transfers of tilapias important to or affecting aquaculture within Asia are noted by the Food and Agriculture Organization. To summarize:

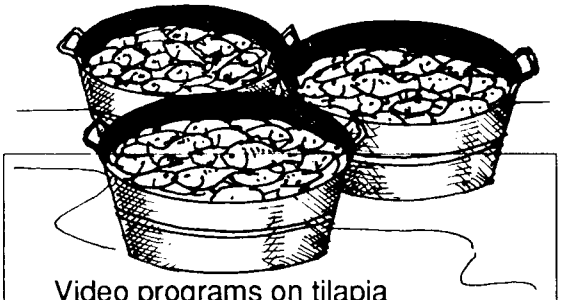
- *Oreochromis mossambicus* is a widespread nuisance and interbreeds with some cultured *O. niloticus* populations.
- *Tilapia rendalli* is not readily available for use in Asian aquaculture except in Sri Lanka, and its performance in farms rather than reservoirs is not documented.
- The identity and status of most Asian red tilapia are unclear.
- *O. aureus* genetic resources are poor throughout Asia.

Introductions and transfers for R & D in tilapia genetics

Asian countries can not rely on the limited genetic resources for the improvement of tilapia culture. It is dangerous to introduce new exotic fish species that could escape from fish farms and become established in natural waters, as did *O. mossambicus*. All new introductions must be quarantined to prevent the spread of disease. Existing populations are already adapted to their local environments but their culture performance may not be reliable. For *O. niloticus* whose performance is well-proven worldwide, it is advisable for countries to transfer the best cultured strains available, to assess their performance, and to use promising strains in new breeding programs.

One constraint in improving tilapia performance is the lack of sources of broodstock for new introductions. Israel, Taiwan, and Africa (e.g., Lake Manzallah, Egypt) are reliable sources of *O. aureus* and *O. niloticus*. To these may be added the Chitralada strain of *O. niloticus* from central Thailand. However, only the Israeli *O. niloticus* and *O. aureus* populations are being checked regularly for inbreeding. Some Taiwanese and Thai *O. niloticus* populations may be affected by inbreeding. Therefore, no new fish should be introduced without full documentation of their genealogy and morphometric and electrophoretic confirmation of their identity.

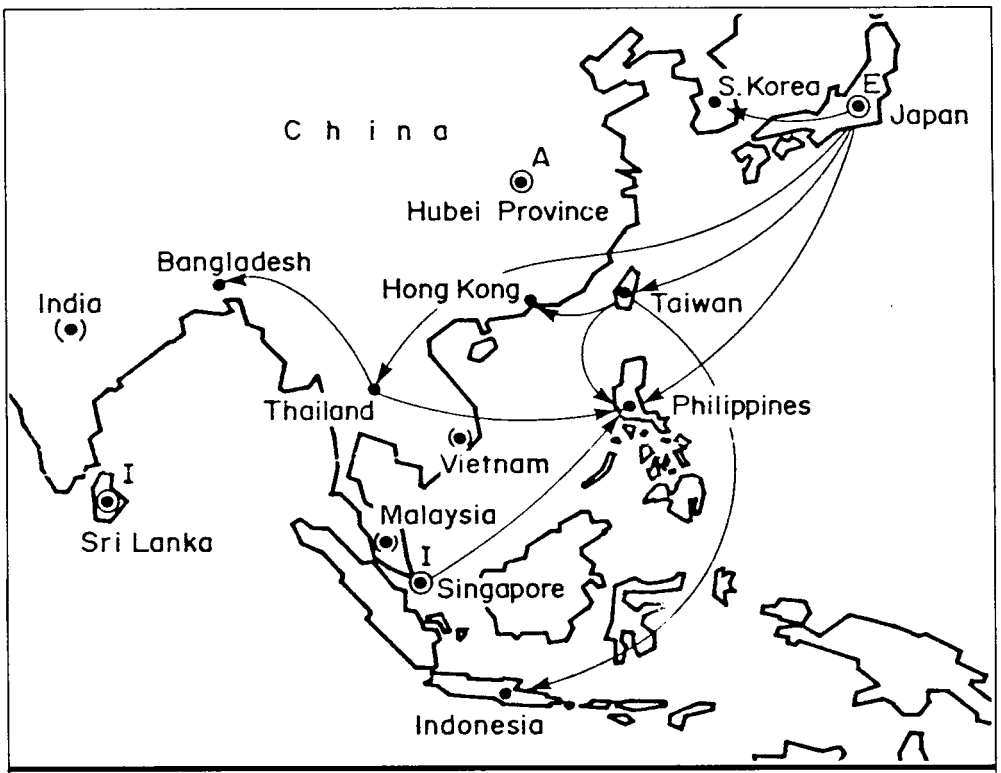
For future research and development work in the Philippines, it would be useful to introduce *O. aureus* from Israel or Africa to supplement the existing genetic resources and assess the culture prospects of this species; this species has good cold tolerance for upland aquaculture. Additional Israel or African introductions of *O. niloticus* could broaden the genetic base of this most important cultured tilapia in the tropics. It would likewise be useful to introduce the *O. niloticus* Chitralada strain from Thailand, since the Thai climate and culture systems are broadly similar to those of the Philippines. The excellent culture characteristics of this strain may be reproducible, although the founder stock introduced to Thailand (50 fish) was small. The introduction of *T. rendalli* (e.g., from Zimbabwe) would enable the initiation of research on culture of herbivorous tilapia. Further introductions of red tilapias are probably undesirable until their genetic characteristics are sufficiently documented. Commercial claims for heritability of color and culture performance



Video programs on tilapia available at SEAFDEC/AQD

Tilapia cage farming 7 min 12 sec
Price: ₱100 US$15

Tilapia cage farming for lakeshore communities 8 min 42 sec
Price: ₱100 US$15



Introductions of *Oreochromis niloticus* to Asia and subsequent transfers between Asian countries. (•), with stocks transferred from undocumented sources within Asia; ⊙, primary introductions to Asia from origins A (Sudan), E (Egypt), and I (Israel, Ghana strain); •, transfers within Asia.

should be treated with caution. The Ein Hamifratz hatchery in Israel is currently developing a pure red strain of *O. niloticus*, but details of its performance are not yet available.

For any future introductions and transfers, it is essential to avoid the mistakes of the past. A founder stock of at least 2000 fingerlings should be acquired and reference collections should be established in which the population never falls below 50 breeding pairs.

Gene banks

Gene banks can help in the documentation and conservation of tilapia genetic resources. But, unlike crops for which germplasm is easily stored, the technology available for fish gene banks is restricted to the maintenance of live fish collections and cryopreservation of spermatozoa. Live fish collections are expensive to maintain and require very careful management. Replication at different locations is essential. Sperm banks are potentially a useful means of conserving and distributing material, but monosex haploid gene banks have obvious limitations. They also require rigorous quality control and database management. Future documentation and conservation work on tilapia genetic resources may, therefore, involve three approaches: conservation of natural populations, live fish collections, and sperm banks.

Future research

Further research on the estimation of genetic parameters, comparative evaluation of different tilapias for culture performance, and breeding schemes to produce genetically improved strains should be undertaken in close cooperation with farmers. The approaches used

successfully in salmonid culture, particularly in Norway, could be repeated for tilapias, provided that the required support and climate of international cooperation are forthcoming.

Sources: (1) RSV Pullin. 1989. *Tilapia genetic resources in Asia with special reference to future tilapia culture R & D in the Philippines.* In: **Proceedings of the Seminar-Workshop on Tilapia Genetics and Culture**, Nueva Ecija, June 20-22, 1985. Los Baños, Laguna: PCAMRD and ICLARM, 1989. 62 p.

(2) RSV Pullin and JB Capili. *Genetic improvement of tilapias: problems and prospects,* p. 259-266. In RSV Pullin, T Bhukaswan, K Tonguthai and JL Maclean (eds.). **The Second International Symposium on Tilapia in Aquaculture.** ICLARM Conference Proceedings 15, 623 p. Department of Fisheries, Thailand, and ICLARM, Philippines.

in the news

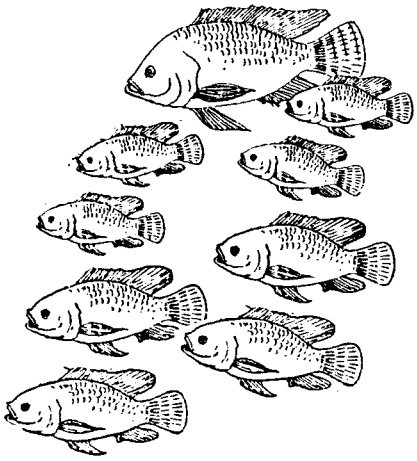
TILAPIA GENE BANK COMPLETED

The country's first "gene bank" of Nilotica strains of tilapia has been set-up in Sucat, Paranaque by BioResearch, a pioneering R & D company in aquaculture. The 3-ha "gene farm" has more than 300 ponds and 800 ferroconcrete hybridization tanks which are stocked with Nile tilapia from Israel, Egypt, Africa, USA, Taiwan, and Singapore. The farm breeds the tilapia to upgrade or enhance its desirable characteristics. The farm also complements the 2.5-ha Gintong Biyaya Hatchery nearby.

BioResearch expects to service the needs of aquaculturists who are interested in genetically superior types of tilapia. The company also offers livelihood and business opportunities for fishfarmers and others who want to raise tilapia.

Source: *The Philippine Star*, 24 Nov. 1991; *The Manila Bulletin*, 13 Aug. 1991.

TILAPIA-BASED SNACKS

Health food enthusiasts can pack more nutrients into their family's diet by making fish-based snacks. Fish processed into noodles, crackers, cakes, and sticks provides a healthy alternative to junk food and is easy to prepare. *Oreochromis niloticus* is one such convenience food.

The Technology and Livelihood Resource Center in the Philippines conducts a course on "How to process ready-to-cook products from tilapia." Call: BTTD,TLRC 818-8328, 856-354.