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*Longlining for
mussels along
the Black Sea*

Aquaculture in the Republic of Georgia

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The Republic of Georgia, a former Soviet Republic located in the Caucasus Region, gained its independence in 1991. Georgia has a total land area of 69,700 km² with abundant water resources including a 310 km coastline on the Black Sea, numerous rivers with sources in the Greater and Lesser Caucasus mountain ranges and a number of lakes and reservoirs ranging from high alpine coolwater lakes to warm lowland river reservoirs (CIA 2007). Total aquaculture production was 72 t of fish, corresponding to US\$191,000 (FAO 2005). A survey of farms that same year (Van Anrooy 2005) indicated that there were 81 fish farms and six fish hatcheries producing a number of fish species, including: *Cyprinus carpio* (common carp), *Hypophthalmichthys molitrix* (silver carp), *Ctenopharyngodon idella* (grass carp), *Oncorhynchus mykiss* (rainbow trout), *Capoeta capoeta* (transcaucasian barb), *Carassius carassius* (crucian carp) and *Siluris glanis* (wels catfish). Despite the low production statistics reported FAO (2004), Van Anrooy (2005) reported that most of the aquaculture production consisted of stocking of about 600 t of common carp and 250 t of grass carp into lakes and reservoirs.

Aquaculture began in Georgia during the 1930s Soviet era, largely focusing on stocking of carps into lakes, reservoirs and collective ponds. By the 1950s, there were about 50 aquaculture farms with a total pond surface area of 2,500 ha. Those farms included five hatcheries. During the 1960s through the 1980s the number of fish farms declined in number to below 20, largely a result of there being abundant fish from marine capture fisheries sources and imports (Van Anrooy *et al.* 2006). But during that same time period, interest in trout culture grew in the upland areas, focusing mainly on introduced rainbow trout, with most of the trout marketed in the capital city of Tbilisi. Important trout farms include the Akhaltsikhe trout farm and the trout farm at Akhalkalaki, in the Samtskhe-Dzhavakheti region. Both farms are along rivers flowing from the Lesser Caucasus mountains of southern Georgia.

During the period since the 1991 independence of Georgia and subsequent economic reforms toward privatization took a further toll on the country's aquaculture production. Many of the farms were turned over to individuals lacking the necessary skills and management experience necessary for growing or maintaining a successful aquaculture operation. As a result, production of commercially important species declined in the past decade from 300 t to about 50 t (Van Anrooy *et al.* 2006).

The so-called 'Rose Revolution' of 2003 was a time of



Fig. 1. Cultured brown trout, *Salmo trutta*, at the trout farm at Zvare, in the Keda region of Ajaria in southwestern Georgia. Photo by Michael A. Rice

considerable political reorganization in Georgia and the fisheries sector was identified as an area within the Georgian economy that deserved some attention. As a result the Georgian government requested assistance from the FAO to strengthen the capacity of the Georgian Department of Fisheries in the Ministry of Agriculture so that they could better lead the rehabilitation of the fisheries and aquaculture industries. With the assistance of the FAO, the Department of Fisheries under the leadership of Director Dr. David Iakobidze developed an 11 point master plan for aquaculture development (2005-2020). Key features of the plan include:

- Development of aquaculture as a keystone component of the fisheries sector;
- Target production of 2,000 t annually,
- Increase of the diversity of aquaculture species produced,
- Establishment of an aquaculture industry trade organi-

zation to build national self-sufficiency in hatchery capacity,

- Promotion of aquaculture as a means for rural poverty alleviation,
- Development of bivalve mollusc culture and other maricultural projects in the Black Sea,
- Development of monitoring protocols to assure aquaculture's environmental, economic and social sustainability,
- Focus on developing aquaculture of native species and developing codes of good husbandry practice and
- Establishment of a cost-effective fish health monitoring system (Van Anrooy *et al.* 2006).

Beginning in 2006, steps were taken to act on a number of the points in the master plan. First among these is development of aquaculture based on native species. As previously noted, culture of trout in Georgia has predominantly focused on introduced rainbow trout, which has been popular in Tbilisi markets. As a result of some marketing pressure resulting from the plan, a number of farms including the trout farm at Zvare, in the Keda region and Ajaria in southwestern Georgia (Figure 1), have begun culturing native European brown trout (*Salmo trutta*) occasionally known as the Black Sea salmon in its anadromous form, (Nikandrov and Shindavina, 2007), supplemental to their culture of rainbow trout.

Trout culture in Georgia remains somewhat primitive, relying on relatively low stocking densities in flow-through concrete raceway or tank systems (Figure 2). Most of the trout eggs, fry or fingerlings are obtained from hatcheries within Georgia, but there is some importation, mostly from Turkey. In general, the quality of the fish stocked is rather poor and survival rates are often low, frequently 30 percent or less. Many trout farmers either formulate their own feed from local grain products and fishmeal frequently imported from Turkey and elsewhere and there is considerable reliance on formulated pelleted feed manufactured in Turkey. The most progressive trout farmers use formulated pelleted feeds from Italian or Danish manufacturers that have better essential amino acid profiles and better storage life because of antioxidant and anti-fungal additives. Farmers are finding considerable improvement in feed conversion with the western European diets, but import cost is a considerable concern.

A second major area in the 2005 Georgian master plan for aquaculture development is the development and use of economically viable culture systems for bivalve molluscs in the Black Sea. In late 2005, the Iberian Pontomarine Aquaculture Company (www.ipa.ge) selected a mussel farm site approximately 2 km offshore from the village of Gonio, about 10 km north of the Turkish border. The site is in clean water south of the discharge plume of the nearby Chorokhi River that drains a watershed area of about 12,000 km² in northern Turkey and southwestern Georgia. Predominant currents in the Black Sea carry the silt-laden discharge plume northward away from the farm. It should be noted that since its establishment, the Gonio mussel farm provides part-time employment for a half dozen traditional capture fishermen from Gonio that have been underemployed because of fisheries restrictions imposed in the last few years aimed at



Fig. 2. Typical concrete single-pass trout rearing tanks in the Lesser Caucasus mountain region of Southern Georgia. Photo by Michael A. Rice.



Fig. 3. Concrete mooring block for longlines (approximately 10m³ or 23 t) destined for deployment at the IPA mussel farm at Gonio being loaded at the port of Batumi. Photo by Enrico Beridze.



Fig. 4. Longline array for mussels at Gonio, Ajaria, Georgia. The snowcapped peaks of the Lesser Caucasus mountain range are visible in the distance. Photo by Enrico Beridze.



Fig. 5. Dr. Prof. Rezo Diasamidze of Shota Rustaveli State University in Batumi, Ajaria, Georgia examining the spatfall of mussels at the IPA mussel farm at Gonio. Photo by Enrico Beridze.



Fig. 6. First harvest of commercially cultured mussels in Georgia in May 2007. Photo by Enrico Beridze.

restoring resources along the Black Sea coastline. Longline arrays (Figures 3 and 4) were installed early in 2006 and spat collectors of frayed rope were deployed in March of that year to collect the spring spatfall (Figure 5). In August 2006, mussels collected on the spatlines were manually stripped from the lines and placed into 10m-long cotton fiber mussel socks, at about 500 mussels/m of sock, using a locally fabricated stainless steel socking funnel. The mussels reached harvestable size by May 2007 (Figure 6).

This first production cycle of mussels in Georgian waters was encouraging and is compelling producers to focus their efforts on developing markets for mussels in Georgia and explore export markets. The first efforts in marketing have been to focus on direct marketing to restaurants and hotels in the port city of Batumi, which is also a popular seaside tourist destination within Georgia. Additionally, restaurants and supermarket outlets in the capital city of Tbilisi are providing some marketing opportunities.

Prior to the mid-2007 restriction of trade between Georgia and Russia, there was considerable trans-Caucasus trade of agricultural products, particularly Georgian orchard crops and wines. The tension in trade between Georgia and Russia has been exacerbated by the 2008 military conflict. Export marketing will likely be a considerable challenge, which means building domestic markets is critical if mussel farming is to remain economically viable in the short term for Georgian growers.

One of the most critical ingredients for the attainment of goals in the 2005 Georgian master plan for aquaculture development is the development of educational and research infrastructure in both the academic and governmental sectors. The ability of the IPA mussel farm in Gonio to produce some 20 t of mussels in its first growing season has been, in part, through a business and academic research and outreach partnership. Dr. Prof. Rezo Diasamidze (Figure 5) of Shota Rustaveli State University is an expert in marine sciences who has taken an interest in mussel farming. He has assisted IPA in the initial stages of siting the mussel farm and adopting internationally accepted practices of spat collection and mussel growout methods to local conditions.

However, much more can be done to formalize and expand academic research, educational and extension services that Georgian universities can offer to the fledgling aquaculture industry. Georgia has considerable human capital in the area of science and technology that might be utilized to help build academic-industry connections. The Institute of Zoology at the Georgian Academy of Sciences in Tbilisi has investigated the ichthyological resources of Georgia and has been the primary institution for the study of fish diseases in the country (Kurashvili 1988). Additionally, the seaside campus of Shota Rustaveli State University (<http://bsu.edu.ge/en/>) in Batumi, with its active Biology Department and Faculty of Agricultural Sciences, Black Sea Scientific-Research Institute of Ecology and Biodiversity may be a logical choice for developing an academic program in fisheries and aquaculture. This university has great potential for fostering excellent academic-industry partnerships

because the city of Batumi is one of the major capture fishery centers for the southeastern Black Sea Region as well as a center for Georgia's promising mussel culture and trout farming industries.

The future of aquaculture in the Republic of Georgia is promising if political tension eases to allow for the turn of international trade opportunities. However, considerable attention must be paid to the development of educational and scientific support infrastructure. Considerable research opportunities in terms of fish feed formulation, husbandry of various indigenous species, optimization of aquaculture systems and aquaculture disease management, among many others present themselves if the local educational and research infrastructure is properly supported. Finally, it is suggested that strong tripartite partnerships among the fisheries and aquaculture industries, academia and governmental regulatory authorities can help build an economically sustainable and socially acceptable aquaculture industry, while maintaining healthy aquatic environments.

Notes

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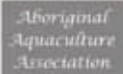

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