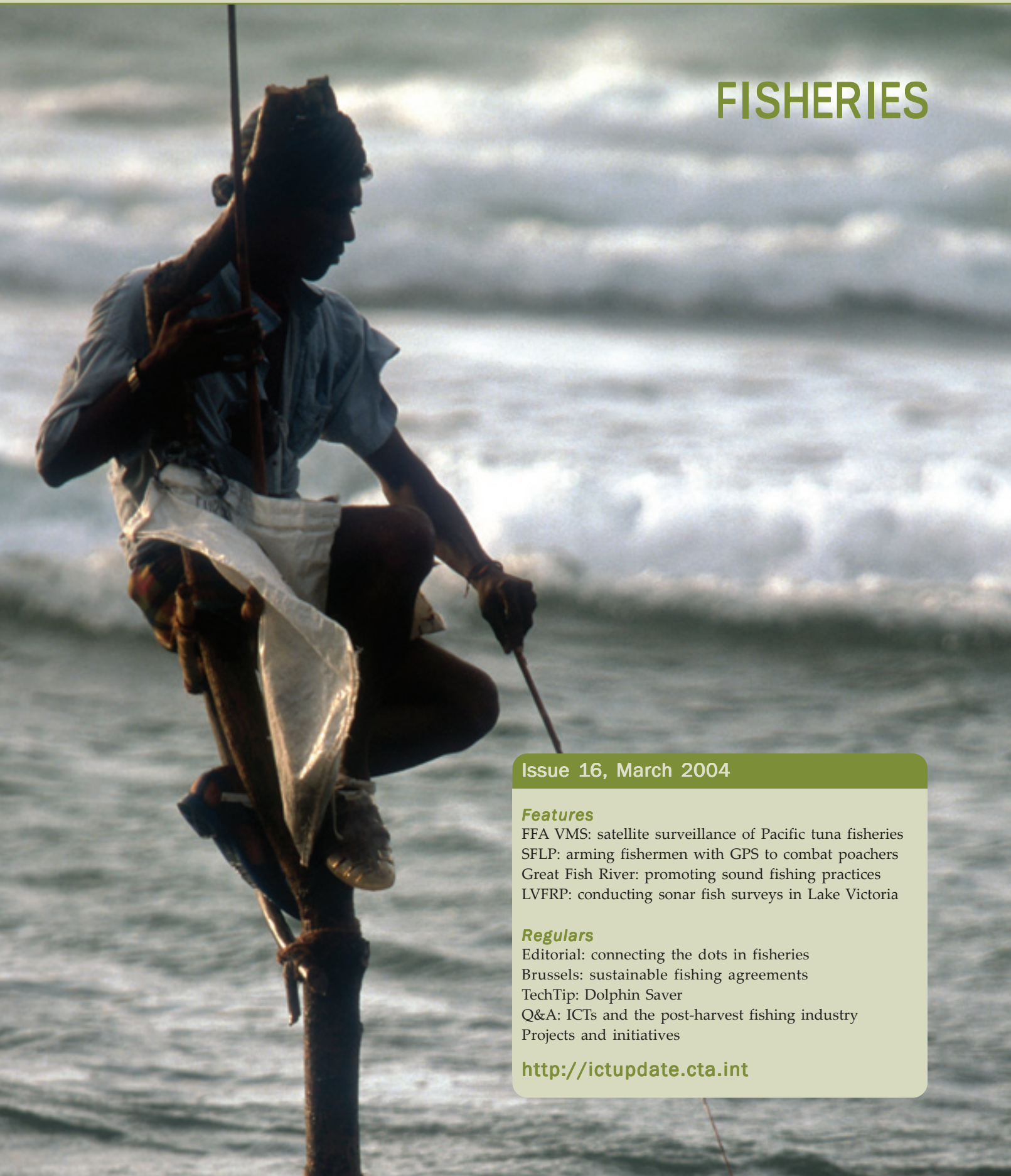
ICT Update
A current awareness bulletin for ACP agriculture

FISHERIES



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Connecting the dots in fisheries

Are ICTs in the fisheries sector benefiting ACP countries? Recent studies paint an ambiguous picture. While ICTs offer cost-effective means to discover new fishing grounds, monitor environmental impacts and combat illegal fishing activities, they are also accelerating the decline of fish populations, in that they enable commercial fishing vessels to exploit stocks in areas once considered too difficult to fish. What's more, big fish eat little fish – developed countries clearly have an advantage over ACP nations in that they are applying ICTs in the fisheries sector, and are threatening the livelihoods of local fishermen.

At the heart of the problem is the failure of policymakers to connect the dots between international and national regulations and their effects on regional and local fisheries. The lack of transparency has prevented collaborative efforts between different administrative levels to improve their fisheries management framework, and has frustrated attempts to take full advantage of ICTs. Yet, spurred by successful initiatives by scientists and NGOs, governing bodies are increasingly recognizing the value – even the necessity – of integrated, ICT-supported approaches to fisheries management. This issue of *ICT Update* highlights some recent initiatives that effectively address the interests of all stakeholders.

The EU, under the new Common Fisheries Policy, is entering into fisheries partnership agreements with ACP countries, with targeted actions to support the implementation of monitoring, inspection and surveillance networks. In the South Pacific, the 17 island members of the Forum Fisheries Agency are collaborating in the operation of a satellite-based vessel monitoring system (VMS) to identify illegal fishing vessels. As Andrew Richards explains, the system is benefiting local fishermen and the region's tuna industry. From Guinea in West Africa, Peter Lowrey reports that local fishermen have formed community patrols and are working with coastguard services to deter illegal trawlers. Armed with GPS receivers, the fishermen can calculate the location of poachers, and radio the information to the nearest coastguard. The approach has proven so effective that it is now being adopted elsewhere in West Africa.

ICTs are also being used in research initiatives aimed at improving the management of entire ecosystems. In South Africa's Great Fish River estuary, for example, acoustic telemetry is being used to monitor two fish species that are targeted by both subsistence and recreational fishermen. Margot Collett describes how the findings will be used in the design of conservation strategies to ensure the sustainability of the estuary's fisheries. Halfway across the continent, Dr William Kudoja reports on the EU-funded Lake Victoria Fisheries Research Project, which is using sonar technology to assess the quantities of fish in the lake. With such data, the authorities can set catch quotas and, eventually, harmonize national measures for the equitable utilization of the lake's resources. Finally, Venu Pidachy explains how ICTs are being integrated into commercial post-harvest activities in Uganda, to ensure that exported fish products comply with the EU's food safety and quality regulations.

It is clear that more comprehensive strategies to manage global fish resources are urgently needed. These initiatives demonstrate that ICTs can play a vital role both in informing policy and in implementing such strategies.

Sustainable fishing agreements

The EU currently has bilateral fishing agreements with 17 ACP countries, enabling European vessels to fish in ACP waters in exchange for financial compensation. Over the years, these agreements have evolved from simple 'pay, fish and go' contracts to broader fisheries partnership agreements (FPAs) containing 'targeted actions' that will contribute to the sustainability of fishing activities at the international level. The agreements are in line with EU commitments made at the World Summit on Sustainable Development in Johannesburg in 2002, including the objective to 'maintain or restore stocks to levels that can produce the maximum sustainable yield, with the aim of achieving these goals for depleted stocks on an urgent basis and where possible not later than 2015'.*

Targeted actions now represent between 20 and 70% of the financial contributions paid by the EU under FPAs. These actions include supporting scientific assessments of fish stocks, controlling and monitoring fisheries activities, training, and the development of the local fisheries sector. The FPAs also stipulate that European vessels operating in foreign waters must not target species that are overfished or fully fished, or those exploited by artisanal fisheries. They must also comply with national fisheries policies of the third countries, respect conservation needs and follow regulations on, for example, mesh sizes and bycatch limitations. Furthermore, they are required to contribute to local economies such as by employing local seamen or observers on European vessels.

In carrying out its targeted actions, the EU recognizes the role of ICTs, particularly communication technologies, in strengthening coordination between local and national authorities involved in fisheries surveillance. Crucially, the EU intends to step up the monitoring of European fishing vessels both in its own waters and in the exclusive economic zones (EEZs) of ACP states. In order to ensure that these vessels comply with fleet capacity limits, since 2000 the EU has required all vessels to be equipped with a satellite-based vessel monitoring system (VMS). These systems can track the speed and course of fishing vessels and relay the information to local coastguards (see right). The EU has pledged financial support to ACP countries to establish regional VMS networks, and specific actions for their implementation are included in the FPAs. So far, such agreements have been signed with Angola, Madagascar, Mauritius, Senegal and the Seychelles, and more are likely to follow soon.

These encouraging developments indicate that there is a growing consensus among EU Member States and ACP nations of the urgent need to turn the existing patchwork of monitoring, control and surveillance systems – involving many different authorities with many different priorities – into a coherent international management framework that will ensure the sustainability of ACP fisheries.

* Communication from the Commission, *On an Integrated Framework for Fisheries Partnership Agreements with Third Countries*, COM(2002) 637 final.

Gregor Kreuzhuber (*gregor.kreuzhuber@cec.eu.int*) is a spokesman for Franz Fischler, European Commissioner for Agriculture. For further information, visit *http://europa.eu.int/comm/fisheries/policy_en.htm*

TechTip: Dolphin Saver

A brand new device to keep dolphins clear of fishing nets is proving, quite literally, a resounding success. Developed by the Dutch company SaveWave, the Dolphin Saver is a sophisticated transmitter just 20 cm long that is attached to the nets. As soon as it touches water, the device emits harmless ultrasonic signals that interfere with the echo-location system used by the dolphins to navigate and find fish. Confused by the resulting ultrasonic jumble, the dolphins turn away, leaving a safe area around the nets. Not only does the device save the mammals from certain death as bycatch, it also prevents them stealing fish from the nets and damaging fishing gear, thus greatly improving catch levels and the overall productivity of fishing fleets. *www.savewave.nl*

FFA VMS: satellite surveillance of Pacific tuna fisheries

Andrew Richards outlines how satellite monitoring of illegal fishing vessels is substantially benefiting local fishermen and the tuna industry in the Pacific.

Constable Hansen Kalran of the Vanuatu Police Maritime Wing has just logged on to the Internet and has downloaded a report that gives her cause for concern. Her monitor shows a satellite map of the entire exclusive economic zone (EEZ) of Vanuatu and the coordinates of all fishing vessels currently navigating its waters. All of the ships are following routes stipulated in their fishing agreements with the island state, save one: a foreign tuna fishing vessel that should be on its way home. Instead of directly leaving the EEZ from the port where it cleared customs, the vessel has stopped off en route, in all probability to catch extra fish illegally. Kalran wastes no time – she alerts her colleagues and within a few minutes a patrol boat is preparing to intercept and inspect the suspect ship.

Dealing with incidents such as this is part of the daily routine of the Monitoring, Control and Surveillance (MCS) Division of the South Pacific Forum Fisheries Agency (FFA). The division has been successfully operating a satellite-based vessel monitoring system (VMS) for its member states in the western and central Pacific since 1999. The VMS is primarily used to ensure that foreign fishing vessels comply with regulations designed to promote the sustainable management and development of and thus to protect the livelihoods of local small-scale tuna fishermen. Enforcing compliance has become increasingly difficult, however. The Pacific tuna fisheries – which support an industry worth $1.8 billion per year – currently account for one-third of global tuna catches, and everyone wants a piece of the pie.

To complicate matters, artisanal, subsistence and commercial tuna fishers are searching for four principal species – skipjack, bigeye, yellowfin and albacore – as they migrate through the numerous national jurisdictions and areas of high seas. Approximately 50–60% of the total catch is taken within the EEZs of FFA members, which cover about 30 million km² of ocean. To stem the increase in illegal fishing vessels in this vast area, most FFA members have reserved their 12 nautical-mile exclusion zones for fishing by artisanal and subsistence fishermen, while other islands have put in place 40 nautical-mile exclusion zones that are off-limits to all foreign fishing vessels. Intruders, however, are always on the alert for fishing opportunities and, increasingly, can only be controlled with the help of ICT systems such as the FFA VMS.

At the core of the FFA VMS is an automatic location communicator (ALC), a sophisticated transponder that every fishing vessel is required to have onboard (left). The information is beamed up to an Inmarsat satellite, and relayed to coastguard staff such as Constable Hansen Kalran of the Vanuatu Police Maritime Wing (above). Photos: FFA, Thrane & Thrane

How the FFA VMS works

The FFA VMS uses satellite technology to pinpoint a vessel's position and then relays that information to an FFA member monitoring station. At the core of the system is an automatic location communicator (ALC), a sophisticated transponder that every fishing vessel operating in FFA territory is required to have onboard. This device, about the size of a car radio, consists of an integrated global positioning system unit and an Inmarsat transceiver, and monitors the vessel's position, speed and course. The information is beamed up from an inbuilt aerial to an Inmarsat satellite, which is fixed in geostationary orbit above the Pacific. The satellite transmits the data to a Land Earth Station in Australia, from where it is carried by telephone lines to the VMS hub computer at the FFA Secretariat in Honiara, in the Solomon Islands, for further processing. This computer identifies any vessels violating fishing regulations and generates alert reports. The reports are downloaded via an encrypted Internet connection by the FFA members in whose EEZ the vessels are operating. In January 2004, for example, FFA members were able to use the system to track the activities of 883 foreign fishing vessels.

The FFA VMS has already proven to be a cost-effective means of providing support to the region's compliance and monitoring programme. According to recent statistics, reported cases of illegal fishing have remained at a consistently low level since its introduction in 1999. Its annual ongoing operating costs, estimated at $845 per vessel, are recovered from the participating tuna fishing vessels. The system also shows strong future potential – it could, for example, easily be applied to track other vessels, such as those that illegally transport live coral reef fish. The FFA VMS is thus paving the way in the development of a fully integrated fisheries management approach for the region.

Andrew Richards (email: *andrew.richards@ffa.int*) is FFA's Monitoring, Control & Surveillance manager. For more information, visit *www.ffa.int/www/index.cfm?itemID=8*

SFLP: arming fishermen with GPS to combat poachers

Peter Lowrey describes how small-scale fishermen in Guinea have traded in their submachine guns for GPS devices to combat foreign trawlers poaching in their fishing grounds.

Only a few years ago, when the subsistence fishermen of Bongolon sighted a trawler poaching in their fishing grounds, they looked on helplessly, sometimes firing submachine guns at it in frustration. The trawler would haul in its nets and leave without fear of penalty. Today, ICTs have come to the rescue of the members of this small community on Guinea's northern coast, in the form of global positioning system (GPS) technology. Upon sighting a poacher, the fishermen can now calculate its exact location using a hand-held GPS receiver, and radio the information to the nearest coastguard station. The coastguard then dispatches a patrol boat to intercept the intruder. Fishermen say that poachers now flee at the sight of them, now they know how quickly they can summon the authorities. A two-year experiment using the GPS and radio-assisted community patrols has proven so successful in Guinea that the approach is being adopted by other West African fishing nations.

This development has come not a minute too soon – poaching is a problem that affects the entire West African coast, an important and highly sensitive fish breeding area. Experts predict that, if the poachers are not stopped, the region's coastal fisheries will be exhausted within 10 years. The situation has already reached crisis proportions in the coastal zone of Guinea, where 30,000 people depend on small-scale ocean fishing. Foreign industrial trawlers destroy the nets of local fishermen by dragging heavy steel trawl nets over them, and regularly collide with their wooden canoes at night, wrecking the boats and injuring or killing their crews. To help Guinea address this problem, in late 1999 the UN Food and Agriculture Organization (FAO) launched the Sustainable Fisheries Livelihoods Programme (SFLP), with funding from the UK's Department for International Development.

Already, government figures confirm the success of the programme. In 2000, before community patrols began around Bongolon and two other fishing villages, industrial trawlers made 450 illegal incursions into the area, where they collided with several canoes, injuring 12 local fishermen. Since the GPS-equipped community patrol boats began operating, the number of poachers has fallen dramatically – only 56 incursions were recorded in the first six months of 2002. The key to the programme's effectiveness lies in the partnership between small-scale fishermen using their own motorized canoes and the Guinean coastguard, which lacks the equipment and resources needed to patrol 300 kilometres of coastline effectively.

Although ICTs are playing a vital role in keeping the poachers at bay, the community patrol system now needs to be institutionalized, with an adequate budget for staff, equipment and training, to ensure that the technology is used to benefit the poor and protect the environment. As part of the programme's participatory approach, a National Coordinating Unit (NCU) has been set up to bring together technicians, government officers and members of key civil society organizations that represent the interests of fishing communities. The members of the NCU act as advocates within the fisheries sector on behalf of the community patrol concept.

Mamadou Moussa Diallo, NCU member and socio-economist at the Boussoura National Centre for Fisheries Science, has carried out a study of the impact of the community surveillance project, which demonstrated its success. 'I think I am getting through to my colleagues about the system, the methodology and how it works. They are interested.'

The coast of Guinea is guarded by the National Centre for Fisheries Surveillance and Protection, whose budget allows for only six or seven patrols per month. According to Mohamed Sidibé, the Centre's Assistant Director-General, community surveillance has been a great success. 'Now our boats can intervene when there is a call, and do not have to patrol at random', he says. 'In the beginning, patrol officers were sensitive about the project – they thought they might be replaced by the village patrols – but now the spirit has changed. The system isn't perfect yet, but we can improve it.'

'The Centre doesn't have the means to expand the patrol network, but community surveillance has now been included in the government's poverty reduction strategy', he notes. 'The government will find the means to pay for its expansion.' One possible source of funding is the Heavily Indebted Poor Countries initiative, a comprehensive approach to debt reduction initiated by the IMF and World Bank.

Meanwhile, the SFLP community patrol system is being adapted for use in the Republic of the Congo, Gabon and Mauritania, and Cameroon has also expressed interest. Little by little, fishermen throughout West Africa are benefiting from the opportunities offered by ICTs to end the threat posed by foreign trawlers and to safeguard their livelihoods.

Upon sighting a poacher, Guinean fishermen can now calculate its exact location using a hand-held GPS receiver, and radio the information to the nearest coastguard station. Photo: FAO/D. Minkoh

Peter Lowrey (email: *peter.lowrey@fao.org*) is a multimedia officer at the FAO. For more information, visit *www.sflp.org* and *www.fao.org/english/newsroom/focus/2003/sflp1.htm*

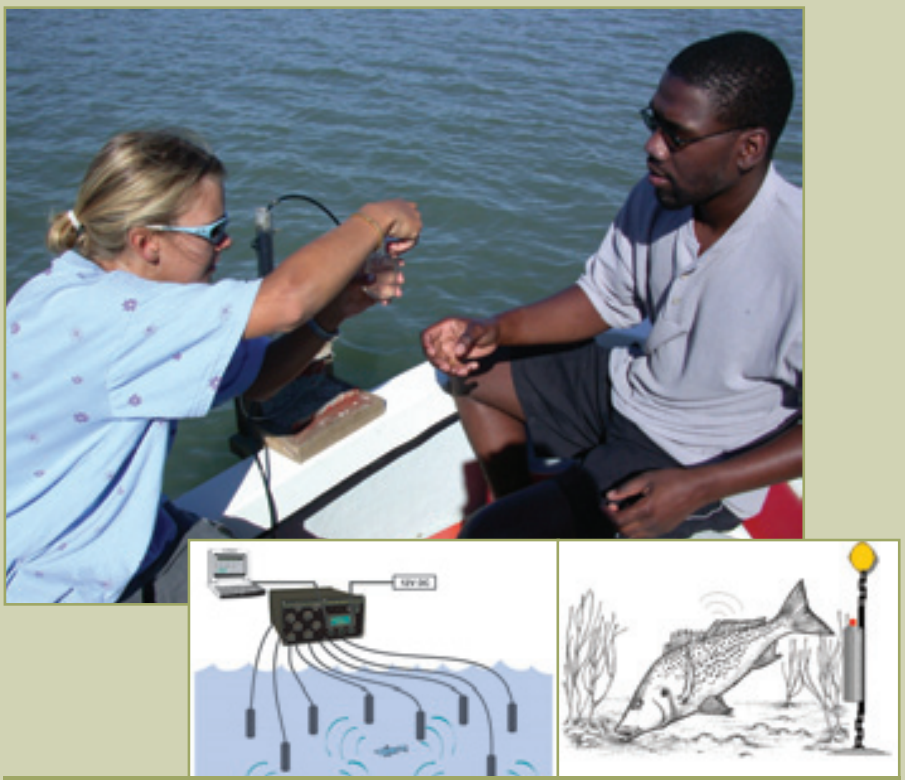
Great Fish River project: promoting sound fishing practices

Margot Collett explains how researchers in South Africa's Great Fish River project are using acoustic telemetry to help in the design of conservation strategies for the estuary's fisheries.

In a boat in the Great Fish River estuary, in South Africa's Eastern Cape province, researchers gather around the screen of a laptop computer to watch a series of moving dots indicating the movements of fish beneath the water. Science fiction or science gone overboard? Neither – the researchers, from the South African Institute for Aquatic Biodiversity (SAIAB) and the Norwegian Institute for Nature Research (NINA), are collaborating in a project using acoustic telemetry, or electronic tagging, to monitor the numbers and the behaviour of two species of fish – the spotted grunter and the dusky kob – as they migrate between the open sea and the estuary. The project's findings will be used to promote more sustainable fishing practices in order to protect the estuary's valuable resources.

After being spawned at sea, spotted grunter (*Pomadasys commersonnii*) and dusky kob (*Argyrosomus japonicus*) enter the nutrient-rich waters of estuaries where they spend the first few years of their lives. Here, juveniles of the two species are heavily exploited, both by local subsistence communities for food, and recreational fishers, to the extent that the sustainability of these fisheries hangs in the balance. Better resource management, based on knowledge of the population biology, habitat and migratory behaviour of the species, is essential. The project team aims to describe the movements of the fish, how long they spend at sea and in the estuary, and the timing of their migration between the two habitats. Answers to these questions will be used to promote the sustainable development of the fisheries, and provide local and national authorities with the information they need to ensure an equitable distribution of the estuary's resources among the different user groups.

The telemetry equipment consists of a battery-powered acoustic transmitter (fish tag) that is either attached externally or surgically implanted. Each transmitter emits unique coded signals on a fixed frequency and allows several individual fish to be tracked simultaneously. The transmitted signals are retrieved in either of two ways. Stationary hydrophones (underwater data-logging receivers), suspended from buoys positioned in the estuary, are used to monitor the presence or absence of fish within a fixed reception range. Alternatively, the researchers use a hand-held hydrophone from a boat to track individual fish more closely. The signals are transferred to a laptop computer that converts the sound signatures into high-resolution spatial data indicating the position, and direction and speed of movement of each fish.



Project members Amber Childs and Pinda Buthelezi lower a hand-held hydrophone from a boat to track individual fish. Photos: SAIAB, Lotek

Electronic tagging is an appropriate ICT tool for tracking migratory fish like the spotted grunter and dusky kob. In contrast with radio waves, for example, the acoustic (sound) signals are not hindered by the poor conductivity of the estuary's salty water. The information collected using this technique also allows the research team to collate fishery catch data with calculations of fish movement trends, in order to assess how vulnerable the species are to localized depletion. The team further hopes to explore the effectiveness of various conservation strategies to protect juveniles, such as creating protected areas within the estuary.

The project's methods and findings could be applied far beyond the estuary – they may also assist in the development of sustainable fish exploitation strategies for various fishery sectors at national level. 'The techniques used in this initiative could also be applied to work we're doing at Kosi Bay [more than 700 km away], where the main recreational and subsistence fisheries target the same species currently being studied on the Great Fish estuary', says Steven Weerts, research assistant at the University of Zululand. 'Institutional collaborations of this nature are invaluable as they assist in the transfer of knowledge and skills, and help build local capacity.'

In future, the team plans to combine biological and physical data obtained from the fish tags with remote sensing data about, for instance, surface temperatures of the sea and the estuary. They will then be able to establish the relationship between movements and behaviour of the fish to oceanographic processes. This would constitute the final major advance necessary to understand the distribution of migratory fish in relation to their changing physical and biological environments on daily and seasonal time scales.

Margot Collett (email: *m.collett@ru.ac.za*) is communications manager at SAIAB.
The Great Fish River estuary project is funded by the South African/Norway Programme on Research Cooperation. For further information, visit *www.saiab.ru.ac.za/story25.htm.*

LVFRP: Conducting sonar fish surveys in Lake Victoria

William Kudoja explains how sonar technology is being used to assess the quantities of fish in Lake Victoria and is helping the authorities to set reasonable catch quotas.

Twice a year, at dusk, a fleet of research vessels begins combing the depths of Lake Victoria in East Africa. The crew members gaze intently at the water surface while their boats advance at a steady, methodical pace. Although the scene bears all the hallmarks of a well organized search party, there is not a single searchlight in sight. That's because instead of using a beam of light, the crew members are relying on beams of sound to find what they are looking for.

The crew in question is a team of scientists working for the EU-funded Lake Victoria Fisheries Research Project (LVFRP) of the Lake Victoria Fisheries Organization. They are investigating the fish stocks in the world's second largest freshwater lake. Assessing the amount of living matter, or biomass, in a body of water covering 68,800 km² may seem like a Herculean task, but the scientists are certainly up to the challenge. Their vessel is equipped with sound navigation ranging (sonar), a technology that was initially developed and used to find submarines at great depths under the ocean.

The scientists are using sonar not only to determine the numbers of fish present in Lake Victoria, but also to identify the various species they find, and to pinpoint areas where fish stocks are concentrated or most heavily depleted.

Here's how it works: onboard the research vessel is a small sonar system, at the heart of which is a transducer, a device that converts electrical energy from a transmitter into high-frequency sound waves, or sonar signals. The sonar signals travel through the water and form an 'acoustic beam'. When the beam hits a fish in the lake, it bounces back an echo, which is captured by the transducer. The transducer converts the echo back into electrical energy and relays it to a laptop computer. That's when things get interesting. Coupled with position data from the vessel's global positioning system (GPS), the computer converts the incoming echoes into a high-resolution echogram showing the exact number and location of targeted fish. What's more, each fish species emits an echo with a unique amplitude that is identified by the computer. By separating the echoes, the researchers can calculate the biomass of different fish species.

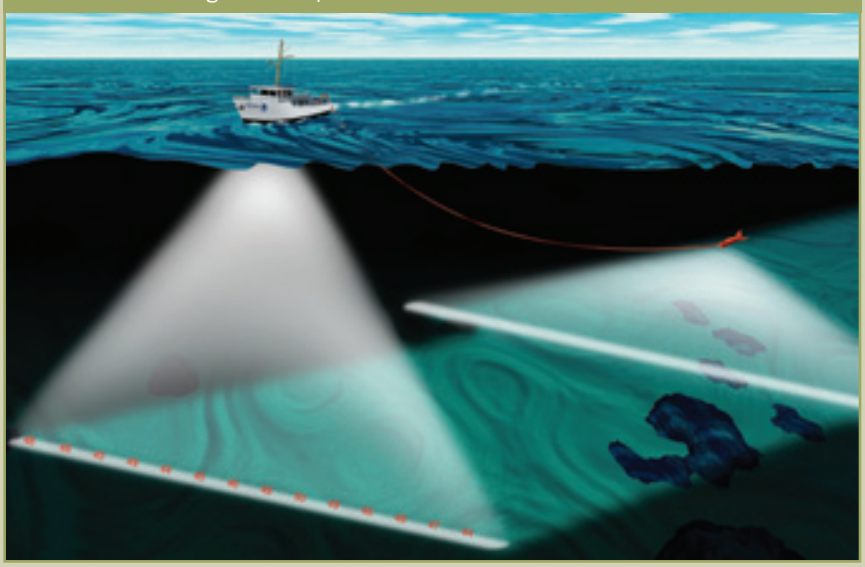
Why go to all the trouble? The reason is that Lake Victoria's fish stocks are at risk of being over-exploited by the three nations bordering the lake – Kenya, Tanzania and Uganda. With accurate data on the number of fish in the lake, the authorities can impose reasonable fishing quotas that will ensure the sustainability of the lake's fisheries. Accordingly, the LVFRP initiative is an important element of the larger fisheries management programme of the tri-state Lake Victoria Fisheries Organization, which aims to harmonize national measures for the equitable utilization of the lake's living resources.

The project has so far carried out stock assessments for Lake Victoria's three most important commercial fish species: the Nile perch (*Lates niloticus*), the Nile tilapia (*Oreochromis niloticus*) and a sardine-like fish known locally as the *dagaa* (*Rastrineobola argentea*). The LVFRP team members have found that the stocks of Nile perch amount to 530,000–650,000 tonnes per square kilometre, while those of Nile tilapia and *dagaa* each amount to approximately 1.2 million tonnes/km². From these biomass estimates, the scientists have calculated the indicative maximum sustainable yield (MSY), or the amount of fish that can be harvested each year without depleting the stocks. For the Nile perch, for example, the MSY is around 212,000 tonnes. If the region's fishery is to remain sustainable, the harvested amount should be below the MSY so that the fish are able to spawn.

Most recently, data from the biannual acoustic surveys were combined with catch assessments and trawl surveys to indicate that Nile perch fishing activities had reached critical levels. The findings showed a significant decline in the number of fish reaching maturity, the presence of too many immature fish in catches, and low fecundity levels. In response to these worrying trends, the Lake Victoria Fisheries Organization partner states have introduced measures to ban the harvesting and processing of Nile perch within the size range 50–85 mm throughout the lake. The measures are aimed at protecting both very young fish, so that they can breed at least once, and adult fish that are about to spawn. To ensure that fishermen catch fish of the permitted size, the use of gill nets with a minimum mesh size of 127 mm has been recommended for the Nile perch and Nile tilapia fisheries. For the *dagaa*, the recommended mesh size is just 10 mm, to be used in designated fishing grounds only.

These and other measures directly related to the development of a long-term fisheries management plan for Lake Victoria have been welcomed by local fishing communities. The fishermen now catch bigger fish, get more money for their catch, and are assured of fish the next day. Thanks in large part to the ongoing efforts of LVFRP scientists, the sustainability of the lake's resources, and the future prospects for local fisheries, are improving steadily.

Onboard sonar systems send out beams of sound that can reveal the exact number and location of targeted fish species in Lake Victoria. Photo: NOAA



Dr William Kudoja (email: *kudoja@lvfo.org*) is a senior scientist at the Lake Victoria Fisheries Organization. For more information, visit *www.inweh.unu.edu/lvfo/Default.htm*.

Projects and initiatives

This section lists key projects and initiatives in the field of fisheries and ICTs. Additional information is available from the web magazine at *http://ictupdate.cta.int*.

AFRICA

Ocean Data and Information Network for Africa (ODINAFRICA) was established by the 20 Member States of UNESCO's **Intergovernmental Oceanographic Commission (IOC)** to enable African states to access data, to help develop skills for manipulation of data and preparation of data and information products, and to develop the infrastructure for archiving, analyzing and disseminating data and information products. The website provides access to scientific information, equipment, software and training, to promote communication between marine scientists in Africa. *www.odinafrica.net*

West African Association for the Development of Artisanal Fisheries (WADAF) is a regional NGO that supports the development of artisanal fisheries. It uses radio broadcasts in local languages, a website and TV for the exchange and dissemination of information on the fish trade and technical information. *www.africaonline.co.ci/AfricaOnline/adepa/*

Melmarina (Monitoring and modelling coastal lagoons: making management tools for aquatic resources in North Africa) is an EU-funded research project to understand the functioning of coastal lagoons in North Africa and to develop tools to enhance the management of these important aquatic ecosystems. Among other things, the project aims to make data and model simulations available to end-users, especially national management agencies. A GIS database will be constructed to facilitate result presentation, and simulation modelling will be refined though workshops and website access. *www.geog.ucl.ac.uk/melmarina/intro.stm*

Angola: Envifish is an EU and INCO-DC funded project to develop appropriate methodologies for improving the sustainable management of small pelagic fish stocks in the Benguela and Angola systems. The project focuses on identifying and quantifying key environmental conditions that influence fluctuations in recruitment and distribution using satellite, meteorological, oceanographic and fisheries data. *www.me.sai.jrc.it/me-website/contents/contract_projects/inprogress/envifish/*

Senegal: Senegalese fishermen have been part of a revolution that has been brought about by **Manobi**, a mobile services operator and Internet specialist. Fishermen use their WAP-enabled mobile phones to get real-time information on the prices of their fish on local markets. The fishermen can master the technology within a few days, and are making full use of the service and the accurate price data it provides in their negotiations with middlemen. Manobi has developed a system that collects data in real time and makes use of Internet and mobile technologies to follow the daily price fluctuations and deliveries of fish to markets. This information is transferred to and stored in a central database, analyzed and transmitted to users via a unique 'multi-modal' data platform. Manobi's innovative service has been nominated for the Stockholm Challenge Award 2003/2004 and the World Summit Award 2003. *www.manobi.net*

CARIBBEAN

The **Caribbean Regional Fisheries Mechanism (CRFM)** is the core of a complex interactive network of a wide variety of stakeholders in fisheries. CRFM participants include the Caribbean Community (CARICOM); the Caribbean Fisheries Forum; and the **Caribbean Fisheries Technical Unit (CFTU) Secretariat**. Among other things, it conducts research and data analysis to support policy formulation and decision making and aims to establish a regional fisheries information system. *www.caricom-fisheries.com/*

ASIA & THE PACIFIC

The **Oceanic Fisheries Programme (OFP)** of the **Secretariat of the Pacific Community (SPC)** disseminates information on the frequency and quantity of regional fish catches throughout the Pacific. The focal point of the programme is a database based primarily on catch and effort logsheets provided to SPC by member countries and territories. Key data from this database, as well as a wide variety of reports and newsletters, may be accessed through the OFP website. *www.spc.int/OceanFish/*

The **Training Optical System for Underwater Resources Assessment (TOSURA)** initiative, funded by AusAID, aims to design an underwater video camera system and software to count fish automatically through electronic imagery. The equipment will enable Pacific Island states to assess reef and lagoon resources. *www.spc.int/coastfish/Sections/reef/projects.shtm*

GLOBAL

The **FAO Fisheries Department** is at the forefront of ICT-supported information services for ACP countries focusing on international trade in fish and fishery products. The Department offers an enormous range of online services, which may be accessed through its website *www.fao.org/fi/default_all.asp*.

The **oneFish Community Directory**, developed by the Support Unit for International Fisheries and Aquatic Research (SIFAR) and FAO, is an impressive portal and resource gateway for the fisheries and aquatic research and development sector. oneFish supports SIFAR in fostering more responsive research, encouraging knowledge-based decision making for policy, and stimulating debate and information sharing. *www.onefish.org/global/index.jsp*

The **oneFish Fish Technology Knowledge Base**, developed as part of the EU-funded Fish-Tech-DB project, offers access to many resources focusing on fish utilization and processing technology and related areas, to ensure more effective R&D, application of technology, and better quality and safety. A future objective is to establish a global network on fish technology in collaboration with the FAO Fisheries Department. *www.onefish.org/global/fishtechnology.jsp*

Globefish: In the late 1970s the FAO launched a network of regional marketing information services: INFOPESCA (South and Central America), INFOFISH (Asia and Pacific), INFOPECHE (Africa), INFOSAMAK (Arab countries) EUROFISH (Eastern and Central Europe), and INFOYU (China). This INFOnetwork, coordinated by Globefish, promotes trade in fish products by providing up-to-date information on markets and prices; bringing buyers and sellers together in international conferences; and training for industry and government on quality requirements. *www.globefish.org/*

The **FAO Fisheries Global Information System (FIGIS)** is a global network of integrated fisheries information. Visitors can search for documents, analytical data and statistics, maps, software and web tools for aquatic species, marine resources, marine fisheries, fishing technologies and aquaculture. Of particular interest is the FAO Species Identification and Data Programme (SIDP). *www.fao.org/fi/figis/*

Q&A: ICTs and the post-harvest fishing industry

How are ICTs being used to support post-harvest fishing activities? **Venu Pidachy** explains how, in order to comply with strict international food safety and quality regulations, the Ugandan Nile perch exporter **Marine Products Ltd** is using methods originally designed by NASA to keep food safe in outer space.

What is the focus of attention in the post-harvest fishing industry?

Like other branches of the food sector, the post-harvest fishing industry depends on providing products that are both safe and which meet consumers' increasing demands for quality. As fish exporters, we have a particularly difficult job because fish are extremely susceptible to contamination. They are exposed to everything from pathogens and allergens to heavy metals, parasites and toxins, so the potential health hazards for fish consumers are legion. What's more, fish are highly perishable. Especially in hot climates, significant quality losses can occur very soon after the fish are caught. What is needed, then, is a control mechanism that takes in both these factors right through the entire fish processing supply chain, from the moment a fish is caught to the dispatch of the final product.

Our fish processing plant in Uganda is one of the first in East Africa to implement such a comprehensive control mechanism. It has put into place a system of Hazard Analysis Critical Control Points (HACCP) which is based on standard operating procedures and good manufacturing practices. HACCP dates back to the 1960s, when NASA needed a foolproof method to prevent potentially catastrophic disease-producing bacteria and toxins in food consumed on space missions. From the 1990s onwards, the food industry has adopted this method to comply with international food safety and hygiene regulations, chief among them European Council directives 91/493/EEC and 98/83/EEC, which lay down the requirements for handling and marketing fish products destined for the EU.

HACCP is, essentially, a management tool that establishes control over the entire food preparation process. It aims to *prevent* food safety problems rather than identifying them after they have already occurred. Under this system, food inspections take place at every level of the fish supply chain – at the catch, landing, processing and marketing stages – and involve all main industry stakeholders, from small fishermen and processing plant workers to traders and regulatory authorities. When, for example, a parasite is found in a catch at the landing stage, it is stopped in its tracks and will never reach the processing plant, thus preventing mounting costs and the further spread of the organism. HACCP also imposes strict standards regarding the construction of buildings and equipment intended for holding fish prior to export. On-site laboratories, strict record keeping, and accurate traceability procedures are other requirements.

Fish processing lines are becoming increasingly high-tech. This unit uses laser vision to trim, weigh, portion and grade fish. Photo: Marel

Can you describe the fish processing phases and how ICTs are integrated?

The chain starts with the local fishermen, who are increasingly using ICTs in their daily activities. Mobile phones, for example, now allow fishing crews to communicate with staff on shore, to notify them of any preparations that need to be made or to alert them to any difficulties. Many larger fishing vessels are equipped with computers and software that allow their crews to weigh their catch immediately and store it at the right temperature. Also, in the near future, sophisticated GPS and sonar devices will provide an affordable means of accurately tracking and determining the size of fish stocks (see elsewhere in this issue).

Once ashore, the fish are subjected to quality control inspections with the help of software that measures the catch against predefined standards, assessing everything from the freshness and shelf-life of the fish, to their texture and post-mortem skin colour. The results are entered into a database. Fish that pass the test are transported to the processing plant, where they are weighed by electronic scales and graded with the help of another software package. The next step involves plant workers filleting or descaling the fish, while computer programs calculate the speed at which this is carried out and continually regulate work environment temperatures. When the fish have been deskinned and trimmed, they are graded once more as workers input their new weight and quality parameters into a database. They are then quickly moved to a chilling/freezing area, where a computer monitors the temperature and total amount of time the fish are required to stay inside. The fish are subsequently packed in boxes or cartons and moved to a separate cold storage area, which is also computer-controlled, before being dispatched to the airport or port.

Marine Products Ltd is currently working to perfect this HACCP-based and ICT-supported quality control system. HACCP not only allows us to comply with EU regulations, it also produces an efficient work environment that our employees find stimulating. Above all, the system – which is in place in several other Ugandan fish processing plants – has made it possible for us to stay competitive in the international export market and to secure the future of our national fisheries.

Venu Pidachy (email: *pvenu@ugandamarine.com*) is a quality assurance manager at Uganda Marine Products, Kampala.

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