

Dragnet

A new satellite-based surveillance system will keep a sharp eye on those plundering the oceans

THE *Yongding* is something of a ghost ship, disappearing and changing her name many times, along with her flag of registration. The 62-metre vessel was last spotted on January 13th in a marine conservation area in the Southern Ocean, blatantly hauling up outlawed gill nets laden with toothfish, a catch so prized that it is known as “white gold”. Interpol is seeking information about who operates the ship and profits from its activities, as well as those of two accompanying vessels, *Kunlun* (pictured above, landing a toothfish) and *Songhua*. In the vastness of the open ocean, policing vessels like *Yongding*, *Kunlun* and *Songhua* is hard. But it is about to get easier—for with just a few mouse clicks a satellite-based monitoring system, unveiled this week, will be able to compile a dossier of evidence about even the most clandestine fishing operations.

The scale of illegal and unreported fishing is, for obvious reasons, difficult to estimate. The Pew Charitable Trusts, an American research group, has nevertheless had a stab at it. It reckons that around one fish in five sold in restaurants or shops has been caught outside the law. That may amount to 26m tonnes of them every year, worth more than \$23 billion. This illegal trade, though not the only cause of overfishing, is an important one. Stamping it out would help those countries whose re-

sources are being stolen. It would also help to conserve fish stocks, some of which are threatened with extinction. It might even (if the more apocalyptic claims of some ecologists are well founded) slow down the journey towards a wider extinction crisis in the oceans.

A global game of hide and seek

The new monitoring system has been developed by the Satellite Applications Catapult, a British government-backed innovation centre based at Harwell, near Oxford, in collaboration with Pew. In essence, it is a big-data project, pulling together and cross-checking information on tens of thousands of fishing boats operating around the world. At its heart is what its developers call a virtual watch room, which resembles the control centre for a space mission. A giant video wall displays a map of the world, showing clusters of lighted dots, each representing a fishing boat.

The data used to draw this map come from various sources, the most important of which are ships’ automatic identification systems (AIS). These are like the transponders carried by aircraft. They broadcast a vessel’s identity, position and other information to nearby ships and coastal stations, and also to satellites. An AIS is mandatory for all commercial vessels, fishing boats included, with a gross tonnage of

more than 300. Such boats are also required, in many cases, to carry a second device, known as a VMS (vessel monitoring system). This transmits similar data directly to the authorities who control the waters in which the vessel is fishing, and carrying it is a condition of a boat’s licence to fish there. Enforcement of the AIS regime is patchy, and captains do sometimes have what they feel is a legitimate reason for turning it off, in order not to alert other boats in the area to profitable shoals. But the VMS transmits only to officialdom, so there can be no excuse for disabling it. Switching off either system will alert the watch room to potential shenanigans.

The watch room first filters vessels it believes are fishing from others that are not. It does this by looking at, for example, which boats are in areas where fish congregate. It then tracks these boats using a series of algorithms that trigger an alert if, say, a vessel enters a marine conservation area and slows to fishing speed, or goes “dark” by turning off its identification systems. Operators can then zoom in on the vessel and request further information to find out what is going on. Satellites armed with synthetic-aperture radar can detect a vessel’s position regardless of weather conditions. This means that even if a ship has gone dark, its fishing pattern can be logged. Zigzagging, for example, suggests it is long-lining for tuna. When the weather is set fair, this radar information can be supplemented by high-resolution satellite photographs. Such images mean, for instance, that what purports to be a merchant ship can be fingered as a transshipment vessel by watching fishing boats transfer their illicit catch to it.

As powerful as the watch room is, though, its success will depend on govern- ▶▶

ments, fishing authorities and industry adopting the technology and working together, says Commander Tony Long, a 27-year veteran of the Royal Navy who is the director of Pew’s illegal-fishing project. Those authorities need to make sure AIS and VMS systems are not just fitted, but are used correctly and not tampered with. This should get easier as the cost of the technology falls.

Enforcing the use of an identification number that stays with a ship throughout its life, even if it changes hands or country of registration, is also necessary. An exemption for fishing boats ended in 2013, but the numbering is still not universally applied. Signatories to a treaty agreed in 2009, to make ports exert stricter controls on foreign-flagged fishing vessels, also need to act. Fishermen seek out ports with lax regulations to land illegal catches.

Preserving Nature’s bounty

One of the most promising ideas for using the watch room is that shops could employ its findings to protect their supply chains, and thus their reputations for not handling what are, in effect, stolen goods. Governments sometimes have reason to drag their feet about enforcing fisheries rules. Supermarkets, though, will generally want to be seen as playing by them. The watch room’s

developers say they are already in discussions with a large European supermarket group to do just this.

The watch room will also allow the effective monitoring of marine reserves around small island states that do not have the resources to do it for themselves. The first test of this approach could be to regulate a reserve of 836,000 square kilometres around the Pitcairn Islands group, a British territory in the middle of the South Pacific with only a few dozen inhabitants.

The Pitcairn reserve, which may be set up later this year, will be one of the world’s largest marine sanctuaries. By proving that the watch room can keep an eye on such a remote site, its developers hope other places with similar requirements will be encouraged to get involved.

The watch-room system is, moreover, capable of enlargement as new information sources are developed. One such may be nanosats. These are satellites, a few centimetres across, that can be launched in swarms to increase the number of electronic eyes in the sky while simultaneously reducing costs. Closer to the surface, unmanned drones can do the same. The watch room, then, is a work in progress. But in the game of cat and mouse that enforcing fishing regulations has become, it will give the cat an important advantage. ■