5th International Billfish Symposium,

Taipei, Taiwan, 4-8 November 2013

Many of the world's leading players in the field of billfish research as well as a good number of up and coming scientists gathered in Taipei to focus on the global conservation and sustainable management of billfishes. With support from the NZ Sport Fishing Council and Whangamata Ocean Sports Club John Holdsworth attended to present the early results from the marlin ID project led by Clive Roberts and Lara Shepherd from Te Papa. The project has been well supported with many sportfishing clubs and motivated individuals collecting detailed measurements and samples of muscle and external parasites for genetic analysis. This was one of 50 presentations in Taipei spanning the latest in billfish genetics, stock structure, habitat utilisation, aging, modelling and more.

Marlin

The New Zealand marlin ID project found several measurements that were useful for separating the three marlin species across the whole size range, however no single characteristic separated all three. The branchiostegal membrane or frill covering the gills is shorter in blue marlin (16% to 19% of body length) than in black and striped marlin (Figure 1). Black marlin have a shorter dorsal fin than striped marlin. While size, body shape and pectoral fins are still useful, a few quick measurements can confirm species where there is doubt. These species IDs were backed up by genetic analysis.

Figure 1: The shorter frill covering the gills in blue marlin (left) than black marlin (right) is diagnostic.

Photo Kevin Flutey

Striped marlin caught in the New Zealand recreational fishery contributed samples to one of the first validated studies of age, growth and reproductive biology for the species. Some striped marlin in this region spawn in the Coral Sea, northeast of Brisbane Australia, during spring and early summer. After breeding, large adults move southward to New Zealand and the south coast of Australia to access food resources. Large striped marlin, up to 8 and a half years old, are caught in the New Zealand recreational fishery although most fish ranging from 60 kg to 110 kg are about 3 to 5 years of age. Researchers at the symposium were encouraged to collect muscle samples from spawning striped marlin or catch larvae from spawning sites for an in depth analysis of striped marlin population structure.

John Graves reported on the global population genetic structure of billfishes. Most billfishes move thousands of kilometres each year and it was previously thought that this highly migratory behaviour limited the development of separate spawning populations. Increasing genetic evidence, however, suggests the presence of unique populations of billfishes which need to be considered by fishery managers. In particular, striped marlin caught in the New Zealand recreational fishery are made up of at least one unique population within the southwest Pacific Ocean. Blue and black marlin are represented by geographically larger populations possibly on the scale of ocean basins (eg Pacific vs Indian Ocean).

Oceanography

Of interest to sport fishers is the way marlin, broadbill and sailfish seek out the edge of warm water eddies. A Japanese research vessel capable of recording ocean conditions and fishing several gear types at once showed that prey species also favour the edge of eddies where water masses converge. These eddies are not always visible in the SST plots but are revealed by sea surface height and models which look at areas of warm sub surface water. A number of studies found that in the "transition zone" between areas of high and low sea surface height, currents are higher, and billfish catch rates are higher (Figure 2 Plot of sea surface height with high catch stations circled).

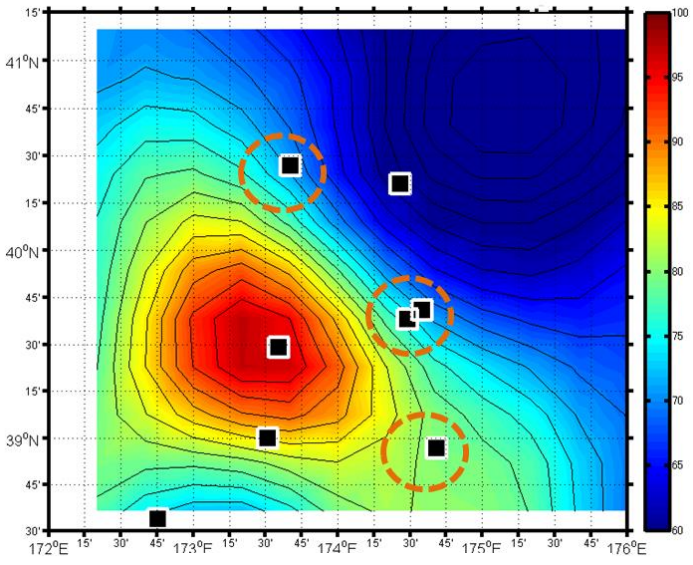


Figure 2: Sea surface height and research fishing locations in the North Pacific

Striped marlin spawning and habitat utilisation in Central America where described. They found spawning was spread over several months with a preference for 26° to 28° C SST. But the warmer water was not often preferred when feeding. Again transition zones on the edge of large eddies were favoured.

Sea surface temperature often changes with weather conditions while the subsurface temperature and salinity of eddies take much longer to change. Satellites detect small changes in surface height using radar, which is possible even through cloud cover. This helps determine how "spicy" (hot and salty) the subsurface water is. The eddies off Central America are fleeting, but off eastern Australia and NZ they can last for several days or weeks.

Eric Prince showed that the massive area of a low oxygen zone in the east Atlantic is expanding westward (Figure 3). This restricts the habitat that marlin and some prey species prefer to mainly shallower depths. Prince suggests that this phenomenon makes billfishes and tunas more

susceptible to commercial fishing gear, which may contribute to overfishing. Thankfully low oxygen zones are not an issue in the southwest Pacific Ocean due to the direction of ocean currents and upwelling zones.

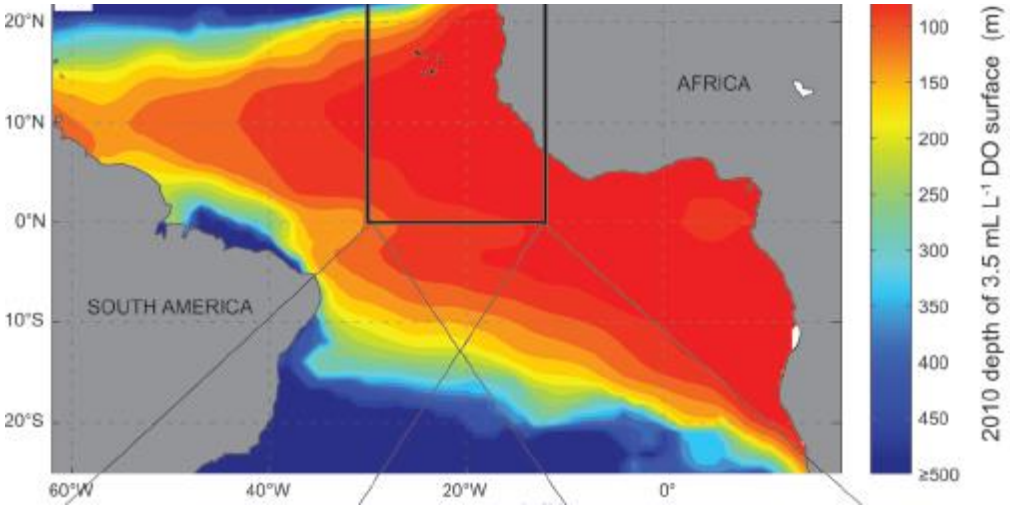


Figure 3: Depth of a low oxygen zone in the Atlantic influencing the swimming depth of blue marlin.

Also worth noting was the timely recovery of Atlantic swordfish following quota reductions and closed areas in the mid 2000s. A period of good recruitment also helped. John Neilson posed the question, was it "good luck or good management", seems it was a bit of both. John highlighted some of the difficulties of getting effective international management action in place. When real quota cuts were made, Atlantic swordfish were able to recover. The recovery was aided by some remarkable aspects of swordfish biology. They are adapted to deep cold water with special eye and brain heaters which give them an advantage over prey, the largest females tend to feed in high latitudes where fishing pressure is generally less, and there is an extended spawning season in tropical waters. It is no accident the swordfish are one of the most widely distributed species of fish on the planet. There is some hope that swordfish stocks in NZ will continue to improve after a reduction in fishing effort in northern waters.

Hook type and tagging

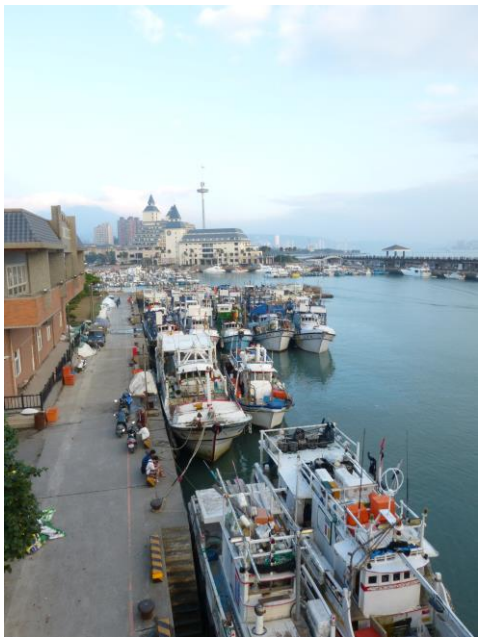
Capture stress and release mortality was studied in Atlantic white marlin (closely related to striped marlin). Lactate, glucose, sodium, and cortisol in the blood increased significantly with fight time, though these changes were not lethal. 200 white marlin caught on natural baits and circle hooks were tracked with satellite tags. Just 2% were gut hooked and 98% survived. Of 72 white marlin caught on natural baits and J hooks 41% where hooked internally and 35% died. Fish caught on J hooks were 41 times more likely to be hooked deeply and 15 times more likely to be bleeding than fish caught on non-offset circle hooks. The US has passed a law that circle hooks must be used in all billfish tournaments. Fishers in NZ need to use circle hooks in natural baits for marlin if there is a chance that the fish may be tagged.

Julian Pepperell presented a summary of 40 years of conventional tagging in Australia. More than 110,000 billfish (sailfish and marlin) have been tagged and released. Apart from black marlin many Australian billfish show movement between spawning northern grounds and southern foraging grounds (eg. off Queensland and New South Wales). A breakdown of recaptures by species by decade clearly slowed that conventional tagging was still adding to our knowledge of long term movements of billfish. Defining stock structure and identifying spawning grounds are important for fisheries management. Black marlin have a well-known spawning ground off the Great Barrier Reef

but is that the only one in the Pacific? Where do black marlin from the Indian Ocean come from? Over 56,000 black marlin have been tagged in Australia and 390 recaptures reported (Figure 4). Much of what we know about the movement of this species comes from fish tagged by sport fishers. The combined information from tag cards also provides a detailed record of recreational catch and trends in the fishery. And most of the fish survive. Win Win Win.

Figure 4: Recapture locations for black marlin tagged in Australia, mature fish (red) (Domeier & Speare 2012).

Selected highlights reported by John Holdsworth and Keller Kopf for the New Zealand Sport Fishing Council, November 2013. For a full list of the Symposium topics go to:
http://billfish5.oc.ntu.edu.tw/program.html



Fishing boats at Tamsui

The hotel and conference venue Taipei