From: **Tim Frawley - NOAA Affiliate** tim.frawley@noaa.gov
Subject: Re: Seminar on Albacore Today
Date: June 17, 2019 at 12:33 PM
To: Natasha Hardy nahardy@ualberta.ca

Hey Tash,
I've attached a couple papers that might be of interests. The first is by Andrew Bakun who describes the physics of the fronts and eddies that are believed to be responsible for the aggregating predators and prey in pelagic environments. The second discusses how changes in these physical properties can alter forage community structure (I think you were right with anchovies being more nutritious by the way...). The last describes how fishers hone in on these physical-oceanographic features when choosing locations to fish. None of these papers are the last word on any of these topics but all inspired my thinking when I was trying to get to the bottom of my squid mystery down in the Gulf of California.
Dove into the albacore logbook data last week; too soon to say what is what but there are some interesting signals (i.e. fishing effort moving north and closer to shore over the last decade) that resonate with the information Gwendal has collected in his interviews. I will keep you posted. It is nice to know someone else is thinking intensely about the where and why of this fish.

Tim

On Sat, Jun 15, 2019 at 6:32 AM Natasha Hardy <nahardy@ualberta.ca> wrote:

> Tim, FYI this is the comment from Mitchell Roffer that basically says what you were saying. And which I think we can incorporate into our analyses at least to better frame them. If you know of any published papers describing this, that would be great! I haven't found anything yet that describes this but I have read comments in papers and from fishermen that describe this.
>
> For our analyses, we could characterise prey communities in the diets in relation to oceanic conditions (we were going to do that anyway), but with an additional focus on stability of oceanographic features in the vicinity of tuna sampling. Such as eddy strength or velocity, there are other metrics. I'll just have to see what's out there.
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> ---------- Forwarded message ---------
> From: **Mitchell Roffer** <tunadoctor@me.com>
> Date: Mon, Jun 10, 2019 at 4:24 PM
> Subject: Seminar on Albacore Today
> To: <stephanie.green@ualberta.ca>, <lbcrowd@stanford.edu>, <nahardy@ualberta.ca>
> Cc: William Goldsmith <wgoldsmith@pewtrusts.org>
>
> I enjoyed your seminar and think that this modeling technique will be very useful for fish like lion fish and other fish. As I asked this morning I think this type of work may be more revealing with other species rather than tunas as with the albacore and other tunas the key to their distribution, relative abundance, and catchability is water temp, oxygen, turbidity - transparency/chlorophyll and frontal characteristics in time and space. This well established. In the larger areas in terms of overall distribution and movements the fish move in lenses of water that allow for their optimal physiological functioning. Within that lens the predator- prey relationships are are controlled by prey availability which is a function of ocean frontal dynamics and especially their persistence. Three to five day persistent fronts concentrate the forage and thus concentrate the tunas. When the fronts dissipate the prey moves or is pulled to the next stable frontal boundary. These systems are on the order of 1-10km which is difficult to study unless you are on the vessels or get exact location data from the fishermen (hook and line, purse seiner, etc.) The tuna seem to disappear to the fishers, but in reality they are moving to the next concentration of forage. When the ocean is unstable the tuna are not particularly concentrated. But when the ocean produces these stable fronts, then the fish are in great abundance. I know Larry is well aware of this. Most of this information is not published as I moved directly from my Ph.D. to a fish forecasting business that after 30+ years I sold last year. I doubt that I will ever publish it although I have presented it in various scientific venues over the years.
>
> While some people have thought that fat content of tuna prey is critical when food selecting where there is an abundance of prey in a given area. But in my experience, in a prey shortage situation they will eat what they find from crabs to shrimp to squid and fish. Before becoming a desk biologist, I spent a considerable amount of time on boats and as a port sampler. I also have interviewed thousands of fishers over my career as a fish forecaster and researcher. I understand that bioenergetic information is critical in understanding species ecology and thus think that that this research is important. But I ultimately believe that climate change will more influence their distribution through hydrography rather than prey characteristics of size and shape. That being said I think this research may be more appropriate, more likely to reveal useful managements results when considering larval tuna survival issues and recruitment. Prey type (species) and size and fat content appears critical in tuna larvae survival. This is an area that really needs the type of research you presented today.
>
> Regards and again I enjoyed the seminar,
>
> Mitch
>
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Bakun_2006.pdf

Lingen_2006.pdf

Watson et al 2018.pdf