Introduction

Yellowtail (*Seriola lalandi*) are one of the most sought-after gamefish in southern California and are major targets of local fishing effort (Dotson & Charter 2003), yet little is known about their movement patterns. Previous studies have shown that a greater chance of catching yellowtail leads to more people fishing (Dotson & Charter 2003). Catch rates of yellowtail in the Southern California Bight (SCB) begin to increase with ocean warming in the spring (Dotson & Charter 2003). This increase is met with great anticipation by many anglers, from private-boaters and kayakers to the southern California Commercial Passenger Fishing Vessel (CPFV) fleet. Where these fish were during winter months, however, is still unclear. Baxter, in 1960, showed that tagged fish migrated northward from Baja California, Mexico into the Southern California Bight (SCB) during the spring and summer. While this may explain the higher summer catch rates, the winter catches of large yellowtail in the SCB are unexplained. Despite their economic value (Southwick 2009), patterns of space-use and catch of yellowtail in California remain virtually unstudied.

Understanding fish movements and habitat use is especially relevant because California's ambitious program of marine spatial management mandated by the Marine Life Protection Act (MLPA, CA-DFW). The design of coherent spatial management, however, depends upon an understanding of the areas and seasons that are essential for target species (i.e. spawning). While spatial data exist for some target species in the SCB, no such data are available for yellowtail. This is because yellowtail, although highly sought-after, do not fit within existing federal or state management strategies. They are not listed as a "Highly Migratory Species" (HMS) by the National Marine Fisheries Service (NMFS) and so are not managed federally. Further, they are neither Coastal Pelagic Finfish nor Groundfish, as determined by the California Department of Fish and Wildlife (CA-DFW), and due largely to budgetary constraints, are not state management priorities (Valle pers comm.).

When it comes to comprehending movements, fishermen are an often overlooked source of qualitative information. Successful fishermen understand basic movement patterns quite well due to years spent targeting certain species (Parnell et al. 2010). This is definitely the case for yellowtail (M. Medak pers comm). However, because these general movement patterns as well as finer-scale patterns of space and habitat usage have never been quantified, they are not available in the scientific literature or able to be used for management.

This study aims to fill this knowledge gap and quantify the spatial and temporal movements of yellowtail by combining broad-scale insights from the analysis of long-term catch data with fine-scale insights gained from conventional tagging and passive acoustic telemetry. The combination of tagging methods provides spatial data while also engaging and educating the angling public. With large enough sample sizes, conventional tagging can provide an estimation of basic demographic data (DeLury 1951, Cormack 1964, Pine et al. 2003) and is a great way to directly engage the angling public and give them a stake in the research project (Grorud-Colvert 2010). In complement, acoustic tagging provides fine-scale movement information as well as a method to determine seasonal residence times of large yellowtail in and around the La Jolla kelp forest (Meyer 2007).

This project addresses the following questions:

1. Are there spatial and temporal differences in the sizes of yellowtail caught in the SCB?
2. Are the larger yellowtail caught in inshore areas during episodes of cooler water

widely ranging migrants or local residents?
3. Can passive acoustic telemetry be used to monitor yellowtail movements along near-shore kelp forest and rocky reef habitat?
4. What do these movements tell us about their susceptibility to recreational fishing pressure?

Through answering the above questions, we hope to generate a robust data-set of spatial information. The end goal being to provide the information necessary to begin to proactively manage SCB yellowtail populations as well as to better understand the impact of spatial management regulations currently in place on nearshore yellowtail and the associated recreational fishery.

Methods

Recreational Catch Data -

Data Sources - Recreational fishery data were obtained from the Recreational Fisheries Information Network (RecFIN) Web site for the years 1993 to 2011. The dataset consisted of information from both the Marine Recreational Fisheries Statistics Survey (MRFSS, 1980-2004) and the California Recreational Fisheries Survey (CRFS, 2004-present). MRFSS is a National Marine Fisheries Service survey that provided the framework for CRFS but assigned samplers in different frequencies as well as computed effort statistics differently. This renders direct comparisons between the two impossible. However, both datasets do contain identical information gathered by DFG (the parameters listed below). These data were mined for this project (as well as the reason for the 1993-2010 range).
Catch-per-unit-effort for yellowtail based on RecFIN catch records was not calculated due to differences in methods of estimation within each database. To circumvent this issue, all results were reported in relative proportion to the overall catch. Additionally, both the Los Angeles Times Daily Catch Report database and CPFV daily logbook data were used to calculate CPFV effort for yellowtail as well as angler totals from the southern California CPFV fleet. Data on southern California CPFV angler and catch totals are reported daily in logbooks mandated by the California Department of Fish and Wildlife (CA-DFW) and are maintained by NOAA's Southwest Fisheries Science Center (SWFSC data portal). Parameters recorded include coarse locations (DFW sampling block number), number of anglers, hours fished, species and number caught/released, etc. These data can be used to generate daily, monthly and yearly totals and averages for number of anglers, total catch by species or trip and catch per angler by species. While a measure of CPUE can be calculated using logbook data, it does not take into account a variety of factors including time spent fishing for other species as well as the fact that anglers aboard private vessels or kayaks, which, especially in the last 15 years, account for a significant portion of yellowtail catch (RecFIN, pers obs.).

Definitions –

Sampling wave –the 2-month period in which the fish recorded was caught. Wave 1 corresponds to January and February, wave 2 to March and April and so on through wave 6 (November and December).

Fork length (FL) – in centimeters (cm) as measured by Department of Fish and Wildlife creel samplers. FL is measured as the length from the tip of the snout to the deepest point in the fork of the tail.

Inshore/offshore designation – The designation of inshore was based on whether or not the fish recorded was captured within 3 miles of the shore or greater than 3 miles offshore (federal vs. state waters). Conveniently, this 3-mile designation generally approximates the width of the continental shelf along the San Diego coastline of the SCB (Carlucci et al. 1986).

CPFV logbook data – Commercial Passenger Fishing Vessels (CPFV's) are mandated by the state of California to maintain a daily logbook. Data was obtained through a data-sharing agreement with the CA-DFW. The logs contain information on total number of anglers, coarse fishing locations (DFW block number), total number of fish caught, total number of fish released, what species were caught, total hours fished, vessel ID number, and several other parameters. However, the one's listed above were the only parameters looked at for this analysis.

Data analysis
Data were downloaded from the RecFIN database and imported into R (2015) for analysis. All non-numerical values and zeros were removed and any total lengths larger than 2000mm were deemed recording errors and removed as well. Fish were then grouped into inshore and offshore categories. In order to standardize for differences in catch totals, the data were plotted as percentages of the overall catch in each category (inshore and offshore).

Tagging -
Depending on size and location, yellowtail were fitted with one of two types of tags, conventional (Floy FIM 96) or surgically-implanted acoustic transmitters (Vemco V-16h). Conventional tags were deployed throughout the Southern California Bight (SCB) while the bulk of acoustic transmitters were implanted in fish in the near shore waters off of La Jolla, CA. Six yellowtail along the Ventura county coastline were also fitted with V-16 tags to take advantage of existing VR2-W receivers around Santa Cruz Island and the Ventura/Malibu coastline.

Researcher N. Ben-Aderet measuring a tagged yellowtail aboard the fishing vessel "New Lo-An" (9/2015).

Sampling Design
Conventional tagging – To date, ~175 conventional tags have been deployed on yellowtail within the SCB. The general area stretches West to San Clemente Island and Cortez/Tanner Banks and South to Ensenada. The bulk of the offshore tagging have taken place aboard CPFV's home-ported in San Diego. Collaborations with Captain Markus Medak of the F/V *New Lo-an*, Captain Ryan Bostian of the F/V *San Diego,* the Oceanside Senior Anglers, as well as several local fishing guides helped were essential to these tagging efforts.

Acoustic Telemetry - To complement conventional tagging, we used acoustic telemetry to gather higher-resolution spatial data. We deployed 30 Vemco V16-4x passive acoustic tags on adult yellowtail and are will continue to monitor their movements for the life of the tag (initial tags will begin to expire starting fall 2016). The tags emit a coded ping at 69hz once every 30-90 seconds with a nominal delay of 60 seconds. Fish were surgically fitted with these transmitters using methods similar to other telemetry studies (e.g., Topping et al. 2005, Bellquist et al. 2008, Meyer et al. 2007, Mason and Lowe 2010). After release, initial tracking depended upon the fishes' proximity to any acoustic receivers. Our primary detection network was the La Jolla acoustic receiver array (Figure 1), consisting of 40 Vemco VR2W receivers moored along the 10m and 20m depth contours from La Jolla Cove south to Crystal Pier. The array spans two no-take reserves (Matlahuatyl and South La Jolla), some of the most heavily fished areas along San Diego's coastline (Parnell et al. 2010) and what is considered by many as the premier yellowtail fishing location in San Diego county. The La Jolla array was augmented with 4 additional receivers moored in deeper water outside of the main coverage zone as well as several other receiver arrays maintained by researchers at California State University, Long Beach, and the Channel Islands National Marine Sanctuary. These receivers helped gain insights on transitory movements beyond the fine-scale scope of the La Jolla array.

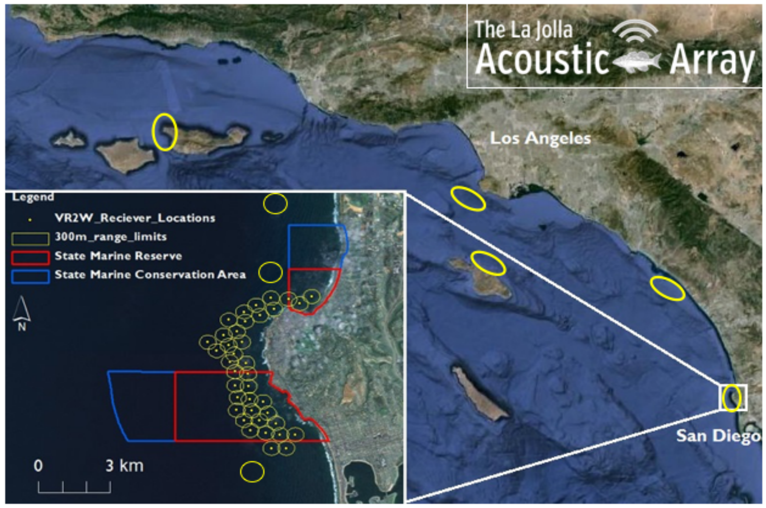

Figure 1. Map of the La Jolla Acoustic Array in reference to the Southern California Bight. Yellow ovals indicate the presence of VR2 acoustic receiver arrays.

N. Ben-Aderet implanting a V16 acoustic transmitter in a large yellowtail and subsequent successful release.

Results

Recreational Catch Data

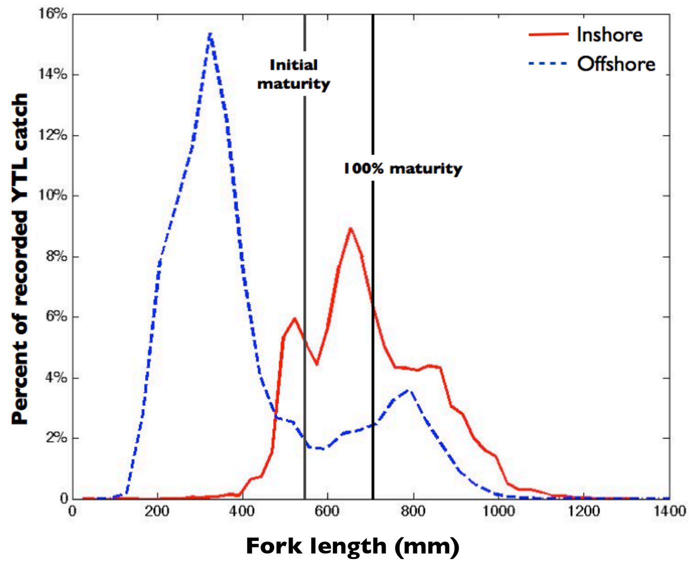

Figure 2. Size Frequency Distribution of Inshore and Offshore Catch: all yellowtail caught in the Southern California Bight between January 1993 and December 2011, **Larger individuals caught in nearshore habitats.** N= 70,056 fish. Inshore fish: mean FL of 697. Offshore fish: mean FL of 668mm. lines denote approximate size at initial and 100% sexual maturity

Figure 2 summarizes the total sampler-examined yellowtail catch between 1993 and 2011 (n=70,056) divided into inshore and offshore catch. Offshore fish (mean FL = 668mm) demonstrate bimodality with a pronounced peak at approximately 300mm FL and a smaller peak at ~750mm FL. Inshore fish are normally distributed, (mean FL = 697mm). It is important to note that the very largest size classes are represented solely within inshore yellowtail.

Considering all yellowtail are sexually mature around 600 mm FL, a clear difference in size and maturity of fish caught inshore and offshore exists when the data are viewed as a proportion of the overall inshore and offshore catch (Fig 2; FL $\geq$ 575mm: Inshore = 63.06%, Offshore = 19.34%; FL $\geq$ 600mm: Inshore = 30.58%, Offshore = 12.11%). When referencing the line indicating 100% maturity, most of the inshore fish were sexually mature adults with very few fish under 500mm. The distribution of fish caught offshore was very different. While it was bimodal, the bulk of the catch was immature. Interestingly, the second peak, while much smaller, consisted of much larger fish (~800mm); indicating very large fish also being caught offshore.

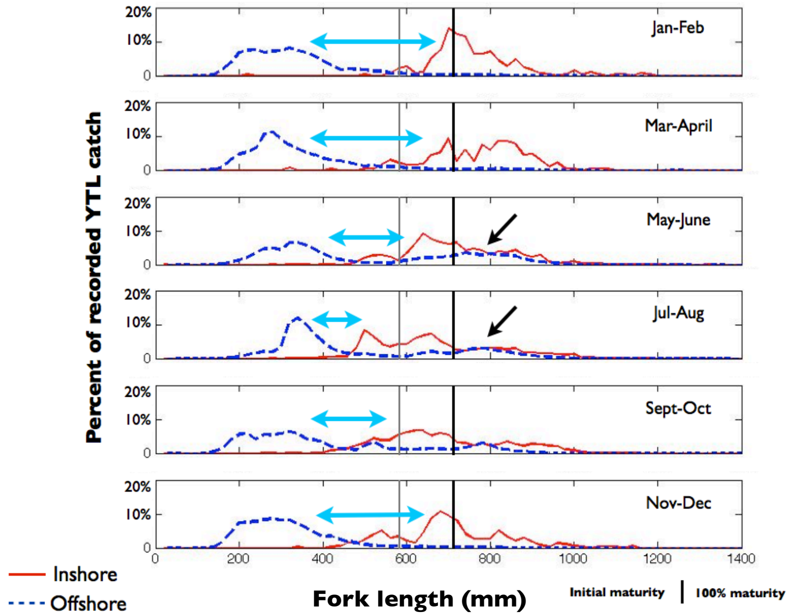

Figure 3: Size-frequency plot representing each 2-month sampling wave's relative contribution to the overall catch for all years (1993-2011). Dashed lines represent fish caught offshore and solid lines represent inshore fish; lines denote approximate size at initial and 100% sexual maturity. **Size segregation** appears to be **reinforced during the winter**, suggesting differential patterns of movement for larger vs. smaller yellowtail. A **seasonal pattern** exists in size-frequency distribution between **inshore and offshore habitats**. In cooler months, offshore catch is dominated by smaller, sub-reproductive fish. However, during the warmest months, very large, mature fish are also caught

Subsequent parsing out of the data into 2-month DFW sampling waves revealed further spatial size segregation (Fig. 3). During waves 1, 2 and 6, which correspond with the coldest water temperatures of the year, there was distinct separation of the size peaks for inshore and offshore fish. Larger fish (>600mm TL) were caught inshore while smaller, sub-reproductive fish were caught offshore. During waves 3 and 4, offshore fish began to demonstrate a bimodal size-frequency distribution. There was a noticeable increase in the proportion of large adults of reproductive size caught offshore and no distinct separation between inshore and offshore size classes. Subsequent analysis of TL as a function of water temperature (Fig. 4) revealed a significant negative correlation between water temperature and median fish size (linear correlation, $n = 132$, $r^2 = 0.128$, $p < 0.01$), with fish size generally decreasing as water temperature increases.

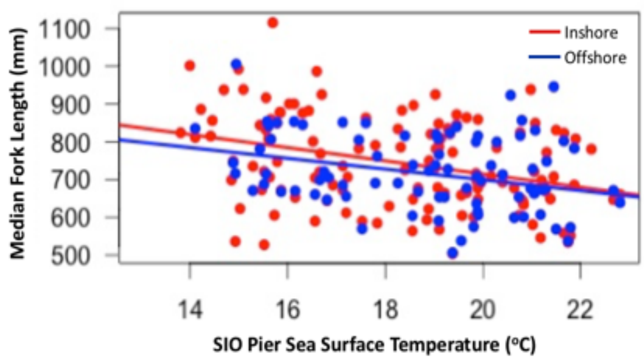

Figure 4. Median monthly sizes of SCB yellowtail (1993 – 2011, n=132) in relation to sea surface temperature as measured from the Scripps Institution of Oceanography pier.

Conventional and Acoustic Tagging

Due to the anomalous marine conditions of the past year and a half, analysis of tracking and tagging data is ongoing. Summary results to date are presented below:

Passive Acoustic Telemetry

Analysis of acoustic tracking data is ongoing (will be completed September 2016), however, several trends are already evident.

1. Most yellowtail are highly transient, although one individual was detected in the La Jolla array almost constantly for the entirety of 2015.

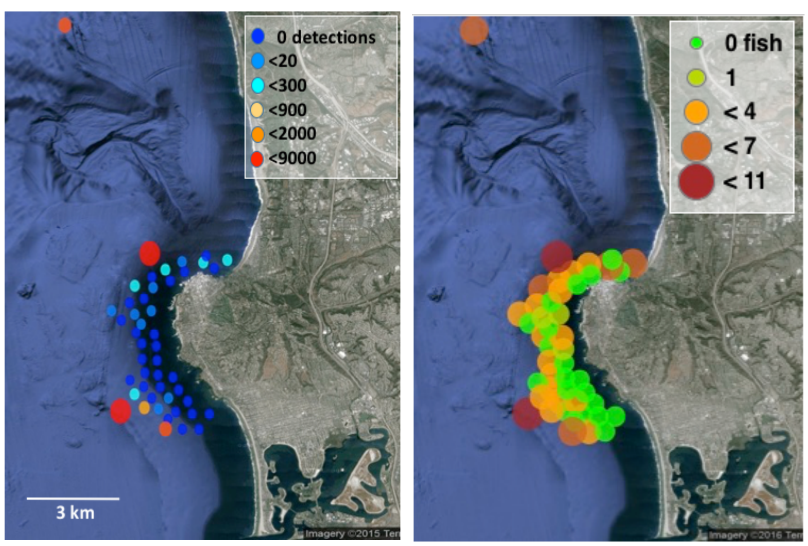

Figure 6: Two maps showing the number of overall detections (left) and number of individual fish detected (right) per receiver (each individual dot) within the La Jolla acoustic array. The majority of detections came from receivers on the outer edge of the kelp forest adjacent to deeper water.

2. Along the greater La Jolla coastline, yellowtail prefer deeper water, adjacent to the kelp

forest. Fish were most commonly detected on the deepest receivers although some differences between sizes were seen (fig. 7).

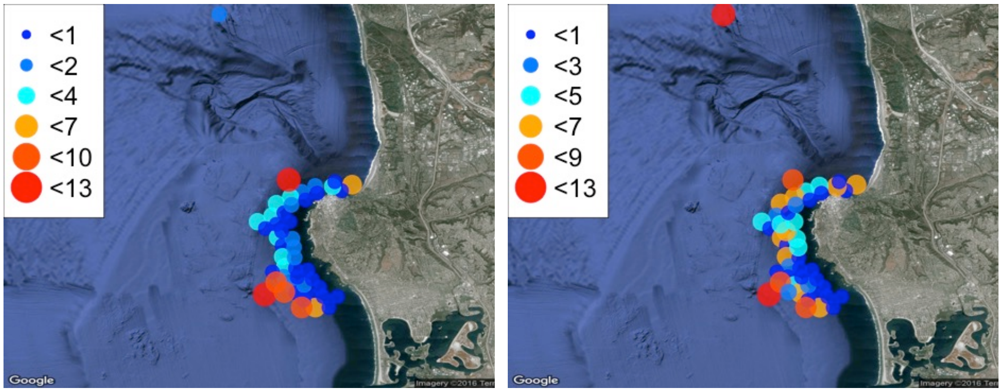

Figure 7: Two maps displaying the number of fish detected (<95cm FL = left map, >95cm FL = right) per receiver (each individual dot) within the La Jolla acoustic array. There were differences in depth and substrate between where smaller and larger fish were detected.

3. Fish appear to travel through the La Jolla area in waves, with most detections clustered in the warm-water months (May-September)

Conventional Tagging

To date, we have tagged 165 fish and recovered 36 tags, equating to a 21.8% return rate. Time at liberty ranged from 20 minutes to 414 days with the median being 31.5 days (mean=106 days). The straight-line distance between the initial tagging location and the recapture location ranged between 0 to 420 km, the median distance was 87.3 km (mean=106km).

In general, the longer the fish was at liberty, the farther they traveled before being recaptured. (Fig. 8, $p=0.00166$)

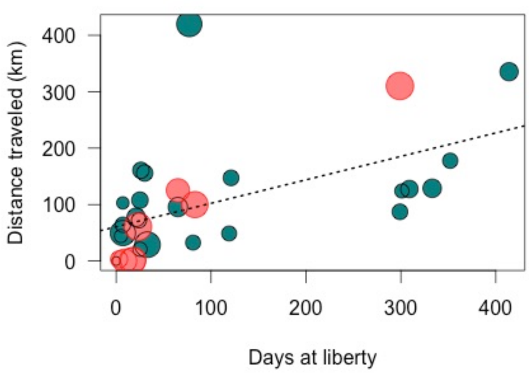

Figure 8. Linear regression of Days at Liberty versus straight-line distance between tagging and recapture locations. Blue circles are offshore fish, red are inshore. Circles are relative to fish size. $p=0.00166$, $R^2= 0.2931$

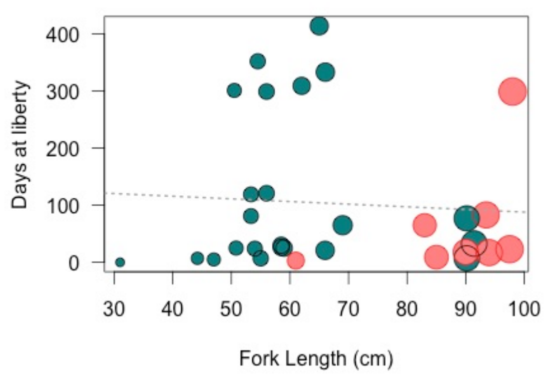

Figure 9. Linear regression of Days at Liberty versus fish fork length (cm). Blue circles are offshore fish, red are inshore. Circles are relative to fish size. $p=0.725$, $R^2= 0.0043$

There was no relationship between the size of the fish tagged and how long they were at liberty before being recaptured (Fig. 9).

There was also no significant relationship between the size of fish (at the time of tagging) and the distance traveled before being recaptured (fig. 10). That being said, we assume the significance of this relationship would improve with increased sample size.

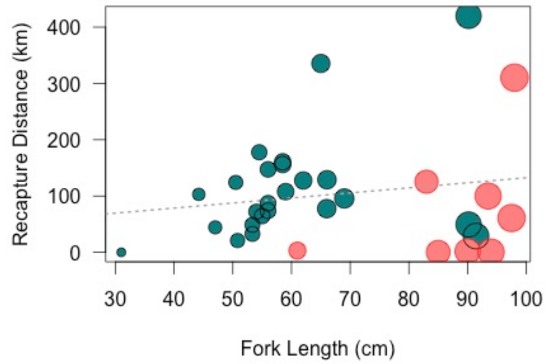

Figure 10. Linear regression of recapture distance versus fish fork length (cm). Blue circles are offshore fish, red are inshore. Circles are relative to fish size. p=0.36, R^2= 0.0028

Discussion

Spatial and temporal size-segregation in SCB yellowtail catch

Anecdotal accounts from recreational fishermen indicate a seasonal increase in the proportion of large, inshore, yellowtail. This trend is evident in the recreational catch. The data indicate that in general, inshore yellowtail are larger than their offshore conspecifics and while all sizes of yellowtail can be caught found offshore during the summer months, predominantly large fish are captured inshore during the winter.

When catch was divided into 2-month sampling waves, the inshore and offshore size distributions did not remain constant and changed depending per wave (Fig. 3). This change is most likely due to water temperature and the seasonal influx of yellowtail from Baja California (Baxter, 1960; Collins, 1973; Kimura et al. 1994). During the winter/cooler months (November-April) catch is divided between smaller (<400mm) fish offshore and larger (>600mm) fish inshore with very little overlap between sizes. During the spring/summer (warmer) months (May-October), the size of fish caught inshore declines and larger (≥800mm) fish begin to show up in the offshore catch. This could be due to offshore migration by large resident inshore fish for spawning, or a 'drowning out' of large inshore fish by an influx of seasonally migrating southern fish (which would increase all sizes represented in all habitats). Furthermore, a significant inverse relationship is seen with fish size (as total length) increasing as water temps cool (fig. 4). Although r^2 is fairly low, this result aligns well with what is demonstrated in Figure 3; that larger fish are being caught in inshore waters during the colder months. The above trends repeat across numerous years, although as noted by some (Baxter, 1960; Collins, 1973; Maccall, 1996), offshore catches of larger fish do seem to correlate with noted warm-water years.

Probable successful spawning in the outer SCB

Yellowtail are thought to spawn in offshore waters of the SCB only during warmer-than-average years (Baxter, 1960). During the time frame analyzed for this study the following years were listed as >0.5ºC above the long-term average: 1994-1995, 1997-1998, 2002-2004, 2006, 2009 (NOAA Climate Prediction Center). Therefore, the increase in large yellowtail caught offshore during the warmest months of the time-frame examined (1993-2010) could be due to spawning activity, although what proportion of the spawning fish are SCB residents and not transients from Baja California is unknown. A massive expansion of tagging efforts would be required to determine the origin of these fish.

With sea-surface temperatures increasing due to changing global climate, as well as the El Niño fueled elevated water temps of the past 2 years, one might assume that spawning is occurring in the outer SCB more frequently than previously assumed (personal observation, Tian 2012) although direct evidence has yet to appear in the literature. While this hypothesis has yet to be tested, Kimura et al. (1994) reported changes in the seasonal occurrence and migrations of Japanese yellowtail (*Seriola quinqueradiata*) due to intrusions of warm water from the Kurishio current. This trend appears to be analogous to the increases of yellowtail catch totals and estimated abundance within the SCB during El Niño years (Dotson and Charter, 2003) as well as to substantial increases in dorado (*Coryphaena hippurus*) and wahoo (*Acanthocybium solandri*) catch by the southern California CPFV fleet over the last 50 years.

Yellowtail over-wintering in the northern SCB

The idea that large yellowtail are year-round residents within the SCB is not particularly new. Baxter (1960) reported in the results of the tagging portion of his study that all large individuals (>1000mm TL) were recaptured much closer to the location of their initial capture than younger, smaller fish. In a study using the historical records of the Avalon Tuna Club on Catalina Island (maintained since 1898), Maccall (1996) states that the SCB's population of yellowtail are probably established or strengthened during periods of prolonged warm water and that during cooler periods, "these populations would no longer be self-sustaining and would slowly decline due to lack of recruitment." Without fishing, adult yellowtail have low mortality rates, and a large enough population could remain resident for many years (maximum lifespan is thought to be between 12-20 years (Baxter 1960, Stewart et al. 2004)). However, during cooler periods even a moderate fishery would have the capacity to rapidly deplete the population (Maccall 1996).

It could be that catch of large yellowtail in inshore waters during cooler months is due to the presence of fish that arrived in warm-water years and remained in the area (i.e. hold-over fish). If so, a marked increase in the catch of yellowtail should be seen in pronounced warm years as well as in the winter months immediately after the warm year. A decline in catch should occur during the winter months each subsequent year as fishing pressure takes its toll and stocks are not seasonally replenished during the summer months. While large increases in the total amount of yellowtail landed by CPFV anglers during El Niño (warm) years were indeed seen, subsequent years did not reveal a gradual return to pre-El Niño levels. In fact, as soon as water temperatures returned to normal levels, so did the catch. This pattern is what leads most fishermen to assume the majority of the fish move primarily in response to water temperatures.

Larger fish inshore, smaller fish offshore

In summary, during cooler months the offshore catch is dominated by smaller, sub-reproductive fish while inshore, the catch is dominated by large, mature fish. During warmer months, however, this pattern weakens. This could be due to several reasons: 1) big fish are inshore during most of the year and move offshore to spawn in summer; 2) big fish are always inshore but the signal in the data is drowned out by large amount of smaller, migratory fish moving in from the south; or, 3) big fish are simply hold-overs from warm-water years and only spawn in CA waters during exceptionally warm years. As it stands, the numbers of tagged fish are currently too low to successfully answer this questions.

Yellowtail in La Jolla demonstrate SCB-wide movements

While final analysis will not be complete until fall 2016, it is clear that acoustically tagged yellowtail in La Jolla move constantly. Only a few individuals appear to be spending prolonged periods of time (several months in a row) in the vicinity of the acoustic array. Coincidentally, these fish were larger fish tagged during winter months (Nov. 2014, January 2015), perhaps this lends credence to the notion held by many anglers that the largest yellowtail are more residential. The more common pattern, however, was for fish to "breeze" through the array and be detected by several (1- 4) receivers within the same time frame (several hours to several days) only to then disappear from the array for some period of time (weeks to months) before returning again. Some fish were detected as far north as Santa Cruz island and 2 were recaptured south of Cabo San Quintin, Mexico (>350km from La Jolla). Detections did appear to be more prevalent in the late spring/early summer as well as in the fall months. This pattern seems to correlate with increases in angler catch as well.

Interactions with Marine Protected Areas

While not an explicit goal, the acoustic tags provide data to gauge the impact of San Diego's MPA's on yellowtail and potentially other highly mobile species. The majority of yellowtail detections were from recorded by receivers outside of the La Jolla MPAs. Because the nature of fishing patterns in La Jolla (Parnell et al 2010) and that the number of anglers has not significantly changed, hypothetically, fishing pressure should simply increase on the edges of the reserves (Hilborn et al. 2004). These edges happen to be the same area where yellowtail are predominantly caught (personal observation) so perhaps increasing angler encounters is an unintentional effect of the La Jolla MPA's? These potential unintended effects have yet to be investigated, but would be a logical next step given the infrastructure already in place.

Long-term Recommendations

22% is an extremely high recapture rate, it means that every year a large proportion of southern California's yellowtail are getting removed through fishing. However, catch rates have not declined (in fact, they have increased in the past 2 years). We currently do not have an answer as to what mechanisms are sustaining southern California's yellowtail population. What is clear however, is that a broader tagging program is needed. Increasing the tagged population size to a level where more robust analysis could be performed would allow for a detailed stock assessment for SCB yellowtail. Such analysis is crucial in determining if further management action should be considered.

However, without dedicated tagging charters, tagging the necessary amount of fish is virtually impossible. Despite the enthusiasm for recreational fishing in southern California, the average Southern California angler rarely releases adult yellowtail, especially if they are a paying passenger aboard a CPFV. As a result, the only way to tag and release a large number of fish is through funding tagging charters. Using this approach, anglers directly participate in the project by working alongside researchers to capture, tag and release fish. This model has proved to be very successful for researchers working with other species in the region, and serves a complementary benefit of increasing awareness and subsequent support for future conservation efforts.

We feel that it is prudent to wait to make policy recommendations until after incorporating the acoustic telemetry data from this upcoming summer, along with further analysis including the 2014/2015 recreational catch. However, it is safe to say that the current recreational size and catch limits for yellowtail might be not be as sustainable as previously thought and should be reconsidered.

Publications and Outreach efforts

Presentations

Upcoming:

• 13th International Coral Reef Symposium – June, 2016. Fishing for Answers: Tracking Yellowtail (*Seriola Lalandi*) Movements and Catch in the Eastern Pacific.

• 67th annual Tuna Conference – May 16-19, 2016. "Fishing for Answers: Spatial and Temporal Trends in Recreational Catch and Movements of Yellowtail (*Seriola lalandi*) in the Southern California Bight"

Previous:

• California Cooperative Oceanic Fisheries Investigation (CalCOFI) annual meeting, December, 2015. "Fishing for Answers: Results from both Recreation Fisheries Data Analysis and Tagging of Yellowtail (*Seriola lalandi*) in the Southern California Bight"

• Scripps Student Symposium – September 16, 2014 – Poster presentation; "Fishing for Answers: The Southern California Yellowtail Tagging Project"

• Ecological Society of America 2014 annual meeting – Presentation – "Spatial and temporal size segregation in southern California yellowtail (*Seriola lalandi*): Results from recreational fishery data and conventional tagging"

Publications

Ben-Aderet N, Semmens BX, Sandin SA. Temporal and Spatial Size-Segregation in Southern California Bight Yellowtail (*Seriola lalandi*) as revealed by Recreational Catch Records. (*in prep*)

Ben-Aderet N, Sandin SA, Semmens BX. Fine-scale movements and local residence times of yellowtail (*Seriola lalandi*) in the La Jolla Near-Shore Management Area. (*in prep*)

Outreach

Fred Hall Fishing and Boat Show, Del Mar, CA (2013, 2014, 2015, 2016).
"Day at the Docks", Point Loma, CA (2014, 2015) - with National Marine Fisheries Service (NMFS)
Rod and Reel Radio, AM 540 (2 interviews, (12/2013))
San Diego Anglers monthly meeting (11/2013)
San Diego Freedivers monthly meeting (6/2014)
Oceanside Senior Anglers monthly meeting (7/2014)
Oceanside Senior Anglers offshore fishing charter (10/2014)
Constant engagement with anglers aboard CPFV's during tagging trips. (2014 – 2016)

Project media

The project, formally known as the "Southern California Yellowtail Tagging Project" has an active social media presence with a popular Facebook page along with associated twitter and

Instagram postings (@saltynoah). Additionally, the project and lead researcher were featured in a Scripps Institution of Oceanography video profile (5/2014) as well as in Pacific Coast Sportfishing (10/2013) and Rod and Reel Radio on AM 540 (2 interviews, (12/2013, 5/2014)).

Data handling and availability
Once final analysis is completed in summer 2016, data will be publically available through the Southern California Acoustic Telemetry Tracking Network (SCATTN) as well as through the data portal on Oceanspaces.org. Efforts are ongoing to provide the data to CA-DFW as well.

Financial Report:

Proposed 2013 Budget:
Tags and Receivers: $21,120.00
- 40 Vemco V13 acoustic tags: ($325/tag) = $13,000.00
- 4 Vemco VR2W receivers (~$1,500 ea.) = $6.000.00
- Conventional (Floy) Tags total w/ tax and shipping = $2120.00

Field equipment and fuel: $1127.00
- 50 gal gasoline tagging skiff ($4.20/gal) = $210.00
- 2 fishing rod/reel combos (Shimano or equivalent, $400.00 ea.) = $800.00
- 1 extra-large landing net (Promar, or equivalent) = $45.00 w/ CA sales tax
- 1 tailing pole (Promar loop snare) =$32.00 w/ CA sales tax
- Amendment to CA-DFW Scientific Collecting permit = $40.00

Public participation and outreach: $1,608.00
- Acoustic tag return reward funds ($50 per tag) = $500.00
- Conventional tag return reward t-shirts (100 @ $10.79 ea.) = $108.00 **This mistake made it through the original budget process. However, because of lack of interest in the tagging tournament and increased interest in tagging program t-shirts, tournament funds were used to cover the shirt funding discrepancy. No further budget issues arose.**
- Yellowtail tagging tournament prize funds = $1000.00

Incidental and data storage costs = $900
External hard drives, tagging posters, outreach flyers, web hosting, etc.
Total = $24,755.00

Literature Cited:

Baxter JL. Fish Bulletin No. 110. A Study of The Yellowtail *Seriola dorsalis* (Gill). Fish Bulletin, Scripps Institution of Oceanography Library, Scripps Institution of Oceanography, UC San Diego (1960)

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