DEVELOPING A NEW METHOD FOR ESTIMATING SHRIMP FISHING EFFORT AS A REPLACEMENT FOR THE FAILING 3G cELB METHOD

by
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TAB D, No. 4

The Message

- This presentation will describe a two-phased project to adapt the P-Sea WindPlot navigation software as necessary to acquire and transmit shrimp fishing effort data.

- The first phase has been to determine how many federally permitted vessels use P-Sea WindPlot, test the approach on one or more general vessels, develop procedures to match landings and trip data and, ultimately, to develop a system for electronically transmitting the data to NMFS databases in a seamless fashion.

- The goal of the Second Phase will be to implement the new method in order to estimate shrimp fishing effort across the Gulf, beginning in the first quarter of next year (2021).

- Initial work conducted as part of Phase I has also been modified to include efforts to acquire 3G cELB data still being recorded.

Introduction

- LGL Ecological Research Associates, Inc. (LGL) is conducting a Phase I Pilot Program for the Southern Shrimp Alliance, Inc. (SSA) to develop an effort-management program to replace the failed cELB approach that has historically been used to measure effort.

- The Pilot-Program began with discussions in August 2020 between NOAA Fisheries (Southeast Fisheries Science Center and Southeast Regional Office) and SSA regarding the looming failure of the current system at the end of this year.

- The agency had been evaluating options for replacing the cELB program and reached out to industry to find a cooperative solution.

- Mr. Steve Bosarge, President of SSA, brought forth the idea that an almost universal navigation system used by the Gulf Shrimp Fishery (P-Sea WindPlot) has an internal logbook that perhaps could be modified to enable recording of the date/time/location data necessary to estimate effort.

Introduction (continued)

- His idea led to this (Phase I Pilot Program) to

  1. Evaluate the likelihood that P-Sea WindPlot is used by a large fraction of the permitted shrimp fleet; and, if so,

  2. Modify and test the software to obtain and record the requisite information for estimating effort and how to most effectively pair effort and landings data at the trip level.

     - Testing will involve implementing the system on one or more actively fishing vessels with a cELB.

     - Working with NMFS, we will assist in physically collecting 3G ELB data still being recorded.

  3. Develop or confirm that the present stratified-random vessel selection process remains appropriate, and develop comprehensive Procedures Manuel integrating the historical and new effort estimation procedures.

Introduction (continued)

- The last steps of the Phase I Pilot study will be to, working with NMFS, randomly select a yet-to-be decided number of vessels to utilize P-Sea WindPlot for monitoring effort in 2021; and, lastly

- Develop a plan to install, equip these vessels with the new P-Sea WindPlot system and train Captains and Dealers in its use in the 1st Quarter of 2021.

- At present, we plan to obtain the data on "thumb-drives" along with the matched landings record, likely on paper. However, we will begin development of an electronic reporting system in the Pilot Study and finalize it during 2021.

- We provide a background on the history of electronic monitoring of the shrimp fishery and how we got to the present situation in Attachment 1, and in Tab D, No 4a, and Tab D, No 4b.

Permitted Shrimp Fleet: August 2020

- Without consideration of whether a permitted vessel is actively fishing or simply holding a permit, there were 1,392 total permits on August 17, 2020 of which 1,283 were valid and another 109 were eligible to be renewed or transferred:

		SUMMARY				
Coast Guard	State		Renew/Trans	Valid	Total Permits	SSA
101	14	AL	11	104	115	13
163	39	FL	21	181	202	22
11	0	GA	1	10	11	0
1	0	IL	0	1	1	0
297	53	LA	26	326	352	17
8	0	MA	1	7	8	0
1	0	MN	0	1	1	0
92	7	MS	8	91	99	7
30	10	NC	2	38	40	10
6	0	NJ	2	4	6	0
1	0	NY	0	1	1	0
2	0	OK	0	2	2	0
6	0	SC	1	5	6	2
523	12	TX	35	500	535	91
13	0	VA	1	12	13	1
1255	**135**		**109**	**1283**	**1392**	**163**

- The information was obtained through the Freedom of Information Act, note that the "State" is address of the permit holder.

Active Vessels with a cELB History

- A switch to a new method of estimating fishing effort will require careful planning to ensure that any changes observed are "real" and not due to the change in method.

- Therefore, in the first year, the pool of vessels to be considered will be actively-fishing, permitted vessels with a cELB history and known ports of landing.

- SSA members within this pool will be contacted, but only to determine if the vessel used P-Sea WindPlot. The P-Sea WindPlot survey focused on SSA members because we had up-to-date contact information for these vessels.

Evidence that P-Sea WindPlot is Commonly or Even Universally-Used by the Gulf Fleet

- **NMFS** provided us a list of permitted vessels which had actively fished in the last few years, had carried a cELB and had known ports of landing. **John Williams of SSA** provided us up-to-date contact information for SSA members on this list.

- There were 577 actively fishing vessels and, of these, 94 were SSA members:

Vessels	State-Port	SSA
97	AL	16
32	FL	7
81	LA	4
24	MS	1
343	TX	66
577		94

- 100% of the SSA component of the sample used P-Sea WindPlot and informed discussions with shrimp fishers across the Gulf reinforces the idea that this software is dominant, it not even universally-used.

Setting up a Server

- We have programmed a stand-alone server, including the necessary software and several dozen custom scripts (e.g., in java, R) to run the ELB project.

  - Read trip data
  - Estimate effort
  - Match landing data

- Programs were tested and validated.

- As a starting point, our server is set-up to run the existing ELB program.

Research on P-Sea WindPlot

- We developed a program to read and plot P-Sea WindPlot "track files" outside of the program and convert them to a format that could be input into the existing ELB software.

- While the track files contained much useful information regarding locations of tows, the tracking feature does not operate continuously and is designed to be easily turned turned on and off between fishing or for other reasons.

  - Position data between tows was rarely recorded and often did not have sufficient time stamp data to accurately determine the recording period between locations (thus hampering ability to infer vessel speed).
  - Given these gaps in data recorded, it would not be possible to ensure that all tow data were included for a trip

- Thus, we judged the data as currently recorded by P-Sea WindPlot to be insufficient for use as an alternate ELB data program.

- In response, we reached out to the developer of P-Sea WindPlot to discuss whether modifications to the program would be feasible.

Progress with P-Sea WindPlot

- We have contracted with P-Sea WindPlot to modify their program to capture the latitude, longitude, date, and time every 10 minutes during the entire length of each trip.

- Upon P-Sea WindPlot starting, the modified program will produce an ascii file on the computer's hard drive where the GPS generated NMEA GPRMC string will be recorded every 10 minutes.

  - This string provides location, time stamp data, and an indication whether the data are valid based on the number of satellites seen by the GPS at the moment of data capture.
  - The file will be named ELB-YYMMDDHHMM.dat to correspond to the date/time of initial creation.

- To retrieve these data, initially, the file will be copied to a USB flash drive.

  - When copied the original file will be automatically renamed with the extension ".old" to prevent subsequent trips being added to a file that has already been processed (while still allowing records be appended to the file prior to data collection even if there are power interruptions).

Matching Effort with Landings

- To match shrimping effort with landings, initially, we will manually pair trip tickets with the data recorded by P Sea WindPlot.

- We have example trip tickets from FL, MS, LA, and TX that we are using to develop a system whereby we scan hard copy tickets, convert to spreadsheet data, and then a custom script reformats the data so that it is compatible with NMFS landings data.
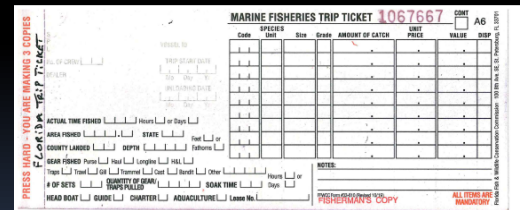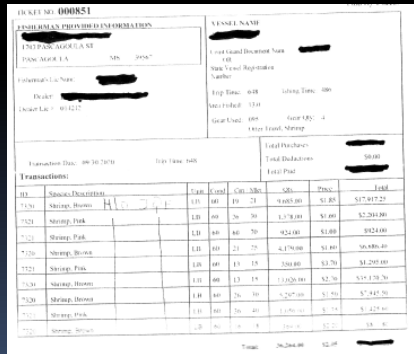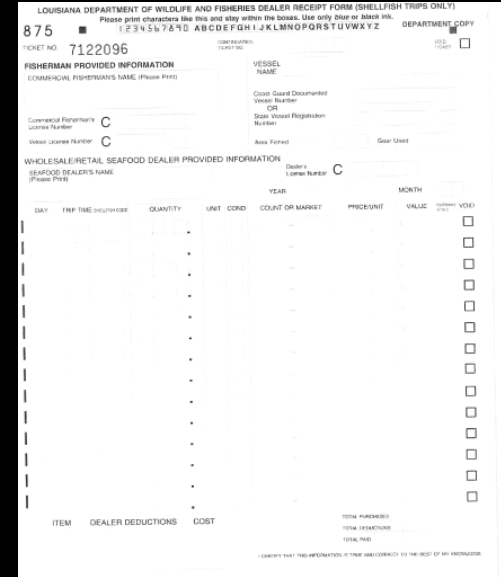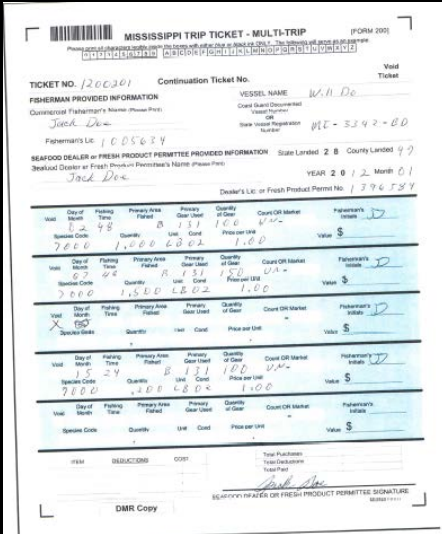
Random Selections for 2021

- The pool of 577 actively fishing permitted vessels described above will provide the universe for the random selection procedures. We will stratify these vessels by port organized into the nine (9) geographical regions.
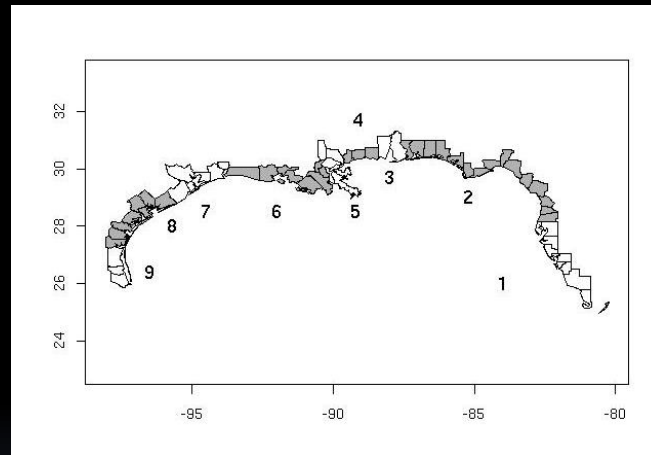
- A description of the regions is provided: 1= Key West to Tampa, FL; 2= Florida north of Tampa; 3= Alabama; 4= Mississippi; 5= Louisiana east of River; 6 Louisiana west of River; 7= Upper Texas; 8= Central Texas and 9= South Texas.

Random Selections for 2021 (continued)

- Working with NMFS, ports will be stratified by total landings and vessels within port will also be stratified by landings and the degree of their participation in the cELB program. The number of selections will be proportional to the weight of each of the respective strata.

- Once selected, the vessels will be contacted that they have been selected and it will be determined if the vessel uses P-Sea WindPlot. If not, an alternate selection will be made.

- The selection procedure will be conducted in cooperation with NMFS. Our intent is to transfer our historical knowledge to the new Cadre of NMFS scientists addressing the shrimp effort studies.

Summary of Path Forward

- Modifications to P-Sea WindPlot are being tested and the software update is near complete as of today.

    - We have partnered with several vessels to update and test the software on actual cruises to be completed by the end of the year

- Random selection of shrimp boats to measure effort for 2021 needs to happen as soon as possible.
    - Also, to the extent possible, the 3G data that have not been downloaded need to be acquired

- Jan, Feb, March 2021: visit boats, help captains install software and make arrangements to retrieve any available 3G data.

    - Expand efforts in April so that the fleet will not miss an entire year of effort (2021)

- Run program for two full years after this is worked out (2022-2023) and pass off to NMFS. The costs of the proposed program are for the initial labor and programming necessary to implement the new system and will not be an ongoing cost.

- Upon completion of the proposed study, the ongoing study should require an annual operating budget that will support about 2 full time equivalent (FTE) staff scientists.

Program Cost Estimates

Phase	Amount	Funded By
Phase I (September-December 2020)	$327,000	SSA
Phase II (January-December 2021)	$1,000,000	NMFS/SSA
Phase III (January-December 2022)	$1,000,000	?
Phase IV (January-December 2023)	$1,000,000	?

Questions for Nov 30-Dec 1 Council Meeting

For Dr. Gallaway:

Answers to these will help staff understand the type of document that the Council may need to initiate to move from the current cELB program to the modified software program for P-Sea WindPlot and the subsequent transfer of effort data from the shrimp vessels to the Science Center.

Questions for Nov 30-Dec 1 Council Meeting (continued)

Question 1. Will the revised P-Sea WindPlot software be compatible with all operating systems/versions that vessels may currently be using? A Shrimp AP member noted that some vessels have very old operating systems.

Answer- **To date, 100% of 94 federally permitted vessels contacted use P-Sea WindPlot. We believe it is the dominant system used in the offshore federal fleet, but doubt that it is universal. It will get us started and we will adapt as we to forward.**

Questions for Nov 30-Dec 1 Council Meeting (continued)

Question 2. Will the software be considered an upgrade that vessel operators would need to pay for, or would it be a free update?

Answer- **The upgrade has been paid for and will be provided as a free update.**

Questions for Nov 30-Dec 1 Council Meeting (continued)

Question 3. From the AP presentation, it appears that only 94 vessels are used in the pilot study. So, until 2024, will only 94 vessels be included? During the AP meeting, Dr. Gallaway said how many additional vessels would be included after the initial phase would be determined in conjunction with NMFS.

Answer- **The 94 vessels do not constitute the pilot study fleet. These were used only to estimate the likelihood that P-Sea WindPlot was widespread in the fleet. The pilot study will be selected from the 577 permitted vessels that have carried a cELB and are actively fishing with known ports of landing.**

Questions for Nov 30-Dec 1 Council Meeting (continued)

Question 4. 66 of the 94 vessels are located in TX, which does not seem representative of the Gulf industry. If expanded, would the additional vessels be more representative of the Gulf industry? If they are not expanded, what are the implications of a non-representative sub-sample of generating fleet level information?

Answer- As indicated above, these vessels were not intended to be a representative subsample of the fleet, these were vessels with known contact information. The representative fleet will be drawn from the 577 previously randomly selected vessels used to estimate effort that are known to still be actively fishing.

Questions for Nov 30-Dec 1 Council Meeting (continued)

Question 5. What will the revisions that the software developer is working on with Dr. Gallaway address? Will they address the issue with the determining tow times versus transit?

Answer- It will provide exactly the same information as both of the historical ELB and cELB systems provided. At the end of the program, the data and, hopefully the paired landings data will be provided directly to a secure NMFS server.

Questions for Nov 30-Dec 1 Council Meeting (continued)

Question 6. How do you see the effort data collected from the shrimp vessels being shared with the Science Center in the short-term for the pilot and long-term when the modified program is handed over to the Science Center?

Answer- **The effort data will be provided directly to the Science Center without any complications about ownership. The revised P-Sea WindPlot software will also be transferred to NMFS. We envision a direct working relationship between industry led by SSA and NMFS. LGL will facilitate the relationship and develop a long-term solution to the measurement of shrimp fishing effort.**

Attachment 1

Background

Background

- Contention regarding Gulf of Mexico shrimp fishing effort and the associated bycatch estimates (especially those for Red Snapper) led the U.S. Congress in 1998 to allocate funding to the Gulf of Mexico shrimp fishery to develop methods for better estimating shrimp fishing effort.

- An efficient and accurate method using an electronic logbook (ELB) was developed, evaluated and refined (Gallaway et al. 2003 a, b and Cole et al 2006).

- The National Marine Fisheries Service (NMFS) which had participated in the ELB development studies, implemented a shrimp effort monitoring program using ELB's in June of 2004, and the program was continued through March 2013.

- Dr. James Nance and Rick Hart, both now retired were the key NMFS participants; myself and John G. Cole (partially retired) were the key LGL players.

Background (continued)

- The initial effort monitoring programs was conducted by LGL based on an initial sole-source contract award for 2004-2006, and then on a competitive procurement basis from 2006 through 2013.

- During the nearly 9 years that LGL conducted the ELB program, over 9,100 trips where trip landings were matched with trip effort were generated.

- The collected data for 555,000 tows, including 54,869,394 total location points and 19,297,351 total intra-tow records.

- The program was featured in a symposium held during the 141st Annual Meeting of the American Fisheries Society in 2011.

Background (continued)

- NMFS led the ELB field program in 2013 and ultimately replaced the ELB system with a cellular ELB (cELB) system beginning in 2014.

- The new cELB technology was developed over the period 2012 to 2013 in order to provide automated data transmission accomplished using cell phones connected to a U.S. government server.

- As the system did not require human intervention to retrieve memory chips, it was estimated to be able to save NMFS hundreds of thousands of dollars per year, while lowering the latency of the data. The change to cellular technology also enabled cost sharing by passing on yearly maintenance and data transmission costs to industry.

- The cELB program initiated in 2014 was and is being fully-run by NMFS. On the order of 475 vessels in the fleet had been equipped with a cELB by 2017.

Background (continued)

- From 2014 to 2020, the cELB has generally met NMFS expectations until recently when it was learned that the 3G system being used to transmit data will expire on 31 December 2020. Further, manufacturing delays occurred, and it took ~2 years to manufacture just 40 4G cELBs. In addition, funding is only enough to buy ~250 new 4G boxes.

- Also, 5G systems may become the requirement before all the 4G systems are acquired. Lastly, the ability to match landings data with trips has declined. On the order of 30-50% of the landings cannot be matched to the trips.

- The cELB system appears to be an non-option and the old ELB system is solid but requires extensive labor and there is a substantial delay between acquiring and transmitting the data.

Attachment 2

Annual Budget Detail

Annual Budget Detail

	Days/mo	Months	Total Days	Rate	Total
			Annual Budget Detail for 2021-2023		
Gallaway	15	12	180	2,336	420,480
Putman	10	12	122	1,304	159,088
Biologist	22	12	260	912	237,120
Cole	7.5	12	90	1000	90,000
					906,688
				Travel, Program, Supplies	93,312
				Personnel and other direct costs-2021	1,000,000
				Personnel and other direct costs-2022	1,000,000
				Personnel and other direct costs-2023	1,000,000