BSFRF
Bering Sea Fisheries Research Foundation

October 5, 2017 NEWSLETTER
[www.bsfrf.org]

Crab Stock Status: In light of the recent announcements for the low allowable harvest for the three major Bering Sea shelf stocks (see back page of this newsletter), it's clear we are currently facing some big challenges to sustainable crab management. Our work continues to be directly supported by funds mostly from the crab industry. BSFRF's annual research plans and long-term strategy is stable and includes plans that focus research priorities relative to lower status periods. The reality is that it's more important than ever to continue improving the science used for Bering Sea crab management. This update provides a pre-season research summary for a few important projects BSFRF has been working on this year including; tagging and crab movement, model/assessment improvements, and continued cooperative crab research.

Crab Movement and Tagging: We are observing variability in environmental conditions in the Bering Sea and Arctic Ocean which are suspected to be related to recent declines in crab biomass. Thirty percent and greater declines in adult crab biomass in 2016 coincided with some of the warmest seawater bottom temperatures on record and a reduction in the cold pool (the cold pool is Bering Sea bottom water <2°C observed during the summer surveys). To better assess the crab stocks and inform commercial fishermen about the status of the stocks, methods to track crab movement need to be developed. BSFRF and NMFS scientists have teamed up with the crab industry and University of Washington Applied Physics Laboratory in Seattle, WA to develop a research plan to improve our knowledge of the dynamics of crab movement. Previous crab tagging projects have assessed movement of red king crab and snow crab using tags that require recapture. Using these conventional tagging approaches, the recapture rate is very low (often <1%) resulting in limited data. Newly developed acoustic tags and data receiving technology has been developed to dramatically reduce the costs associated with tracking tagged crabs. During 2017, we've continued with several steps in collaboration with APL to test and deploy acoustic tags, automated receivers, and develop tracking algorithms capable of tracking crab throughout their range in the eastern Bering Sea. This year's research and development of crab tagging tools was initiated with equipment purchases and initial testing of tags and hydrophones in Puget Sound. A larger scale test of the feasibility of tagging multiple crabs and tracking will occur in the fall 2017 using an automated tracking system developed under a NOAA contract. This pilot project will happen out of Westport Washington later this year during more stormy weather, more similar to Alaska. We will be providing a progress report on this important work as information becomes available. Currently BSFRF has committed $50,000 to this work for 2017.

Crab Models and Assessments: Under the traditional management before crab assessment models existed, the NMFS Bering Sea trawl survey data provided the only comprehensive and systematic basis to inform crab status trends and management choices. For more than a decade, crab models have been in use and continued development for major Bering Sea stocks. As crab assessments have become more data-rich and model approaches have become more complex, the model-assessment outcomes have yielded mixed results for determining the current status of a given stock. In some cases, model outcomes have provided clarity to managers, but in other cases, the models have highlighted more uncertainty. Regardless, BSFRF has supported the continued strengthening of

assessment models for Bering Sea crab stocks. The current models for snow, Tanner, and red king crab depend upon the values of various parameters and survey estimates to accurately assess abundance and

1 mm Carapace Width Length Comp
Small bairdi not typically seen in NMFS surveys

biomass. BSFRF has supported several years of high-value research ($500,000 +/yr) to improve the estimates of key model parameters including NMFS survey trawl selectivity, crab growth, and crab discard mortality rates. Concurrent with standard models, BSFRF has also supported the development of generic models (referred to as GMACs – Generic Models for Alaskan Crab) that has helped to standardize methods, improve transparency, and reduce uncertainty in Bering Sea crab modeling. To date, two major stocks, Bristol Bay red king crab and St. Matthew blue king crab, have been modeled with GMACs. Currently, the St. Matthew blue king crab stock assessment is based on a GMACs model version, reviewed and approved by the Crab Plan Team and the Council's SSC. Further model development and improvements are expected within the next year which will incorporate recent BSFRF data, and expand GMACs into additional crab assessments. BSFRF has committed approximately $100,000 to GMACs and model improvement for 2017.

Collaboration: During the CPT week BSFRF hosted our third annual cooperative research planning dinner with our collaborating partners in Seattle to discuss a few research projects and receive and exchange ideas to help with our upcoming research strategy/planning time. In addition, we co-hosted with the Alaska Bering Sea Crabbers another Crab Science
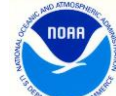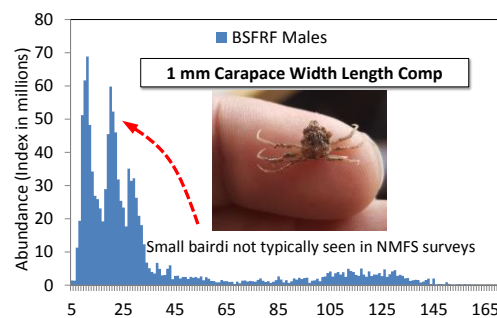
Symposium in Ballard. The Symposium was well-attended and ended with a productive "round table" discussion on research topics, surveys and models. We are continuing with further collaborative efforts through the end of this year – the next of which is a Bairdi Workshop in December in Anchorage. BSFRF is supporting collaborative meetings in 2017 with a budget of approximately $25,000.

Upcoming events and meetings: TAC setting is complete and crab season is about to begin and there are a few important research and management events also on the horizon. Here are a few current and upcoming events/dates:

➢ October 2, NPRB RFP announced (12/15 deadline)
➢ December 4-12, NPFMC Council (Anchorage)
➢ December 13-14, BSFRF Bairdi Workshop (Anchorage)
➢ January 9-11 [2018], Crab Plan Team (modeling workshop)

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…and watch for research updates in future Newsletters this winter.

--see next page of newsletter for major Bering Sea shelf crab stocks TAC history since Rationalization--

CRAB TACS (Totals) FOR MAJOR RATIONALIZED BERING SEA STOCKS
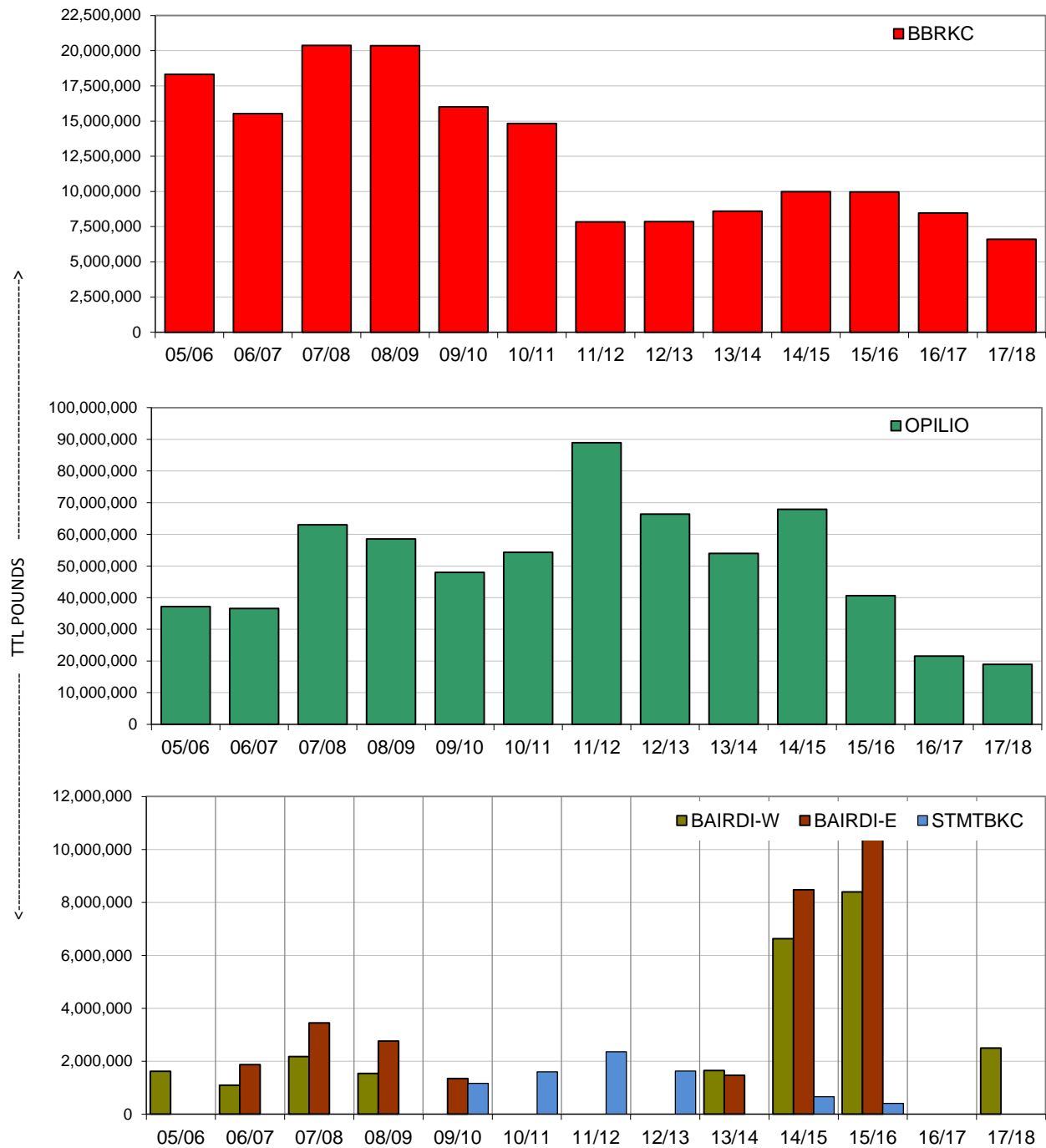
TOTAL	BBRKC		OPILIO		BAIRDI-E		BAIRDI-W		STMTBKC	
05/06	18,329,000	--	37,184,000	--	0	--	1,620,000	--	0	--
06/07	15,527,000	-15%	36,566,000	-2%	1,875,000	NA	1,094,000	-32%	0	NA
07/08	20,383,000	31%	63,034,000	72%	3,445,000	84%	2,176,000	99%	0	NA
08/09	20,364,000	0%	58,550,000	-7%	2,763,000	-20%	1,537,000	-29%	0	NA
09/10	16,009,000	-21%	48,017,000	-18%	1,350,000	-51%	0	-100%	1,167,000	NA
10/11	14,839,000	-7%	54,281,000	13%	0	-100%	0	NA	1,600,000	37%
11/12	7,834,000	-47%	88,894,000	64%	0	NA	0	NA	2,359,000	47%
12/13	7,853,000	0%	66,350,000	-25%	0	NA	0	NA	1,630,000	-31%
13/14	8,600,000	10%	53,983,000	-19%	1,463,000	#DIV/0!	1,645,000	NA	0	-100%
14/15	9,986,000	16%	67,950,000	26%	8,480,000	480%	6,625,000	303%	655,000	NA
15/16	9,973,400	0%	40,611,000	-40%	11,272,000	33%	8,396,000	27%	411,000	-37%
16/17	8,469,000	-15%	21,570,000	-47%	0	-100%	0	-100%	0	-100%
17/18	6,601,000	-22%	18,961,000	-12%	0	NA	2,500,200	NA	0	NA