

Project No: F0522

Title: Reproductive ecology of Atka mackerel, *Pleurogrammus monopterygius*, in Alaska

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Project Summary: Atka mackerel support a multi-million dollar commercial fishery and play a key role in the marine ecosystem of the Aleutian Islands. This study represents an ongoing research effort examining aspects of Atka mackerel reproductive ecology which will be directly applicable to estimates of spawning biomass, recruitment, stock dynamics, and distribution patterns. In 2004, spatio-temporal patterns in distribution were examined with respect to spawning condition and habitat use for nesting sites. Additionally, Atka mackerel embryos were incubated at different temperatures at the Alaska SeaLife Center to allow the construction of developmental series. This information is essential since egg development at low temperatures in deeper waters could extend the spawning season dramatically and influence distribution patterns. Variability in female maturity schedule was examined and it is proposed to estimate variability of realized fecundity that also directly affects reproductive output and estimation of female spawning biomass. Male spawning biomass might influence reproductive success as much as female spawning biomass due to nest guarding. Egg cannibalism as a mating strategy could maximize individual reproductive success and minimize the energetic costs associated with nest tending in males.

Specific objectives of this study are to: 1) analyze additional years of spatio-temporal distributions by reproductive stage, 2) expand embryonic developmental series over finer sampling scales and broader temperature range; 3) determine parentage of egg batches 4) evaluate egg cannibalism using genetic techniques; 5) investigate spatio-temporal variation in reproductive output (maturity schedule, realized fecundity); 6) determine fecundity and egg caloric content of successive batches spawned in captivity

Progress summary: Following is summary of progress made for the specific objectives
1) *Analyze additional years of spatio-temporal distributions by reproductive stage.* Male Atka mackerel gonad samples were collected during the March 2005 NMFS Cod pot

experiment and in May and June 2005 from the NMFS Gulf of Alaska trawl survey to complete the description of the male reproductive cycle using histological methodology.

2) *Expand embryonic developmental series over finer sampling scales and broader temperature range.* The rocky substrate in the study aquarium has been expanded to allow for more potential nesting sites for the Atka mackerel held in captivity at the ASLC. The increase in nesting area is expected to reduce the amount of competition between males and reduce the risk of egg cannibalism.

Two time lapse video recorders have been purchased and a second submersible camera has been installed in the study aquarium for the documentation of spawning events. In addition, 17 live Atka mackerel were collected during the June 2005 NMFS's Gulf of Alaska trawl survey. These animals were added to the captive brood stock at the Alaska SeaLife Center.

IACUC annual renewal has been completed and submitted to the Alaska SeaLife Center's IACUC for review.

3) *Determine parentage of egg batches.* Preliminary screens of larvae from two clutches of eggs produced at the Alaska SeaLife Center in 2004 have been completed and indicate a single pair of parents for each clutch. More extensive analyses of clutches produced in captivity during 2005 and from the field are planned.

4) *Evaluate egg cannibalism using genetic techniques.* We have succeeded in extracting enough high-quality DNA from embryos ingested by males in spawning condition during 2004 to conduct PCR and screen for parentage but have not done so yet. Collection of additional males and females from the field is planned for later this year.

5) *Investigate spatio-temporal variation in reproductive output (maturity schedule, realized fecundity).* Supplies have been ordered to prepare samples for histological processing.

6) *Determine fecundity and egg caloric content of successive batches spawned in captivity.* Sampling methodology has been determined in collaboration with the Alaska SeaLife Center where samples will be collected during the 2005 spawning season (July – October). Female gonad samples were collected from the 2005 Gulf of Alaska trawl survey, which will be used to determine the methodology for estimating egg energetic content.