Title: **A Multivariate Poisson Approach to Estimating Target Catch and Bycatch Production**

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Abstract: This paper develops a count data model of target species and bycatch production for an arbitrary number of species that handles correlation between species and over time. The model is applied to a large observer dataset for fishing trips taken from 1990 to 2008 for roughly 150 vessels participating in the California/ Oregon drift gillnet fishery. The fishery targets swordfish and thresher shark and produces leatherback turtle and marine mammal bycatch. Bycatch in commercial fisheries is an unwanted output which is commonly regulated by conservation measures such as quotas or time-and-area closures that directly impact the status and production of the associated fishery.

Set level production is modeled within a multiproduct production system framework as conditionally dependent on temporal, spatial, technological, environmental, and regulatory explanatory variables. The model is empirically estimated utilizing the multivariate compound Poisson estimator with set level data to estimate the impact of explanatory variables on the rates of target species and bycatch production within the fishery. Empirical results suggest a statistically significant relationship between set and vessel level characteristics and production rates of target species and bycatch. The rare-event risk for protected species bycatch indicates that conservation measures to further reduce bycatch from current rates may have a statistically significant opportunity cost of target species production.