Correction of Blue Marlin Catch Rates Reported in the Logbooks of the Hawaii-based Longline Fleet by Application of GAMs, and the Potential Utility of these Methods in Ecosystem-scale Fisheries Management

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Objectives

- Develop statistical models of catch rates for incidentally-caught blue marlin and other billfishes.
- Generate corrected catch histories.
- Delineate geographic distributions.
- Improve linkage of NMFS fishery observer, commercial logbook, and fish auction data.

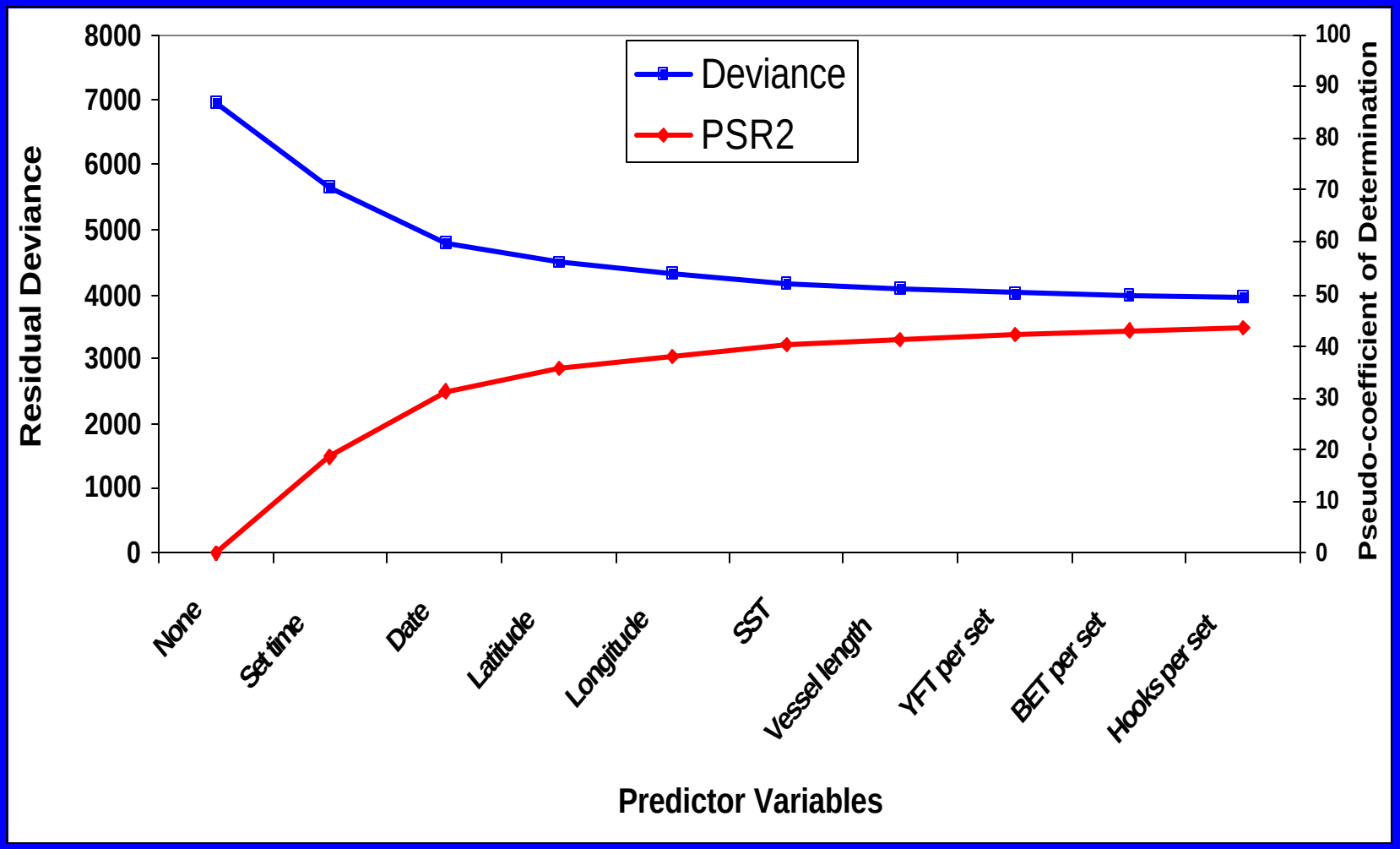
Analytical Methods

- **Generalized additive model (GAM) development.**
  Walsh and Kleiber (*Fisheries Research* 53:115-131)

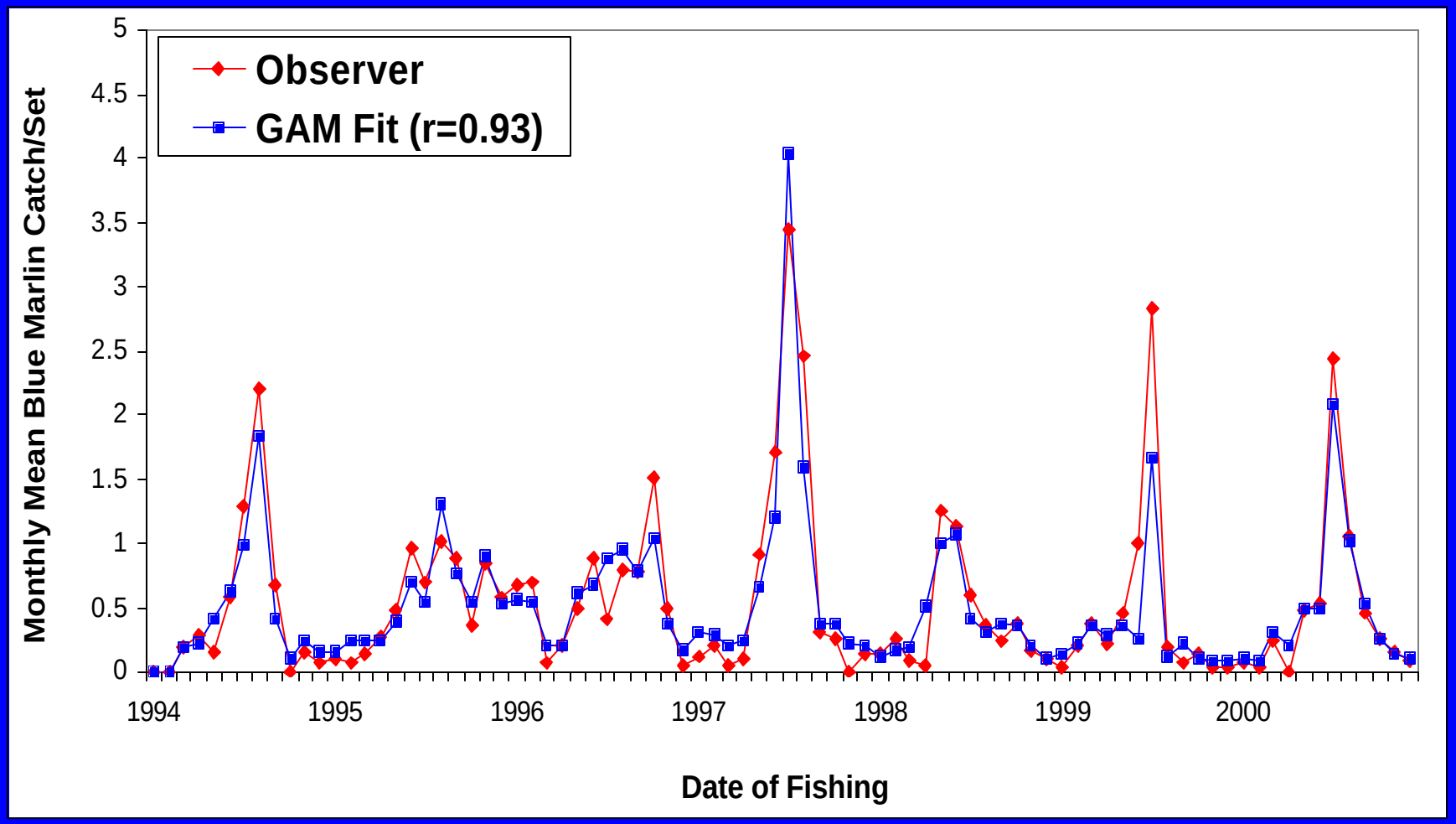
- **Fishery-wide application of statistical models to characterize and estimate biases, to generate corrected catch rates, and to estimate distributions.**
  -Walsh, Kleiber, and McCracken (*Fisheries Research*, in press)

- **Analyses of residuals to identify likely errors to provide the corrections.**

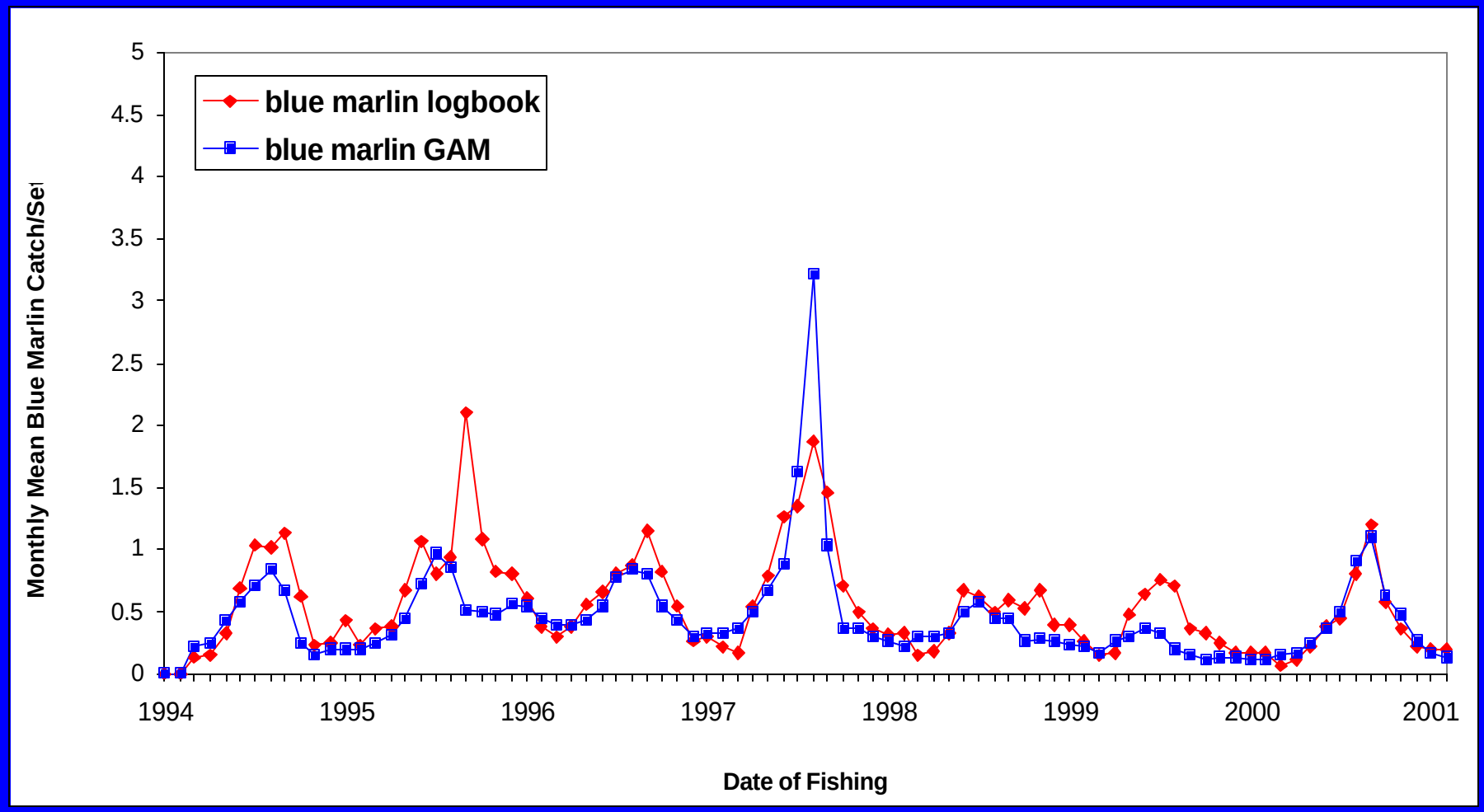
GAM Development



GAM Fit


Observer
GAM Fit (r=0.93)
Monthly Mean Blue Marlin Catch/Set
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1994
1995
1996
1997
1998
1999
2000
Date of Fishing

Blue Marlin Fishery-wide Application (All trip types)



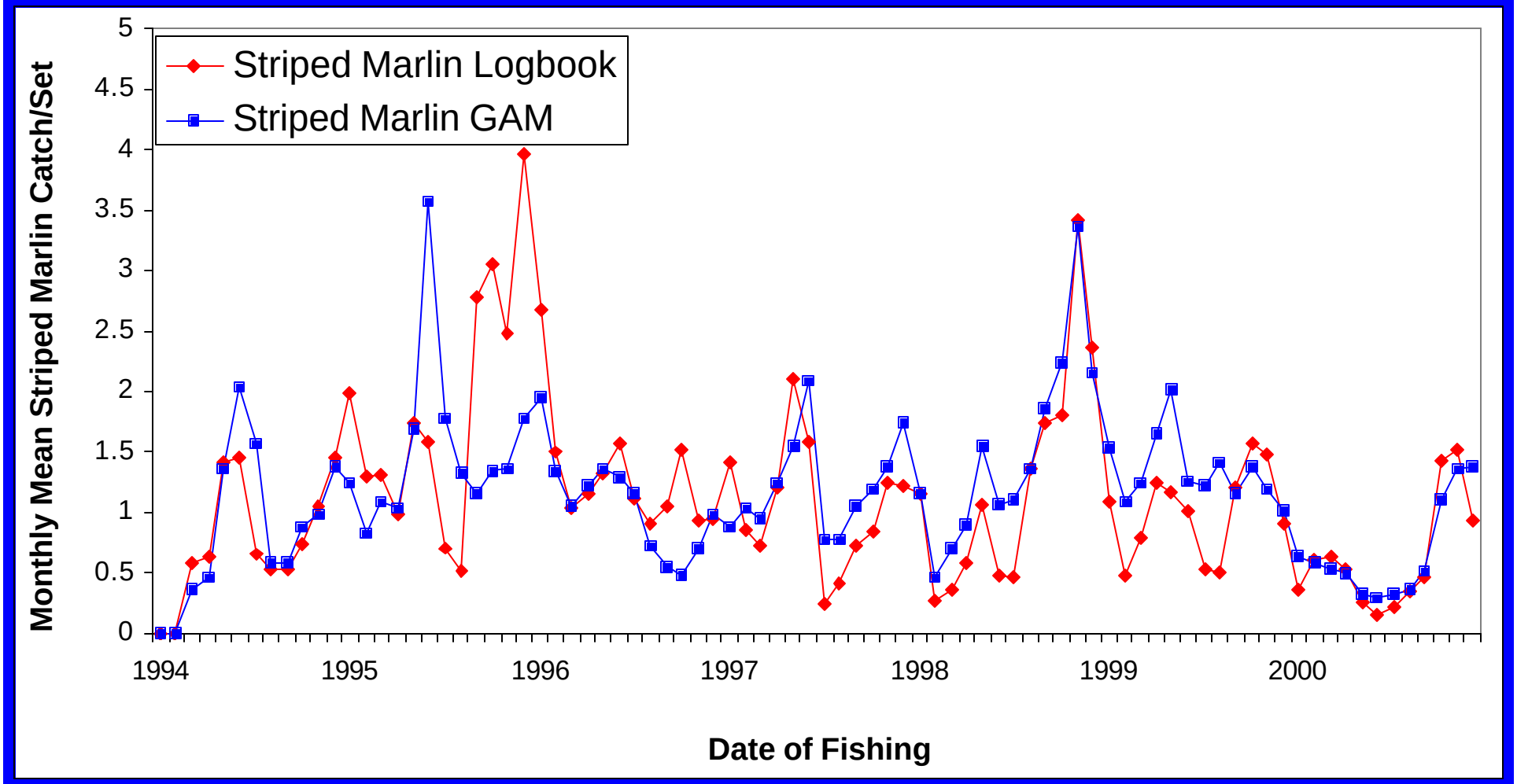
Nominal and Predicted Blue Marlin Catches

Logbook reported total catch (unobserved sets with complete predictor data): 39,761 blue marlin

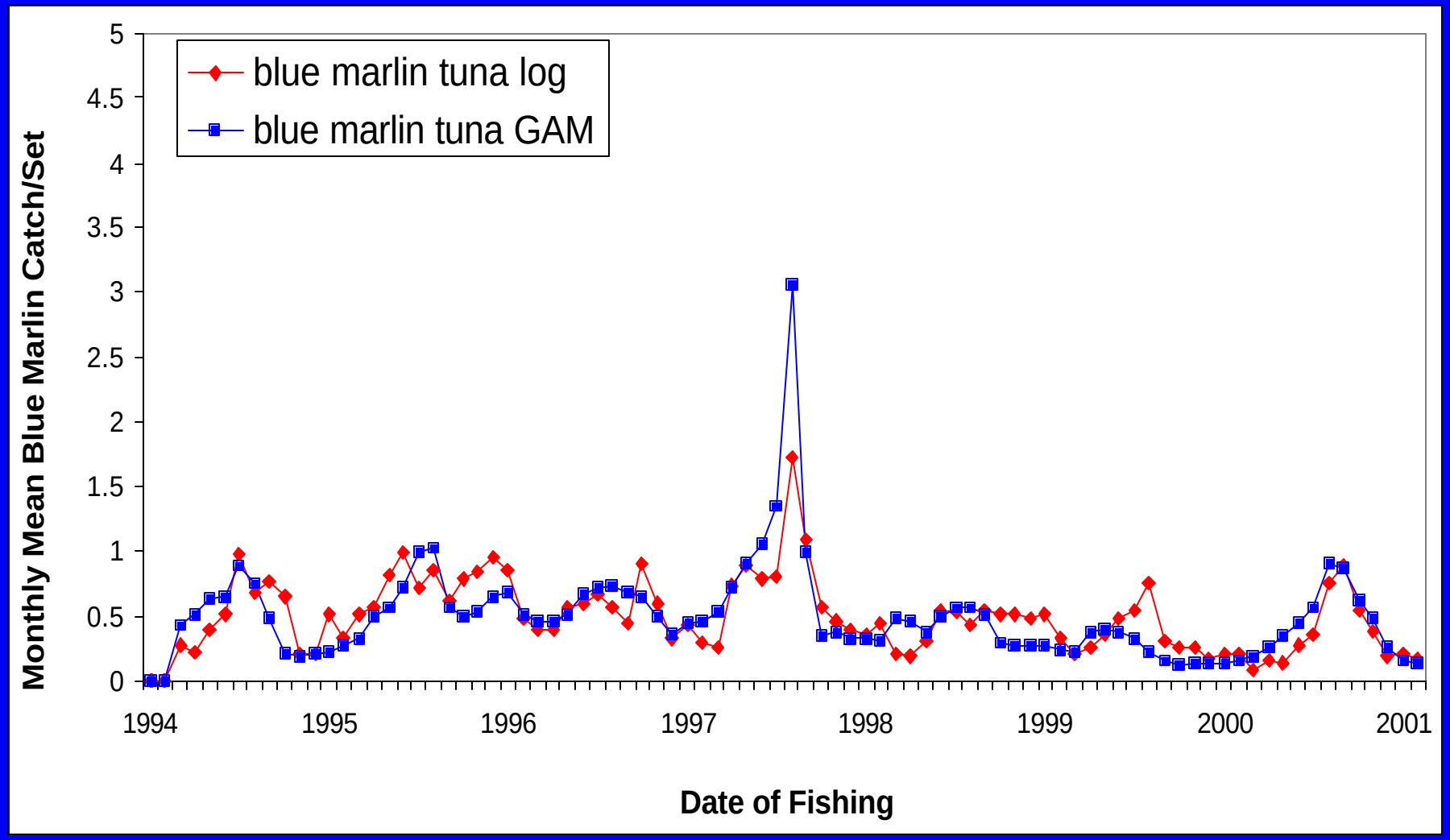
GAM estimated total catch (unobserved sets with complete predictor data): 32,751 blue marlin

Apparent "over-reporting": 21%

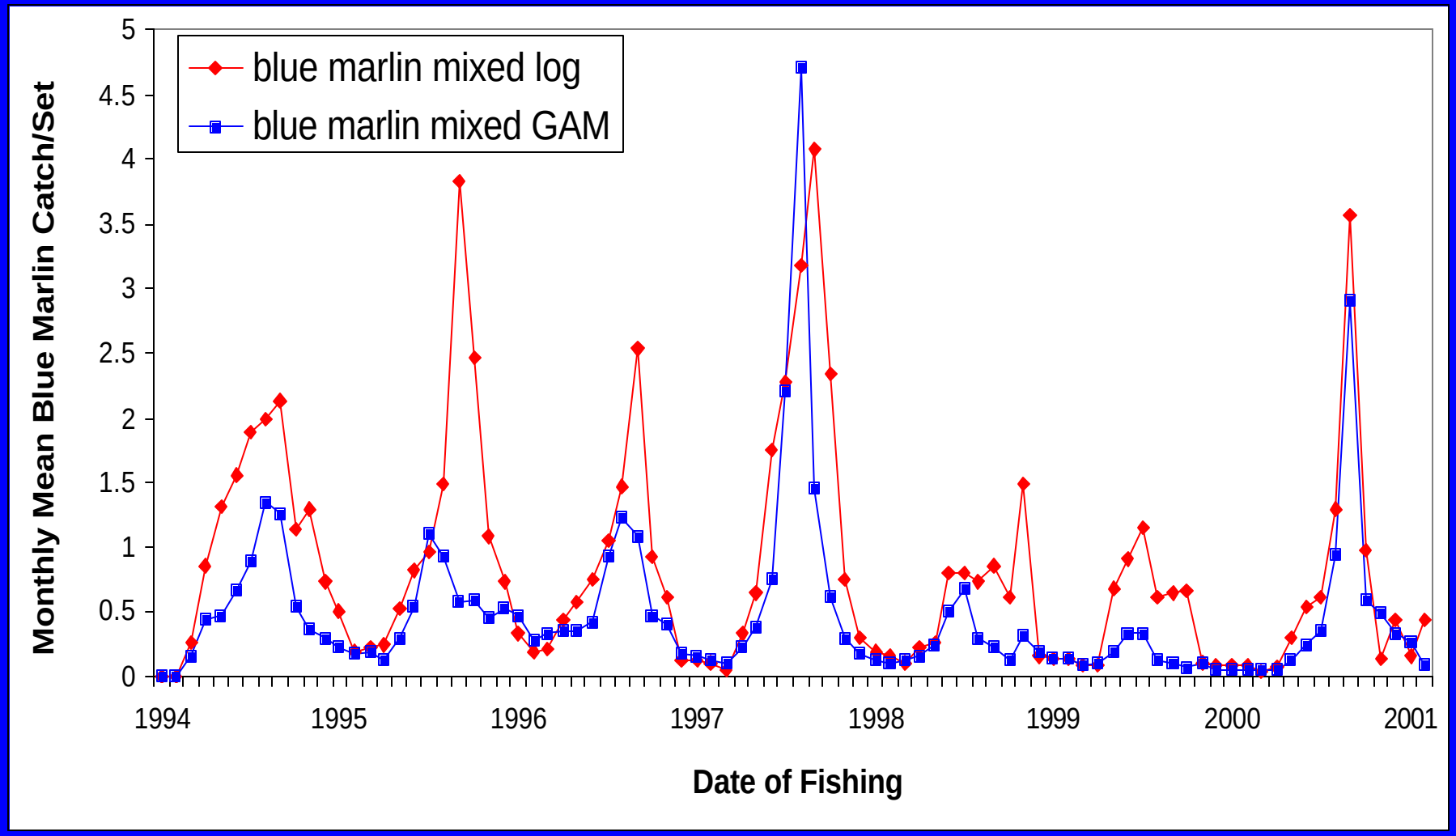
Striped Marlin Fishery-wide Application (All trip types)



Blue Marlin Fishery-wide Application (Tuna Trips)



Blue Marlin Fishery-wide Application (Mixed Trips)



Nominal and Predicted Blue Marlin Catches: January 2000 – February 2001

Logbook reported total catch (unobserved sets with complete predictor data): 3,878 blue marlin

GAM estimated total catch (unobserved sets with complete predictor data): 4,113 blue marlin

Apparent "under-reporting": 6%

Corrections of Blue Marlin Catches: January 2000 – February 2001

- **Deletions:** 55 trips (24 mixed; 31 tuna); 21 vessels (10 mixed, 12 tuna)

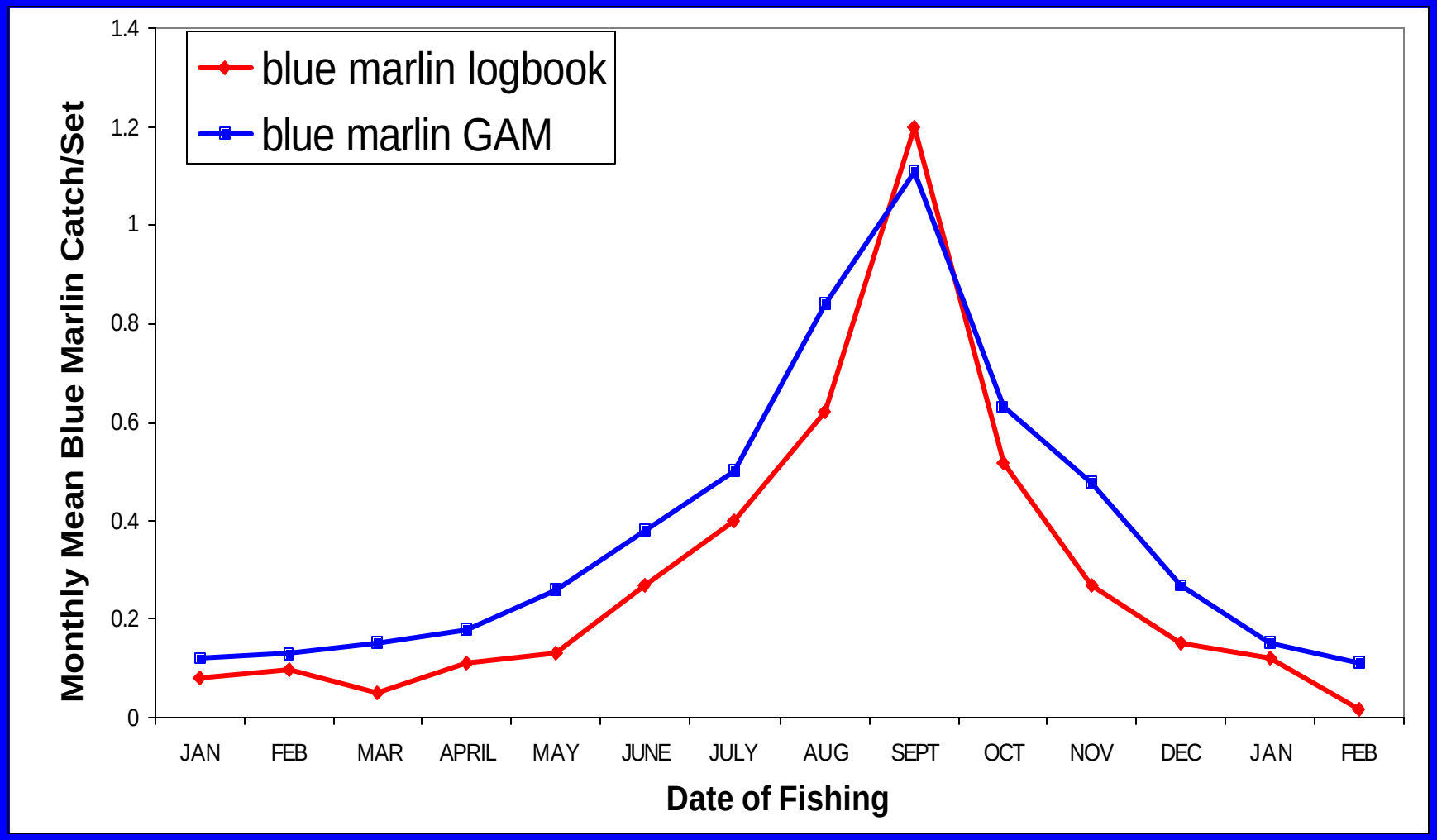
- Comparison of logbook to UFA regarding deletions:
  logbooks- 495 blue marlin; 47 striped marlin
  UFA- 98 blue marlin; 398 striped marlin

- Corrected logbook catch mixed trips: 702 blue marlin
  tuna trips: 2193 blue marlin

- GAM predicted catch mixed trips: 672 blue marlin
  tuna trips: 3208 blue marlin

- Apparent "over-reporting" mixed trips: 4.5%
  "under-reporting" tuna trips: 32%
  Combined apparent "under-reporting": 25%

Blue Marlin Fishery-wide Application: 2000-2001



Current Status and Required Activities

Current Status

- The NMFS Honolulu Laboratory has a seven-year observer data set that is used as the development set for the definitive analyses.

- Updated check on NMFS observer data quality completed.

Required Activities

- Use of described methods to identify errors throughout study period.

- Estimate corrected catches and removals, overall and by trip types. Correct for black marlin and releases.

- Investigate model and logbook peaks in 1997 and 2000; there were no obvious differences in predictor values.

Projected Activities Relevant to Ecosystem-scale Fisheries Management

- Continue GAM development with new species including reduced models featuring oceanographic and remotely-sensed predictors and other species to suggest ecological relationships.

- To have a “ready made” system for data quality control for observer program(s) that may be initiated in the Western Pacific.

Acknowledgments

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