Estimation of *Illex illecebrosus* Biomass Indices from Fishery CPUE Data 1997-2018

© L. Hendrickson

by
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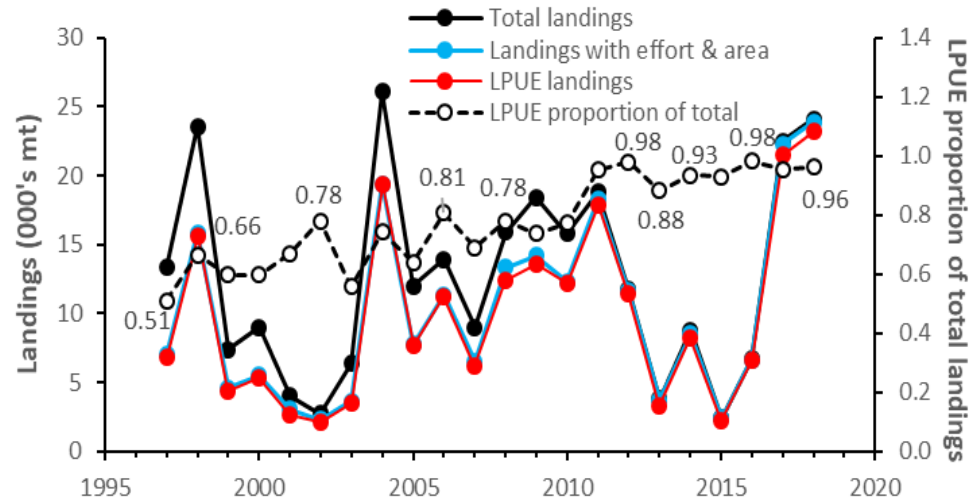and
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Annual CPUE Standardization

1. Referred to here as LPUE (no discards yet)

2. Input data

   - AA tables merge VTR and dealer datasets

   - Only 1:1 matches can be used for LPUE est.

   (they contain VTR effort by SA and actual weighed landings)

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U.S. Department of Commerce | National Oceanic and Atmospheric Administration | National Marine Fisheries Service | Page 2
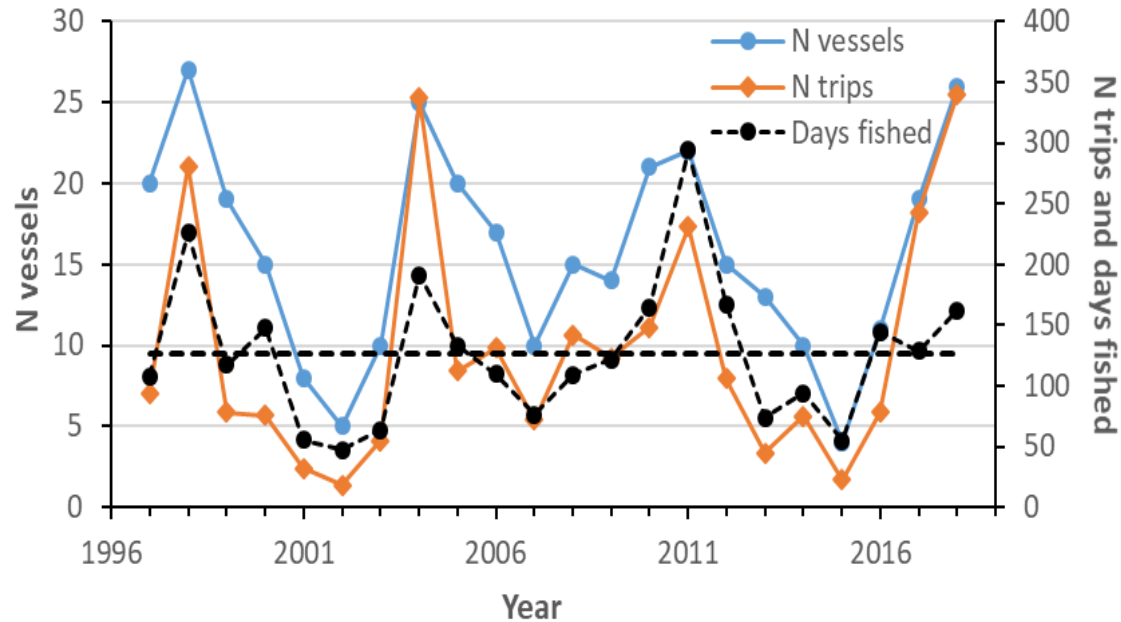
Landings: total, available and used for LPUE Estimation

Dashed line shows proportions of total landings included in LPUE estimation: low in 1997-2005 (0.51-0.78) and highest in 2011-2018 (0.88-0.98)
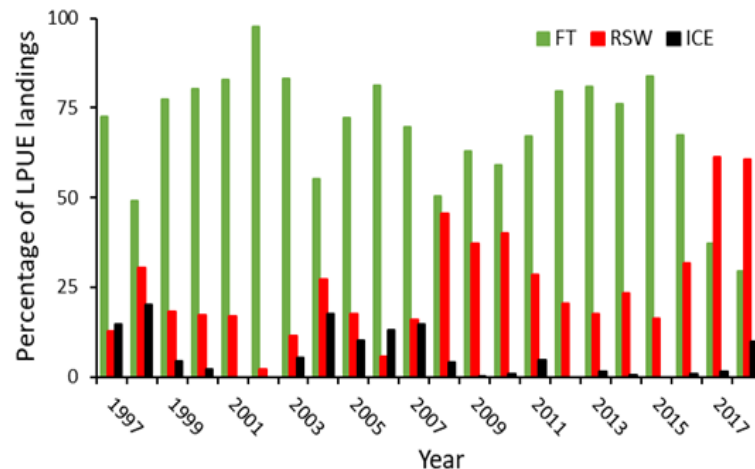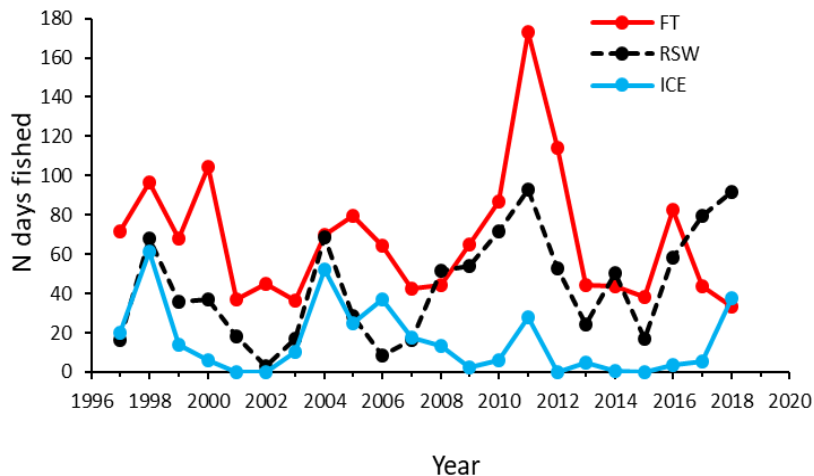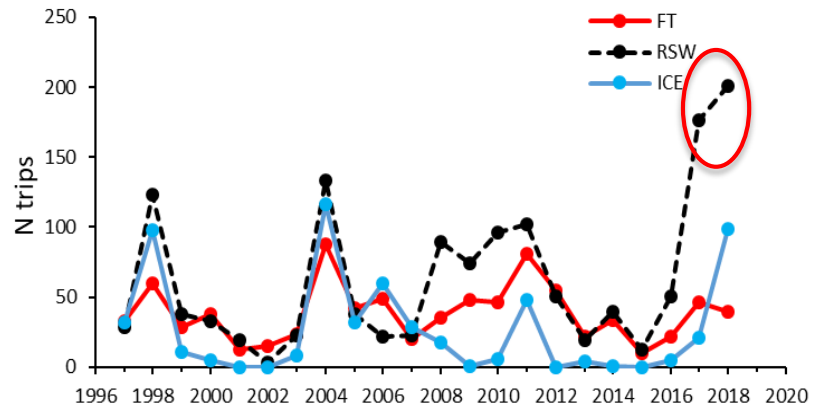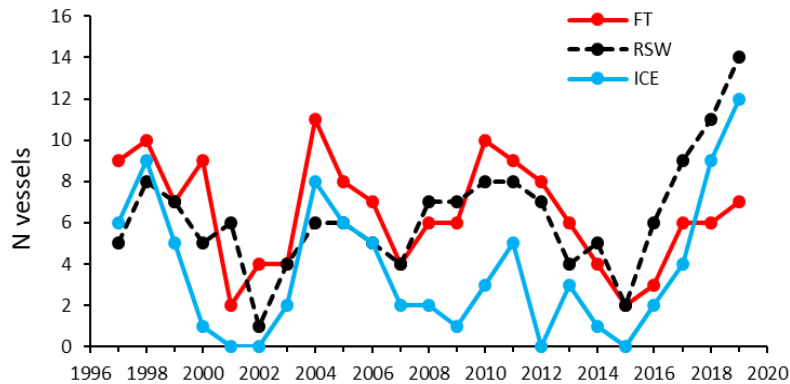
- Red line (landings included in LPUE estimation)
- Blue line (landings for data avail. For LPUE est.) they're similar

LPUE Estimation: N vessels, trips and DF

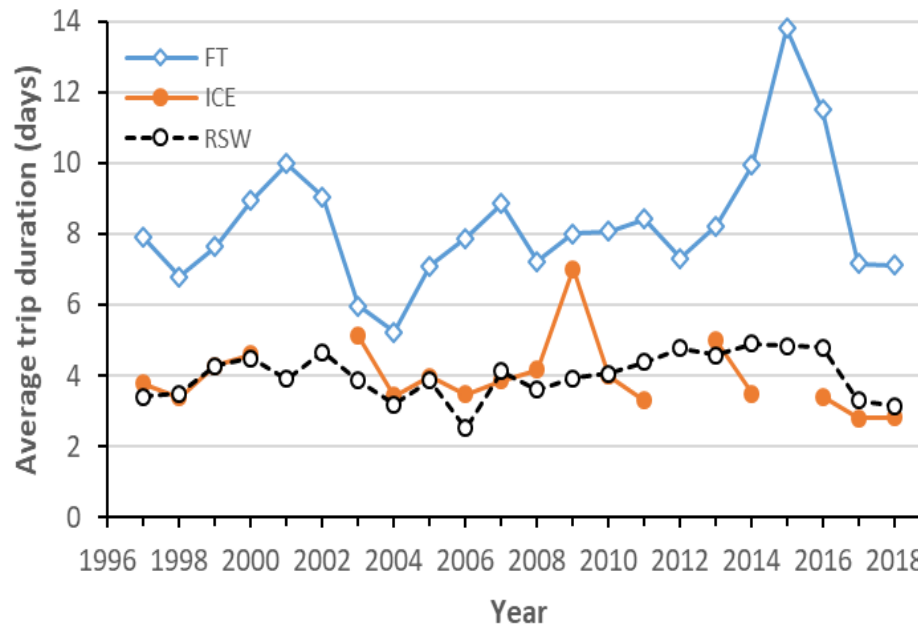**Similar trends, especially between days fished and N trips**

N vessels, trips and days fished by vessel type

Mostly FT boats until recent shift to RSW boats after 2015, incr N trips; FT effort decr.

Most landings fm FTs, until 2017 then shifted to RSW boats
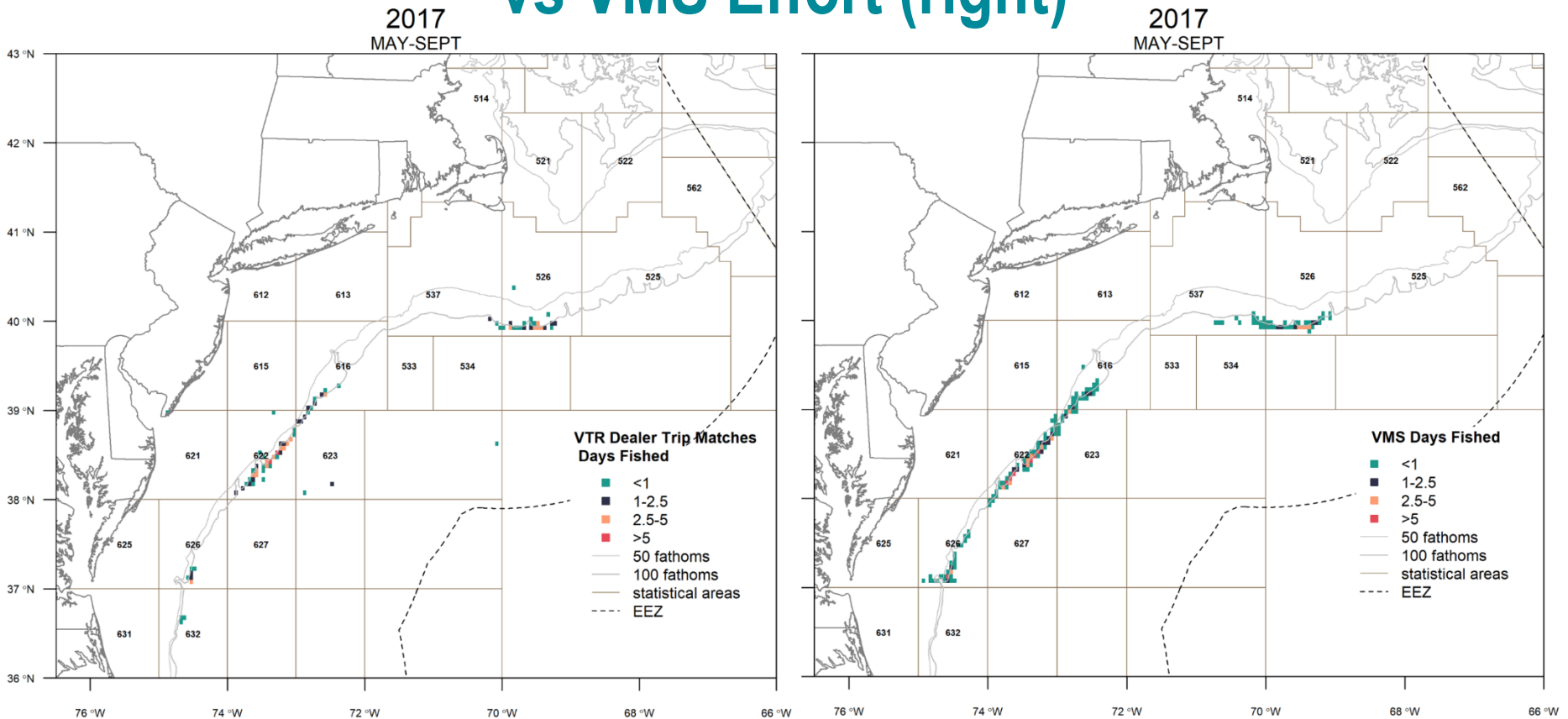
Avg. trip duration by vessel type
1997-2018

FT trips avg. 6-14 days and RSW and ice boats avg. 3-4 days

Spatial Distribution of Effort Data
Used to Compute LPUE (left)
vs VMS Effort (right)

Only have complete fishing season VMS data for 2017-2019

2018 LPUE Effort (left) vs VMS Effort (right)
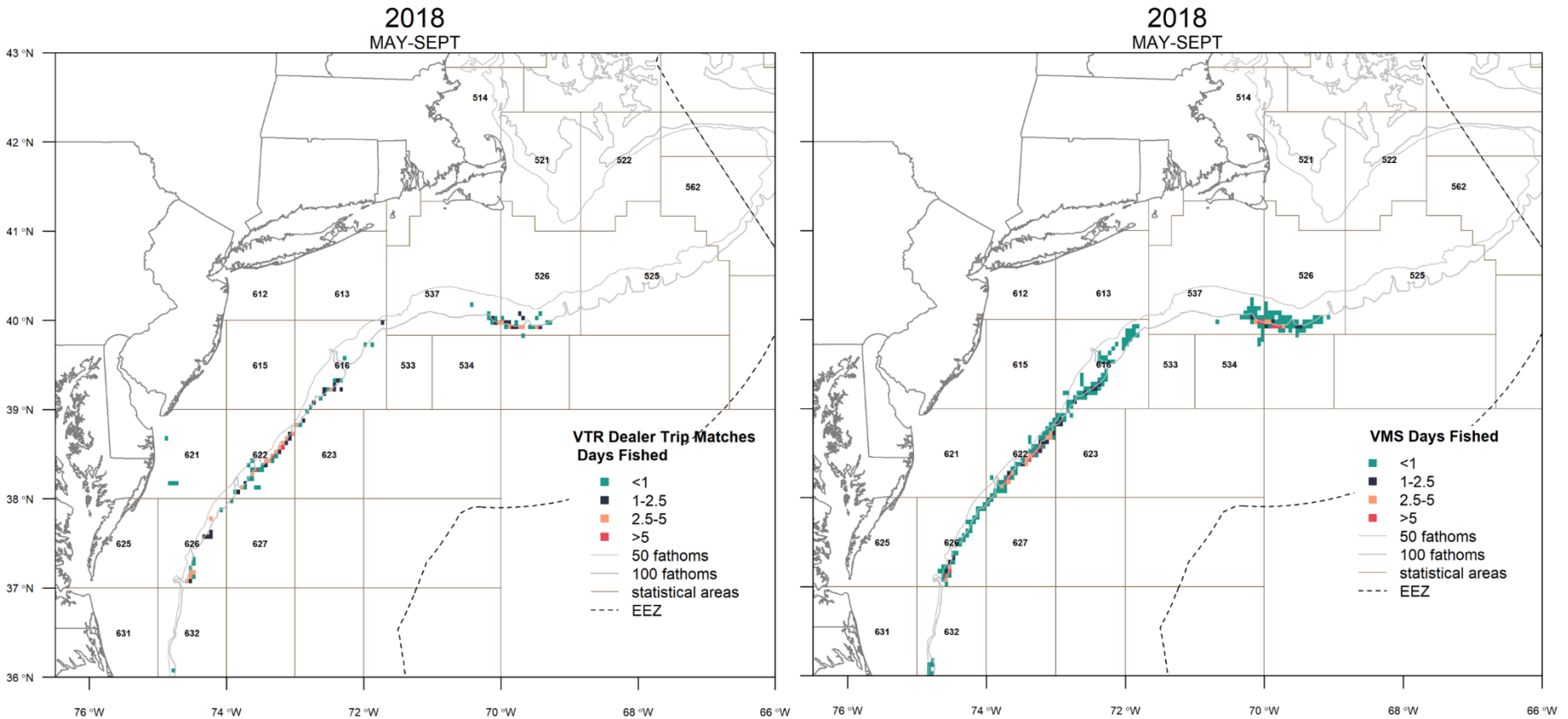
2019 LPUE Effort (left) vs VMS Effort (right)
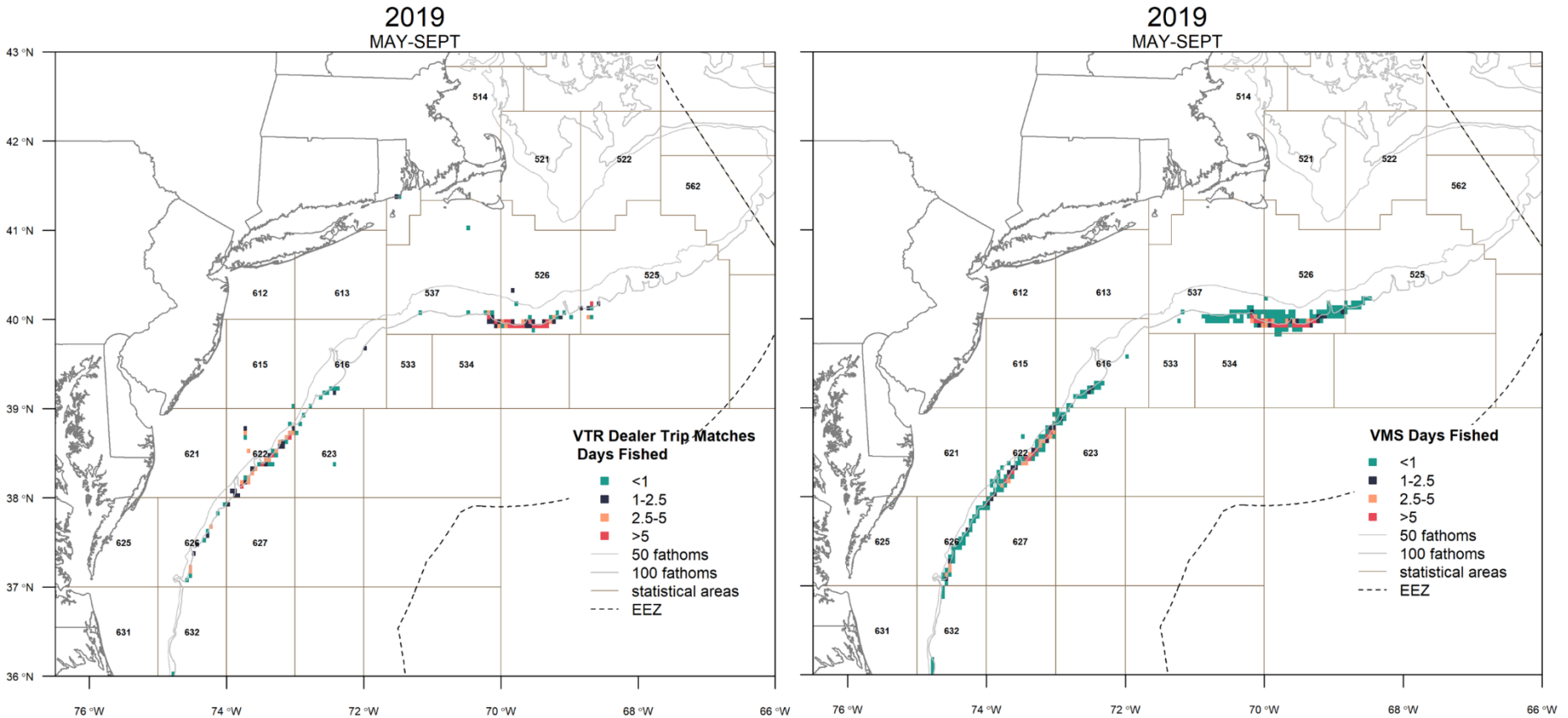
Landings (mt), N trips and days fished (1997-2018)

Nominal LPUE (mt/df)

Dealer *Illex* Directed Trips, 1997-2018
Landings, Trips, and Days Fished
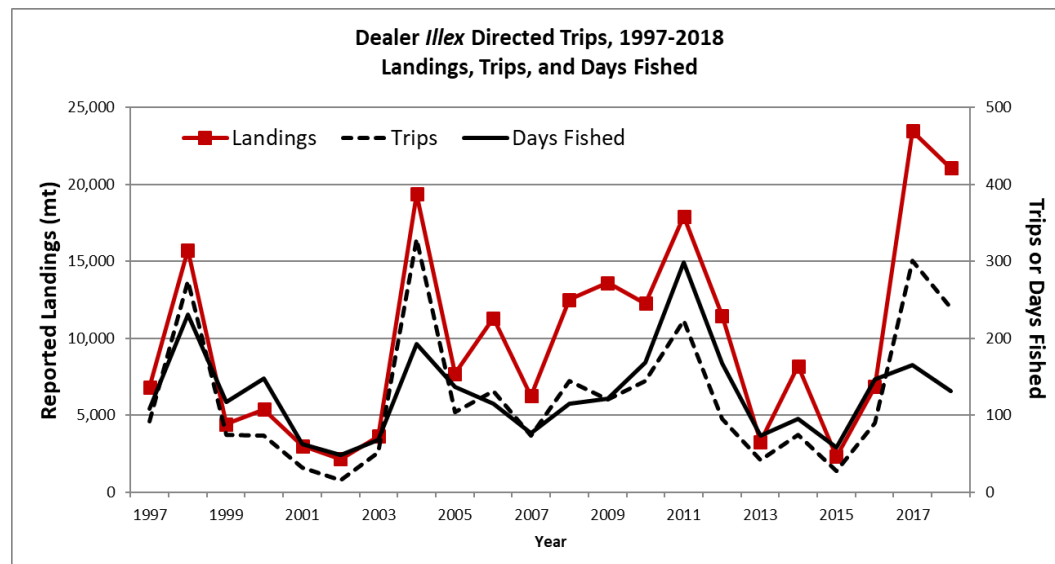
Dealer *Illex* Directed Trips 1997-2018
Nominal LPUE (mt/df)

N Trips vs Nominal LPUE (left) and ln(LPUE)(right)
1997-2018
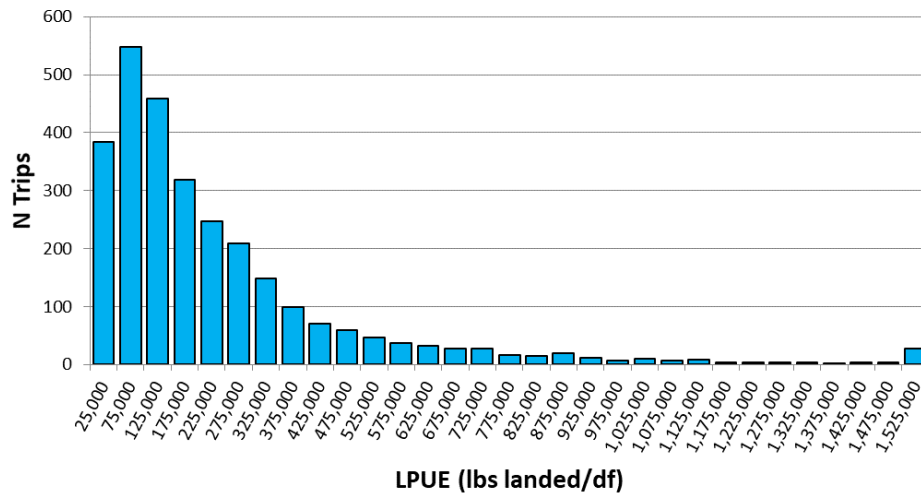
Poisson/Negative binomial distribution
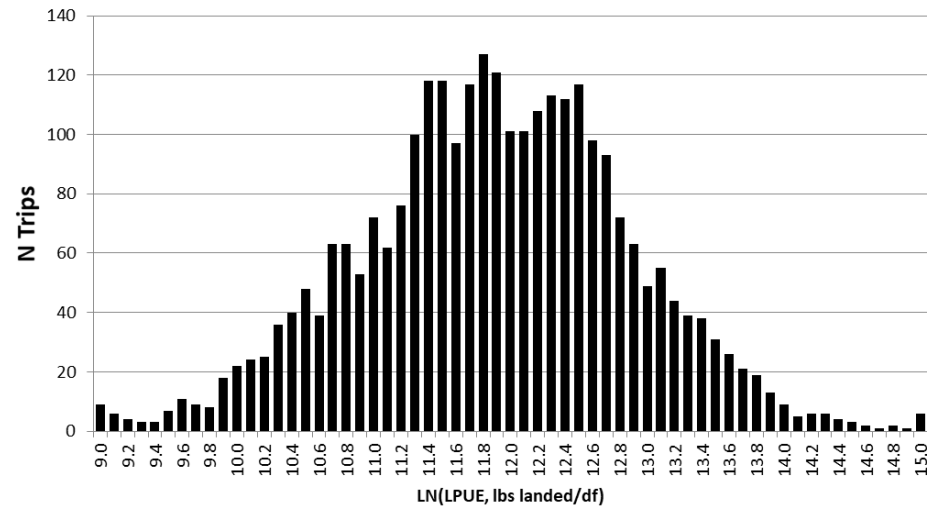
Normal distribution

LPUE Model GOF

Lognormal

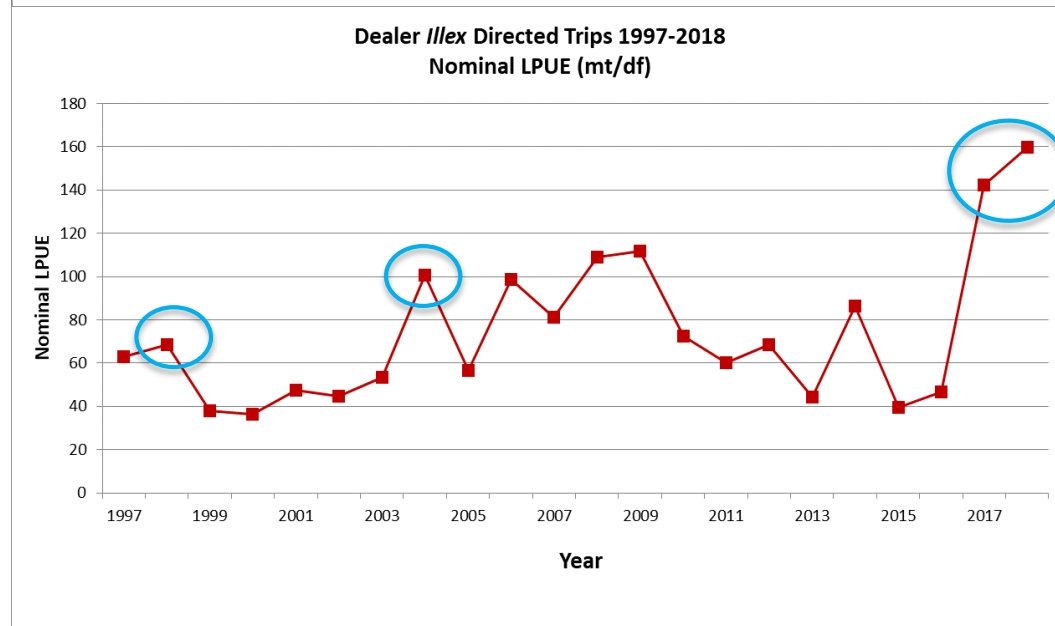| Model	Deviance/DF	Log-Likelihood	AIC	Converge (Neg Hess PD)	All Effects Sig 5%
Year	0.8012	-4038	8121	Y	Y
Year-Week	0.7890	-4000	8101	Y	Y
Year-VessT	0.7288	-3890	7830	Y	Y
Year-Permit	0.5215	-3343	6849	Y	Y
Year-Week-VessT	0.7091	-3833	7773	Y	Y
Year-Week-Permit	0.4911	-3236	6691	Y	Y
Year-VessT-Permit	0.5208	-3341	6846	Y	Y
Year-Week-Permit-Area	*0.4825*	*-3200*	*6651*	*Y*	*Y*
Year-Week-VessT-Permit	0.4907	-3235	6689	Y	N - VessT

Gamma

Model	Deviance/DF	Log-Likelihood	AIC	Converge (Neg Hess PD)	All Effects Sig 5%
Year	0.8011	-41158	82362	Y	Y
Year-Week	0.7877	-41113	82328	Y	Y
Year-VessT	0.7162	-40965	81979	Y	Y
Year-Permit	0.5336	-40437	81036	Y	Y
Year-Week-VessT	0.6993	-40908	81923	Y	Y
Year-Week-Permit	0.5110	-40349	80917	Y	Y
Year-VessT-Permit	0.5331	-40435	81034	Y	Y
Year-Week-Permit-Area	*0.5014*	*-40309*	*80868*	*Y*	*Y*
Year-Week-VessT-Permit	0.5105	-40347	80914	Y	Y

Negative Binomial

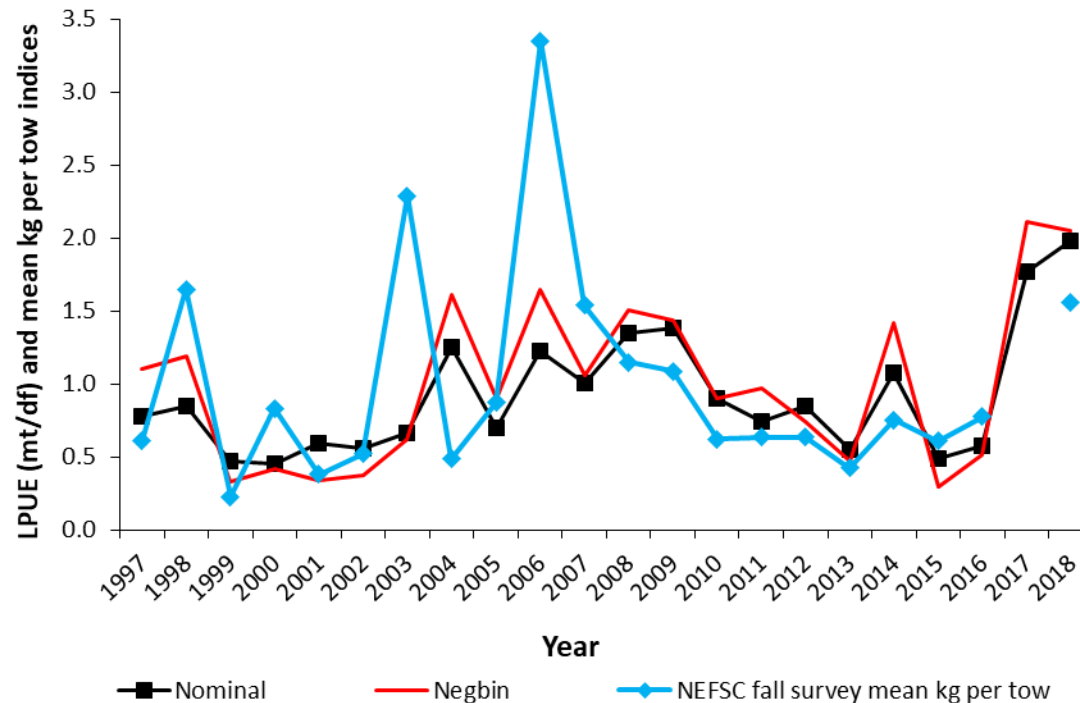| Model	Deviance/DF	Log-Likelihood	AIC	Converge (Neg Hess PD)	All Effects Sig 5%
Year	1.1219	9245219333	82362	Y	Y
Year-Week	1.1298	9245219378	82328	Y	Y
Year-VessT	1.1122	9245219526	81979	Y	Y
Year-Permit	1.1083	9245220054	81036	Y	Y
Year-Week-VessT	1.1196	9245219582	81923	Y	Y
Year-Week-Permit	1.1139	9245220141	80917	Y	Y
Year-VessT-Permit	1.1086	9245220056	81034	Y	Y
Year-Week-Permit-Area	*1.1182*	*9245220182*	*80868*	*Y*	*Y*
Year-Week-VessT-Permit	1.1141	9245220144	80914	Y	Y

LPUE Biomass Indices
(1997-2018)

Similar trends for gamma, lognormal and neg. binomial vs nominal LPUE

Nominal vs neg. binomial with 95% CI (good precision)

Dealer *Illex* Directed Trips 1997-2018
Biomass Indices
Scaled to means

Legend: Nominal, Lognormal, Gamma, Negbin

Dealer *Illex* Directed Trips 1997-2018
Biomass Indices
Scaled to means

Legend: Nominal, Negbin, L95CI, U95CI

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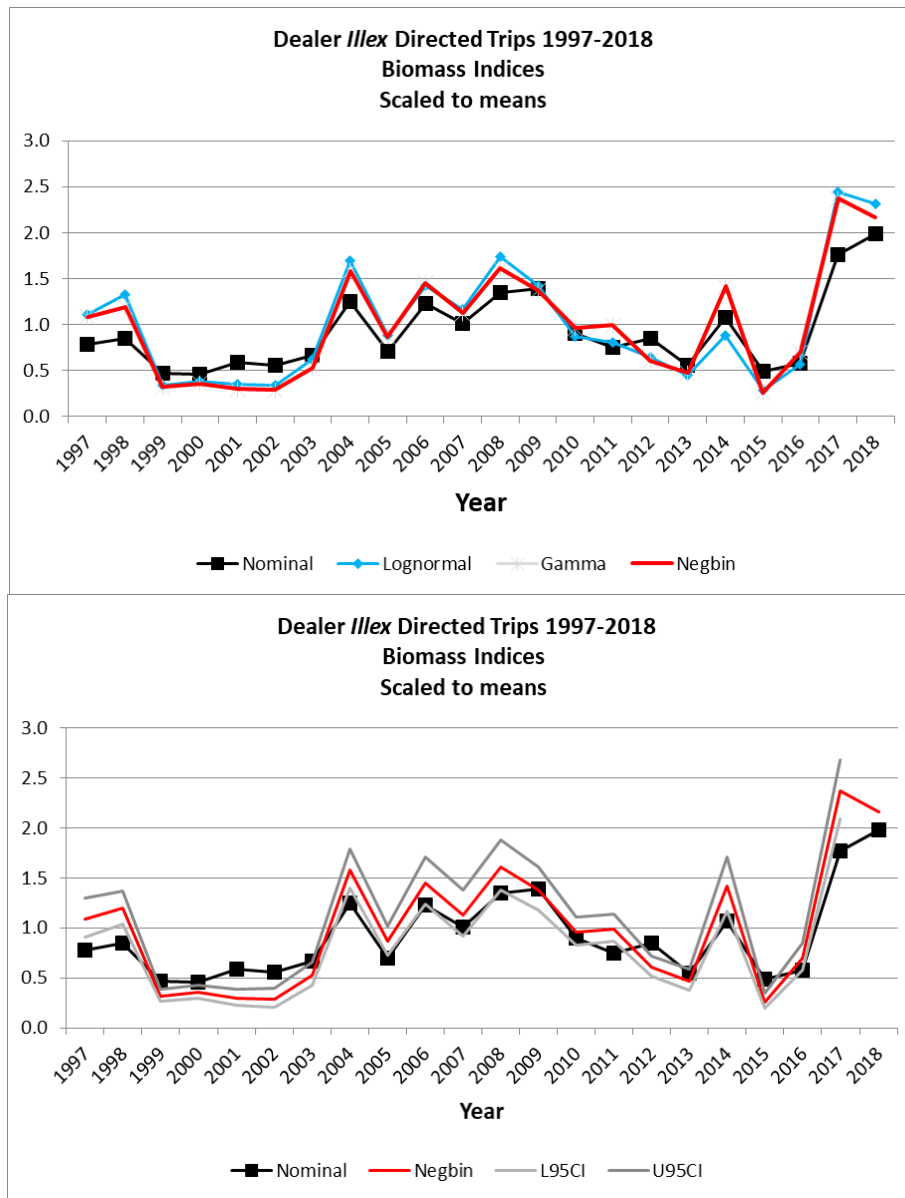
NEFSC Fall Survey Biomass Indices vs. Standardized LPUE Indices

Fall survey is near end of fishing season (post-fishery index) similar trends from 2008 onward

Next Steps for CPUE Analysis

1. Add discards to derive CPUE TS

2. Determine variability of CPUE in relation to changes in fishing location

3. Continue research regarding the use of environmental factors for CPUE forecasting

4. Further analysis of the 2017-2019 VMS ping data
   - Map it to effort data used to compute CPUE to determine it's utility for *Illex* assessments

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