Ghost Surveys in the Sky!

Empirical check on problems with Q in TRAC 2013 VPA (or any other model)

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Preliminary – for empirical YTF TRAC
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Starting out

- Basecase ("split-survey") VPA run from TRAC-2013
- Surveys scaled up to minimum swept-area abundance
  - Area swept between wings
  - Canadian survey Q (capture efficiency) > 1
- Can't interpret Q from TRAC VPA
  - Need area swept between doors because YTF herd
  - Experimental and assessment Q for wing spread often > 1
- Can't compare to other studies
  - Experimentalists all use door spread for flatfish
- Use ghost surveys to get interpretable Q values from TRAC VPA and to check on DFO result
- Two types of Q for a variety of surveys:
 - Q at age
  - Aveage Q for entire survey (ages combined)

Methods - general

- Add ghost survey swept area abundance to VPA and make them easy to interpret
  - Bigelow (uncallibrated, spring and fall), Albatross (years with Albatross and #36 net only, spring and fall), DFO winter, and scallop survey (I don't trust it yet)
  - Best available area swept (door width for bottom trawls, 8' for scallop dredge)
  - Stock area = 10871 nm2 (sum of BTS survey strata)
  - Age specific and ages combined
- Ghost survey obserations get weight = 0.0001
  - Almost no effect on VPA results (check this)
- Compare Q estimate from VPA to:
  - Other estimates for same gear
  - Bounds from other analyses
  - Estimates for other species in similar gear
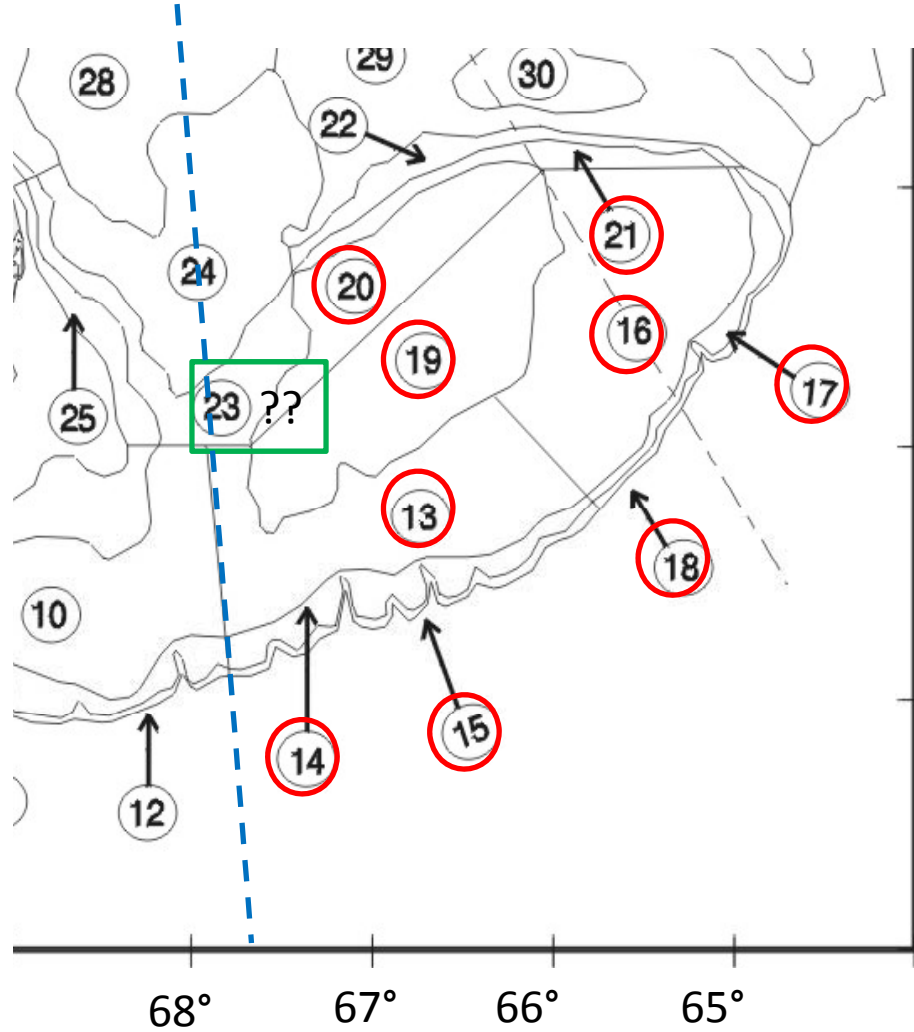
Stock area

- Details may matter: what is the effective area of the stock assessment?
- GBK survey strata well defined and seems to cover distribution
  - 10,871 nm^2
- But
  - Is there a natural break at 68°?
  - Strata 22 and 23?
  - Any movement on/off the bank?

Catch Numbers
YELLOWTAIL FLOUNDER
Fall 1982 - 2013
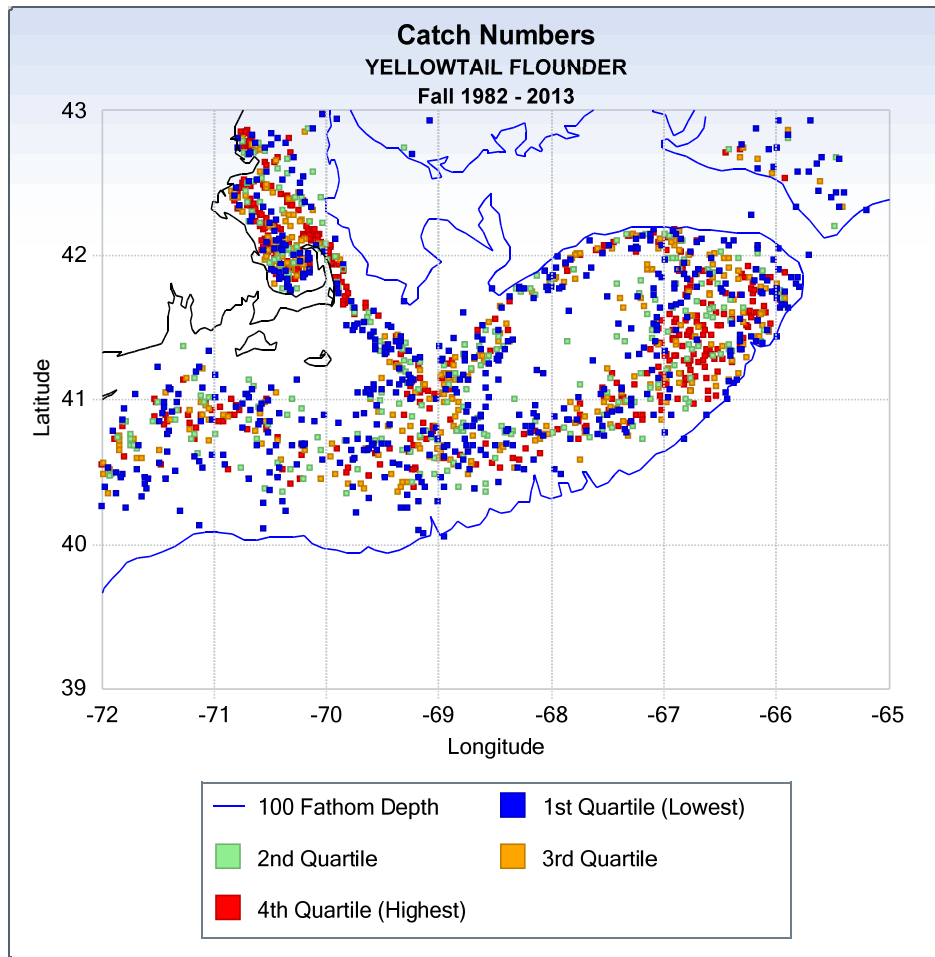
- Probably some uncertainty about effective area of assessment

- If area > 10871, then VPA will underestimate Q

Bigelow survey

- Spring and fall (2009-2012) from SAGA with default age-length keys
  - No calibration! (for ease of interpretation)
- Mean area swept by doors for GBK from TOW_EVALUATION table
  - Could have done for each tow but mean easier
  - Means for different surveys and different seasons similar

Term	Doors	Wings	Units
Mean area swept	0.017675	0.006699	nm^2
Area GBK	10871	10871	nm^2
Expansion factor	615038.4	1622835	

Albatross

- Years with Albatross IV and Yankee #36 net and polyvalent doors only
  - Spring: 1992-1993, 1995-2002, and 2004-2008
  - Fall: 1992 and 1994-2008
- SAGA, default age-length keys

Yankee #36 parameters (P. Politis, pers. comm.)	
Doors (nm)	0.011879
Tow distance (nm)	1.9
Area swept (nm^2)	0.02257
Stock area (nm^2)	10871
Expansion	481652.7

Scallop survey (??)

- Get mean numbers per tow from VPA
  - Don't know how numbers at age were calculated
- Tow distance (D. Hart, pers. comm.)
  - 1 nm 1982-2007
  - 1.1 nm 2008-2010
- Dredge width 8 ft

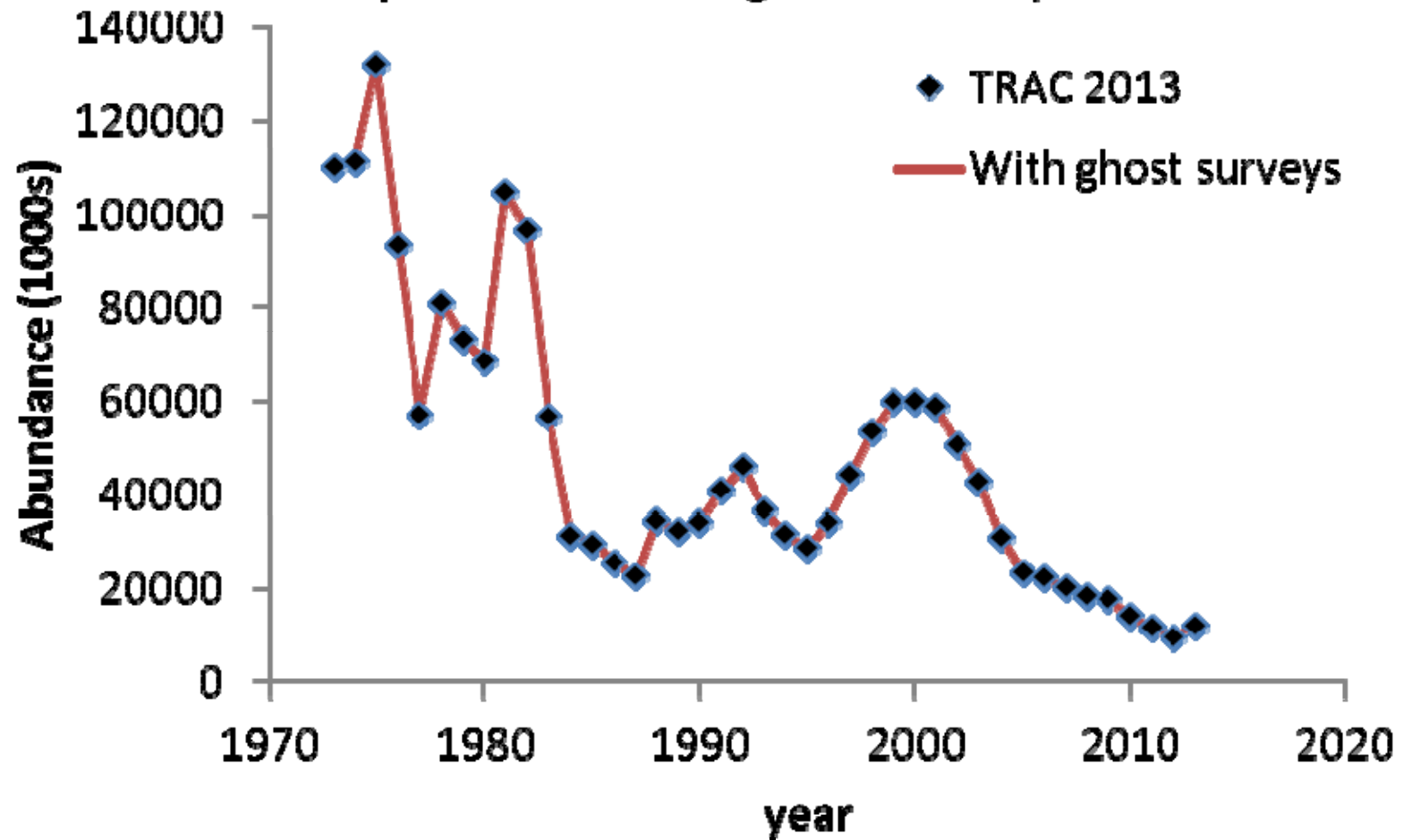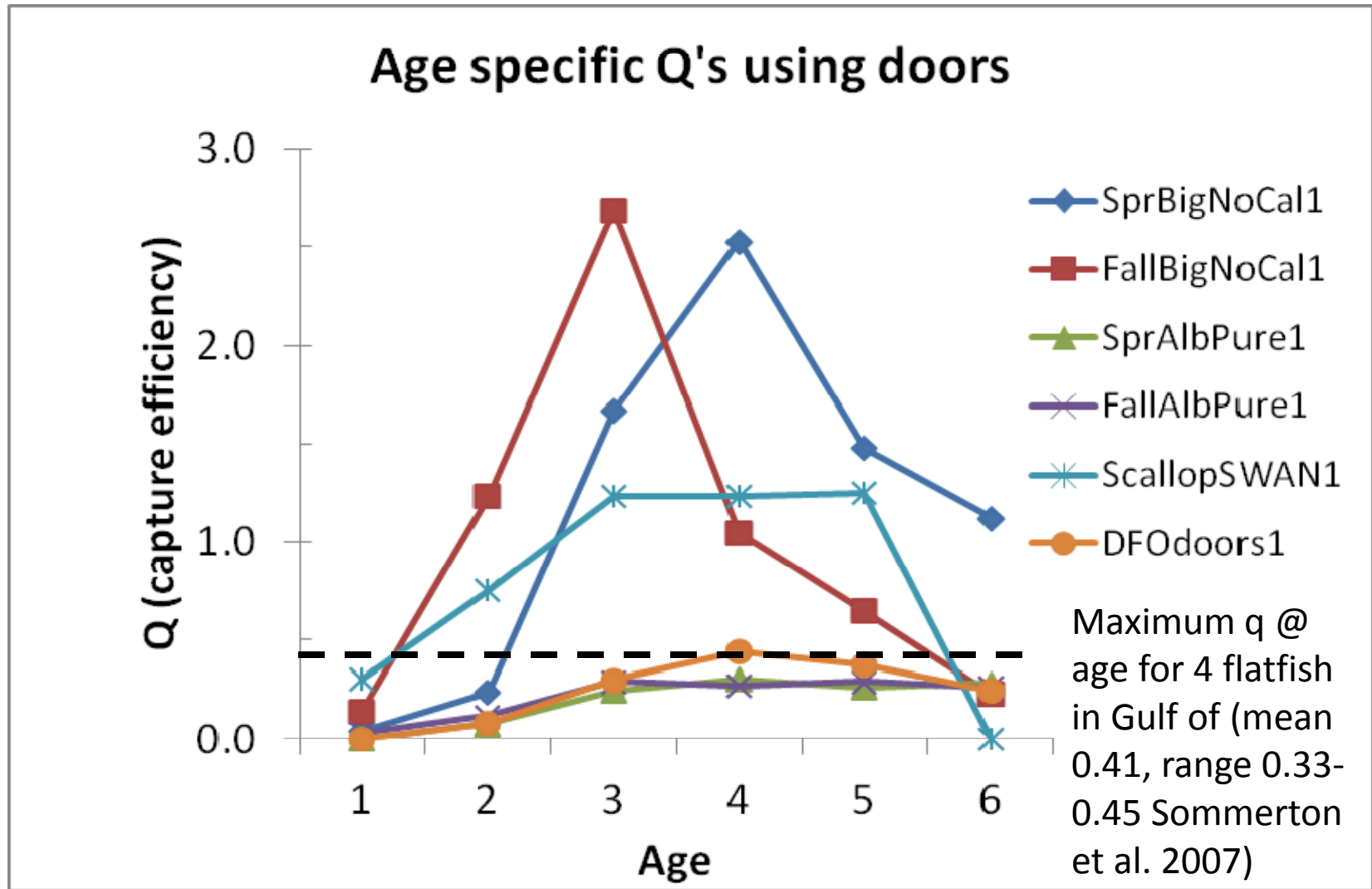| Expansion info for scallop survey		
dredge width (nm)	0.001316631	
stock area (nm^2)	10871	
time period	1982-2007	2008-2010
tow distance (nm)	1	1.1
area swept (nm62)	0.0013166	0.0014483
expansion	8256680.8	7506073.4

Canadian bottom trawl survey

- Get numbers at age from VPA
- Rescale by wing spread / door width
  - 13.5 m / 45 m = 0.3 (exactly ??)

Compare TRAC and ghost survey results

Age specific Q results using doors

Age	SprBigNoCal1	FallBigNoCal1	SprAlbPure1	FallAlbPure1	ScallopSWAN1	DFOdoors1
1	0.045	0.140	0.003	0.037	0.300	0.002
2	0.236	1.235	0.078	0.119	0.749	0.082
3	1.666	2.689	0.248	0.291	1.233	0.299
4	2.528	1.049	0.302	0.272	1.233 ??	0.439
5	1.481	0.646	0.260	0.291	1.247	0.377
6	1.123	0.228	0.282	0.263	0.002	0.247

Age specific Q's using doors

Maximum q @ age for 4 flatfish in Gulf of (mean 0.41, range 0.33-0.45 Sommerton et al. 2007)

Average Q's (ages 1-6 combined)

Average Q's for ages 1+ using doors	
Survey	Q
SprBigNoCall_1-6	1.090
FallBigNoCall_1-6	0.968
SprAlbPure_1-6	0.112
FallAlbPure_1-6	0.113
ScallopSWAN_1-6	0.410
DFOdoors_1-6	0.154

Compare experimental whole trawl (door spread) estimates (0.33-0.44) for flatfish in working paper "Strawman for humble prior on Bigelow catchability and example swept-area calculations"

Conclusions

- Ghost surveys a good way to calculate average or age specific Q's as model diagnostics
  - Surveys used or not used in estimation (e.g. could use 2 yrs of survey data as long s model can calculate Q (but large N better)
  - Does not change model results
  - OR use door spread expansions in modeling
- Surveys with highest capture efficiency (Bigelow spring and fall) are best for diagnostics
- Doors should be used so that Q estimates are interpretable as a lower bound
  - If the lower bound is > 1, then we almost certainly have problems
  - Fewer false positives
  - Comparable to experimental studies
- Q's between doors for DFO survey < 1 (no problem there)
- Bigelow Q's infeasible
  - Abundance estimates almost certainly too low (too low)
  - Agrees with Chris's hypothesis about M or unreported catch
- Scallop survey Q's infeasible but not sure how index was calculated
- Q's for Albatross spring/fall and DFO feasible and similar
  - But true values probably much lower (if Bigelow Q too large, so are rest)