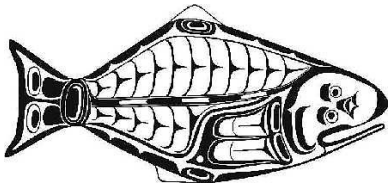


Effects of migration on impacts due to U32* bycatch and U32* wastage of Pacific halibut

Juan L. Valero
Steven R. Hare

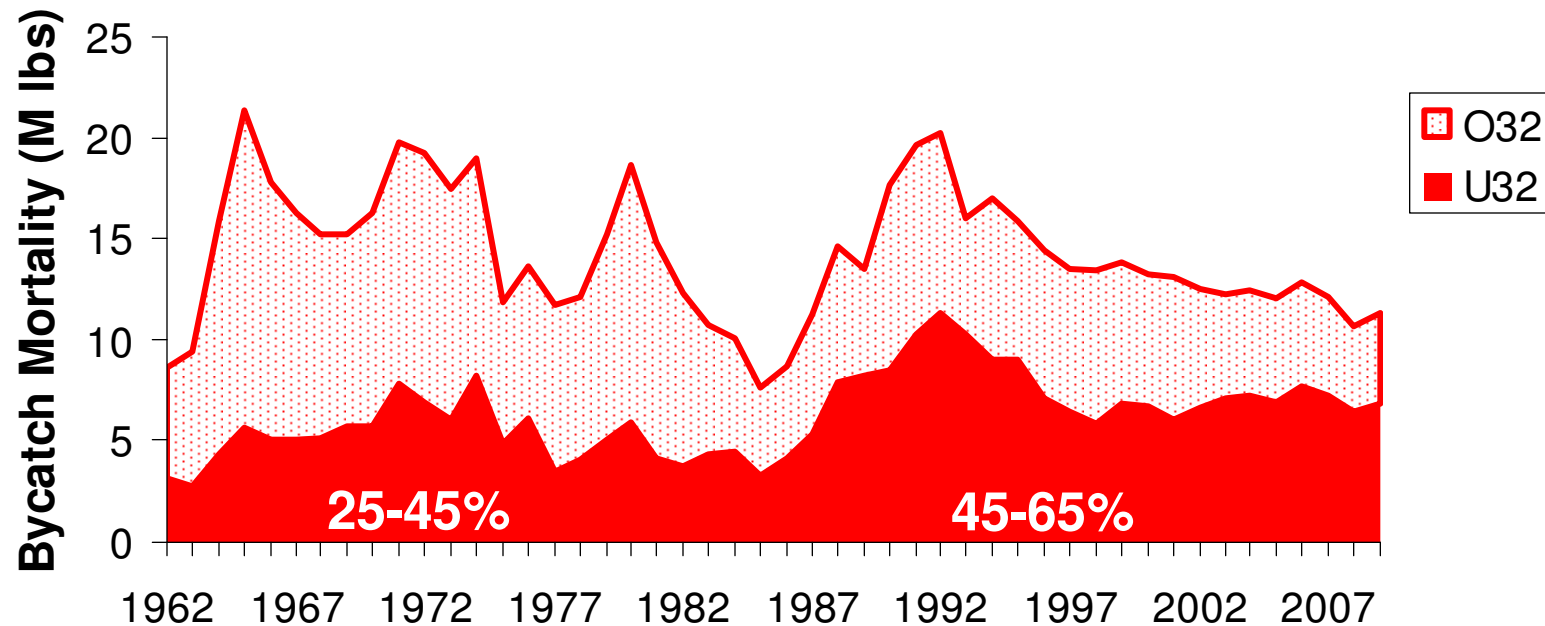


86th IPHC Annual Meeting, Seattle January 26, 2010

This presentation is intended to be complemented by a verbal interpretation. As such, it is offered here solely for informational purposes, and to allow some familiarity with the material prior to its formal presentation.

* U32: Under 32 inches

Halibut bycatch history and management



Years	Focus	Approach
1980s	Lost yield	Calculate yield lost (1.4-1.58 lb) per lb of bycatch (all sizes) Reduce fishery yield in proportion to EBio distribution
1990s	Lost egg production	Replace egg loss (1 lb yield) per lb of bycatch (all sizes) Reduce fishery yield in proportion to EBio distribution
1995	Lost egg production	Add O32 bycatch to local removals Calculate distribution of U32 impacts by migration modeling Not implemented
1996 2010	Harvest rate evaluation	Add O32 bycatch to local removals U32 bycatch and U32 wastage into HR evaluation

Halibut bycatch and migration

Migration (Juveniles + adults)

~~Formerly assumed to be completed by age 8~~

PIT tags show ongoing migration of older halibut

Losses due to bycatch

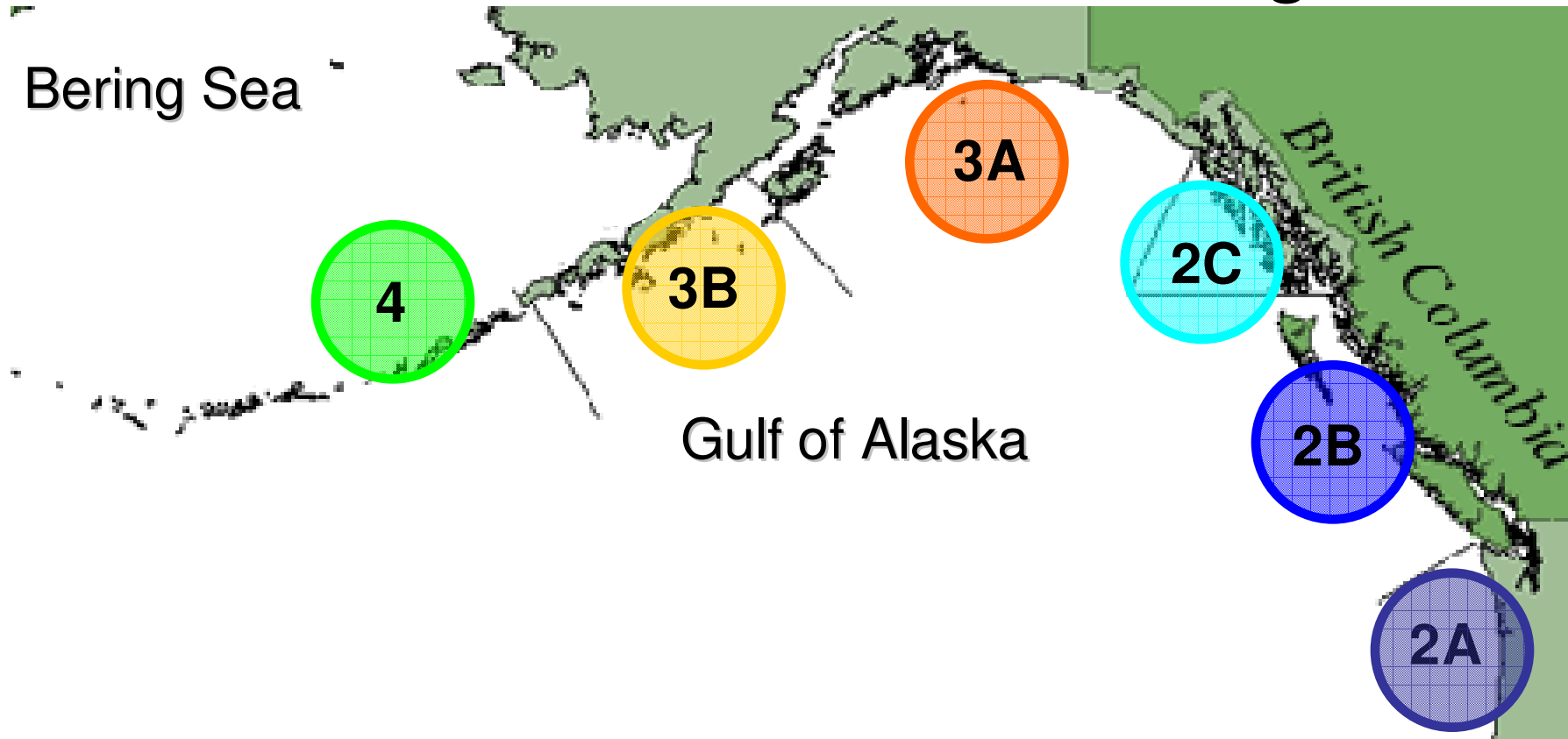
Mostly local ?

Needs reevaluation

OBJECTIVE:

Evaluate **coastwide** and **area specific** impacts of U32 halibut bycatch on Lost Yield, Lost Spawning Biomass and Lost Egg Production when taking into account migration

Modeling structure



Areas 4A, 4B, 4C, 4D and 4E combined as Area 4

6 area model

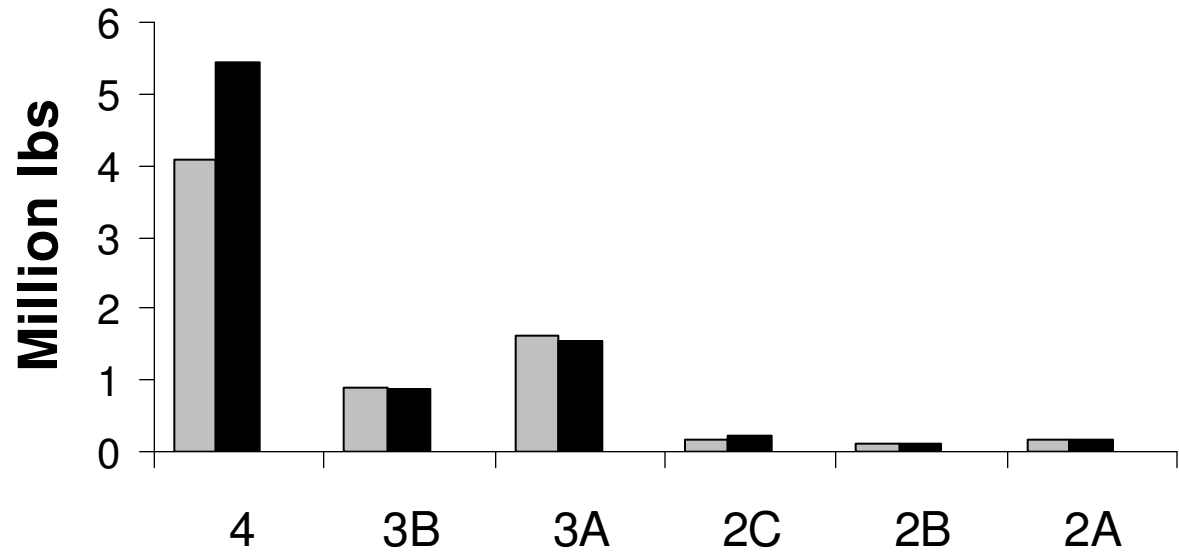
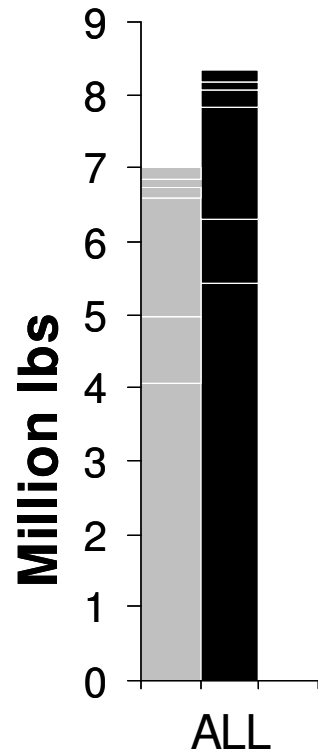
Area-specific size at age

Migratory age/size structured model

Modeling approach

- **Start model with 1996-2008 average U32 fish killed as bycatch (by area, sex and age).**
- **Keep track of where U32 fish, had they not been killed, would have migrated and contributed to metrics of interest:**
 - **Lost Yield (LY)**
 - **Lost Spawning Biomass (SBio)**
 - **Egg Loss (EL)**
- **Migrate fish according to:**
 - * One migration matrix (1M) for all sizes (PIT tags). **See Blue Book**
 - * **Two migration matrices (2M) by size. Results presented here**
 - < 65 cm movement based on tagging of juveniles
 - > 65 cm movement based on PIT tags
- **All runs use a constant harvest rate of ~20%**

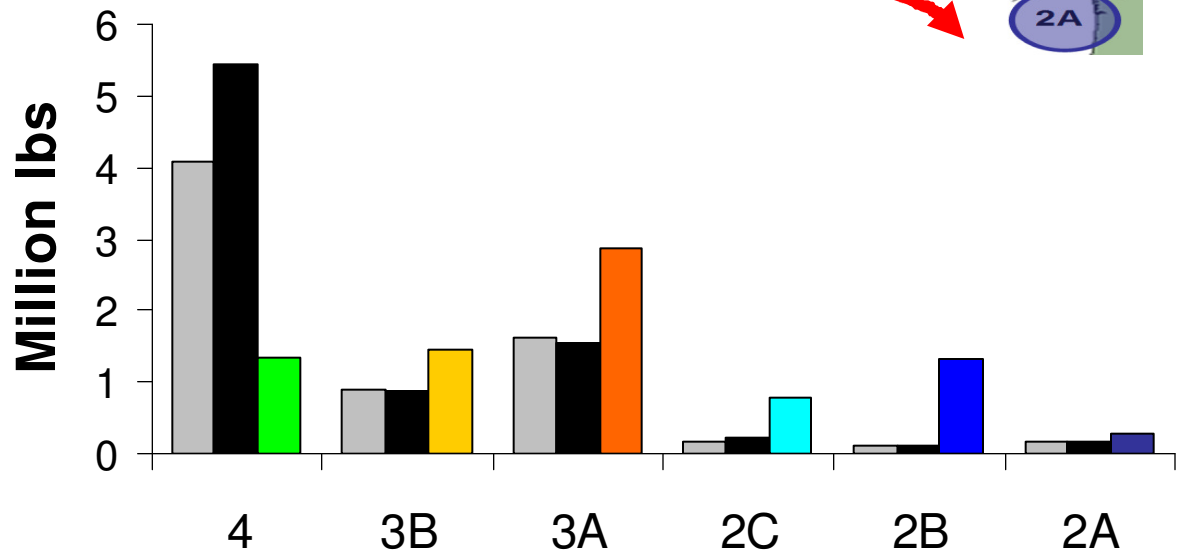
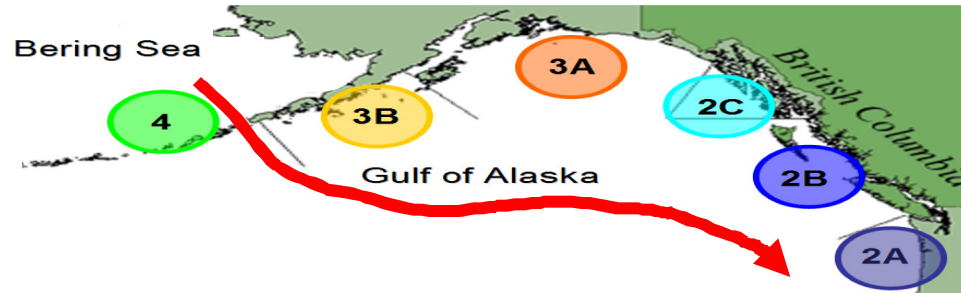
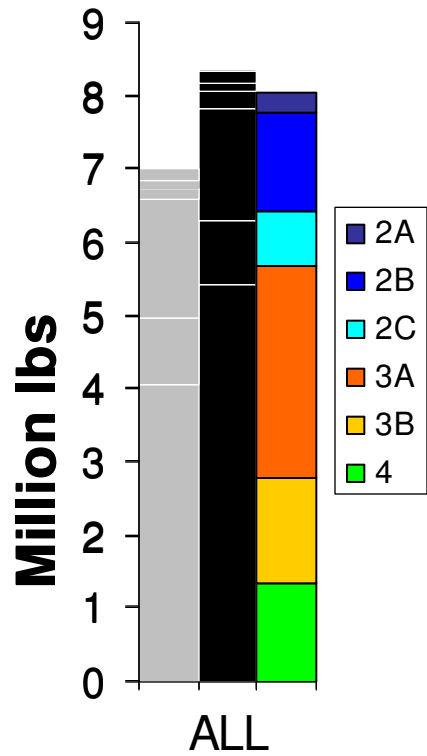
U32 bycatch by area of capture



Not in BB

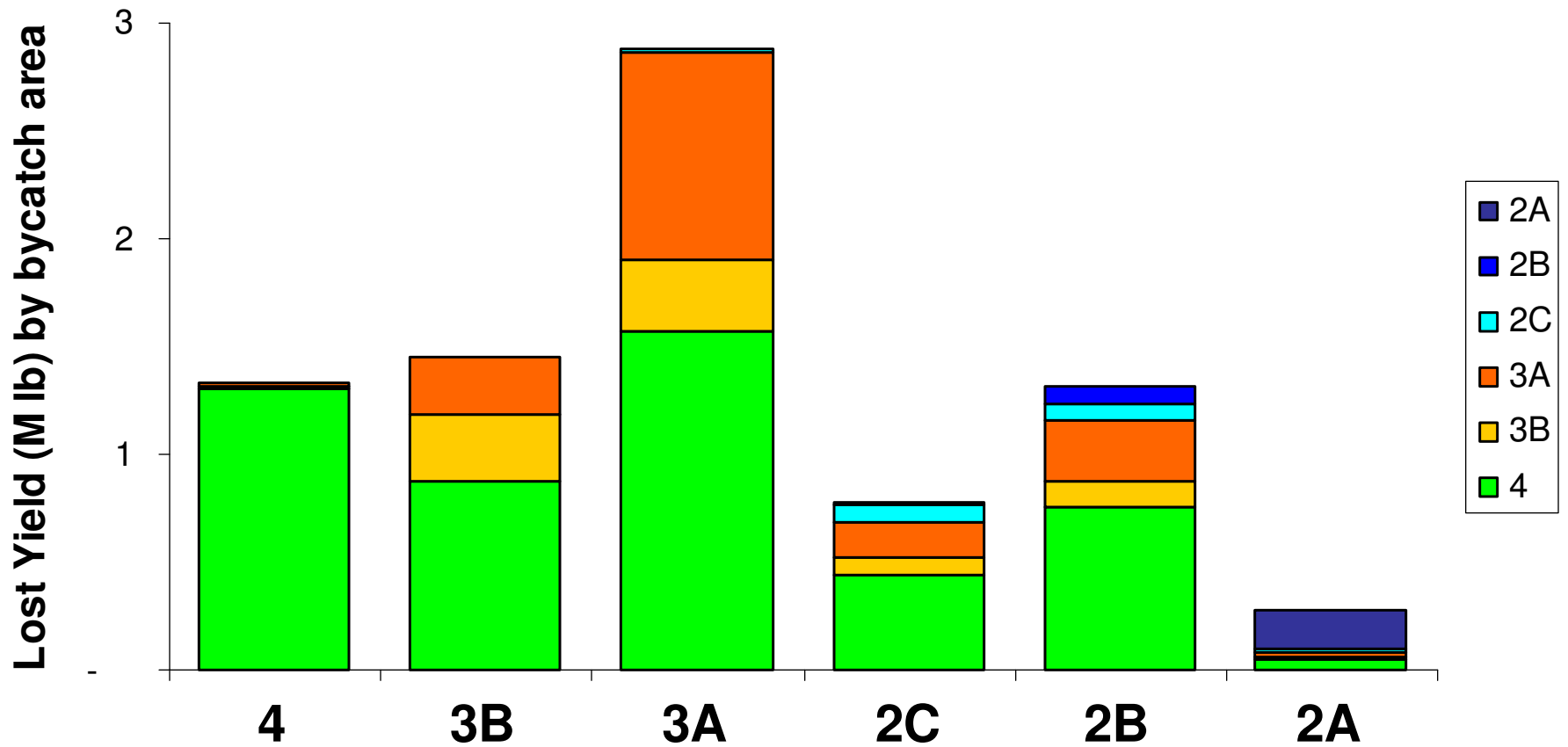
U32 bycatch by area of capture and area where yield is lost

WITH Migration

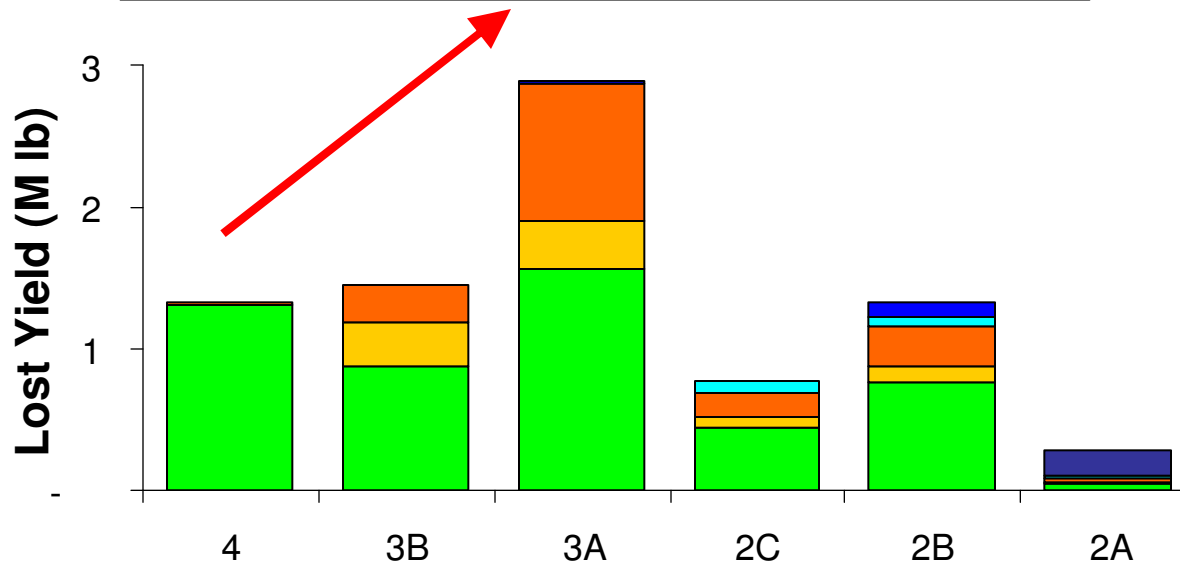
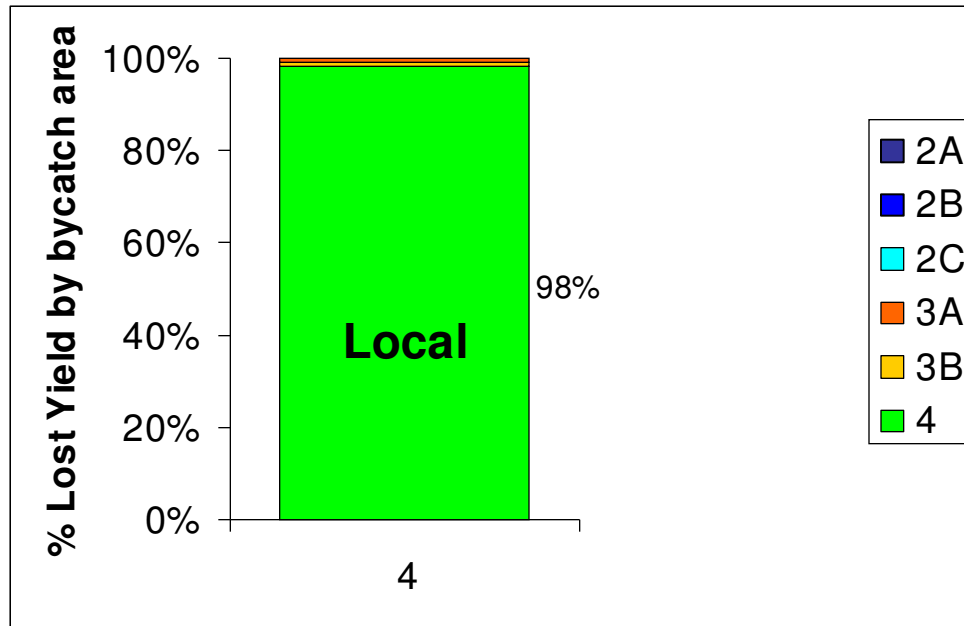


Source of U32 bycatch for each area where yield is lost

WITH Migration



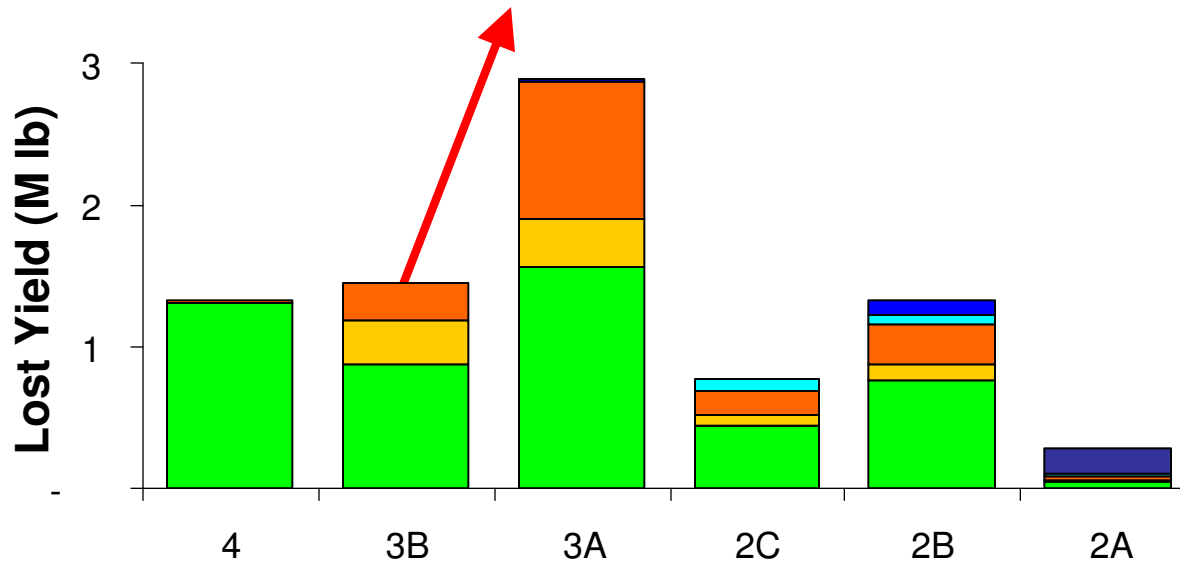
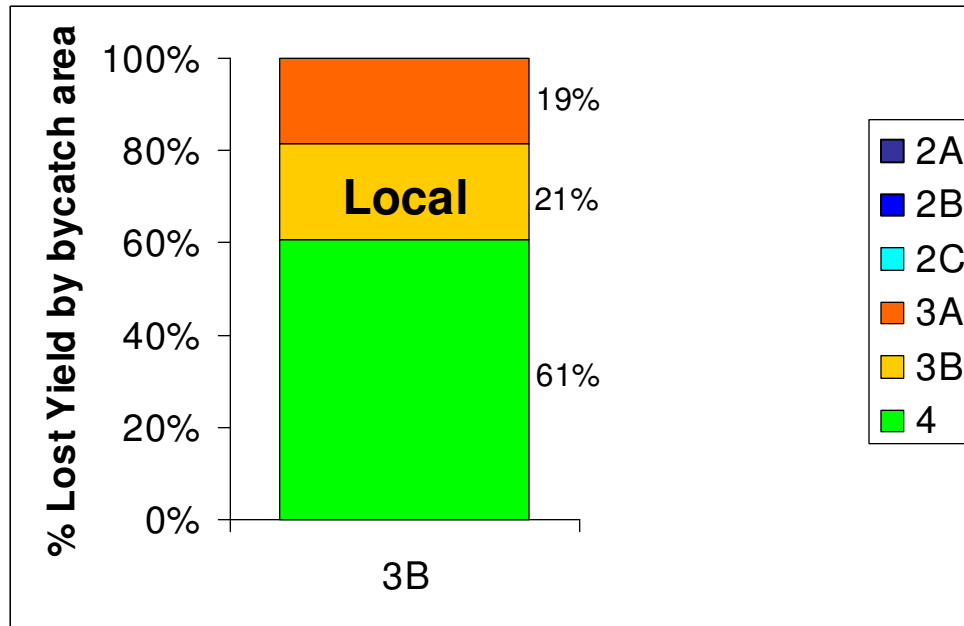
Area 4 summary of lost yield by % origin of U32 bycatch WITH Migration



Not in BB

Area 3B summary of lost yield by % origin of U32 bycatch

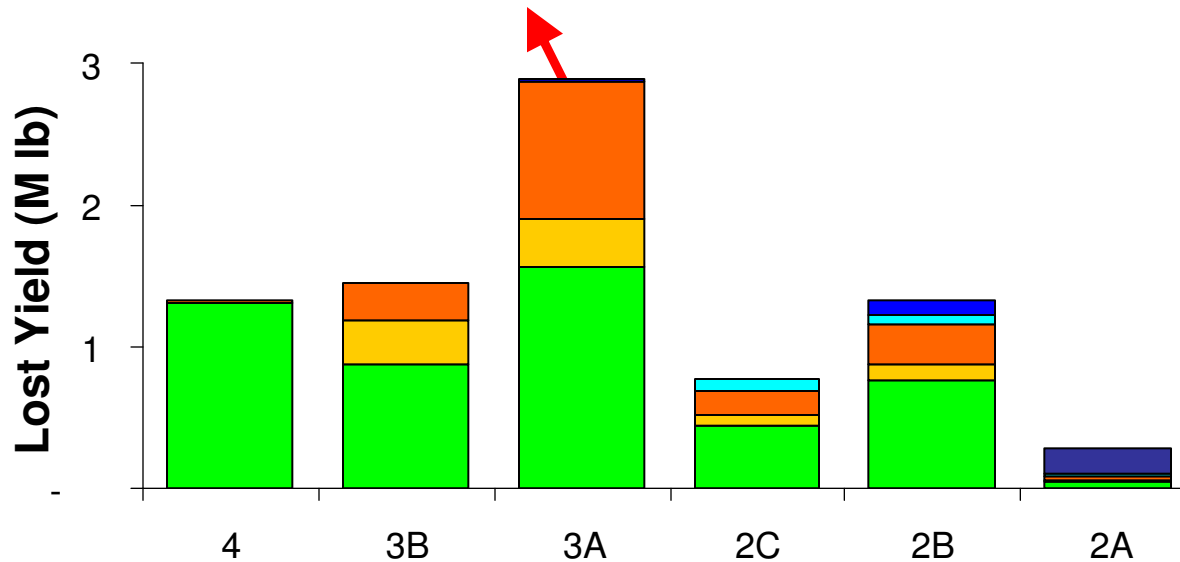
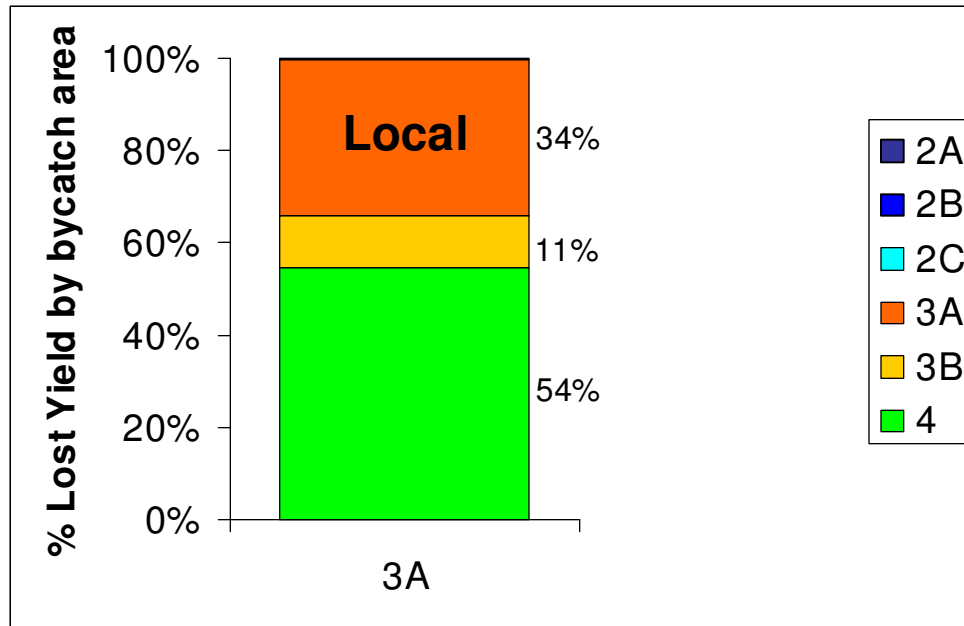
WITH Migration



Not in BB

Area 3A summary of lost yield by % origin of U32 bycatch

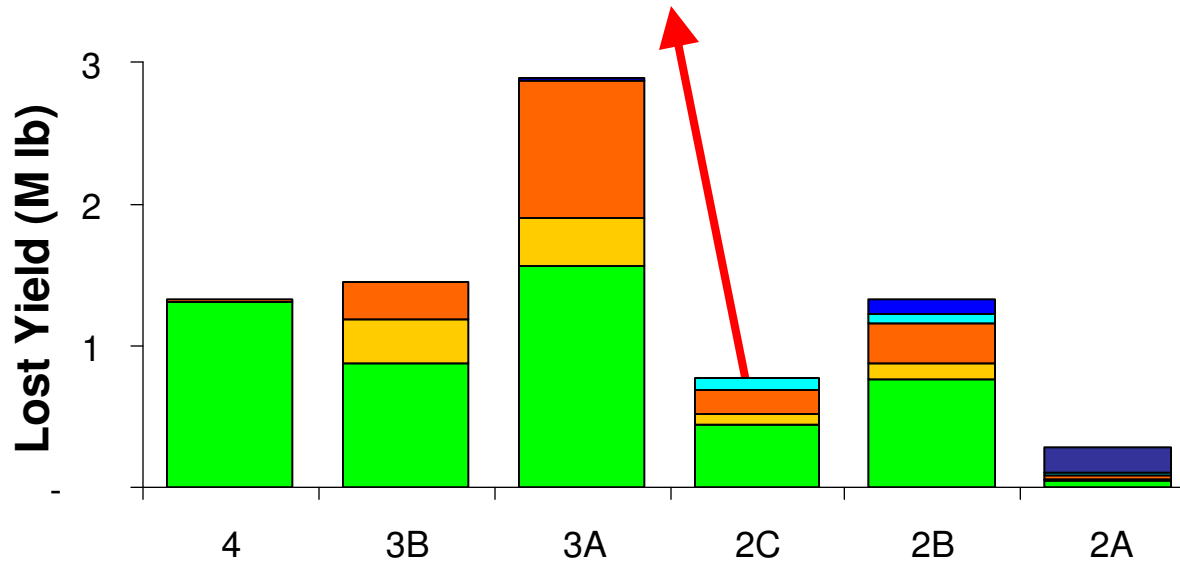
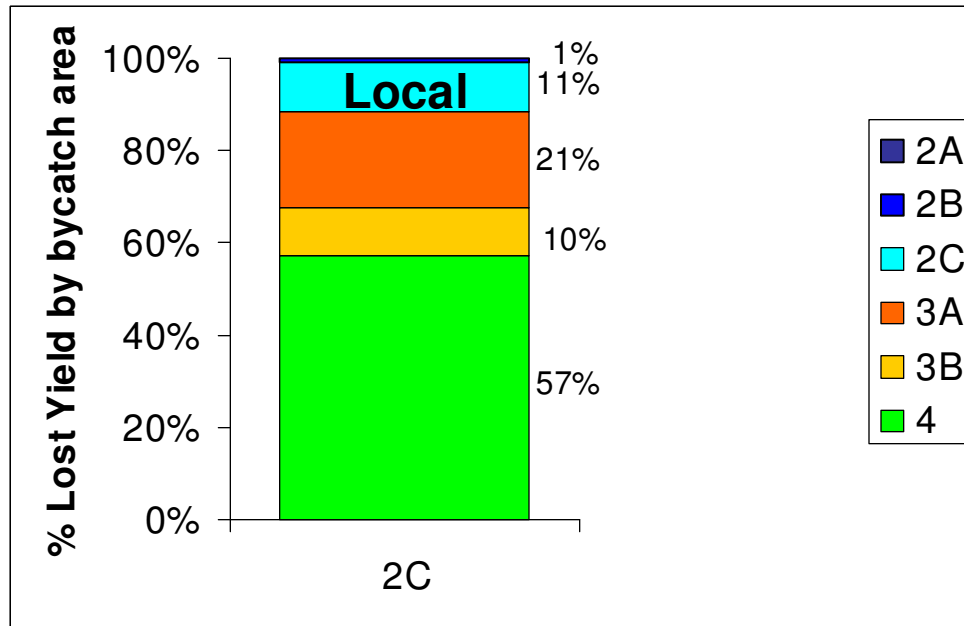
WITH Migration



Not in BB

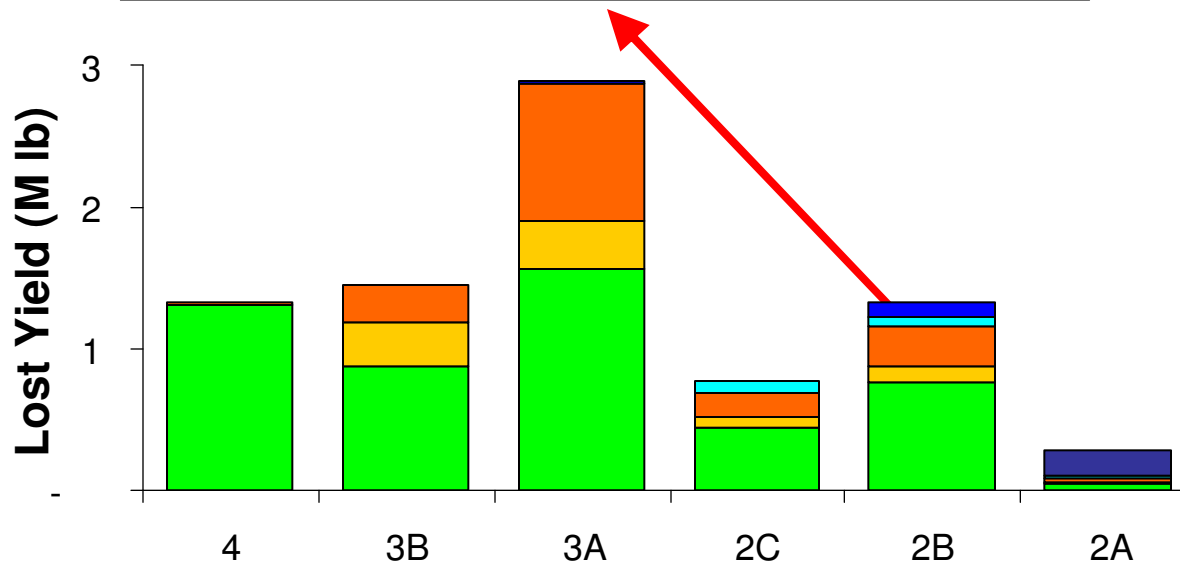
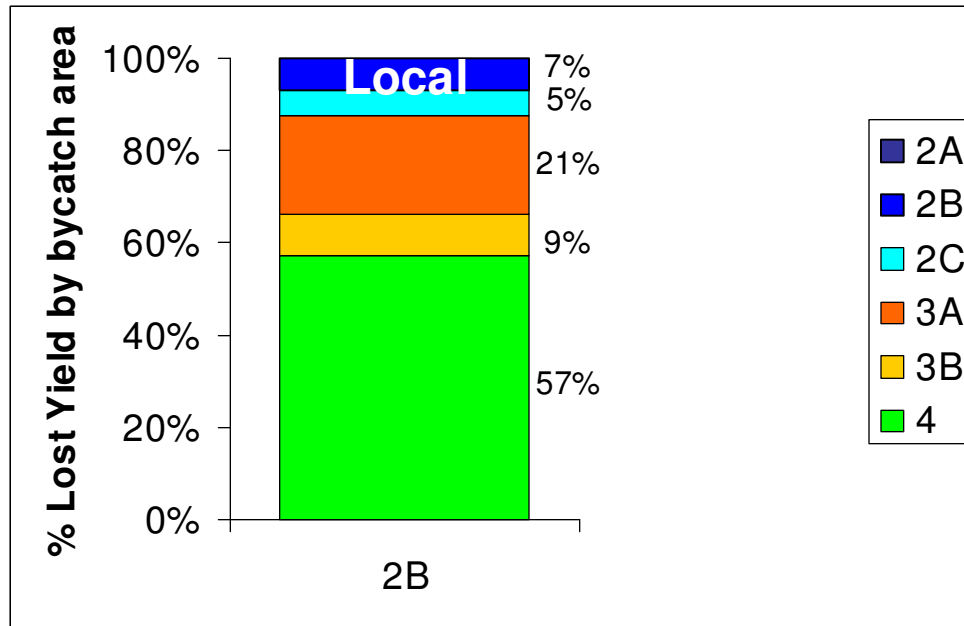
Area 2C summary of lost yield by % origin of U32 bycatch

WITH Migration



Not in BB

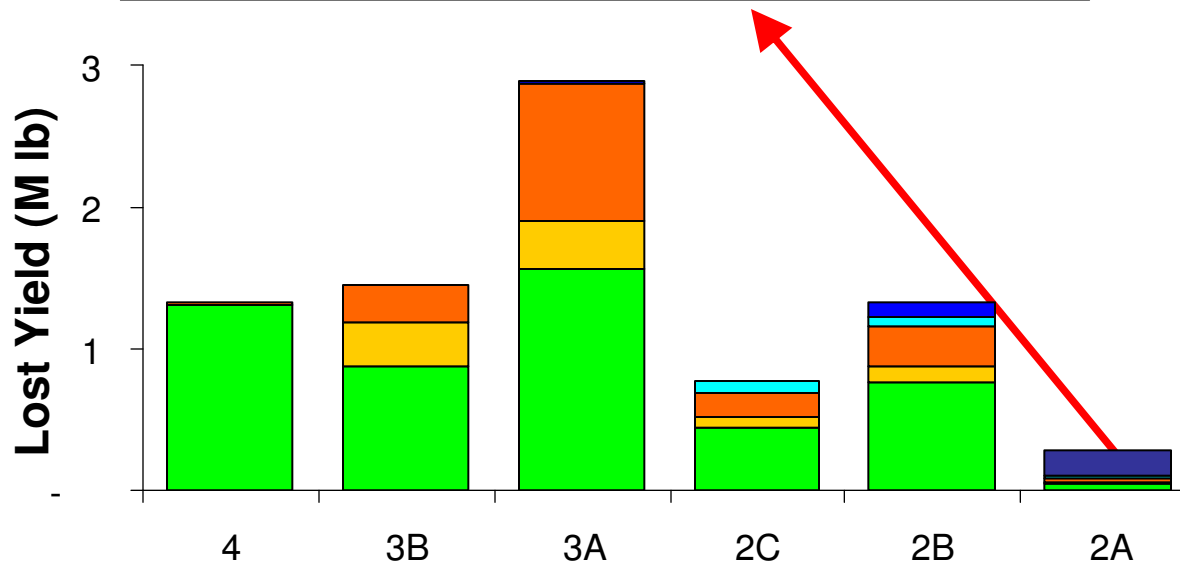
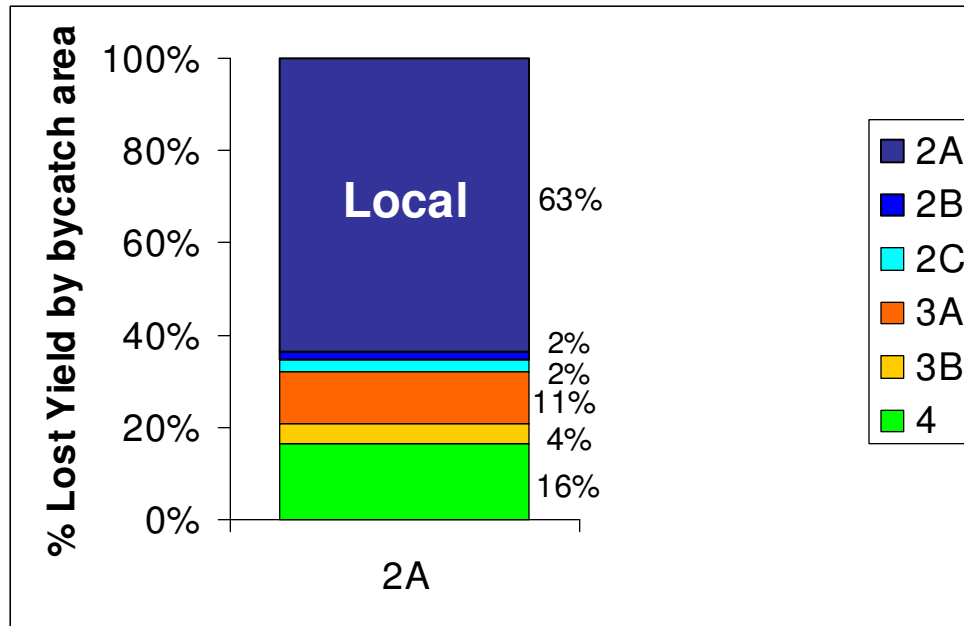
Area 2B summary of lost yield by % origin of U32 bycatch WITH Migration



Not in BB

Area 2A summary of lost yield by % origin of U32 bycatch

WITH Migration

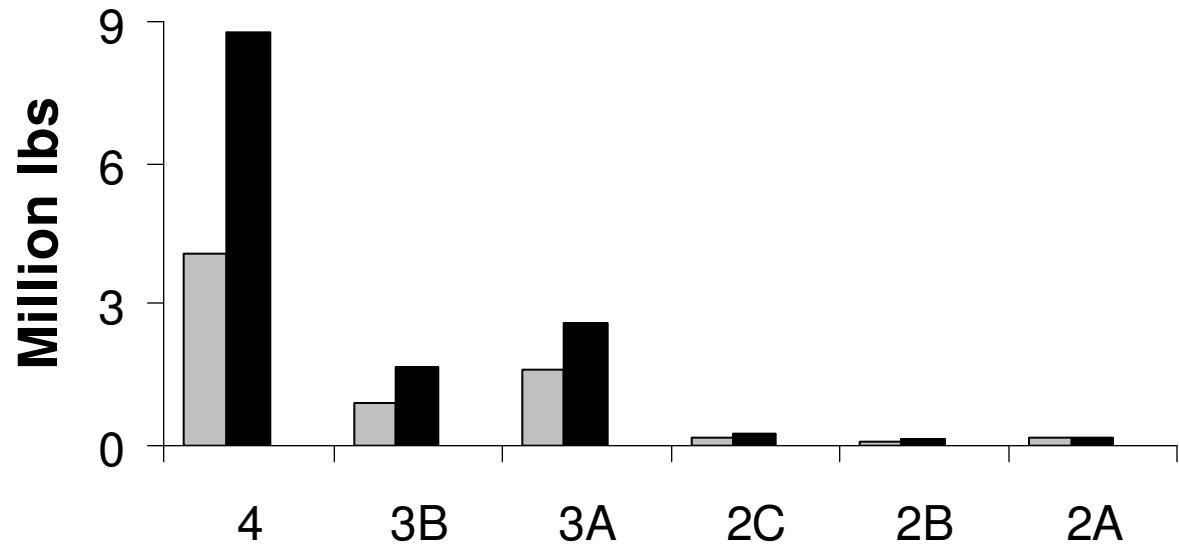
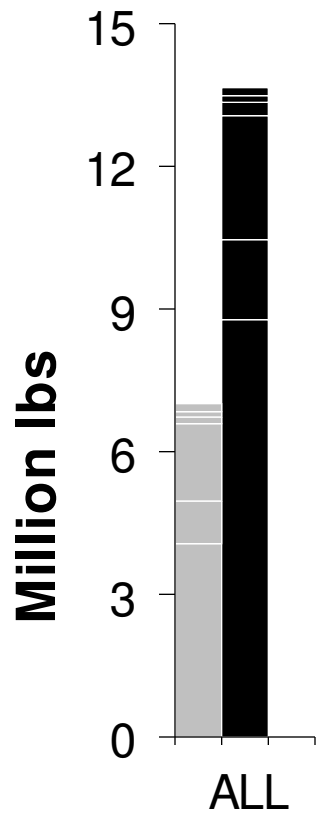


Not in BB

U32 bycatch by area of capture and area where SBio is lost

(SBio replacement)

NO Migration

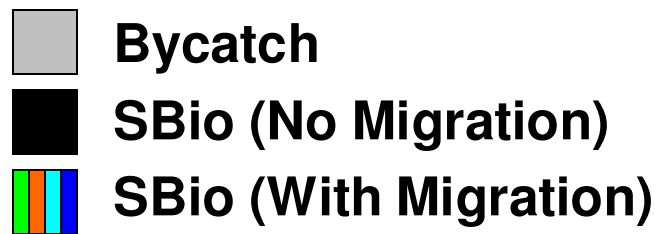
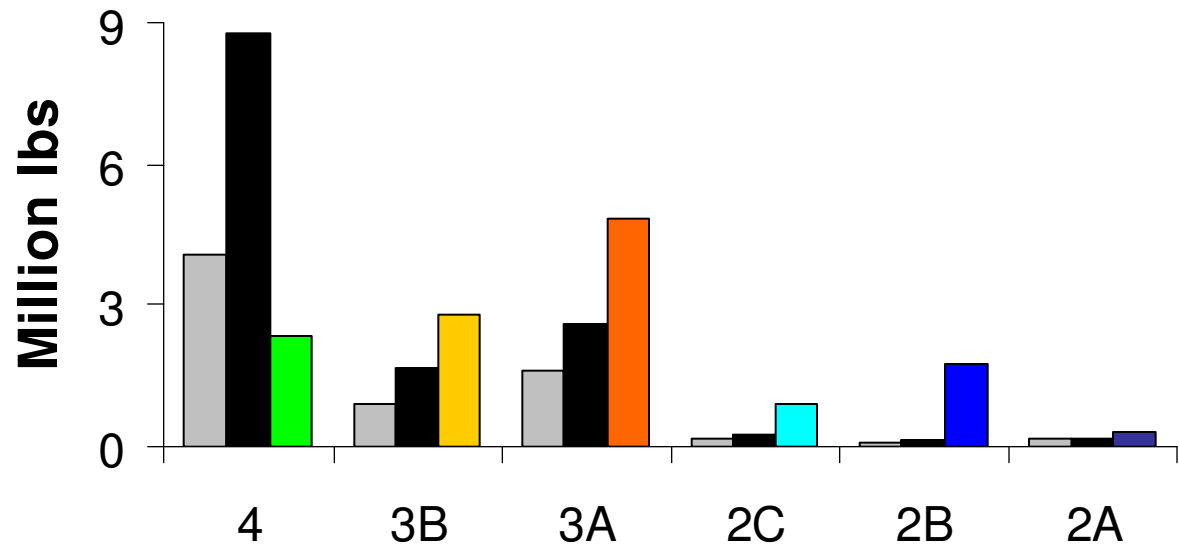
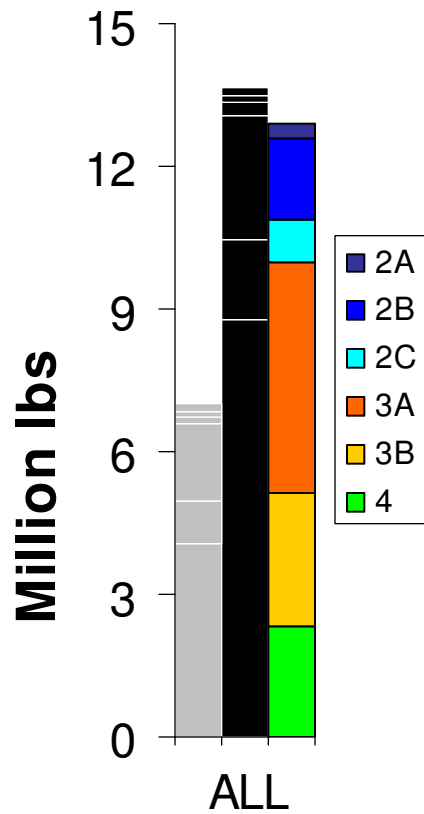


Not in BB

U32 bycatch by area of capture and area where SBio is lost

(SBio replacement)

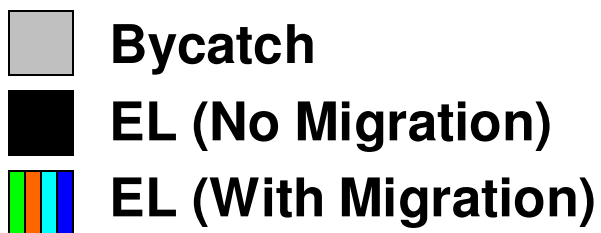
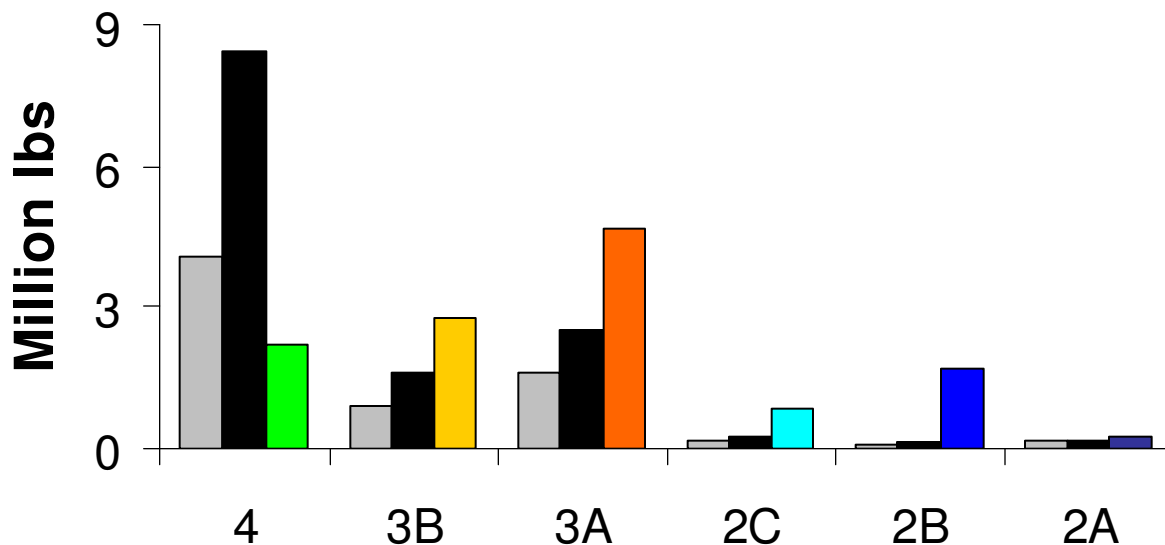
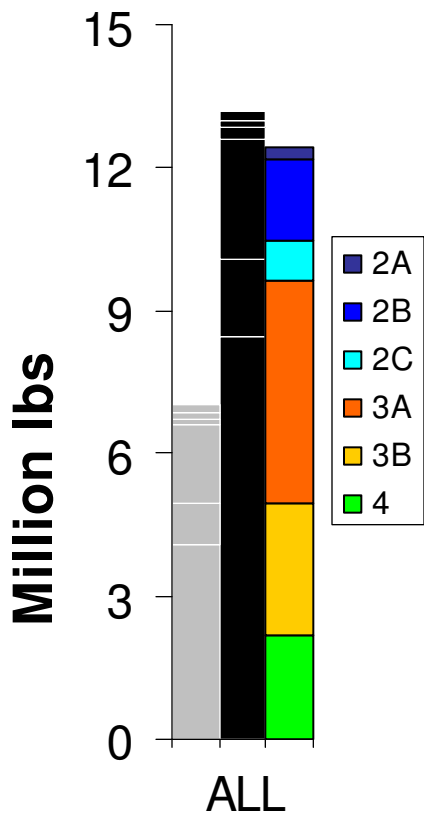
WITH Migration



U32 bycatch by area of capture and area where eggs are lost

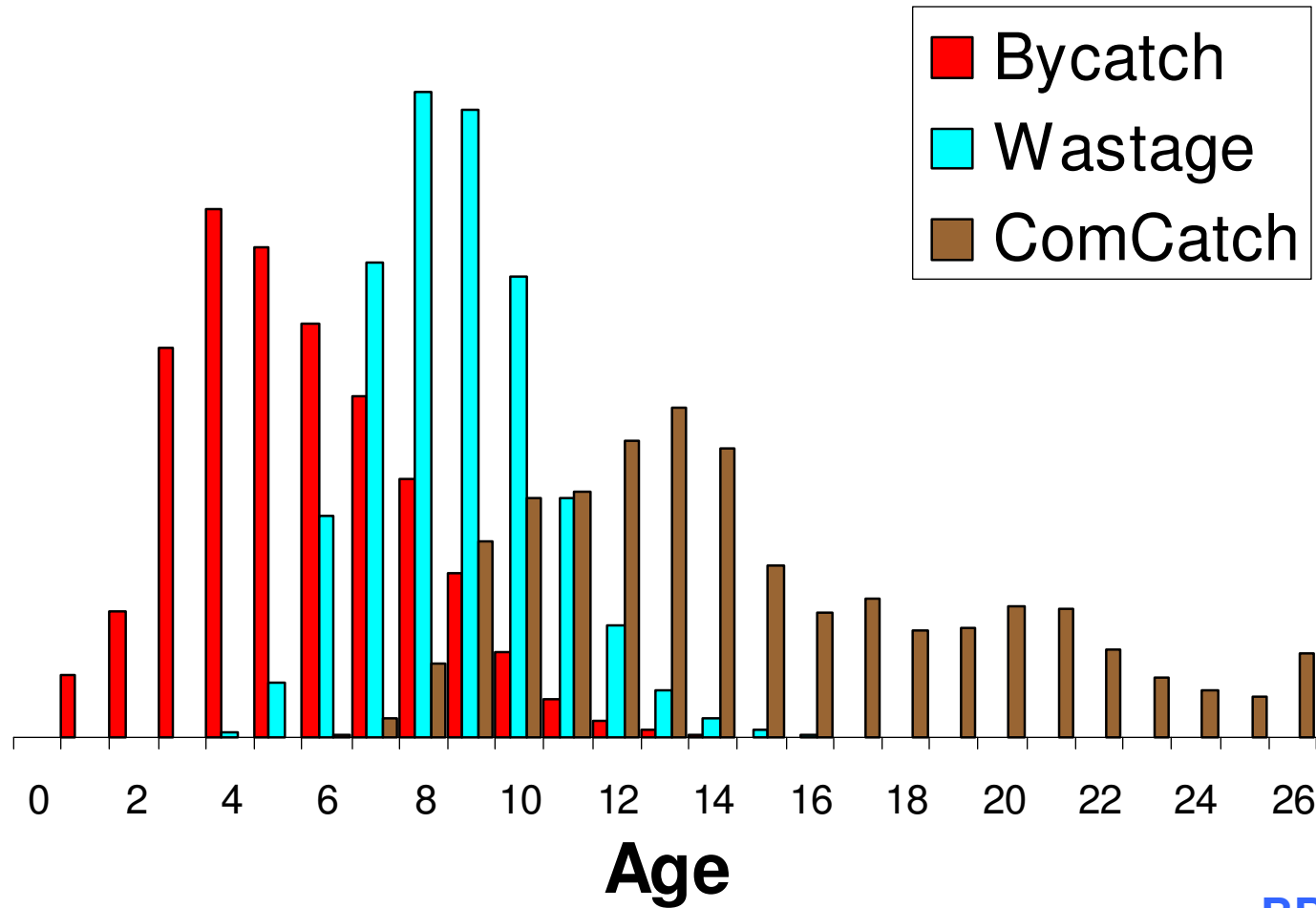
(Egg Loss replacement)

WITH Migration

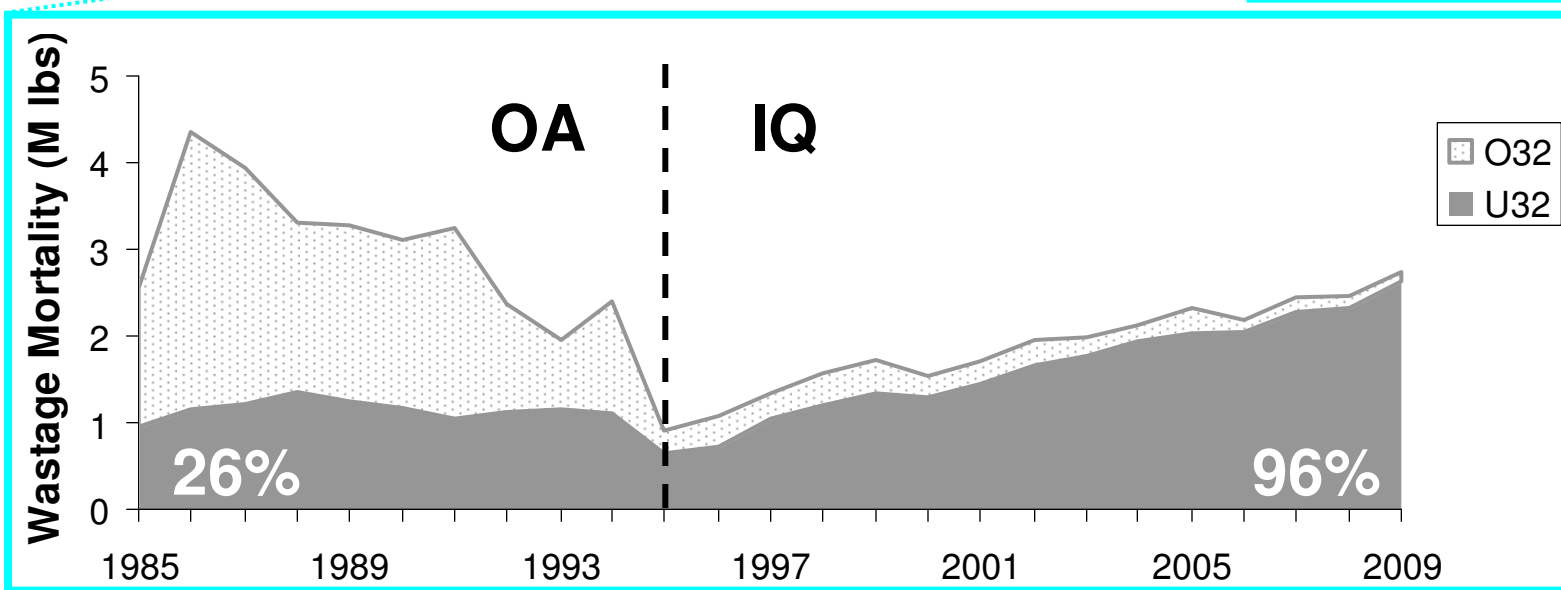
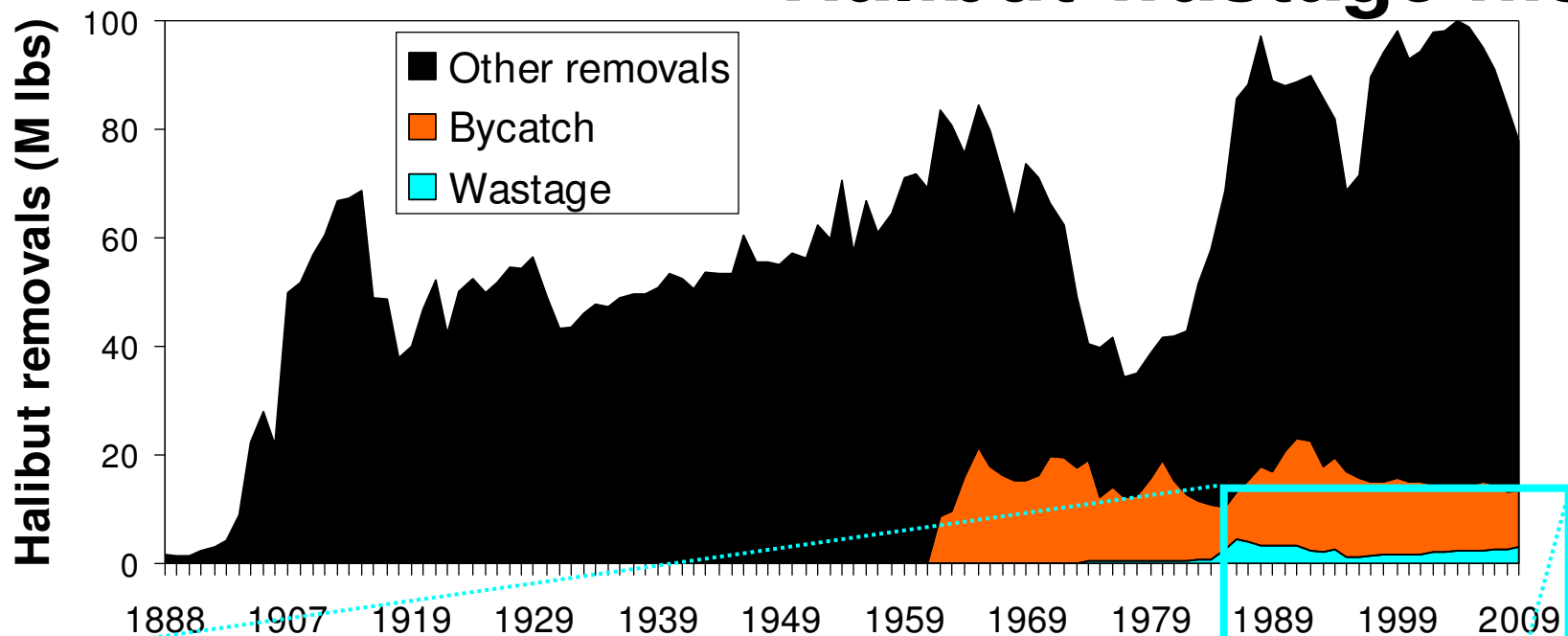


Lost yield due to U32 wastage: Effects of migration

Age freq. distributions of U32 Bycatch, U32 Wastage, Com. Catch



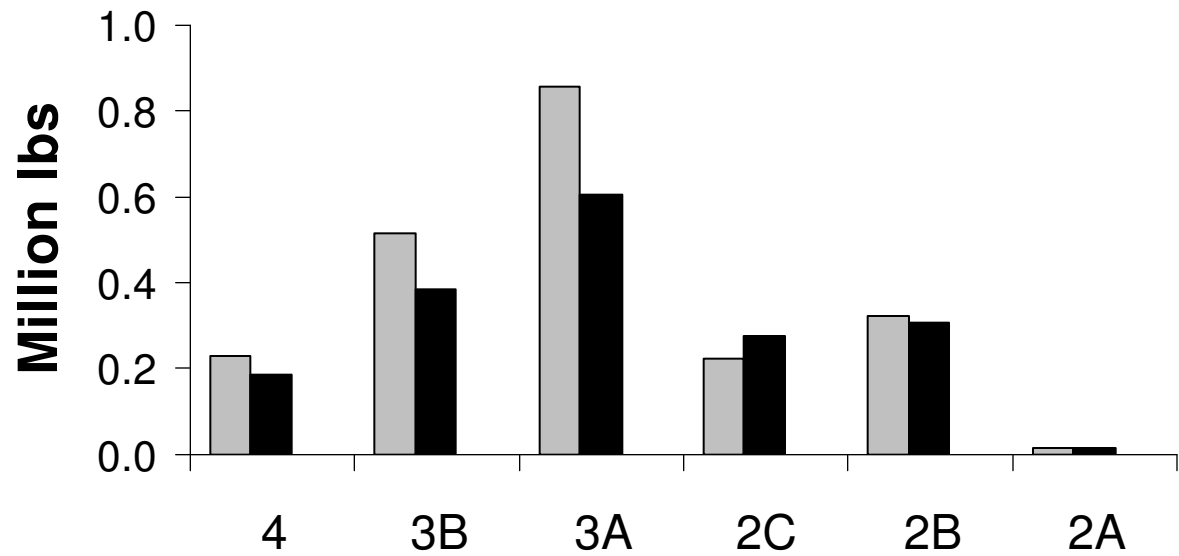
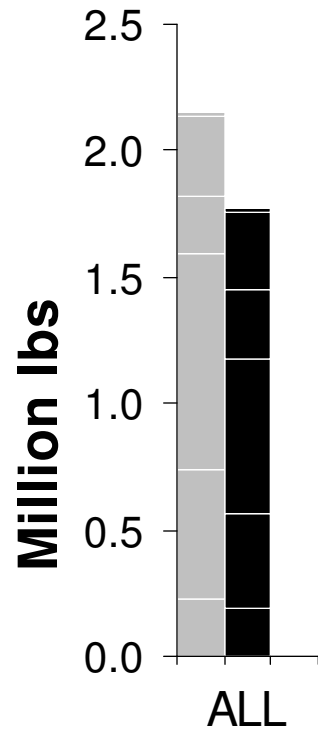
Halibut wastage history



Not in BB

U32 wastage by area of capture and area where yield is lost

NO Migration

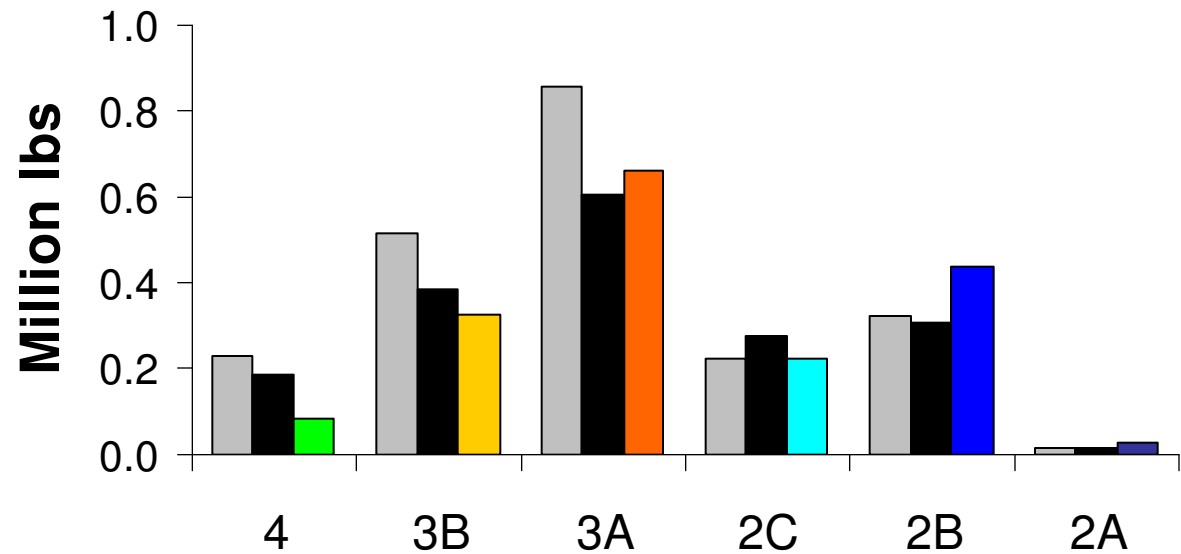
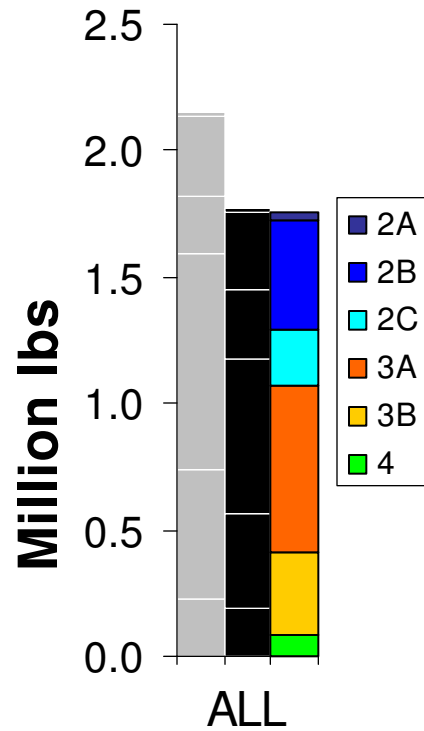


 **Wastage**
 **Lost Yield (No Migration)**

Not in BB

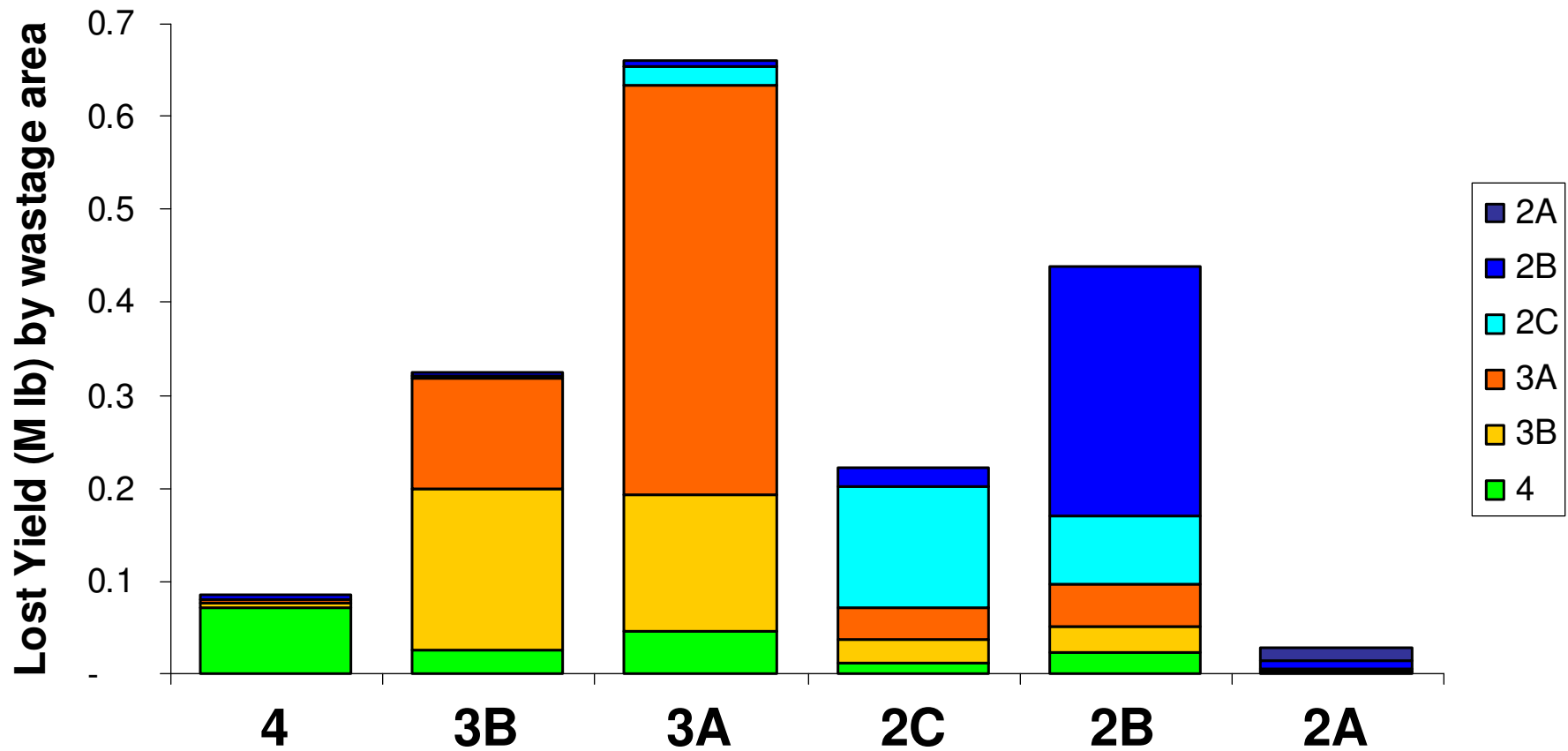
U32 wastage by area of capture and area where yield is lost

WITH Migration



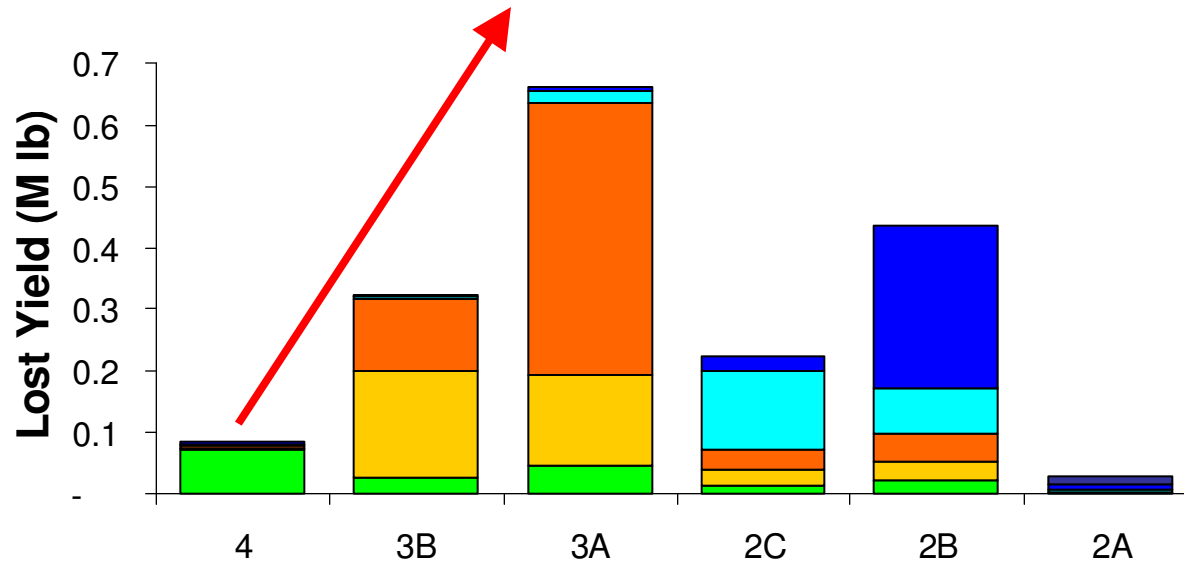
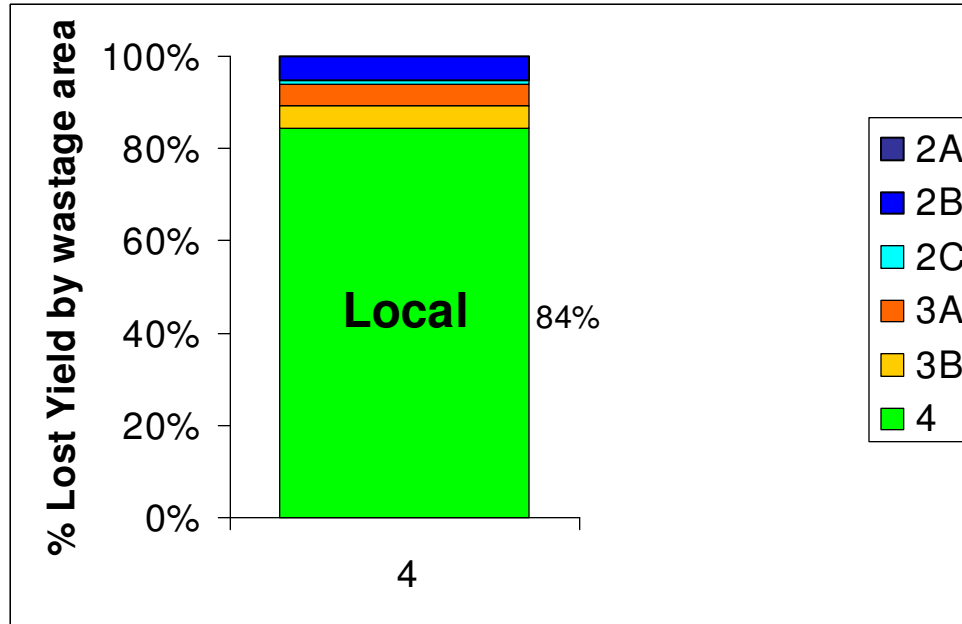
Source of U32 wastage for each area where yield is lost

WITH Migration



Area 4 summary of lost yield by % origin of U32 wastage

WITH Migration

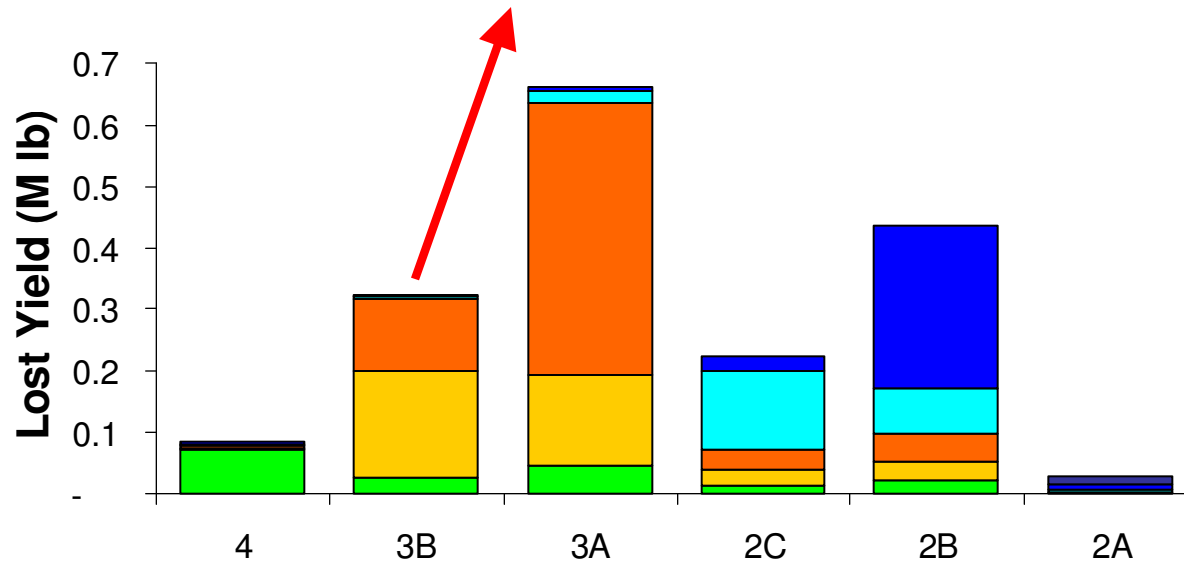
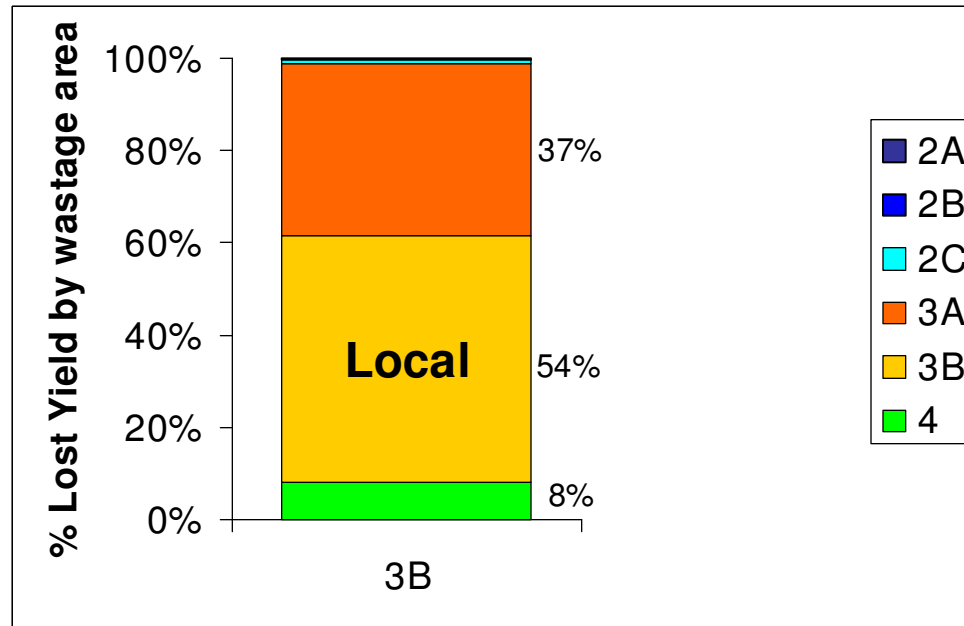


Not in BB

24

Area 3B summary of lost yield by % origin of U32 wastage

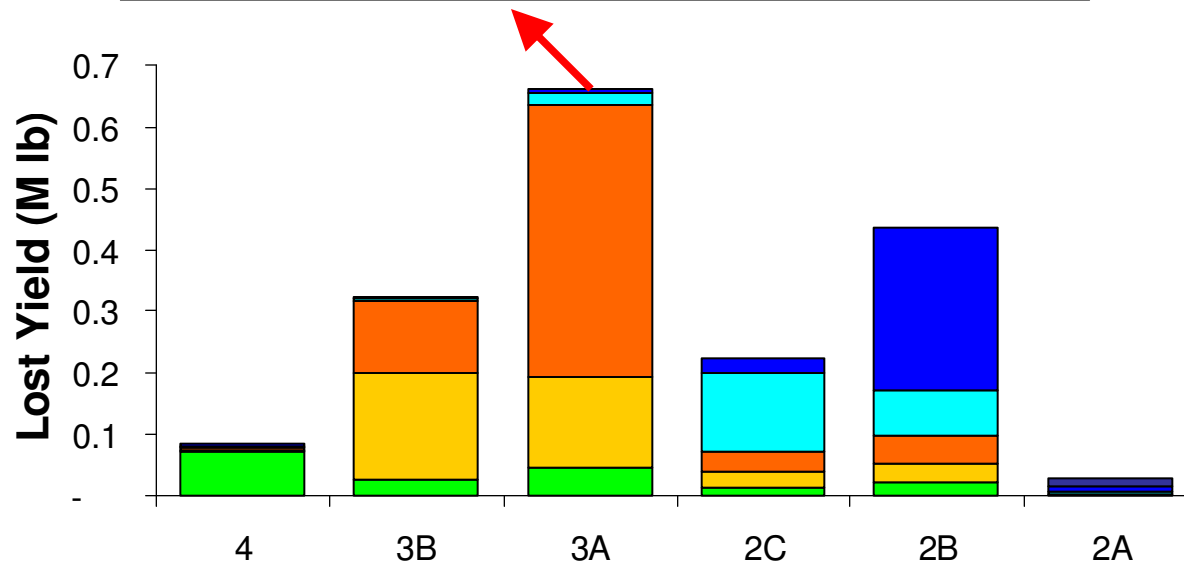
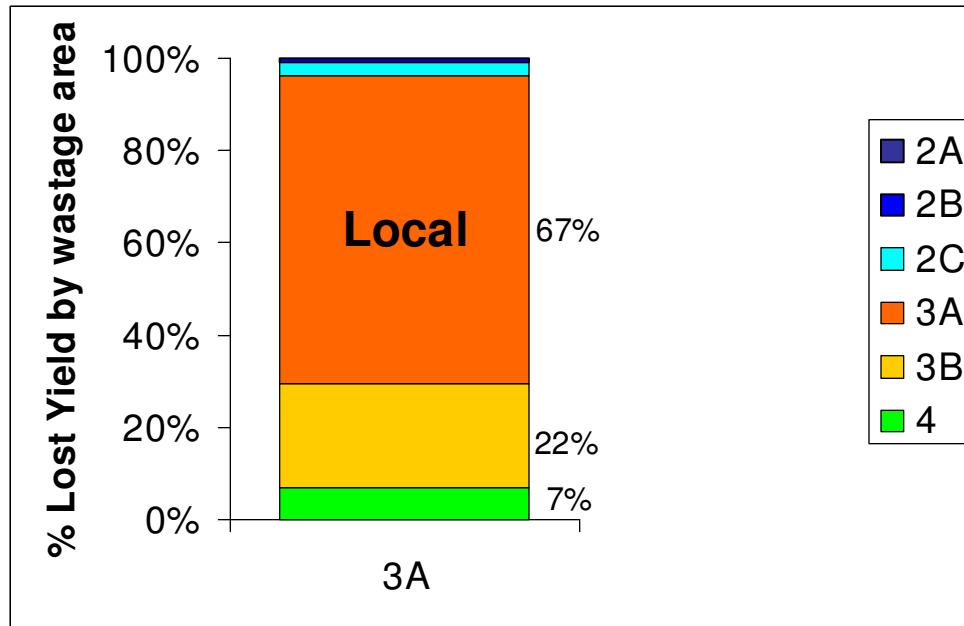
WITH Migration



Not in BB

Area 3A summary of lost yield by % origin of U32 wastage

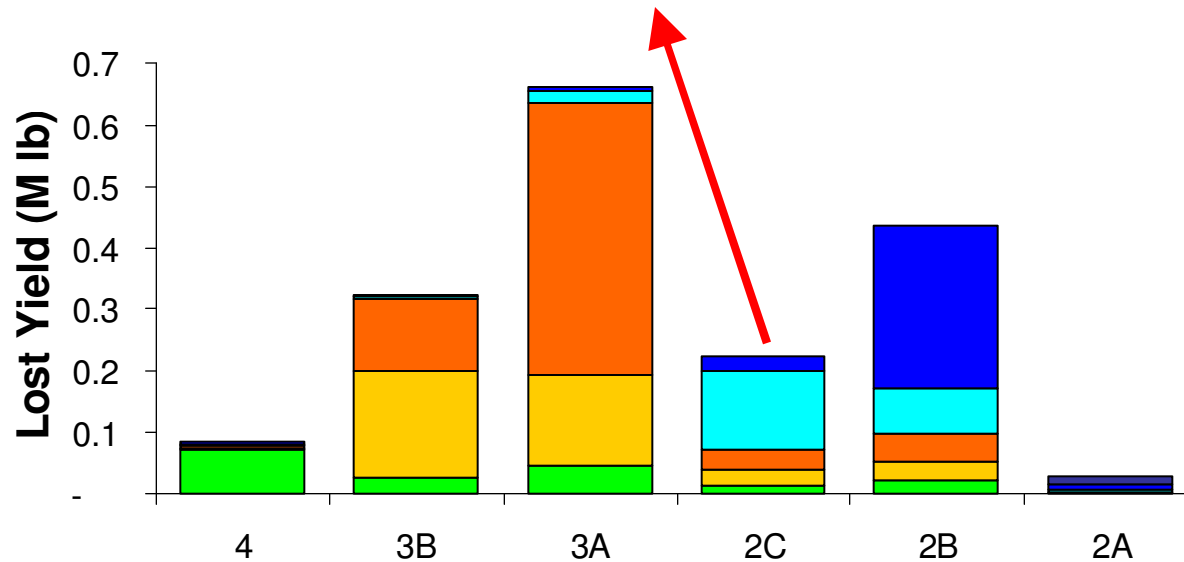
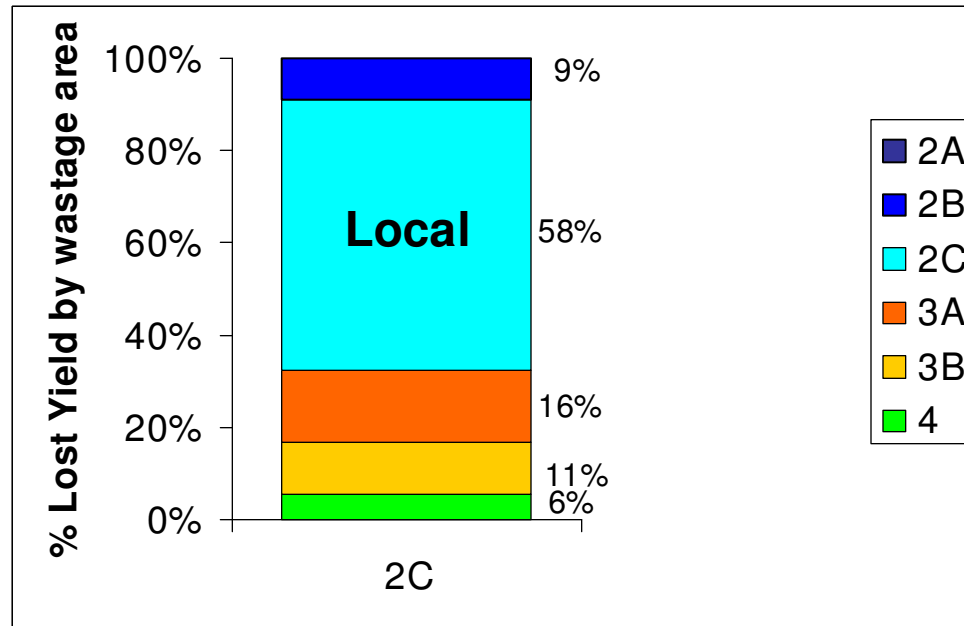
WITH Migration



Not in BB

Area 2C summary of lost yield by % origin of U32 wastage

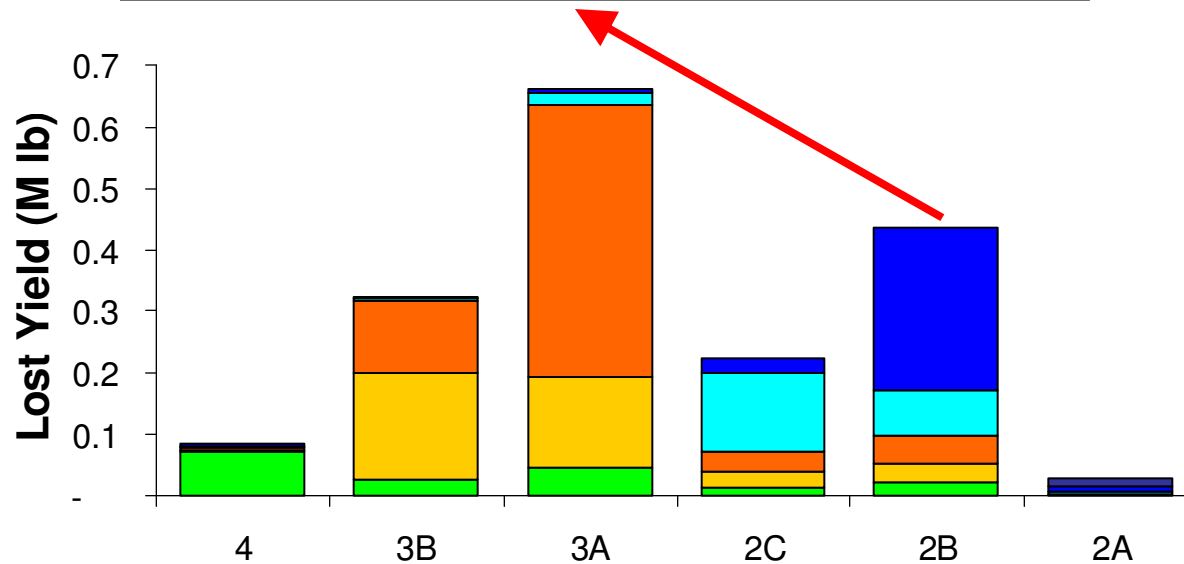
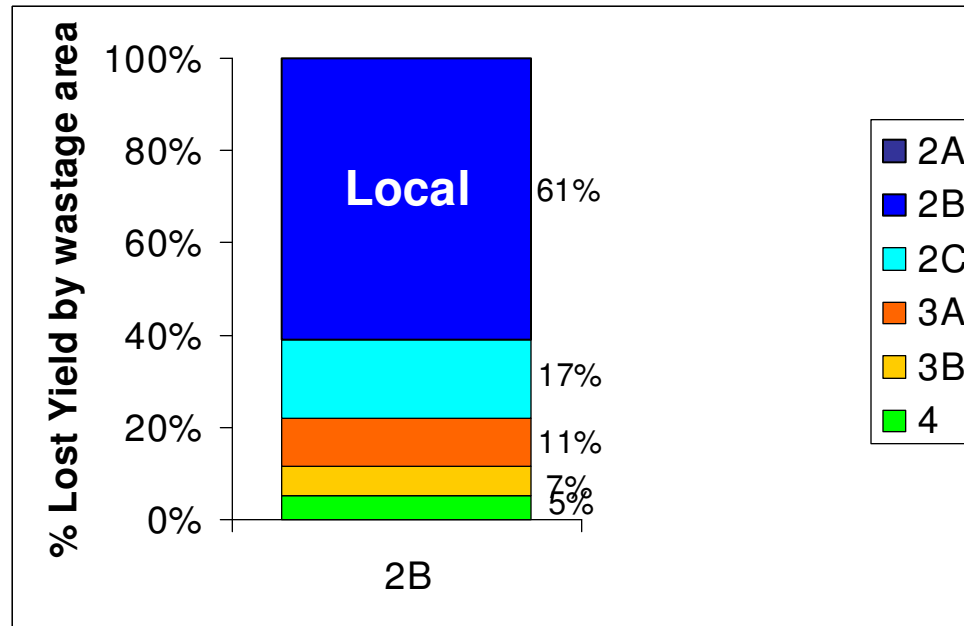
WITH Migration



Not in BB

Area 2B summary of lost yield by % origin of U32 wastage

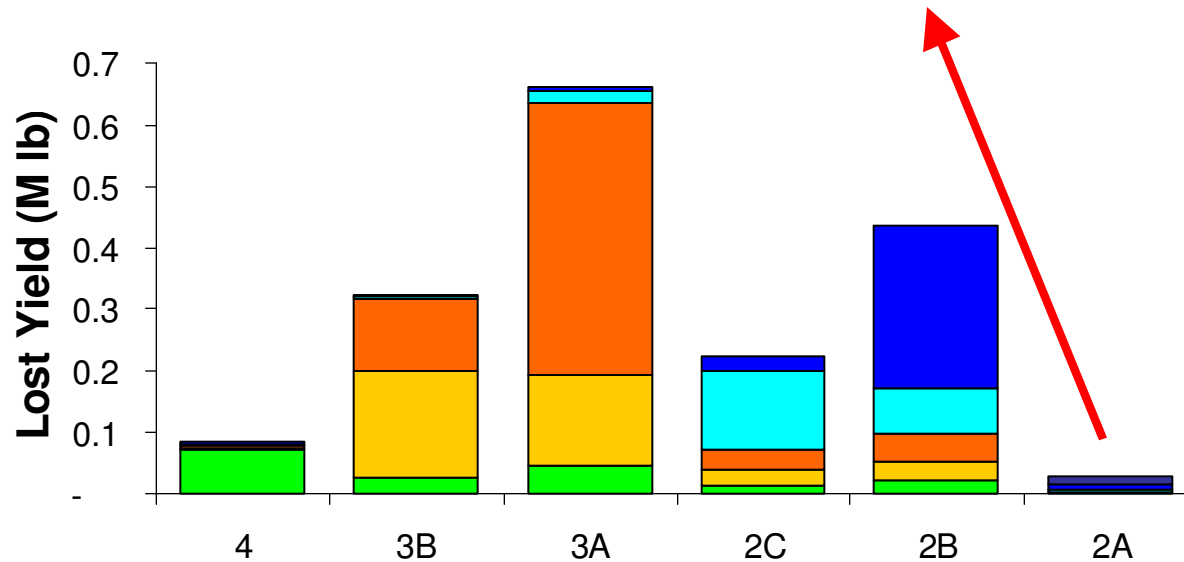
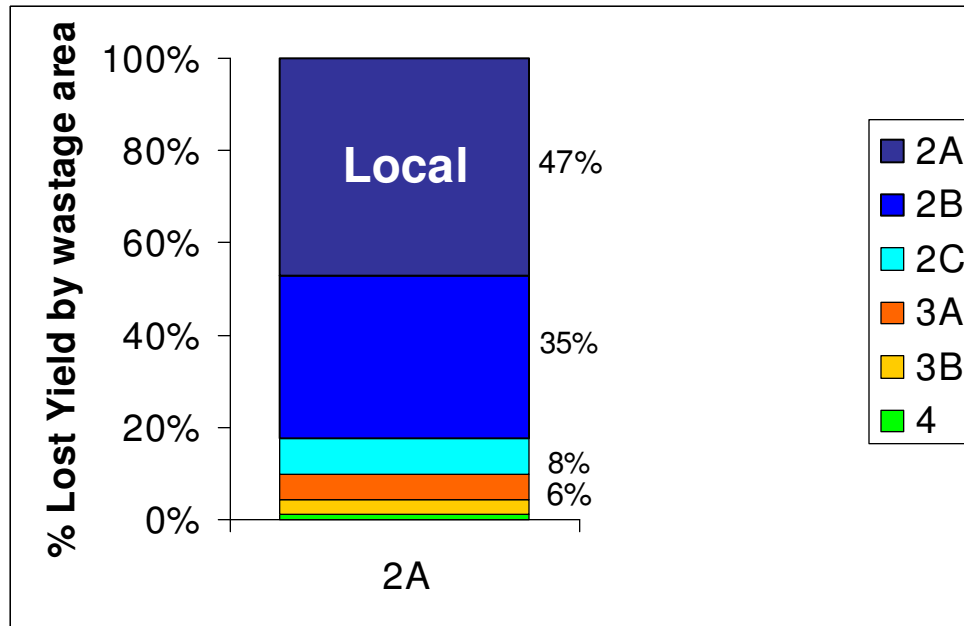
WITH Migration



Not in BB

Area 2A summary of lost yield by % origin of U32 wastage

WITH Migration



Not in BB

Summary of effects of migration on U32 impacts on Lost Yield (LY), Lost SBio and Egg Loss (EL)

- **Coastwide** impacts are similar with or without accounting for migration of U32 bycatch and U32 wastage
- **Area specific** impacts differ by area and type of U32 mortality when accounting for migration :
 - Decreased impacts of U32 bycatch & U32 wastage on Area 4 and increased impacts on other areas, particularly Area 2
 - Most of the impacts of U32 bycatch from **out of area bycatch**
 - Most of the impacts of U32 wastage are from **local wastage**