New England Fishery Management Council
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C.M. 'Rip' Cunningham, Jr., *Chairman* | Paul J. Howard, *Executive Director*

MEMORANDUM

DATE: **November 1, 2011**

TO: Whiting Oversight Committee and Advisory Panel

FROM: Whiting Plan Development Team

SUBJECT: **Analysis of potential red and silver hake possession limit alternatives**

During the development of accountability measure alternatives in Draft Amendment 19, the Whiting Oversight Committee and Council identified several measures that would rely on incidental or year around possession limits to limit landings and catch, reducing the risk that catch would exceed the ACL and that an early reduction of red hake possession limits to incidental levels could increase discards while vessels target silver hake.

The actual possession limit amounts were to be determined by analysis and the Council may take out to public hearing a range of alternatives for comment. The analysis presented in this document evaluates the potential effectiveness of various red and silver/offshore hake possession limits. It quickly became apparent to the PDT that there is no perfect solution and landings per trip have a considerable range (see Figures 1, 3, 5, and 7), regardless of reported mesh size and the amount of revenue derived from hake landings (a measure of targeting hakes). As usual, the choice will require a tradeoff between effectively reducing landings and catch versus increasing discards and reducing fishery revenue. In the near term, the Total Allowable Landings (TALs) are several times higher than recent landings and it is unlikely that the TAL triggers to invoke incidental possession limits will occur except for northern red hake. And as long as landings do not appreciably increase, the only measures that will be meaningful will be the northern red hake incidental possession limit and the year around possession limits for red hake.

The PDT examined and analyzed red and silver hake landings per trip data from 2008-2010 to provide guidance to the Oversight Committee and advisors. Landings by a vessel on a single day or with consistent VTR serial numbers were considered to be one trip, regardless of the number of dealers reporting landings. All landings were converted to live weight for analysis which would be consistent with the proposed possession limits in Amendment 19. Trips were categorized by the reported mesh size (for trips with matching VTR serial numbers) and by the proportion of a trip's revenue derived from the landings of red, silver, and offshore hake. Mesh size was grouped into three categories: < 2.5 inch mesh (often trips targeting other species like

herring, shrimp, and squid), 2.5-4.5 inch mesh (often trips targeting hakes), and > 4.5 inch mesh (often trips targeting other species like regulated groundfish, black sea bass, and summer flounder).

Trips were also categorized into four revenue groups: <15% (trips targeting other species), 15-45% (trips targeting other species with a significant catch of hakes), 45-75% (mixed trips), and >75% (trips targeting hakes) (see the table below). This categorization was important, because lacking a more sophisticated possession limit model, the PDT made certain simplifying assumptions about how fishermen would respond when the trip's landings exceeded various possession limits.

For the first group of trips targeting other species, the PDT assumed that landings would be reduced to the possession limit and the remainder would be discarded, i.e. the trip would continue regardless of the hake possession limit. For the second group with hake revenue between 15 and 45 % of the total on the trip, the PDT assumed that the trips would continue and discard the excess when landings were less than twice the possession limit. When landings were more than twice the silver hake possession limit, the PDT assumed that only 75 percent of the trips would continue and the other 25% would either stop fishing or fish in other ways to reduce their catch of silver hake. And because many of these trips land red hake incidentally while targeting silver hake, the PDT assumed that trips with red hake landings more than twice the red hake possession limit would continue, discarding the excess.

Similar logic was applied to the mixed trip category, with hake revenue between 45 and 75 percent of the trip's total revenue. The PDT assumed that only 25% of the trips would continue fishing as before when the silver hake landings were more than twice the possession limit, but would otherwise continue fishing as before when landings were less than twice the possession limit. For red hake, the PDT assumed that 75% of trips would continue fishing because many are targeting silver hake as discussed above.

And for trips targeting hakes (with hake revenue > 75% of the total), the PDT assumed that trips would not continue fishing when silver hake landings exceeded the possession limit, but would fish as before when landings were less than or equal to the silver hake possession limit. And as discussed above, many of the trips that land red hake target silver hake, the PDT assumed that 50% of the trips would fish as they had when red hake landings were less than twice the red hake possession limit and 25% of the trips would continue doing so when red hake landings were more than that.

The results, particularly the estimate of discard to kept (D/K) ratios and expected catch reduction are sensitive to the above assumptions. But lacking a more sophisticated model and data on daily fishing costs, the PDT thought that these choices are reasonable assumptions to make to compare the potential effect of various possession limit alternatives.

Table 1. Example possession limit analysis applied to trips landing silver hake (top) and red hake (bottom).

Calendar year	2008-2010	Proposed possession limit	2500
Management area	(All)	Predicted landings reduction	-62.2%
Stock	Northern Stock	Predicted silver hake revenue reduction	-63.1%
Species	SILVER_HAKE	Predicted catch reduction	-60.1%
Mesh	(All)	Discard to kept ratio	5.6%
		Proportion of trips affected	23.8%

Continue fishing @ < 2X & >2X	< 15% hake revenue		15-45% hake revenue		45-75% hake revenue		>75% hake revenue	
	100%	100%	100%	75%	100%	25%	0%	0%
	Landings	Revenue	Landings	Revenue	Landings	Revenue	Landings	Revenue
Trips	1,234		40		343		991	
Trips > possession limit & < 2x possession	-		-		61		251	
Percent	0%		0%		18%		25%	
Trips > 2X possession limit	-		-		34		276	
Landings (lbs)	43,233	25,723	19,673	7,619	829,518	397,928	5,764,454	3,679,529
Landings>possession limit (lbs) & < 2x	-	25,723	-	7,619	215,441	397,928	870,812	3,679,529
Percent	0%		0%		26%		15%	
Landings > 2X possession limit (lbs)	-		-		328,478		4,280,567	
Predicted landings	43,233	$ 25,723	19,673	$ 7,619	523,099	$ 250,936	1,930,575	$ 1,232,312
Predicted catch	43,233		19,673		662,847		1,930,575	

Calendar year	2008-2010	Proposed possession limit	500
Management area	(All)	Predicted landings reduction	-48.1%
Stock	Northern Stock	Predicted red hake revenue reduction	-48.1%
Species	RED_HAKE	Predicted catch reduction	-25.4%
Mesh	(All)	Discard to kept ratio	43.7%
		Proportion of trips affected	34.4%

Continue fishing @ < 2X & >2X	< 15% hake revenue		15-45% hake revenue		45-75% hake revenue		>75% hake revenue	
	100%	100%	100%	100%	100%	75%	50%	25%
	Landings	Revenue	Landings	Revenue	Landings	Revenue	Landings	Revenue
Trips	31		4		30		284	
Trips > possession limit & < 2x possession	-		1		8		52	
Percent	0%		25%		27%		18%	
Trips > 2X possession limit	-		-		8		51	
Landings (lbs)	1,629	787	1,048	547	21,115	8,415	167,856	78,554
Landings>possession limit (lbs) & < 2x	-	787	890	547	5,717	8,415	36,871	78,554
Percent	0%		85%		27%		22%	
Landings > 2X possession limit (lbs)	-		-		12,285		96,415	
Predicted landings	1,629	$ 787	658	$ 343	11,113	$ 4,429	86,070	$ 40,279
Predicted catch	1,629		1,048		19,794		120,516	

Incidental possession limit analysis

Application of these assumptions to dealer reported landings on trips landing hakes can suggest an appropriate range of possession limits. For an incidental possession limit accountability measure, it becomes more important to effectively reduce landings with a trigger that is a high proportion of the TAL, especially when the buffer to account for management uncertainty is small. On the other hand, a lower TAL trigger or larger management uncertainty buffer could allow for a higher incidental possession limit that would not cause excessive discarding.

Over the range of potential possession limits, a few relevant characteristics were summarized and plotted in the following figures. The percent of trips affected by a possession limit and the expected proportion of landings reduction were summarized. For the measure to be effective and prevent the catch from exceeding the ACL, it is important to substantially reduce landings by 80% or more, especially if only 10% of the TAL has not been landed. Doing so may create unacceptable discards if the landings on trips targeting other species are higher than the incidental possession limit. The PDT estimated the effect that the possession limit alternatives would have on catch, after accounting for expected discarding as described above. And a discard to kept ratio could be estimated from the new discard divided by expected landings. In cases where most of the landings over the possession limit were from trips targeting hakes, discards were low and possession limits were more effective in reducing catch. And vice versa.

Red hake

For red hake in the northern stock area, the PDT analyzed limits from 50 to 600 lbs. of red hake (Figure 2), which were calculated to reduce landings by over 90 to less than 50%. These limits would have affected 85 to 30% of the 2008-2010 trips. But because many trips target other species, the estimated discard to kept ratio was high, exceeding a 2:1 ratio with a 50 lb. possession limit and being almost 0.4:1 with a 600 lbs. limit. For northern red hake, the PDT

recommends that the Council consider an incidental northern red hake possession limit of 200 to 400 lbs.

For red hake in the southern stock area, the potential possession limits would be even less likely to reduce catch and would be more likely to increase discarding (see Figure 4). At a 200 lbs. possession limit for example, discards might be as high as 1.8:1 while reducing landings by only 73%. The PDT again recommends consideration of a 200 to 400 lbs. possession limit, but cautions that a 200 lbs. limit might cause unacceptable discarding.

As an alternative, the Council may want to consider incidental red hake possession limits which are on the higher end of the range, but with a lower TAL trigger (i.e. less than 90%). Taking this approach might reduce the opportunity for targeting red hake, but reduce the potential that it could become a choke species and cause high discards for vessels targeting silver hake.

Silver hake

Possession limits are generally more effective in reducing catch while not increasing discarding than they are for red hake because vessels that land silver hake are typically targeting silver hake. This generalization is more correct in the northern stock area (Figure 6) than in the southern stock area (Figure 8). This is probably due mainly to the small mesh exemption programs on Georges Bank and in the Gulf of Maine. But trips typically land higher amounts of silver hake than red hake. In both areas, an incidental limit of 500 lbs. or less is expected to reduce landings by more than 90%.

In the north (Figure 6), catch would be reduced by over 85% with discards between 0.3:1 and 0.7:1. The D/K ratio with incidental limits of 500 lbs. or more are expected to be below 0.3:1. In the south (Figure 8), a 500 lbs. incidental silver hake possession limit would be as effective reducing landings but not quite as effective in reducing catch. The discard to kept ratio would exceed 1:1. In contrast, an incidental possession limit of 2000 lbs. would reduce landings by more than 70% but with discards less than 50% of silver hake landings (0.5:1).

For silver hake, the Council may want to consider incidental silver hake possession limits of 500, 1000, and 2000 lbs. based on this analysis of the 2008-2010 trip data.

Red hake year around possession limits

The Oversight Committee and Advisors also included in Draft Amendment 19 alternatives for red hake possession limits by mesh size, similar to existing limits for silver hake. These limits would help to prevent red hake from becoming a choke species for vessels targeting silver hake, promote fishing with larger more size selective mesh, while allowing for customary red hake landings on the majority of trips.

The PDT examined silver to red hake landings ratios on trips landing at least one pound of red hake, but mesh size and stock area. The intention was to use the data to provide some guidance applying these ratios to the silver hake possession limits to derive potential red hake possession limits. In the northern stock area, most of the trips used 2.5-4.5 inch mesh (mostly 3 inch mesh in the small mesh exemption programs) (see Figure 9), or were trips without matching VTR serial numbers (hence no recorded mesh size). The PDT also examined these ratios by the

percent of trip revenue from hake landings to determine whether this ratio was different on trips targeting other species.

The average silver hake to red hake landings ratio in the northern stock area was 6:1 to 11:1 on trips targeting hakes (>75% revenue) and 3:1 to 8:1 on mixed species trips (45-75% hake revenue). Trips landing red hake in the northern area when using mesh < 2.5 inches or > 4.5 inches was more sparse, but the silver to red hake landings ratio ranged from 6:1 to 9:1. Thus with a 30,000 lbs. silver hake possession limit for large mesh, a reasonable red hake limit might range from 3,000 to 5,000 lbs. And with a 3,500 lbs. silver hake limit for vessels using less than 2.5 inch mesh, the landings ratio of 6:1 implies a 500 lbs. limit. Very few trips landed more than these amounts, however.

Similar to the incidental possession limit analysis above, the PDT estimated the effectiveness of various red hake possession limits. The range examined included limits that would reduce landings by about 20% to limits that would accommodate the landings from nearly all 2008-2010 trips reported by dealers, but the PDT recognizes that this does not include transfers at sea for bait and the Council needs to identify how those landings would be applied if a red hake possession limit exists.

In the northern area, the Council may want to use the red hake possession limit to reduce landings, reducing the risk that landings would approach the TAL and trigger a greater reduction to the incidental limit. Based on the results shown in Figure 10, the PDT recommends that the Council consider red hake possession limit alternatives of 1,000 to 3,000 lbs for vessels using 3 inch mesh and of 300 to 1,200 lbs. for all other mesh trawls and other gears.

In the southern stock area (Figure 11), there are considerably more trips landing red hake with small (<2.5") and large (>4.5") mesh. For trips using 3" mesh and for trips without matching VTRs, the ratio of silver hake to red hake landings is about 3.5:1 to 4.5:1 for trips targeting hake, suggesting that with a 30,000 lbs. silver hake possession limit, an appropriate red hake possession limit might be about 6,500 to 9,000 lbs. But very few trips landed more than 7,500 lbs. For small mesh (<2.5") trips, trips targeting hakes had an average silver hake to red hake landings ratio of 1.2:1 to 2.2:1. And with a 3,500 to 7,500 lbs. silver hake limit, these data suggest that a red hake limit around 3,000 lbs. might be appropriate.

Figure 12 shows the estimated effectiveness of various potential red hake possession limits in the southern stock area. It is not as important in the southern stock area that a red hake possession limit reduce landings, since the 2012-2014 TALs are well above recent landings. Thus based on the results shown in Figure 12, the PDT recommends that the Council consider a southern red hake possession limit between 4,000 and 10,000 lbs. for vessels using 3" mesh and between 2,000 and 6,000 lbs. for all other mesh trawls and other gears.

Conclusions

The PDT analysis indicates that setting possession limits based on the analysis of 2008-2010 trip data is suggestive, but not definitive and a range of possession limits could be taken out to public hearing for comment.

Appropriate incidental possession limits for red hake appear to be in the 200-400 lbs. range, but would not be as effective as silver hake incidental possession limits to reduce catch

(and prevent it from exceeding the ACL). The Council may want to consider using an incidental limit at the higher range with a lower TAL trigger, to minimize discards with limits that are not as effective in reducing landings.

Appropriate incidental possession limits for silver hake appear to be 500, 1000, and 2000 lbs. in both the northern and southern stock area.

A year around red hake possession limit in the northern stock area should be between 1,000 to 3,000 lbs for vessels using 3 inch mesh and of 300 to 1,200 lbs. for all other mesh trawls and other gears. The preferred alternative might be chosen based on how important it is to spread out landings throughout the fishing year, since the TAL is close to or somewhat less than recent landings.

In the southern stock area, a year around red hake possession limit should be between 4,000 and 10,000 lbs for vessels using 3" mesh and between 2,000 and 6,000 lbs. for all other mesh trawls and other gears.

Alternatively, the year around red hake possession limits in both stock areas could be simplified to apply to all trips, regardless of mesh size or gear used.

Figure 1. 2008-2010 landings per trip histograms for northern red hake by hake revenue category.

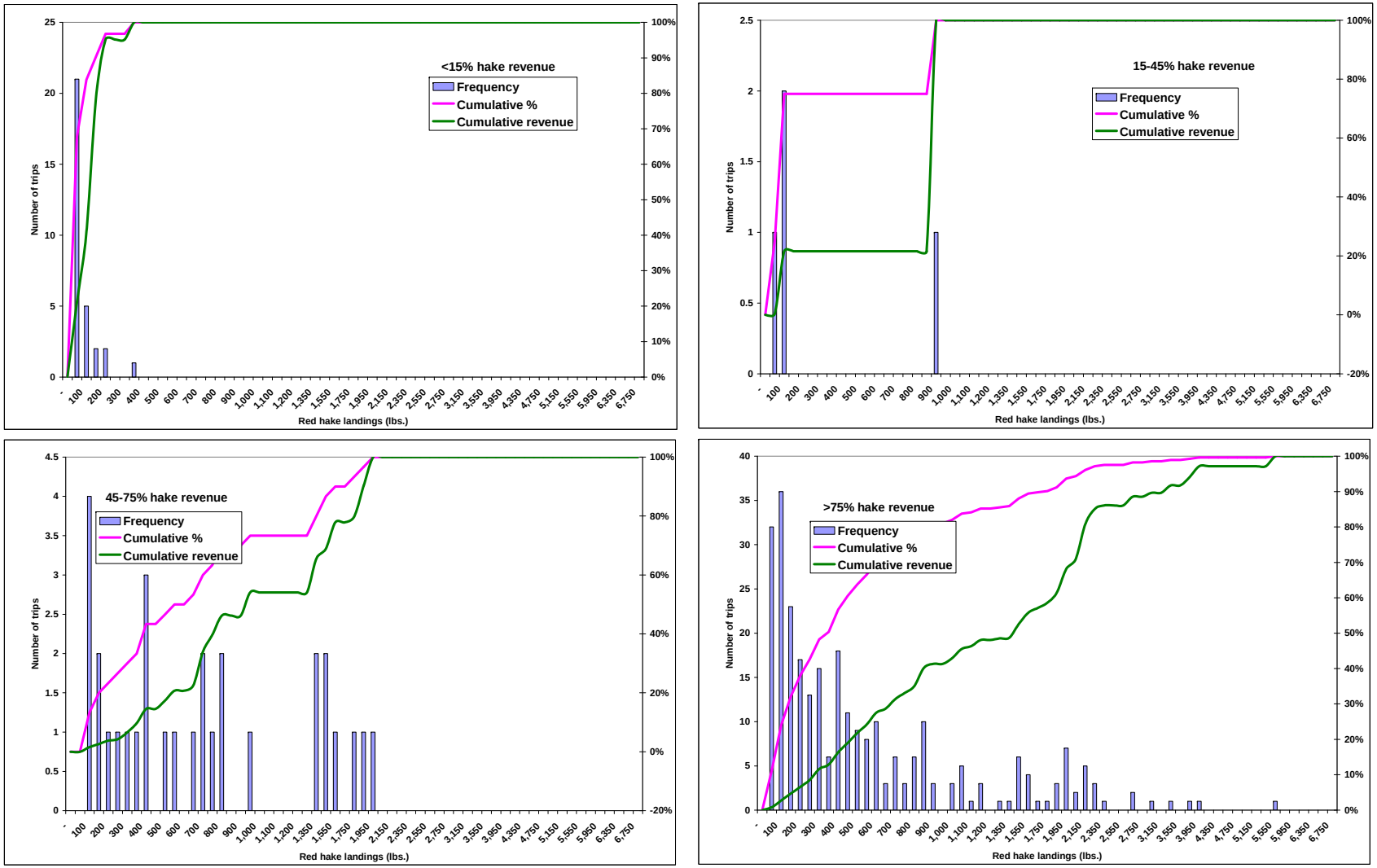


Figure 2. Incidental possession limit effectiveness for northern red hake based on 2008-2010 landings per trip using dealer reported data.

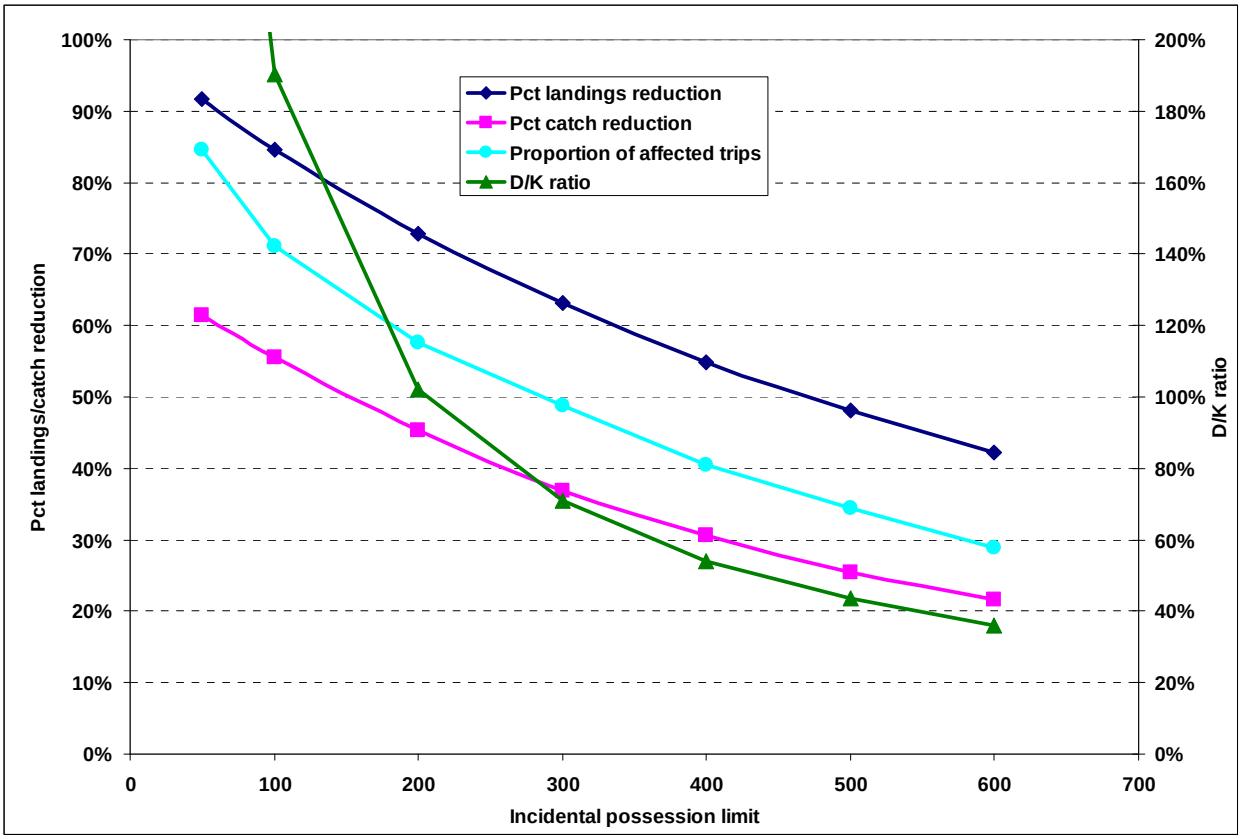


Figure 3. 2008-2010 landings per trip histograms for <u>southern red hake</u> by hake revenue category.

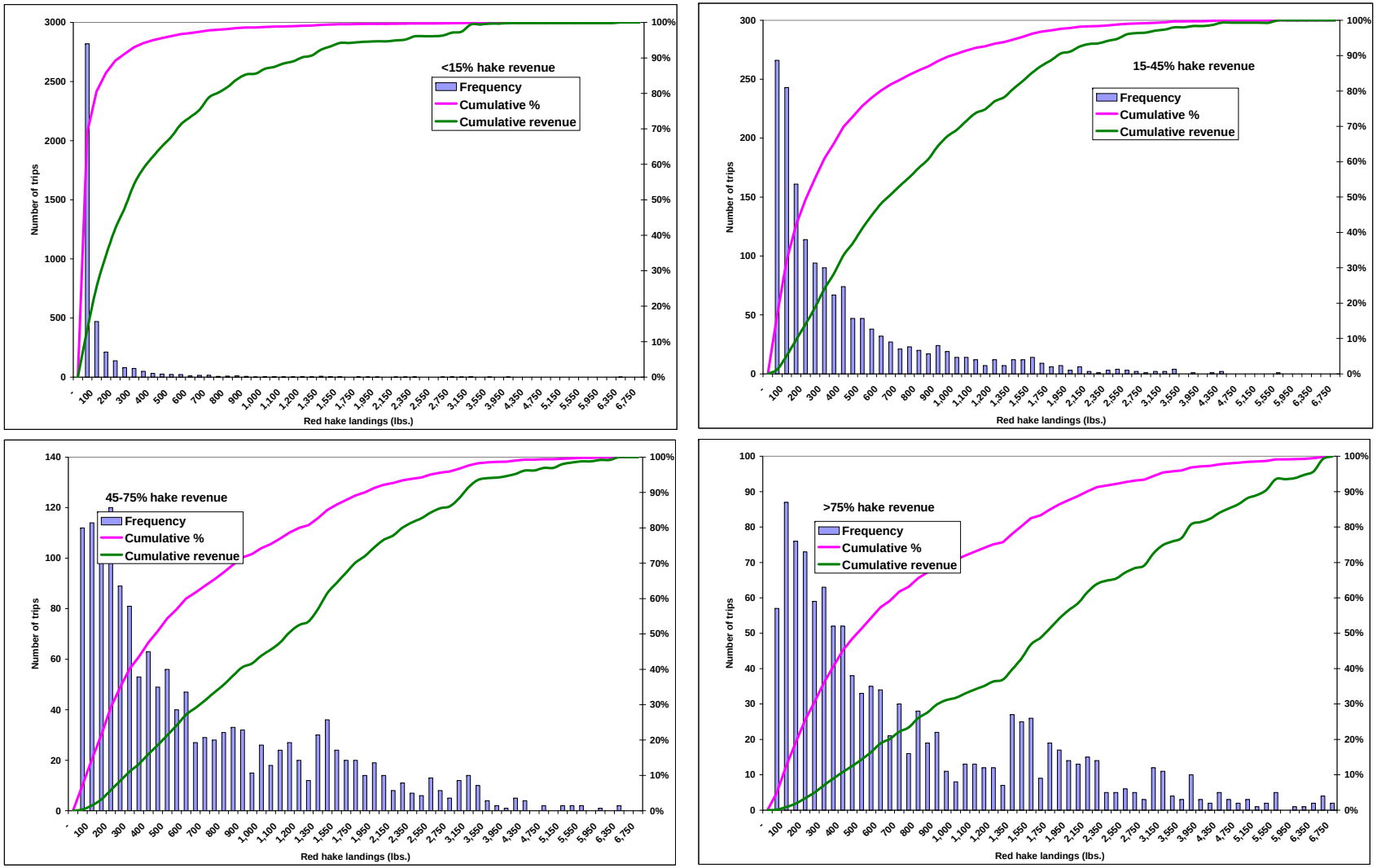


Figure 4. Incidental possession limit effectiveness for southern red hake based on 2008-2010 landings per trip using dealer reported data.

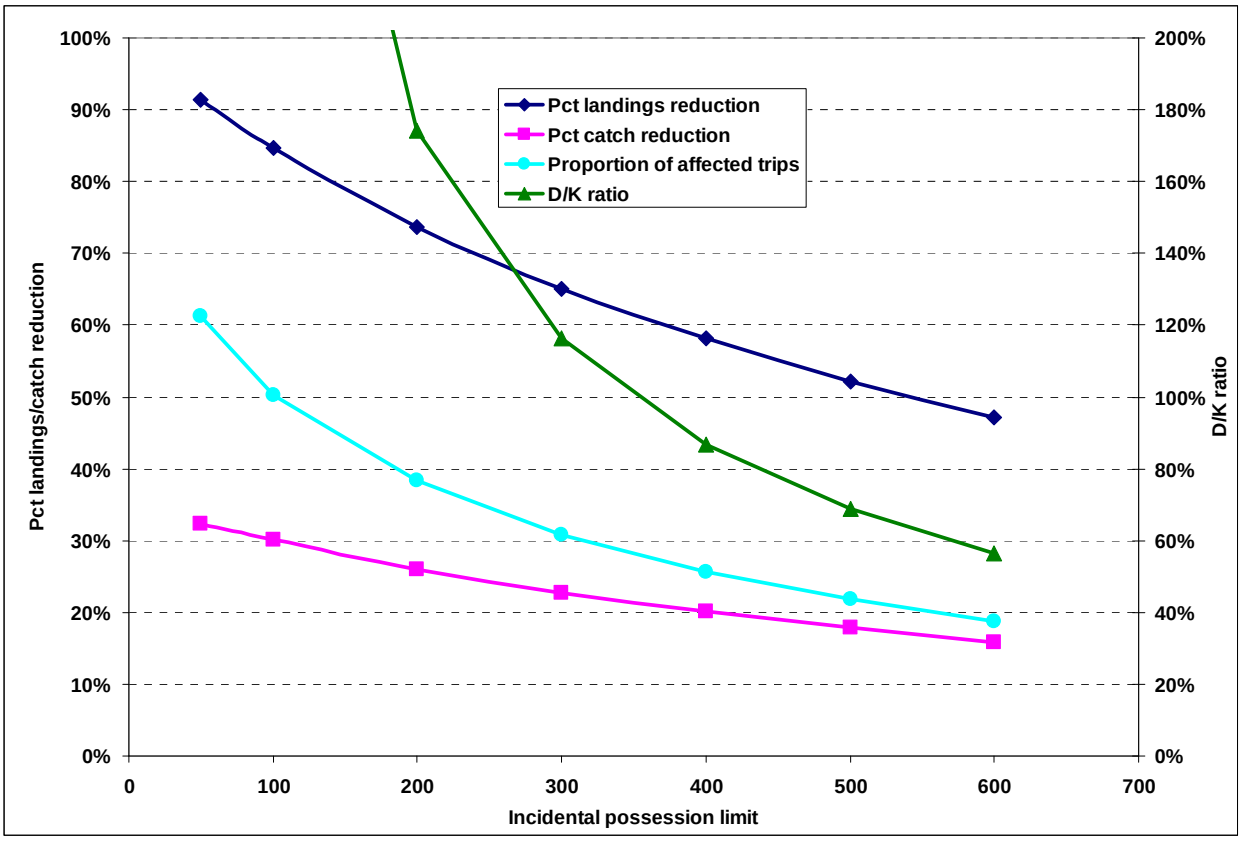


Figure 5. 2008-2010 landings per trip histograms for northern silver hake by hake revenue category.

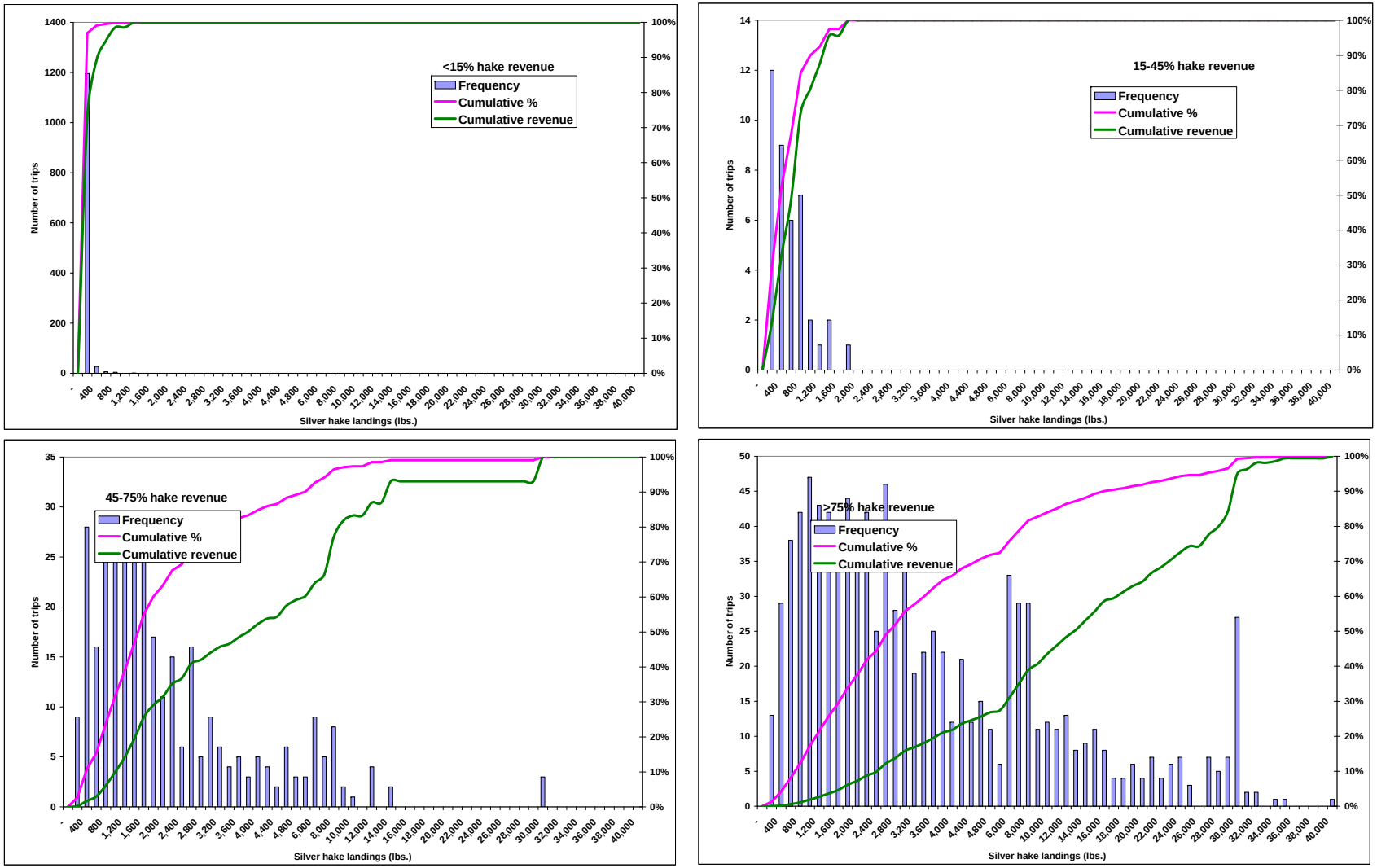


Figure 6. Incidental possession limit effectiveness for northern silver hake based on 2008-2010 landings per trip using dealer reported data.

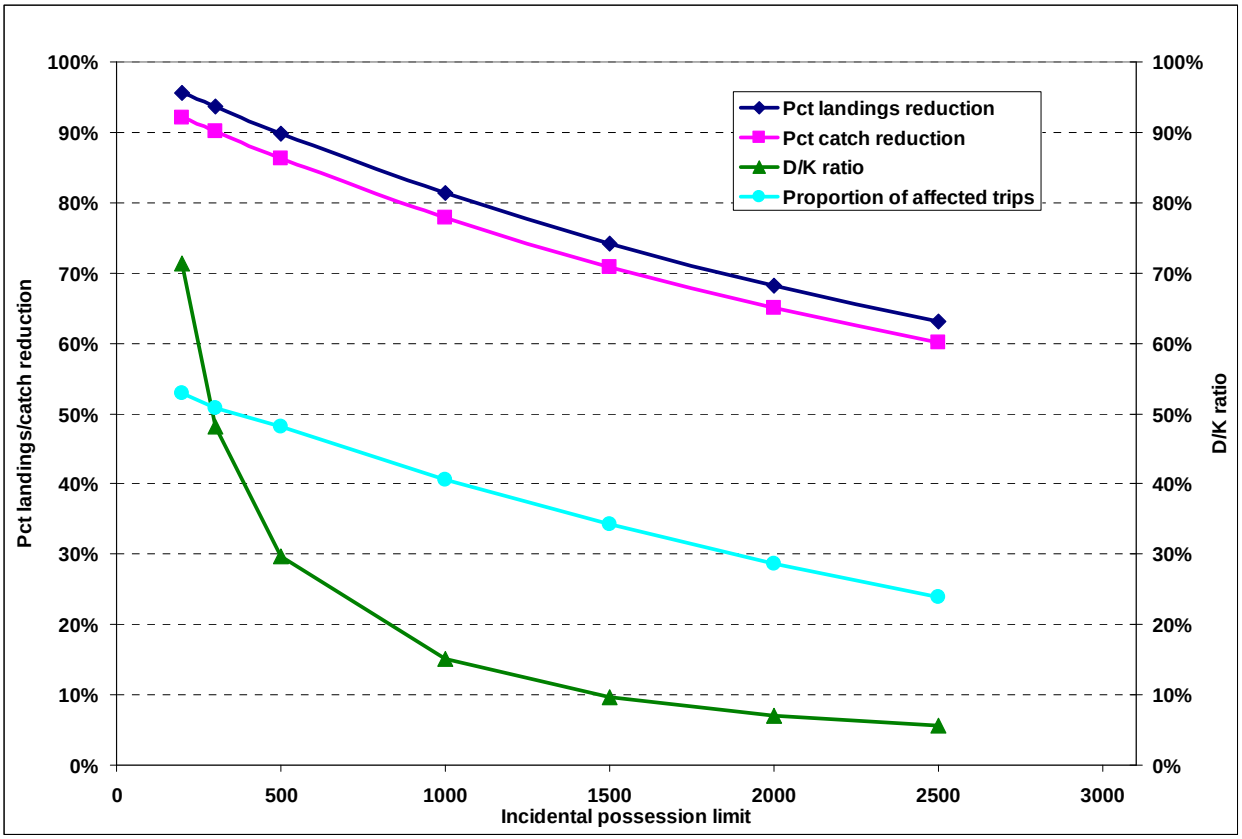
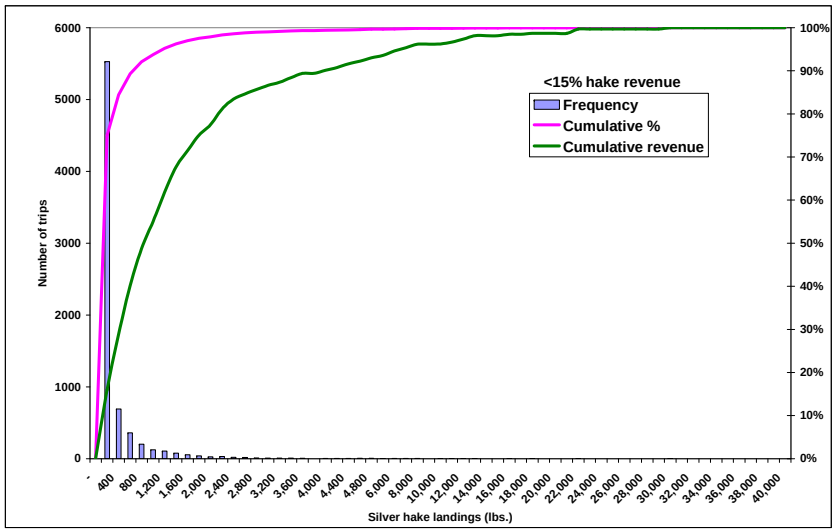
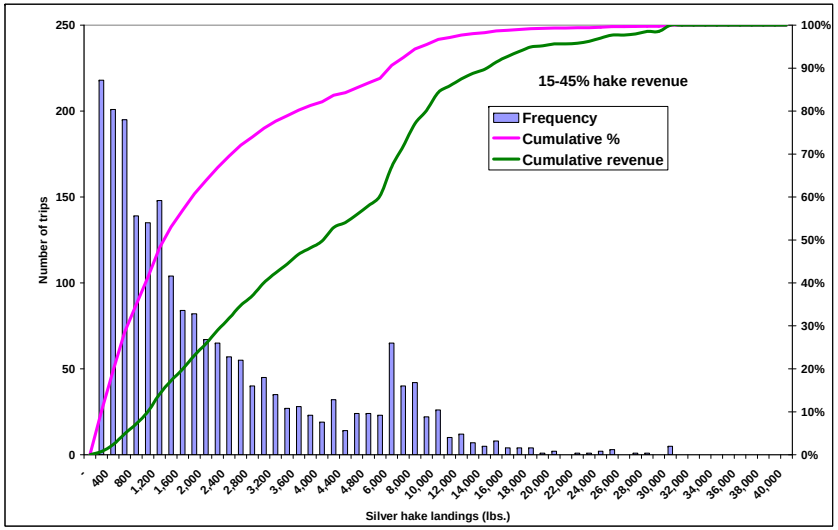
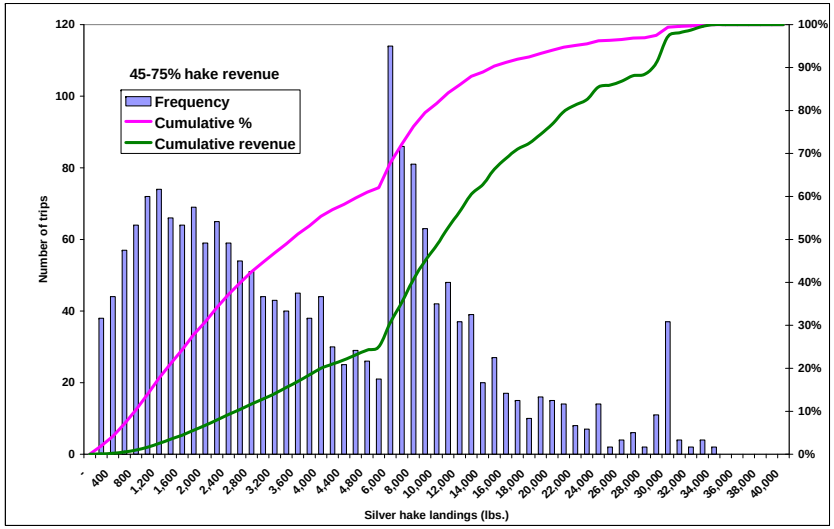


Figure 7. 2008-2010 landings per trip histograms for southern silver hake by hake revenue category.







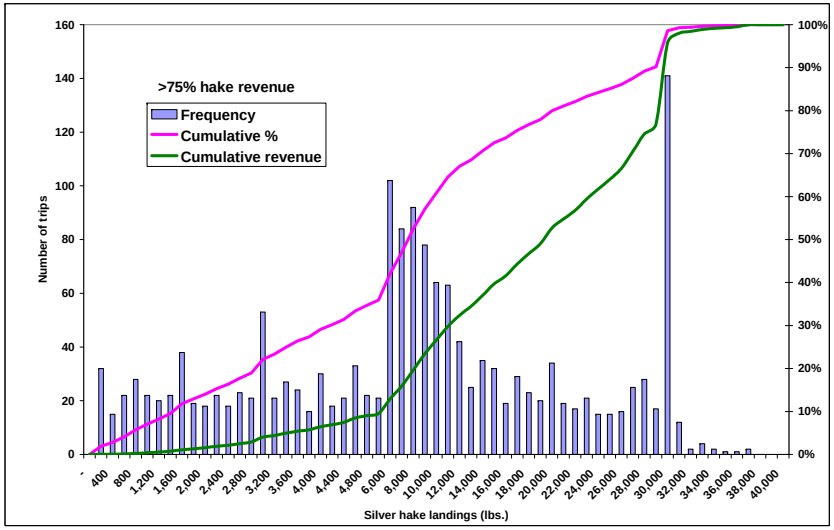


Figure 8. Incidental possession limit effectiveness for southern silver hake based on 2008-2010 landings per trip using dealer reported data.

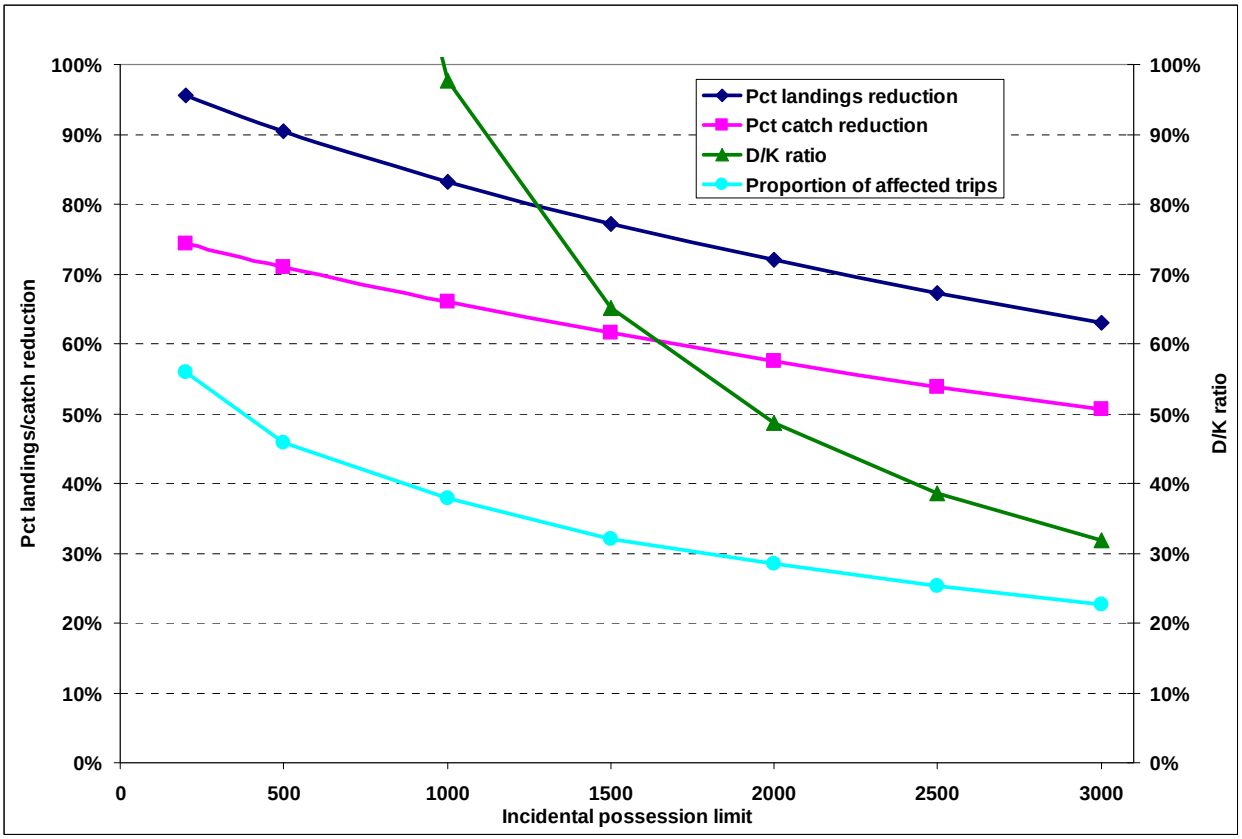
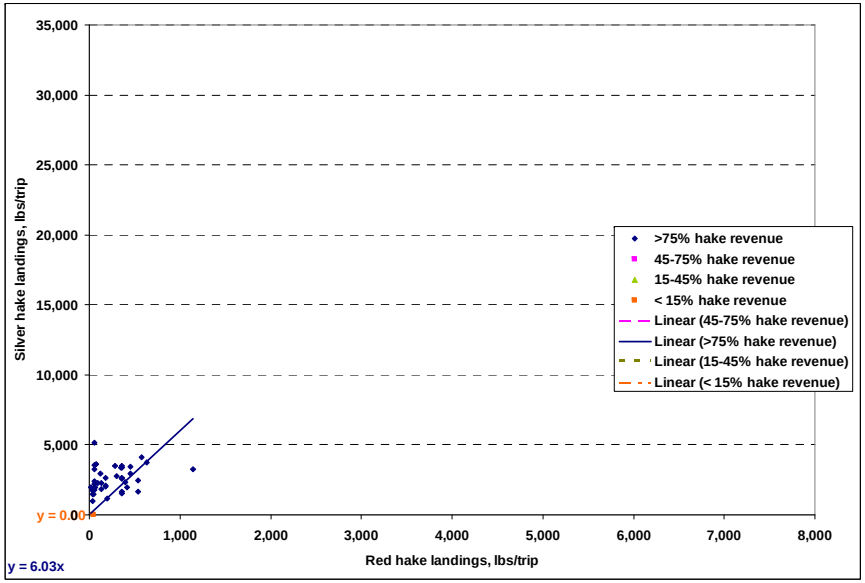
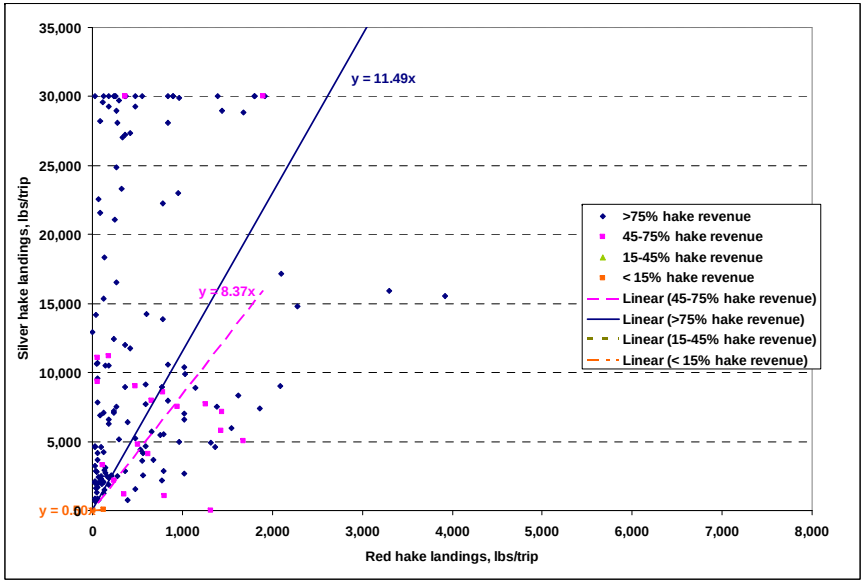


Figure 9. Silver hake to red hake landings ratio by mesh in the northern stock area, 2008-2010. Each point represents landings on a specific day by a specific vessel using bottom trawls, summed over all dealers reporting landings. Source: NMFS SAFIS data.

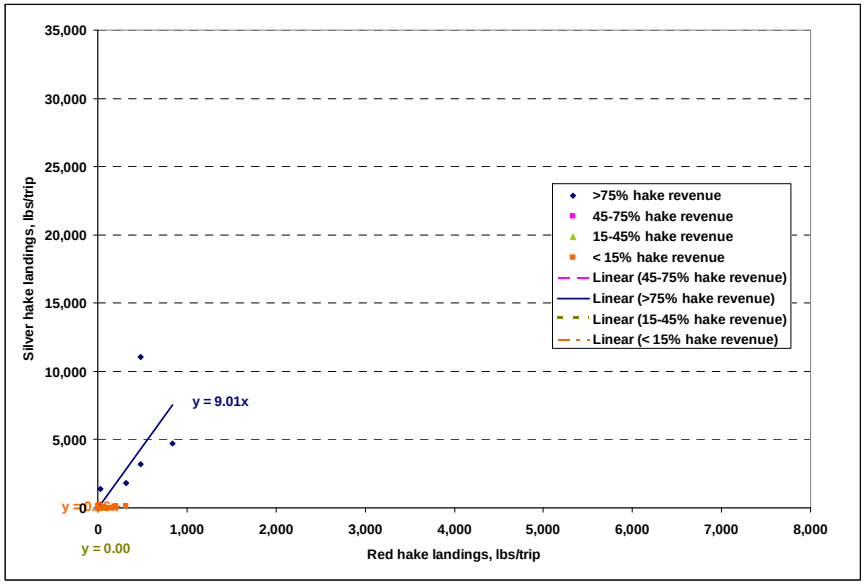
< 2.5" mesh



2.5-4.5" mesh



> 4.5" mesh



Unrecorded mesh

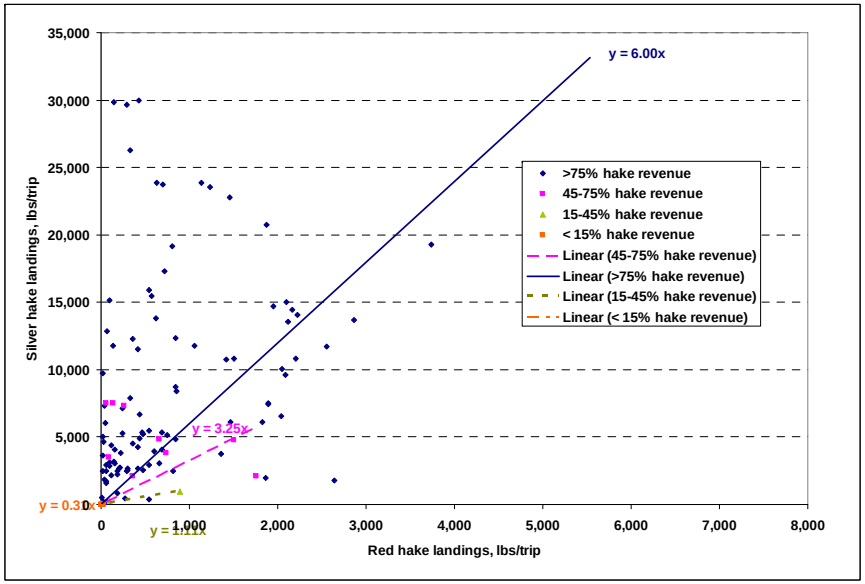
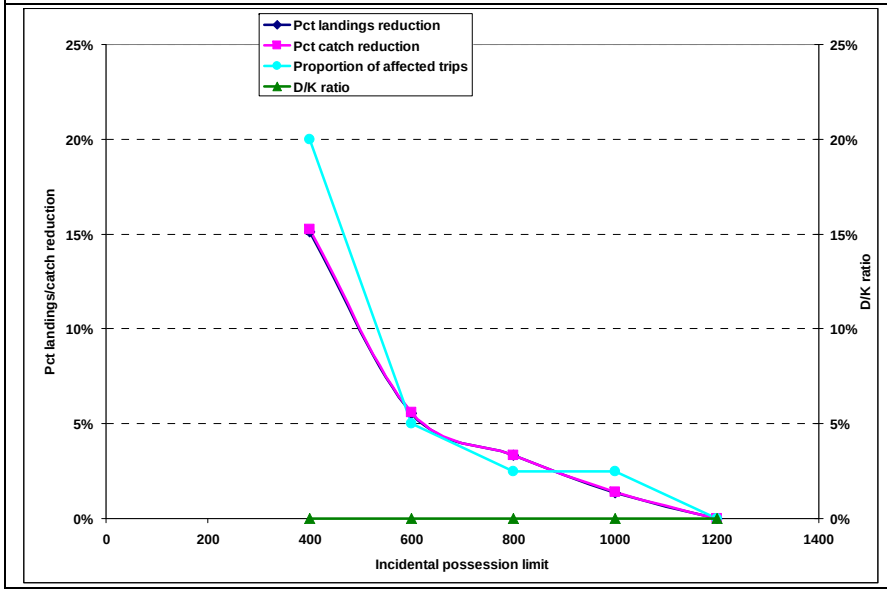
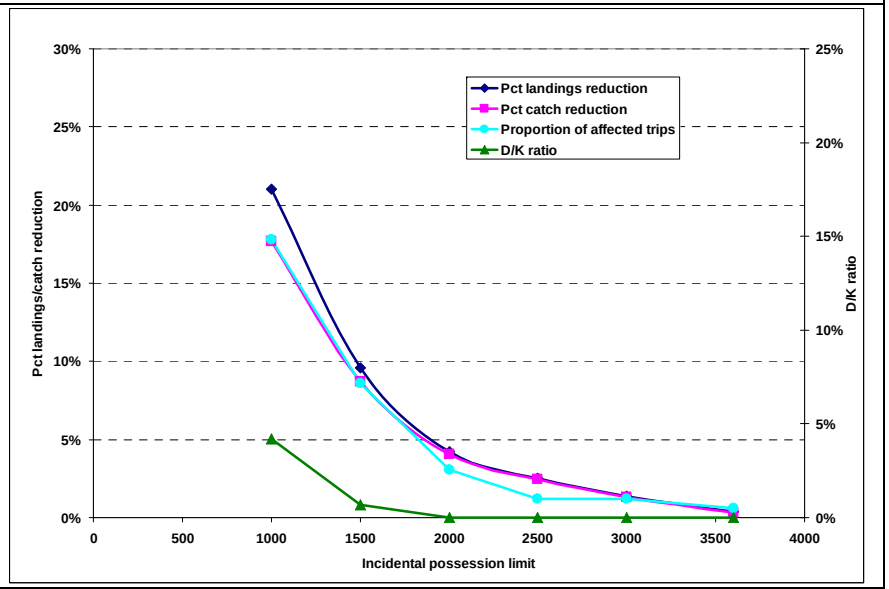


Figure 10. Estimated effect of various northern stock area red hake possession limits by reported mesh size to reduce or cap landings and catch. D/K ratio is the expected amount of additional red hake discards divided by expected red hake landings. The proportion of affected trips is plotted against the left axis.

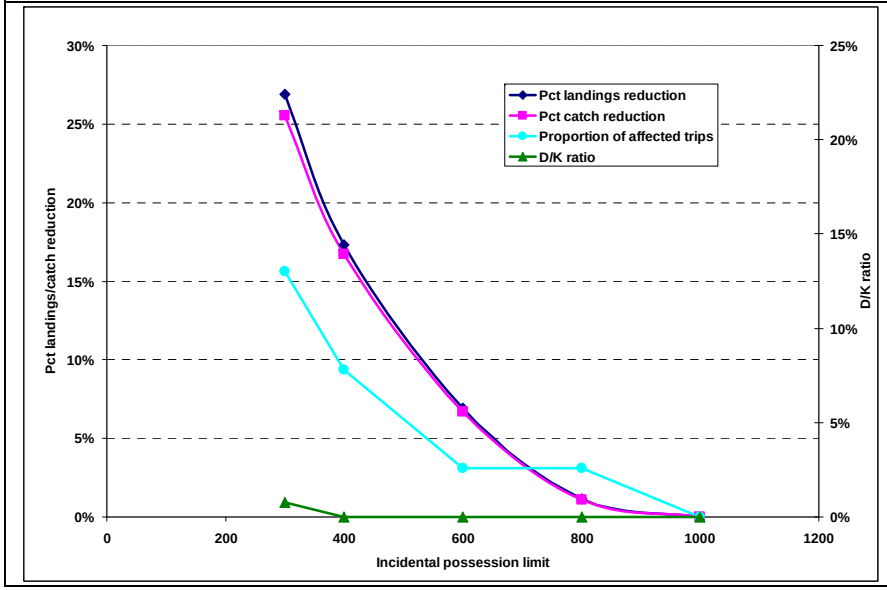
< 2.5" mesh



2.5-4.5" mesh



> 4.5" mesh



All trawls

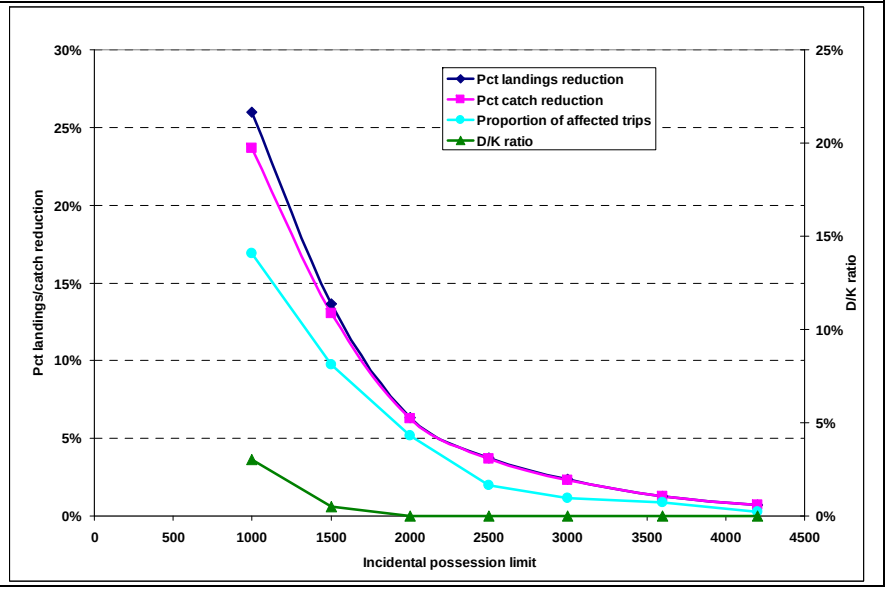
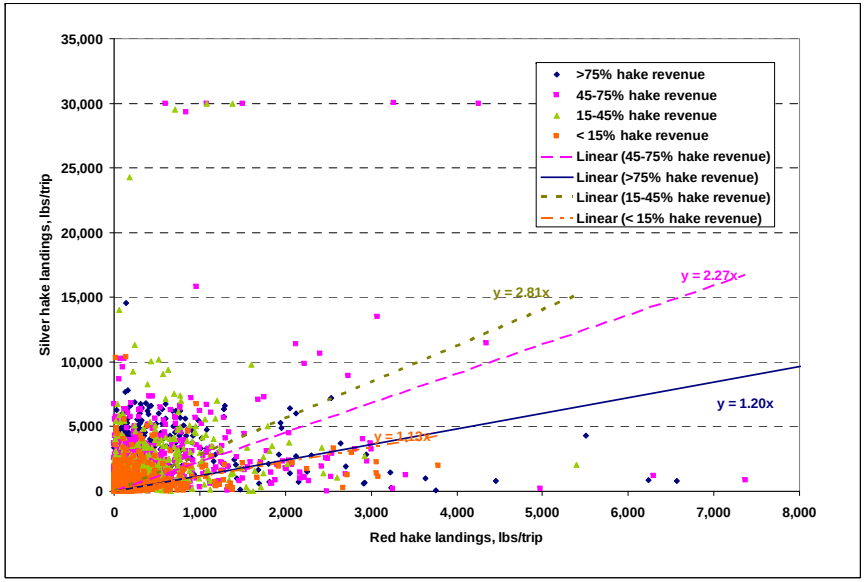
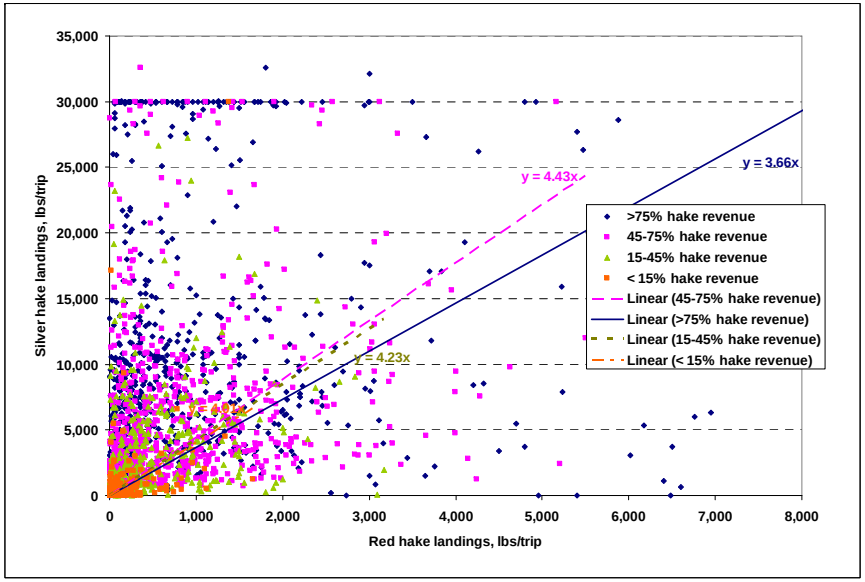


Figure 11. Silver hake to red hake landings ratio by mesh in the southern stock area, 2008-2010. Each point represents landings on a specific day by a specific vessel using bottom trawls, summed over all dealers reporting landings. Source: NMFS SAFIS data.

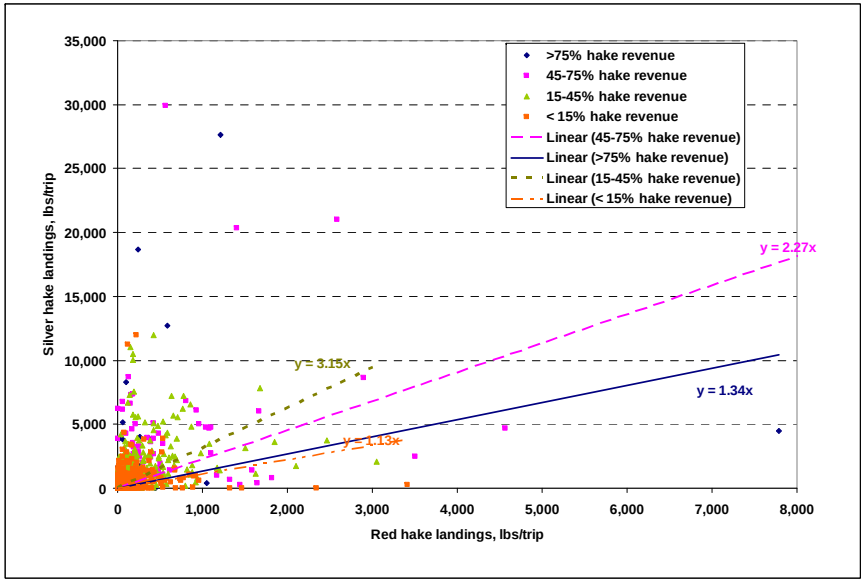
< 2.5" mesh



2.5-4.5" mesh



> 4.5" mesh



Unrecorded mesh

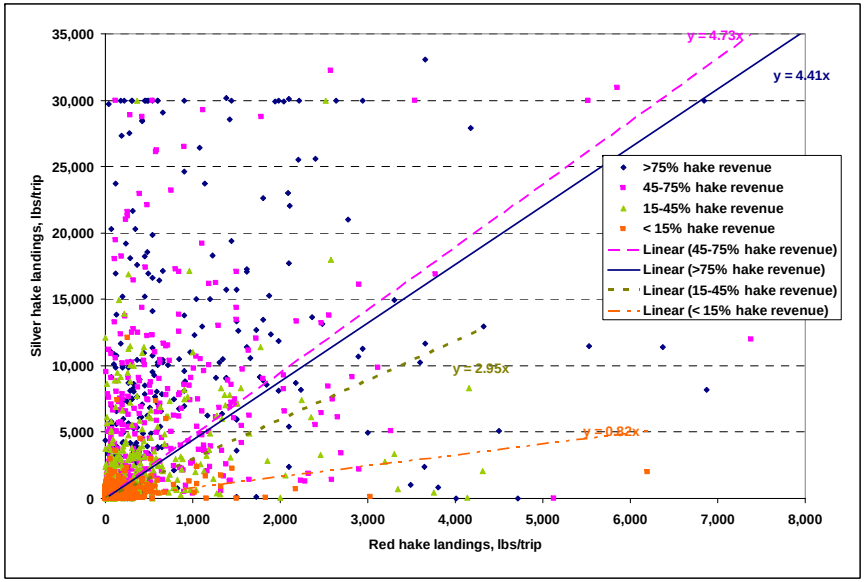
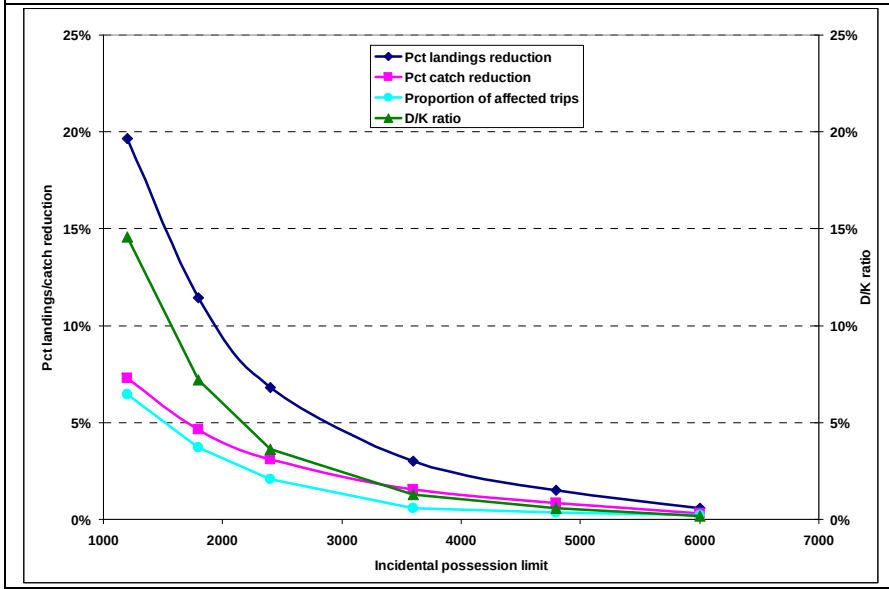
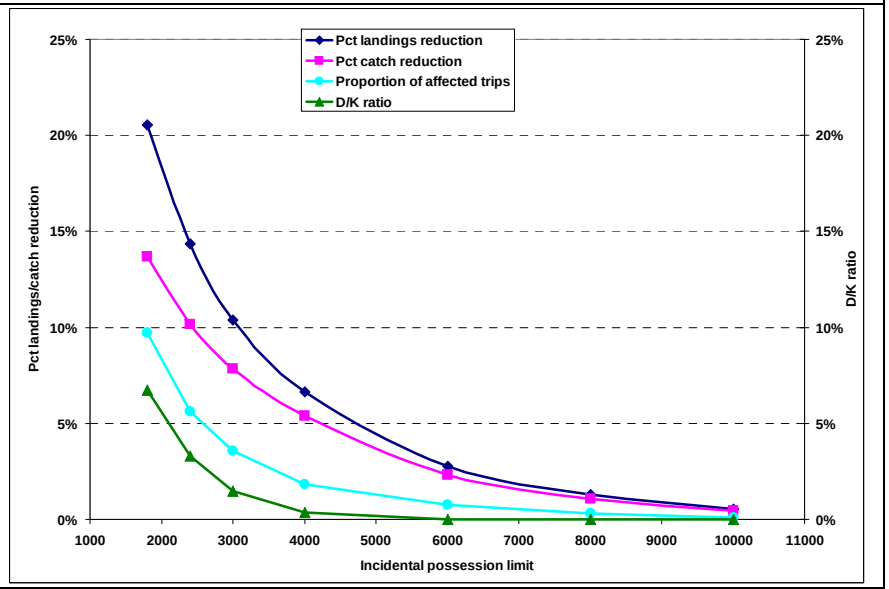


Figure 12. Estimated effect of various southern stock area red hake possession limits by reported mesh size to reduce or cap landings and catch. D/K ratio is the expected amount of additional red hake discards divided by expected red hake landings. The proportion of affected trips is plotted against the left axis.

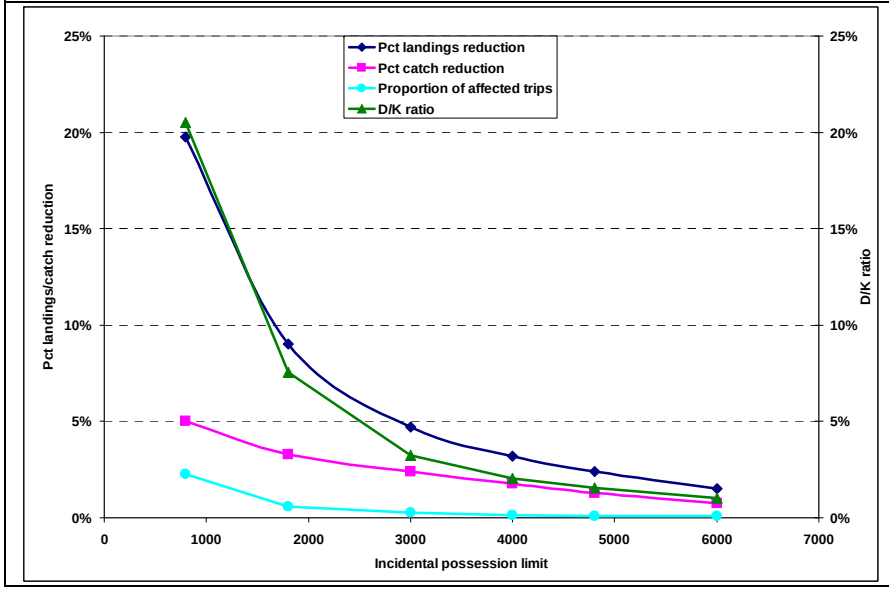
< 2.5" mesh



2.5-4.5" mesh



> 4.5" mesh



All trawls