

### Chinook catch per unit effort for the bottom trawl and non-whiting midwater trawl fisheries

At the Council’s June meeting, additional analysis was requested for consideration at the September 2015 meeting. In June, the NMFS Report 1 (Agenda Item D.3.a) provided bycatch rate data for whiting fisheries (#Chinook per metric ton of Pacific whiting). The Groundfish Management Team (GMT) specifically requested additional Chinook catch per unit effort (CPUE) data (e.g., salmon/trawling hour or salmon/target species) for the non-whiting shoreside fisheries (midwater and bottom trawl separately) along with density plots. The GMT suggested that analyses be provided for these strategies separately, because “these fisheries operate in different areas using different gears. In addition, there are seasonal differences in fishing effort between these two fisheries. As such, catch rates (and overall catch) may be much different between the two. For example, NMFS Report 1 (see Tables 22 and 23) and Erickson and Pikitch (1994) show relatively high bycatch rates for non-whiting midwater trawls. A clear separation of non-whiting midwater trawl and bottom trawl should be provided in the next version of this report to enable the Council to decide whether these strategies should be combined or separated when establishing ITS limits”. The GMT indicated that the maps would be very useful for visualizing Chinook salmon bycatch hotspots and that the CPUE tables and figures would be useful for predicting potential impacts of management measures, such as areas or seasonal closures. CPUE data are needed to tease apart information on where and when salmon are most abundant. Table 1 provides annual CPUE data (trawl hours) for the bottom trawl and non-whiting midwater trawl fishery for 2011 to 2014. Density maps are also provided for each fishery. Tables 2 and 3 provide annual CPUE data by area and depth bin for the bottom trawl fishery for 2002 to 2014.

**Table 1.** Bottom and midwater non-whiting trawl effort and Chinook catch rates, 2011-2014 (WCGOP August 15, 2015 data query)

|                  | Fishery                    | Year   |               |               |               |
|------------------|----------------------------|--------|---------------|---------------|---------------|
|                  |                            | 2011   | 2012          | 2013          | 2014          |
| Chinook          | Bottom Trawl               | 179    | 298           | 315           | 966           |
|                  | Midwater Non-whiting Trawl | c      | 69            | 78            | 799 a/        |
|                  | <i>Total</i>               |        | <i>367</i>    | <i>393</i>    | <i>1,765</i>  |
| Trawl Hours      | Bottom Trawl               | 39,901 | 37,896        | 41,819        | 34,023        |
|                  | Midwater Non-whiting Trawl | c      | 931           | 1,525         | 2,315 b/      |
|                  | <i>Total</i>               |        | <i>38,827</i> | <i>43,344</i> | <i>36,338</i> |
| Chinook per hour | Bottom Trawl               | 0.004  | 0.008         | 0.008         | 0.028         |
|                  | Midwater Non-whiting Trawl | c      | 0.074         | 0.051         | 0.345 d/      |
|                  | <i>Total</i>               |        | <i>0.009</i>  | <i>0.009</i>  | <i>0.049</i>  |

a/ 658 Chinook occurred in depths from 0-100 fm and 141 Chinook occurred in depths >100 fm.

b/ 1,786 hours occurred in depths from 0-100 fm and 529 hours occurred in depths >100 fm.

c/ Confidential

d/ Chinook per hour was 0.368 in depths between 0 and 100 fm and 0.267 in depths >100 fm.

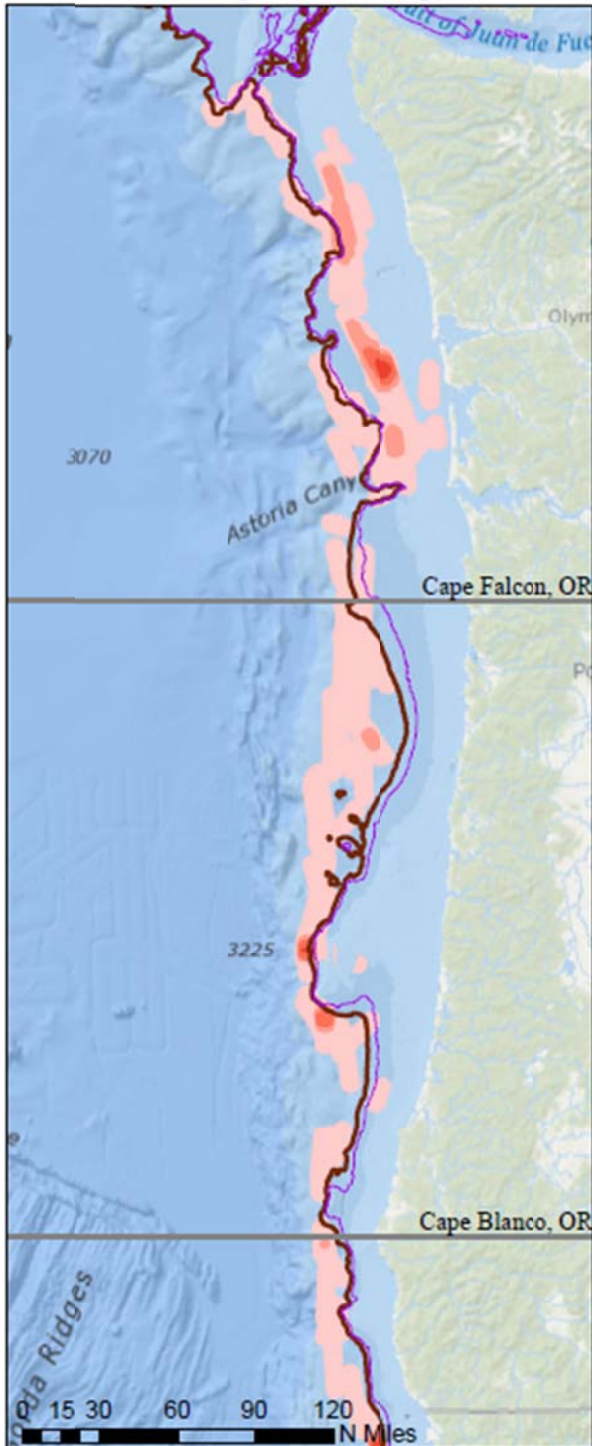
**Table 2.** Bottom trawl effort and Chinook catch rates by year, area, and depth, 2011-2014 (WCGOP August 15, 2015 data query)

|      | Area                          | Depth Bin (fm) | Retained groundfish (mt) | Trawl hours | Chinook | Chinook/hr |
|------|-------------------------------|----------------|--------------------------|-------------|---------|------------|
| 2011 | North of Cape Falcon          | 0-100          | 2,289                    | 3,990       | 41      | 0.0103     |
|      |                               | >100-150       | 154                      | 168         | 19      | 0.1128     |
|      |                               | >150-200       | 932                      | 989         | 1       | 0.0010     |
|      |                               | >200           | 4,073                    | 10,261      | 2       | 0.0002     |
|      | Cape Falcon to Cape Blanco    | 0-100          | 173                      | 689         | 0       | 0.0000     |
|      |                               | >100-150       | 12                       | 15          | 0       | 0.0000     |
|      |                               | >150-200       | 308                      | 444         | 97      | 0.2182     |
|      |                               | >200           | 3,561                    | 8,815       | 9       | 0.0010     |
|      | Cape Blanco to 40°10' N. Lat. | 0-100          | 62                       | 135         | 4       | 0.296      |
|      |                               | >100-150       |                          |             |         |            |
|      |                               | >150-200       |                          |             |         |            |
|      |                               | >200           | 3,506                    | 8,248       | 4       | 0.0005     |
|      | South of 40°10' N. Lat.       | 0-100          | 410                      | 773         | 2       | 0.0026     |
|      |                               | >100-150       | 13                       | 22          | 0       | 0.0000     |
|      |                               | >150-200       | 157                      | 245         | 0       | 0.0000     |
|      |                               | >200           | 1,607                    | 5,107       | 0       | 0.0000     |
| 2012 | North of Cape Falcon          | 0-100          | 3,002                    | 4,883       | 7       | 0.0014     |
|      |                               | >100-150       | 417                      | 497         | 26      | 0.0524     |
|      |                               | >150-200       | 666                      | 822         | 5       | 0.0061     |
|      |                               | >200           | 3,299                    | 7,315       | 5       | 0.0007     |
|      | Cape Falcon to Cape Blanco    | 0-100          | 144                      | 626         | 0       | 0.0000     |
|      |                               | >100-150       |                          |             |         |            |
|      |                               | >150-200       |                          |             |         |            |
|      |                               | >200           | 3,573                    | 9,036       | 9       | 0.0010     |
|      | Cape Blanco to 40°10' N. Lat. | 0-100          | 66                       | 136         | 0       | 0.0000     |
|      |                               | >100-150       | --                       | --          | --      | --         |
|      |                               | >150-200       | 31                       | 50          | 166     | 3.3508     |
|      |                               | >200           | 3,054                    | 7,763       | 50      | 0.0064     |
|      | South of 40°10' N. Lat.       | 0-100          | 322                      | 855         | 1       | 0.0012     |
|      |                               | >100-150       | 36                       | 68          | 0       | 0.0000     |
|      |                               | >150-200       | 189                      | 294         | 0       | 0.0000     |
|      |                               | >200           | 1,918                    | 5,153       | 0       | 0.0000     |

|      | Area                               | Depth Bin (fm) | Retained groundfish (mt) | Trawl hours | Chinook | Chinook/hr |
|------|------------------------------------|----------------|--------------------------|-------------|---------|------------|
| 2013 | North of Cape Falcon               | 0-100          | 2,877                    | 5,474       | 155     | 0.0283     |
|      |                                    | >100-150       | 107                      | 134         | 1       | 0.0075     |
|      |                                    | >150-200       | 801                      | 1,017       | 10      | 0.0098     |
|      |                                    | >200           | 3,713                    | 8,431       | 3       | 0.0004     |
|      | Cape Falcon to Cape Blanco         | 0-100          | 185                      | 608         | 1       | 0.0016     |
|      |                                    | >100-150       | 7                        | 6           | 0       | 0.0000     |
|      |                                    | >150-200       | 728                      | 679         | 11      | 0.0162     |
|      |                                    | >200           | 3,759                    | 9,525       | 22      | 0.0023     |
|      | Cape Blanco to 40°10' N. Lat.      | 0-100          | 231                      | 406         | 12      | 0.0296     |
|      |                                    | >100-150       |                          |             |         |            |
|      |                                    | >150-200       | 120                      | 178         | 16      | 0.0899     |
|      |                                    | >200           | 3,422                    | 8,500       | 79      | 0.0093     |
|      | South of 40°10' N. Lat.            | 0-100          | 604                      | 960         | 5       | 0.0056     |
|      |                                    | >100-150       | 36                       | 55          | 0       | 0.0000     |
|      |                                    | >150-200       | 206                      | 270         | 0       | 0.0000     |
|      |                                    | >200           | 1,818                    | 5,576       | 0       | 0.0000     |
| 2014 | North of Cape Falcon               | 0-100          | 2,730                    | 4,906       | 380     | 0.0775     |
|      |                                    | >100-150       | 57                       | 65          | 0       | 0.0000     |
|      |                                    | >150-200       | 323                      | 457         | 3       | 0.0066     |
|      |                                    | >200           | 2,715                    | 5,623       | 8       | 0.0014     |
|      | Cape Falcon to Blanco              | 0-100          | 180                      | 535         | 0       | 0.0000     |
|      |                                    | >100-150       | 16                       | 24          | 0       | 0.0000     |
|      |                                    | >150-200       | 907                      | 659         | 85      | 0.1294     |
|      |                                    | >200           | 2,899                    | 6,923       | 23      | 0.0033     |
|      | Cape Blanco to Cape 40°10' N. Lat. | 0-100          | 339                      | 562         | 7       | 0.0125     |
|      |                                    | >100-150       | --                       | --          | --      | --         |
|      |                                    | >150-200       | 63                       | 109         | 254     | 2.3203     |
|      |                                    | >200           | 3,214                    | 7,648       | 61      | 0.0080     |
|      | South of 40°10' N. Lat.            | 0-100          | 593                      | 1,356       | 139     | 0.1025     |
|      |                                    | >100-150       | 44                       | 80          | 0       | 0.0000     |
|      |                                    | >150-200       | 257                      | 218         | 3       | 0.0137     |
|      |                                    | >200           | 1,658                    | 4,858       | 3       | 0.0006     |

# IFQ Bottom Trawl 2011 - 2014

Washington and Oregon

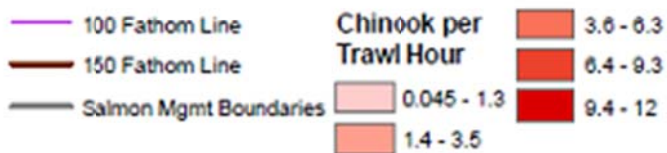


California



K. Somers

# IFQ Non-Whiting Midwater Trawl 2011 - 2014



K. Somers

**Table 3.** Bottom trawl effort and Chinook catch rates by year, area, and depth, 2002-2010 (WCGOP August 15, 2015 data query)

|      | Area                          | Depth Bin (fm) | Retained groundfish (mt) | Trawl hours | Chinook | Chinook/hr |
|------|-------------------------------|----------------|--------------------------|-------------|---------|------------|
| 2002 | North of Cape Falcon          | 0-125          | 3,509                    | 14,012      | 1,287   | 0.0919     |
|      |                               | 125-250        | 1,294                    | 3,381       | 315     | 0.0932     |
|      |                               | >250           | 1,137                    | 7,875       | 27      | 0.0034     |
|      | Cape Falcon to Cape Blanco    | 0-125          | 1,438                    | 5,375       | 1,281   | 0.2383     |
|      |                               | 125-250        | 993                      | 3,598       | 6,041   | 1.6789     |
|      |                               | >250           | 1,413                    | 7,476       | 0       | 0.0000     |
|      | Cape Blanco to 40°10' N. Lat. | 0-125          | 1,015                    | 4,505       | 2,639   | 0.5857     |
|      |                               | 125-250        | 614                      | 2,925       | 2,659   | 0.0091     |
|      |                               | >250           | 1,931                    | 13,410      | 39      | 0.0029     |
|      | South of 40°10' N. Lat.       | 0-125          | 765                      | 2,647       | 197     | 0.0744     |
|      |                               | 125-250        | 1,211                    | 3,694       | 49      | 0.0133     |
|      |                               | >250           | 2,686                    | 14,362      | 0       | 0.0000     |
| 2003 | North of Cape Falcon          | 0-125          | 2,651                    | 9,809       | 2,883   | 0.2939     |
|      |                               | 125-250        | 1,803                    | 6,007       | 320     | 0.0533     |
|      |                               | >250           | 1,666                    | 9,909       | 0       | 0.0000     |
|      | Cape Falcon to Cape Blanco    | 0-125          | 1,294                    | 4,357       | 7,707   | 1.7689     |
|      |                               | 125-250        | 1,460                    | 5,966       | 2,912   | 0.4881     |
|      |                               | >250           | 1,568                    | 7,283       | 34      | 0.0047     |
|      | Cape Blanco to 40°10' N. Lat. | 0-125          | 428                      | 1,152       | 1,001   | 0.8690     |
|      |                               | 125-250        | 940                      | 2,967       | 1,294   | 0.9091     |
|      |                               | >250           | 2,355                    | 12,686      | 0       | 0.0000     |
|      | South of 40°10' N. Lat.       | 0-125          | 567                      | 3,078       | 189     | 0.0614     |
|      |                               | 125-250        | 804                      | 2,751       | 0       | 0.0000     |
|      |                               | >250           | 2,853                    | 11,562      | 0       | 0.0000     |
| 2004 | North of Cape Falcon          | 0-125          | 3,083                    | 10,195      | 521     | 0.0511     |
|      |                               | 125-250        | 2,425                    | 4,955       | 156     | 0.0315     |
|      |                               | >250           | 1,660                    | 4,917       | 7       | 0.0014     |
|      | Cape Falcon to Cape Blanco    | 0-125          | 553                      | 1,624       | 473     | 0.2913     |
|      |                               | 125-250        | 1,829                    | 4,263       | 312     | 0.0732     |
|      |                               | >250           | 1,824                    | 5,202       | 4       | 0.0008     |
|      | Cape Blanco to 40°10' N. Lat. | 0-125          | 473                      | 1,065       | 34      | 0.0319     |
|      |                               | 125-250        | 715                      | 1,691       | 200     | 0.1182     |
|      |                               | >250           | 1,400                    | 4,470       | 3       | 0.0007     |
|      | South of 40°10' N. Lat.       | 0-125          | 266                      | 2,264       | 11      | 0.0049     |
|      |                               | 125-250        | 973                      | 2,583       | 8       | 0.0031     |
|      |                               | >250           | 2,468                    | 8,331       | 0       | 0.0000     |

|      | Area                          | Depth Bin (fm) | Retained groundfish (mt) | Trawl hours | Chinook | Chinook/hr |
|------|-------------------------------|----------------|--------------------------|-------------|---------|------------|
| 2005 | North of Cape Falcon          | 0-125          | 5,332                    | 13,567      | 5       | 0.0004     |
|      |                               | 125-250        | 1,819                    | 3,163       | 584     | 0.1846     |
|      |                               | >250           | 1,614                    | 4,470       | 0       | 0.0000     |
|      | Cape Falcon to Cape Blanco    | 0-125          | 1,323                    | 3,658       | 10      | 0.0027     |
|      |                               | 125-250        | 1,310                    | 3,453       | 108     | 0.0313     |
|      |                               | >250           | 1,623                    | 4,788       | 0       | 0.0000     |
|      | Cape Blanco to 40°10' N. Lat. | 0-125          | 565                      | 1,537       | 13      | 0.0085     |
|      |                               | 125-250        | 872                      | 2,026       | 94      | 0.0464     |
|      |                               | >250           | 1,740                    | 5,397       | 0       | 0.0000     |
|      | South of 40°10' N. Lat.       | 0-125          | 394                      | 2,515       | 4       | 0.0016     |
|      |                               | 125-250        | 709                      | 1,765       | 0       | 0.0000     |
|      |                               | >250           | 1,971                    | 6,875       | 0       | 0.0000     |
| 2006 | North of Cape Falcon          | 0-125          | 4,511                    | 13,670      | 21      | 0.0015     |
|      |                               | 125-250        | 1,714                    | 3,347       | 34      | 0.0102     |
|      |                               | >250           | 1,591                    | 4,758       | 0       | 0.0000     |
|      | Cape Falcon to Cape Blanco    | 0-125          | 1,070                    | 3,806       | 1       | 0.0003     |
|      |                               | 125-250        | 1,497                    | 4,385       | 4       | 0.0009     |
|      |                               | >250           | 1,732                    | 6,041       | 0       | 0.0000     |
|      | Cape Blanco to 40°10' N. Lat. | 0-125          | 650                      | 1,848       | 0       | 0.0000     |
|      |                               | 125-250        | 796                      | 2,342       | 8       | 0.0034     |
|      |                               | >250           | 1,792                    | 6,201       | 0       | 0.0000     |
|      | South of 40°10' N. Lat.       | 0-125          | 306                      | 1,732       | 0       | 0.0000     |
|      |                               | 125-250        | 598                      | 1,722       | 0       | 0.0000     |
|      |                               | >250           | 1,509                    | 5,778       | 0       | 0.0000     |
| 2007 | North of Cape Falcon          | 0-125          | 2,091                    | 7,389       | 47      | 0.0064     |
|      |                               | 125-250        | 3,212                    | 5,064       | 79      | 0.0156     |
|      |                               | >250           | 2,679                    | 7,847       | 0       | 0.0000     |
|      | Cape Falcon to Cape Blanco    | 0-125          | 603                      | 2,574       | 0       | 0.0000     |
|      |                               | 125-250        | 2,411                    | 7,471       | 49      | 0.0066     |
|      |                               | >250           | 2,313                    | 6,911       | 5       | 0.0007     |
|      | Cape Blanco to 40°10' N. Lat. | 0-125          | 518                      | 1,484       | --      | --         |
|      |                               | 125-250        | 1,524                    | 3,773       | 13      | 0.0034     |
|      |                               | >250           | 2,561                    | 8,182       | 0       | 0.0000     |
|      | South of 40°10' N. Lat.       | 0-125          | 429                      | 2,816       | 0       | 0.0000     |
|      |                               | 125-250        | 983                      | 2,752       | 0       | 0.0000     |
|      |                               | >250           | 1,118                    | 4,430       | 0       | 0.0000     |



|      | Area                          | Depth Bin (fm) | Retained groundfish (mt) | Trawl hours | Chinook | Chinook/hr |
|------|-------------------------------|----------------|--------------------------|-------------|---------|------------|
| 2008 | North of Cape Falcon          | 0-125          | 1,218                    | 3,273       | 0       | 0.0000     |
|      |                               | 125-250        | 4,174                    | 7,009       | 72      | 0.0103     |
|      |                               | >250           | 4,243                    | 12,947      | 0       | 0.0000     |
|      | Cape Falcon to Cape Blanco    | 0-125          | 352                      | 1,798       | 0       | 0.0000     |
|      |                               | 125-250        | 3,040                    | 10,091      | 125     | 0.0124     |
|      |                               | >250           | 3,285                    | 10,854      | 0       | 0.0000     |
|      | Cape Blanco to 40°10' N. Lat. | 0-125          | 254                      | 765         | --      | --         |
|      |                               | 125-250        | 1,689                    | 4,531       | 113     | 0.0249     |
|      |                               | >250           | 3,008                    | 9,326       | 0       | 0.0000     |
|      | South of 40°10' N. Lat.       | 0-125          | 433                      | 2,807       | 14      | 0.0050     |
|      |                               | 125-250        | 1,028                    | 2,992       | 0       | 0.0000     |
|      |                               | >250           | 1,461                    | 6,003       | 0       | 0.0000     |
| 2009 | North of Cape Falcon          | 0-125          | 2,060                    | 5,248       | 142     | 0.0271     |
|      |                               | 125-250        | 4,880                    | 7,481       | 10      | 0.0013     |
|      |                               | >250           | 4,147                    | 12,985      | 0       | 0.0000     |
|      | Cape Falcon to Cape Blanco    | 0-125          | 851                      | 3,460       | 0       | 0.0000     |
|      |                               | 125-250        | 2,566                    | 8,968       | 51      | 0.0057     |
|      |                               | >250           | 4,000                    | 16,881      | 0       | 0.0000     |
|      | Cape Blanco to 40°10' N. Lat. | 0-125          | 154                      | 837         | --      | --         |
|      |                               | 125-250        | 1,486                    | 3,430       | 33      | 0.0096     |
|      |                               | >250           | 3,213                    | 10,851      | 8       | 0.0007     |
|      | South of 40°10' N. Lat.       | 0-125          | 262                      | 2,029       | 55      | 0.0271     |
|      |                               | 125-250        | 975                      | 2,582       | 0       | 0.0000     |
|      |                               | >250           | 1,458                    | 5,841       | 0       | 0.0000     |
| 2010 | North of Cape Falcon          | 0-125          | 1,420                    | 3,349       | 0       | 0.0000     |
|      |                               | 125-250        | 4,159                    | 4,958       | 0       | 0.0000     |
|      |                               | >250           | 3,880                    | 11,969      | 0       | 0.0000     |
|      | Cape Falcon to Cape Blanco    | 0-125          | 355                      | 1,604       | 0       | 0.0000     |
|      |                               | 125-250        | 2,325                    | 6,346       | 37      | 0.0058     |
|      |                               | >250           | 3,669                    | 13,896      | 0       | 0.0000     |
|      | Cape Blanco to 40°10' N. Lat. | 0-125          | 13                       | 126         | --      | --         |
|      |                               | 125-250        | 1,207                    | 2,583       | 16      | 0.0062     |
|      |                               | >250           | 2,800                    | 10,501      | 0       | 0.0000     |
|      | South of 40°10' N. Lat.       | 0-125          | 350                      | 1,737       | 0       | 0.0000     |
|      |                               | 125-250        | 542                      | 1,630       | 0       | 0.0000     |
|      |                               | >250           | 1,599                    | 6,694       | 0       | 0.0000     |