

## **Summary of the Royal Red Shrimp Data Grids C11, 14, 15, 18 and 23**

**Background:** On November 24, 2010, NOAA closed 4,213 square miles of area off the coast of Louisiana to royal red shrimp fishing in federal waters as a result of semi-solid tarballs being caught by a fisherman while trawling on November 20, 2010. NOAA had previously opened this area to fishing on November 15, 2010 after the results of sensory (286 finfish and 55 shrimp specimens) and chemical (207 finfish samples in 33 composites and 50 shrimp samples in 9 composites) testing on seafood specimens showed that the seafood from this area was safe for consumption. To ensure that seafood from the area continues to be safe for consumption, the grids C11, C14, C15, C18 and C23 were re-sampled between December 4 and 5 (first pass), again between December 7 and 14 (second pass), and lastly between January 6 and 14, 2011 (third pass). During these sampling efforts, royal red shrimp specimens were taken and were processed into samples for sensory and chemical analyses. In addition, other species of shrimp, as well as important reef and pelagic finfish samples, were also collected in these grids and analyzed for chemistry only. The sensory and analytical chemical analyses provide sufficient information to confirm that the seafood from these areas continues to be safe for human consumption.

The royal red shrimp samples were analyzed for polycyclic aromatic hydrocarbons (PAHs) in seafood samples using a gas chromatography/mass spectrometry method developed by NOAA

(<http://www.nwfsc.noaa.gov/publications/displayallinfo.cfm?docmetadataid=4330>). The royal red shrimp samples, as well as other shrimp species and finfish, were also analyzed by the high performance liquid chromatography/fluorescence method developed by the FDA (<http://www.fda.gov/downloads/ScienceResearch/UCM220209.pdf>). The HPLC-UVF method provides reliable estimates of PAH levels in seafood. A minor difference between the two methods is that the HPLC method has higher limits of quantitation than the GC/MS method but this does not affect the ability to measure PAHs and determine if they are below the levels of concern.

In addition, these seafood specimens were analyzed for dioctyl sodium sulfosuccinate (DOSS) a component of the dispersant used in response to the DWH spill. The HPLC MS/MS method that was jointly developed and validated by FDA and NOAA was used (see “New Method for DOSS Detection in Seafood” at:

<http://www.fda.gov/Food/FoodSafety/Product-SpecificInformation/Seafood/ucm210970.htm#DOSS>).

**Royal Red Shrimp Results:** The [sensory](#) and [chemistry](#) results for royal red shrimp collected from grids C11, 14, 15, 18 and 23 are reported in the accompanying table files. Sensory samples collected during the first and second passes in December 2010 (shown above the yellow line) were analyzed by a panel of three, with all samples passing sensory testing except three royal red shrimp samples collected from grids C14 and C18 that were determined to be suspect meaning there was an indication of taint which required additional sensory analysis. As a result of these findings, grids C11, 14, 15, 18

and 23 were resampled in January 2011 for royal red shrimp and the other shrimp specimens were evaluated by a seven-person panel using the Reopening Protocol. All of the third pass samples passed sensory analysis and the PAH and DOSS levels measured in all seafood analyzed by GC/MS or HPLC-UVF were well below the levels of concern (LOC). The chemistry data are reported in nanograms per gram (parts per billion: ppb) PAH or micrograms per gram (parts per million: ppm) DOSS in edible tissues of the seafood collected. Above each compound symbol is a numeric value for the LOC expressed in ppb for PAHs or ppm DOSS. Chemistry results below the LOC for that particular PAH compound or DOSS show that the shrimp specimen is safe for human consumption. Results that include the “less than” (<) symbol indicate results that are below the limit of quantitation for PAHs determined by GC/MS, below the limit of quantitation for DOSS determined by HPLC MS/MS or less than the limit of detection for PAHs determined by HPLC-UVF. These values are the levels at which the analytical instrumentation can measure the quantity of the compound in a samples.

The three tables below present a summary of the royal red shrimp data found in the accompanying [sensory](#) and [chemistry](#) data files and summaries of data from other species of shrimp and fish that were caught in tows with the royal red shrimp.

## Royal Red Shrimp Grids C11, C14, C15, C18, C23

| PAHs                     | Level of Concern (ppb) | Data table symbol | Range of values (ppb) GC/MS analyses | Range of values (ppb) HPLC/fluorescence analyses^ |
|--------------------------|------------------------|-------------------|--------------------------------------|---|
| Naphthalene              | 123,000                | NPH               | 0.63 – 2.0                           | <2.4  |
| Fluorene                 | 246,000                | FLU               | 0.13 - 0.53                          | <0.41   |
| Anthracene/ Phenanthrene | 1,846,000*             | ANT/PHN           | 0.23 – 1.6                           | <1.24 – 3.3                                       |
| Pyrene                   | 185,000                | PYR               | <0.070 - 0.41                        | <5.7  |
| Fluoranthene             | 246,000                | FLA               | <0.071 - 0.33                        | <6.5  |
| Chrysene                 | 132,000                | CHR               | <0.14 – 1.1                          | <3.7  |
| Benzo(k)fluoranthene     | 13,200                 | BKF               | <0.12 - <0.31                        | <0.26 – 2.7                                       |
| Benzo(b)fluoranthene     | 1320                   | BBF               | <0.12 - <0.31                        | <0.66   |
| Benz(a)anthracene        | 1320                   | BAA               | <0.11 - <0.22                        | <1.1  |
| Indeno(1,2,3-cd)pyrene   | 1320                   | IDP               | <0.11 - <0.22                        | <7.7  |
| Dibenz(a,h)anthracene    | 132                    | DBA               | <0.094 - <0.23                       | <1.8  |
| Benzo(a)pyrene           | 132                    | BAP               | <0.11 - <0.28                        | <0.96   |

  

| DOSS                  | Level of Concern (ppm) |      | Range of values (ppm) | Range of values (ppm) |
|-----------------------|------------------------|------|-----------------------|-----------------------|
| Diethylsulfosuccinate | 500                    | DOSS | <0.043 - <0.045       | ---                   |

\* Level of Concern for Anthracene and Phenanthrene combined

^ HPLC/fluorescence (screening) analyses have higher limits of quantitation than the more sensitive and laborious GC/MS analyses.

## Other Shrimp Caught with Royal Red Shrimp in Grids C11, C14, C15, C18, C23

| PAHs                        | Level of Concern (ppb) | Data table symbol | Range of values (ppb) HPLC/fluorescence analyses <sup>^</sup> |
|-----------------------------|------------------------|-------------------|---|
| Naphthalene                 | 123,000                | NPH               | <2.4  |
| Fluorene                    | 246,000                | FLU               | <0.41   |
| Anthracene/ Phenanthrene    | 1,846,000*             | ANT/PHN           | <1.24 – 3.0   |
| Pyrene                      | 185,000                | PYR               | <5.7  |
| Fluoranthene                | 246,000                | FLA               | <6.5  |
| Chrysene                    | 132,000                | CHR               | <3.7  |
| Benzo(k)fluoranthene        | 13,200                 | BKF               | <0.26   |
| Benzo(b)fluoranthene        | 1320                   | BBF               | <0.66   |
| Benz(a)anthracene           | 1320                   | BAA               | <1.1  |
| Indeno(1,2,3-cd)pyrene      | 1320                   | IDP               | <7.7  |
| Dibenz(a,h)anthracene       | 132                    | DBA               | <1.8  |
| Benzo(a)pyrene              | 132                    | BAP               | <0.96   |
| DOSS                        | Level of Concern (ppm) |                   | Range of values (ppm)   |
| <b>Diocylsulfosuccinate</b> | 500                    | <b>DOSS</b>       | ---   |

\* Level of Concern for Anthracene and Phenanthrene combined

<sup>^</sup> HPLC/fluorescence (screening) analyses have higher limits of quantitation than the more sensitive and laborious GC/MS analyses.

## Fish caught with Royal Red Shrimp in Grids C11, C14, C15, C18, C23

| <b>PAHs</b>              | <b>Level of Concern (ppb)</b> | <b>Data table symbol</b> | <b>Range of values (ppb) HPLC/fluorescence analyses<sup>^</sup></b> |
|--------------------------|-------------------------------|--------------------------|---|
| Naphthalene              | 32,700                        | NPH                      | <11   |
| Fluorene                 | 65,300                        | FLU                      | <0.55   |
| Anthracene/ Phenanthrene | 490,000*                      | ANT/PHN                  | <2.0  |
| Pyrene                   | 49,000                        | PYR                      | <3.2  |
| Fluoranthene             | 65,300                        | FLA                      | <5.6  |
| Chrysene                 | 35,000                        | CHR                      | <4.3  |
| Benzo(k)fluoranthene     | 3,500                         | BKF                      | <0.63 – 2.9   |
| Benzo(b)fluoranthene     | 350                           | BBF                      | <0.77 – 1.9   |
| Benz(a)anthracene        | 350                           | BAA                      | <3.4  |
| Indeno(1,2,3-cd)pyrene   | 350                           | IDP                      | <1.9  |
| Dibenz(a,h)anthracene    | 35                            | DBA                      | <1.2  |
| Benzo(a)pyrene           | 35                            | BAP                      | <0.81   |

  

| <b>DOSS</b>                   | <b>Level of Concern (ppm)</b> | <b>DOSS</b> | <b>Range of values (ppm)</b> |
|-------------------------------|-------------------------------|-------------|------------------------------|
| <b>Diocetylsulfosuccinate</b> | 100                           | <b>DOSS</b> | ---                          |

\* Level of Concern for Anthracene and Phenanthrene combined

<sup>^</sup> HPLC/fluorescence (screening) analyses have higher limits of quantitation than the more sensitive and laborious GC/MS analyses.