



## **REVIEW OF EXXONMOBIL CANADA'S 2008 OFFSHORE ENVIRONMENTAL EFFECTS MONITORING REPORT**

### **Context**

DFO Maritimes Science was asked by the Oceans, Habitat, and Species at Risk Branch to review ExxonMobil Canada Properties Inc.'s 2008 annual report "Offshore Environmental Effects Monitoring Program ExxonMobil Canada Properties – Sable Offshore Energy Project" (Amec and Conestoga-Rovers & Associates 2009) on 24 April 2009. In addition, ExxonMobil's Environmental Effects Monitoring (EEM) proposal for 2009 was also provided. A response was requested by 31 May 2009. Given the short timeline to prepare a response, and since reviews of ExxonMobil's previous EEM reports had been provided by DFO Science in 2007 (DFO 2007) and 2008 (DFO 2008), DFO Maritimes Science determined that the Special Science Response Process would be used.

### **Background**

The Sable Offshore Energy Project's (SOEP) EEM Program was designed to evaluate predictions made during its Environmental Assessment (EA) process. The scale and scope of this EEM program has changed over time. In 2006, the proponent monitored benthic habitat and fish density, produced water chemistry and toxicity, marine mammals during pile driving activities at the Thebaud site, seabirds, and air quality. In 2007, the proponent continued to examine produced water chemistry and toxicity, seabirds and air quality; added mussel hydrocarbon body burden, sediment chemistry and toxicity monitoring; but did not conduct benthic habitat and fish density monitoring. In 2008, the proponent reinstated benthic habitat and fish density monitoring, continued to monitor produced water chemistry and toxicity, sea birds and air quality, mussel hydrocarbon body burden, but did not monitor sediment chemistry and toxicity. This Science Response includes the DFO Science review of monitoring results for benthic habitat and fish density, produced water chemistry and toxicity, mussel hydrocarbon body burden. Environment Canada generally reviews monitoring results for seabirds and air quality.

### **Analysis and Responses**

#### **General**

Although fish and shellfish are identified as valuable ecosystem components, there are still no studies to determine if and to what extent fish health and fish quality is being affected around the site. There needs to be an evaluation of whether fish in the area are being contaminated (e.g., through chemical analysis) or tainted (e.g., through sensory analysis). Such information is needed if only for assurance. Most of the reporting related to fish, fisheries and the environment deals with produced water chemistry and acute toxicity. This is generally the domain of compliance monitoring rather than Environmental Effects Monitoring, which is being carried out

for a different purpose (see EEM objectives under Section 1.4). There is limited EEM data in the report this year in relation to the three sub-objectives of the EEM program.

Ancillary data provided in the report (e.g., on fish aggregation and growth on structures), however, was thought to be useful. In addition, the report was quite well organized.

### Benthic Habitat and Fish Density

Benthic habitat and fish density along the pipeline was evaluated using VHS video recordings and images taken during routine inspections and surveys with a remotely operated vehicle. The platforms were not surveyed.

As mentioned in previous reviews, there is no statistical design associated with this component of the EEM program and no quantitative information has been collected; thus, it is difficult to evaluate the impact of production activities on benthic habitat and fish density along the pipeline based upon the EEM results. Other than counts of observed marine life by major species groupings, only qualitative observations are presented. Additional numeric results, such as numbers per square meter in comparison to baseline conditions or a reference site, may have been more useful. In addition, some form of "BACI"-design (before-after-control-impact statistical design) may have been useful to help evaluate the success of mitigation and the validity of the environmental assessment predictions. Random visual surveys along pipelines may not be an effective sampling design to examine biological effects of industrial activity.

Table 2.2 provides counts of the number of taxa observed as a way of summarizing the information collected; however, the taxonomic groups used are too coarse to allow for any meaningful interpretation. Also, it is unclear why Cnidaria (phylum), Porifera (phylum) and Tunicata (subphylum or the phyla Chordata) have been grouped together. Echinoid is not a useful term to use for this table as Echinoid can mean either the order Echinoidea, which would encompass the urchins, or the Phylum Echinodermata, which would contain brittle stars, basket stars, sea stars, sea cucumbers, and urchins. Perhaps use of Echinodermata in the table would be more appropriate. In the future, it would be more useful to work at the family level if the quality of the video or level of identification expertise is insufficient to allow for identification of the fauna to the species level.

Comparison between the 2008 results and results from previous years is done in a qualitative manner, with a comparison of numerical results by pipeline segment provided only for snow crab. This makes it difficult to verify the statements made, such as "there was a much higher diversity and density in all pipeline segments except along Segment 9, which was completely buried, and Segment 10 which were similar to previous surveys" (p. 2-6). Given the sampling technique and video resolution, this type of conclusion appears to be unwarranted.

The possible occurrence of soft coral was noted along one of the pipeline sections. Given that it is difficult even for DFO Science to be able to tell the difference between taxa within the order Alcyonacea, and given the quality of the ROV video and imagery, it is understandable that the presence and type of soft coral could not be confirmed. Within the Maritimes Region, there are three possibilities for Alcyonacea at these depths: *Duva florida*, other Nephtheidae (basically undescribed or yet to be identified species that look on video to be very similar to *Duva*), and *Gersemia rubiformis*. *Gersemia* is relatively easy to distinguish from *Duva* and Nephtheidae, but it is unlikely that the proponent would have been able to discern this from video since they are relatively small. It is more likely that they would have seen *Duva* or members of the family Nephtheidae.

## Produced Water Chemistry and Toxicity

In 2008, produced water samples were collected from Thebaud, South Venture, Alma and Venture platforms. Acute toxicity was evaluated using three tests – a threespine stickleback test, a Microtox test, and an echinoid fertilization test. Chemical analysis was also conducted. Comments on this aspect of the EEM have been provided in previous reviews (DFO 2007; DFO 2008) and many of these continue to be applicable.

In terms of the bioassay results, toxicity is attributed to elevated concentrations of petroleum hydrocarbons. There has been no attempt to provide verification of this hypothesis. It is not clear that observed detrimental effects are due to elevated concentrations of petroleum hydrocarbons and not chemical toxicity from metals, elevated ammonia concentrations, etc.

Considering the range of inter-annual variability within the discharge stream that may occur from the same formation, conclusions such as, "produced water from South Venture platform shows an increased toxicity in the fish bioassays in 2008 compared with consistency in 2006 and 2007" (p. 3-10), are questioned.

The statement is made that "chemical constituents of produced water will be diluted to non-toxic levels within a few meters of the discharge" (p. 3-11). This will be highly dependent on produced water volume, and similar general statements about produced water have been indicated to be not supportable (i.e., in literature related to monitoring, modeling and toxicity). Literature reference should be a critical component in such EEM reports, but have not generally been included within the SOEI EEM reports.

## Mussel Body Burden

Comments have also been provided previously by DFO Science on the mussel body burden component of the SOEI EEM program (DFO 2007; unpublished comments in 2005).

It is interesting that the proponent has suggested the possibility of enhanced mussel growth in close proximity to the rig as a result of produced water discharge. Although the proponent has had limited success in the past with moorings, it would be interesting to try to use mussels to delineate the impact zone attributed to produced water discharge based on differences in mussel growth.

Should SOEI want to continue tainting studies with mussels, they would have to be placed at different depths in the water column as well as different distances from the development site. However, one could expect growth and gonadal maturation differences at different depths in the water column, which could be quite confounding in relation to interpretation of any contaminant accumulation and tainting. Also, one will also likely be required to measure diesel range alkanes and PAH along with assessment of tainting through sensory analysis. The actual benefits versus costs for extensive mussel studies in this area are highly uncertain.

## Proposed 2009 EEM Plan

The level of detail provided in the proposed 2009 EEM Plan is insufficient to determine the likelihood of achieving monitoring objectives. For example, it is proposed that analysis of ROV videotape will be conducted both for the main subsea pipeline (as conducted in 2008), as well as around the Thebaud platform (conducted in 2006); however, the sampling methodology and analysis to be used is not described. It is assumed that the approach used would be similar to

that used in 2008, though it is unclear how comparisons would be made with previous results. Observations made in 2006 around the Thebaud platform were very qualitative but did specifically mention Atlantic cod and cunner. If more quantitative data from 2006 exists for these two species, then comparisons could potentially be made for them both. It is unclear what the proposed estimates of average fish densities of commercial fish species would be compared against (i.e., to a reference site, past results, or future sampling).

Analysis of mussel body burden is proposed around the Thebaud platform, which is to be conducted in a manner consistent with the 2008 program. Comments provided previously would apply.

The proponent has expressed an interest in supporting DFO Science's Program of Energy Research and Development (PERD) studies to monitor the impact of produced water discharge. The current plan is to participate in a field study in July/August 2009 to characterize the chemical composition of produced water discharged from the Thebaud platform and to identify the zone of impact in terms of alterations in microbial population and structure. Data will be used to verify predictive discharge models being developed within DFO and to validate those (e.g., DREAM model) used by the oil industry. This information will be provided to ExxonMobil for inclusion in their next EEM Report, as well as to the DFO Maritimes Oceans, Habitat and Species at Risk Branch.

## Conclusions

SOEP's 2008 EEM report is consistent with previous reports. While monitoring of benthic habitat and fish density was conducted this year, the methods used were such that the results are not considered to be particularly meaningful or conclusive.

An ongoing shortcoming in the SOEP EEM is the failure to address fish health and fish quality (tainting) issues. In similar monitoring programs from other areas (Grand Banks, Europe) biomarkers are seen as an important tool in proving or disproving whether oil development is having an effect on fish. The monitoring approach used in the SOEP EEM program has not allowed for this type of analysis.

Finally, as recommended in previous years, it is suggested that ExxonMobil develop a reporting format for the EEM results that would allow routine comparisons across years for monitoring components which are collected annually.

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## Sources of Information

Amec, and Conestoga-Rovers & Associates 2009. 2008 Annual Report Offshore Environmental Effects Monitoring Program. Submitted to ExxonMobil Canada Properties – Sable Offshore Energy Project by AMEC and Conestoga-Rovers & Associates on behalf of ACCENT Engineering Consultants Inc.

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