Environmental stressors can affect the organisms at any stage of life, but developing larvae are particularly vulnerable. Exposure of fish embryos to relatively low concentrations of oil has been implicated in sub-lethal toxicity. However, the effect of oil and commonly used dispersants, singly and in combination should be more thoroughly evaluated to better understand and anticipate the ecological impacts. Oil (1 ppm) and 0.1 ppm dispersants (Corexit 9500 and 9527) were weathered singly and in combination with oil in 25 µl per embryo for 7 days in barreled water in a hood. The aqueous part post weathering (Weathered solution, WS) was diluted at 1:5 (200 ml WS: 1000 ml 25 ppt saltwater) following. Twenty-25 Menidia beryllina embryos at 30-48 hrs post-fertilization were exposed to diluted WS as giá the following: Control (1 liter 25 ppt Saltwater), Oil (200 µl/L), C9500 (20 µl/L), C9527 (20 µl/L), Oil+C9500 (20 µl/L + 20 µl/L), Oil+C9527 (20 µl/L + 20 µl/L). Mortality, normal, and abnormal embryos were enumerated daily for 4 days post-exposure. Abnormality scores were significantly different (p=0.002 and 0.007, respectively) with the lowest heartbeats and abnormality scores were significantly different (p=0.002 and 0.007, respectively) with the lowest heartbeats and abnormality scores recorded in dispersant exposed embryos. Although oil and dispersants exposed embryos developed to the hatching stage, significantly more embryos were in a state of deterioration, with arrested tissue development.

**RESULTS**

- Temperature was 19-21°C
- Mortality was not significant, nor significantly different among treatments throughout
- Heartbeat was significantly different (p=0.002) with the lowest levels (67.1 ± 3.6%) observed in Corexit 9527 exposed embryos
- Abnormality scores were significantly different (p=0.002 and 0.007, respectively) with the lowest heartbeats and abnormality scores recorded in dispersant exposed embryos. Although oil and dispersants exposed embryos developed to the hatching stage, significantly more embryos were in a state of deterioration, with arrested tissue development.

**CONCLUSIONS**

Studies on crude oils and PAHs, particularly in the aftermath of the Exxon Valdez spill, have described embryonic heart failure, bradycardia, arrhythmias, reduction of contractility, and a syndrome of cardiogenic fluid accumulation (edema) in exposed fish embryos (Carls et al. 1999). In this study:

- Significantly more embryos exposed to dispersants and oil/dispersant combinations deteriorated and failed to hatch
- Skeletal abnormalities were observed only in dispersant- and oil/dispersant exposed embryos
- Other abnormalities such as malformations, pericardial and abdominal oedema were prevalent in embryos exposed to Corexit 9500 and oil/9500 combination
- Heart beat was also significantly lowered in dispersant-exposed embryos

This data supports previous assertion that early life stages of fish and other vertebrates are particularly vulnerable to oil pollution. The interesting toxic effects of oil and dispersant possibly reflect the dispersant’s ability to solubilize oil into the water column. The significant effects found for chemically dispersed oil solutions may be due to the presence of oil droplets and the resulting increase in the concentration of PAH in the water column (Milinkovitch et al., 2008). The evidence of Corexit 9500 and 9527’s toxicity to Menidia beryllina embryos necessitates considering the types of organisms present at the site of a spill and the developmental stages of those organisms before removal action can be taken.