**Highlights**

* Low solubility of nickel ions from metallic nickel nanoparticles in seawater.
* No lethality of sea urchin embryos up to 3 mg/L metallic nickel nanoparticles.
* Considerable size reduction after 48 hours was comparable to the reduction for 1.2 mg/L nickel salt.
* Contributes to the overall understanding of metallic Ni NPs in the marine environment.