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A new annelid species from whalebones in Greenland and aquaculture sites in Newfoundland: *Ophryotrocha cyclops*, sp. nov. (Eunicida: Dorvilleidae)

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Abstract

A new species of *Ophryotrocha* was discovered on whalebones in Greenland (120 m depth) and at finfish aquaculture sites in Newfoundland (30–70 m depth), where it is considered to be a bioindicator of aquaculture-related organic enrichment. Phylogenetic analyses based on three genes (COI, 16S mitochondrial and H3 nuclear genes) show close affinities with *O. lobifera* and *O. craigsmithi,* two species also found on both whalebones and at aquaculture sites (North Sea), and with *O. shieldsi* from aquaculture sites in Tasmania. The new species is named *Ophryotrocha cyclops* **sp. nov.** due to the juxtaposed, quasi-fused central eyes that give the impression of a single eye in live specimens.

Key words: Phylogeny, organic enrichment, taxonomy, annelids

Introduction

In marine ecosystems, organic matter enrichment linked to natural events or human activities modifies benthic community structure in both shallow water (coastal eutrophication, aquaculture) and deeper habitats (cold seeps, whale falls) (Pearson & Rosenberg 1978; Sibuet & Olu-Le Roy 2003; Smith & Baco 2003; Borja & Muxika 2005; Diaz & Rosenberg 2008). Opportunistic species often colonize benthic habitats subjected to organic enrichment; an overlap in species composition has been observed between habitats experiencing organic enrichment from anthropogenic versus natural causes (e.g. Glover *et al.* 2005; Wiklund *et al*. 2009).

Recently, opportunistic annelid complexes (termed OPC) were observed on rocky substrates underneath finfish aquaculture cages on the south coast of Newfoundland, and were linked to fish farm activity (Murray *et al*. 2012; Hamoutene *et al*. 2013). OPC are visible during video surveys of the seafloor: they typically form dense colonies surrounded by mucus that can completely obstruct the view of the substrate (Hamoutene *et al*. 2013). Opportunistic annelids at aquaculture sites can also live within sediment or flocculent matter and co-occur with mats of sulfur oxidizing *Beggiatoa* spp. (Grant *et al*. 1995; Capone *et al.* 1996; Saravanakumar *et al.* 2012; Hamoutene *et al.* 2013). Annelid-bacterial mat associations were also reported at other organically enriched habitats such as hydrothermal vents, cold seeps and wood or whale falls (Blake & Hilbig 1990; Weiss & Hilbig 1992; Sahling *et al.* 2002; Levin *et al*. 2009; Huusgaard *et al*. 2012).

Annelids forming OPC in Newfoundland were identified as belonging to the genus *Ophryotrocha* Claparède & Mecznikow, 1869, family Dorvilleidae (Murray *et al*. 2012). Dorvilleids live in a range of habitats from shallow water (Hilbig & Blake 1991; Prevedelli *et al.* 2005) to the deep sea, including extreme habitats such as methane seeps (Levin & Michener 2002; Levin *et al.* 2006; Decker & Olu 2010; Thurber *et al.* 2010), hydrothermal vents (Blake & Hilbig 1990; Weiss & Hilbig 1992; Bergquist *et al.* 2007; Paxton & Morineaux 2009), aquaculture sites

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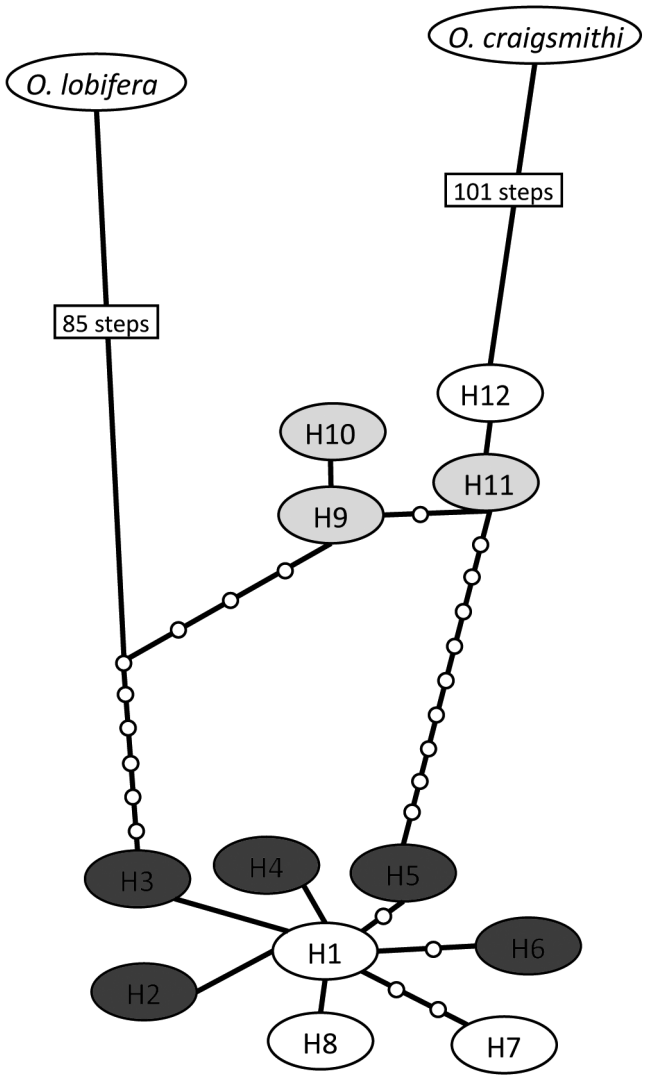

FIGURE 4. Haplotype network from TCS using fifteen COI sequences from the new species, *Ophryotrocha cyclops*, resulting in twelve haplotypes. Light grey: specimens from the Greenland site; white: specimens from Newfoundland sites A and B; dark grey: specimens from Newfoundland site C.

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