A multi-omic analysis of potential cetacean skin-associated chemical cues for cyprid settlement in the tassel barnacle, *Xenobalanus globicipitis*

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**Introduction**

Distribution and Life Cycle
- The tassel barnacle (*Xenobalanus globicipitis*) is a pseudo-stalked member of the Coronulidae, an entirely epizoic barnacle family
- Cosmopolitan¹ obligate commensal found living exclusively on dolphins and a few other species of small whales; primarily on the rear margins of the pectoral fins, dorsal fin, and flukes² (Fig. 1)

**Biofilms and Settlement**
- Biofilms are thin layers of microbes that form on all environmental surfaces and have been observed to act as either excitatory or inhibitory cues for biofouling invertebrates and increase adhesion strength in some species³
- Life cycle begins with hatching into a naupliar larval stage, followed by a series of naupliar larval instar stages, then a final molt into the cyprid larval stage during which exploration for suitable substratum occurs

**Methods**

**Extraction and Settlement Assay**
- Cryohomogenized dolphin skin (Fig. 3a) will be extracted using standard MTBE/methanol and urea wash techniques to isolate the lipid and protein fractions, respectively; remaining fraction will be termed as other
- Gellan gum 'lollipops' infused with extracted fractions (Fig. 3b) will be placed into a flow tank, where cyprids will be deposited and allowed to settle (Fig. 3c)

**Lipidomics**
- Lipid profiles will be characterized using liquid chromatography-tandem mass-spectrometry (LC-MS/MS) and compared across demographics, body location, and presence or absence of *X. globicipitis*

**Biofilms and Settlement**
- Live dolphins were swabbed on all fins during a capture-release health assessment in Sarasota, FL, and mounted onFTA⁴ indicator cards for sequencing as well as stored for lab culturing of biofilms

**Objective 1:**
- Assay cyprids for settlement using gels infused with lipid, protein, metabolite, or combination extracts
  - \( H_1 \): Cyprids will preferentially settle on gels that contain epidermal lipids
  - \( H_2 \): Cyprids will settle preferentially on gels that contain epidermal proteins

**Objective 2:**
- Characterize the epidermal lipidome of various cetaceans and compare across demographic, body location, and presence of *X. globicipitis*

**Objective 3:**
- Characterize biofilm microbes and assay for settlement effects

**Significance**

**Settlement Biology**
- elucidating the poorly understood relationship between the barnacle and its host and lending important clues to the settlement biology of related coronulid barnacles (Fig. 5)

**Lipidomics and Genomics**
- developing protocols to characterize lipids associated with dolphin skin, facilitating the screening of changes to dolphin health
- Identifying common epidermal microbes on dolphins and effects on settlement will clarify occurrence intensity patterns

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