

# Electron microscopy reveals insights into the nano scale world of marine sponges

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## Viruses

- Are the most abundant entities in marine environments, with about  $10^{10}$  viruses per litre of seawater;
- Likely infect all organisms, from prokaryotic to eukaryotic cells;
- Play important roles in regulating biological processes in the marine environment.

## Sponges

- Are conspicuous, biodiverse and functionally important members of marine benthic communities;
- Harbor dense and diverse communities of microbial symbionts;
- Connect the benthic and pelagic environments by selectively filtering nanoparticles from the seawater.

## Aim

Describe the diversity of virus-like particles associated with marine sponges using Transmission Electron Microscopy to determine whether sponges are a relevant model for studying host-viral interactions in the marine environment.

## Methods

Transmission Electron Microscopy (TEM) preparations:

- Direct purification of viruses from the sponge tissue using cesium chloride density gradients (Figure I A-H);
- Sectioning thin tissue from fixed sponges (Figure I I-Q).

## Results & Conclusion

A wide diversity of viral morphologies are present in sponge tissue and their associated prokaryotic symbionts (Figure I). This is the first description of viruses associated with GBR and Red Sea sponges and confirms the hypothesis that sponges are a hotspot of viral diversity and an ideal model for studying host-virus interactions in the marine ecosystem.

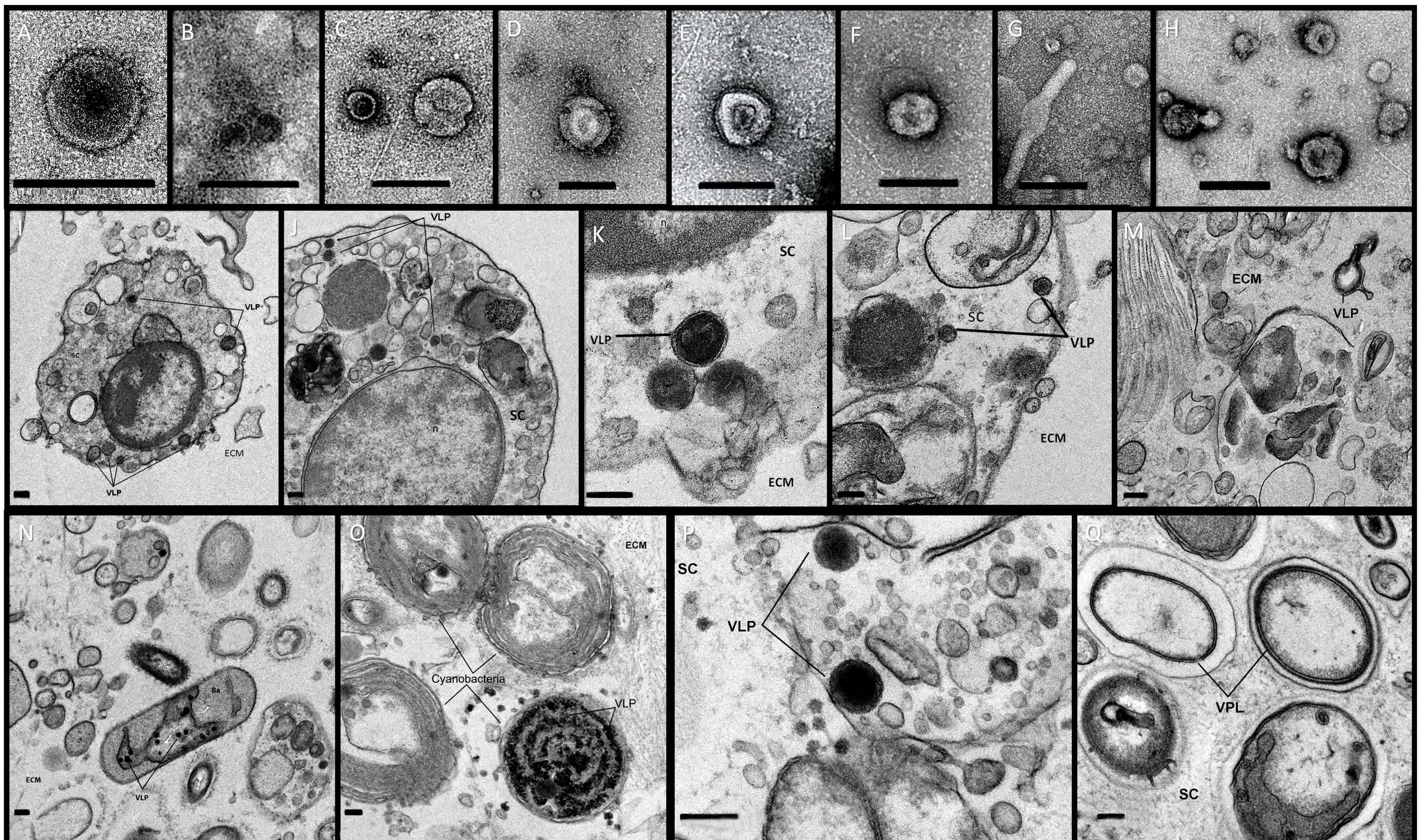


Figure I – TEM (CsCl purification (A-H) and sponge tissue sections (I-Q)) of the sponges *Carteriospongia foliascens* (A, O); *Stylissa carteri* (B, G, H); *Auletta* sp. (C, D); *Crella cyathophora* (E); *Amphimedon queenslandica* (F); *Amphimedon achracea* (I-K); *Xestospongia testudinaria* (L, N); *Mycale* sp. (M); *Hyrtios erectus* (P, Q). VLP, virus-like particles; ECM, extracellular matrix; SC, sponge cell, n, sponge nucleus within sponge cell, sponge-associated bacteria (Ba). Scale bar indicates 200 nm.