Comparative observations of flow around Hawaiian deep-sea corals.

Frank Parrish and Thomas Oliver

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Pacific Islands Fisheries Science Center
In the patch

Adjacent to the patch

Depth
Temp
Flow rate
Tidal spectra
Suspended mat.
Commercially harvested precious corals

Pink

Red

Bamboo

“midas”

Gold
### Physiography of coral patches

<table>
<thead>
<tr>
<th>Location</th>
<th>Topography/size</th>
<th>Depth</th>
<th>Common precious coral taxa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbers Pinnacle</td>
<td>0.05 square km</td>
<td>330 m</td>
<td>Gold coral, Kulamanamana haumeaeae, Bamboo, Acanella dispar</td>
</tr>
<tr>
<td>Keahole Pt.</td>
<td>2.7 square kms</td>
<td>379 m</td>
<td>Gold coral, Kulamanamana haumeaeae, Bamboo, Acanella dispar, Red coral, Hemicorallium laauense</td>
</tr>
<tr>
<td>Makapuu Pt.</td>
<td>12.5 square kms</td>
<td>415 m</td>
<td>Gold coral, Kulamanamana haumeaeae, Bamboo, Acanella dispar, Red coral, Hemicorallium laauense, Pink coral, Pleurocorallium secundum</td>
</tr>
</tbody>
</table>
Instruments – all 3 sites

2007 Nov-Apr
2013 Dec-July
2012-2015
Instruments - Makapuu

2016-2017
Flow direction

North-South Speed (cm/s)

East-West Speed (cm/s)

Compass heading

Days
Backscatter
Northern pulse of water from deep colder water biogenic?
<table>
<thead>
<tr>
<th>Taxa</th>
<th>No.</th>
<th>Observed mean flow cm/s (std)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acanella dispar</td>
<td>19</td>
<td>2.78 (3.98) - 18.89 (10.36)</td>
</tr>
<tr>
<td>Acanthogorgia sp.</td>
<td>17</td>
<td>4.89 (5.23)</td>
</tr>
<tr>
<td>Antipatharia sp.</td>
<td>2</td>
<td>9.6 (10.7) - 18.4 (10.1)</td>
</tr>
<tr>
<td>Dendropathes bacotaylorae</td>
<td>6</td>
<td>4.89 (5.23) - 14.9 (8.59)</td>
</tr>
<tr>
<td>Equchipsammia sp.</td>
<td>11</td>
<td>9.6 (10.7) - 13.5 (13.8)</td>
</tr>
<tr>
<td>Eunicella sp</td>
<td>1</td>
<td>14.92 (8.59)</td>
</tr>
<tr>
<td>Halipteris sp.</td>
<td>16</td>
<td>0.54 (1.91) - 7.94 (7.24)</td>
</tr>
<tr>
<td>Hemicorallium laauense</td>
<td>10</td>
<td>0.54 (1.91) - 4.89 (5.23)</td>
</tr>
<tr>
<td>Kulamanamana haumeaeae</td>
<td>22</td>
<td>2.78 (3.98) - 17.07 (9.05)</td>
</tr>
<tr>
<td>Lepidisis olapa</td>
<td>3</td>
<td>2.78 (3.98) - 14.9 (8.59)</td>
</tr>
<tr>
<td>Narella gigas</td>
<td>5</td>
<td>18.89 (10.36)</td>
</tr>
<tr>
<td>Narella muzikae</td>
<td>11</td>
<td>18.4 (10.1) - 21.7 (11.93)</td>
</tr>
<tr>
<td>Paracalyptrophora sp.</td>
<td>1</td>
<td>18.4 (10.1)</td>
</tr>
<tr>
<td>Pleurocorallium secundum</td>
<td>51</td>
<td>12.6 (10.61) - 18.4 (10.1)</td>
</tr>
<tr>
<td>Plexaurid</td>
<td>9</td>
<td>2.78 (3.98)-18.4 (10.1)</td>
</tr>
<tr>
<td>Plexaurid blue</td>
<td>10</td>
<td>14.92 (8.59)-18.89 (10.36)</td>
</tr>
<tr>
<td>Plexaurid gold</td>
<td>3</td>
<td>14.92 (8.59)-18.89 (10.36)</td>
</tr>
<tr>
<td>Telopathes sp.</td>
<td>1</td>
<td>12.7 (7.44)</td>
</tr>
<tr>
<td>Thourella hilgendorfi</td>
<td>1</td>
<td>16.8 (9.25)</td>
</tr>
</tbody>
</table>
Range of mean flow by coral type

- Primnoids - 63
- Pleurocorallium secundum PINK - 51
- Acanella dispar BAMBOO - 19
- Plexuarids - 20
- Antipatharia - 6
- Kulamanamana haumea ae GOLD - 22
- Lepidisis olapa - 3
- Pennatulids - 16
- Hemicorallium lauense RED - 10
- No coral

cm / sec
Range of mean flow by coral type

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- Pleurocorallium secundum (PINK): 51 cm/sec
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(cm/sec)
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cm / sec
Edge of Barbers patch
Greater backscatter strength = more food

-42 dB

-29 dB

Greater backscatter strength = more food
Primnoids

*Narella gigas*

*Narella muzikae*
Corallids

Red and Pink Coral Colony Counts

Hemicorallium laauense

Pleurocorallium secundum
Red Keahole

Pink Makapuu

Face multiple directions – low flow

Face same direction – high flow

Mean °C

Mean flow cm/s
Bamboo and Gold - all sites

Acanella dispar

Kulamanamana haumeaee
More golds at lower flow
Height of gold colonies differs among sites
P<0.05
Summary

• Within depth/temp envelopes for deep coral flow is an important variable
• Difference in backscatter can shift the scale of flow suitable for corals
• Different taxa have different flow preferences
  • Intensity
  • Spatial and temporal spectra
• Able to put some numbers on expected relationships
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