

Cascadia sites BB850 and FS19 information – SIO ABALONES OBS

Site: BB850	Site: FS19
Relocation Survey coordinates: LAT 44.5332 (N) LON -128.0460 (W)	Relocation Survey coordinates: LAT 40.6239 (N) LON -124.4704 (W)
Depth: 2875 meters	Depth: 100 meters
Acoustic Release Package information: Acoustic: #164 Enable: 166312 Disable: 166331 Burn-1: 147370 Burn-2: 147417 End Burn: 166377	Acoustic Release Package information: Acoustic: #163 Enable: 166164 Disable: 166206 Burn-1: 147336 Burn-2: 147353

General information:

The instrument type is an SIO ABALONES OBS as part of the Cascadia Initiative array. During the deployment cruise aboard the *R/V Oceanus* (July 24 – August 06, 2014) an acoustic ranging survey at was performed to relocate the on-bottom instrument position (typical accuracy within ~10 meters).

On Sept 9, 2015 the SIO team aboard the *R/V Oceanus* spent 6 hours at the site initiating the burn command a total of 16 times to both release units. With no success the instrument was deemed “stuck” and the ship continued on to the next site of the OBS array. The acoustics worked fine and the instrument was responding to the burn commands, this confirms the unit is at the drop site and intact.

Possible failure causes:

- corrosion in release cable
- battery failure / depletion in acoustic release unit
- release mechanism not properly separating from anchor (i.e. “hung”)
- biofouling / sediment sequestration

Abalones weight and floatation specifications:

Dry weight with anchor = 894 lbs Dry weight w/o anchor = 561 lbs Dry weight anchor = 333 lbs	Wet weight anchor = 287 lbs Negative buoyancy = -223 lbs Positive buoyancy upon release = 63 lbs Rise rate = 38 m/min
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A detailed description and photos of the ABALONES instrument are included toward potential ROV recovery efforts.

The ABALONES OBS System

Termed the ABALONES (Autonomous Broad Application Low Obstruction Noise Exempt System) OBS, it likens itself to the marine mollusk that has a protective shell and is very difficult to pry off the bottom. The variety of configurations includes an intermediate-period/BB, strong-motion, and short-period OBS (see figures below). The “standard package” is robust enough to offer a suite of sensor options while maintaining trawl resistance, seismometer isolation and current shielding, deep-water capability and robustness through a conformal syntactic-foam flotation-based frame design. Data is recorded to Compact Flash (CF) and retrieved at a user defined instrument recovery interval (exceeding 1-year).

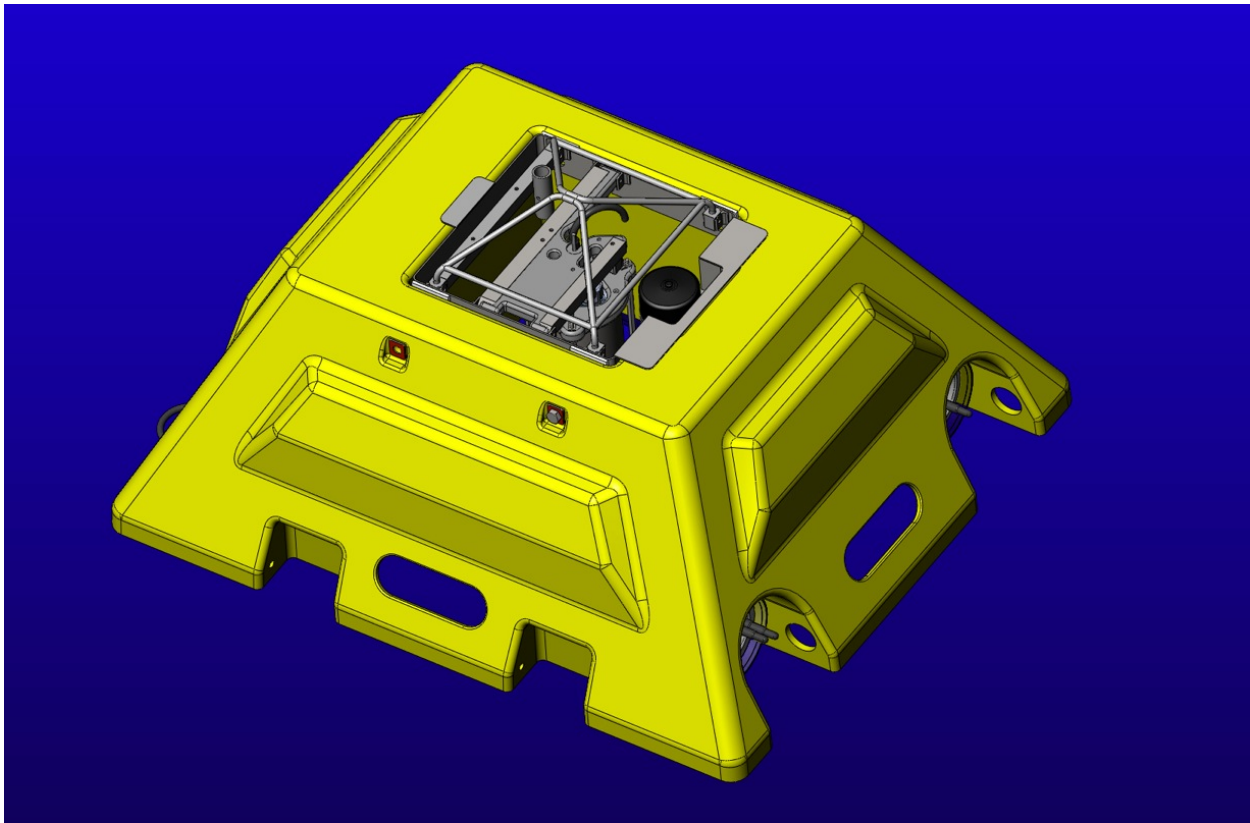


Figure 1. 3D-CAD drawing of the ABALONES Ocean Bottom Seismometer design. The trawl resistant design includes a detachable, mechanically decoupled sensor that is shielded from seafloor currents. The package integrates conformal syntactic foam flotation to increase reliability. The configuration is suitable for deployments up to 6 km. The autonomous unit with self contained anchor and flotation is designed for quick deployment and recovery while at sea (i.e. no ROV, no winch/tow cable, or other special equipment required), which reduces ship time and associate costs.



Figure 2. ABALONES unit attached to anchor (sitting on pallet in IGPP service yard). The Trillium-Compact sensor package is shown in front of ABALONES unit for perspective. In deployment mode, the sensor package is housed within the center well of the syntactic flotation-based frame and is mechanically detached from the main frame via corrodable link. At recovery, the steel anchor is left on the seafloor.



Figure 3. ABALONES unit on the deck of the *R/V Robert Gordon Sproull* before deployment during an October 2011 test cruise.

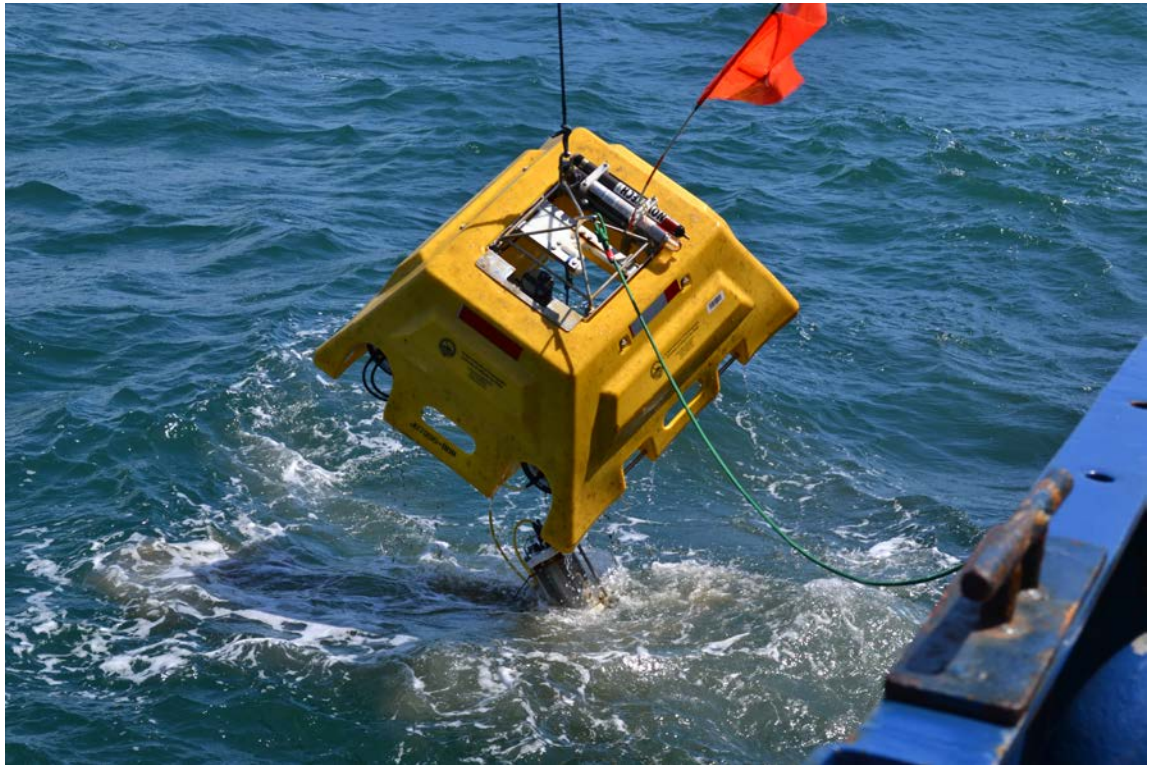


Figure 4. Pictures of ABALONES recovery aboard the *R/V Oceanus* during second year of Cascadia Initiative (2012-2013). Note that the T-C sensor package is attached by a rigid strap and dangles slightly below the primary instrument housing during recovery.

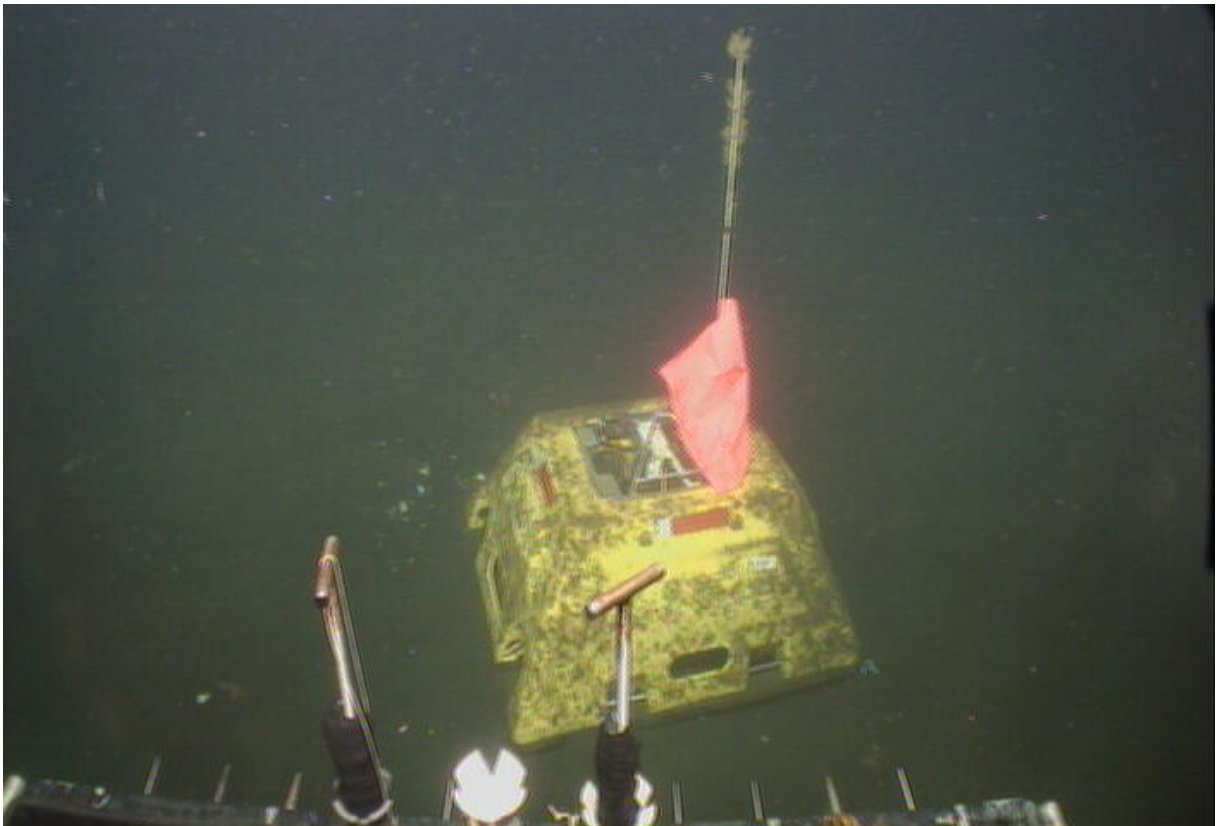


Figure 5. Pictures of ABALONES unit J33A on the bottom taken by ROV Jason in July 2012. With a deployment depth of 348m the unit at this shallow site has accumulated considerable bio-growth near the end of the 1-year deployment.

Detailed ABALONES Design Specifications

The ABALONES is a versatile low power system that allows the use of one main recording package to support all recording configurations. The general characteristics of these instruments include:

- 24-bit analog-to-digital converter
- precision time base
- solid-state storage
- independent acoustics
- 3-axis broadband seismometer (passive)
- hydrophone (active) –or– low frequency DPG/hydrophone (passive)

Table 1 gives a general description of ABALONES instrument components

Table 1: ABALONES Design Specifications

Seismometer/ Accelerometer	Intermediate-Period: Nanometrics Trillium-Compact seismometer, which has a flat velocity response from 120s to 100 Hz. The seismometer is housed within an 8” Inside Diameter (ID) Titanium cylinder and a custom-designed active leveling system which can be leveled from $\pm 180^\circ$ to vertical with $\sim 0.3^\circ$ accuracy.
Pressure Sensor	Short-period: Customized HiTech hydrophone with internal preamp. Bandwidth (-3 dB) is 50 mHz - 15 kHz. Long-period: Differential Pressure Gauge (DPG) with response from 10 mHz - 10 Hz.
Digitizer	24-bit A/D with solid-state recording (CompactFlash). The dynamic range is ~ 126 dB (3-bit self-noise). The ABALONES design includes the latest seismic A/D chip with programmable sample rates from 1 Hz to 4 kHz.
Clock	Low-power, digitally-temperature-compensated (DTCXO), precision time base. The drift rate is $1:3\text{-}5 \times 10^{-8}$ (<5 ms/day before correction and <1.5 s/yr)
Recording Capacity	Single CompactFlash card slot \rightarrow 64 Gb CF cards currently available. Capable of recording 1-year deployment on 4-channels @ 100 Hz.
Data Offload	USB2 through the end cap without opening the pressure case. Offload rates are CF card dependent, currently up to 400 Mb/s.
Battery Pack	Batteries are mounted in the main data logger pressure case and optionally in an additional battery case. Alkaline batteries power the acoustic release.
Recording duration	IPA: Lithium battery pack can provide power for 12 months, Alkaline packs can provide power for 4+ months. SPA: Lithium battery pack can provide power for 18+ months.
Weight	850/550 lbs with/without anchor (in air)
Pressure Case	5” diameter Al cylinder – 6 km depth rating
Release	Double burn wire operated acoustically
Dimensions	29" high x 42" x 42" (w/ bail)
Power (Total)	Intermediate: <300 mW (4 chan), plus ~ 160 mW w/ Trillium-Compact

Cruise ID: <u>CASCADIA</u> IRIS Code: <u>X9</u> NEW ELECTRONICS CHECKLIST	
Lab Checkout Date: <u>7/15/14</u>	Deployment Prep By: _____ ?
Lab Checkout By: <u>JL/PG</u>	Instrument Type: _____ ?
STATION INFORMATION	DEPLOYMENT
Site ID: <u>BB850</u>	Power Relays:
Deployment LAT: <u>44 32.030</u>	Main <input checked="" type="checkbox"/> Trillium <input type="checkbox"/>
Deployment LON: <u>128 02.857</u>	Clock <input checked="" type="checkbox"/> Analog <input checked="" type="checkbox"/>
Water Depth (M): <u>2875.72</u>	Voltage: <u>14.97</u> Temp: <u>22.8</u>
Relocation LAT: <u>44.5332</u>	Initialize CF: <input checked="" type="checkbox"/>
Relocation LON: <u>-128.0468</u>	D2D Dat Files Found: <u>29</u>
EQUIPMENT INFORMATION	First LBA: <u>1079552</u>
Data Logger: <u>1</u>	Last LBA: <u>122714367</u>
Acoustic: <u>164</u>	Get Current LBA: <input type="checkbox"/>
Frame: <u>1</u>	Enable FPGA Reset Detect: <input checked="" type="checkbox"/>
Float: <u>-</u>	Save Mission to EEPROM: <input checked="" type="checkbox"/>
Radio: <u>None</u>	Display Mission Match: <input type="checkbox"/>
Strobe: <u>None</u>	Mission: <u>Abalones 4th Cascadia</u>
Geophone: <u>#1</u>	Sample Rate: <u>50</u>
Hydrophone: <u>#1 (003019)</u>	Gains:
CF Serial Number: <u>2014-604</u>	CH1 <input type="checkbox"/> CH2 <input type="checkbox"/> CH3 <input type="checkbox"/> CH4 <u>64</u>
CF Size: <u>64</u>	M1 <input checked="" type="checkbox"/> M2 <input checked="" type="checkbox"/> M3 <input checked="" type="checkbox"/> M4 <input checked="" type="checkbox"/>
BATTERY INFORMATION	Sync Clocks 1:
Main Power Type: <u>2x7cell Li 39,7.5,15</u>	Sync Clocks 2: <u>2014:206:20:43:00</u>
Quantity: <u>2</u>	System TAG: <u>2014:206:20:43:59.9999972</u>
Clock Pack Type: <u>Part of Pack</u>	Clock TAG: <u>2014:206:20:40:59.9999995 45:0000000</u>
Quantity: <u>N/A</u>	SYS: _____ CLK: _____ ?
LOGGER INFORMATION	Start Mission: <input checked="" type="checkbox"/> <u>2R</u>
Logger Module: <u>1</u>	RECOVERY
CPU: _____	Voltage: _____ Temp: _____
A2D: _____	FPGA Not Reset: <input type="checkbox"/> (If reset DO NOT Click End Logging)
A2D Daughter: <u>0</u>	Check LBA 1:
Clock Board: <u>2</u>	Check LBA 2:
Seascan: <u>1639</u>	End Logging- T1234: <input type="checkbox"/>
Power Board: <u>5</u>	Save Time TAG:
Power Dist: <u>5</u>	PS Time TAG:
Version - same as previous Trillium & DPG sw: Aug 23, 2012 14:59:18 Aug 22, 2012 17:12:59 (49)	PC Time TAG:
	PC Drift:
	Type HS: <input type="checkbox"/>
NOTES	
<p>STUCK ? <input type="checkbox"/> Survey & Disable</p> <p style="text-align: right;">ABALONES</p>	

* STUCK

Cruise ID: <u>CASCADIA</u> IRIS Code: <u>X9</u> NEW ELECTRONICS CHECKLIST	
Lab Checkout Date: <u>7/15/14</u>	Deployment Prep By: <u>mrb</u>
Lab Checkout By: <u>PG/JL</u>	Instrument Type: <u>Abalones</u>
STATION INFORMATION	DEPLOYMENT
Site ID: <u>FS19</u>	Power Relays:
Deployment LAT: <u>40.624083</u>	Main <input checked="" type="checkbox"/> Trillium <input checked="" type="checkbox"/>
Deployment LON: <u>-124.470300</u>	Clock <input checked="" type="checkbox"/> Analog <input checked="" type="checkbox"/>
Water Depth (M): <u>100</u>	Voltage: <u>15.32</u> Temp: <u>60.8 F</u>
Relocation LAT: <u>40.6239</u>	Initialize CF: <input checked="" type="checkbox"/>
Relocation LON: <u>-124.4704</u>	D2D Dat Files Found: <u>29=64GB</u>
EQUIPMENT INFORMATION	First LBA: <u>107952</u>
Data Logger: <u>12</u>	Last LBA: <u>122714367</u>
Acoustic: <u>163</u>	Get Current LBA: <input checked="" type="checkbox"/>
Frame: <u>16</u>	Enable FPGA Reset Detect: <input checked="" type="checkbox"/>
Float:	Save Mission to EEPROM: <input checked="" type="checkbox"/>
Radio: <u>battery bottle 12</u>	Display Mission Match: <input checked="" type="checkbox"/>
Strobe:	Mission: <u>Abalones 4th CAS</u>
Geophone: <u>14</u>	Sample Rate: <u>50</u>
Hydrophone:	Gains:
CF Serial Number: <u>2014-705</u>	CH1 <input type="checkbox"/> CH2 <input type="checkbox"/> CH3 <input type="checkbox"/> CH4 <u>64</u>
CF Size: <u>64</u>	M1 <input checked="" type="checkbox"/> M2 <input checked="" type="checkbox"/> M3 <input checked="" type="checkbox"/> M4 <input checked="" type="checkbox"/>
BATTERY INFORMATION	Sync Clocks 1: <u>2014:224:05:15:00</u>
Main Power Type: <u>2x7cell Li 3.9,7.5,15</u>	Sync Clocks 2: <u>2014:224:05:18:00</u>
Quantity: <u>2</u>	System TAG: <u>2014:224:05:18:59.9997370</u>
Clock Pack Type: <u>Part of Pack</u>	Clock TAG: <u>2014:224:05:21:00.0000172</u>
Quantity: <u>N/A</u>	SYS: <u>3</u> CLK: <u>3</u>
LOGGER INFORMATION	Start Mission: <input checked="" type="checkbox"/>
Logger Module: <u>12</u>	RECOVERY
CPU: <u>10</u>	Voltage: _____ Temp: _____
A2D: <u>15</u>	FPGA Not Reset: <input type="checkbox"/> (If reset DO NOT Click End Logging)
A2D Daughter: <u>8</u>	Check LBA 1:
Clock Board: <u>9</u>	Check LBA 2:
Seascan: <u>1437</u>	End Logging- T1234: <input type="checkbox"/>
Power Board: <u>2</u>	Save Time TAG:
Power Dist: <u>7</u>	PS Time TAG:
Version same as previous Trillium & DPG sw: Aug 23, 2012 14:59:18 Aug 22, 2012 17:12:59	PC Time TAG:
	PC Drift:
	Type HS: <input type="checkbox"/>
NOTES	
<div style="border: 1px solid black; padding: 5px; display: inline-block;">* STUCK</div> <div style="margin-left: 200px; font-size: 2em;">✓ Survey + Disable</div> <div style="text-align: right; font-size: 2em; margin-top: 20px;">ABALONES</div>	