Workshop 1: Technology for Change

Moderated By
Al Ramadan, Play Bigger
Evolution of Technology for Ocean / Land Interface

- **1872**: Wireline Sounding Machine
- **1914**: Fessenden Oscillator
- **1922-39**: Acoustic Echo Sounders
- **1941-45**: WWII Shoran
- **1961**: Scripps Deep Tow
- **1982**: NOAA Pacific Array
- **1992**: TOPEX / Poseidon
- **1995**: Declassification of Geosat satellite radar altimetry data
- **2004**: Google acquires Google Earth
- **2010**: Census of Marine Life
Driving an explosion in the availability of data
Researchers decided to tap the vast amount of data generated by anti-collision beacons on ships —some 22 billion messages from 2012 to 2016.

In 2016 alone, these ships traveled more than 460 million kilometers—about five times the distance from Earth to the sun.
Our Panel

Matt Mulrennan
Director, Ocean Initiative
XPRIZE

Matthew Morey
Chief Technology Officer
MJD Interactive

Shannon Waters
Smartfin / Surfrider

Jose Borrero
Director and Senior Consultant
eCoast Marine Consulting and Research
Matt Mulrennan

Director, Ocean Initiative, XPRIZE
Technology for Change
“The problems of the world cannot possibly be solved by skeptics or cynics whose horizons are limited by the obvious realities. We need people who can dream of things that never were.”

-John F. Kennedy
SOME OF OUR MOST SIGNIFICANT GRAND CHALLENGES INVOLVE OCEANS
XPRIZE Ocean Initiative

A ten-year commitment to conduct five ocean XPRIZE competitions by 2020, and engage in thought leadership, outreach and impact.

The vision is to make the ocean Healthy, Valued, and Understood.

Inspires solutions to ocean Grand Challenges.

Funding provided by Wendy Schmidt starting in 2013.
The $2 Million Global Competition to Improve Our Understanding of Ocean Acidification
PUBLIC RELATIONS

XPrize's $2 million mission to protect the oceans

XPRIZE Winners Combat Ocean Acidification
WORKSHOP SUMMARIES

‘So much ocean data, so little being used.’

• Challenges and opportunities for accomplishing the shared vision:
  • culture, interoperability, valley of death, improving access to data and data quality, better models and forecasting tools.

• Lots of interesting ocean datasets, ocean community recognizes need, and many big industries/public users of ocean resources.

• Great potential for growth of ocean data products and services.

• Strong desire for an ocean service incubator and accelerator of ocean data products.

• Need for new thinking, competition and breakthroughs!
$100,000 for mobile apps to turn ocean data into the products and services we need.

“7 Award-Winning Apps Launch a Mobile Age for the Ocean Economy.”
NAVISEA

ENJOY THE OCEAN YOU LOVE

SeaStatus
Sustainable fishing and fishing

SeaSee

FishAngler.com
CONNECT. CATCH. COMPETE

Endangered Waves App
savethewaves.org

Sophie

APP
CHILE ES MAR
changing the tides towards sustainable SEA-TO-TABLE

XPRIZE
OCEAN EXPLORATION AND CONSERVATION NON-PROFIT BASED IN VENICE BEACH, CALIFORNIA.

HIGH-PROFILE AND CHALLENGING OCEAN EXPEDITIONS TO FIND AND FILM EXOTIC MARINE LIFE WHILE CAMPAIGNING TO PROTECT THEIR HABITATS.

WE GO BIG TO EXPLORE AND PROTECT THE OCEAN.
WE GO BIG –
TO EXPLORE AND PROTECT OUR OCEAN

Go big, or go home
OCEAN EXPLORATION
KOLOSSAL EXPEDITIONS

BIG, challenging, high-profile. See we go big.

Clear, specific targets and goals.

Easy to explain.

Focuses on exotic marine life.

Supports an ocean conservation campaign.

Tells a larger story.

Inspiring.
#GETKRAKEN – MISSION TO FIND THE COLOSSAL SQUID
OCEAN CONSERVATION

KOLOSSAL
KOLOSSAL CONSERVATION CAMPAIGNS

BIG, challenging campaigns

Public facing and engaging

Optimistic

Use pop culture and humor

Simple asks

Clear victories

First campaign promoting local, sustainable seafood and community supported fishing (CSF) in Los Angeles and Southern California. Maximizing the local seafood movement’s benefit for the global ocean.
Technology for Change

Matthew Mulrennan
Director, Ocean Initiative, XPRIZE
Co-Founder, CEO, KOLOSSAL
@kolossaloceans
matt@kolossal.org
Matthew Morey <me@matthewmorey.com>  

to nik  

Nik,

Just ran across https://herox.com/bigoeanbutton/entry/14508.

I'm a San Diego based surfer and CTO of http://mjinteractive.com/ (we build mobile apps here). I would love to beta test the app for you.

Let me know.

Thanks,

Matt Morey

---

Nik Strong-Cvetich <nik@savethewaves.org>  

to Matthew  

Hi Matt,

Thanks for the interest! We'd love to have your help. We are going to be releasing it on itunes around the end of the year.

Also wondering if you guys might have any bandwidth on development. We are hoping to have the minimum viable product out by Jan 1, and are still seeking development assistance.

Would love to connect when you have time.

Thanks!

Nik

Nik Strong-Cvetich
(pronounced "strong-suh-vcetich")
Executive Director

SAVE THE WAVES

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Phone: 206-939-9457
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Facebook - Instagram - Twitter - LinkedIn
Matthew Morey <me@matthewmorey.com>
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We go from ideation to scale.

Uncover known and unknown challenges while identifying opportunities.

Exercises that unlock collaborative creativity, leading to remarkably original ideas.

Get our ideas into user’s hands in a matter of days, at a fraction of cost.

Look through the lenses of customer desirability, technical feasibility, and business goals.

Build validated digital products and experiences through UX, design and software engineering.

Successfully launch enterprise rollout of your new product at scale.
ENDANGERED WAVES - SAVE THE WAVES APP MAP

VIEWING REPORTED ISSUES

REPORTED ISSUES MAP VIEW

1. Map View
   - First screen when opening app
   - Can see local reported issues

2. Post Button
   - Highly visible button to report your own issue

3. View Options
   - Map view or list view options
   - Active option is darker than inactive option

4. List View

5. Image of issue

6. Details of issue

7. Take Action Button

8. Share reported issue

9. Go to SaveTheWaves.org website

REPORTED ISSUES LIST VIEW

4. Map View
   - First screen when opening app
   - Can see local reported issues

5. Post Button
   - Highly visible button to report your own issue

6. View Options
   - Map view or list view options
   - Active option is darker than inactive option

7. List View

8. Image of issue

9. Details of issue

10. Take Action Button

11. Share reported issue

12. Go to SaveTheWaves.org website
ENDANGERED WAVES - SAVE THE WAVES APP MAP

REPORTING AN ISSUE

1. Take Photo or Upload
2. Report an Issue Detail Screen
3. Thank You Message

Details:
1. Camera
2. Photo Library
3. Chosen Photos
4. Shutter button
5. Uploaded Images
6. Threat Category
7. Description and Location Input Fields
8. Post Button
9. Thank you message & take action CTAs
WE MAKE SURE THE RIGHT PEOPLE SEE IT

SEWAGE

TRASHED

OIL SPILL

- SKIP -
class AppCoordinator : Coordinator {
    var userManager: UserMananger!

    override func start() {
        userManager = UserMananger.shared
        showContent()
        if isFirstLaunch() {
            showOnboarding()
        }

        showContent()
        let containerCoordinator = ContainerCoordinator(with: rootViewController)
        childCoordinators.append(containerCoordinator)
    }
}
Welcome to the App Store.

Congratulations! We’re pleased to let you know that your app, Endangered Waves by STW, has been approved for the App Store. Once your app has been released, it can take up to 24 hours before your app becomes available on the App Store.

If your contracts are not yet in effect, your app status will be Pending Contract. Check the status of your contracts in the Agreements, Tax, and Banking module in iTunes Connect.

You have the opportunity to reach a global audience. To get started, check out the resources below to learn how to promote your app, grow your business worldwide, and keep your app updated so you can take advantage of new features and keep users engaged.

Make the Most of the App Store
Discover how to optimize your app’s searchability, build your presence, keep users coming back to your app, and much more.

App Analytics
Measure user engagement, marketing campaigns, and monetization with data you won’t find anywhere else.

App Store Marketing Guidelines
Find out how to properly promote your affiliation with the App Store.

Search Ads
Put your app at the top of relevant App Store search results to reach customers at the right moment.

We appreciate your great work and look forward to your future innovations. If you have any questions, contact us.

Best regards,

App Store Review
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Best regards,

App Store Review
Shannon Waters

Smartfin / Surfrider
Plymouth, UK

Ocean Warming
--------
Coral Bleaching
--------
Sand Replenishment Project Impacts
--------
Ocean Acidification
--------
Hypoxia
--------
Sea Level Rise
--------
Living Shorelines as Buffers
--------
Coastal Erosion
--------
Sea Wall Impacts
THANK YOU!

Shannon Waters
Smartfin Program Manager, Surfrider Foundation
swaters@surfrider.org
Jose Borrero

Director and Senior Consultant, eCoast
Using the Rip Curl ‘Search GPS’ watch for the analysis, mapping and monitoring of surfbreaks.
How it works:

- GPS on watch tracks position at 1-Hz
- Synchronized to web with app on device or desktop
- Rip Curl API collects wave, wind, tide and other information from Magic Seaweed

Data set description:

- Recorded sessions from 01/01/2014 to 12/31/2017
- 948,299 ‘sessions’
- 24,772 individual users
- 56 features: user characteristics, weather conditions, ocean conditions, date, time...

Acknowledgment: Lots of work done on this by eCoast interns Chris O’Day (BS Mech. Eng. Cal Poly SLO) and Jadd Riffai (MSc Data Science, Ecole Centrale de Lille, France).

FIRSTLY: Big thanks to Rip Curl, especially Shane Helm for supporting this project, giving us access to the data and supplying watches for the New Zealand Surfbreak Study.
**Data Problems and How to Fix**

**Missing values:**
- Location: 30%
- Tide level: 45%
- Wind direction: 45%
- Demographic info: ~50%

**Bad data:**
- Several names for 1 location: “El Porto”, “El Port”, etc.
- Chinese/Japanese characters
- Missing tide, wind, swell data

**Correct Surf Spot Name/ID**
- Use lat/long and calculate distance to master spot list/look up table
- This took a long time!

**Correct Time**
- Sessions recorded in local time
- Use date and lat/long to determine time zone and DST
- Correct to UTC

**Correct Environmental Info**
- With correct UTC time stamp, could now link to global databases
- TMD for tide
- ECMWF and NOAA-WW3 for waves

*This was a lot more complicated than it seems from this slide!*
Cleaning Individual Wave Data

- Sessions written to .kml files for viewing in Google Earth
- Individual wave tracks inspected
- If it does not look like a surf ride, it is deleted
  - kiting, boating, running, driving in cars…
  - this data could be useful for other purposes
- Surfbreak analysis done on ‘cleaned’ data

All ‘WAVES’                These are NOT surfing rides!                Cleaned Data
Global Breakdown

### Recorded sessions by country

- **Australia**: 48%
- **USA**: 34%
- **Japan**: 21%
- **Brasil**: 12%
- **Indonesia**: 10%
- **Hawaii**: 8%
- **France**: 5%
- **Portugal**: 4%
- **South Africa**: 4%
- **Spain**: 3%

### Recorded sessions by spot

- **El Porto**: 20%
- **AKB**: 15%
- **Huntington Beach**: 10%
- **San onofre**: 4%
- **Arroyo Point**: 4%
- **Trestles**: 4%
- **Bolsa Chica**: 4%
- **Jan Juc Beach**: 3%
- **East Hesoya Toyohashi**: 3%
OK, now for some analysis…

We first looked at El Porto, Los Angeles, Ca.

- Urban area
- Heavily used and surfed
- Best in winter (Nov-March)

5877 Sessions
284 Users
62% Male
2% Female
36% no response
Basic Data Plots: When are people surfing the most at El Porto?

Weekly sessions over a calendar year

Weekly sessions over watch availability

Tide Level

Swell Height

Swell Direction
Ride Length as a Function of Wind/Wave Conditions

Swell Height

Swell Period

Wind Direction

Tide Level

Swell Direction

Wind Speed
Which Factor Has Strongest Influence on the Ride?

**Ride Length**
- Swell Direction
- Swell Height
- Tide Direction
- Tide Level

**Surfer Speed**
- Swell Direction
- Swell Height
- Tide Level
- Tide Direction
Spatial Analysis – Very Powerful!

Top 5 Users

User 1

User 2

User 3

User 4

User 5

User #1: One Season (Winter 2015)

One Session

One Wave

0-10 km/hr
10-20 km/hr
20-30 km/hr
30-40 km/hr
Mapping Take-off Spots

Trestles

El Porto
Take Off Spots

Can be used to map morphological changes and highlight differences in swell conditions

El Porto: Winter Swell vs. Summer Swell
Surfing locations change due to morphological changes.

Trestles: Winter Swell vs Summer Swell
Surfing locations change due to different swell direction
OK, So what about New Zealand?

Piha                      Whangamata Bar             Wainui/Pines
Raglan, Manu Bay                      Lyall Bay                             Whareakeake

Aramoana
What are the waves like? (all waves)

RIDE LENGTH

MAX SPEED
Under what conditions are most people surfing?

WAVE SIZE

TIDE LEVEL

Piha

Whangamata

Manu Bay
Can we say anything about surf spots generally?

<table>
<thead>
<tr>
<th>Location</th>
<th>Sample Size (# waves)</th>
<th>Mean. Ride Length (m)</th>
<th>Med. Ride Length (m)</th>
<th>Mean Surfer Speed (km/hr)</th>
<th>Med Surfer Speed (km/hr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PIHA</td>
<td>1464</td>
<td>78 ±38</td>
<td>69</td>
<td>23.4 ±5.7</td>
<td>22.6</td>
</tr>
<tr>
<td>WHANGAMATA</td>
<td>611</td>
<td>126 ±69</td>
<td>109</td>
<td>24.3 ±5.5</td>
<td>23.4</td>
</tr>
<tr>
<td>WAINUI</td>
<td>145</td>
<td>77 ±34</td>
<td>70</td>
<td>23.0 ±5.9</td>
<td>22.5</td>
</tr>
<tr>
<td>MANU BAY</td>
<td>1613</td>
<td>125 ±67</td>
<td>110</td>
<td>26.2 ±5.7</td>
<td>25.6</td>
</tr>
<tr>
<td>LYALL BAY</td>
<td>236</td>
<td>69 ±43</td>
<td>57</td>
<td>22.7 ±5.8</td>
<td>21.9</td>
</tr>
<tr>
<td>WHAREAKEAKE</td>
<td>74 145</td>
<td>108 ±62</td>
<td>83</td>
<td>27.3 ±6.2</td>
<td>26.2</td>
</tr>
<tr>
<td>ARAMOA NA</td>
<td></td>
<td>77 ±34</td>
<td>70</td>
<td>23.0 ±5.9</td>
<td>22.5</td>
</tr>
</tbody>
</table>

Beach Break: ~60 - 70 m ride length, ~22 km/hr
Point/River Bar: ~80 - 110 m ride length, 23-25 km/hr

Remarkably consistent considering these are very different break on very different beaches with very different swell conditions!
NOW WHAT?

We have all these tools...
What else can we do with them?
1) Surf Performance and Training?

Matt Wilkinson: Bells 2015

Wilkinson: J-Bay 2014

Gabriel Medina: Pipe 2016

Wilkinson: Cloudbreak 2014
1) Surf Performance and Training?

Not a big difference at Pipe, much more apparent at Trestles. Also note how ‘slow’ speeds are at Pipe. Surprising, eh?
2) Detailed Wave Breaking and Bathymetry Analysis

- **Swell Direction**
- **Takeoff Points**
- **Ride tracks**

BINGIN, BALI
3) Surf Break Protection and Management

Bastion Point, Australia

- Boat ramp built 2013 affected break

Watch data can be used to assess usage patterns prior to proposed developments.

Unfortunately for this spot, we have no ‘before’ data.
3) Surf Break Protection and Management
Martha Lavinia, King Island, Tasmania

- Permit granted to explore options for salmon farm operation east of the beach.
- Watch data shows where people surf, so potential impacts can be assessed.
- Can be combined with pollutant dispersal models to find a workable solution or shut down the whole idea...
3) Surf Break Protection and Management

Mapping surf-related activities within World Surfing Reserves

- Could be a useful tool for determining boundaries of future WSR’s
- “World Surfing Reserves proactively identifies, designates and preserves outstanding waves, **surf zones and surrounding environments**”
- Ties in to the concept of and provides another data layer for Martine Spatial Planning (MSP) efforts.
THE END!

One of my best surfs:
2 hr 44 min
19 waves
10 km paddling
3.5 km wave sliding

>800m Outsides to the top of Whale Bay!
41.6 km/hr top speed