

CWI



Home

Video

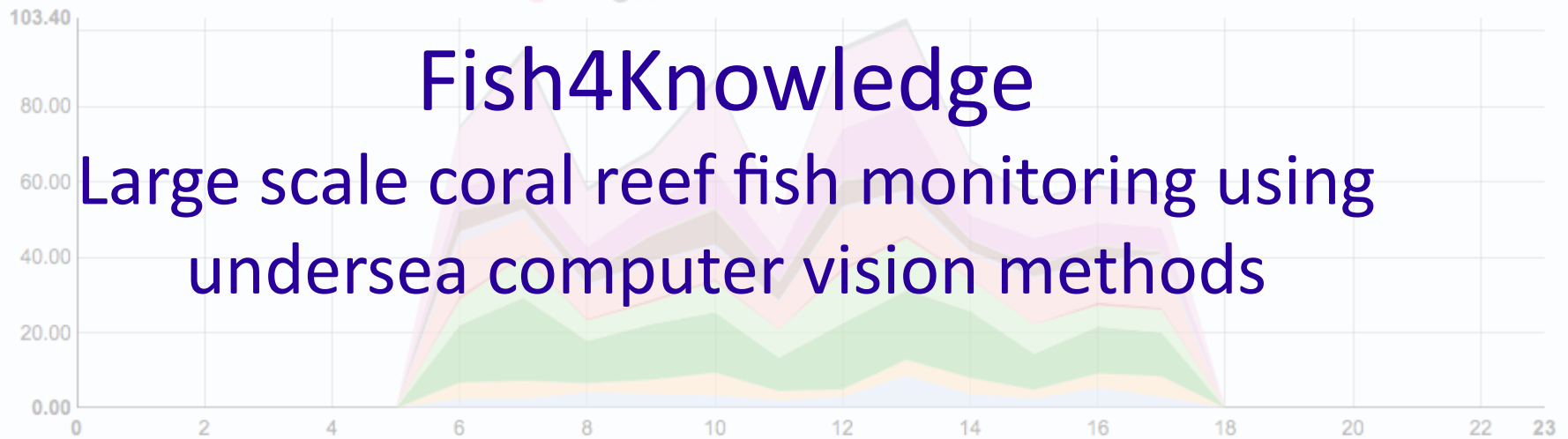
Video Analysis

Raw Data

Visualization

Report

● Stacked ○ Expanded ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○ 11 ○ 13 ○ 26 ○ 27 ○ 36



Fish4Knowledge

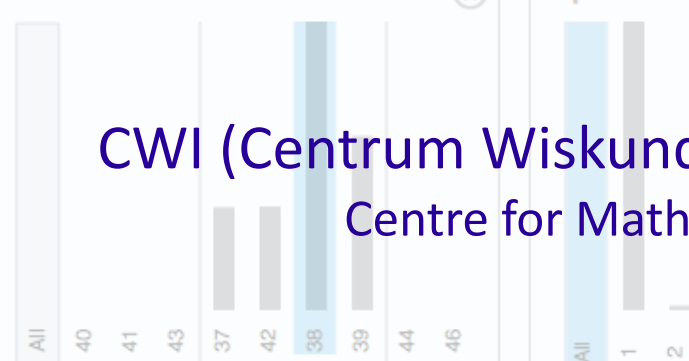
Large scale coral reef fish monitoring using undersea computer vision methods

Y Axis: Fish Count X Axis: Hour Stacked Chart: Species

Open a filter ↓ Current Filters Year: 2011 Week: 10 Month: All Camera: 26 Species: All Certainty Score: [0, 1] Software: D50-R52

Lynda Hardman

Camera



Species



CWI (Centrum Wiskunde & Informatica), Amsterdam, NL
Centre for Mathematics & Computer Science

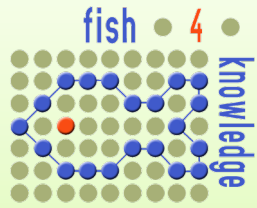
1. Collecting Video Data

- Collecting videos
- Detecting fish
- Recognizing fish species
- Recognizing fish behaviors
- Evaluating video analysis accuracy



2. Exploring Video Data

- Exploring fish counts
- Investigating species composition
- Checking potential biases



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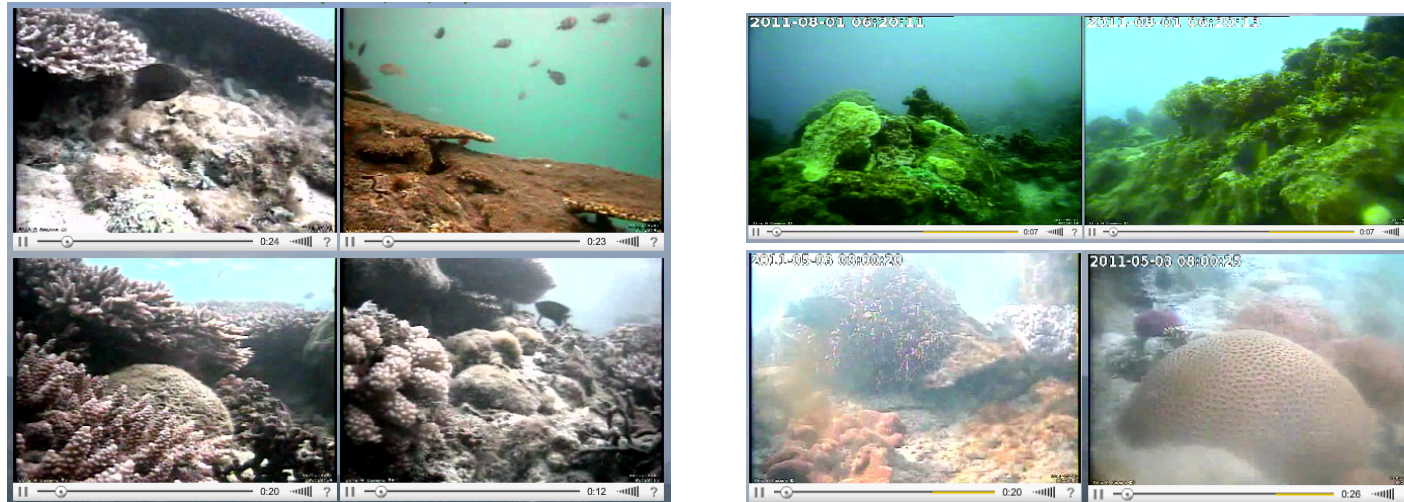


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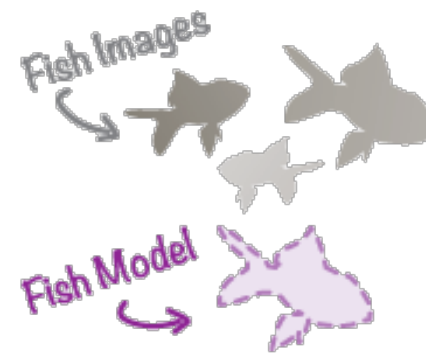
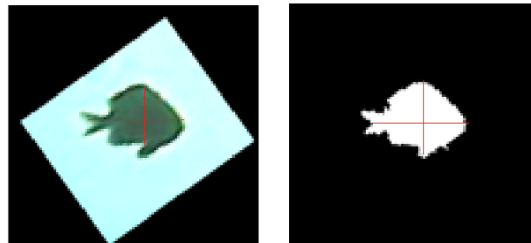
- ✓ **Multiple video streams:** 9 Cameras, >20,000 hours of videos (*Dec. 2012*)
- ✓ **Terabyte-scale data platform**
- ✓ **High-performance servers for data access**

DETECTING FISH



- ✓ **Detection of fish in each frame**
- ✓ **Description of fish contour, color, texture... (>30 features)**
- ✓ **Tracking of single fish over several frames**
- ✓ **Handling partial and total occlusions**
- ✓ **Over 400 million fish detections**

RECOGNIZING FISH SPECIES



- ☑ Detection of body parts (*head, tail...*)
- ☑ Construction of a fish model for each species
- ☑ 15 species detected (96% of total number of fish)

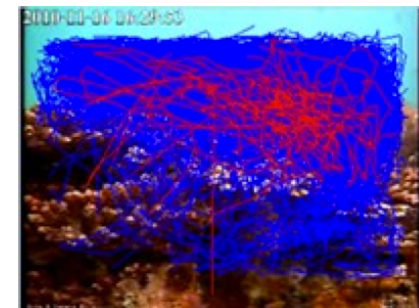
RECOGNIZING FISH BEHAVIORS



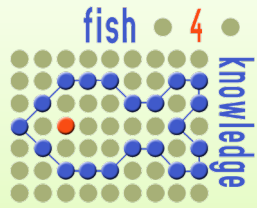
Fish Trajectories



Description of scene's background



- ☑ Detection of behaviors by analyzing trajectories
- ☑ Relation to background objects (feeding, hiding...)
- ☑ Relation to other fish (pairing, grouping, solitary...)



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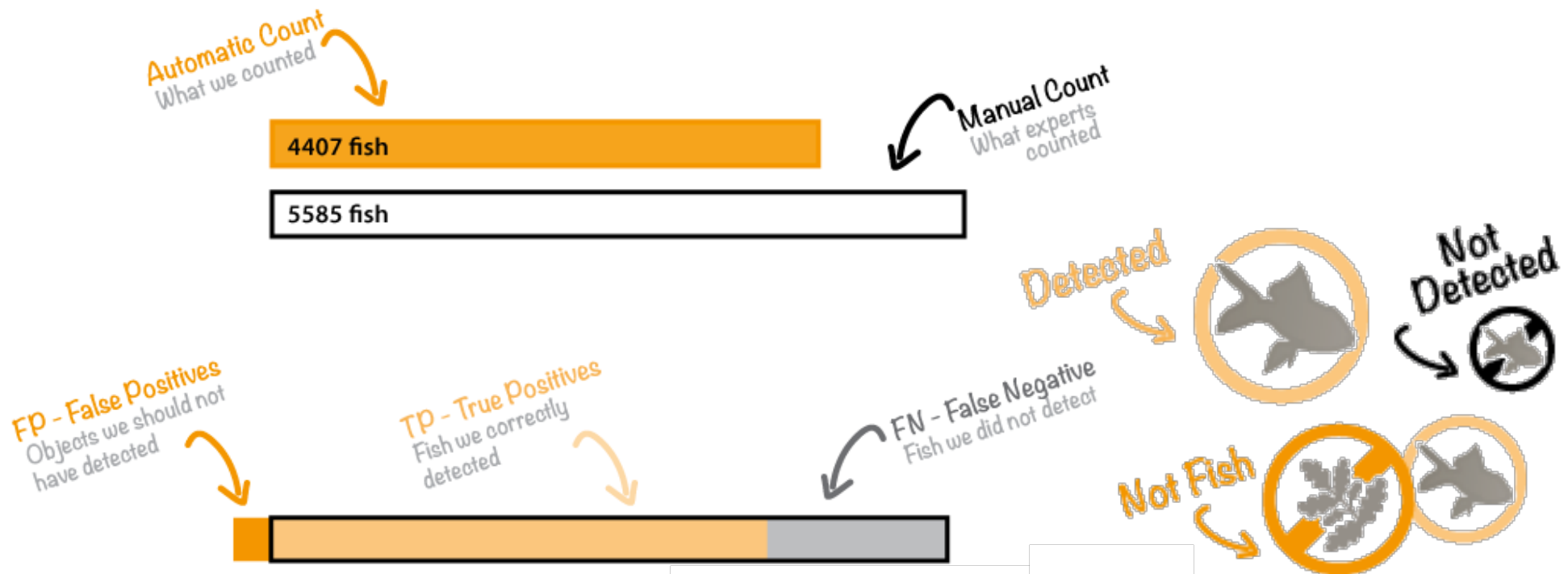
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EVALUATING VIDEO ANALYSIS ACCURACY



- ✓ Comparison with manual detections by experts
- ✓ Fish detection game to encourage crowd sourcing

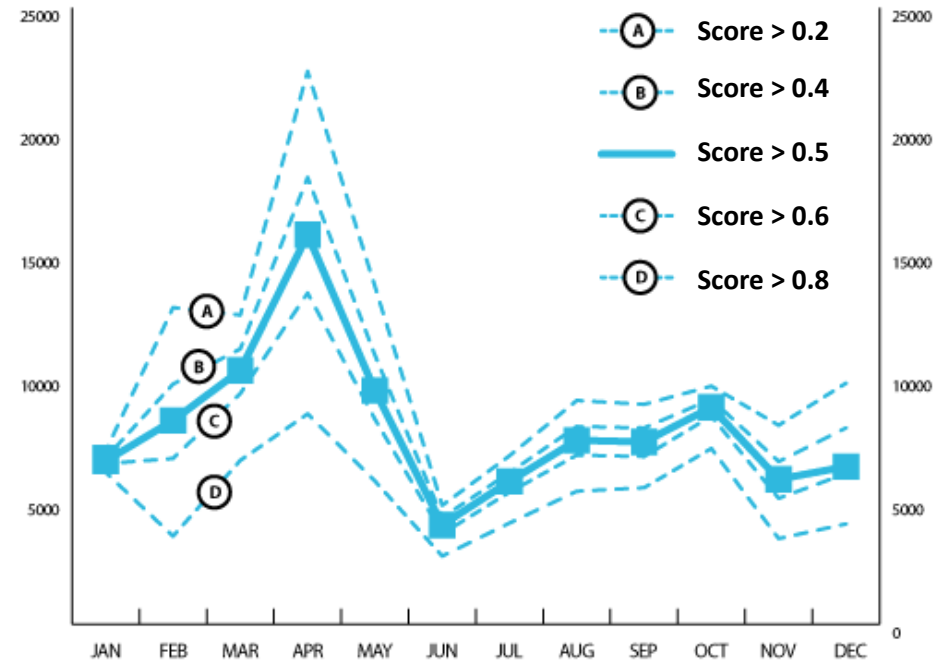
EVALUATING VIDEO ANALYSIS ACCURACY



Certainty Score: **0.4** Certainty Score: **0.6**

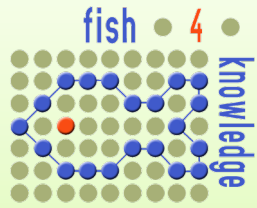


Certainty Score: **0.75** Certainty Score: **0.9**



Fish Counts for 5 Certainty Score Thresholds

- ☑ Certainty Scores indicate the quality of each detection
- ☑ These can be used to filter out low-quality fish



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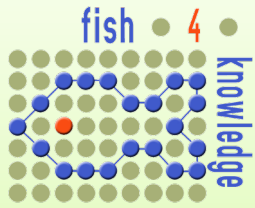


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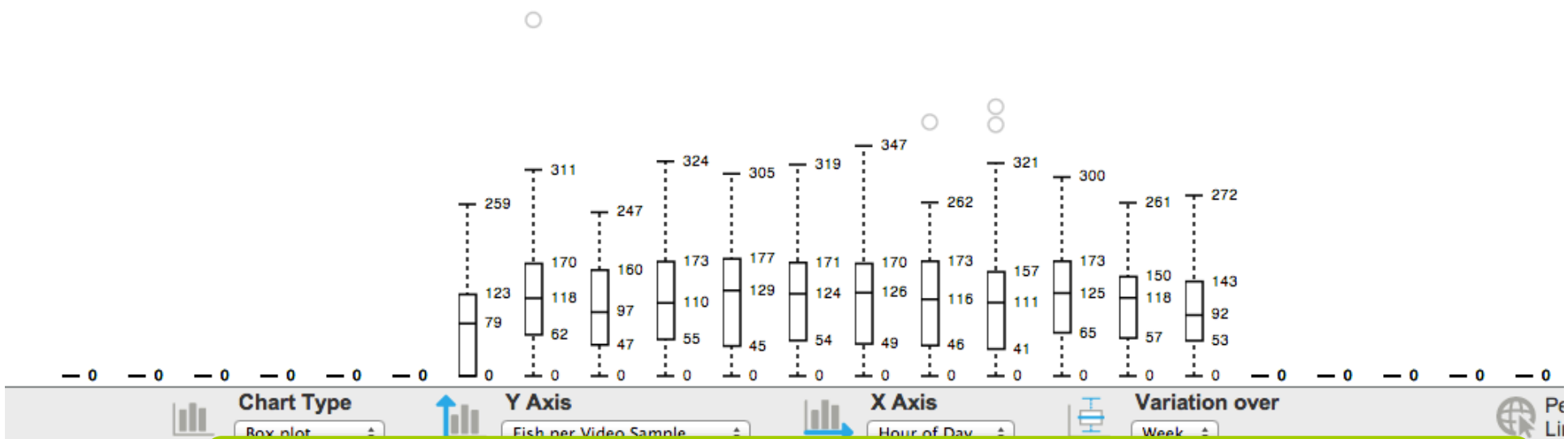
ABUNDANCE OF DASCYLLUS RETICULATUS

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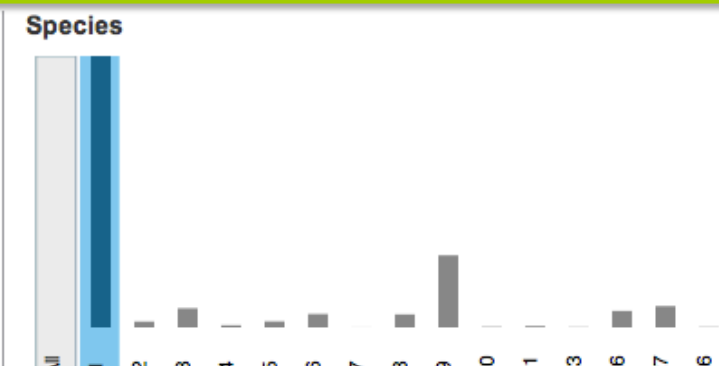
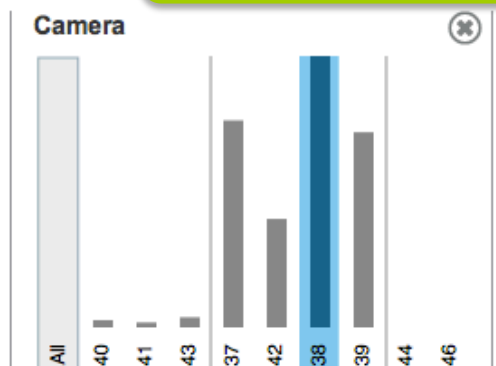


Home Video Video Analysis Raw Data Visualization Report Hello lynda! Logout Pass

Fish per Video Sample over Hours of the Day with variance over Week for Species 1 in 2011 at Camera 38 analyzed by D50-R52



Current Filters: Year:2011 Week:All Hour:All Species:Dascyllus reticulatus Certainty Score:0.0-1.0 Software:D50-R52 Camera:38



- 1 Dascyllus reticulatus
- 2 Chromis margaritifer
- 3 Plectroglyphidodon dickii
- 4 Acanthurus nigrofuscus
- 5 Myripristis berndti
- 6 Chaetodon trifascialis
- 7 Zebrasoma scopas

ABUNDANCE OF DASYLLUS RETICULATUS

Videos

Camera38 (2216 videos)

- 2011-01-17 17:00 (164 fish)
- 2011-01-18 07:00 (375 fish)
- 2011-01-18 09:00 (471 fish)
- 2011-01-18 10:00 (314 fish)
- 2011-01-18 11:00 (348 fish)

Show more

2011-01-17 17:00

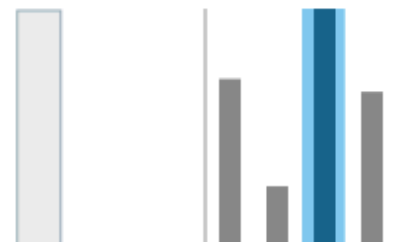


Species counts in current video

Dascyllus reticulatus (164)

Open a filter ↓ ↑ Current Filters: Year:2011 Week:All Hour:All Species:Dascyllus reticulatus Certainty Score:0.0-1.0 Software:D50-R52 Ca

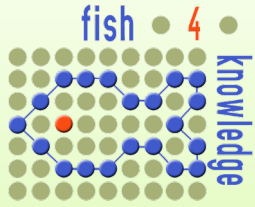
Camera



Species



- Dascyllus reticulatus
- Chromis margaritifer
- Plectroglyphidodon dickii
- Acanthurus nigrofuscus
- Muraenichthys berndti



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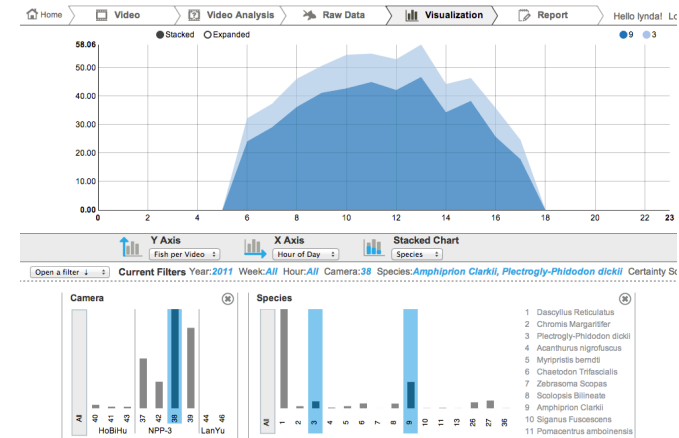


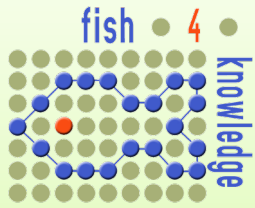
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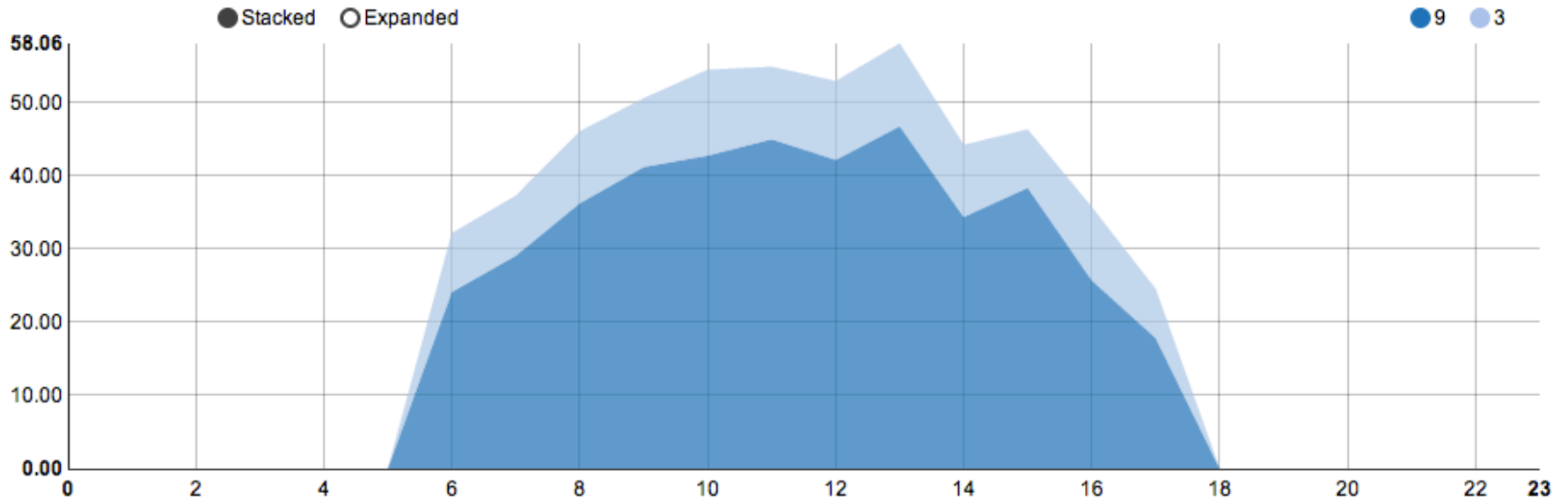


SPECIES COMPOSITION DEPENDS ON LOCATION

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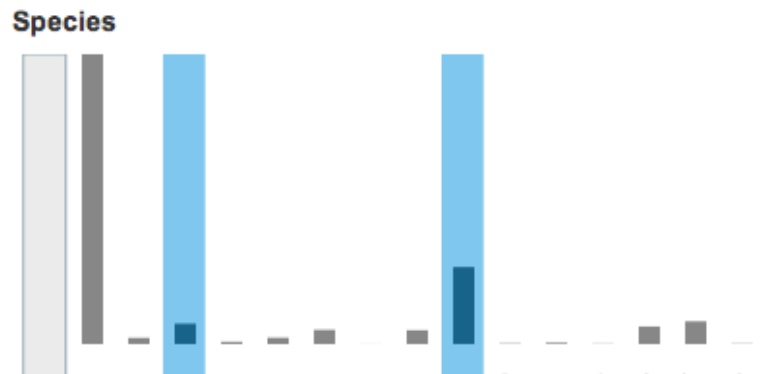
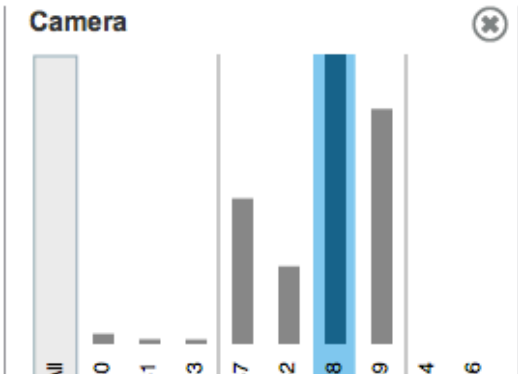


Home Video Video Analysis Raw Data Visualization Report Hello lynda! Lc



Y Axis: Fish per Video
 X Axis: Hour of Day
 Stacked Chart: Species

Open a filter ↓ Current Filters Year: 2011 Week: All Hour: All Camera: 38 Species: Amphiprion Clarkii, Plectrogly-Phidodon dickii Certainty Sc



- 1 Dascyllus Reticulatus
- 2 Chromis Margaritifer
- 3 Plectrogly-Phidodon dickii
- 4 Acanthurus nigrofuscus
- 5 Myripristis berndti
- 6 Chaetodon Trifascialis
- 7 Zebrasoma Scopas
- 8 Scolopsis Bilineate
- 9 Amphiprion Clarkii
- 10 Siganus Fuscus

2011-01-27 07:00

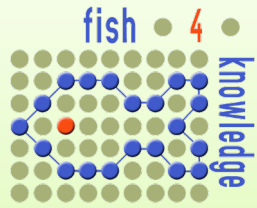


Amphiprion clarkii, Camera 38

2011-03-28 06:00



Plectroglyphidodon dickii, Camera 39

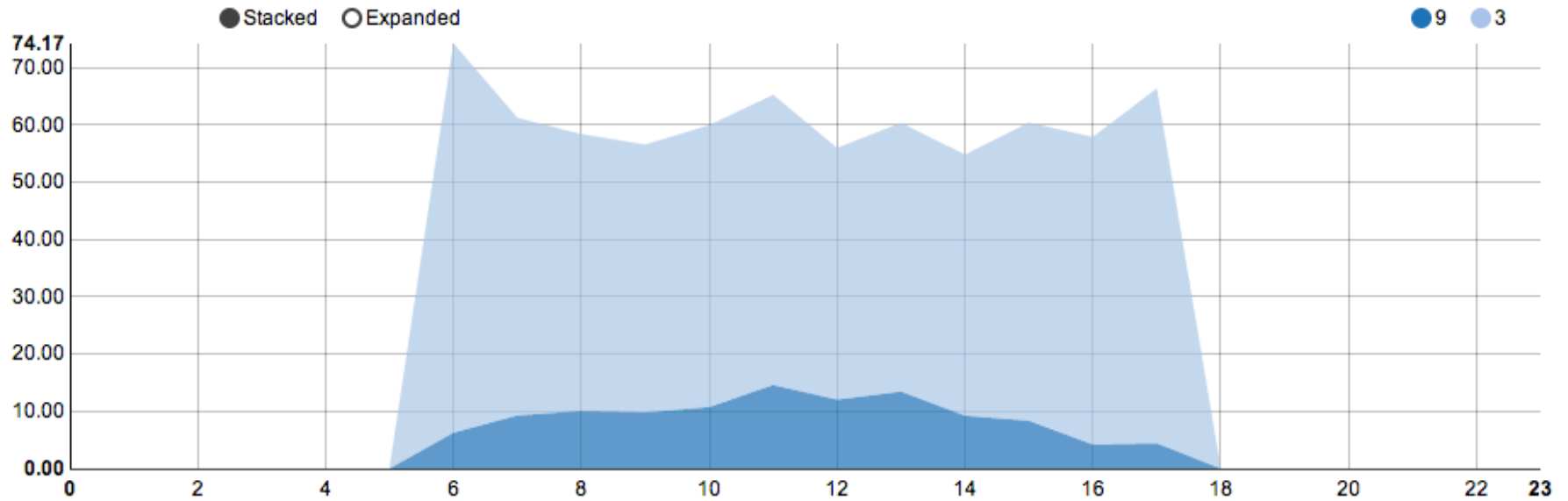


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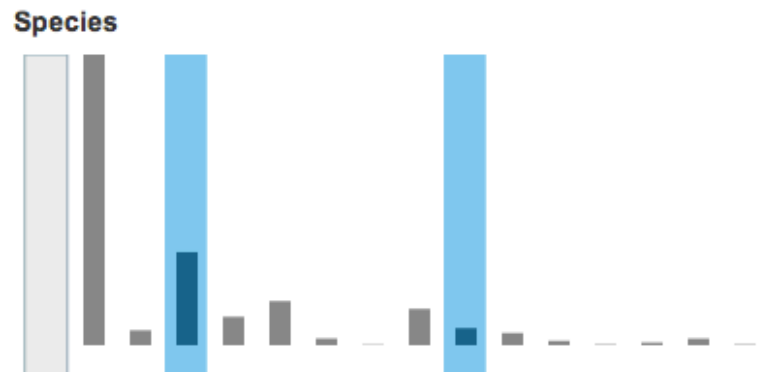
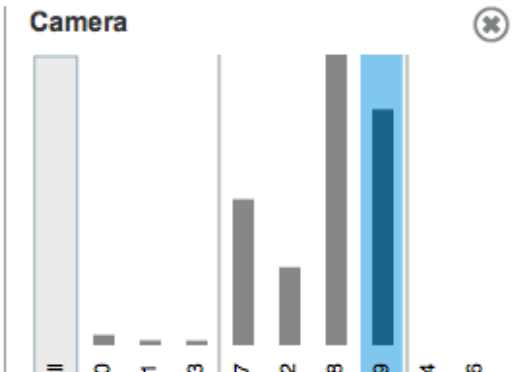


Home Video Video Analysis Raw Data Visualization Report Hello lynda! L

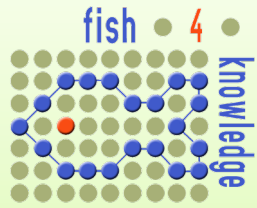


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- 9 Amphiprion Clarkii



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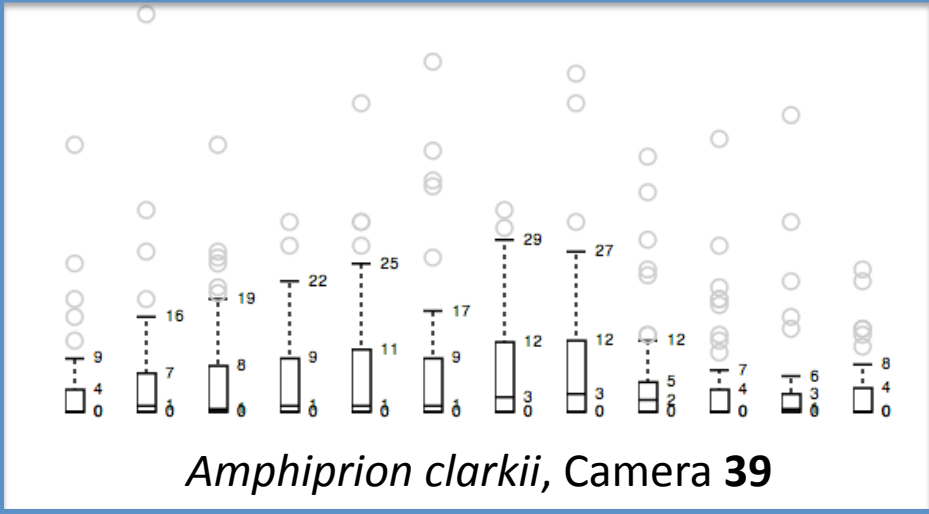
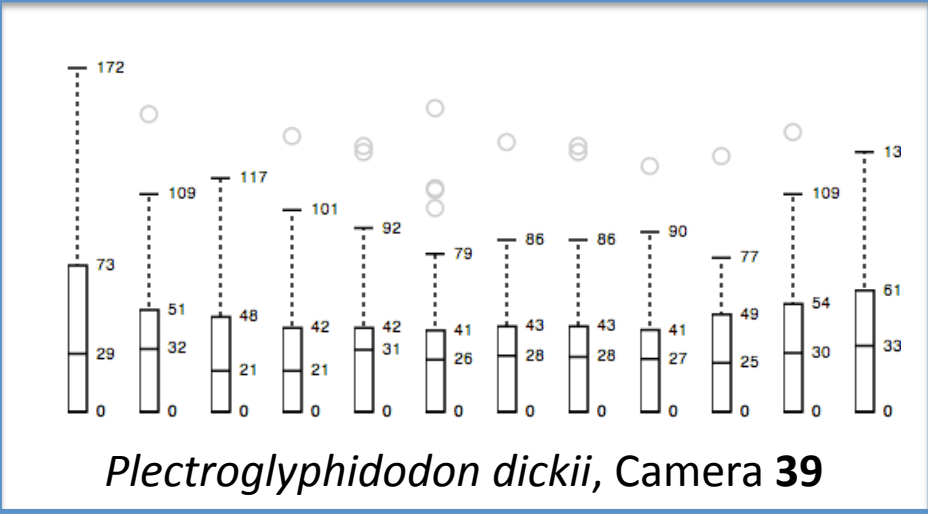
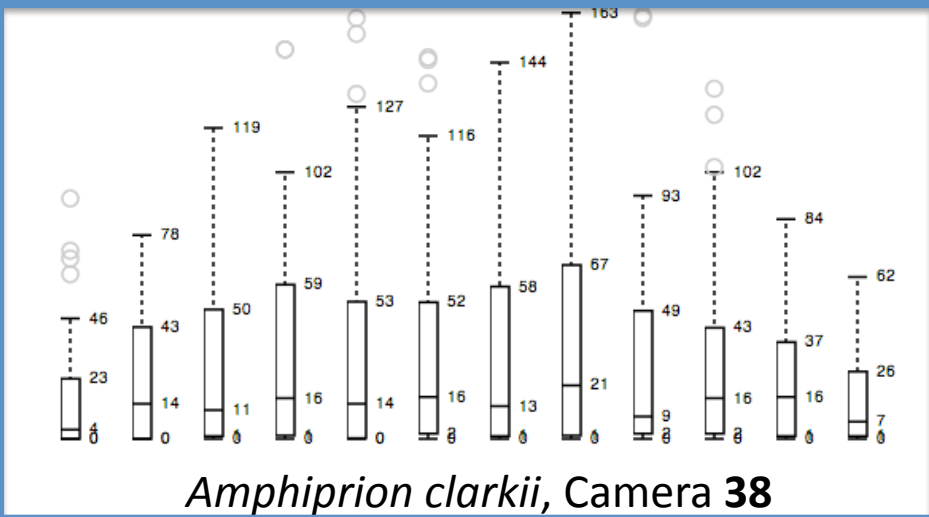
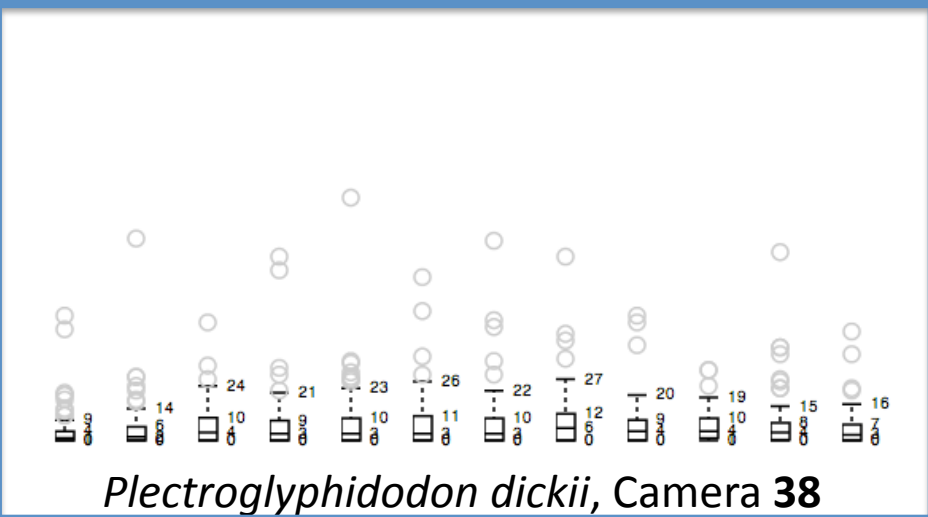
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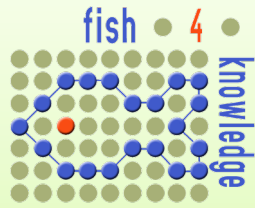
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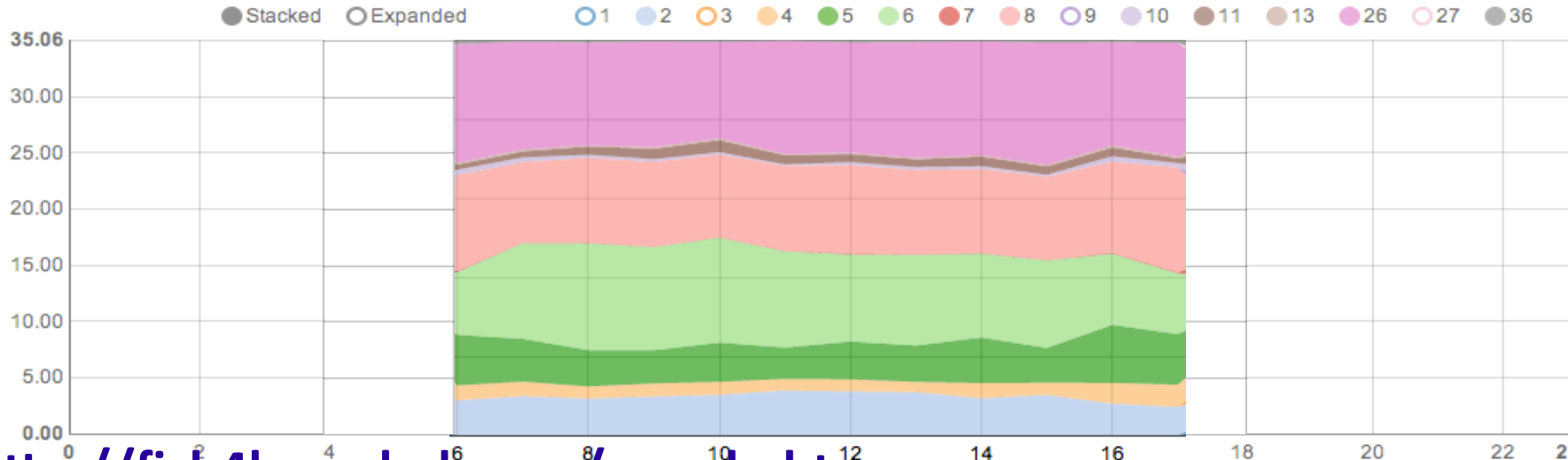


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<http://fish4knowledge.eu/people.htm>

Y Axis: Fish per Video
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Stacked Chart: Species

Open a filter Current Filters Year:2011 Week:All Hour:All Camera:38 Species:All Certainty Score:[0, 1] Software:D50-R52

- University of Edinburgh (United Kingdom)
- Università di Catania (Italy)
- Centrum Wiskunde & Informatica (Netherlands)
- National Applied Research Laboratories (Taiwan)

Species

- 1 Myxoclinemus reticulosus
- 2 Chromis Margarifer
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- 6 Pteroisodon lineolatus
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