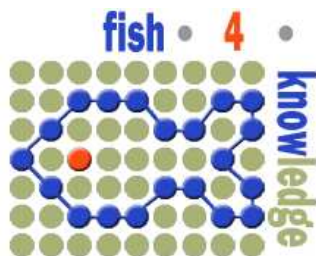


Welcome



Jenny Benois-Pineau	LABRI - Laboratoire Bordelais de Recherche en Informatique
Anna Bosch Rué	University of Girona
Stefano Bertolo	European Commission

## Project Teams

- **Univ of Edinburgh admin:** Fisher, Clark
- **Univ of Edinburgh vision:** Boom, Huang
- **Univ of Edinburgh workflow:** Chen-Burger, Nadarajan
- **Univ of Catania:** Giordano, Spampinato, Di Salvo, Palazzo
- **National Applied Research Laboratories:** Lin, Chang, Chen, Lo, Shiau, Tseng
- **Centrum voor Wiskunde en Informatica:** Hardman, Ossenbruggen, Beauxis-Ausselet, He

## Scientific Advisory Board

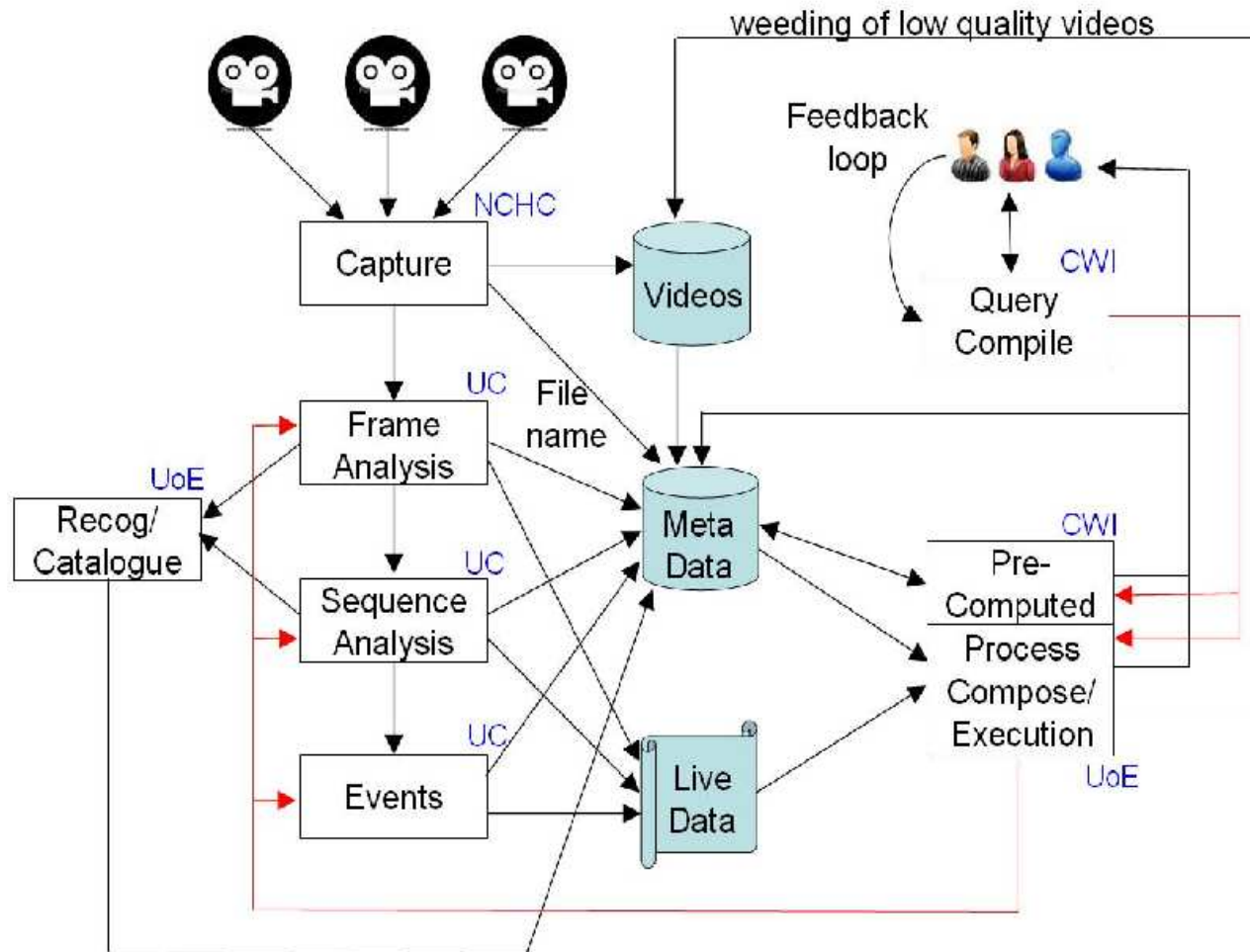
- Kwang-Tsao Shao (Biodiversity Research Center, Academia Sinica) - marine biology, in particular Asian fish species
- Konstantinos Stergiou (Aristotle Univ. Thessaloniki) - marine biology, particularly biodiversity and sustainability
- Monique Thonnat (INRIA) - ontology guided visual interpretation
- Steffen Staab (Univ. Koblenz) - semantic web, knowledge management ability

## Goals

1. Acquire, process and store **massive** video datasets: 10 cameras \* 2 years \* 365 days \* 12 hours/day \* 3600 seconds/hour \* 10 frames/second =  $3 * 10^9$  frames or  $2 * 10^{14}$  bytes of compressed raw video data, leading to  $10^{11} - 10^{12}$  bytes of data about  $10^{10}$  fish
2. Develop methods based on **ontologies and semantic web** concepts for allowing non-programming specialists access to massive datasets.
3. Build a **working prototype** by month 24, leaving last 12 months for evaluation and developing additional query answering capabilities.
4. Work with marine biologists to produce **useful answers to biological questions**.

**Sample video**

# System Concept



## Biologist Empowerment

1. What species and numbers of fish appeared in the last N days?
2. What unrecognised fish were detected? Do they cluster by appearance?
3. Show me examples of fish from species X?
4. Show me examples of a fish with description X?
5. What other species were also present when species X was seen?
6. Are the observed numbers of species X increasing in the past 3 years?

## Scientific Issues

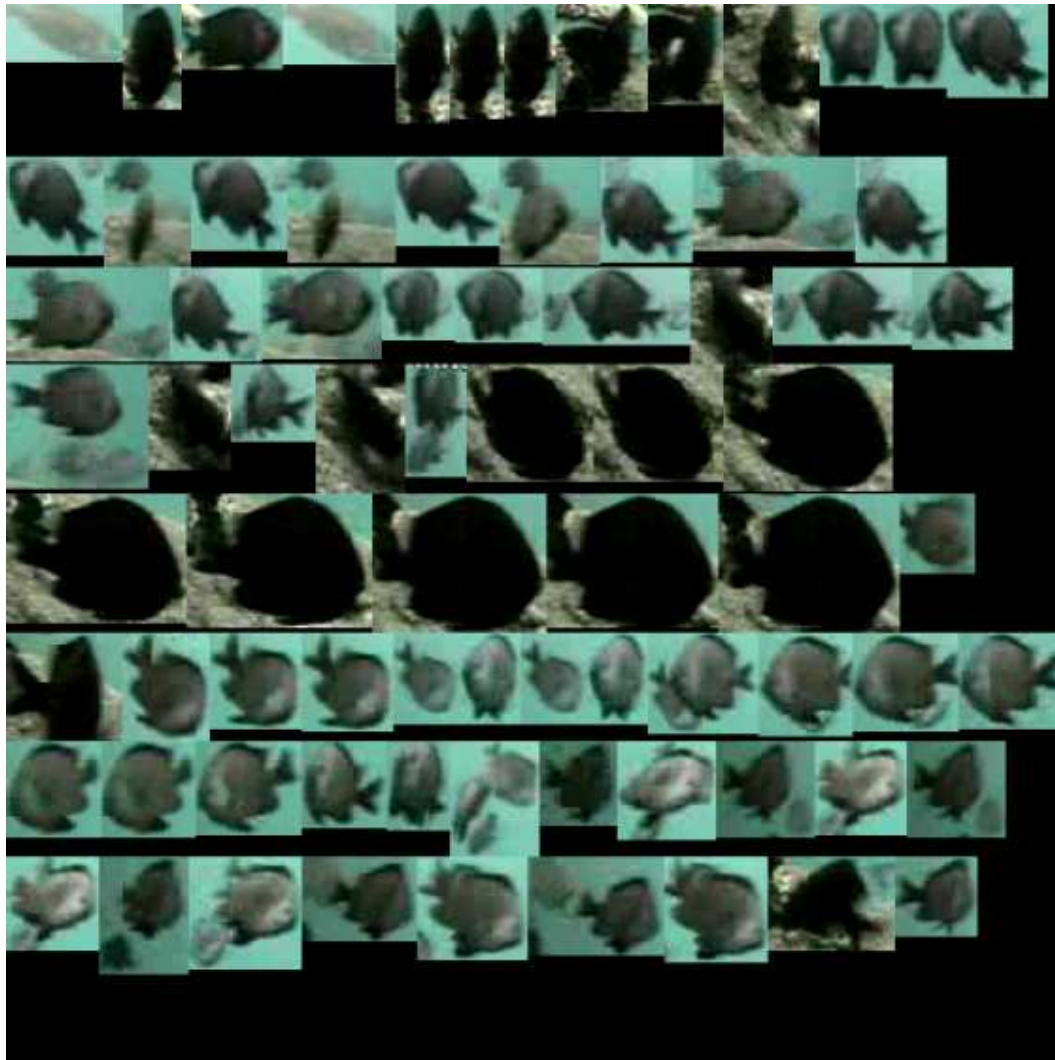
1. Ontologies and vocabularies for fish/massive datasets?
2. Storage representations for access in massive datasets?
3. Computer vision methods for shape description, model learning and recognition?
4. How to empower user to extract information from database?
5. What computer structures allow continuous acquisition, processing, storage and query answering?
6. How to structure components to allow query-driven reconfiguration?
7. What form can users best query the data?
8. How effectively can users query the data?



# View from 9 Cameras



## Example fish detections



## Sample Fish Detections





# Sample Fish Trackings



## Top 11 Species from Ground Truthing



**Dascyllus  
reticulatus**



**Zebrasoma  
scopas**



**Myripristis  
kuntee**



**Pomacentrus  
moluccensis**



**Plectrogl-  
yphidodon  
dickii**



**Chromis  
margaritifer**



**unknown**



**Scolopsis  
lineata**



**Amphiprion  
clarkii**

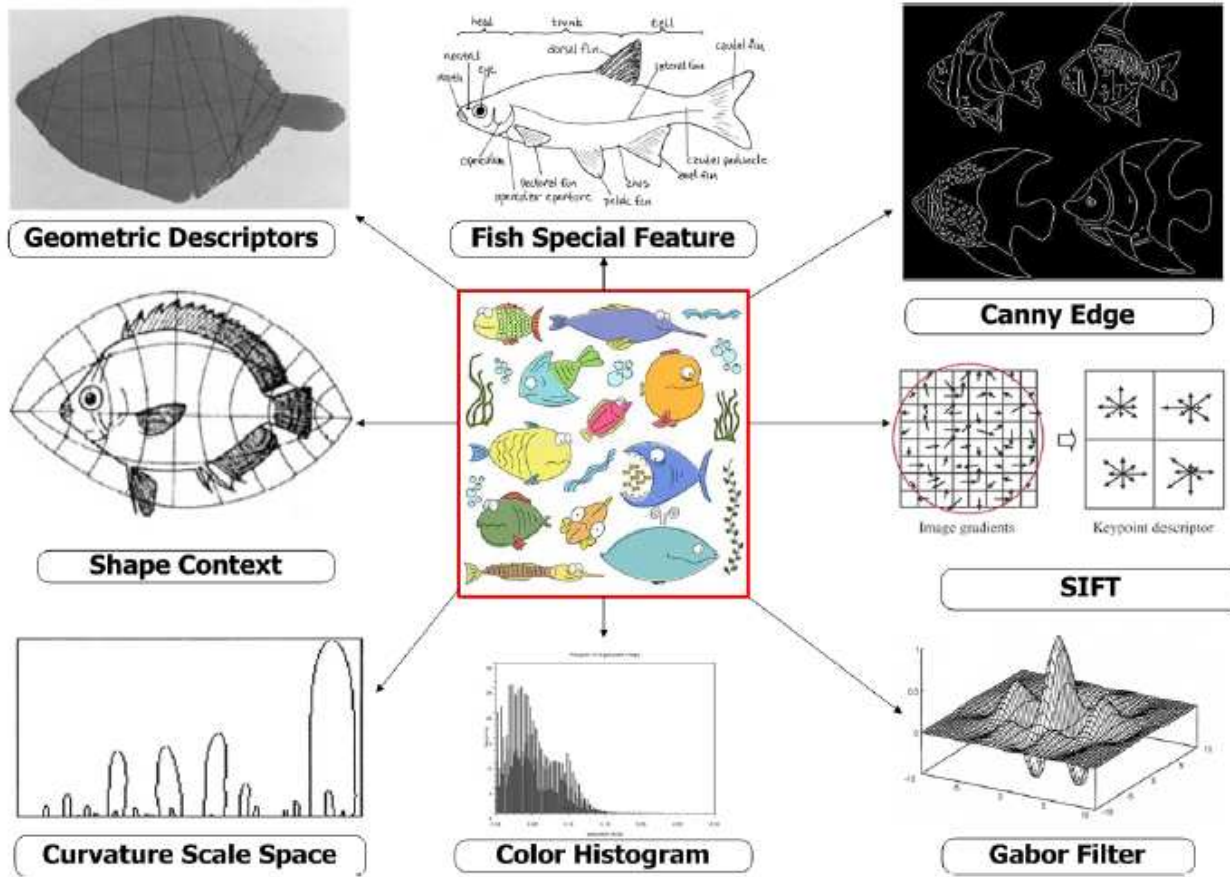


**Balistapus  
undulatus**



**Chaetodon  
trifascialis**

# Fish Description Possibilities





# SQL Recordkeeping

The screenshot shows a MySQL database interface with the following table structure and data:

fish_id	best_video_id	best_frame	best_bounding_box	best_contour	component_id
338132	5208	509	POLYGON((161 64,213 64,213 101,161 ...	POLYGON((43 0,41 0,42 1,43 2,43 3,43 4,43 5,44 6,41 7,40 8,47 9,48 10,46 11, ...	18
338133	5211	1081	POLYGON((110 74,155 74,155 105,110 ...	POLYGON((10 0,11 0,12 1,13 2,14 3,15 3,15 4,15 5,14 6,13 7,13 8,14 9,15 10, ...	16
338134	5211	1181	POLYGON((262 100,313 100,313 126,2... ..	POLYGON((24 0,25 0,26 0,27 0,28 0,29 0,30 0,31 0,32 0,33 0,34 0,35 0,36 1,3 ...	16
338135	5211	1193	POLYGON((76 77,133 77,133 105,76 10... ..	POLYGON((10 0,11 0,12 0,13 0,14 0,15 0,16 0,17 0,18 0,19 0,20 0,21 0,22 0,2 ...	16
338136	5211	1212	POLYGON((274 84,308 84,308 120,274 ... ..	POLYGON((21 0,22 0,23 0,24 0,25 1,26 1,27 2,28 3,29 4,30 5,30 6,31 7,32 8,3 ...	16
338137	5208	733	POLYGON((184 106,228 106,228 137,1... ..	POLYGON((27 0,28 0,29 0,30 0,31 0,32 0,33 0,34 0,35 1,35 2,35 3,36 4,36 5,3 ...	18
338138	5211	1432	POLYGON((267 90,292 90,292 133,267 ... ..	POLYGON((15 0,17 0,18 1,19 1,20 2,21 3,22 4,22 5,23 6,23 7,24 8,24 9,24 10, ...	16
338139	5211	1430	POLYGON((191 60,250 60,250 112,191 ... ..	POLYGON((0 10,0 11,0 12 0,13 0,14 0,15 0,16 0,17 0,18 0,19 0,20 1,21 1,22 ...	16
338140	5208	752	POLYGON((160 52,219 52,219 98,160 9... ..	POLYGON((32 0,33 0,34 0,35 0,36 0,37 0,38 0,39 1,39 2,38 3,38 4,38 5,38 6,3 ...	18
338141	5211	1442	POLYGON((236 72,271 72,271 117,236 ... ..	POLYGON((9 0,10 0,11 0,12 0,13 0,14 0,15 1,16 2,17 3,18 4,18 5,19 6,19 7,20 ...	16
338142	5211	1481	POLYGON((246 92,288 92,288 123,246 ... ..	POLYGON((1 0,2 0,3 0,4 0,5 0,6 0,7 0,8 0,9 1,9 2,10 3,11 4,12 4,13 4,14 4,15 ...	16
338143	5211	1513	POLYGON((208 53,247 53,247 91,208 9... ..	POLYGON((25 0,26 0,27 0,28 1,29 2,30 3,30 4,31 5,31 6,31 7,32 8,33 9,34 10, ...	16
338144	5211	1555	POLYGON((165 40,205 40,205 69,165 6... ..	POLYGON((15 0,17 0,18 0,19 0,20 0,21 0,22 0,23 1,24 1,25 1,26 1,27 1,28 2,2 ...	16
338145	5208	752	POLYGON((94 43,128 43,128 86,94 86... ..	POLYGON((20 0,21 0,22 0,23 0,24 1,25 2,26 3,27 4,28 5,28 6,29 7,29 8,30 9,3 ...	18
338146	5208	750	POLYGON((164 53,217 53,217 94,164 9... ..	POLYGON((15 0,16 0,17 0,18 1,18 2,19 3,19 4,19 5,20 6,21 7,22 8,23 9,24 10, ...	18
338147	5211	1501	POLYGON((259 73,308 73,308 120,259 ... ..	POLYGON((25 0,26 0,27 0,28 0,29 0,30 0,31 0,32 0,33 0,34 0,35 0,36 0,37 1,3 ...	16
338148	5208	809	POLYGON((165 60,213 60,213 99,165 9... ..	POLYGON((30 0,31 0,32 0,33 1,33 2,33 3,34 4,34 5,34 6,34 7,35 8,36 9,36 10, ...	18
338149	5208	809	POLYGON((94 56,133 56,133 95,94 95... ..	POLYGON((28 0,29 0,30 0,31 0,32 0,33 0,34 0,35 1,36 1,37 2,37 3,37 4,37 5,3 ...	18
338150	5211	1751	POLYGON((170 48,254 48,254 92,170 9... ..	POLYGON((14 0,15 0,16 0,17 0,18 0,19 0,20 0,21 0,22 0,23 0,24 0,25 0,26 1,2 ...	16
338151	5208	827	POLYGON((67 50,114 50,114 87,67 87... ..	POLYGON((12 0,13 0,14 0,15 1,15 2,16 3,17 4,18 5,19 6,20 2,21 2,22 2,23 2,2 ...	18
338152	5211	1584	POLYGON((240 25,313 25,313 88,240 8... ..	POLYGON((25 0,27 0,28 0,29 0,30 0,31 0,32 0,33 1,34 1,35 1,36 1,37 2,38 2,3 ...	16
338153	5211	1583	POLYGON((263 113,310 113,310 151,2... ..	POLYGON((10 0,11 0,12 0,13 0,14 1,15 1,16 1,17 1,18 1,19 1,20 1,21 1,22 1,2 ...	16
338154	5208	853	POLYGON((66 56,122 56,122 94,66 94... ..	POLYGON((18 0,19 0,20 0,21 0,22 0,23 1,23 2,23 3,24 4,24 5,24 6,24 7,24 8,2 ...	18
338155	5208	827	POLYGON((134 58,171 58,171 98,134 9... ..	POLYGON((19 0,20 0,21 1,21 2,21 3,22 4,22 5,23 6,23 7,24 8,24 9,25 10,26 11, ...	18
338156	5211	2271	POLYGON((930 100,783 100,783 126,2... ..	POLYGON((15 0,16 0,17 0,18 0,19 0,20 0,21 0,22 0,23 0,24 0,25 0,26 1,27 1,2 ...	16
338157	5208	851	POLYGON((250 53,304 53,304 108,250 ... ..	POLYGON((22 0,23 0,24 0,25 0,26 1,27 2,28 3,28 4,29 5,29 6,29 7,27 8,28 9,2 ...	18
338158	5211	2325	POLYGON((66 86,120 86,120 127,66 12... ..	POLYGON((10 0,11 0,12 0,13 0,14 0,15 0,16 0,17 0,18 0,19 0,20 0,21 0,22 1,2 ...	16
338159	5208	873	POLYGON((68 56,120 56,120 85,68 85... ..	POLYGON((11 0,12 0,13 0,14 0,15 0,16 0,17 0,18 0,19 0,20 0,20 1,19 2,18 2,1 ...	18
338160	5211	2405	POLYGON((274 88,314 88,314 122,274 ... ..	POLYGON((12 0,13 0,14 0,15 0,16 0,17 0,18 0,19 1,20 1,21 1,22 2,23 2,24 2,2 ...	16
338161	5208	872	POLYGON((151 66,203 66,203 108,151 ... ..	POLYGON((10 0,11 0,12 1,13 2,14 2,15 2,16 1,17 0,18 0,19 1,20 2,21 3,22 4,2 ...	18
338162	5208	912	POLYGON((153 63,207 63,207 112,153 ... ..	POLYGON((31 0,32 0,33 1,34 2,35 3,36 4,36 5,37 6,38 7,38 8,39 9,39 10,40 11, ...	18

# User Interface Design

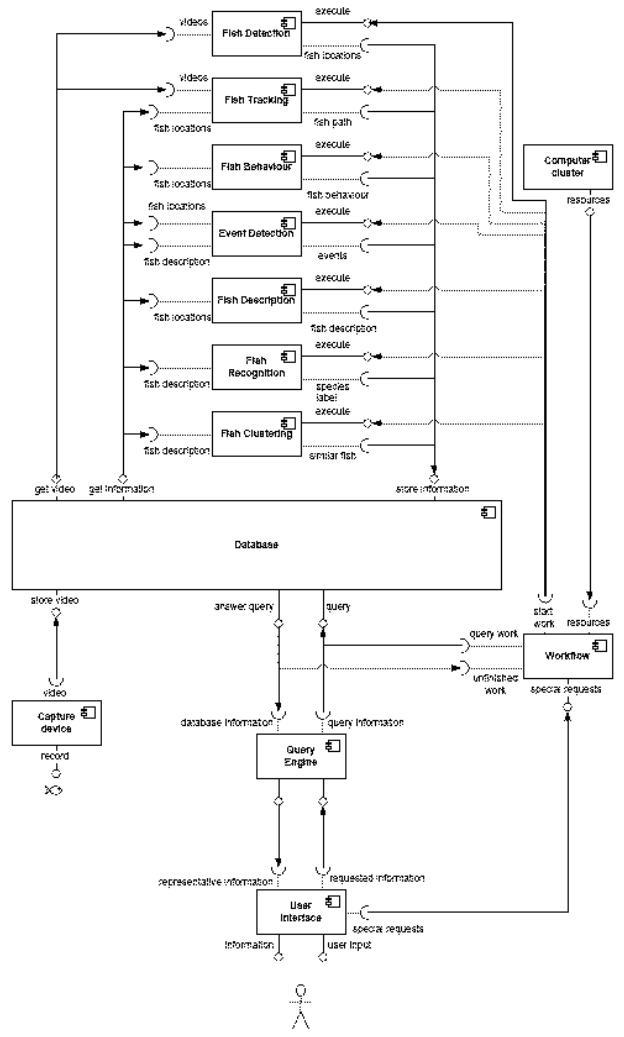




## 48 Processor Host



# System Integration Design



## Second Life Showcase Upstairs



## Second Life Showcase Downstairs

