



Dolphins of the Kelp



Photo-identification and Matching protocol 2017

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1. Photo-identification techniques

Photo identification techniques can be applied to several species, including cetaceans, sharks, dugongs and turtles. These techniques allow the capture and recapture of individuals without physical handling. The combination of multiple recapture occasions results in individual capture histories that are used by mark-recapture models to estimate demographic parameters of the population such as abundance, survival probability, growth and recruitment rate, group composition and association, breeding cycle, as well as residency and movement patterns.

Individual dolphins are generally identified based on the presence of natural markings on the dorsal fin. This latter and the upper body are usually appearing above the surface of the water during respiration.

The distinctive features considered suitable for individual identification includes nicks, scars, and notches visible on the edge of the dorsal fin and/or the body profile, from both sides. Secondary features include scars and pigmentation patterns visible only from one side.

Individual identity is assigned by comparing photographs with a catalogue comprising distinct individuals previously identified in the area. If the individual is not present in the catalogue a new code is assigned and the new individual is incorporated into the catalogue. The catalogue provides the capture history of each animal identified at a particular study area over time.

2. Pictures collection

Photographs are taken using a CANON EOS 7D Mark II, equipped with a lens EF 70-200mm f/2.8 L IS II USM, and a Nikon D7200, equipped with a lens AF-S VR-NIKKOR 70-200mm 1:2.8G. Underwater videos are taken using a GOPRO Hero 4 fixed on a 1.5 m pole.

Memory cards used are: for the Canon, one Lexar Professional 1066x 32GB Speed 160MB/s and one Lexar Professional 1066x 64GB Speed 160MB/s; for the Nikon, two Lexar Professional 2000x 32GB Speed 300MB/s.

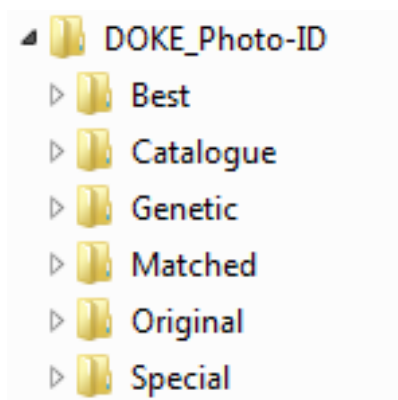
Photographs are taken in RAW format (.TIFF for Canon and .NEF for Nikon). Cameras are usually set on high shutter speed and autofocus, adjusting the speed in base of the light; ISO was set at 400. Setting could change in respect to the daylight.

During each sighting, a large number of pictures are usually taken, in a proportion of about four pictures for each individual present on the group. Attempts are made to collect pictures of all individuals in the group, irrespective to their distinctness. The photographic session ends when dolphin move away, researchers consider that all dolphins have been

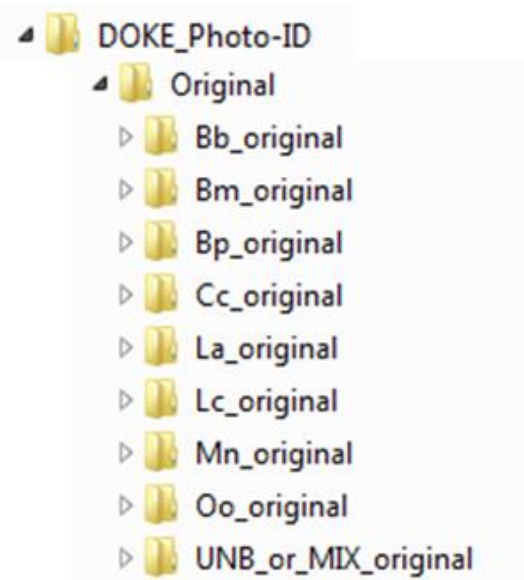
photographed, weather conditions deteriorate, or other factors force the team to end the observation.

3. Folder organization

All the photographic material used for cetacean photo-identification is stored in the folder **DOKE_Photo-ID** (where DOKE is the acronym for the project “Dolphins of the Kelp”). The main folder included the following folders: **Best** (best pictures of dolphins used for media), **Catalogue** (see later), **Genetic** (including the pictures collected during tissue sampling), **Matched** (see later), **Original** (see below), and **Special** (including pictures of scars, injuries, calf, gender, etc.).



The folder **Original** contained a number of folders for each species, as shown below:

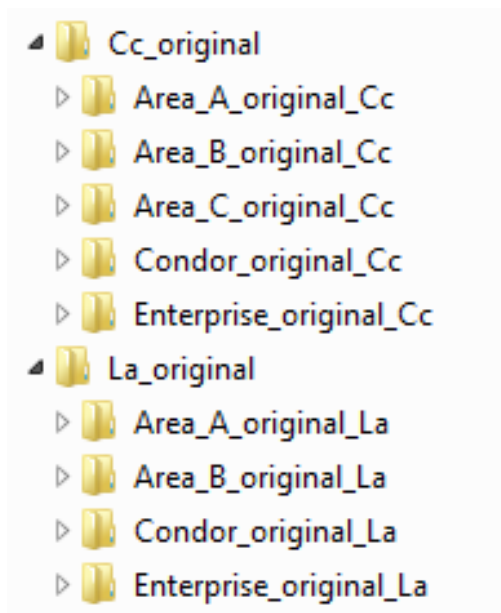


Where:

- Bb: *Balaenoptera borealis* (Sei whale)
- Bm: *Balaenoptera musculus* (Blue whale)
- Bp: *Balaenoptera physalus* (Fin whale)
- Cc: *Cephalorhynchus commersonii* (Commerson’s dolphin)

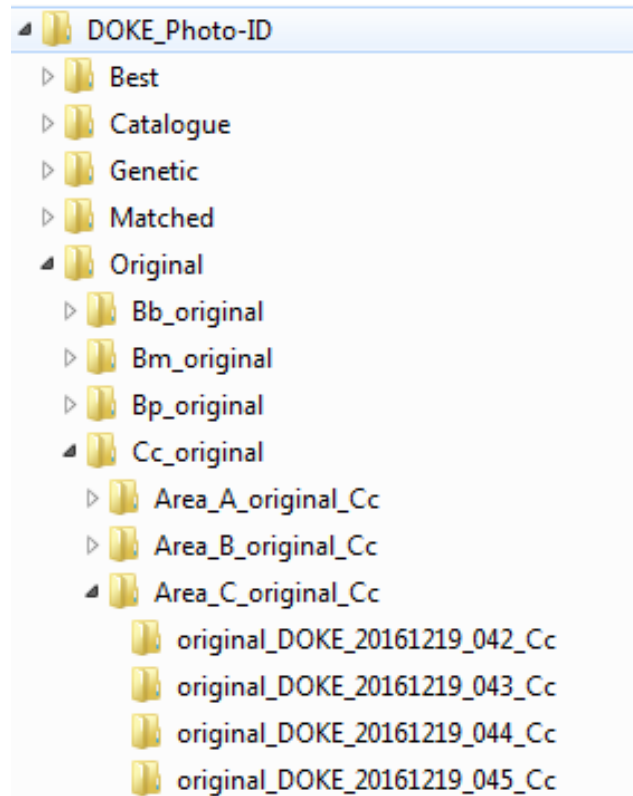
- La: *Lagenorhynchus australis* (Peale's dolphin)
- Lc: *Lagenorhynchus cruciger* (Hourglass dolphin)
- Mn: *Megaptera novaeangliae* (Humpback whale)
- Oo: *Orcinus orca* (Orca)
- UNB: Unknown baleen whale
- MIX: Mix species of baleen whales

Each species folder include folders indicating the area or the survey where the pictures were taken, including: **Area A, B and C** for the Focal Study; **Condor** for the survey carried out with the vessel Condor in the waters off West Falkland; **Enterprise** for the 10 days survey carried out on board of the HMS Enterprise to South Georgia. Another folder, not shown in the picture, is **Opportunistic**, including picture of sightings made during trips, walks, etc.



If a species has not been encountered in one of the areas/survey, that folder is not included.

Each area/survey folders include a folder for each sighting made.



Sighting folders are named using the format: **original_DOKE_yyyymmdd_xxx_Cc** where, **DOKE** is the acronym for the project, **yyymmdd** is the date (i.e. 20170312), **xxx** is the number of the sighting (019), and **Cc** is the code for the species (i.e. Cc=*Cephalorhynchus commersonii*).

4. Rename the pictures

The raw pictures are downloaded in the sighting folder with the name given by the camera. The number is inserted in the excel database in the field 'Pic_taken'. Pictures not suitable for dolphin matching are removed. The remaining pictures are renamed as follow:

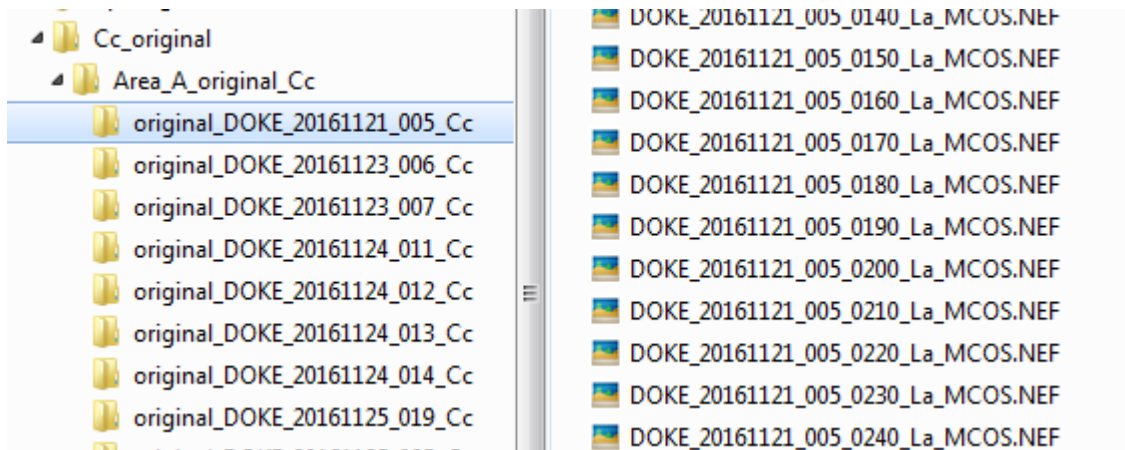
DOKE_yyyymmdd_sighting#_picture#0_Species_PhotographerCode

i.e. **DOKE_20161121_005_0010_Cc_MCOS**

Sighting number has 3 digits, picture number four digits. Please note that the picture number is formed by three numbers followed by a 0, resulting in:

_001 become _001**0**
 _002 become _002**0**

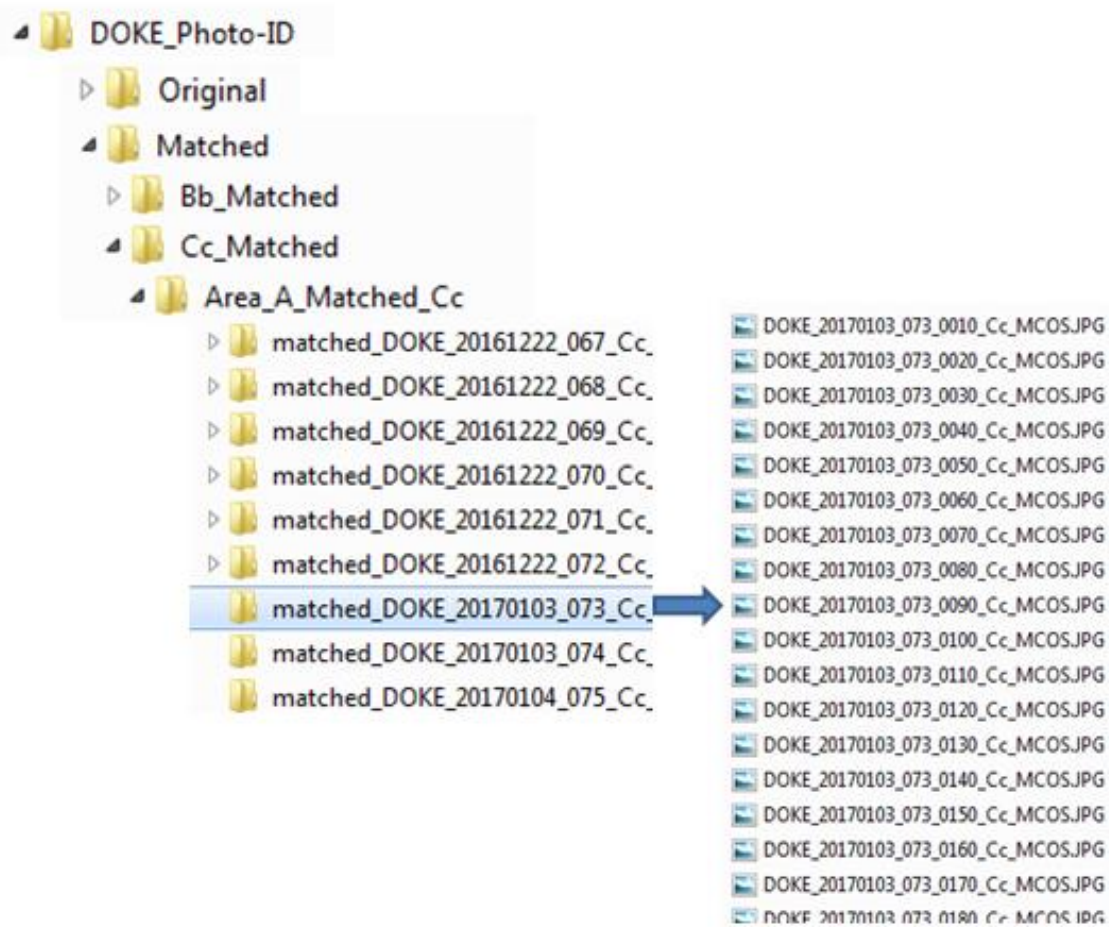
 _010 become _010**0**



The photographer code include the first letter of the name followed by the first three letters of the surname (i.e. MCOS=Marina COSTa, MGAR=Maria GARCia, CWEL=Caroline WEIr).

5. Copy the pictures to the Matched folder

Original raw pictures are converted into JPEG (<6Mb) and saved in the matched sighting folders, named **matched_DOKE_ yyyymmdd _xxx_Cc** (similarly to what done for the original folders). The matched sighting folders are included in their area/surveys folders located in the **Matched** folder, inside thr DOKE_Photo-ID folder, as shown below.



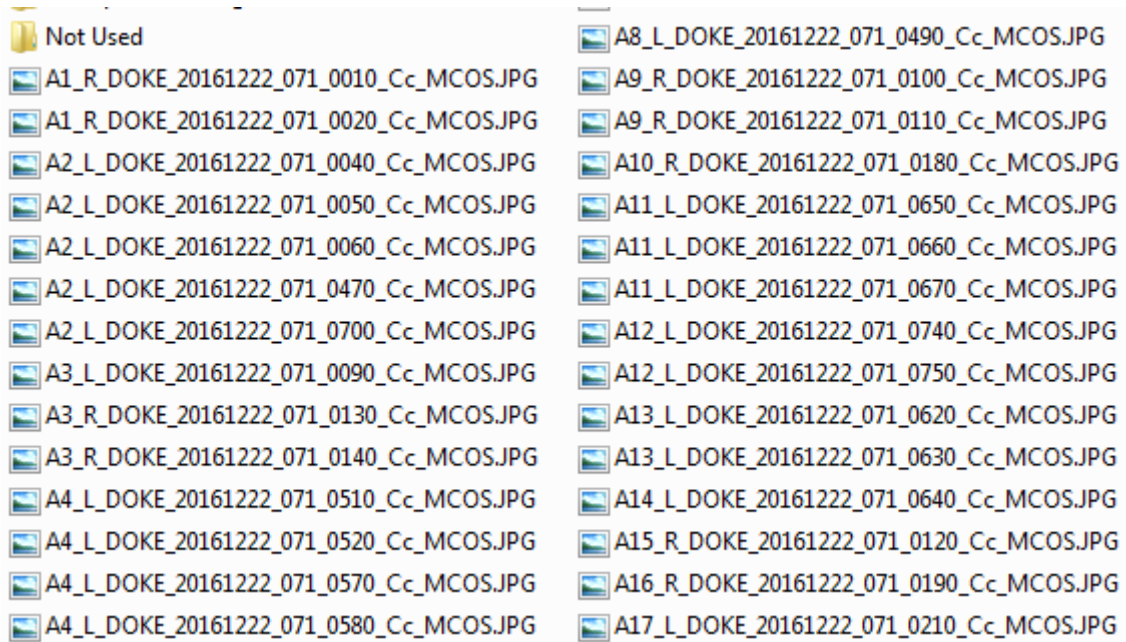
Only pictures in the matched folder are processed.

6. Matching process

The matching process consisted of two steps: assigning a provisional code to the pictures of the same individuals in the same sighting (i.e. A1, A2, etc.) (from 6.1 to 6.5), and; matching the individuals identified with dolphins already in the catalogue (from 6.6 to 6.9).

6.1. Matching within a sighting folder

Pictures of the same individual are identified and labelled with the same prefix (i.e. A1, A2, etc.) and a letter (L=left and R=right) indicating the body side, as shown:



Pictures that were considered **not useful** for the photo-id were moved to a folder called **Not_used**.

6.2. Two fins in the same picture

When **two fins** are present in the **same picture**, a copy is made. Both pictures are renamed by replacing the final '0' in the picture-number with '1' and '2' respectively. For example the picture **DOKE_20160212_024_0010_Cc_MCOS.jpeg** is copied and renamed as:



A1_L_DOKE_20160212_024_0011_Cc_MCOS.jpeg



A2_L_DOKE_20160212_024_0012_Cc_MCOS.jpeg

Every picture with more fins is copied and renamed a number of time identical to the number of fins represented. Add an arrow or a sign to indicate which fin is represented in the picture.

6.3. Association adult-calf/newborn

Pictures showing two individuals of different size in close (and repeated) association are renamed as follow:

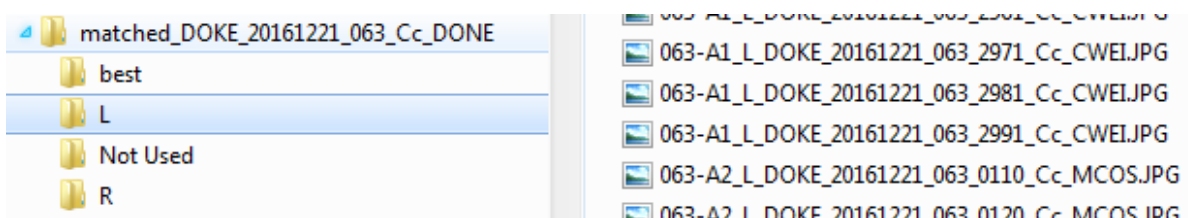
- A1_L_DOKE_20160212_024_001~~1~~_Cc_MCOS.jpeg
- A1-~~SON1~~L_DOKE_20160212_024_001~~2~~_Cc_MCOS.jpeg

This system is used to underline an adult-calf association spotted in the field; does not mean that the adult is necessarily the mother.

For Peale's and Commerson's dolphins, a **calf** is considered a yearly baby, measuring half (or less than $\frac{3}{4}$) of the body length of an adult and, for Commerson's dolphin, usually slightly darker in colour. A **newborn** is considered measuring less than half of the body length of the adult, has a usually a different coloration pattern (yellowish instead of white for Peale's, and darker in colour for Commerson's), present foetal folds on the body sides, and swim closely associated with the adult. The foetal folds usually disappear after few weeks from birth. The category of **juvenile** (more than one year old but not yet independent from the mother) that is evident in other species (such as common bottlenose dolphins or killer whales) was not clearly identified for the target species, possibly because of the baby rapid growth.

6.4. Unmarked individuals

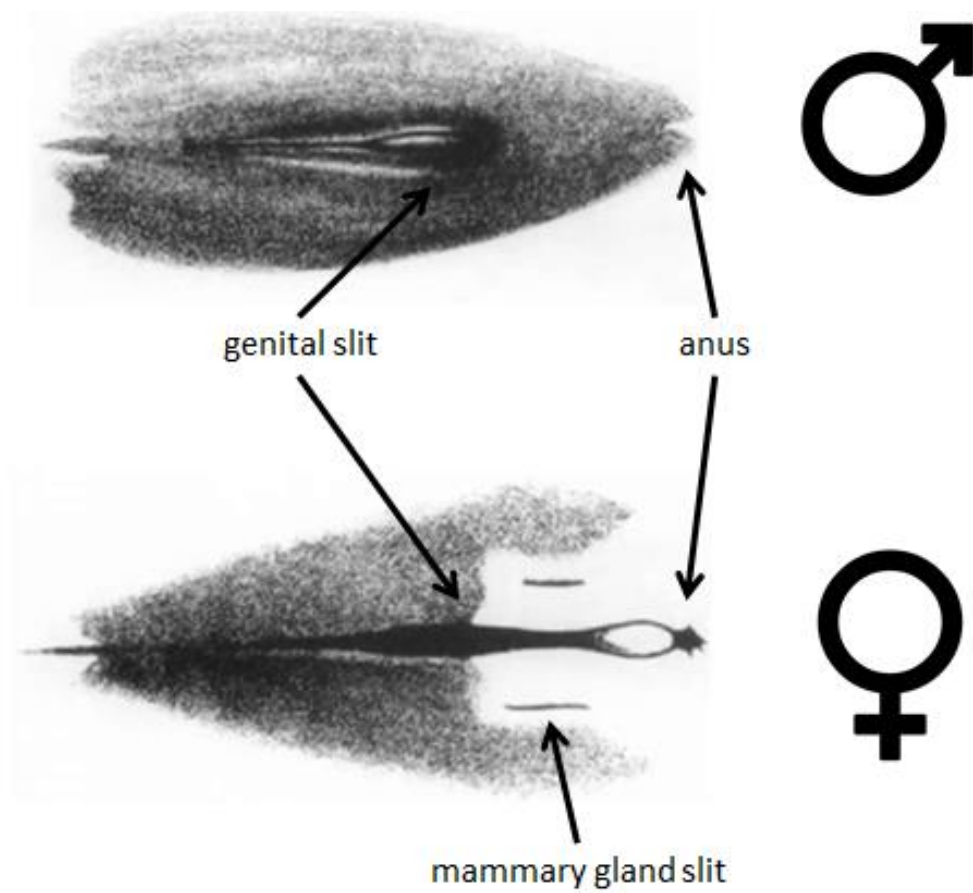
Pictures of unmarked individuals are moved in the L(ef) and R(ight) folders depending on their fin. Presence of scars or pigmentation patterns helps in the matching of unmarked fins from each side (R or L) although it is often impossible to associate the R and L sides. Unmarked individuals are renamed with the number of the sighting, hyphen, and a progressive code such as A1, A2, etc. Do not use the same code for R and L individuals.



6.5. Gender

Gender was identified sometime during jumps or from underwater videos/pictures. Pictures showing the genital area of individuals are copied in the folder **Special** → **Gender**.

Commerson's dolphins present a ventral dark patch allowing gender identification, as shown below:



Drawing from <http://what-when-how.com/marine-mammals/coloration-marine-mammals/>



Commerson's dolphin leaping out of the water; the oval shape of the black ventral patch identify the individual as a male.

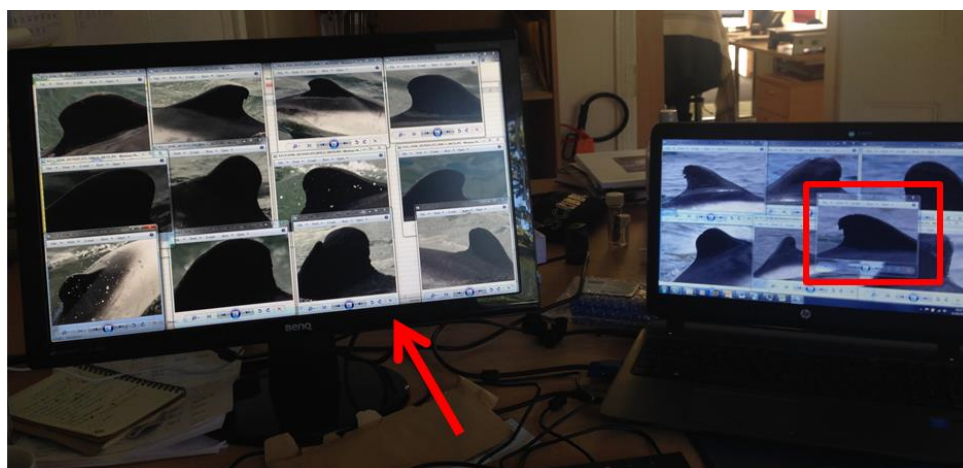
For Peale's dolphins the presence of the mammary gland slit and/or the penis are used for gender identification.



Female Peale's dolphin leaping out of the water.

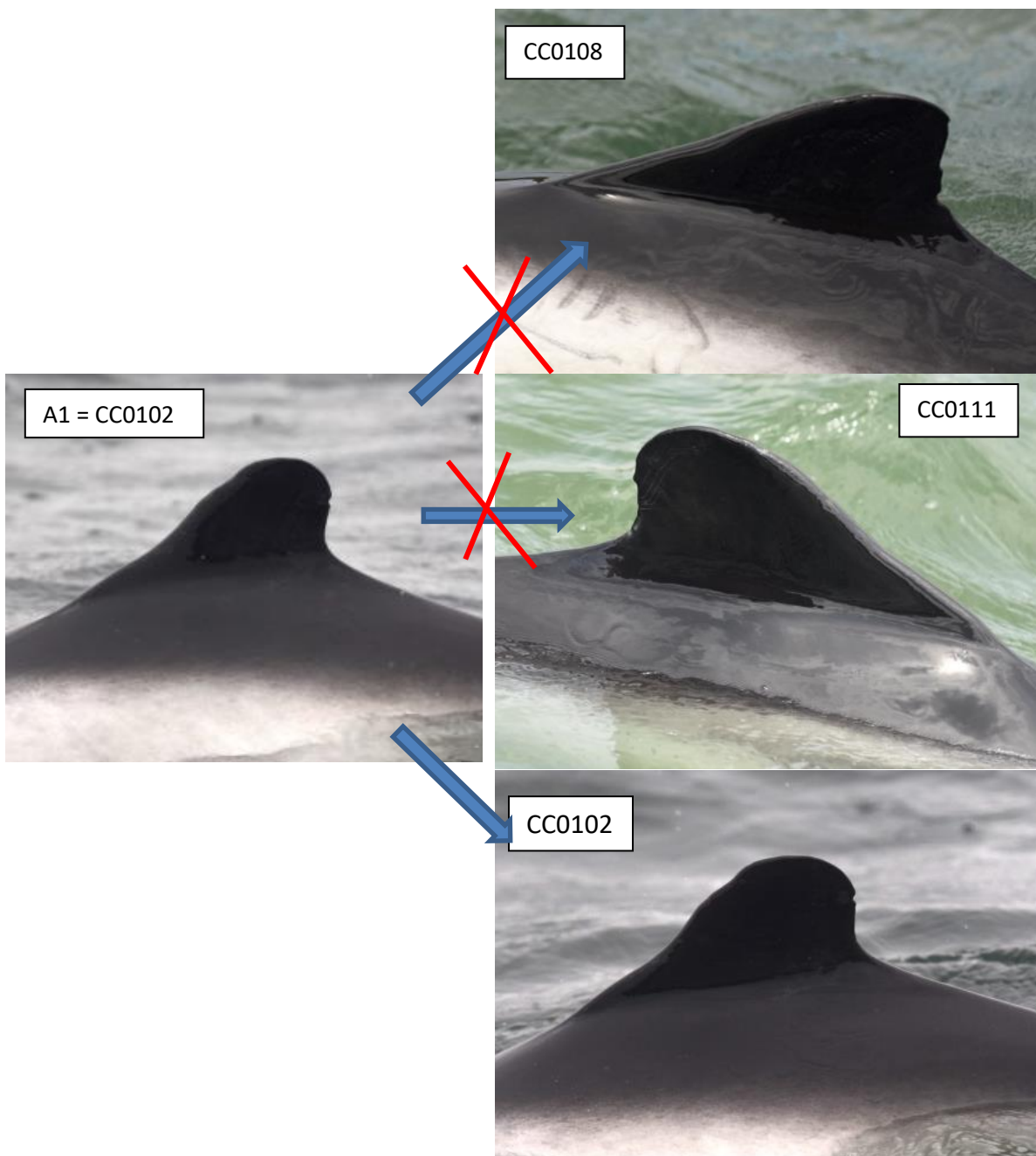
6.6. Matching within the catalogue

Once all marked individuals are identified and a code is assigned, they are matched with the pictures in the **catalogue** including animal previously identified. The folder **Catalogue** is found inside the main folder **DOKE_Photo-ID**.



When an animal is matched with those in the catalogue the temporary code is replaced with the dolphin name, i.e. **CC0001** or **LA0001** (where CC stays for *Cephalorhynchus commersonii* and La for *Lagenorhynchus australis*).

The best pictures of **ALL** identified dolphins are copied in the folder **best** within the sighting folder. All the pictures in the folder best are added to the catalogue after a check. If there is any doubt, do not add the best picture to the main catalogue; create a new folder called and copy the picture there. The checker will move the picture in the main catalogue after a control.



6.7. New individual

Individuals that are not matched with catalogue receive a new name, assigning the first consecutive code available.

6.8. Unmarked individual

For Commerson's dolphin unmarked individuals for whom only L or R pictures are available are not included in the catalogue.

6.9. Suggestions to facilitate the matching process

- Begin with the most marked animal and leave the less marked at the end.
- Displaying pictures in different windows helps in the matching process.
- It might be useful to sketch the fin profile reporting the code assigned.
- Non-perpendicular pictures where scars are visible in both side might help association L side with R side in unmarked individuals.
- Use two+ screens to display more individuals, simultaneously.



Example of a non-perpendicular picture where scars are helping in the association of the right side with the left side in unmarked dolphin.

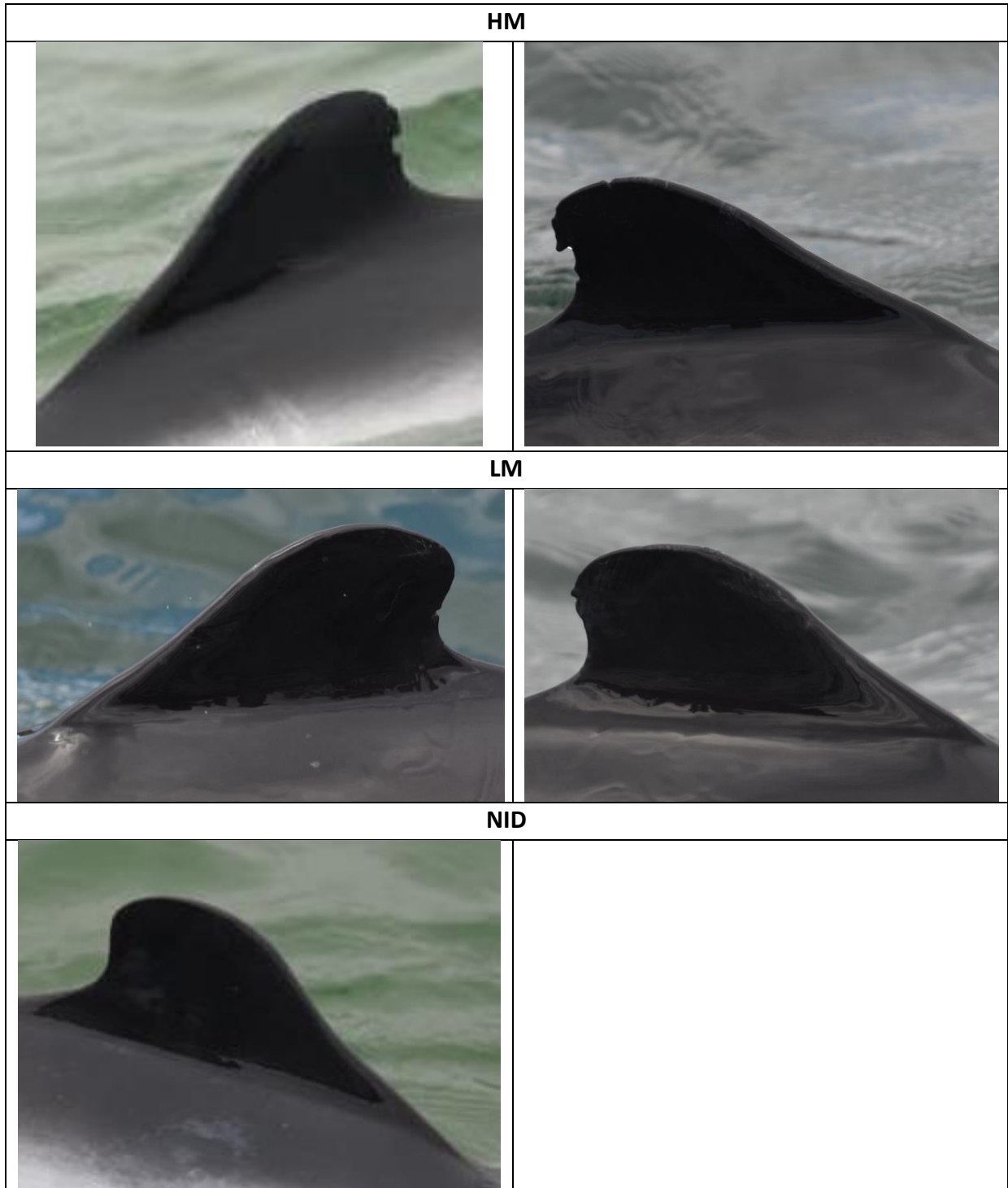
7. Fin Distinctiveness

Overall individual distinctiveness is based on the amount of information present on the dorsal fin, including notches on the trailing and/or leading edge, coloration and scarring and fin shape. There are three categories to score distinctiveness.

Code4	Description	Example
HM (highly marked)	D1: very distinctive; features evident even in distant or poor quality pictures	Deformed Mutilated Big chunk missing Tip missing 1+ notch 2+ nicks
	D2: distinctive; average amount of information content	1 nick and 1+ small nicks 4+ small nicks Peculiar shape
LM (low marked)	D3: distinctive, little amount of information	1 nick only 3 small nicks
NID (non Identifiable)	D4: very little/no information	1-2 small nicks Clean fin

Below, are some key words used for such descriptions and takes into account the following definitions:

- **Notch:** mark or incisures of size >5 cm
- **Nick:** mark or incisures of size from 1 to 5 cm
- **Small nick:** mark or incisures of size <1 cm
- **Scar:** cicatrix; a mark remaining after the healing of a wound or other morbid process or any visible manifestation of an earlier event



8. Photographic Quality

Characteristic	Score	Description
Focus/ Clarity	1	Excellent - perfect focus - outline and details are visible
	3	Good - good focus - all details visible but small nicks not in perfect focus
	5	Moderate - slightly blurry - general outline visible but small nicks not visible
	9	Poor - very blurry - details are not visible
Contrast	1	Perfect exposure
	2	Slightly dark or light
	3	Too dark or too light - marks on edges are still visible but not the scratches
Angle	1	Perpendicular or nearly perpendicular with less than 10° deviation
	2	Close to perpendicular with 10° to 45° deviation
	8	Oblique with more than 45° deviation
Visibility	0	All fin visible
	2	Trailing edge of fin visible
	8	Fin is obscure