Sound types for audit (beaked, sperm and pilot whales)

Use always the same volume in the computer and with headphones, when you are giving qualifiers about received level.

Codes given to the sounds are composed by different layers of information, in this order:

1) **Who made it**:

focal (from the tag whale, no code needed);

non focal (other whales of the study species, codified as **nf**).

indeterminate (difficult to distinguish if it is produced by the tag whale or by nearby conspecific, codified as **i**);

To distinguish between focal and no focal clicks consider the loudness of the clicks and the spectrogram. Normally focal clicks do have low frequency energy and sound louder, while non focal clicks miss the energy in the low frequency part of the spectrogram and sound less loud or not at all (if they are ultrasonic). However, non focal clicks from animals near the tagged whale can appear as focal clicks. Get familiar with the appearance of the focal clicks in periods where it is clear (usually at the bottom of deep dives). In stereo tags check the consistency of the angle of arrival (AOA) and the variability in the received level. Focal clicks tend to be more constant in RL and in appearance than non focal clicks. The AOA of focal clicks changes due to movements of the head with respect to the position of the tag on the back of the whale, but these changes are much larger in non focal clicks

other species (codified according to the sp,

d=dolphins; sw=sperm whale, pw=pilot whale,

other species use the initials of the latin name, e.g. bm=blue whale, etc) and

unknown (e.g. low intensity clicks of unknown origin, codified as **u**

2) **what is the sound**: e.g. click sequence (cs), rasp (rs), whistle (w), squeak (sk), start of clicking (soc), etc (see below)

Other attributes of the sound can be added by leaving a space between the previous codes and the following information

3) **apparent received level (RL) attribute for non focal sounds:** high (h), medium (m), low (l), to facilitate finding examples later on. More objective analysis of RL will have to be done at a later stage if required.
4) **Apparent number of signals or non focal whales.** This is in specific cases when there are many nf whistles, for example, and you don´t want to spend time separating them but you heard that there were many, or n whistles . Or that there are clearly many non focal whales clicking

Examples:

Focal squeak: sk

Non focal squeak of high intensity: nfsk h

Indeterminate whistle: iw

Many non focal high RL whistles: nfw h many

Three non focal medium RL whistles: nfw m 3

Further information

In tagaudit you can select a section with **s** or just a point with **l** . You can use the point to add short further comments if required. Long comments would be better in a notepad that is kept in the same location than the audit (i.e. tag/tag2/metadata/audit)

Starting and end of each auditing session

- Soa (space) abbreviation of the name of the auditing person.
  E.g. soa pat = start of auditing patricia
- Eoa (space) abbreviation of the name of the auditing person.
  E.g. eoa pat

This is very important in order to know which parts have been audited and by whom, so that any doubt can be solved in the future. At the start of each audit session, if you start auditing where you ended before, delete that eoa and just

continue auditing, adding a eoa at the end of the session. If the audit does not cover all the record, e.g. only auditing deep dives, there will as many soa and eoa as deep dives, and this indicates that the part between an eoa and the following soa has not been audited.

Types of sounds

1) Produced by the tagged whale: vocal events

"soc" and "eoc" Start of regular clicking, and end of regular clicking.

Soc is marked as a point and indicates the start of a dedicated foraging part in a dive that ends with **eoc**. Most often there is only one soc and one eoc per dive. In Blainvilles and Cuvier's beaked whales, soc usually starts at some 300 m in the descent of deep dives and eoc usually occurs close after the ascent phase starts. Short interruptions of clicking are not indicated with eoc, they are only pauses. To select where to put eoc can be tricky and what we do is putting it when pauses start to be longer than click sequences. From eoc, click sequences are codified as cs (see below).

"p" Pause (segment). Interruption of regular clicking (RC) by 1 second or more. It may contain other sounds, such as squeaks, a whistle, rasp or an air sound. These are included in the pause and codified separately as well. Sometimes the whale goes directly from RC to a buzz/rasp and after the buzz/rasp there is a pause, which in this case finishes after the buzz.

"cs" Click sequence (segment) that is short (2-3 15 sec audit screens max). If it is much longer use soc and eoc and add pauses if required.

"sc" Single clic (one point)

"pc" Posible click. Point or segment with possible clicks, probable not really from the whale (maybe produced by the bubbles of the tag when approaching the surface, etc) but you are not sure and want to check it later. It is useful for peace of mind when starting to audit, after that it becomes easier to distinguish real from unreal clicks.

"rs" Rasp (segment). Short series of clicks with ICI just a bit slower than a buzz, it sounds like caressing a comb.

"rs many" segment with many rasps interspersed with fast clicking, making difficult to separate individual rasps.

"bz" Buzz (segmento).

"pbz" Posible buzz. It has not been used ever, but in case you need it

"w" Whistle (segment). Formed by one or very few harmonics.

"sk" Squeak (segment). Complex tonal sounds with many harmonics,

"skp" Squeak pulsed (segment). This is a burst pulse that sounds tonal.

2) Produced by the tagged whale: non vocal events

"bubbles" Sound of bubbles coming from the blowhole.

"air" Sound of air, often like recharging a compressed air gun. Most probable related with air recycling during pauses.

"ib" Sound of air that may be produced by the whale or by air movements in the tag, not clear.

"resp" Arrival to the surface when the blow is NOT heard (segment).

"resph" Blow heard at the surface, respiration heard (segment).

"log" Logging period

"b" Blow (respiration) heard at the surface within a logging period.

"hs" High speed event (segment). Most often the sprints related to hunting. Heard due to the increase of noise of the water against the tag. Whales seem to swim a bit noisier than average when starting the dive, maybe related to fighting buoyancy, this is not considered a hs event.

"cont" Contact or impact with another whale or a possible prey. (sometimes it has been recorded as "imp")

"indet" Indeterminate (segmento). Whatever odd sounds that you don´t know how to classify.

3) Produced by other beaked whales

Any sound used for focal whales can be used for non focal whales by adding **nf at the beginning** of the sound type.

nfsoc y nfeoc are used whenever there are many non focal clicks nearly continuous, even if they stop for 1 or 2 screens.

nfcs is used when there is a series of non focal clicks of short duration. It is good to specify if it is a loud sequence, by using nfcs h . If there is a high RL series within a period included between a nfsoc and a nfeoc please mark it also.

nfcs many a nfcs where there are many non focal whales

"nfw" "nfsk" one non focal whistle or squeak. Their RL as it appears in the screen is subjectively classified in high (nfsk h) médium (nfsk m) or low (nfsk l). I

"nfw many" "nfsk many" periods with many non focal w or sk. Again you can classify them according to apparent RL in high (nfsk h many) médium (nfsk m many) or low (nfsk l many). If you can count them, put the number instead of many. E.g. nfw h 3

4) No idea if it was focal or not!

These are indeterminate, when a non focal whale can be vocalizing closer to the tag than the tag whale, and even the angle of arrival may be similar between tag and non tagged whale. Any sound used for focal whales can be used for indeterminate by adding **i at the beginning** of the sound type.

5) Other species

Use same codes, when applicable, starting with the abbreviated name of the species. Most common are "dcs" "dw" for dolphins of unknown species

6) Non biological sounds

"nbn" Non biological noise (segment). Do not mark every time that the tag makes noises. This is for something that we don´t know the origin, it can be pile driving, etc

"echosounder" Jt can be a point or section, or if it stays for long periods use soechosounder and eoechosounder . Echosounders from fishing boats appear as dots at some 30 kHz with remarkable stable ICI

"sv" "ev" Start/end vessel (points) often far away. You can add an apparent level attribute to it. E.g sv l

"v" Vessel (segment). Short periodo f vessel noise. Please add apparent level attribute.

"tagoff" moment when the tag comes off the whale. Probably it keeps recording in the ascent to the surface.

"endofrecord" end of the acoustic record of the tag, even if it is still attached to the whale.

Echoes point or segment, if you clearly receive echoes from the bottom/surface, etc

Please, any sound type in the audits should correspond to this list (excepting comments). If there is a need to add new sound types, please communicate with Natacha Aguilar (naguilar@ull.es)