F2HK. v2 BABOON TRACKING COLLAR

Overview

F2HK.v2 collars were developed by authors Gaelle Fehlmann, Phillip Hopkins, Mark Holton, and Andrew King and with advices from Emily Shepard, Rory Wilson and the rest of the Swansea Lab for Animal Movement (SLAM) at Swansea University, Carlo Catoni from TechnoSmArt (Italy), Gwenda Kesans from 'Ride and Drive Equestrian' (Wales), Nicolas Chatelain from the Institut Pluridisciplinaire Hubert Curien, Departement d'Ecologie, Physiologie et Ethologie (France). Here, we provide an overview of the components and construction of the collars to enable others to use and deploy the F2HKv2 collar design. Table 1 gives an overview of the collars characteristics, Figure 1 provides a schematic of the collar design, and Table 2 lists all components.

Table 1: Collar characteristics

Weight	Circumference max	Width	Thickness	Longevity
450 g	700 mm	42 mm	8 mm	42 days

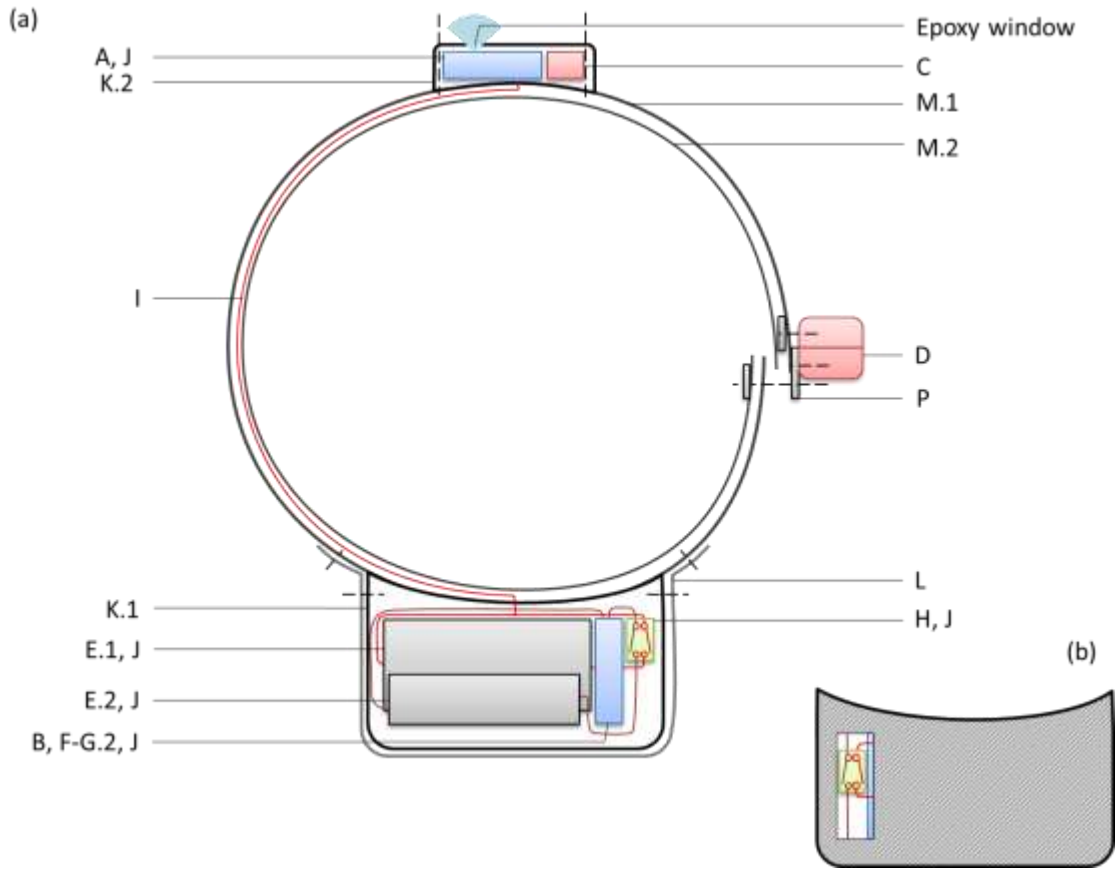

Fig. 1: Schematic of the collar. Annotations from A to P refer to the components indicated in Table 2. (a) The collar is represented open, from the front. Dotted lines indicate screws (O.1-O.2). (b) Back of the main unit. A trap enables the access to the GPS/Daily Diary switch and can be sealed the day before the capture.

Table 2. List of components

Code	Component	Supplier	Details
A	GPS	TechnosmArt	GiPSy 4
B	Acc-Mag	Wildbyte Technologies	Daily Diary
C	VHF	Sirtrack	Ultimate Lite Single Stage Inmplant Transmitter
D	Drop-off	Lotek	TRD-L
E.1	GPS battery	Saft	D cell, 19 Ah, 3.6V
E.2	Acc-Mag battery	Saft	A cell, 3.6 Ah, 3.6V
F	Micro SD card	Transcend	2 Go
G.1	Crimp Housing	Farnell Elememt 14	1.25 mm, 2 way
G.2	Contact socket	Farnell Elememt 14	26 AWG, crimp
H	Switch	Farnell Elememt 14	4 way
I	Wiring	Farnell Elememt 14	
J	Glue lined Heatshrink	Heatshrink online	Clear, Ø32mm, Ø20mm, Ø44mm
K.1	Main Unit	Phil Hopkins	3D printed
K.2	GPS Unit	Phil Hopkins	3D printed
L	Aluminium cradle	Phil Hopkins	
M.1	Main Leather	Ride and Drive Equestrian	42mm wide, 4 mm thick
M.2	Soft Leather	Ride and Drive Equestrian	42mm wide, 1 mm thick
N	Cloth tape	Tesa	4651 acrylic cloth tape
O.1	screws	RS component	M3 stainless steel cap head bolts
O.2	Nyloc nuts	RS component	M3 stainless steel nyloc nuts
P	Fixation plates	Phil Hopkins	3 x 1.5, 3x3

Device set up

Settings were optimised to maximise resolution and battery longevity. GPS accuracy was tested in various habitats while standing or walking with the unit. Memory cards for the Daily Diaries were fully formatted (file system FAT) and tested beforehand. Table 3 provides details of the device recording frequency, sampling period, and mode of data acquisition for these devices, and the set-up of the drop-off mechanism.

Table 3. Device features

	GiPSy 4	DailyDiary	TRD-L
Frequency	1Hz	40Hz	-
Longevity	42 days	30 days	60 days
Sampling period (UTC)	5:00 - 17:00	5:00 - 17:00	-
Power supply	19.0 Ah	3.6 Ah	-
Accuracy	7m	-	-
Mode	Short period: 200/1000	Set start time: 15:00	Time release

Collar shaping

The collars were constituted of two units containing the recording devices and batteries. The main unit located at the bottom of the collar contained batteries and the acceleration/magnetometers. This unit was the heaviest, ensuring the collar maintained the correct position on the animal. The second unit contained the GPS and the VHF and was located on the top of the collar, sky oriented to maximise satellite reception. Figure 2 and 3 show the design of both units.

Main unit

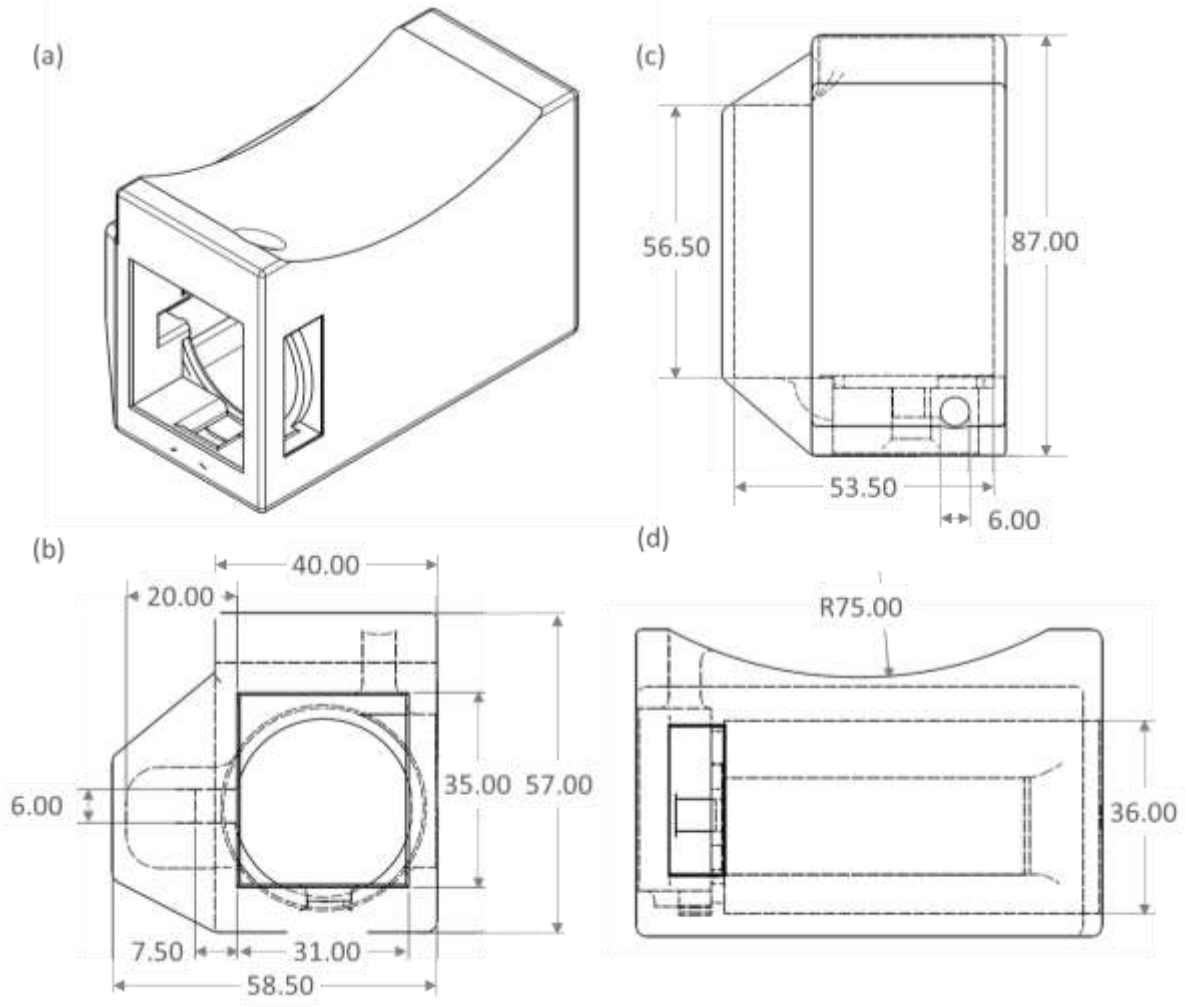

Fig. 2: Main unit dimensions. Dashed lines represent the inside edges of the housing. The housing is presented from the back trap and device trap perspective (a), the left side (b), the top (c), the front (d).

Aluminium cradles were added to protect the edge of the main unit from potential impact.

Antenna unit

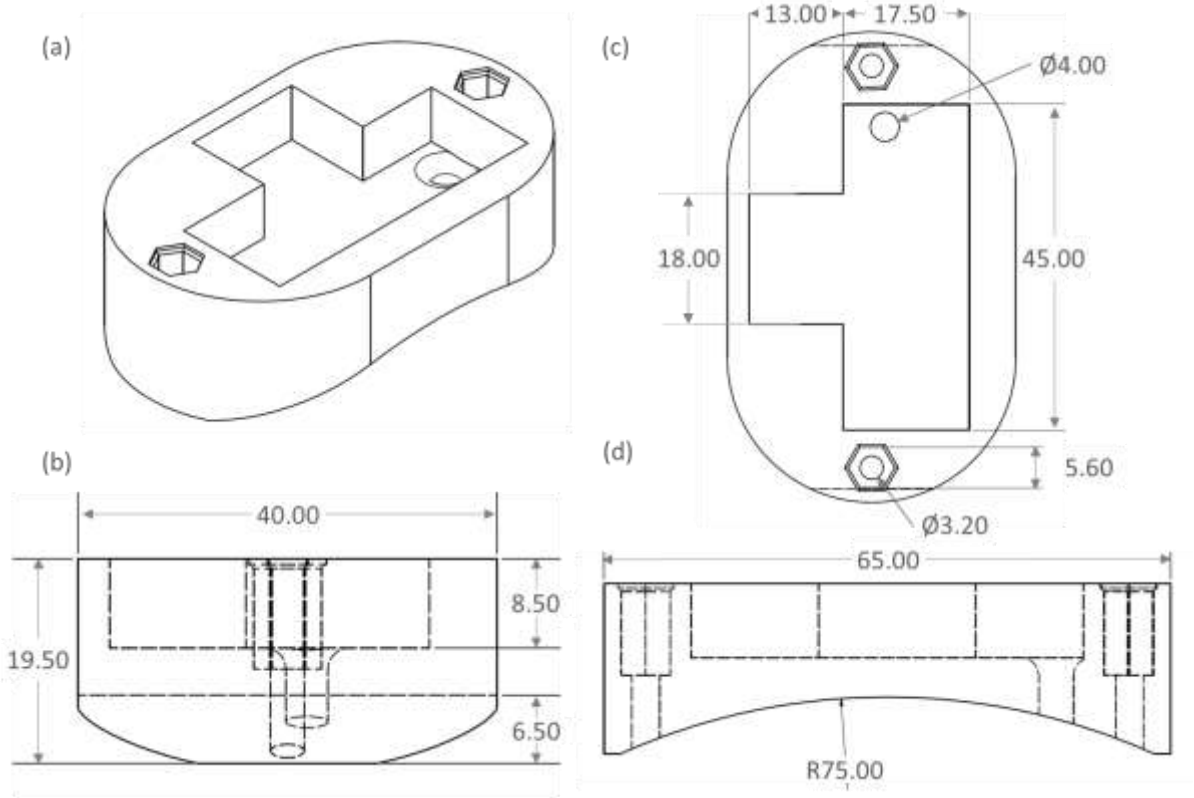

Fig. 3: Antenna unit dimensions. Dashed lines represent the inside edges of the housing. The housing is presented from the back left perspective (a), the left side (b), the top (c), the front (d).

A hole was made on the lid and refilled with epoxy. When the GPS is turned on, this allows the user to see the light emitted by the GPS for the first minute and check that there is no connection issues.

Assembly

- Aluminium cradles were wrapped in soft leather to protect the baboon from the aluminium
- Drop off were installed at one edge of the collar
- Cradles were attached at 6 cm from the drop off
- GPS unit was attached at 16 cm from the edge of the cradle

Wiring

The recording devices need to be wired to the power supply and to the switch according the schematic (shown in Fig. 4). The switch enables start of data collection in the field and is accessed through the trap at the back of the main unit.

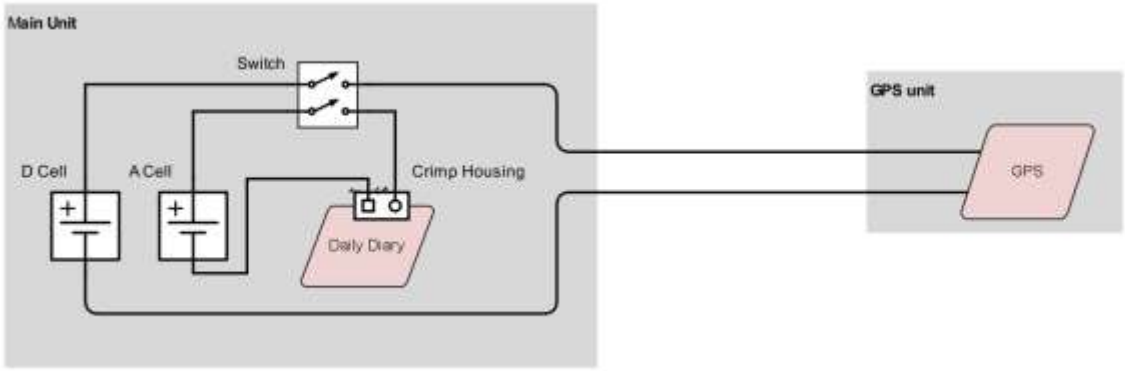

Fig. 4: Wiring. GPS wires have to come out the GPS unit and come back in the main unit to connect to the battery and switch. The length of the wires has to be adjusted accordingly.

Waterproofing

The following parts were encapsulated in glue lined heatshrink to protect all connections from water condensation/infiltration and dust. About 1cm of wires was included in the heatshrink and each wire was clearly separated from the others to maximise waterproofing.

- GPS
- Daily Diary
- Switch
- Batteries, individually

Collar coating

To improve the attachment of each part to the collar and overall waterproofing, the collar was wrapped in TESA tape. Figure 5 shows the overall aspect of the collar

Fig. 5: Finished collar. Each square of the scale bars represent 1 cm and the full length of the scales represent 10 cm.

Launch data acquisition on the field

The day before the capture, the following procedure was undertaken directly on the study site to maximise the calibration accuracy. The time of the day depend on the set start time of the Daily Diary (here 15:00 UTC). The UTC time is known thanks to a laptop connected to internet with a USB router. Every step is video recorded and time stamped with the UTC time.

- GPS switch turned on at 14:55 UTC
- DD switch turned on at 14:59:30 UTC
- DD activated with magnet at 15:00 UTC
- Acceleration calibration
- Magnetometer calibration

Collar building procedure

Each step of the collar building is listed below and ranked in chronological order.

1. Housing printing
2. Tag’s set up
3. Cradle wrapped in leather

4. Drop off installation
5. Attachment of the cradle
6. GPS unit attachment to leather
7. Battery wiring, encapsulation and installation
8. Daily Diary wiring, encapsulation and installation
9. Switch wiring, encapsulation and installation
10. Main unit installation
11. GPS wiring, encapsulation and installation
12. VHF installation
13. GPS unit sealing
14. Addition of soft leather to the inside of the collar
15. Collar coating

16. Launching data acquisition
17. Sealing of main unit

18. Collar attachment to animal