Suggested citation:

Ramey, A.M., Soos, C., Link, P., Walther, P., Tibbitts, T.L., Douglas, D.C., 2019, Tracking data for Blue-winged Teal (Anas discors)(ver 1.0, September 2019): U.S. Geological Survey data release, https://doi.org/10.5066/P9Z9BA9F

Data package files:

File name*	File contents	File format
.\rawData files:		
<NAME>_deploymentAttributes.csv	Deployment data	UTF-8 (ASCII), CSV
<NAME>_diagLegacy.txt	Argos DIAG, legacy format	UTF-8 (ASCII), custom
<NAME>_diagTabular.csv	Argos DIAG, tabular format	UTF-8 (ASCII), CSV
<NAME>_dsLegacy.txt	Argos DS, legacy format	UTF-8 (ASCII), custom
<NAME>_dsTabular.csv	Argos DS, tabular format	UTF-8 (ASCII), CSV
<NAME>_rawData_metadata.xml	Metadata	UTF-8 (ASCII), XML
.\processedData files:		
<NAME>_decodedSensor.csv	Decoded sensor data	UTF-8 (ASCII), CSV
<NAME>_deploymentAttributes.csv	Deployment data	UTF-8 (ASCII), CSV
<NAME>_diag_filteredLocations.csv	Argos DIAG tab, w/ filter flag	UTF-8 (ASCII), CSV
<NAME>_processedData_metadata.xml	Metadata	UTF-8 (ASCII), XML

 *<NAME>: blueWingedTeal_USGS_ASC_argos

Deployment data description (included with all data packages):

- ## Deployment Attributes file:

    Copies of this data file appear in both the .\rawData and .\processedData subdirectories. It contains information that documents which transmitters were deployed on which individual animals, the deployment dates, and ancillary attributes about the animals if recorded (e.g., sex, age, weight, etc.).

    This file contains a categorical variable named *Deployment_Fate* with five possible values: alive, dead, shed, shed/dead, and undetermined. The value of *Deployment_Fate* was determined by a manual assessment of sensor and movement data with the goal of defining the date/time when tracking each live free-ranging animal may have ended. That date/time is recorded in the variable *Deployment_End_Timestamp_UTC*.

Deployment_Fate		*Deployment_End_Timestamp_UTC*
alive	Default – No evidence that animal died or shed PTT	Date/time of the last transmission obtained from the PTT
shed	Definitive – a live animal observed without attached PTT	Date/time of the last transmission obtained from the PTT with sensor data indicating attachment to a live free-ranging animal
dead	Definitive – observed carcass or unambiguous sensor data	
shed/dead	Ambiguous – evidence of shed or dead, but insufficient evidence to distinguish which one	
undetermined	No assessment of mortality or attachment	No date/time is provided

All tabular-format data files in this data package (described below) include a related, *Tracking_Status,* variable. *Tracking_Status* = 'alive' for all data records collected while the animal was believed to be alive. If there was evidence that the animal died, or the transmitter was shed, then all data records thereafter will have *Tracking_Status* coded as dead, shed, or shed/dead. ***Users are cautioned to exclude post-mortality or post-detachment data records before analyzing data assumed to be collected from live, free-ranging animals.***

Note that the final tracking destination (location) of an animal may have only been obtained post-mortality or post-detachment. Raw Argos data are included for up to 6 months beyond that date to ensure information from after the *Deployment_End_Timestamp_UTC* was preserved (if available). If final destinations are of interest, the first 'non-alive' locations (if available) should be examined. To help prevent unintended use of 'non-alive' location data, the coordinates of those records in the "diag_filteredLocations" file (in the processed data folder) are stored as the variables *Lat_ShedDead* and *Lon_ShedDead*.

Raw data-package file descriptions

- <u>Argos DS (a.k.a. Dispose) legacy format file</u>:

  The Argos DS format contains all transmissions (messages) collected during any given satellite overpass. Each overpass is reported on multiple lines of data beginning with a header (PTT number, satellite ID, etc.) and followed by a variable number of records reporting the raw sensor data carried by each transmission. DS is the most appropriate data format for analyses of sensor data. The DS legacy data have been archived in their original format as received from CLS (a.k.a. Service Argos). That format, however, has changed a few times since its inception in the early 1980s. Description of the Argos DS legacy format is provided in Argos System User Manuals.

- <u>Argos DIAG (a.k.a. Diagnostic) legacy format file</u>:

  The Argos DIAG format (since 1988) contains multiple lines of data for a given satellite overpass that report the primary location estimate, the alternate location estimate, and several other variables such as the location class index (accuracy) and signal strength and concludes with raw sensor data values obtained from a single (arbitrary) transmission. DIAG is the most appropriate data format for analyses of location. The DIAG legacy data are in their original format as received from CLS (a.k.a. Service Argos), but that format has changed a few times since its inception in the late 1980s. Description of the Argos DIAG legacy format is provided in Argos System User Manuals.

- <u>Argos DS tabular format file</u>:

  The DS tabular data format contains the same information as the legacy DS format, however, all the variables are reported on single comma-delimited records. As such, the tabular DS format is more convenient for ingestion into database software. Tabular DS holds a full complement of the raw coded sensor data in which one data record contains the data obtained from one PTT transmission. Ancillary identifying variables and *Tracking_Status* have been added to the tabular records by USGS for this data release.

- <u>Argos DIAG tabular format file</u>:

  The DIAG tabular data format contains the same information as the legacy DIAG format, however, all the variables associated with a given satellite overpass are reported on one single comma-delimited record. As such, the DIAG tabular format is more convenient for ingestion into database or GIS software. Tabular DIAG holds a full complement of raw <u>unfiltered</u> location data. One data record contains all variables (including primary and alternate location estimates) from one satellite overpass. Ancillary identifying variables and *Tracking_Status* have been added to the tabular records by USGS for this data release. Prior to July 2009, the variable *Pass_Satellite_ID* was added to the DIAG tabular records by USGS through temporal matching with the satellite overpasses in the DS data; please note that since multiple satellites can be visible to the transmitter at the same time, it is possible that some satellite IDs may be mismatched (prior to July 2009 only). Also, beginning July 2009, the tabular DIAG files contain data fields describing the Argos error ellipse.

Processed data-package file descriptions

- <u>Filtered Argos DIAG data - tabular format</u>:

  This data file contains every record from the raw DIAG tabular format that had an Argos location estimate. A variable named "*DAF_Filter*" has been added by USGS that flags implausible locations: *DAF_Filter*= 1 for implausible locations and *DAF_Filter*=0 for plausible locations. Implausible locations were identified using the <u>Douglas Argos-filter Algorithm</u> as implemented at the Movebank tracking data portal (<u>www.movebank.org</u>) as follows:

  The Argos DIAG tabular data and telemetry attributes files were uploaded into a Movebank Study named "blueWingedTealI_USGS_ASC_argos" (publicly available at <u>movebank.org</u>). The Douglas Argos-filter (DAF) was then applied using the user-defined parameters shown below:

Douglas Filter Parameters

See manual ⑦

Filter Method	Best Hybrid ▼
keep_lc	1 ▼
maxredun	10

Duplicate record treatment:
offset by one sec. ◉
filter ○

MRD filter advanced parameters:
keeplast ☐ enabled
skiploc ☐ enabled

DAR filter parameters:
minrate 120
r_only ☐ enabled
ratecoef 25

Best Hybrid filter parameters:

xmigrate	2
xoverrun	1.5
xdirect	20
xangle	150
xpercent	20
testp_0a	2
testp_bz	3

Best of Day filter	☐ enabled
pickday	☐ enabled
minoffh	8
rankmeth	1 (LC, IQX, IQY, NBMES) ▼

[Run] [Cancel] [Reset] This configuration was applied on 2019-09-09 20:06:11.887

As recommended by Douglas et al. (2012), DAF decisions for each animal's track were manually scanned and over-ridden when deemed appropriate. The final binary filtering flags were downloaded from Movebank and added to the DIAG tabular file (the *DAF_Filter* variable as described above). The processed DIAG tabular file also adds the *Latitude* and *Longitude* variables that contain an algorithm-derived choice between the two location solutions (*Location_Lat/Long_Solution_1* vs. *Solution_2*) which are products of Doppler-based geolocation methods. *Latitude* and *Longitude* are empty when *Tracking_Status* does not equal 'alive'. Coordinates for any locations obtained after *Deployment_End_Timestamp_UTC* are stored as *Lat_ShedDead* and *Lon_ShedDead* to minimize risk of unintended analysis.

The Movebank Study is open access. Movebank user accounts are also free. All processed location data can be downloaded from Movebank.org, or, the filtered location data can be read directly into a move::MoveStack object in Program R as illustrated below.

```
#############################################################################
### R script for directly reading data from a Movebank Study (ex. R version 4.3.3)

require(RCurl)
require(move)

curl <- getCurlHandle()
```

```
options(RCurlOptions = list(capath = system.file("CurlSSL", "cacert.pem",
        package = "RCurl"), ssl.verifypeer = FALSE))
curlSetOpt(.opts = list(proxy = "proxyserver:port"), curl = curl)

### Get data directly from Movebank Study
Login<-movebankLogin(username='YOUR_MOVEBANK_USER',password='YOUR_MOVEBANK_PASSWORD')
MBstudymoveObject<-getMovebankData(study="blueWingedTeal_USGS_ASC_argos",
                                   login=Login, removeDuplicatedTimestamps=TRUE)
proj4string(MBstudymoveObject)<-CRS("+proj=longlat +ellps=WGS84
                                     +datum=WGS84 +towgs84=0,0,0")

### Plot all locations in the MoveStack object
require(maps)
plot(MBstudymoveObject, type="o", col=4, lwd=1, pch=20,
     xlab="location_long", ylab="location_lat")
map(database="world",add=TRUE)

### Convert the MoveStack object to a data.frame
Move_DAF_tbl<-as(MBstudymoveObject, 'data.frame')

### Remove locations that were not obtained from a live free-ranging animal
Move_DAF_tbl_alive<-subset(Move_DAF_tbl, comments=='alive')

############################################################################
```

- ## Decoded sensor data file:

  The transmitters summarized in this data package collected sensor data such as temperature (measured within the PTT just prior to transmission), voltage (battery voltage just prior to transmission), and activity (a revolving counter that incremented with changes in PTT orientation). Raw sensor data were transmitted as optimized integer values that represented temperature, voltage, etc. Those raw values have been decoded into usable units when applicable (e.g., Celsius and volts). **Note**, parity errors (misrepresentations of 1's and 0's introduced during earth-to-satellite communication) occasionally corrupt the sensor data values, so care should be exercised to recognize their existence when analyzing and interpreting the sensor data. No checksum values were embedded in the sensor messages to help screen for parity errors. As general guidance, users should interpret the dominant modes or dominant patterns of the sensor data and be suspect of outlier values.

Metadata

FGDC metadata records are included with each data folder. The metadata provides specific details and definitions about all data files and variables. We encourage users to carefully examine the associated metadata to understand appropriate use and data limitations