

Florida Calf Loss – Final Report 2017

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Summary

In year 1 (2017) of the study we have secured all the equipment and supporting supplies to undertake calf loss studies on three ranchers, one more set than initially planned. The first of these ranches has had gateway tower equipment set-up completed, equipment tested and footprint of sensor readability mapped. Initial herd has had baseline samples taken and palpation completed by ranch employed veterinarians. The second ranch will be set-up in September 2017 and the third ranch December 2017. Our initial timeline included a spring calving in 2017 but we adjusted the timeline of objectives and rearranged spending across our multi-year project due to the inability to have equipment on hand for the spring calving season. During Phase 1 of study we also identified several improvements that needed to be made with equipment so as to increase our capability and logistical ease to follow calf loss. The manufacturing company has made refinements to equipment, improving function to allow greater coverage and ease of recovery in a beef cow-calf pastured system. Furthermore, we have made improvements for sampling procedures and increased the extent of testing available to the project through BADDL. In addition we have secured the full use of a 4x4 Chevrolet truck on permanent loan from the US Fish and Wildlife Service for the project, and the Florida Wildlife Commission and USFWS staff associated with predator identification of livestock kills have agreed and been given permission to support the project with confirmation of calf loss kills for the project with onsite visits. The support and encouragement of multiple agencies to gain the most informative and accurate results from this project is a testament to the willingness and collaborative support that is being invested to improve our knowledge of the difficult issue of calf loss in the livestock industry.

Objectives:

Each phase listed below comes from the original submission. Updates on each phase have been discussed if occurring in year 1 of study.

Phase 1: A test of the birthing sensory equipment needed to undertake the study was implemented September 2016 and completed January 2017 (funded in kind with materials and time by Medria INC, Ridge Large Animal Veterinary Services, Buck Island Ranch and UF RCREC).

This test at Buck Island Ranch showed that the sensor equipment deployed in the birthing canal of cows is retained for the period needed for the study (90-120 days), with constant temperature

logging, and calving alerts sent to tracking website and via text messaging using gateway base station (cellular modem), with no connection failures. There were several sensors that failed 30-60 days into the test and were identified as faulty due to a battery power regulator modification, this modification has since been replaced and fixed. During phase 1 several important concerns were raised about sensor and gateway capabilities, relating to spatial coverage of base station and ability to find sensors in the field once expelled.

Concern 1: Spatial Coverage

Keeping in mind that the original equipment had been designed for an “*in barn*” scenario, the coverage of the base tower gateway was of concern after initial implementation and testing suggesting a maximum limit of quarter mile from gateway. A typical size 250-400ac pasture was requested and we are pleased to say that updated technology has allowed a footprint measurement of 600acres, about half mile from central base tower gateway. In addition to this increased footprint we were concerned about “dead zones” or areas where dense vegetation may block sensor signals to gateway, and the system now includes an ability to add moveable repeaters that can be placed to improve signal function from sensors to tower and improve coverage. The repeaters can also be used to increase the footprint by another quarter mile.

Concern 2: Sensor Retrieval

After the test study it was obvious the hardest issue to solve in an open pasture system was location of sensor and the associated birthing event. The “*in barn*” version does not require tracking of sensor to find calf. The sensors are now fitted with two features to allow their recovery in a pasture situation. The first is a visual signal in the form of a bright red LED light. The light can be seen from half a mile away and is an excellent tool at night when most calves are born. The second is a blue tooth receiver that allows connectivity to any blue tooth device. Currently the distance of use is about 50-75 yards but by the end 2017 the tool will allow detection of sensors from 300 yards away. There was discussion to use GPS locators but these are costly to add to the sensor and have high battery consumption that in turn severely reduces the lifespan of the re-usable sensors.

Phase 2: Year 1 of study will be used to solve any methodological issues and only require equipment and staff to implement two cattle ranches at a time (repeatable in spring and fall to cover 4 ranches total).

This phase was modified to be implemented on three ranches in fall of 2017. During Phase 1 of study and now in Phase 2 we have worked on implementing the field based gateway tower, acquiring multiple sets of equipment, implementing the first ranch set-up at Big Cypress, fine-tuning calf loss procedures and sample collection with BADDL, registering with Department of Interior for use of VHF frequencies, coordinating with Florida Wildlife Commission and US Fish and Wildlife Service to undertake and support suspected predator caused calf loss site reports.

Initial Set-Up Big Cypress

The Big Cypress location ended up being our first set-up because of the timing of calving being earlier than our other two sites. The site is situated south east of the Big Cypress Seminole township and abuts the Big Cypress National Preserve north of Interstate 75. Set-up began in July 2017 after equipment arrived. A two day instrumentation set-up and test was performed by John Balbian (JMB cow monitor), Emmanuel Monier (JMD cow monitor France), Dr Raoul Boughton (RCREC) and Alex Johns (Seminole Beef). During this process complications connecting with AT&T were solved, location of tower decided, and footprint of signal read measured. In August of 2017 Dr Boughton completed the set-up of tower equipment and migrated full set-up onto 100% solar power (Figure 2).



Figure 1: Big Cypress Calf Loss location – Mary Jene Koenes ranch with tower location (red star), cross fencing (black lines) and boundary fence roads along which tower footprint was recorded and 100% successful in communication (area 380acres).



Figure 2: Final set-up of gateway tower on Big Cypress ranch fully operational on solar power (right upper panel), mounted on power pole specially erected by Heath Crum (Seminole Beef) and crew (left panel). Arrival of first batch of new LED red light sensors (right bottom panel)

Birthing system sensors and gateway equipment, ear tag mortality tracking and logger system equipment purchases, utv support vehicles, materials needed to observe calves at night, and materials for sampling, immobilization, and data storage have been accrued to support three set-ups and sampling of calves and cows for these three ranches (see attached budget justification). First calves are expected on the ground in October and will continue into April for these three ranchers.

Ear-tag VHF Transmitters Frequencies

An unknown issue raised itself when we applied to register for 330 independent VHF frequencies for each unique calf. There were not that many frequencies available in Florida in the research bandwidth. The Department of Interior listed over 60 active research projects in Florida. It is important to have unique frequencies and no overlap of projects in the same area. In the end we were able to identify 110 unique frequencies (i.e., on set-up) and those frequencies would be repeated three times. The disadvantage 110 frequencies is calving pastures cannot not be within 10 miles of each other, and equipment cannot be shared among sites due to duplication.

BADDL increased testing

Through support and feedback from BADDL we have adjusted our sampling so it will include an initial herd health test, where 25 of the 110 pregnant cows will have tests to assess general herd health. These will include cellular blood counts, blood chemistry profiles, and cervix swabs. An increased panel of tests has been organized for calves and cows depending on the field

conditions under which they were found dead (See Appendix I for test list). Not all tests will be run on every calf. For example if a calf was observed healthy, nursing and no physical signs of distress, and later found killed with evidence of a predator (e.g., showing hemorrhaging, bruising, bite wounds, evisceration), a narrower set of health and disease sampling will be undertaken.

USFWS and FWC Commitments

In addition to funding from the FCEB and support from BADDL, the project has garnered support from the conservation and wildlife community, with USFWS providing a 4x4 Chevrolet truck for the lifetime of the project, and USFWS and FWC through their predator biology core group are providing services to identify predators from suspected calf kills. The team follows a phone tree of six biologists to ensure full coverage including weekends. For any suspected predator kill we are also collecting DNA swabs from bite wounds to help confirm physical evidence (see Appendix II). This is of high importance as there is concern among the community of correct identification of kills solely by physical description of carcass and site.

Next Steps

As we move into the full set-up and monitoring stage of the project our number one priority is securing great field staff to undertake observations, tagging and sampling. This has been achieved for the Big Cypress location and is in process for Longino and Buck Island as those sites come online in Fall of 2017. Careful and timely planning of dead calves and samples to BADDL is of utmost importance and continued conversation and improvement of logistics in the field will be undertaken where needed. At the completion of the fall/winter calving season a summary report for the Cattleman's Quarterly will be written based on initial findings and datasets from these three ranches. The next three herds will then be implemented for the next round of calf loss studies.

Phase 3: On successful implementation of phase 2, a doubling of equipment and staff to implement the study on four ranches during spring and fall calving, for the 2nd and 3rd year will be undertaken to increase sample size.

We will be modifying phase 3 based on funding being reduced for the second year of this multi-year project. We will maintain our sample size to three rather than four ranches. This will require the currently budgeted staffing, accommodation and vehicle expenses, and diagnostic costs.

Phase 4: In future collaborations with ranch industry partners the expensive equipment can be used for up to another 5 years on targeted calf loss questions in the field on ranches.

Yet to be implemented

Educational Objectives

In addition to above phases of monitoring ranch calf loss, the following educational objectives were prepared to be implemented across the multi-year study.

1. The technology used and tested for this project will be shared with cattlemen of Florida through the Florida Cattleman's Livestock Journal (2017).

An initial technology report was written by Dr Boughton in The Florida Cattleman and Livestock Journal, Oct 2016, titled Technology and Florida Calf Loss - Ona Report. A second talk was given as a research update report at the RCREC. Further updates on technology will be provided as Dr Boughton's next report in the The Florida Cattleman and Livestock Journal.

2. In depth results of the calf loss study will be updated to the cattlemen each year of the study through at quarterly and annual meetings, in appropriate committees and events. (2017, 2018 and 2019)

Expected first results of calf loss to be available February 2018 for first ranch setup at Big Cypress, second ranches will follow shortly afterwards.

4. A projects page will be added to rangeland wildlife program website highlighting the study and ongoing findings. This page will be shared with extension agents, ranchers and UF/IFAS.

Done

5. During implementation and data collection phases of the project, in conjunction with collaborating ranchers, ultrasound and sensor deployment workshops will be offered for interested ranchers.

To be conducted as deployment occurs starting in fall 2017.

6. Results will be used to publish an EDIS extensions series on common causes of calf loss in Florida and disseminated to extension agents and ranchers to help with calf loss management. This will be a calf loss cause report to be used as a guide by ranchers and agents (2018, 2019).

To be implemented 2018-2019

7. As dataset grows we will publish results in appropriate industry media, Florida Cattleman and Livestock Journal, National Cattleman's Beef Magazine, as well as to scientific peer reviewed journals; American Association of Bovine Practitioners, Society for Theriogenology, Journal of the American Veterinary Medical Association, and Journal of Wildlife Management. A minimum of three research papers will be published –

1. Calf Loss Causes in Florida

2. Technology to track early calf loss

3. Predator calf loss as a component of total calf loss

To be implemented 2018-2020

8. Results will be presented at the Range Cattle Research and Educational Center (Ona) Field Day every 18months, at which there is up to 200 attendees.

To be implemented 2018-2019

9. Results will also be presented at county cattleman associations in conjunction with extension livestock agents.

To be implemented 2018-2019

10. In year 2 and 3 of the study an on ranch workshop day will be undertaken with cattleman to discuss findings of the study and suggest management solutions to reduce calf loss. At these workshops we will identify willing participants for follow-up on the success of implemented activities.

To be implemented 2018-2019

11. Specific information collected during the study will also be used in several other documents including A Rancher's Guide to Identifying Predator Attacks on Livestock and a Video guide on how to use birthing sensors in cattle.

To be implemented 2018-2019

Appendix I

Table 1: Proposed list of possible assays and diagnostic tests to be performed on calves.

Abortion Cause	Specimen of Choice	Assay	Typical Fee
Calf Necropsy	Fresh carcass or live calf	Necropsy	\$50
Calf Euthanasia	Live calf	Necropsy	\$30
Spinal cord examination (juvenile lymphoma/other)	Fresh carcass		\$25
CBC	EDTA blood (will also look for hemoparasites)	CP	\$0
Histopathology (including several segments of Skeletal muscle)	Fixed tissues	H	0
IBR virus (BHV-1)	Fixed fetal tissues and placenta Paired maternal sera	H, IHC, S	Serology \$7.50 each (\$15 pair) IHC \$15 tentative (not yet available)
BVD virus	Ear notch Paired maternal sera (RT)	H, PCR, S	Serology \$4.50 each (\$9 pair) PCR \$17

Bluetongue Virus	Fixed fetal tissues and placenta Pooled Fresh spleen, heart, brain, Paired maternal sera (RT)	PCR, S	Serology \$7 each (\$14.00 pair) <i>TVMDL PCR \$30</i>
Neospora caninum	Fixed fetal tissue Maternal sera (RT) (Herd basis)	H, IHC, S	Serology \$8. IHC \$15 tentative (not yet available)
Sarcocystis cruzi	Fixed fetal tissue (brain, heart, liver, placenta)	H	0
Mycoplasma/ureaplasma ?	Placenta, gastric contents, lungs, kidney	Culture?	\$28 TVMDL PCR
*Ruminant abortion panel LSI Vetmax -Coxiella brunetii, - Chamydophila spp, -Listeria monocytogenes, -Salmonella spp, -Campylobacter fetus, -Leptospira pathogenic strains, - Anaplasma phagocytophila, - Bovine Herpes 4	Placenta, vaginal and cervical swab	PCR	\$25 / sample submitted

Leptospirosis	SEE PCR PANEL IFO* <i>Paired maternal sera (RT)</i>	PCR S	PCR PANEL calf Serology \$15 maternal sera
Bovine Herpes virus type 4	SEE PCR PANEL IFO*	PCR	PCR PANEL
Salmonella sp	SEE PCR PANEL IFO*	PCR	PCR PANEL
Anaplasma phagocytophila	SEE PCR PANEL IFO*	PCR	PCR PANEL
Coxiella brunetii (Rickettsia)	SEE PCR PANEL IFO*	PCR	PCR PANEL
Listeria monocytogenes	SEE PCR PANEL IFO*	PCR	PCR PANEL
Brucella abortus	Fixed fetal tissues and placenta Fresh fetal stomach contents, liver, lung, spleen, placenta Maternal sera	Culture, S	Serology 0 Culture \$40
Histophilus somni	CSF, Brain, liver, kidney,	Bact. Culture (selective culture media)	0

Tritrichomonas foetus	Fresh placenta, stomach contents, lung InPouch Trich sample of Preputial and vaginal fluid	PCR	\$17
Chlamydophila spp.	SEE PCR PANEL IFO*	PCR	PCR PANEL
Campylobacter fetus var. venerealis	SEE PCR PANEL IFO*	PCR	PCR PANEL
E. coli (Endotoxin) (secondary to mastitis)	Fetal tissues and stomach contents	Culture	0
Trueperella pyogenes	Fetal stomach contents	Culture	0
<u>Mycoses</u> (Aspergillus, Absidia, Mucor, Rhizopus)	Fixed placenta and fetal tissues Fresh placenta and fetal tissues (stomach contents, lung)	Culture	0
<i>Chlamydophila abortus</i> <i>Chlamydophila pecorum</i>	SEE PCR PANEL IFO	PCR	PCR PANEL
<u>Toxic plants</u>	Locoweed (Oxytropis or Astragalus sp), Broomweed (Guttierrezia microcephala), Coumarins from rat poison, moldy sweet clover, and other grasses.	Division of Plant industry	0

<p>Pine Needles (Isocupressic acid)</p> <p>USDA poisonous plant research lab. Logan, Utah. Contact Dale Gardner</p>	<p>Pine needle analysis. abomasal fluid, thoracic fluid, serum</p>		<p>0</p>
<p>Nitrate</p>	<p>serum, ocular fluid</p>		<p>\$20</p>
<p>Nutritional deficiency (Selenium, Vitamin E, Iron, other)</p> <p>Trace nutrient elements or toxic (Se ,Cu,Zn, Fe, Mo, Mn). <i>Will detect trace as well as toxic minerals & heavy metals</i></p>	<p>Fetal liver or maternal blood/serum <u>Fetal liver preferred</u></p>		<p>\$45</p>

* Serology is the preferred method for specific diagnosis of brucellosis.

VI-Virus isolation; PCR—Polymerase chain reaction; IHC-Immunohistochemistry; S-Serology; FA-fluorescence antibody test; H-Histopathology

Appendix II

DNA Trace Evidence Collection Protocol

Supplies: Every Depredation Investigator shall have access to and maintain the following supplies:

- Package of sterile latex gloves
- Individually Packaged Cotton Swabs
- 10 2ml vials of ETOH
- 20 Small Paper Coin Envelopes

Procedure

1. Put on latex gloves. **WARNING:** If you frequently handle predators (e.g., bears, Florida panthers, bobcats), insure you do not wear clothes or other gear that may be contaminated with DNA (i.e., hair, blood, etc.). This could lead to contamination of samples and incorrect designation of predator involved in an incident.
2. Identify wounds believed to be from the predator (if possible ignore claw wounds). Puncture wounds from canine teeth are preferred sites for DNA collection. Feeding wounds are secondary sites that should be considered as well.
3. Remove cotton swab from packaging
4. Swab the entire wound area for approximately 20 seconds (avoid coating the swab in blood if possible and for large feeding wounds limit swabbing to a 10 cm x 10 cm area). For puncture wounds, focus swabbing around the perimeter of the wound and in the center. For feeding wounds, focus on the edge of any flesh that has been sheared by the predator or on tips of ribs/bones that have been chewed.
5. Place swab in paper envelope and break off shaft (break off enough to ensure the envelope can be closed and sealed)
6. Repeat this process for an additional 2 swabs. Place swabs collected from different locations in different envelopes.
7. Repeat the above sampling at the same locations with 3 swabs dipped in ETOH prior to swabbing. Store these ETOH swabs in separate envelopes from the dry swabs.
8. Do not seal envelopes with saliva. Use tape upon returning sample to the office.
9. Label envelope with the incident number generated through the WIMS system (if applicable), date, time, incident location, UTM coordinates, swab collection location on animal, and whether the swab location was a killing bite or feeding location or unknown, and whether swab was dipped in ETOH or not prior to collection.
10. Provide envelopes to FWC Panther staff for cataloging. Samples should be stored either in freezer or in a storage container with desiccant beads.
11. FWC Panther Staff will submit the samples weekly to the National Genomics Center for Fish and Wildlife Conservation in accordance with the procedures established with the lab. Samples will be mailed via FedEx Ground.
12. Once the lab notifies FWC of the results, the Panther Team will update the DNA database with any pertinent results.

BUDGET FOR FLORIDA CATTLE ENHANCEMENT FUND APPLICATION

PROJECT TITLE & FCEB #: Florida Calf Loss | FCB #41

DETAILED LINE ITEM DESCRIPTION	QTY	% Complete	TOTAL	EXPLANATION/JUSTIFICATION OF DELIVERABLE	COMPLETION DATE
Set-up 1: Equipment Purchases and Testing (Big Cypress Ranch)	1	100%	\$ 62,829.50	Birth sensor equipment, base station and antenna for birthing sensor communication and relay through to cellular gateway for communication and data sending to website and text messaging of calving events. Unique VHF eartags for mortality sensing of tagged calves after birth, base station datalogger and antennas for 24hr monitoring of mortality signals. Dataplan for cellular gateway and communications support. Pasture vehicle (UTV) for tracking down births, tagging calves and collecting samples.	9/01/2017
Set-Up 2: Equipment Purchase and Testing (Longino Ranch)	1	100%	\$ 62,176.21	Birth sensor equipment, base station and antenna for birthing sensor communication and relay through to cellular gateway for communication and data sending to website and text messaging of calving events. Unique VHF eartags for mortality sensing of tagged calves after birth, base station datalogger and antennas for 24hr monitoring of mortality signals. Dataplan for cellular gateway and communications support. Pasture vehicle (UTV) for tracking down births, tagging calves and collecting samples.	9/01/2017
Set-Up 3: Equipment Purchase and Testing (Buck Island Ranch)	1	100%	\$ 51,834.21	Birth sensor equipment, base station and antenna for birthing sensor communication and relay through to cellular gateway for communication and data sending to website and text messaging of calving events. Unique VHF eartags for mortality sensing of tagged calves after birth, base station datalogger and antennas for 24hr monitoring of mortality signals. Dataplan for cellular gateway and communications support. Pasture vehicle supplied by Boughton Lab.	9/01/2017
Materials for sampling 240 calves and 240 cows	480	100%	\$ 8,900.20	Needles, Vials, Biopsy Syringes, Vacutainers, Coolers, Freezer packs, Long-term storage vials and racks, sanitization liquids and materials	9/01/2017
Immobilization and Equipment for night observations	2 sets	100%	\$ 7,466.08	Projector for firing anesthetics darts, immobilization drugs, binoculars and field lights for undertaking safe observation of calves, and collection of samples from both cows and calves.	9/01/2017
Field tough data storage	1	100%	\$ 2,944.58	Toughbook computer for field data collection on site in chute and for lead field research assistant data management and entry	9/01/2017
Final Research Project Report	1			Project report detailing research, which may include, findings, future needs, results, conclusions, issues, risks, assessments and all other pertinent information.	9/01/2017
GRAND TOTAL: (equal to percentage of completion)			\$196,150.77		9/01/2017