

Reducing the impact of feral livestock in and around the Centre Hills



Giovanna Massei ¹, Sugoto Roy ¹,
Sarah Sanders ²

¹ Food & Environment Research Agency, UK

² RSPB, UK



Potential impact of livestock

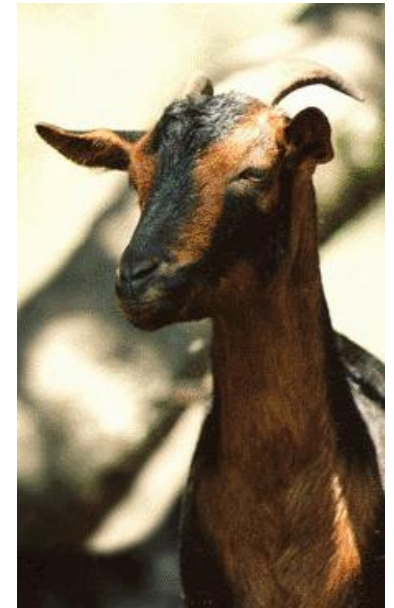


- Predation on globally threatened species
- Destruction of native plants -evolved in the absence of ungulates-
- Dissemination of non-native, fast-spreading plant species such as guava
- Consumption of the native *Heliconia caribaea*, causing loss of Montserrat oriole nests and territories
- Negative impact on tourism
- Pollution of water courses + damage to infrastructures
- Prevention of forest regeneration
- Soil erosion



Project Purpose

To establish a sustainable, locally managed programme to minimise the destructive impacts of feral livestock in and around the Centre Hills



Project Objectives

1. Knowledge of existing feral livestock in and around the Centre Hills boundary is increased
2. Technical expertise is enhanced and new skills developed in the monitoring and control of feral livestock
3. Options to control feral livestock in and around the Centre Hills are assessed
4. Actions to control feral livestock in and around the Centre Hills are improved
5. Policies on livestock management are strengthened
6. Awareness is raised on Montserrat and in the Caribbean about the impacts of feral livestock on biodiversity and livelihoods



Timing of food available to feral pigs in Montserrat

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Guava		Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
Banana		Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange
Coconut		Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange	Orange
Almonds		Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
Bread fruit									Dark Green	Dark Green	Dark Green		
Mango							Teal	Teal	Teal	Teal			
Black Berry				Cyan	Cyan	Cyan				Cyan	Cyan	Cyan	
Hog plum											Light Blue	Light Blue	
Mame apple							Purple	Purple	Purple				
Turtle nests							Magenta	Magenta	Magenta	Magenta	Magenta	Magenta	
Mt.chicken						Dark Purple	Dark Purple	Dark Purple	Dark Purple				

Project methods

- ❑ Obtain baseline distribution and no. of feral livestock
- ❑ Derive baseline on reproduction and diet of pigs
- ❑ Identify options (e.g. eradication, culling, fencing, tethering) to mitigate human-livestock conflicts
- ❑ Implement action plan & review livestock policy
- ❑ Evaluate effectiveness and costs of action plan
- ❑ Raise awareness on Montserrat and in the Caribbean about the impacts of feral livestock on biodiversity and livelihoods



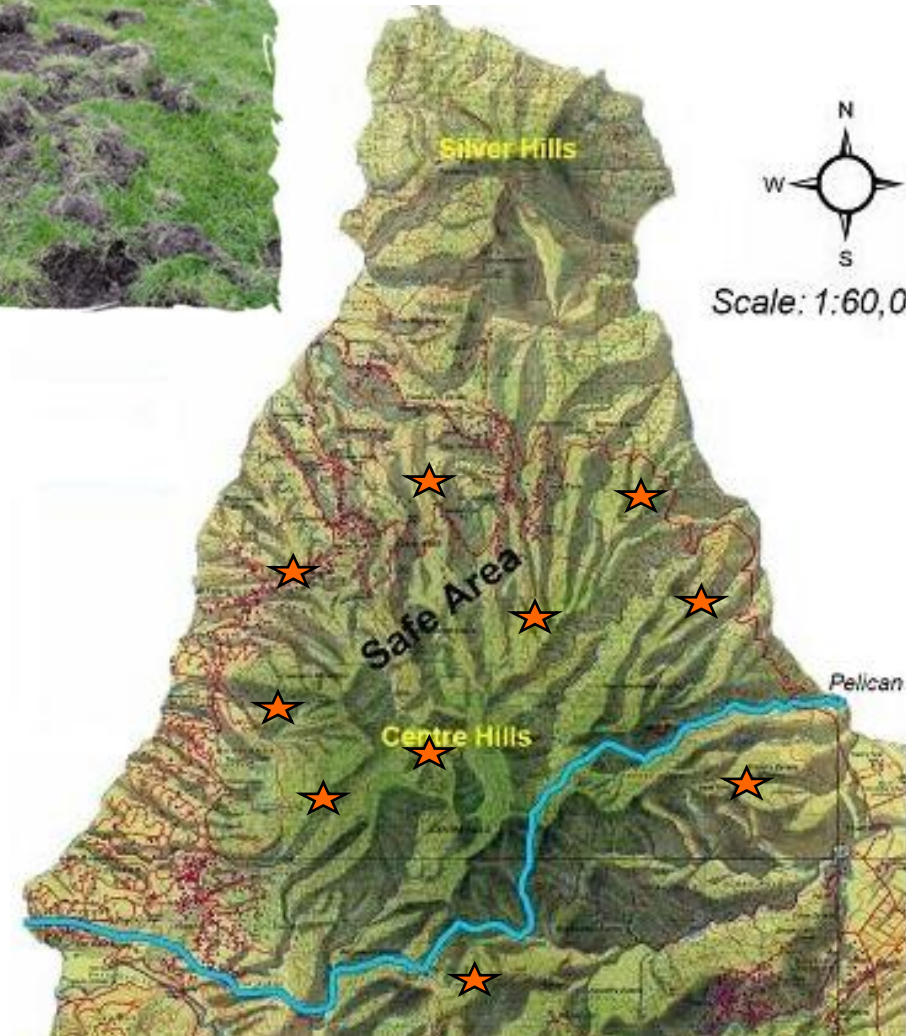
1- Baseline distribution and numbers of feral livestock

☐ Transects
activity signs, sightings

☐ Bait stations
★ BOS= Boar-Operated-System

☐ Camera traps

☐ Catch/unit effort
n. pigs culled / day/ hunter



Monitoring pig presence

BOS = Boar Operated System



BOS tests in captivity



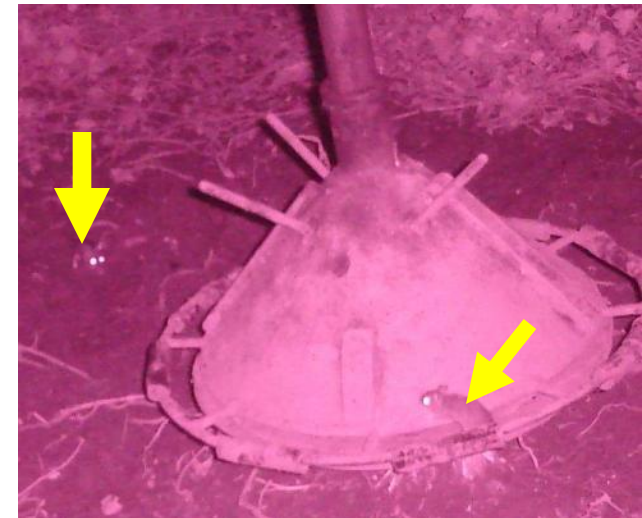
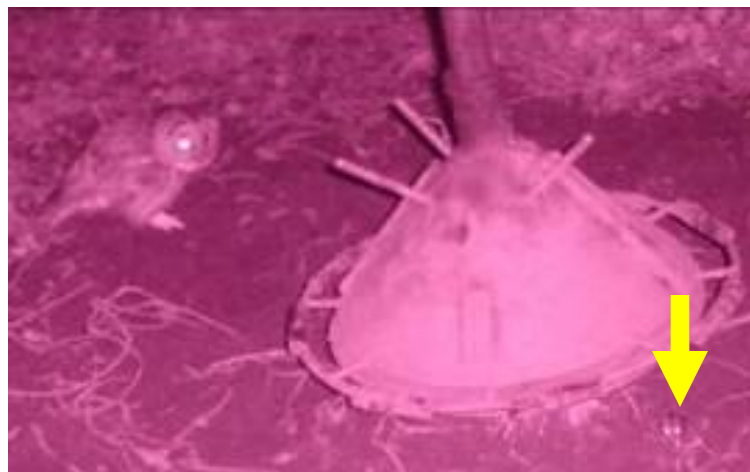
BOS with free-living wild boar



BOS tested on wild boar as target species



Specie non-target



2- Baseline reproduction and diet of pigs

❑ Why is it important?

❑ REPRODUCTION

age of females at first litter

litter size

proportion of females with piglets

timing of births

Output: establish potential growth of the pig population



2- Baseline reproduction and diet of pigs

□ Why is it important?



□ DIET

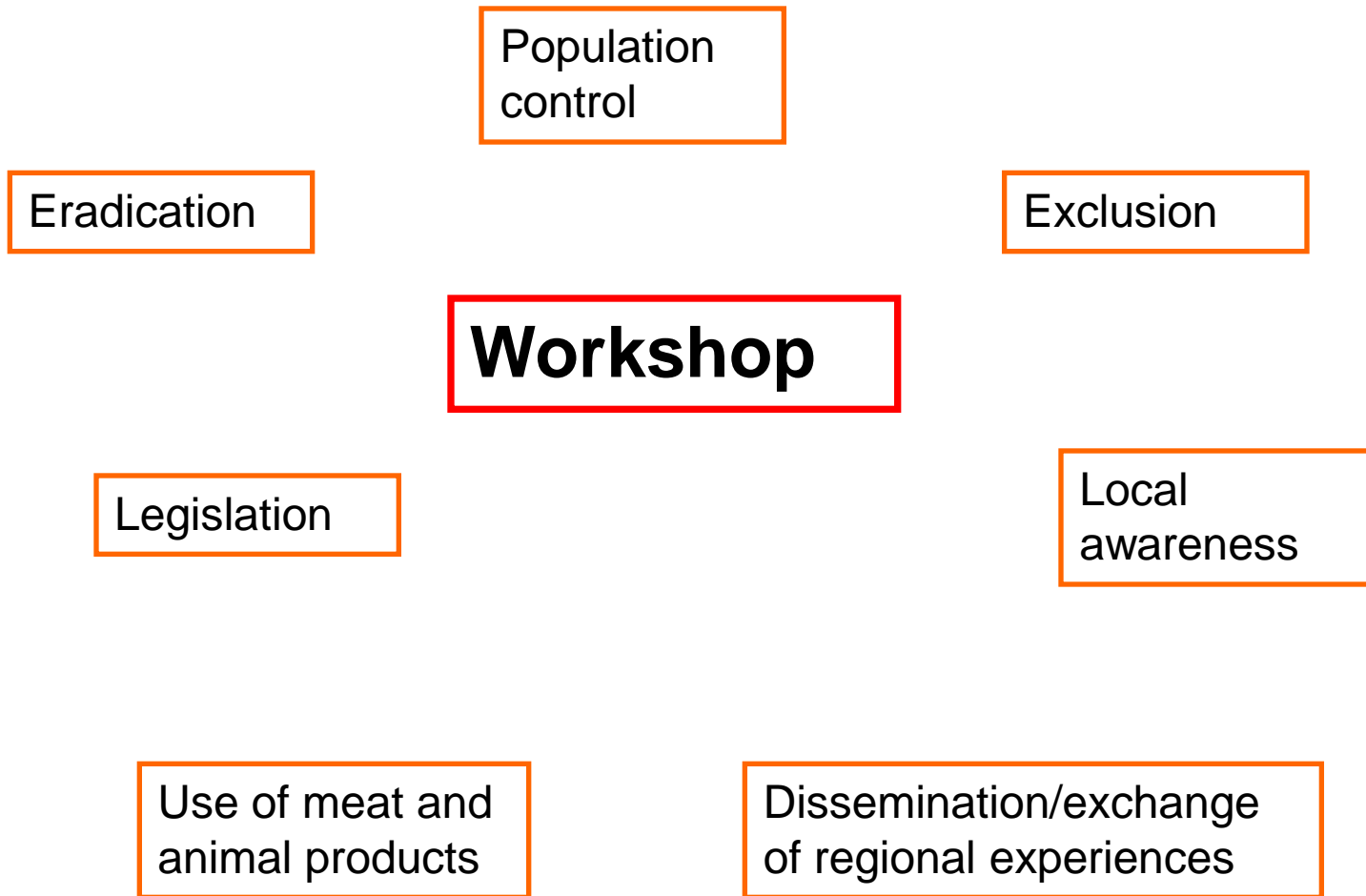
stomach content



Output: establish potential impact on plants and animals



3- Identify options to mitigate human-livestock conflicts



4 - Implement action plan

Baseline data on pigs and goats



Management options to mitigate conflicts



Action plan



Action plan implementation



Evaluation of effectiveness of action plan



5- Evaluate effectiveness & costs of action plan

□ Effectiveness

did the plan reduce the numbers of free-living goats and pigs?
for how long?

□ Costs

how much?

are the costs of implementing similar plans sustainable ?

can costs be offset by other financial/ non-financial benefits?

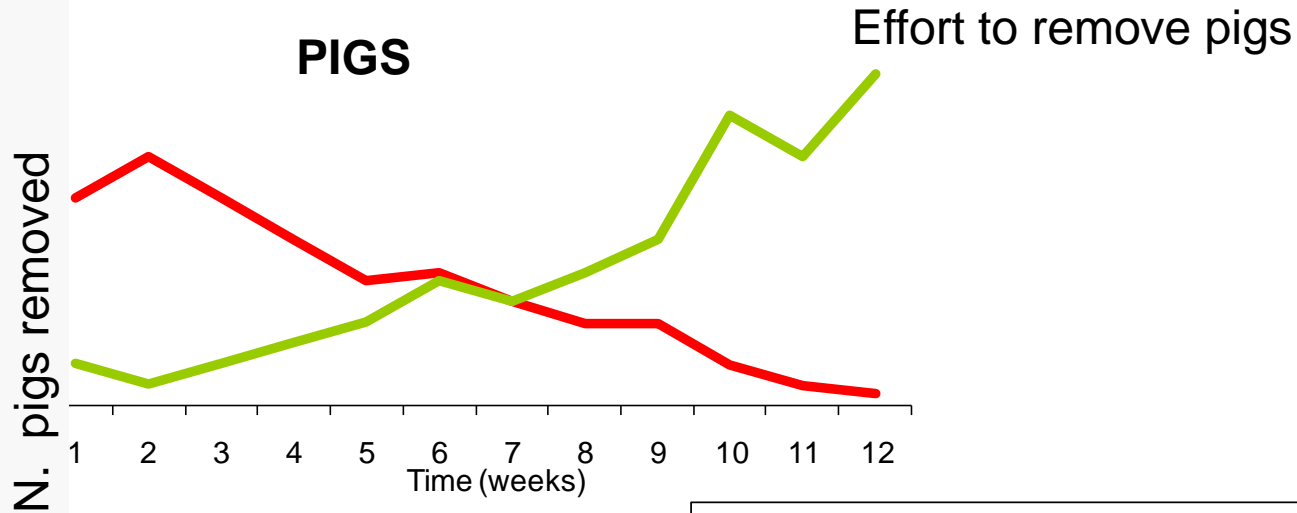
□ Lessons learned: what went well and what could be done better?



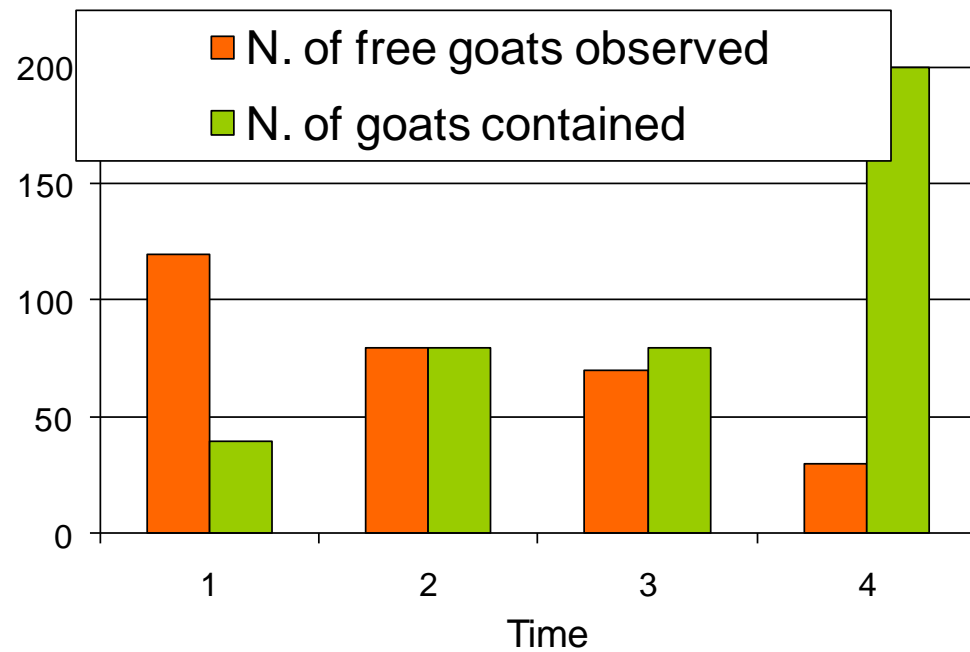
6- Raise awareness of impact of livestock

Training	local staff	Local
Workshop	local community	Regional
Demonstrations	farmers, small business, tourism authorities	Regional
Booklet	local and regional community, public authorities	Regional
Scientific papers	scientists, conservationists, wildlife managers	International
Media	local and international community	International

Expected results



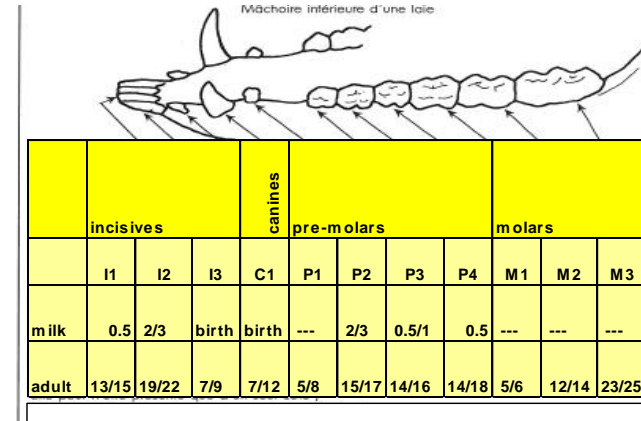
GOATS



Recording and training

Labels

Hunter _____
 ID number _____
 Location _____
 Date _____
 Sex _____
 Pig _____
 weight _____
 Pregnant? Y/N _____
 Number of foetuses: _____



Age from tooth eruption

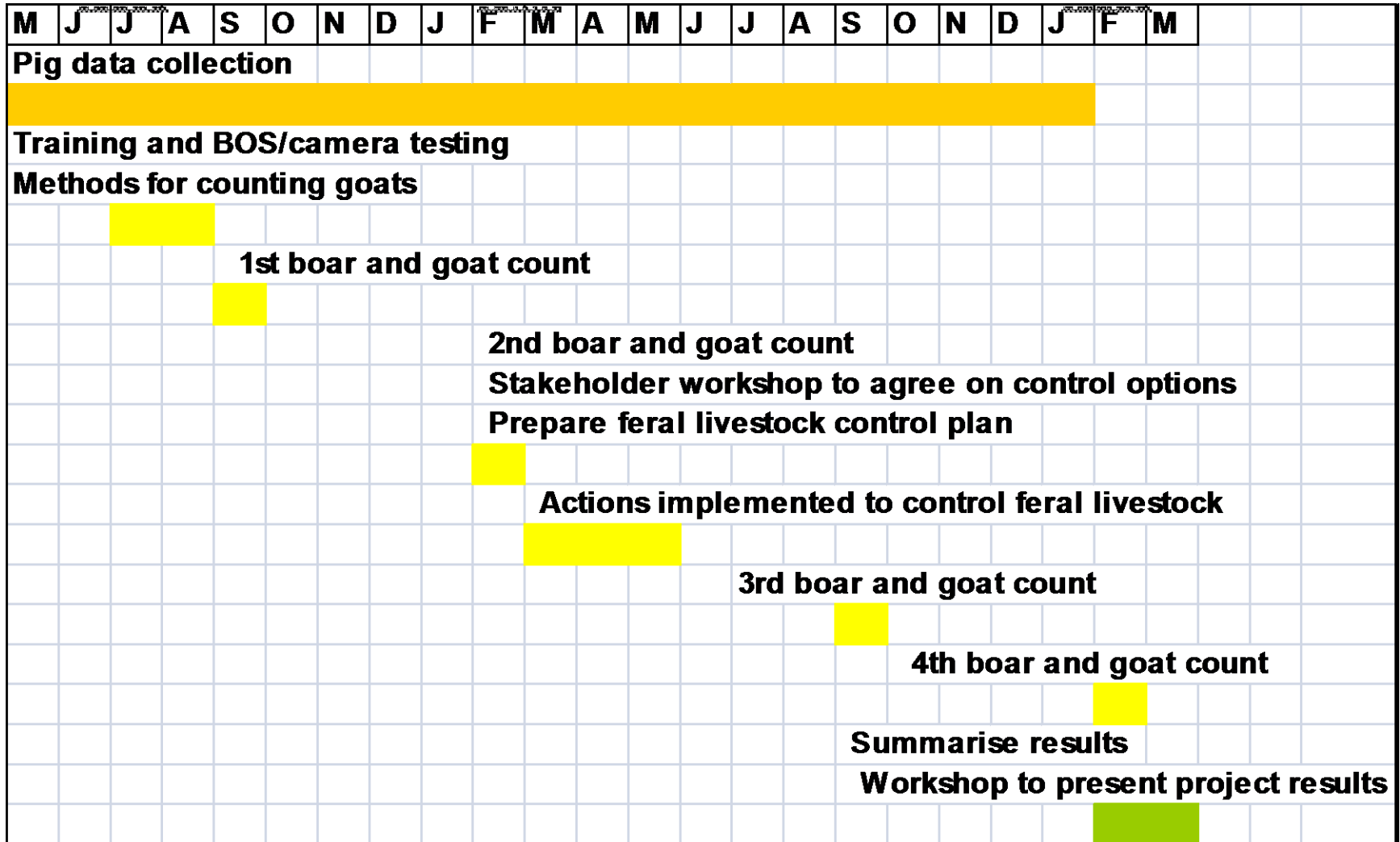


Project timing

2009

2010

2011



Monitoring project progress

- Populations key species stable by end Y2
- Water quality does not deteriorate by end Y2
- Livestock management is improved by end Y2
- Number of sightings of feral livestock decreases by end Y2
- Catch per hunting effort decreases by end Y2
- Baseline assessment completed by end Y1
- DOA and DOE use data to inform activities by end Y2
- Key stakeholders agree on control options for livestock
- Number of livestock registered increased by end Y2
- Review existing policy and recommendations integrated into DOA and DOE business plans by end Y2

Project outputs

- ❑ Baseline assessment for future monitoring
- ❑ Sustainable, cost-effective management plan for livestock
- ❑ Identification of potential uses of livestock products
- ❑ Transfer of skills to build local expertise
- ❑ Flagship project to disseminate information in the region



Training on methods to monitor feral livestock densities and to age pigs

On the 21st of July 2009 Giovanna Massei and Sugoto Roy held a training session to demonstrate methods on how to collect data on feral livestock. In total thirteen attended the 2-hour session and included staff from Government Departments such as DoA, DoE and Planning, together with independent operatives such as local hunters and livestock owners. Having introduced the aims and objectives of the Centre Hills Project, The training included the following:

1. *Monitoring and estimating densities of feral pigs using remote camera systems.* Participants gained experience of setting up camera systems in the field, manipulating the settings to collect appropriate data for the Centre Hills Project, and downloading data.
2. *Monitoring feral pig populations at fixed locations using a “Boar-Operated-System”, in combination with remote camera traps.* Participants gained experience of erecting a pig specific bait delivery system. Bait choice and construction was discussed.
3. *Aging culled boar from tooth eruption patterns:* Using a series of skulls provide by one of the participants, attendees were shown how to age from patterns of tooth wear and eruption.

The training programme described above served to introduce and familiarise participants with the techniques listed. Those involved with the Centre Hills Project had further opportunities to develop skills in these areas, as the initial training was reinforced by a series of field trials over the following two weeks.

Firearms handling for wildlife management: A report on a course run by FERA on Montserrat

Sugoto Roy and Ray Ridley

31/03/2010



Contents

1.0 Summary	3
2.0 Introduction	4
3.0 Course structure	5
4.0 Participants	6
5.0 Building on the work done.....	6
6.0 Acknowledgements.....	7
7.0 References	7
8.0 APPENDIX 1. PHOTOGRAPHS OF THE COURSE	8

1.0 Summary

A five day course was designed and run on Montserrat in order to train the staff of the Montserrat Departments of Agriculture and Environment in the use of shotguns and rifles for wildlife management. The course was run jointly by FERA and the Royal Montserrat Police Force. The course covered the following aspects:

- *Firearm storage and safe handling.*
- *Safe handling and operation of shotgun and rifle on a range and in the field.*
- *Basic strategy for shooting in the field using ambush and stalking techniques.*
- *Humane culling of feral livestock (pigs, goats and cattle)*
- *Safe shooting at close and long range.*
- *First aid.*
- *Maintenance of equipment.*
- *Choice of equipment that is fit for purpose for use in Montserrat*

Prior to the course there was little capacity for humane lethal wildlife management using firearms.

This has now been addressed. #



Plate 1. Feral livestock in the volcano exclusion zone

2.0 Introduction

In recent years, oceanic islands such as Montserrat have been identified as hotspots of biodiversity as they have more endemic species per unit area than continental landmasses. Thus, focussing conservation efforts on such islands and their native ecosystems is arguably the most effective long-term way of conserving global taxonomic biodiversity (Myers *et al.* 2000; Oldfield & Sheppard 1997). In Montserrat, the management of invasive species, in particular feral livestock, has been highlighted as a conservation priority by the Government to protect fragile pristine ecosystems such as the “Centre Hills” (Pienkowski 2005; Hilton, Martin & Daley 2006). In addition to this, the maintenance and restoration of the island’s biodiversity is recognised as a source of significant potential income through eco-tourism (Oldfield & Sheppard 1997; Weaver 1995). A Darwin funded project, completed in 2008 assessed the ecological value of the Centre Hills and found that they were of significant economic value to the island (Sanders, Gray & Mendes 2008). A post-Darwin project is currently underway to assess the options for long-term feral livestock management, and culling will form a large part of this.

In order for culling operations to be carried out effectively a fire arms handling course was designed and run over 5 days in March 2010 by a firearms trainer from FERA and representatives from the Royal Montserrat Police Force. A total of 11 DOE and DOA staff were trained in the safe and effective use of shotguns and rifles for feral animal management. This has significantly raised national and regional capacity for humane lethal wildlife management as a result.

3.0 Course structure

The course was run in a classroom, a firing range and in field sites in the Centre Hills and combined both theoretical and practical exercises. It was run jointly by Inspector Daroux of the Royal Montserrat Police and Ray Ridley of FERA. The logistics of accessing field sites and training areas was provided by Gerard Gray and Richard Bunting of the DOE.

Day 1: Power point presentation on the general principles of firearms use for wildlife management

Day 2: Stripping, cleaning and reassembling the following weapons; Shotguns with 12g shot and solid slugs, .22 rimfire rifles, .223 semi-automatic rifles. All weapons were fired at targets and different stances and positions were demonstrated (Plate 3).

Day 3: Use of firearms at a field site ("Jackboy Hill"). The purpose of this section of the course was to explore the safe positioning of staff in the field during shooting operations. Some feral goats were hunted.

Day 4: Use of firearms at a field site ("Salem"). A hunting exercise was carried out and cattle and pigs were hunted using both .223 rifles and shotguns with slugs. Stalking and ambush techniques were also explored. The safe handling of meat for consumption was demonstrated.

Day 5: Recap, summary and question answer sessions.

4.0 Participants

The following people attended the course.

- Gerard Gray – Director of Environment
- Richard Bunting – Project coordinator, Department of Environment
- Lloyd Aymer – Forest ranger, Department of Environment
- James Daley – Forest ranger, Department of Environment
- Selvyn Maloney – Veterinary officer, Department of Agriculture
- Rudolph Lee – Veterinary assistant, Department of Agriculture
- Elvis Gerald - Veterinary assistant, Department of Agriculture
- Sinclair Lee – Head animal warden, Department of Agriculture
- Andy Daley – Mechanic, Department of Agriculture
- Dawnel Francis – Clerical officer, Department of Agriculture
- Clarence Piper – Technician LIME (hunter from workshop) attended range and field days only.

5.0 Building on the work done

- Both the Montserrat Police force trainers and FERA gun trainers remain available to answer questions as they arise.
- Rifles have now been purchased by the DOA and DOE in Montserrat for wildlife management purposes.
- Protocols and standard operating procedures for their safe use are being drawn up.
- As Staff become more experienced in lethal wildlife management techniques, regional capacity for firearms use will develop and already discussions are underway in developing regional multi-national teams for feral livestock management projects in Anguilla and Antigua.

6.0 Acknowledgements

FERA thanks Defra for funding the project. Thanks also go to The Royal Montserrat police for co-hosting the course, and to the DOE and DOA for their logistical support.

7.0 References

Hilton, G., Martin, L. & Daley, J. S. (2006) Montserrat. *Important bird areas in the United Kingdom Overseas Territories* (ed S. Sanders), pp. 171-178. The RSPB, Bedfordshire.

Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A. B. & Kent, J. (2000) Biodiversity hotspots for conservation priorities. *Nature*, **403**, 853-858.

Oldfield, S. & Sheppard, C. (1997) Conservation of biodiversity and research needs in the UK Dependent Territories. *Journal of Applied Ecology*, **34**, 1111-1121.

Pienkowski, M. W. Review of existing and potential Ramsar sites in UK Overseas Territories and Crown Dependencies. 1-104. 2005. Peterborough, UKOTCF.

Sanders, S., Gray, G. & Mendes, S. Enabling the people of Montserrat to conserve the Centre Hills. 1-39. 2008. Darwin Initiative.

8.0 APPENDIX 1. PHOTOGRAPHS OF THE COURSE



Plates 2 and 3. Carriage and assemblage of firearms





Plates 4 and 5. Standing shooting positions





Plates 6 and 7. Shooting with support from stick and while seated





Plates 8 and 9. Flushing feral livestock in the field to guns, and the safe handling of meat for consumption.



The Marksmanship Principles

Billy Darroux
Firearms Instructor

February 2010 1

The Marksmanship Principles

1. The position and hold must be firm enough to support the weapon
2. The weapon must point naturally at the target without undue physical effort
3. Sight alignment and sight picture must be correct
4. The shot must be released and followed through without undue disturbance to the position.

2

Position and Hold

The body

- about 20 deg. to the line of fire
- spine straight - shoulders square to it
- left leg extended parallel to the spine
- right leg extended parallel to the line of fire

The left arm and hand

- supports the rifle
- straight line from shoulder, through elbow to hand
- equal angle between upper and lower arm
- wrist straight
- rifle across the palm of the hand
- grasp: firm - not tight !

The right hand and arm

- positions the butt in the shoulder
- grasps the pistol grip & pulls the butt into the shoulder
- trigger finger capable of independent movement
- thumb around the small of the butt - **not** alongside

The Right Elbow

- same distance from axis of weapon as left elbow

The Head:

- upright - eye central in its socket
- cheek resting lightly on the cheekpiece

3

Natural Pointing

- Whilst adopting the position - ignore the target !
- Establish a comfortable position
- Where is the rifle pointing ?
- Adjust the position:
 - Lateral: Pivot on the left elbow
 - Vertical: Both elbows remain in position - move the body towards or away from them.
- Test the position
- Re-adjust if necessary

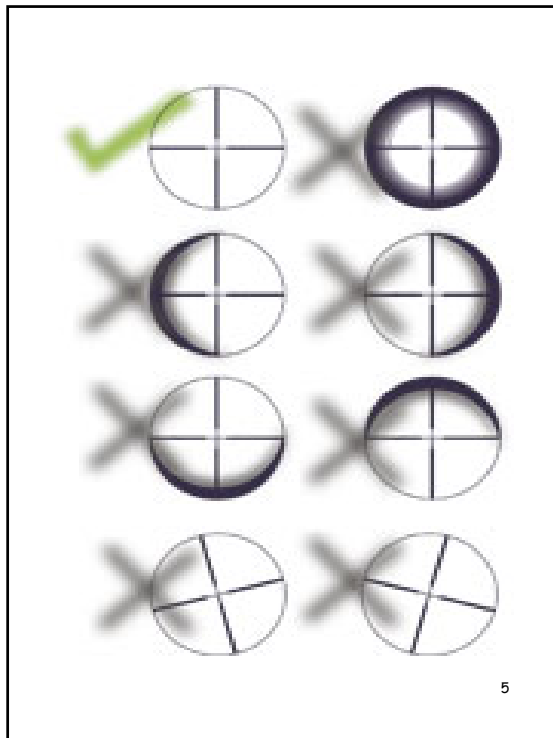
Sight Alignment and Aim

- **Sight Alignment:**
- the relationship between the eye, the rearsight and the foresight

Aim:

- the relationship between those three and the target
- Top left is the only correct 'scope picture. With cheek resting on the butt, move your head back and forward until the correct picture is seen. This is usually results in a distance of 4-5 inches between the scope and your eye

4



Sight Alignment and Aim

- **The Head:** should be upright
- **The Eye:**
 1. Look through the centre of the rear-sight aperture
 2. place the tip of the foresight in the centre of the rear-sight aperture
- **Maintaining the sight alignment:**
 - place the tip of the foresight on the aiming mark

Common Causes of Misalignment

- Failure to centralize the tip of the foresight in the rear-sight aperture
- A tendency to focus on the target during shot release:
- Concentration is drawn away from maintaining correct sight alignment
- So - to ensure accurate placement of the foresight on the target
- **Focus on the foresight !**

Shot Release and Follow Through

- **Breath Control:**
 - during a normal cycle the lungs are never completely full or completely empty
 - after breathing out there is a natural pause before breathing in
 - the complete cycle takes about five seconds

Breathing patterns

Shot Release and Follow Through

- **Trigger Operation:**
 - hand correctly positioned on pistol grip
 - take up slack or "first pressure"
 - operate the trigger - smoothly !!
 - monitor and maintain the sight picture throughout

Trigger pressure
Use the most sensitive part of your finger. Squeeze the trigger and maintain finger lightly touching the trigger immediately after the shot goes off

- **The Follow Through:**
 - do not attempt to resist or counteract the recoil
 - hold the trigger back and maintain the grip
 - maintain sight alignment
- **Declaring the Shot:**
 - was the sight alignment and aim correct at the moment of shot release ?
 - did the rifle behave consistently during the follow through and did the sights return to the original point of aim?

- If not
- A loose hold
- The rifle was not "pointing naturally"
- The position and hold were not maintained throughout the "follow through"

9

In this lesson...

- marksmanship principles
- position and hold
- natural pointing
- sight alignment and aim
 - common causes of misalignment
- shot release and follow through
 - breath control
 - trigger operation
 - declaring the shot

10

prone position

standing position

kneeling position

<http://visual.merriam-webster.com/sports-games/precision-accuracy-sports/rifle-shooting/shooting-positions.php>

11

Shooting positions

16

standing position
 The shooter stands with two feet on the ground and no other support; the rifle is held in both hands, against the shoulder and along the aiming cheek.
Your feet should be spaced sufficiently far apart forward and to the side to give you a larger and more stable shooting platform.

12



<http://airsoftcommando.wordpress.com/2008/07/28/unsupported-shooting-positions/>



prone position

Lying on the stomach, the shooter holds the weapon with two hands and one shoulder; the cheek can be held against the stock but the forearm cannot touch the ground.

Your elbows and torso should form a tripod.



<http://airsoftcommando.wordpress.com/2008/07/28/unsupported-shooting-positions/>

kneeling position

Three points of contact with the ground are allowed: left foot, right knee and toe of the right foot (for a right-handed person); the rifle must be held in two hands, against the aiming shoulder.

Note that "Bone on Flesh" is necessary for stability. So your elbow should not rest on your knee. Place your elbow on the fleshy part of your thigh above your knee, or place your triceps against your knee.

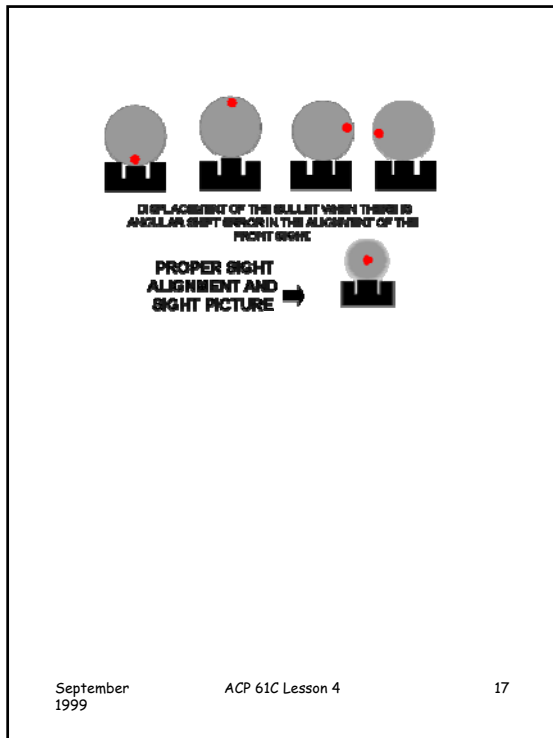


<http://airsoftcommando.wordpress.com/2008/07/28/unsupported-shooting-positions/>

seating position

These variations of the seating position are not difficult for most persons, and requires less use of the larger muscles, thus decreasing the incidence of fatigue.





Gun handling course for livestock management

Ray Ridley

Fire arms handler

Food and Environment Research Agency

York UK

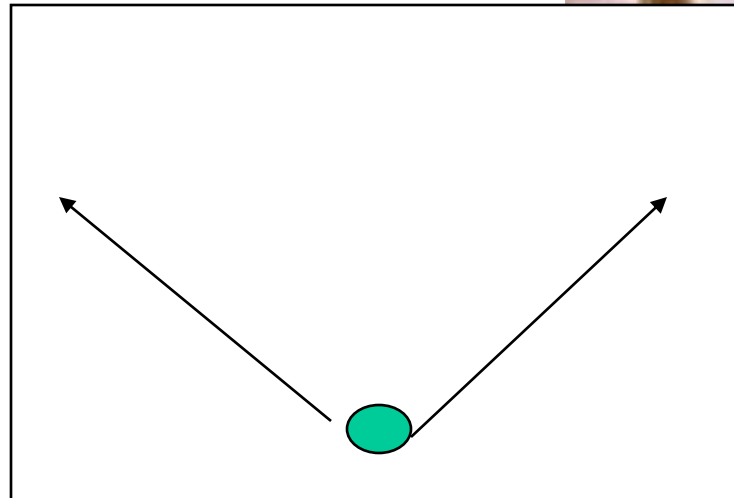


Course Structure

- Classroom day
 - » Safe handling
 - » Shot guns
 - » Rifles
 - » End of day safety
 - » 1st aid
- Range Day
 - » Identifying range, safety kit
 - » Backstops
 - » Distance
 - » Zeroing
 - » Stances, bipods and stick
- Two days in the field
 - » Ambushing; high seats and hides
 - » Hillside shooting
 - » Beaters and dogs
 - » Reaction to shot
 - » Meat handling

Safe handling

- Strip and clean
- Ammunition
- Barrel types
- Arcs of fire
- Back Stop
- Handing



Rifles

- Strip and clean
- Ammunition
- Safety Selector
- Moderator
- Scope – eye relief – sight picture
- Loading and unloading
- Precaution and safety
- Handing over

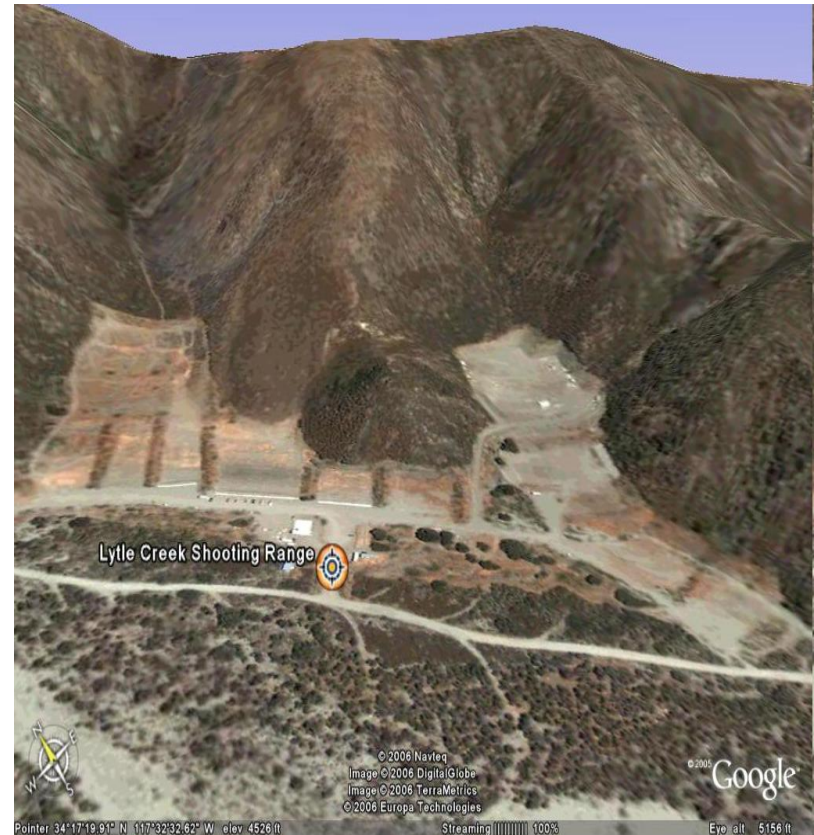


End of day safety

- Checking empty
- Locking up in vehicles
- Storage in buildings

Range

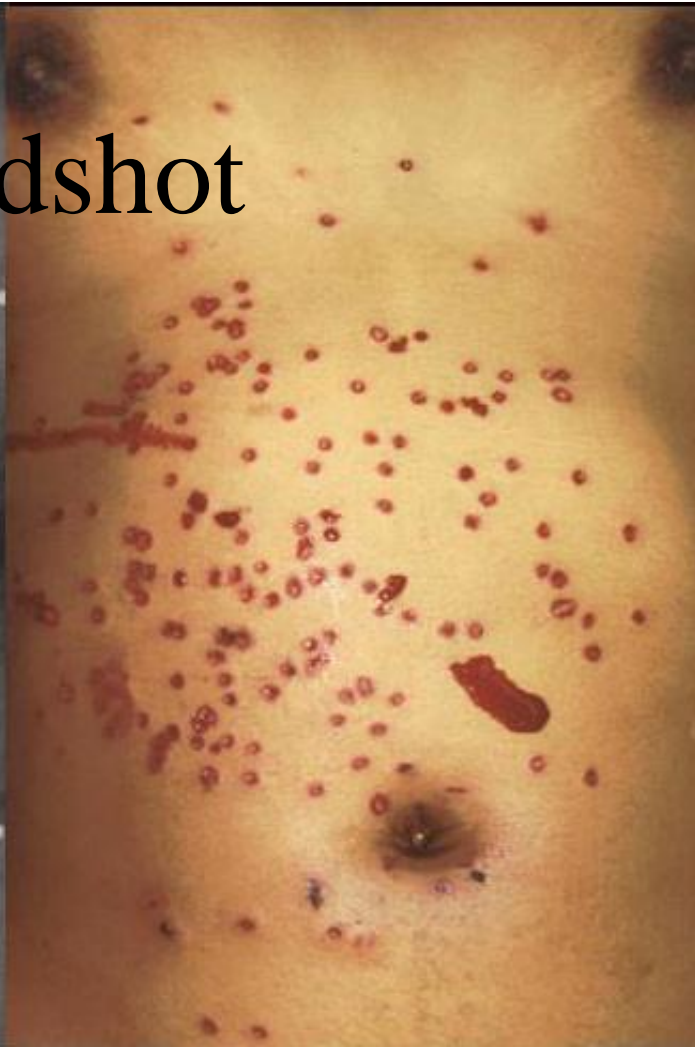
- Identifying range
- Safety kit
- Backstops
- Distances
- Zeroing
- Shooting stances; bipod and sticks



1st aid

- Shotguns
- Most end in fatality
- Water very important
- Basic first aid kit
- Bandages – triangular
- Packing material

Birdshot



Slugs and rifles

- Head shots fatal
- Exit wound treatment important



Slugs and rifle injuries

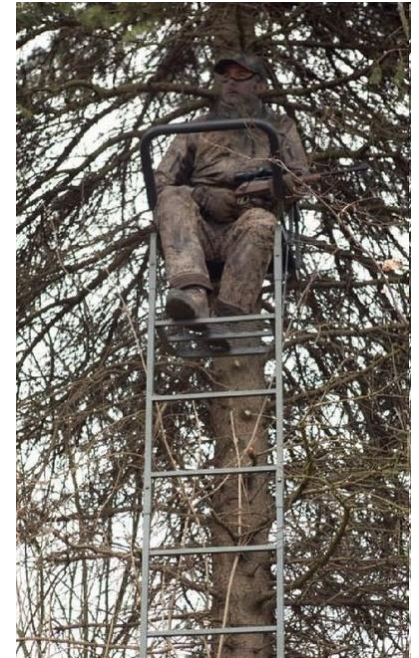
- Full metal jacket go through
- Sporting rounds – soft – mushroom
- Slugs - percussion

Treatment

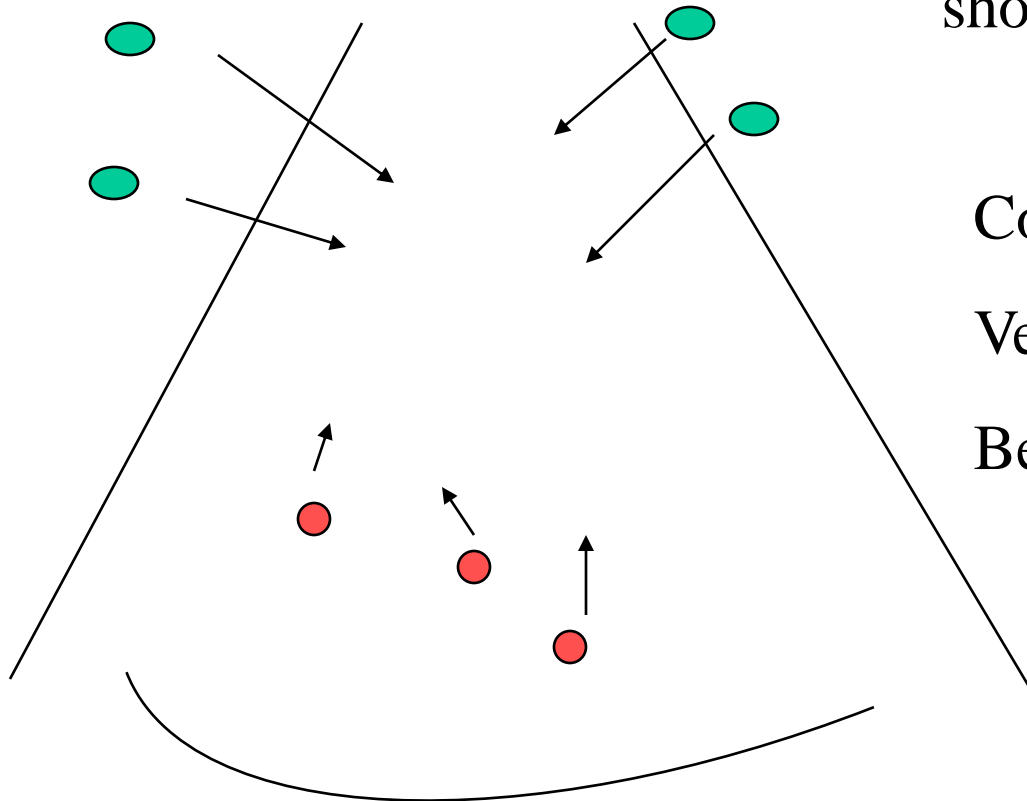
- Stop bleeding
- Pressure
- Move if in remote area
- Elevate depending where shot
- Shotgun – shot – stings
- Slugs big entry and exit (depending on distance)
- Rifles More hydraulic shock – small entry – big exit
- Keep warm
- Immobilized where possible
- Others are in shock too
- Especially the shooter
- Make sure every weapon is safe
- Keep wound clean
- Mobilize emergencies

Strategy

- Static ambush
- High seats
- Hides
- Site selection
- Beaters and dogs
- Knowing where people are
- Vests
- Communication
- “Footpath wardens”



Formations



Same height –
shooting down

Communications

Vests

Bells?

Dogs and beaters

Stalking

- Wind blowing to you
- Stay concealed
- Below sky line
- Get in range
- Can you get it out?
- Can you butcher on hill?

Shooting in a corral

- One or two people
- Side by side
- Same side
- As concealed as possible
- It will put pressure on the corral
 - a corner of it
- Shoot as many as quickly and as humanely as possible
- Chest shots – or head shots

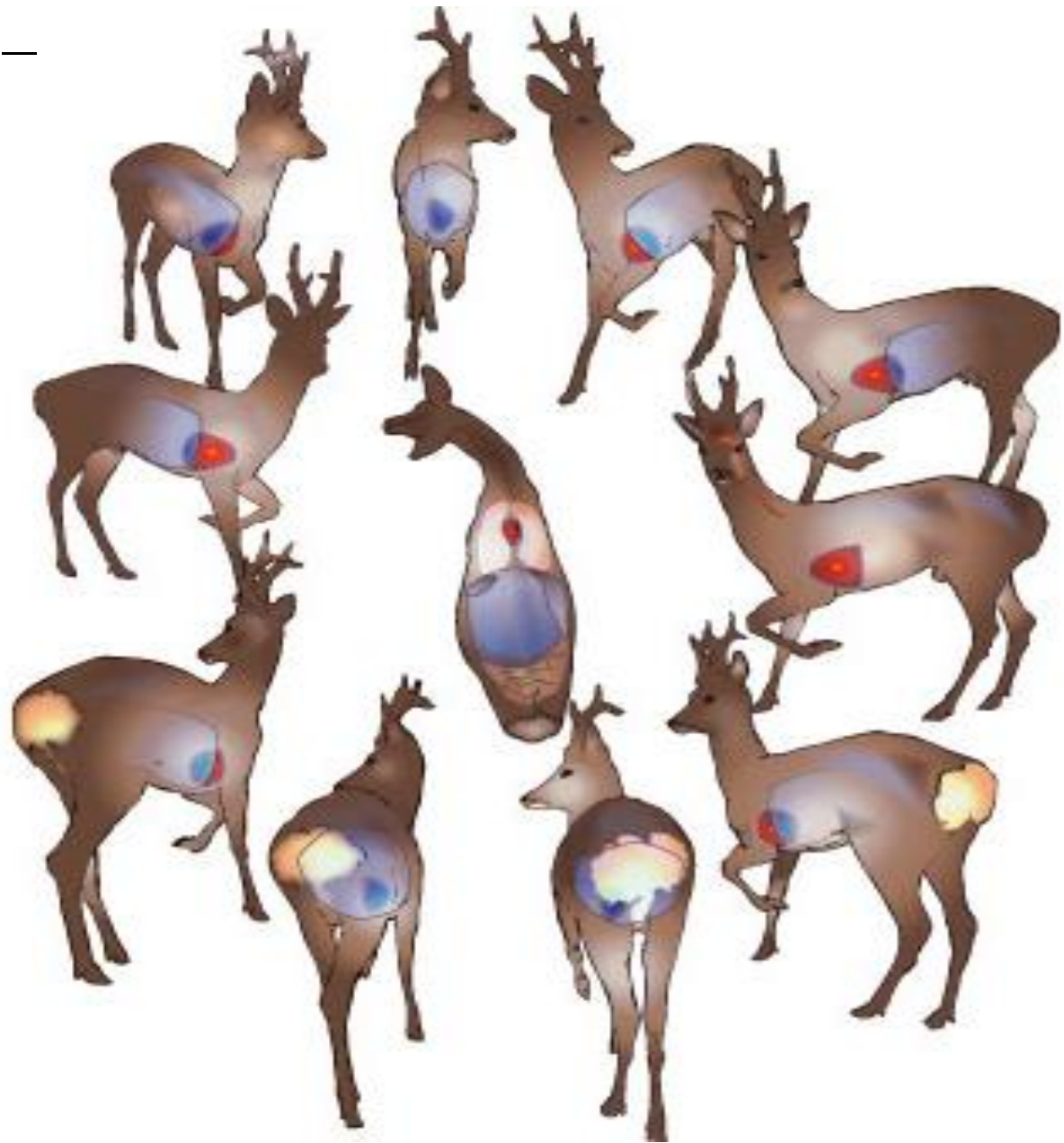
Reaction to shot

- Where was animal hit – will determine what it will do next
- Chest – heart lung – lurches forward drops suddenly in 20 m
- Neck – Drops instantly, as long as vertebrae is hit, if not it can run away and never be seen again. If only some vertebral spines are hit, can fall, then rapidly rise and charge
- Gut shot – very messy, hunches up, shoot again as soon as possible.
- Spine shot – Paralysed downwards, head end can remain active, shoot again ASAP

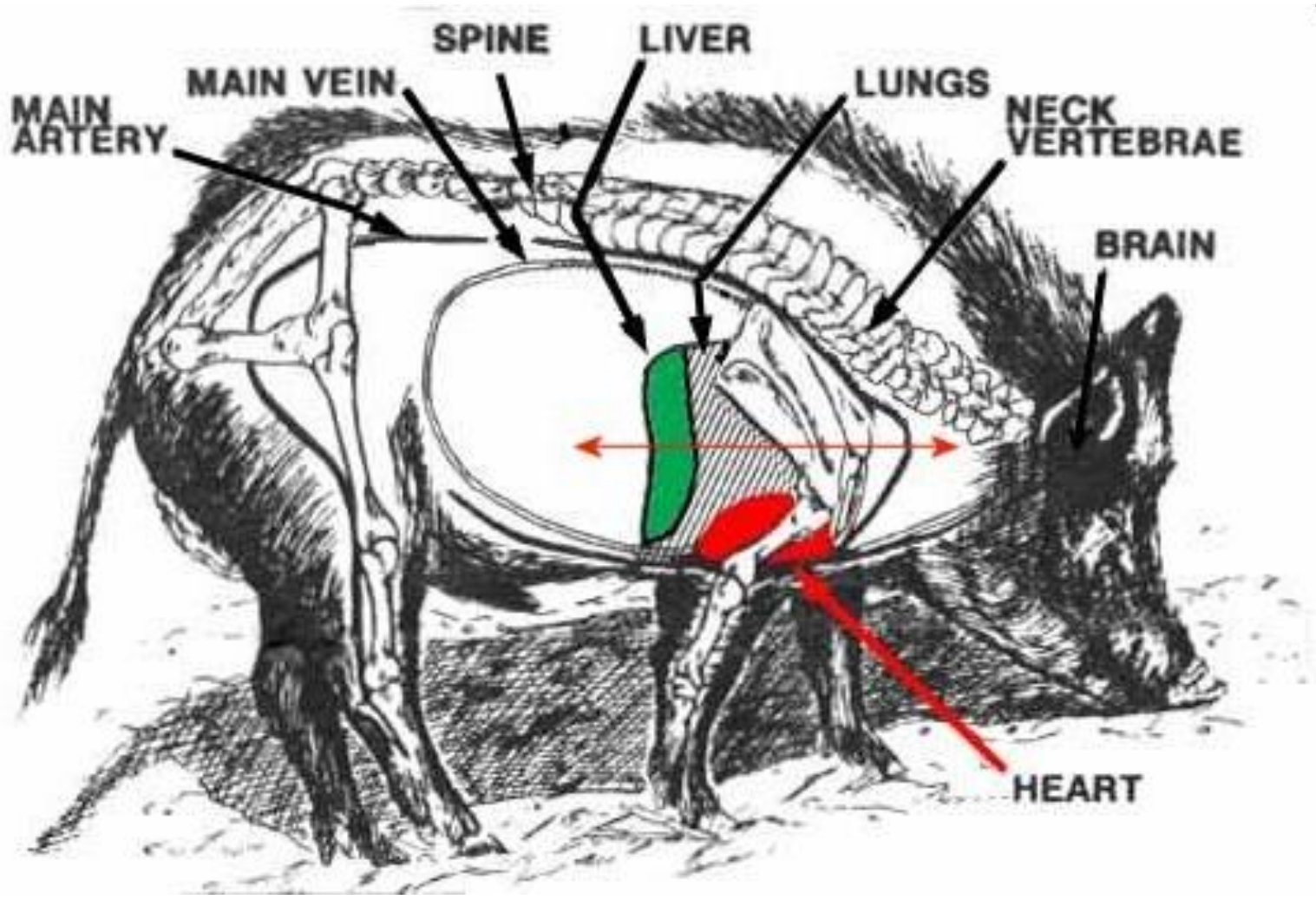
- Follow up, let dogs track wounded animals, and then shoot again.
- Poke with a stick – blink reflex – big cause of injury

- If charged – shoot again if safe to do so, if not run or climb

Shot placement – deer/goats



Boar shot placement



Meat handling

- Check it is dead!
- Bleed – through jugular – down hill or hung
- Gralloch – disembowel open up spill it, pull out,
- Don't allow tainting, keep the contents unruptured
- If you had to butcher
 - » Cut into as big a piece as possible
 - » Leave skin on if clean
 - Chill ASAP
 - Tow to a road?
 - Pole and four legs
 - Piggy back
 - Jointing meat – can show you

Livestock in the Centre Hills; current situation

James Scriber Daley

Pigs -History

- Became feral after the volcano erupted
- Several farms were abandoned after volcano eruption mainly from the East, South and Central Montserrat

Current feral pig

- In 2000 observed evidence of pig activity in the Centre Hills
- Hotspots
- Group size
- Changes in behaviour

Current feral pig

- Litter sizes and breeding ages
- Breeding season
- Weight and size
- Tusks
- Skin colour
- Diet



How they are hunted

- How hunted
- Current efforts – 29 hunters
- What happens to the carcasses, meat cuts
- Control in the exclusion zones



Control efforts

- Previous control efforts
- 2003 numbers



Issues

- Crop damage
- Predation on turtles and other species
- Danger to public
- How many pigs are here?



Goats

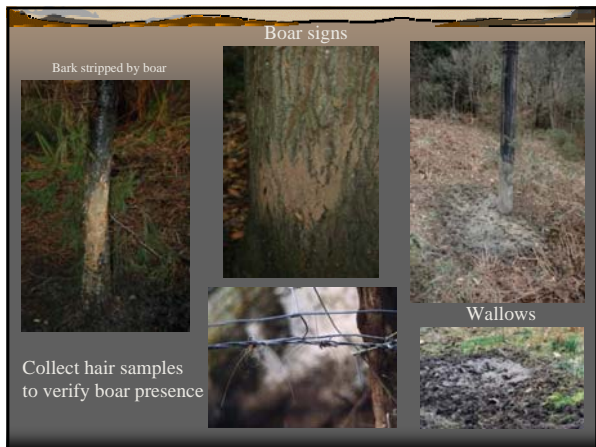
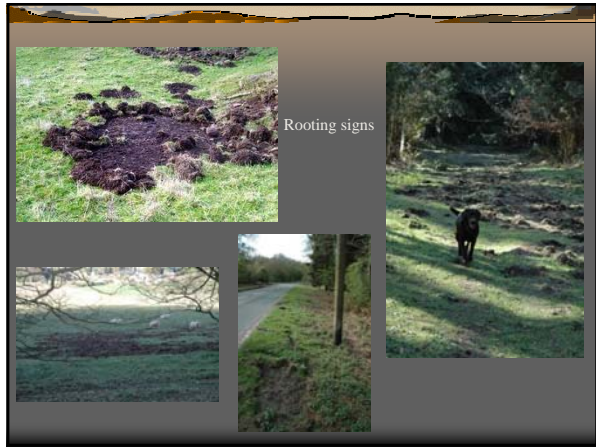
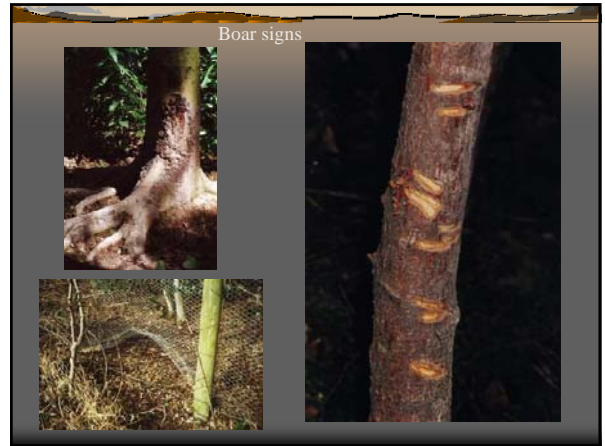
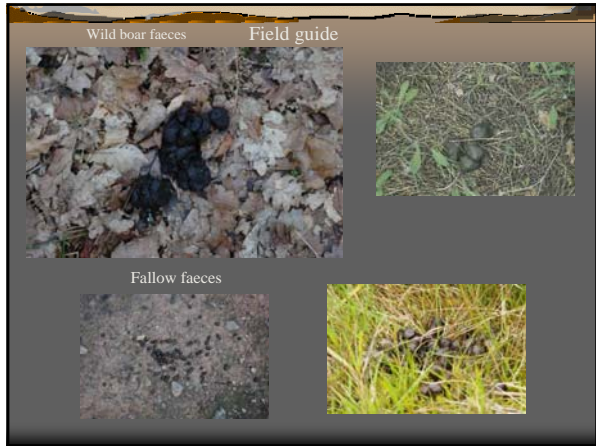
- Arrived with settlers
- Spreading in the Centre Hills



Issues

- Grazing on endemic plants
- Soil erosion
- Spread weeds

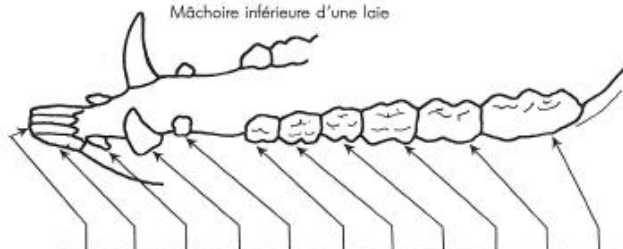




DATES D'APPARITION DES DENTS

(Table de G.H. Matschke)

Mâchoire inférieure d'une laie



Âge (en mois) à l'apparition des dents :	*I ₁	I ₂	I ₃	C	P ₁	P ₂	P ₃	P ₄	M ₁	M ₂	M ₃
	incisives			canines	prémolaires				molaires		
de lait	0,5	2/3	N	N	—	2/3	0,5-1	0,5	—	—	—
définitives	13/15	19/22	7/9	7/12	5/8	15/17	14/16	14/18	5/6	12/14	23/25

N : présence à la naissance ;
 — absence de dent de lait. P₁ : est souvent absente,
 elle peut n'être présente que d'un seul côté ;
 (*Numérotation conventionnelle des dents définitives).

La table de Matschke (1967) qui fait état de la chronologie de la croissance dentaire, a été établie aux Etats-Unis. Nous avons vérifié sa validité en France par l'examen de 220 mâchoires de sangliers marqués évoluant en forêt ouverte, et dont nous connaissons l'âge avec précision.

