



Fig. 1. Effect of photon energy on absorption characteristics of fine grain sand (+) and water (●). —, 660 keV; ---, 60 keV.

by caesium-137 transmission only, when the mean values of μ''_s and μ''_w are used as the experimental absorption coefficient.

Table 1. COMPARISON OF ACTUAL AND MEASURED MASS THICKNESS VALUES OF SOIL AND WATER

Sample	Dual energy method				Single energy method	
	S (g/cm ²)		W (g/cm ²)		$S+W$ (g/cm ²)	
	Actual	Measured	Actual	Measured	Actual	Measured
1	23	24	4	3	27	28
2	23	22	6	6	29	29
3	2	2	17	18	19	20

I have not as yet made a detailed analysis of the experimental errors involved in the dual energy method, but it would seem that the accuracy is likely to be acceptable for many purposes and capable of improvement.

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GENERAL

Seal Hunting in the Gulf of St Lawrence

FROM March 7 to 9, I visited the Gulf of St Lawrence, Canada, to investigate the methods being used to hunt newly born harp seals, *Pagophilus groelandicus*, for their fur. I conducted post-mortem examinations on the carcasses of a random sample of 154 newly born seals which had been killed by hunters working from ships and from light aircraft in Gulf area district 2 (south of 50° N. latitude and west of a line from Channel Head in Newfoundland to Scatari Light, Scatari Island, off Cape Breton Island). The prescribed method of killing is hitting the animal on the forehead with a wooden club which has to conform to certain specifications as to length and diameter (Order in Council PC 1967-87 of January 19, 1967, Ottawa, Canada). Fifty thousand newly born

harp seals, or "whitecoats" as they are called, are taken in Gulf area district 2 annually by hunters working from ships and aircraft.

The method of post-mortem examination was first to examine the dorsal head and neck and ventral head and neck regions for signs of soft tissue damage, followed by an examination of the cranial bones, with removal of muscle and fascia where necessary for signs of fracture. A fracture, if present, was usually massive; the thin frontal and parietal bones were shattered and lying in fragments over and within the damaged brain. Finally, I opened the thorax and examined the lungs for signs of haemorrhage.

Methods of clubbing consistent with some of the post-mortem findings were witnessed, that is, the clubbing of animals over the throat. In the presence of witnesses the hunters delivered multiple blows to the head region before skinning, and on post-mortem examination these animals were found to have fractured crania. In areas where hunters had been working not under observation the percentage of carcasses with unfractured skulls was found to be more than 50 per cent and the pattern of bruising, if any, indicated that single and not multiple blows had been struck before skinning.

Table 1. CARCASSES WITH FRACTURED CRANIA: 64 PER CENT OF TOTAL

No.	Fracture of dorsal cranium	Fracture of ventral cranium	Bruising to ventral cervical region	Haemorrhage in lung
98	95	6	10	6

Table 2. CARCASSES WITH UNFRACTURED CRANIA: 36 PER CENT OF TOTAL

No.	Dorsal head and neck, soft tissue damage	Fractured nasal bones	Ventral cervical region, soft tissue damage	Haemorrhage in lung	No injury
56	38	13	4	0	5

Tables 1 and 2 show that ninety-eight carcasses, or 64 per cent of the total examined, had fractured crania. One was a post-mortem fracture, the rest were ante-mortem. The dorsal cranial bones were fractured in ninety-five of these ninety-eight carcasses, and the ventral cranial bones were fractured in six carcasses. Of these six, three had both dorsal and ventral cranial bones fractured, and three had ventral cranial bones alone fractured. Ten of the ninety-eight carcasses with fractured crania had extensive haemorrhage and bruising in the ventral cervical region, suggesting that blows to the throat had been given before death.

Fifty-six carcasses, or 36 per cent of the total examined, did not have fractured crania. Thirty-eight of these fifty-six had soft tissue damage to the dorsal head and neck region, and thirteen had fractured nasal bones, indicating that blows had been delivered either inaccurately or with insufficient force to fracture the cranium. There were four carcasses which showed signs of ante-mortem injury to the ventral cervical region indicating that these animals had received a blow or blows on the throat before death. Five carcasses showed no sign of injury apart from skinning.

The presence of an ante-mortem fractured skull, with its concomitant brain injury, was taken as evidence of unconsciousness before skinning. In most of these carcasses the fracture was comminuted and brain damage was so great that the animal would have been dead before it was skinned. The presence of an unfractured skull was taken as evidence of doubt as to the state of consciousness of the animal before skinning. The extent of bruising of the dorsal head region suggested that some animals would have been unconscious, but in others bruising was either minimal or non-existent and it seems likely that these animals could have been conscious when skinning began. These post mortem findings suggest that a large percentage of the hunted animals die in a manner which is of doubtful humanity.

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