FACIAL ASYMMETRY IN A LEOPARD SEAL (*HYDRURGA LEPTONYX*)

A. J. E. CAVE

Institute of Zoology, Zoological Society of London, Regent's Park, London NW1 4RY, UK

and

W. N. BONNER

British Antarctic Survey, Natural Environment Research Council, High Cross, Madingley Road, Cambridge CB3 0ET, UK

ABSTRACT. A description is given of the first-time occurrence of facial asymmetry in the leopard seal (*Hydrurga leptonyx*). It is concluded that this resulted from a crushing injury in early life, possibly as a result of the subject being trapped between floating ice masses.

INTRODUCTION

The architecture and configuration of any bone is determined by a variety of internal and external environmental forces acting continuously upon its substance, and alteration of these forces effects changes in the bone's general morphology. One such force is the tension exerted upon certain bones by the muscles attached to them, which force may be altered by gross change in the bones whether occasioned by trauma, defective vascularization or interference with innervation.

To some degree the symmetry of the facial skeleton is due to equal reciprocal muscle tensions exerted between its cranial and mandibular components by the principal muscles of mastication, whereby the development of its dextral and sinistral moieties is maintained in equilibrium. Unilateral damage to the masticatory muscles effects a primary mandibular dystrophy and a secondary distortion of the facial skeleton.

Such a condition is virtually unknown for wild-living animals so that its occurrence in a specimen of the leopard seal (*Hydrurga leptonyx*) merits report.

DESCRIPTION OF SPECIMEN

The specimen described (now preserved in the Odontological Museum of the Royal College of Surgeons of England, No. A 175.21) is the skull of an immature female leopard seal (nose-to-tail length 2.52 m) shot on 19 February 1975 at Signy Island, South Orkney Islands. The animal displayed a sinistral deviation of the muzzle and a collapsed condition of the left orbit contents indicative of blindness on that side.

The facial portion of the skull displays asymmetry in both the vertical and horizontal planes (Figs 1 and 2). The left nasal, premaxillary, maxillary and palatine bones are less well developed than their contralateral counterparts; the floor components of the left infratemporal fossa are unduly approximated; the left glenoid fossa is unduly shallow and the associated mandibular condyle is misshapen, having an uneven articular surface, and the associated coronoid process is less robust than that on the right. A linear series of small, adventitious vascular foramina in the glenoid fossa floor and an additional large foramen therein testify to former disruption of this surface.

In contrast to the gracile, loosely articulated right zygomatic arch, the left arch is

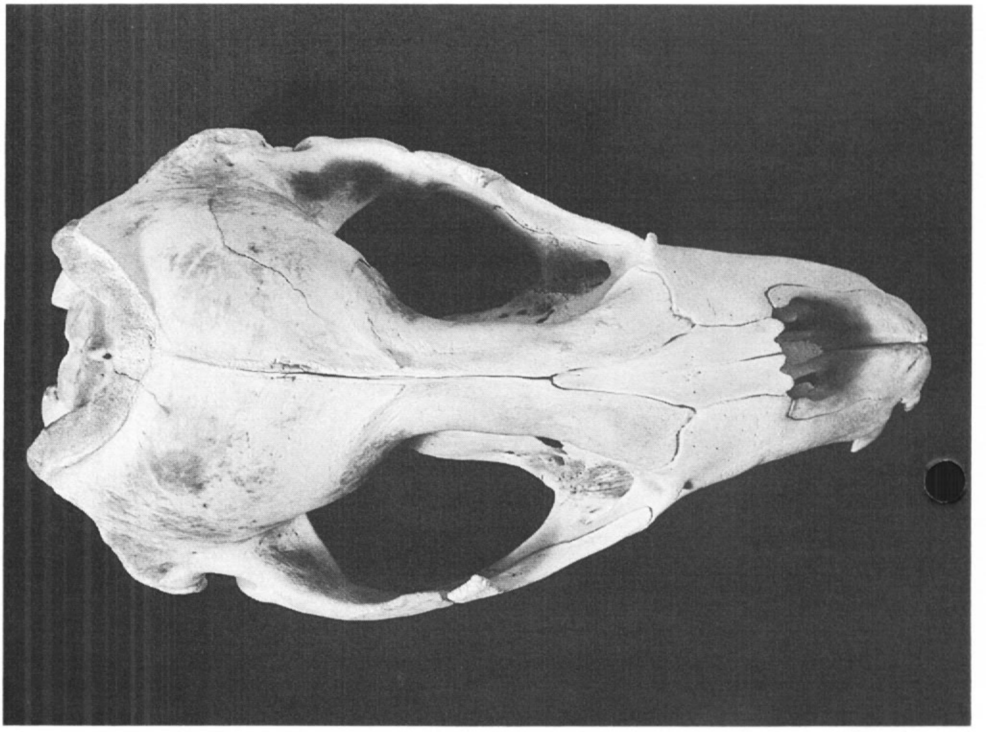

Fig. 1. Dorsal view of skull of female leopard seal (*Hydrurga leptonyx*) showing facial dystrophy. (Photograph Brian Thomas, BAS.)

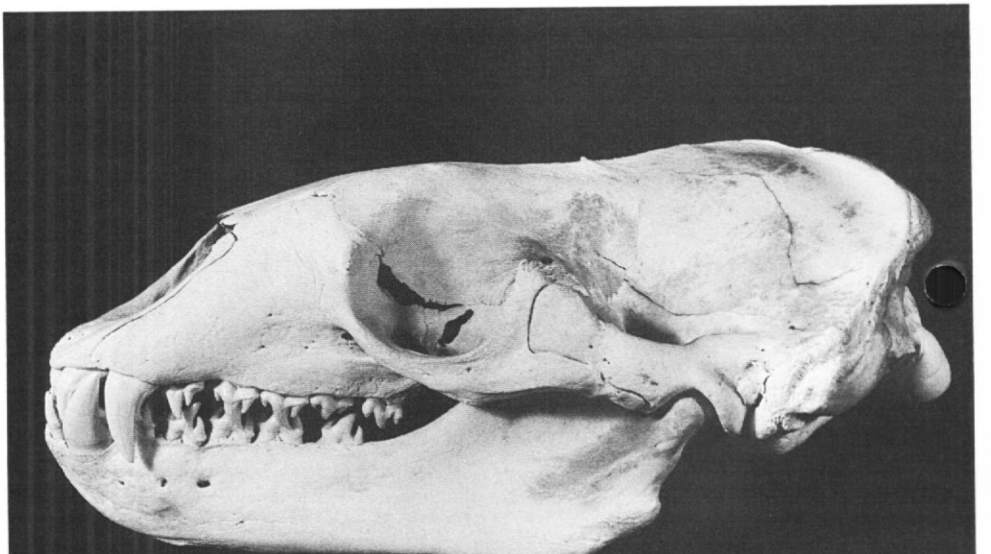

Fig. 2. Left lateral view of same specimen. (Photograph Brian Thomas, BAS.)

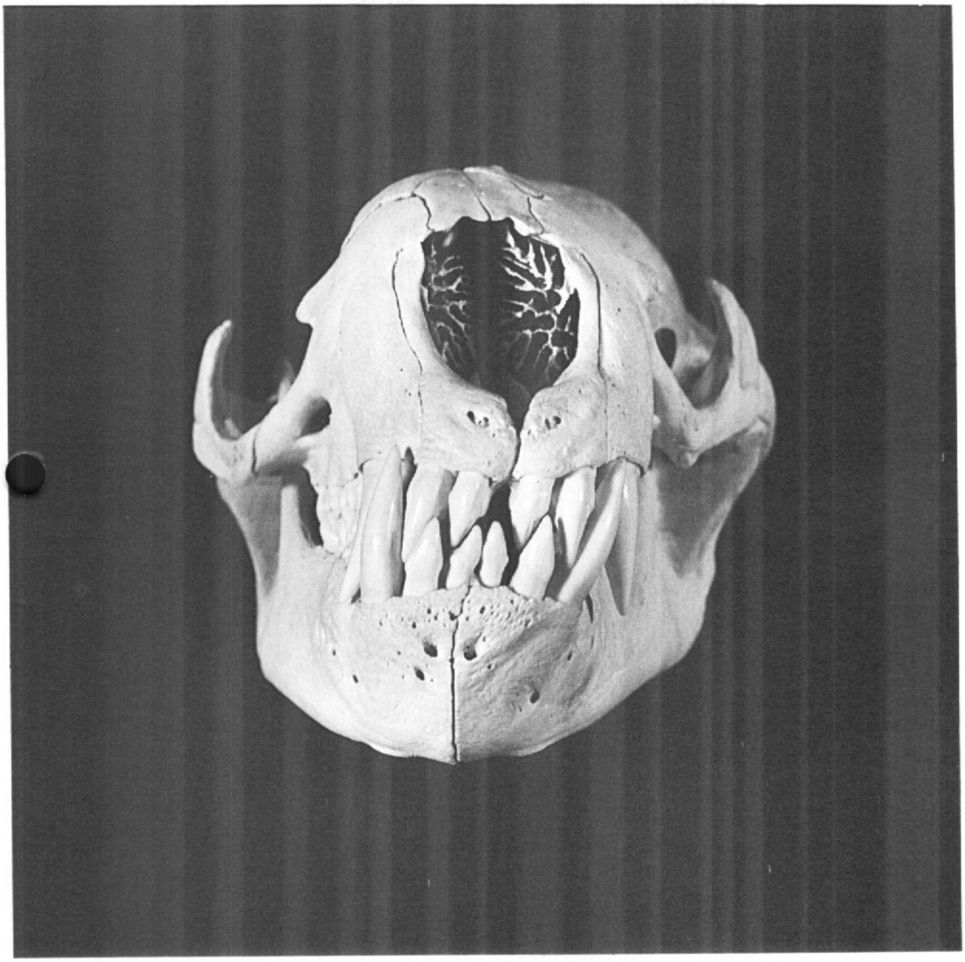

Fig. 3. Anterior view of same specimen. (Photograph Brian Thomas, BAS.)

much thickened and distorted from old-standing fracture of its conjoint jugal and squamosal components. The site of fracture is indicated by a groove in the lateral and inferior aspects of the arch, by the localized deposition of new bone and by the presence of small vascular foramina associated with the process of fracture-repair (Fig. 4). This repair has been exceptionally good, but has been achieved at the cost of jugo-maxillary and jugal-squamosal synostosis.

The left external auditory meatus is plugged by an adventitious spiculate bony mass (Fig. 4), the origin of which is not evident. This particular lesion is strongly suggestive of either the severe impairment, or the abolition, of hearing on the left side.

The jaws retain a full complement $\frac{2.1.2.3}{2.1.2.3}$ of well-formed teeth without trace of dental or parodontal disease. Those of the left side display a marked malocclusion and crowding from impaired growth of the corresponding moiety of the facial skeleton. The left lower row of postcanine teeth is, relative to the upper, further forward by about half the width of a tooth, the lower teeth lying on the medial side

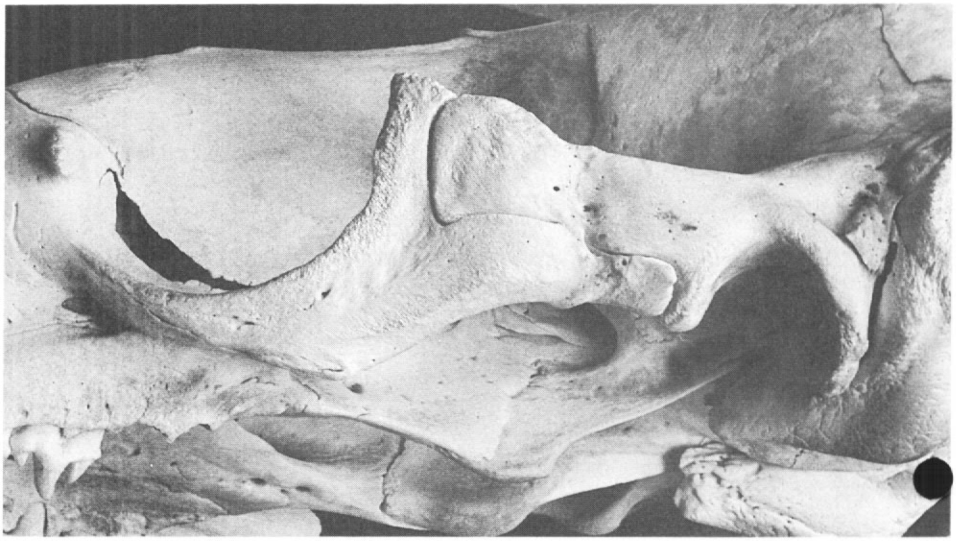

Fig. 4. Site of healed fracture in left zygomatic arch. (Photograph M. E. Lyster.)

of the upper teeth (Fig. 2). The disposition of both upper and lower teeth has been affected by the twisting of the muzzle. The upper incisors are obliquely disposed, those of the right being the larger; the mandibular incisors are obliquely disposed in the reverse direction and are so irregularly spaced that the right I_1 deviates across the median plane to effect crown-apposition with the left I_1, whilst the crowns of both these teeth interpose between the upper medial incisors (Fig. 3). Canine tooth occlusion is normal on the right, but on the left the maxillary canine overlaps the mandibular first premolar. The right maxillary postcanine teeth are evenly spaced, but the left are crowded and somewhat malpositioned, the fourth member of the series being placed obliquely to the long axis of the dental row. The mandibular right postcanine teeth are normally spaced but the left are crowded, and the second and third teeth are tilted backwards. In sum, an erupting permanent dentition had found ample accommodation in the right moiety of the facial skeleton but restricted accommodation in the subnormally developed left moiety.

Discussion

The anatomical evidence shows the muzzle deviation to have resulted from facial dystrophy following severe damage to the sinistral muscles of mastication. This damage is itself part of a more widespread cranial injury – which includes crush-fracture of the zygomatic arch, disruption of the glenoid fossa, and occlusion of the external auditory meatus – and which was inflicted during the animal's early life. The facial skeleton dystrophy is clearly the result of unequal development of its moieties from diminished tension on the part of the impaired sinistral masticatory musculature and enforced malocclusion and crowding of the left-sided teeth. It illustrates the importance of muscle action in determining the complicated pattern of bone growth, and testifies to the potential for repair following the infliction of serious disability. In the animal concerned fracture-repair has been notably successful and the mandibular joints have escaped functional impairment, so obviating death from starvation.

Zygomatic arch fracture and muscle damage resulting in facial skeleton dystrophy in the wild animal has been reported but once previously (by Colyer, 1936) for the American black bear (*Ursus americanus*). A skull of this species (specimen G.81.1, Odontological Series, Royal College of Surgeons Museum) shows bullet-wound mutilation of the palate and zygomatic arch, an injury which also damaged the associated masticatory musculature and induced facial skeletal dystrophy.

No example of facial dystrophy was encountered by Colyer (1936) in 653 pinniped crania examined. Hamilton (1939) reported the skull of a large female leopard seal (No. OS 1092 in the Hunterian Museum of the Royal College of Surgeons) with the second lower left incisor missing and the adjacent canine broken. Only four of the ten cheek teeth in the upper jaw were complete, the remainder being broken; there was also one broken cheek tooth in the mandible. Hamilton further notes that tooth marks on skulls are found from time to time, some of them very severe (he gives no further details) and broken teeth are fairly common, particularly in large females. He was unable to say whether these resulted from accident, combat or courtship.

King (1963) reported that many leopard seals have been found with deep wounds probably inflicted by killer whales (*Orcinus orca*). We are not aware of reports of leopard seals from the Scotia Sea – Antarctic Peninsula region bearing wounds that can reliably be ascribed to killer whales. It may be noted that many early reports of crabeater seals (*Lobodon carcinophagus*) carrying scars inflicted by killer whales (e.g. Bertram, 1940) are now believed to result from confusion with attacks by leopard seals (Laws, 1984; Siniff and Bengtson, 1977). Killer whales are known to hunt crabeater seals (Smith and others, 1981) and it is possible that they may also take leopard seals. However, the extensive crush-fracture sustained by the present animal is unilateral and thus unlikely to have resulted from a killer whale (or shark) bite, and its infliction during early life would seem to exclude intraspecific fighting of a sexual nature. The probability is that the animal received this injury as a result of entrapment between floating masses of pack ice.

Received 25 November 1986; accepted 20 January 1987

References

BERTRAM, G. C. L. 1940. The biology of the Weddell and crabeater seals. *Scientific Reports of the British Grahamland Expedition, 1934–37*, **1** (1), 1–139.

COLYER, J. F. 1936. *Variations and diseases of the teeth of animals*. Bale Sons & Danielsson, London.

HAMILTON, J. E. 1939. The leopard seal *Hydrurga leptonyx* (de Blainville). '*Discovery*' *Reports*, **18**, 239–64.

KING, J. E. 1963. *Seals of the world*. British Museum (Natural History), London.

LAWS, R. M. 1984. Chapter 12, Seals. In LAWS, R. M. *ed. Antarctic ecology*, Academic Press, London, 621–716.

SINIFF, D. B *and* BENGTSON, J. L. 1977. Observations and hypotheses concerning the interactions among crabeater seals, leopard seals and killer whales. *Journal of Mammalogy*, **58**, 414–16.

SMITH, T. G., SINIFF, D. B., REICHLE, R. *and* STONE, S. 1981. Co-ordinated behaviour of killer whales, *Orcinus orca*, hunting a crabeater seal, *Lobodon carcinophagus*. *Canadian Journal of Zoology*, **59**, (6), 1185–9.