

CONCERN ABOUT PLASTIC POLLUTION IN SOUTHERN OCEAN SEABIRDS

During the last few years there has been growing concern worldwide about marine plastic pollution. The Southern Ocean has not escaped this problem; plastic objects are resistant to biological degradation and are virtually resistant to ultraviolet degradation while in water, allowing long-distance dispersal of floating objects from source areas. Plastic now frequently is encountered at sea in the Southern Ocean and washed up on remote Antarctic and sub-Antarctic beaches (Gregory *et al.* 1984, Gregory 1987, Ryan 1987a). Many of these objects derive from vessels operating in the Southern Ocean, but some disperse to the area from distant industrialized source regions. Recent evidence suggests that long-distance dispersal is becoming a more important source of plastic pollution to the Southern Ocean (Ryan & Watkins 1988).

But does plastic pollution have environmental impacts other than reducing the aesthetic appeal of the far south? Seabirds and seals occasionally are entangled in plastic debris, causing debilitating wounds or death (Bonner & McCann 1982, Ryan 1987a), but this apparently is infrequent and is unlikely to endanger populations at the current levels of incidence. A potentially much more serious problem is that of plastic ingestion by seabirds in the Southern Ocean.

One of the first records of seabirds ingesting plastic was in 1960, when prions stranded on New Zealand beaches were found to contain plastic particles (Harper & Fowler 1987). Subsequently, plastic has been recorded from at least 37 of 50 Southern Ocean seabird species, with the incidence in some species such as Blue Petrels *Halobaena caerulea*, Great Shearwaters *Puffinus gravis*, Whitefaced Stormpetrels *Pelagodroma marina*, and Pintado Petrels *Daption capense* exceeding 80% (Ryan 1987b). These are among the most severe plastic pollution levels recorded worldwide (Day *et al.*

1985), and the incidence within at least some species is increasing (Ryan 1988a).

The problem is particularly acute in the Southern Ocean, because of the predominance of procellariiforms, a group of seabirds that accumulate ingested plastic rather than regurgitating or excreting it (Furness 1985, Ryan 1988a). Crude estimates suggest the half-life of plastic particles in petrel stomachs to be at least one year (Ryan & Jackson 1987). In these seabirds the most important mechanism to void accumulated plastic is during the chick-feeding period, when plastic particles are fed to chicks along with regurgitated food (Ryan 1988a). This results in larger plastic loads in immatures than in breeding adults.

The question remains whether ingested plastic poses a serious threat to Southern Ocean seabird populations. Ulcerations of the stomach wall are infrequent and apparently are seldom serious (Ryan & Jackson 1987). Obstruction of the digestive tract can occur, causing starvation (Fry *et al.* 1987), but this has not been recorded from Southern Ocean birds (Ryan & Jackson 1987). Plastic particles probably are a source of toxic chemicals such as PCBs, but the amounts released and their severity are unknown (Ryan *et al.* 1988). Probably the most serious effect of ingested plastic results from large plastic loads reducing the effective stomach volume, resulting in smaller meal sizes and the inability to feed efficiently (Ryan 1988b). This probably causes increased mortality during stressful periods (e.g. moult, breeding, adverse weather conditions, etc.) and may affect large proportions of some species' populations.

What can be done about the problem? Most pelagic seabirds swallow plastic particles through confusion with prey items, ingesting a variety of particles from many different sources (Ryan

1987b). The only solution is to reduce the density of plastic particles at sea. This requires better control of solid waste disposal both at sea and on land. All sea-going nations should ratify Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL) which comes into force late in 1988 and prohibits the dumping of all plastic products at sea. Beach clean-up drives and awareness campaigns also can effect local changes in disposal patterns. Finally, continued monitoring of the levels of plastic in seabirds is essential. Nondestructive techniques, such as examination of beached birds (Harper & Fowler 1987) and skua regurgitations (Ryan & Fraser 1988) should be used.

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- P.G. Ryan, Percy FitzPatrick Institute of African Ornithology, University of Cape Town, Rondebosch 7700, South Africa. Received 11 May 1988.