Fifth International Marine Debris Conference
Waves of Change: Global lessons to inspire local action

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Reshape and relocate:

Seabirds as transformers and transporters of microplastics

The Netherlands Ministry of Infrastructure and the Environment
NYK LINE
NYK LOGISTICS & MEGACARRIER
Chevron
NZG

North Sea Fulmar EcoQO *(monitoring session presentation 54)*

Northern Fulmar – *Fulmarus glacialis*

Northern Fulmar *Fulmarus glacialis*

NORTH SEA plastic in beached Fulmars *(2003-2007; n=1295)*

- Incidence 95 %
- Nr of particles 35 items
- Mass of plastic 0.31 gram
- EcoQO % (>0.1g) 58 %

'Healthy' and 'slowly starved' birds have same amount of plastic.
thus the North Sea population of 2 million Fulmars continuously transports:

- 70 million pieces of plastic
- weighing *ca.* 0.6 ton

GLOBAL

Assuming that globally Fulmars have half as much plastic,
the total population of 30 million Fulmars flies around with:

- over 500 million particles
- and 5 tons of plastic

Laysan Albatross - *Phoebastria immutabilis*

Laysan Albatross - *Phoebastria immutabilis*

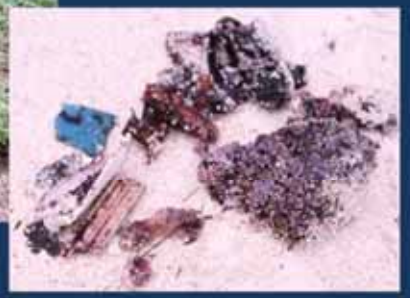
Mass of plastics in chicks:

Fry et al. 1987: Midway 36g in 'healthy' chicks; 77g in ones found dead

Auman et al 1997 : Midway 10g in 'healthy' roadkills, 20 g in ones that died

Young et al. 2009 : Kure 38 g and Oahu 4g (in regurgitated boluses)

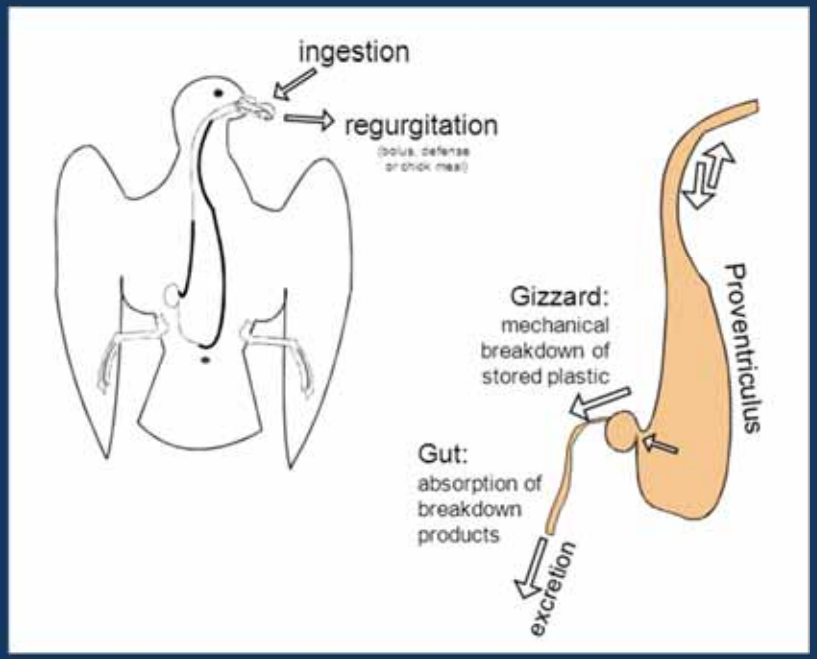
Breeding Laysan Albatrosses (0.6 million pair) annually transport 6 tons of plastic litter to chicks on land



For Midway Atoll, John Klavitter US Fish & Wildlife Service estimated:

- *8 tons of plastic debris washing up on the beaches*
- *8.6 tons of netting entangled on reefs or sand*
- *4.5 tons of plastic brought in by seabirds and feeding chicks*

Rate of passage and breakdown of plastics through the digestive system ?



Disappearance rates of plastics from stomachs of Cape Petrels

on Ardery Island Antarctica , after return from their wintering grounds

Disappearance rates of squidbeaks from stomachs of Cape Petrels

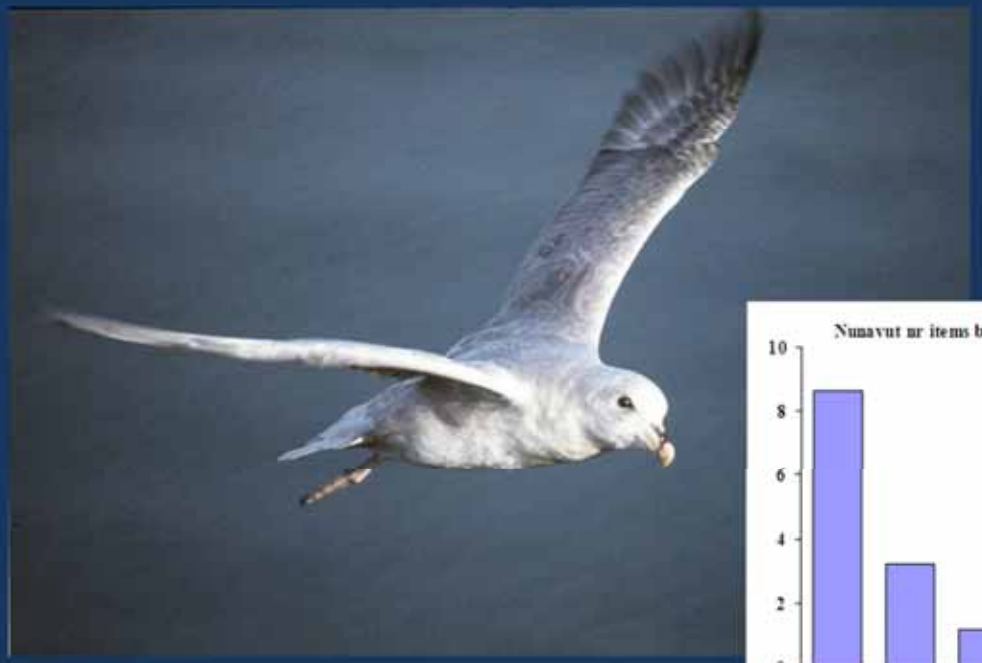
on Ardery Island Antarctica , after return from their wintering grounds

	December		January		
	n	average nr of squid beaks in stomach	*n*	average nr of squid beaks in stomach	% decrease
Southern Fulmar	*6*	**9.5**	*21*	**3.6**	**62%**
Antarctic Petrel	*5*	**7.6**	*6*	**1.2**	**84%**
Cape Petrel	*9*	**11.1**	*20*	**1.1**	**90%**
Snow Petrel (major)	*4*	**1.5**	*13*	**0.9**	**40%**
Snow Petrel (nivea)	*7*	**1.6**	*2*	**1**	**38%**
fulmarine petrels combined	*31*	**6.8**	*62*	**1.9**	**72%**

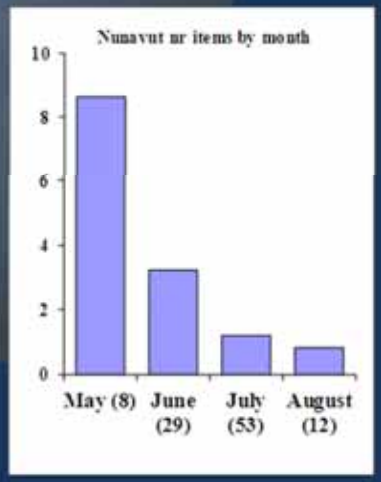
Similar rates of disappearance of plastic seen in seabirds returning to the Canadian Arctic

Murres
(Provencher 2010 MarPolBul 60)

Incidence
- June 12%
- august 0%



Fulmars
(Mallory 2008 MarPolBul 56)



RATE OF BREAKDOWN AND GUT PASSAGE OF PLASTICS IN DIGESTIVE SYSTEMS OF PETRELS CAN BE ESTIMATED AT 75 % OF AVERAGE STOMAGE CONTENT PER MONTH

'processed' =

- reduced to mm size and below
- uptake of breakdown products in gut
- excretion as microplastics, partially in other habitats

Northern Fulmar *Fulmarus glacialis*

NORTH SEA

Two million Fulmars annually reshape and relocate:

- 630 million pieces
- 6 ton of plastic

GLOBAL

At half stomach contents of North Sea, the global Fulmar population of 30 million Fulmars annually reshape and relocate:

- 5 billion particles
- 42 ton of plastic

Wilson's Storm-Petrel *Oceanites oceanicus*

may annually process:

- 10 billion pieces
- 35 ton of plastic

Part of which is ingested in northern hemisphere and then relocated to the Antarctic

Antarctica

Conclusion:

Seabirds continuously degrade substantial tonnages of marine plastic litter, and partly relocate these to distant environments that would otherwise remain unaffected by (micro-) plastic pollution

		tons of plastic annually processed
Great Shearwater	*Puffinus gravis*	157
Shorttailed Shearwater	*Puffinus tenuirostris*	47
Sooty Shearwater	*Puffinus griseus*	18
Manx Shearwater	*Puffinus puffinus*	3
Cory's Shearwater	*Calonectris diomedea*	2
Northern Fulmar	*Fulmarus glacialis*	42
White-chinned Petrel	*Procellaria aequinoctialis*	15
Blue Petrel	*Halobaena caerulea*	5
Cape Petrel	*Daption capense*	4
.....etc		

Great Shearwater

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Priority Actions

Actions to reduce marine debris from 2011-2021

1) Protect seabirds – they clean up plastic debris and speed up ultimate breakdown
2) Clean up accumulated litter within seabird colonies
3) Use these data to stimulate awareness

REDUCE – REUSE – RECYCLE

www.imares.wur.nl *Click dossiers .... Plastic.....*

www.zeevogelgroep.nl *Click downloads ... Fulmar study*

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Priority Actions

REDUCE – REUSE – RECYCLE

- **Make deposit & return systems legally required**: high deposit fees for ALL products containing plastic must be standard.
- **Forbid the production of so-called degradable or compostable packaging** for both fossil- or bio-sourced plastic: ***Let plastic be plastic!***

Create value on plastic 'waste'