International Polar Year 2007-2008
The Netherlands
(IPY•NL)

(Name and address of the main and co-applicant, project title and an executive summary (in English) are provided through the on-line electronic submission system and will be automatically inserted at the front of the application)

Is this application part of a *coordinating project proposal*? X Yes O No

Title coordinating project proposal: BIRDHEALTH Health of Arctic and Antarctic bird populations

Related international IPY 'Full proposal'
(submitted to ICSU-WMO Joint Committee for IPY)
Title: BIRDHEALTH Health of Arctic and Antarctic bird populations
Lead contact (name, organisation, country): Dr. Maarten J.J.E. Loonen, Arctic Centre, University of Groningen, The Netherlands
ID No: 172
Website URL for more information: www.birdhealth.nl

Geographic area of interest for this (IPY•NL) application

O Antarctic X Arctic (X) Bipolar

The project is mainly arctic but has some international partners focussing on the antarctic

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1a. Further details of the applicant(s)

Main applicant

Gender:	X Male	O Female
Tenure Position:	O Yes	X No
Research School:	Functional ecology	
Website URL:	www.birdhealth.nl	

1b. Alternative contact

Name: Prof. Dr. T. Piersma
Tel/Fax: 050-3632043 (secr. 2040)
Email: t.piersma@rug.nl

1c. Does the local authority support your application? x Yes O No

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1d.Renewed application? O Yes x No
(in case of renewed application please summarize main changes under item 4**)** **Dossier nr:**

1e. Applying for: O PhD student x Postdoc (3y) O Research costs
(for PhD student please underline promotor in question 1f, composition of research group)

1f. Composition of the research group

Name and title	Specialization	Employment/Institute
Dr. M.J.J.E. Loonen	Arctic ecology, geese	University of Groningen, Arctic Centre
Prof. Dr. T. Piersma	Animal Ecology	University of Groningen, Animal ecology
Dr. I. Tieleman	Ecological immunology	University of Groningen, Animal Ecology
Prof. Dr. R.H. Drent	Animal Ecology	University of Groningen, Animal Ecology
Dr. H. van der Jeugd	Bird ecology	University of Groningen, Animal Ecology/SOVON
Dr. R.A.M. Fouchier	Virology, virus genetics	Dept. Virology, Erasmus Medical Centre
Prof. Dr. G. Dorrestein	Pathology, pathogen-host interaction	Veterinary Sciences, Utrecht University

Name and title	Specialization	Employment/Institute
Prof. Dr. J.A.P.Heesterbeek	Modelling infectious diseases	Theoretical Epidemiology, Utrecht University
Dr. O. Dolnik	Coccidiosis and intestinal parasites	University of Kiel, Inst. Polar Ecology
Dr. B. Olsen	Bird born infections	Umea University, Dep. Infectious Diseases

People listed, not belonging to the University of Groningen, have specific expertise or equipment to perform analyses or to interpret results. They have been directly involved in this proposal. Apart from these people, there is a long list of scientists wo have joined BIRDHEALTH and which will eventually contribute to this program. See: www.birdhealth.nl under join.

2. Populaire samenvatting van de aanvraag (Nederlands)
(if granted, this description will be used for Dutch communication, also to non-specialists)

De kans op een besmetting door een parasiet, bacterie of virus is niet op iedere plek en op ieder moment gelijk. Op een plek met een hoge bevolkingsdichtheid en met veel individuen in een slechte lichaamsconditie is deze kans het grootst. Dat geldt voor mensen maar ook voor vogels. Tijdens de trek komen trekvogels in hoge dichtheden voor, waardoor het gemakkelijk is om soortgenoten te besmetten. Maar in de poolgebieden is de dichtheid aan soortgenoten en daarmee de besmettingskans veel lager. Dit is maar goed ook, want in de poolgebieden vindt ook de voortplanting plaats en in deze periode zijn de vogels extra kwetsbaar. Wat betekent een besmetting voor een vogel? Gaat het om een dodelijke besmetting, een tijdelijk ongemak of een chronisch ziekteverloop? Hoe gaan verschillende soorten om met de kans op besmetting, als ze geen toegang hebben tot medicijnen? We gaan dit bestuderen, door de vogels op te zoeken in hun arctische broedgebieden. We gaan vaststellen met welke ziekteverwekkers de vogels in aanraking komen en wat dit voor hun functioneren betekent. We kijken daarbij naar geringde vogels en testen hun bloed en poep op het voorkomen van ziektes. Zieke dieren worden vergeleken met gezonde dieren of dieren die met medicijn zijn behandeld om vast te stellen hoeveel last de zieke dieren van de infectie hebben. De werking van het immuunsysteem wordt getest om beter te begrijpen hoe gevoelig de dieren zijn voor een besmetting in verschillende fases van hun leven. We gaan zoeken naar variatie tussen populaties en individuen en proberen een relatie te leggen met trekroutes, vervuiling, klimaatverandering en versnippering van het landschap. Uiteindelijk hopen we door dit onderzoek beter te begrijpen hoe ziekteverwekkers zich kunnen handhaven. Dit is vooral belangrijk voor die ziekteverwekkers, waarmee ook mensen besmet kunnen worden.

3a. Top 5 scientific publications of the applicants related to the proposed research

1. **Loonen, M.J.J.E.**, Bruinzeel, L.W., Black, J.M. & **Drent, R.H.** 1999. The benefit of large broods in Barnacle geese: a study using natural and experimental manipulations. J. Anim. Ecol. 68: 753-768.
2. **Piersma, T.** 1997. Do global patterns of habitat use and migration strategies co-evolve with relative investments in immunocompetence due to spatial variation in parasite pressure? Oikos 80: 623-632.
3. Mendes, L., **Piersma T.**, Lecocq, M., Spaans, B. & Ricklefs, R.E. 2005. Disease-limited distributions ? Contrasts in the prevelance of avian malaria in shore bird species using marine and fresh water habitats. Oikos 109: 396-404.
4. **Tieleman, B.I.**, Williams, J.B., Ricklefs, R.E. & Klasing, K.C. 2005. Constitutive innate immunity is a component of the pace-of-life syndrome in tropical birds. Proceedings of the Royal Society Biological Sciences Series B. 272:1715-1720.
5. Stahl J., Tolsma P.H., **Loonen M.J.J.E.** & **Drent R.H.** (2000) Subordinates explore but dominants profit: resource competition in high arctic barnacle goose flocks. Animal behaviour 61: 257-264.

3b. Other relevant publications (max 1 page for publications, min 10 pts)

By the applying research group:

Cope, D.R., **M.J.J.E. Loonen**, J.M. Rowcliffe & R.A. Pettifor. 2005. Larger barnacle geese (Branta leucopsis) are more efficient feeders: a possible mechanism for observed body size- fitness relationships. Journal of Zoology: proc. Zool. Soc. London 265: 37-42.

Stahl, J., D. Bos & **M.J.J.E. Loonen**. 2002. Foraging along a salinity gradient. The effect of tidal inundation on site choice by Dark-bellied Brent Brante bernicla and Barnacle Geese Branta leucopsis. Ardea 90: 201-212

Loonen, M.J.J.E., K. Oosterbeek & **R.H. Drent** 1997. Density dependent effects on growth of young and final adult size in Barnacle Geese Branta leucopsis. Ardea 85: 177-192.

Loonen, M.J.J.E., I.M. Tombre. & F. Mehlum. 1998. Development of an arctic barnacle goose colony: interactions between density and predation. In: Mehlum, F., J.M. Black. & J. Maden. (eds) Research on Arctic Geese. Proceedings of the Svalbard Symposium, Oslo, Norway, 23-26 sept. 1997. Nork Polarinstitutt Skrifter 200: 67-79.

Mendes L., **T. Piersma**, D. Hasselquist, K.D. Matson and R.E. Ricklefs. 2006. Variation in the innate and acquired arms of the immune system among five shorebird species. *J. Exp. Biol.* 209: 284-291.

Piersma, T. 2002. Energetic bottlenecks and other design constraints in avian annual cycles. *Integr. Comp. Biol.* 42: 51-67.

Veen, I. van der, H.P. van der Jeugd & **M.J.J.E. Loonen** (1999) Rain limits food supply for temperate breeding barnacle geese Branta leucopsis. Wildfowl 50: 57-67.

Other references with respect to the application:

Clayton D.H. & Drown D.M. 2001. Critical evaluation of five methods for quantifying chewing lice (Insecta: Phthiraptera). Journal of Parasitology 87: 1291-1300.

Deerenberg, C., V. Apanius, S. Daan & N. Bos. 1997. Reproductive effort decreases antibody responsiveness. Proceedings of the Royal Society Biological Sciences Series B 264: 1021-1029.

Fallon S.M., R.E. Ricklefs, B.L. Swamson & E. Bermingham. 2003. Detecting avian malaria: an improved polymerase chain reaction diagnostic. Journal of Parasitology 87: 1291-1300.

Greiner E.C., G.F. Bennet, E.M. White & R.F. Coombs. 1975. Distribution of the avian hematozoa of North America. Canadian Journal of Zoology 53: 1762-1787.

Grenfell B.T., W. Amos, P. Arneberg, O.N. Bjørnstad, J.V. Greenman, J. Harwood, P. Lanfranchi, A.R. McLean, R.A. Norman, A.F. Read & A. Skorping. 2002. Chapter 9: Visions for future research in wildlife epidemiology. In: Hudson P.J., A. Rizzoli, B.T. Grenfell, **J.A.P. Heesterbeek** & A.P. Dobson (eds) The Ecology of Wildlife Diseases. Oxford University Press.

Hasselquist D., J.A. Marsh, P.W. Sherman & J,C. Wingfield. 1999. Is avian humoral immunocompetence suppressed by testosterone? Behav Ecol Sociobiol 45: 167-175.

Hudson, P.J., Newborn, D., and Dobson, A.P. 1992. Regulation and stability of a free-living host parasite system, T*richostrongylus tenuis* in red grouse. I. Monitoring and parasite reduction experiments. J. Anim. Ecol. 61: 477–486.

Matson K.D., A.A. Cohen, K.C. Klasing, R.E. Ricklefs & A. Scheuerlein. 2005a. No simple answer for ecological immunology: relationships among immune indices at the species level in waterfowl. Proceedings of the Royal Society Biological Sciences Series B:

Matson K.D., R.E. Ricklefs, K.C. Klasing. 2005b. A hemolysis-hemagglutination assay for characterizing constitutive innate humoral immunity in wild and domestic birds. Developmental and Comparative Immunology 29: 275-286.

Møller A.P., J. Erritzøe. 1998. Host immune defence and migration in birds. Evol Ecol 8: 945-953.

Olsen B., S. Bergström, D.J. McCafferty, M. Sellin & J. Wiström. 1996. *Salmonella enteritidis* in Antarctica: zoonosis in man or humanosis in penguins? The Lancet, 348: 1319-1320.

Righi M.& G. Gauthier. 2002. Natural infection by intestinal cestodes: variability and effect on growth in Greater Snow Goose goslings (Chen caerulescens atlantica). Ca. J. Zool. 80: 1077-1083.

Sellin M., H. Palmgren, T. Broman, S. Bergström and **B. Olsen**. 2000. Involving Ornithologists in the Surveillance of Vancomycin-Resistant Enterococci. Emerging Infectious Diseases 6: 87-88.

Smits J.E., G.R. Bortolotti & J.L. Tella. 1999 Simplifying the phytohaemagglutinin skin-testing technique in studies of avian immunocompetence. Funct. Ecol. 13: 567-572.

4. Detailed description of research area and research plan
(max 4 pages, min 10 pts, including figures)
(Objectives, innovative aspects, history/background, scientific approach and research methodology)

Healthy individuals are able to optimize resource use, survival and reproduction. Health of an individual will be under constant attack. Animals have developed immunological, physiological and behavioural strategies to battle these attacks from pathogens, parasites and/or pollution on their health. Pathogens and parasites have co-evolved and try to survive using their hosts as pools and vectors for transmission. These battles for survival are the main theme of the study.

The presence of pathogens and viruses in a population is not constant over time and place. During an outbreak of a highly pathogenic agent, the effects of this on the population and distribution of the host animals is very clear. However, many pathogens and parasites are low pathogenic and can easily persist in populations. These infections can still have measurable effects on resource allocation and fitness. And even complex interactions exist e.g. in the study of parasitic infections in red grouse, where these infections explained population cycles in the host species (Hudson *et al.* 1992). This project tries to measure geographical and temporal variation in a wide range of pathogens and parasites over a range of several bird species.

The polar regions are of special interest for this study. These areas are considered to have relatively low levels of pathogens, parasites and pollution (Piersma 1997). Migratory birds linking temperate regions with the Arctic are potential vectors of diseases as shown by the recent spread of the West Nile Virus and Avian Influenza: diseases which are threatening domestic animals and humans. With a changing arctic due to climate change and pollution, more knowledge is needed on how animals cope with attacks on their health.

The project has four main **objectives**:

1. Screening individually marked birds for the presence of pathogens and infections and quantify the present status of their health and immune system.
2. Relating the findings above to individual fitness of the birds.
3. Testing causal links between health and fitness and studying the interaction between health and pollution by experimentation in the field
4. Providing parameterisation for theoretical models explaining the population dynamics of both the pathogens and their hosts.

The proposed position will play a crucial role in combining the data gathered in the database of the BIRDHEALTH program. It will provide additional analysis of field samples and perform more detailed experimental work on a model species: the barnacle goose.

Health screening

This is a short introduction to the various components which will be screened respectively: parasites, bacterial infections, viruses, the state of the immune system and fitness. Birds may be important reservoirs and vectors for transmission of disease-causing organisms as influenza, Lyme disease *Borrelia*, Ehrlichia, Salmonella and *Campylobacter*. Bird-borne zoonoses can be transmitted to wild and domesticated animals as well as to humans, with severe negative consequences for animal and public health. The potential for wild birds to transmit diseases is high since many bird species move long distances during migration, and often migrate from regions with higher abundance and diversity of pathogens (Møller & Erritzøe 1998) to regions where such organisms are less common. The fact that many bird species occur in large numbers at stopover and breeding sites in Europe, often in close proximity to humans and domesticated animals, contribute to the possibility for birds to become infected with and to transmit pathogens. This makes wild birds excellent vectors for long-distance transmission of pathogens, including antibiotic-resistant bacteria (Sellin 2000). Antibodies can be determined in blood plasma, but in recent years the study of various strains of pathogens is greatly enhanced by molecular techniques.

- Parasites

In wild animal populations parasites can be considered at least as important as predators simply because of their abundance and diversity. Parasites comprise a great selection pressure on their host, and even those with low pathogenisity in energetically unfavourable situation may play an important

role for the host's fitness and survival. We are planning to study ectoparasites, coccidiosis, intestinal parasites and blood parasites.
Ectoparasites : Tics and feather lice are regularly found on birds and can be quantified by a standardized visual inspection (Clayton & Drown 2001). There prevalence varies over the year and is especially high during the breeding season when the birds nest. Fitness effects have been shown through experimental treatment of birds with insecticide. Tics can also act as a vector of other diseases (e.g. Lyme borreliosis).
Coccidiosis : Eimeriidae Coccidia are common parasites of wild animals and in particular birds. These are protozoan intracellular parasites that do not need an intermediate transmitter for the spread of infection, and the new host becomes infected after occasional ingesting of faeces containing sporulated oocysts with food or water. During merogony and gametogony these parasites destroy intestinal cells of the host that leads to a reduction of its absorption function. Especially in young birds coccidiosis may become a great problem if the birds are exposed to extreme conditions /high energetic costs.
Intestinal parasites : Cestodes, trematodes and nematodes can be determined in faeces samples from the presence of their eggs. They are normally low pathogenic and considered a secondary infection, which builds up in a period of stress.
Blood parasites **:** Research on blood parasites has shown that species inhabiting high arctic and marine habitats have lower parasites levels than species inhabiting lower latitude and aquatic environments (Greiner et al. 1975). This conclusion has recently been confirmed specifically within shorebird species sampled in the Arctic, temperate Europe, and aquatic and marine habitats in tropical West Africa. Infected individuals were found mainly in tropical habitats and the prevalence of infection was much higher in the tropical aquatic than the tropical marine habitats (Mendes et al. 2005). In 1995, in a pilot study on barnacle geese on Spitsbergen, we did not find any blood parasites in juvenile barnacle geese (Loonen unpublished). Malarial parasites can be measured with a targeted PCR technique in a DNA sample (Fallon *et al.* 2003).
- Bacterial infections : At this moment, we propose to study the prevalence of *Campylobacter spp.*, Lyme disease *Borrelia*, *Salmonella*, *Mycobacterium avium*, Avian cholera (*Pasteurella*) and the occurrence of antibiotic resistant bacteria.
- Viruses: ***Avian influenza*** receives much attention since the outbreaks of hihly pathogenic avian influenza in the Netherlands (2003) and South East Asia (1997-2005). It is the main subject of subproject c. and details can be found in that proposal. ***West Nile Virus*** is currently spreading from the east to the west coast in North America, which has been linked to the warming of the arctic as a consequence of global change. The strain is relatively pathogenic and uses both insects and birds as hosts. ***Paramyxoviruses*** (PMV) PMV-1 is known to cause Newcastle disease in domestic poultry, Less pathogenic variants have been isolated from migratory waterfowl.
- State of the immune system
Matson et al. (2005a) has used a set of protocols to measure 13 variables of immune function based on a single blood sample subdivided into leukocyte (blood smear) and plasma (frozen until analysis) components.
There are many types of ***leucocytes*** (white blood cells), which play an important role in both innate and acquired immune responses. A total and differential count of leukocytes reveals information about the present stage of the immune system. A differential count requires microscopic determination in a blood smear. Total count can be obtained using a hemacytometer.
Natural levels of ***antibodies*** can be determined in a hemolysis-hemmagglutination assay for characterising innate humoral immunity (Matson et al. 2005b).
A relative new test is the ***killing capacity of blood*** (Tieleman et al. 2005) where whole blood or plasma, collected at capture is incubated with bacteria or yeast and plated on agar. A count of bacterial colonies on agar plates with and without blood can be regarded as a general immune response.
- Fitness
In an evolutionary context, success means the propagation of genes into the next generations. Life-time reproductive success (LRS) is the optimal measure of an individual's fitness. Because of difficulty in determining LRS, there are many derived measures used as fitness measures which relate to LRS. These include individual survival (true survival or local survival), annual reproductive success (clutch size, number of fledglings, offspring survival), body condition or social hierarchy.

Collecting field data.
The collection of field data is based on a standardized protocol, which will be further developed with international partners in the project during a workshop in spring 2006. All methodology will be tested in an Arctic breeding barnacle goose population in 2006 (NAP-grant 851.30.011).

Catching, ringing and sampling birds
When the birds are caught, a standardized sampling protocol will be followed. It can contain the following elements:

- Morphological measurements to establish body condition as a measure of fitness
- Ringing with individually coded easy observable rings to allow monitoring of future fitness
- Standardized visual inspection on ecto-parasites and signs of diseases.
- Sampling of blood for analysis of pathogens and antibodies and running tests on the immune respons.
- Preparing a blood smear for a differential white blood cell count
- Collecting faeces samples for determining intestinal parasites and coccidiosis
- Collecting cloacal swaps for determining the stage of an avian influenza infection.
- Collecting preening gland wax for analysis of fat-soluble pollutants like PCB and DDT (in cooperation with the IPY project COPOL).

Fitness measurements by observation
Individually marked birds can be studied throughout the breeding season or even over their life time. Parameters which can be established are direct behaviour (lethargy, feeding rate, dominance, fat stores by abdominal profile indices), reproductive success (clutch size, number of fledglings) or survival (return rate or true survival).

Additional faeces samples
Faeces samples will be collected during catching, but there is also an option in the field when the birds are recognized from their individually coded rings.

Experimental manipulations
After the first season in which most of the screening is done, we envisage a second season with experimental manipulations. A causal link between health and fitness can be revealed by experimental treatment or infection. The functioning of the immune system can be tested with specific challenges. All of these tests require permission for animal experiments. The list below is a first indication without a critical examination of the ethical and juridical problems. During the workshop in spring 2006, the various methods need further evaluation.

Manipulating pathogen or parasite presence
Health can be manipulated by treating birds with medicine (Righi & Gauthier 2002).

Manipulating condition
Work load can be manipulated by e.g. varying clutch size (Deerenberg et al. 1997). Pathogen and parasite presence or immunocompetence can be tested in relation to work load or body condition.

Testing immunocompetence
Humoral immunocompetence is estimated as the antibody response to a non-pathogenic antigen challenge (sheep-red-blood-cells or a diphtheria-tetanus vaccine) measured with an ELISA (Deerenberg et al. 1997: Hasselquist et al. 1999). Cell-mediated immunocompetence is estimated by injecting phytohaemagglutinin in the wing web skin (Smits et al. 1999). It causes a local swelling measured as the wing thickness.

Focus on the barnacle goose
The main applicant is studying individual fitness in a barnacle goose population on Spitsbergen since 1990. In 2005/2006 a project was funded by NWO to study health issues structuring this goose population, which can be seen as a kind of pilot project to BIRDHEALTH. A first set of blood samples of marked individuals is taken for analysis, but the samples are not analysed yet. In 2006, a field test of the BIRDHEALTH sampling protocol is planned, one year in advance of the circumpolar sampling. This advantage in time will continue in the two following years, allowing tests of any specific plans developed during the IPY-period.

The Kongsfjorden population of the Spitsbergen Barnacle Goose provides a unique opportunity to study the occurrence and effects of pathogens and parasites. The majority of the population (>70%) is individually marked. Since 1990, details on age, dominance and reproductive output have been monitored annually. Individual geese can be caught easily and repeatable during the incubation and the moulting phase. In 1995, a pilot experiment was performed on the occurrence of intestinal and blood parasites in young of the Spitsbergen Barnacle Goose. We did not find any blood parasites. 13% of the goslings had intestinal helminths infections and 68% suffered from coccidiosis. We found non-significant negative effects of coccidiosis on growth and survival. In 2005, we sampled serum of individually marked adult geese and made blood smears. Analysis on the presence of viruses and a test on the killing ability of the blood are currently in progress.

The Barnacle Goose can be divided in three different arctic breeding populations (Greenland, Spitsbergen and Russia) and two temperate breeding population (Gotland and the Netherlands). All these populations have shown a rapid population growth in recent decades and are studied using individually marked birds. A focus on geographical variation and especially a comparison between arctic and temperate breeding populations fits perfect in the goals of the BIRDHEALTH program.

From Ny-Ålesund, Spitsbergen to other parts of the arctic

The international research village Ny-Ålesund is the main vantage point for the field work in this subproject. The village is the most northern town of the world with excellent laboratory and transportation facilities. Any fieldwork in this facility deploys in the focus of the international research community as more than 10 countries have permanent arctic facilities. The Netherlands has a small station, which will be full of activity. In Ny-Ålesund, a Norwegian conglomerate of scientists plan to work on Arctic Terns, Kittiwakes and Eider Ducks as part of their contribution to BIRDHEALTH. Over the past 15 years, a special relation has been formed with the legal owner and the local government, which will facilitate animal experimentation. The knowledge and accessibility of remote areas on Spitsbergen is relatively good and will improve in the International Polar Year.

The detailed observations on Spitsbergen need to be extended to other parts in the Arctic. Emphasis is needed in the Russian part of the flyway. The link of BIRDHEALTH to other projects, running already in this area, guarantee the proposed extension of the scope of the study. PRISM-II, ECORA (GEF) and Alterra focus on Pechora delta, Kolguev, Nova Zemlya and Taimyr.

Innovative aspects

In the book: Ecology of Wildlife Diseases, leading epidemiologists present their vision for future research in wildlife epidemiology. (Grenfell et al. 2002). They present two major challenges: 1. "… *a call for more integration, both conceptually and across disciplines*" 2. "*A particular focus for future immunoepdemiological work should be the collection of detailed spatio-temporal data…"*. The proposed project addresses these challenges perfectly.

The screening of wildlife for the presence of potential harmful diseases for domestic animals and humans has received a lot of interest since recent outbreaks and spreads of these agents have led to major economic problems and human casualties. A new management strategy needs to be developed which can build on knowledge on pool dynamics and transition chances. Detailed work on the pathogen host interaction is urgently needed.

When there are less virulent pathogens involved, the chain from pathogen towards host behaviour, host fitness and host population dynamics is rarely studied. There is only limited knowledge on dynamics of the pathogen within the host and fitness effects are often considered minimal without proper scrutiny. Experimental manipulations are essential and only performed in a few studies. Geographical variation in fitness effects is rarely addressed.

Molecular techniques provide new methods to type different strains of pathogens and has boosted the detection of variation in pathogens. These new techniques will be used to provide new insights in the geographic distribution.

The international IPY committee has named outreach, education and the involvement of local people as innovative aspects of the new IPY. All these aspects are easily met by the current proposal. The circumpolar sampling on both poles will be a truly international enterprise.

5. Timetable of the project and working programme:

2006 September-December: coordination of bird health program
2007 January-May: preparation of field work, coordination of sampling, training of field assistants
June-August: fieldwork
September-December: analysis of samples
2008 January-May: preparation of field work, coordination of sampling
June-August: fieldwork
September-December: analysis of samples
2009 January-August: Compilation of results, writing up

For the BIRDHEALTH program, the year 2007 is a field season were the focus lies on screening of geographical variation. In 2008, more detailed questions will be addressed based on the results of 2007. For the study on the barnacle geese, we hope to be one year ahead of this timing in 2007, so we can focus on experimentation in both years.

6. Affiliation with (inter)national research programmes
(This should include an explicit description of existing and planned cooperation)

The project is an international project IPY, with research groups joining from various countries, but also with specific expertise (see the project website www.birdhealth.nl under join). It has clear links with other IPY-projects focussing on fitness of birds, pollution (175: COPOL), biodiversity an human health. Cooperation with other IPY projects will be used for access to study sites (11: Arctic Wolves, 72: ArcDiv, 133: CBMP). The project is officially fully endorsed by both the International IPY Committee and the working group CAFF (Conservation of Arctic Flora and Fauna).

PRISM-II *Partners for Water* is an international program co-funded by the Ministry of Transport, Public Works and Water which plans a field expedition to the Pechora delta in Russia and supports a local Russian initiative for capacity building of Nenetskiy Zapovednik (www.prism-pechora.nl).

ECORA Integrated Ecosystem Approach to Conserve Biodiversity and Minimize Habitat Fragmentation in the Russian Arctic is an international program implemented by the United Nations Environmental program.

7. Societal significance
Motivation of the relevant policy aspects, such as:.
- Political / societal significance in a national and international context
- Urgency for international and/or national policy

(These are important for the evaluation of the proposal, because of the funding by several ministries.)

Bird-born diseases are a human health risk. At this moment avian influenza receives a lot of attention and this study will supply essential data for understanding its epidemiology. This is already clearly stated in the central BIRDHEALTH proposal and subprojects 3 and 4. Here I will give some information on *Capylobacter*, showing that there are more relevant examples. *Campylobacter* is a genus, of which several members are pathogenic to animals and humans. *C. jejuni* is today the most common cause of human bacterial enteritis in large parts of the industrialised world, with severe negative impact on economy and health. Many countries have experienced an increase in the number of reported cases during the last 10 or 15 years. An astonishing example is the fourfold increase of *Campylobacter* infections among humans in Denmark from 1992 to 2001, where the incidence of imported and domestic cases in 2001 reached 86 cases per 100,000 inhabitants. Birds have for long been implied as the most important reservoirs for *C. jejuni*, *C. coli* and *C. lari* among wild animals, but what role birds actually have as vectors for these bacteria is poorly understood.

Most Arctic breeding bird populations are migratory birds, crossing international borders and wintering in temperate regions like the Netherlands. Their well-being is linked with nature management in several countries and affected by global warming and effects of humans on their habitat. The Dutch government has invested in international nature conservation, science and education along these migratory routes and BIRDHEALTH fits in this previous investment. We will specifically invest in partnerships with Russia through Dutch partners (MoU 2005), to create geographical balance in our circumpolar approach. We plan to specifically report on our results to the arctic people of Russia.

Education, outreach and communication are important focus points for IPY and should guarantee that there is an off-spin from the science towards the general public and politicians. The set-up of this program allows a lot of focus on this matter. We plan to train not only Dutch students but also Arctic people for sampling in this project.

8. Legal requirements

For fieldwork to Antarctica additional information is needed for an initial assessment whether or not the applicant will have to apply for a permit under the 'Wet bescherming Antarctica'.

Do you plan to visit Antarctica, South of 60°S? O Yes x No
If the above question is answered with "yes" please fill in the separate 'WBA-IPY' form for details

Has been complied with the law and legal requirements with respect to the proposed Research, such as 'Wet op Dierproeven' and 'DNA-recombinant legislation?
x Yes O No

9a. Requested budget from ALW

		2006	2007	2008	2009	2010
Personnel (mm)		4	20	24	12	
Research costs (k€)						
	Equipment		10			
	Consumables		31	39	8	
	Fieldwork		60	60		
	Education, Outreach & Communication		25		3	
	Coordination*	XXXXXXXX	XXXXXXX	XXXXXXX	XXXXXXX	XXXXXXXX
Shiptime NIOZ-MRF (in days)		XXXXXXXX				XXXXXXXX

* Costs for coordination can only be requested if main applicant is lead contact of the related IPY "Full proposal". If this is a subproject of a coordinating project proposal, the coordination costs can only be requested in the application form of the coordinating project.

9b. Explanation and/or remarks to the proposed budget:

(Personell, equipment, consumables, fieldwork, EOC, coordination and Shiptime NIOZ-MRF)
(Education, Outreach & Communication (EOC) plan must be included here)

Personel

Post-doc for three years, starting in September 2006. This person will play a central role in BIRDHEALTH, to organize the circumpolar sampling and to coordinate between partners.
Analytical (field) assistant: two years, starting in May 2008. This person will help processing the large amount of samples. We envisage that it will be impossible to analyse all collected samples among the partners of BIRDHEALTH without additional analytical and technical support..

Equipment

Spotting scopes for field observation, tents, catching equipment for two sites. Expensive analytical equipment will be used in existing laboratories.

Consumables
Ringing material (individually coded) 10 K€ for all partners in BIRDHEALTH
Sampling kit for blood and faeces (1 k€) for at least 10 sites annually= 20 k€
Analysis of samples 48 k€ (a relative large amount to process all samples, which are collected without funding for analysis).
Fieldwork
Two seasons, two months fieldwork on Spitsbergen for post-doc and student 4 x 7.5 k€ = 30 k€
Two seasons, two months fieldwork on Pechora for assistant and student 4 x 7.5 = 30 k€
Field work and travel for 10 students to various field sites for sampling: 20 x 3 = 60 k€
EOC
Digital video cameras for registration of field activities, for use on film and internet: 3 k€
Travel and stay of arctic people (10 persons) to the Netherlands to train them for field sampling: 20 k€
Production of a folder about the project for distribution abroad in all languages of arctic nations: 2 k€
Travel costs for presentations about the results also to Russia: 3 k€
Contribution to the 2008 workshop proposal outlined in the coordinating proposal and to all projects to disseminate results to the general public, students and stakeholders: p.m.

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10. Financial assistance from (an)other source(s)

NAP 2006/2007: Field work for a pilot project, main focus Spitsbergen 2007 during summer

Interdepartementaal Polair Overleg: grant to the Arctic Centre for coordinating Dutch research, for running a field station on Spitsbergen and for representation within e.g. CAFF (Conservation Arctic Flora and Fauna www.caff.is)

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11. Relation research program university, large institutions, research schools, etc.

The post-doc will work in both the Arctic Centre and the Animal Ecology, within the Centre for Ecological and Evolutionary Studies of the University of Groningen. The work will be embedded in the national Dutch research school Functional Ecology.
The Arctic Centre of the University of Groningen is representing the Dutch science community in a number of international arctic science forums, financed by the government. Nationally, it aims to be a hub and facilitator for polar science and education.
Within the University of Groningen there are also other research groups with histories in Arctic (Animal Ecology) and Antarctic (Marine Biology) research which are presently combining their strength into a virtual centre of polar ecology and education.

(No signatures required for electronic submission)