Managing stakeholder concerns associated with releases of imported stock in insect control programmes

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Summary

A commitment to reducing pesticide use and the development of novel technologies are driving a renewed interest in insect-mediated pest and vector control programmes. These, along with conservation and pollination applications, lead to an increased transport volume of live insect stock. At release sites, concerns surrounding imported insects can be reduced by using local genotypes that have been mass-produced elsewhere. Remaining plausible concerns are likely to be centred on human (vector behaviour or capacity) and ecological (interacting species) factors and should be anticipated in the design of communication materials. Well designed, locally relevant communication and engagement material is an important part of programme success.

Stakeholder engagement is thus critical to reducing risks of perceived and plausible concerns affecting programme outcomes in an increasingly electronically connected world. Experience at release sites can help inform design of accessible information useful to all stages of the transportation pathway. For trans-nationally transported insects, providing such information to specific stakeholders (e.g. courier companies and border authorities) will reduce the likelihood of delays

which can, in turn, affect the quality and mortality of the transported insects.

Keywords

Biocontrol – Community engagement – Pesticide reduction – SIT – Stakeholders.

Introduction

Insects and other arthropods include the greatest number of species among animals, but they are the least widely known by non-specialists. They have a mixed public profile and while many are considered to be beneficial due to their human-relevant uses (silkworms, domesticated honeybees, and fruit flies in research applications, for example), others are rightly viewed as serious pests and/or vectors affecting agriculture, domestic animals, and humans (1). With increasingly firm commitments to pesticide use reduction around the world, insect-mediated control strategies are set to expand substantially. As a result, the number of live insects being transported will rise as part of the 'greener' approaches to insect population management (2, 3, 4, 5).

Many nascent and established Sterile Insect Technique (SIT), Biological Control (Biocontrol – including Augmentative strategies), Insect Incompatibility Technique (IIT), and other genetic strategy programmes established for area-wide control of pest, nuisance or vector insects rely on insect stock produced some distance from the release sites (6, 7, 8). They are not alone: pollinator enhancement and conservation breeding programmes also do this to take advantage of economies of scale and production expertise available elsewhere and which are not achievable at the local scale or with available funds and facilities (9, 10, 11). In tandem with an expansion in insect trade, the current ecological and climate crises are bringing new interested parties with passionate views to the table. It is critically important for the future success of many insect control programmes to find ways for accurate information to flow openly to this increasingly engaged and broader stakeholder base. Asymmetries in information, which can result from a lack of clear and appropriate communication between the many

interested parties, can increase risks of adverse publicity, opposition, and conflict in many circumstances (12, 13, 14). Allocating the time and resources to well-designed stakeholder engagement reduces the potential of people reacting to assumptions or partial information (7, 15). This engagement and communication plan should also be designed to include monitoring and evaluation of its own implementation, so that the sector can develop specific best practice (16).

The specialist knowledge of entomologists may need to be explained to external audiences because release programmes, particularly for vector control, are frequently misunderstood. Why, and which, insects are being released, for instance, is information that can help build an accurate understanding for members of the general public (17). Increasing environmental awareness means we see more people watching and advocating, but many do so from a limited knowledge base and with differing risk perceptions. This, coupled with greater community connectivity through social media channels, means misinformation and anxiety can spread rapidly (18, 19). These factors make it easy for release activities to become confusing or combative – learning how to prevent or mitigate this marks a sea-change in how entomological professionals will have to interact with their publics.

Many entomologists have already successfully added some stakeholder engagement tools to their skillsets though more research is required to evaluate and understand which methods work best to provide timely information, allay fears, and communicate effectively across many parties (15). The broad messages are clear – people like advance information, they like to understand the 'why' of situations and to be offered the opportunity to contribute their views. We know that by providing well-designed and accessible information at appropriate detail and in advance, anxiety and opposition are reduced, local sense of 'ownership' is increased, and programme success will be supported. Successful communication tools to demonstrate transparent process and substantiation of decision-making can initially seem burdensome, but must become designed-in for smooth, mutually supportive relations to develop (20, 21,). The knowledge and expertise of entomologists needs

to be presented accessibly and demonstrated publicly to help facilitate this shift in public perception.

For entomologists and programme managers, engaging with public stakeholders is important at many phases of an insect management operation (7, 22). There is now substantial experience of this as part of planning and field site preparation, where this helps communities feel involved and leads to decisions with longstanding local support (23, 22, 24). Though this article considers concerns related to recipient sites, the predicted rise in numbers of trans-nationally transported insects and the promotion of insect-mediated control programmes calls for an expansion of stakeholder mapping to include those involved in the transport stages, such as courier companies and border authorities. Providing appropriate information at these stages will reduce risks of delay which, in turn, affects mortality and quality of transported insects (6, 25).

[Place Figure 1 here]

An overview of a stakeholder engagement process

Stakeholder Mapping is an important early step for any insect release programme as this defines who should be included in the project's dialogue and development and considers how they can be engaged (26). **The initial highest-level** (ministerial policy) contacts are likely to have an awareness of relevant biotechnology and insect-mediated management techniques. At **regional governance** levels this is not always the case and being able to provide a contextual history of comparable programmes is often useful (23). The relevant in-country regulatory status, if any, or that of other pertinent countries, along with outline information about the specific intervention, location and the potential beneficial outcomes is also important to provide. The regulatory context for insect-mediated strategies varies between countries, though useful advice is given by the International Standard for Phytosanitary Measures (ISPM) No. 3 (27). This internationally authoritative document describes the requirements and standards for export, shipment, and release of biocontrol agents and other beneficial

organisms in agriculture and can support conveying these to stakeholders.

Biotech and insect-mediated strategies are widely accepted in the agricultural sector; their transition to human-health related interventions raises their profile and stakeholder attention. This means increased attention to matching the social perceptions of the interventions with scientific evidence. To effectively disperse accurate information, establishing a **local advisory forum** with a range of relevant stakeholders is useful to inform not only the population of the release site(s) but the wider local population (28). This helps to manage relationships and provides legitimacy through a multi-way route for all to voice opinions. The stakeholder groups represented may include other pest control practitioners, expert scientists (entomologists, ecologists, epidemiologists, sociologists), environmental associations, local politicians, media outlets, local health professionals and services and any other interested parties such as teachers, religious representatives, or community groups (7, 16).

In tandem with this local, but broader, level of engagement comes that at **specific field sites**. This is often a phase that requires dedicated officers who can remain identifiable to, and contactable by, residents throughout the programme and who implement the communication plan (28). Field site stakeholders also refer to the members of the local advisory form and other appropriate professional layers for opinion and the scientific information that all stakeholder layers have must be consistent (24).

Information content and design

Creating a profile for the problem (crop loss, disease risk, nuisance etc.) helps when offering unfamiliar solutions. If there is already an awareness of the problem, then information should start with the biology and ecology of the target insect and then describe the limitations of current conventional control methods. Where importation of a biocontrol agent is planned, the ecology of this is critical too. At all stages, the language and vocabulary must be appropriate to the recipient; it must be accessible, informative, cautious and without

overwhelming detail (29). Communicating with illiterate audiences through graphics is useful, though there may be different interpretations of imagery in some contexts (30). The communication plans used locally must, therefore, be developed jointly by researchers, engagement specialists and community stakeholders and should aim to consider the perceived concerns of the local civil society (15). Evaluation of the effectiveness of approach and content of entomological stakeholder engagement has rarely been published, though will be essential to improving such communication in different regions (15, 31).

Useful model information is available from the World Mosquito Program (formerly Eliminate Dengue), which has led the field in developing an engagement framework which integrates community with programme to increase familiarity with the technical and research components. Their engagement framework developed in Australia and using 'foundations of trust' for community participation has contributed to community-supported releases in Vietnam, Brazil, Indonesia and elsewhere (32, 33). Other useful examples from EU projects are of the engagement materials used in LIFE CONOPS targeting invasive mosquito management and BIOCOMES which developed animations about biological control (34, 35) (and available to stakeholders via websites and YouTube).

Anticipating and understanding stakeholder concerns

Suppressing target insect populations through an insect-mediated approach that reduces chemical use will have relatively positive effects on human and environmental health, though this can raise questions about potential unintended impacts (Table 1). Proposed genetic strategies have raised the profile of insect releases and, in particular, those of risks of gene-flow from released insects into native populations or via unequal competitive effects arising from genotypic differences in released insects (36). Extensive experience with previous insect release programmes underlines that a critical objective of the communication plan is not only to inform the population about the technology proposed

by promoting the benefits but also to inform about risks and how these are mitigated (28). Differentiating between **perceived risk and plausible risk** is vital for risk management, though both types should be anticipated when responding to stakeholder concerns (37).

[Place Table I here]

Conclusions

Plausible concerns that are more closely associated specifically with imported insects are likely to be related to novelty at either human or ecological levels (Table 1). In many situations it is possible to mitigate these concerns substantially by supplying external mass producers with locally sourced insect stock, so that while the insects have travelled, the genotype is not novel. This is common practice with mosquito SIT programmes in Europe (38, 28). Plausible risks can also be quantified, although with some uncertainties, and engagement teams can be trained in addressing specific and surrounding questions (37). Perceived, or emotionally triggered, concerns may be less quantifiable, but some reassurance can be provided through discussion of pathways to impact. A greater awareness of the current experience in insect-mediated strategies worldwide could support future expansion of regional and international live-insect transportation. This could be delivered via an academic synthesis to underpin elements of communication plans which could be used at several critical stages of the production, transportation, and delivery sequence.

In summary, it is likely that while there are risks associated with insect transportation as part of insect-mediated control strategies, the single biggest risk in the future will be in failing to plan for, and adequately fund, appropriate stakeholder engagement and communication materials. Co-developed and tested accessible information, that is presented in an appropriate way, has been demonstrated to lead to widespread local and/or regional support; this could be useful to all stages of the transportation pathway. For trans-nationally transported insects, whether for research, conservation, or pest/vector control, providing such information to specific stakeholders (such as courier companies and border authorities) is critical to reduce the likelihood of

delays which can, in turn, affect the quality and mortality of the transported insects.

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Table I

Potential stakeholder concerns arising from insect release programmes

Concerns expressed	
Human concerns	Vector new diseases or differential vectorial capacity
	Greater nuisance (bites and buzzing)
Ecological concern (Species-level)	Potential gene flow (insecticide resistance or other non-neutral trait introduction)
Ecosystem concerns (Community level)	Effects of releases of large numbers of individuals on associated fauna: predators and competitors for food resources
	The potential for population replacement by an alternative vector species in the vacant niche
	Changes in species' abundance and interactions via reduced larval competition
Mechanical concern	Damage to infrastructure elements (consumption of wood, rubber, plastics, or insulation materials for example)

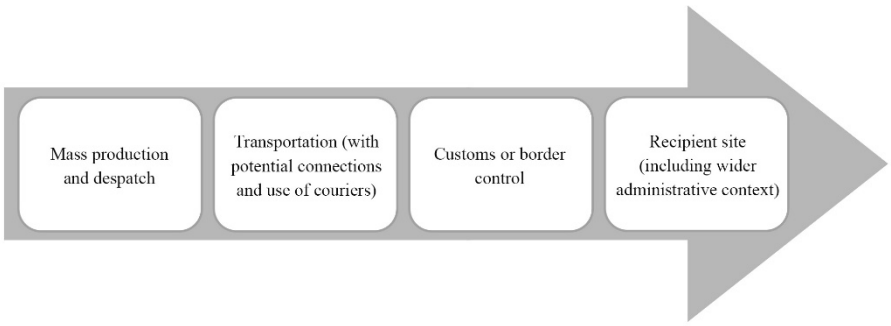

Fig. 1

The four key engagement milieus associated with insect transportation between regions or countries. This article addresses engagement at the final stage.