

# Mexico's island biosecurity programme: collaborative formulation and implementation

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**Abstract** Mexico's National Strategy on Invasive Species (2010) and the National Strategy for the Conservation and Sustainable Development of Islands (2012) embrace its steady and positive 20-year trajectory on island restoration. Mexico has come halfway to having all islands free of invasive mammals. To sustain these results in the long-term, biosecurity became a priority. To implement these national strategies, the National Commission for Knowledge and Use of Biodiversity (CONABIO) and the National Commission for Natural Protected Areas (CONANP) integrated a participatory programme to develop the country's capacities for managing invasive alien species (IAS). With funding from the Global Environment Facility (GEF) through the United Nations Development Programme (UNDP), and private donors, the IAS programme is now under operation. Grupo de Ecología y Conservación de Islas, A.C. (GECI), a professional Mexican NGO, is implementing the programme on islands, along four lines of action: (1) island biosecurity; (2) environmental learning and capacity building; (3) control and eradication of IAS; and (4) monitoring to assess ecological recovery. While promoting the importance of biosecurity amongst all social actors, the focus is on long-term formal implementation, culture and everyday life. The methods therefore vary: workshops with authorities, integration of specific biosecurity protocols, and art and conservation activities with the local communities, particularly with children and young adults. The experience to date shows that enforcement by authorities and integration of the subject by local fishermen communities and island users are two key factors in sustaining the valuable and tangible results achieved to date over the long term.

**Keywords:** biosecurity, conservation, early detection, eradication, prevention, rapid response

## INTRODUCTION

As one of the world's megadiverse countries, Mexico acknowledges the importance of safeguarding its biodiversity and over 10,000 endemic species (Llorente-Bousquets & Ocegueda-Cruz, 2008). Invasive alien species (IAS) pose the most important threat to biodiversity worldwide (Reaser, et al., 2007; Towns, 2011), and have caused 67% of the extinctions of Mexican vertebrates (Aguirre-Muñoz, et al., 2011a). Consequently, a National Advisory Committee for the Strategy on Invasive Species (CANEI, for its Spanish acronym) was created in 2008. It is comprised of governmental and academic institutions, as well as non-profit civil society organisations. Coordinated by the National Commission for the Knowledge and Use of Biodiversity (CONABIO), the CANEI developed the "National strategy on invasive species: prevention, control and eradication" in 2010. Its vision is to address the problems of IAS, by creating efficient prevention, early detection and rapid response systems, as well as a legal framework to mitigate, control and eradicate these species (CANEI, 2010).

The nearly 4,000 Mexican islands, as do most of the islands around the world, host a disproportionate amount of the country's biodiversity (Whittaker & Fernández-Palacios, 2007). They are hotspots of endemism richness, with 14 times more endemic species than the mainland (Aguirre-Muñoz, et al., 2016a). In recognition of the need to protect this biodiversity as well as the livelihoods of island communities, the Mexican government has included all islands in the National System of Natural Protected Areas (Aguirre-Muñoz, et al., 2017a) with the recent decree of the Islas del Pacífico de la Península de Baja California Biosphere Reserve (DOF, 2016). Therefore, the formulation of the National Strategy for the Conservation and Sustainable Development of the Mexican Island Territory (2012) was an important step forward. This national strategy sets priorities to work on three tactical lines – sovereignty, conservation and sustainable

development – through four transverse lines of action – knowledge, public policies, inter-institutional coordination and financing (CANTIM, 2012).

## ISLAND CONSERVATION IN MEXICO

The history of island conservation in Mexico delivers a restoration success story. Through to 2017, 60 populations of 11 invasive mammal species have been eradicated from 39 islands, which represents over 59,000 ha restored (Aguirre-Muñoz, et al., 2018). Thanks to these efforts, at least 147 endemic taxa of mammals, reptiles, birds and plants are protected. Furthermore, 227 highly vulnerable seabird colonies are recovering from the impacts of IAS (Aguirre-Muñoz, et al., 2016b). A growing network of collaborating federal government agencies, e.g. the National Commission for Protected Areas (CONANP), CONABIO, the National Institute of Ecology and Climate Change (INECC), and the Department of the Environment and Natural Resources (SEMARNAT), academic institutions, local communities, fishing cooperatives, civil society organisations and donors (national and international) has been fundamental to achieving success. Working in close collaboration with the multiple partners, Grupo de Ecología y Conservación de Islas, A.C. (GECI) has implemented all but two of the island eradications in Mexico and is currently executing other eradication projects on several islands. GECI is a Mexican civil society organisation, which works with an interdisciplinary and comprehensive approach toward the restoration, conservation and sustainable development of islands (Aguirre-Muñoz, et al., 2011b).

GECI's goal, as outlined in the IUCN's Honolulu Challenge, is to remove invasive mammals from all islands of Mexico by 2030 (IUCN, 2017). To achieve it, we need to eradicate a further 70 populations of invasive mammals from 34 islands. To do so, we aim to eradicate invasive mammals following restoration priorities, including where

endemic species are vulnerable, eradications are feasible and risk of reinvasion is lower (Latofski-Robles, et al., 2014). Therefore, the implementation of a National Programme for Island Biosecurity – the policies, measures and actions to protect island biodiversity from IAS by preventing their arrival and establishment (Roberts, 2003; Russell, et al., 2008) – is vital to ensure that successes achieved remain in the long term, and that the investment in conservation measures, such as eradications, has the highest return rates (Broome, 2009). Implementing biosecurity will also further Mexico's achieved international commitments, in line with Aichi Biodiversity Target #9 which states: "By 2020, IAS and pathways are identified and prioritised, priority species are controlled or eradicated, and measures are in place to manage pathways to prevent their introduction and establishment" (CBD, 2010). Additionally, new restoration projects will benefit from building biosecurity capacities beforehand. Thus, biosecurity becomes a transverse line of action amongst all of GECEI's restoration projects (Aguirre-Muñoz, et al., 2016b).

### FORMULATING THE NATIONAL ISLAND BIOSECURITY PROGRAMME

Islands significantly contribute to the country's megadiversity. They harbour 8.3% of all vascular plant and terrestrial vertebrates (CANTIM, 2012). They also support the livelihood of more than 200,000 people, most of which rely on the valuable marine resources that thrive in adjacent waters. However, some islands have faced the negative impacts of IAS, particularly mammalian predators, for centuries. The introduction of such problematic species to islands in Mexico has been mainly due to anthropogenic reasons, either intentionally or accidentally. Before the 20<sup>th</sup> century, introduction of IAS was mainly related to the harvesting of marine mammals and guano mining. Nowadays, the sources of introductions have diversified and include commercial and sport fishing, as well as tourism related activities (Aguirre-Muñoz, et al., 2011b). At first, restoration projects were all about solving the problem already at hand, eliminating the IAS; however, as we free islands of their IAS, we must change our way of thinking and become proactive in preventing reintroductions or new introductions. In order to halt the introduction of IAS, intentional or accidental, we need a society that is aware of the root causes and problems associated with the loss of biodiversity and the ecosystem services it provides. We need the social construction of a new paradigm, of everyone feeling a sense of privilege every time we visit an island and acknowledging that the conservation of such a special place is in our own hands.

Therefore, GECEI's restoration projects are accompanied by an environmental learning and outreach campaign that is designed for that specific island and its local community's characteristics. We seek to boost the local community identity, by publicising the island's biodiversity, as well as its endemic or more charismatic species. We produce and distribute different outreach materials (e.g. posters, photographic catalogues, wristbands, colouring books, puzzles, etc.) that showcase the island's uniqueness and what you can do to protect it. We also give varied talks to different sectors, such as schools, universities, fishing cooperatives and tourist operators, about the restoration project and the outcomes expected. Moreover, we learn about the way local communities understand, interact with and feel about their environment through their artistic expressions. We provide the opportunity for youngsters to express their connection to nature through music, painting, drawing and story-telling workshops, and have documented beautiful results.

GECEI's efforts to make island biosecurity a subject matter and common topic amongst island users and

managers became systematic with the nationwide project to implement the Strategy on Invasive Species in Mexico. With funding from the Global Environment Facility (GEF) in coordination with the United Nations Development Programme (UNDP), the CONABIO and the CONANP lead the inter-sectorial project to implement this Strategy. Implementing biosecurity protocols and building capacities on managing IAS are two priority actions established in the Invasive Species Strategy (CANEI, 2010). The project is implemented in priority areas of conservation and focuses on preventing the arrival and establishment of IAS through prevention measures, early detection systems and rapid response (Born-Schmidt, et al., 2017).

The project began the planning stage in 2012, and GECEI, who is coordinating the island programme, started by identifying priority protected areas for implementation and setting action guidelines. The lines of action, with a 2015–2018 implementation horizon, are: 1) Biosecurity: development, implementation and evaluation of biosecurity protocols, creation of biosecurity committees; 2) Environmental learning and outreach: producing outreach materials, developing awareness campaigns about IAS, building capacities for local groups on early detection and rapid response; 3) Restoration: management of the IAS, as well as native species present; 4) Monitoring: documenting ecosystem responses to eradication of IAS (Aguirre-Muñoz, et al., 2013). Six priority protected areas are our pilot project areas where the biosecurity project is currently being implemented (Table 1, Fig. 1). The project is being replicated in the Gulf of California, in a group of islands known as the Midriff Islands.

### DESIGNING AND IMPLEMENTING ISLAND BIOSECURITY PROTOCOLS

In order for biosecurity to fulfil its purpose, we need to analyse and take into account all the particular activities that different sectors carry out on the island. Consequently, we decided on a "bottom-up" strategy to create site-specific biosecurity protocols in an adaptive and participatory manner (Aguirre-Muñoz, et al., 2013). With every sector involved in the protocol design from the beginning, they provide the information needed to make an informed risk analysis and detect critical control points (González-Martínez, et al., 2017). Furthermore, by being involved, the communities are more likely to approve and adopt prevention measures that need to be carried out in everyday life and with a long-term vision.

Biosecurity protocols are documents where all the components of biosecurity are detailed; so that each stakeholder understands what will be implemented, and how he/she is involved. The main components of biosecurity are prevention, early detection and incursion response (Russell, et al., 2008). The key behind prevention



**Fig. 1** Map of the islands and their coastal areas of influence for the Biosecurity Programme.

**Table 1** Biosecurity pilot project areas.

Island	Location	Previous eradications	IAS present	Local community
Isla Guadalupe Biosphere Reserve	Pacific Ocean (260 km off the coast of the Baja California Peninsula)	rabbit & donkey (2002) horse (2004) goat (2006) dog (2007) cat (in progress)	Plants 47 Reptiles 0 Birds 5 Mammals 2	100 people, comprising a fishermen's camp, a Navy Station and GECCI's station.
Isla Cedros – Pacific Peninsula of Baja California Biosphere Reserve	Pacific Ocean (25 km off the coast of Baja California Sur Peninsula)	Cedros: dog (in progress) San Benito Oeste: rabbit & goat (1998) donkey (2005) cactus mouse (2013)	Cedros: Plants unknown Reptiles 0 Birds 4 Mammals 6 San Benito Oeste: Plants 9 Reptiles 0 Birds 4 Mammals 0	10,000 people comprising a fishermen's cooperative, the Navy Station, and the salt exporter.
Islands: Cedros & San Benito Oeste				
Archipiélago de Revillagigedo National Park	Pacific Ocean (480 km off the coast of Baja California Sur)	Socorro: sheep (2010) cat (in progress) Clarión: sheep & pig (2002)	Socorro: Plants 47 Reptiles 1 Birds 5 Mammals 2 Clarión: Plants unknown Reptiles 1 Birds 5 Mammals 1	Socorro: 40 people at the Navy Station Clarión: 15 people at the Navy Station
Islands: Socorro & Clarión				
Isla Espíritu Santo – Gulf of California Islands Protected Area	Gulf of California (25 km off the coast of Baja California Sur)	cat (2017/absence confirmation stage) goat (in progress)	Plants 5 Reptiles 0 Birds 0 Mammals 1	No permanent settlement, however during fishing season around 90 people camp there. Highly visited tourist spot.
Banco Chinchorro Biosphere Reserve	Caribbean Sea (30 km off the coast of Quintana Roo)	Cayo Centro: black rat & cat (2015) Cayo Norte Mayor & Menor: black rat (2012)	Plants 6 Reptiles 1 Birds 2 Mammals 0	Cayo Norte Mayor: 12 people Navy Station Cayo Centro: 3 people CONANP station, 100 people fishermen's camps. Tourist visitors.
Islands: Cayo Centro, Cayo Norte Mayor & Cayo Norte Menor.				
Arrecife Alacranes National Park	Gulf of Mexico (140 km off the coast of Yucatan)	Pérez: black rat (2011)	Plants 5 Reptiles 0 Birds 1 Mammals 0	Pérez: 15 people from the Navy Station and CONANP station. During fishing tournaments around 40 camp.
Islands: Pérez, Pájaros, Muertos, Desterrada & Chica.		Muertos & Pájaros: house mouse (2011)		

is to set as many obstacles as possible throughout the pathways of introduction, to reduce the probability for IAS to get to the islands. Early detection means a surveillance method through detection devices, such as traps, to determine if there is an incursion. Surveillance is a long-term strategy that requires funding and local capacity building. Finally, an incursion response plan, in case an IAS is detected or suspected, aims not only to confirm the incursion but also to eliminate the IAS (Moore, et al., 2010). Biosecurity protocols contemplate, at least, the following aspects: 1) Identifying the main potential IAS; 2) Identifying possible pathways and vectors of introduction; 3) Establishing prevention measures on the mainland; 4) Establishing early detection systems at disembarking sites; 5) Establishing an incursion response plan; 6) Establishing stakeholders responsibilities (PII, 2013).

Since 2014, we have held workshops for the participative formulation of biosecurity protocols for our pilot areas (and others). We invite local authorities (CONANP,

SEMAR, port authorities), fishermen and tourist operators, and we go through all stages of biosecurity and discuss the sites most visited, frequency, and type of transportation. Afterwards, we vote on prevention measures and where to implement them. Additionally, we do a field practice about surveillance and early detection devices commonly used.

To date, we have six unique, specific, updated, island biosecurity protocols, created in a participatory manner. The protocols contain priorities for prevention measures and the most cost-effective and site-specific tools and methods. Protocols are currently under review by the corresponding authorities (Latofski-Robles, et al., 2017). Protocols were formally validated through workshops with the Advisory Council for each island. Furthermore, we strive to create Biosecurity Committees that are a subgroup of said Advisory Councils. These Committees will be in charge of implementation, evaluation and updating of the protocols, as well as fundraising for biosecurity to continue in the long run.

## ISLAND BIOSECURITY AT WORK

The most relevant component of biosecurity is prevention. However, all stakeholders need to communicate and coordinate in order for it to be effective. Prevention is closely linked to outreach and environmental education campaigns (Parkes, 2013). An analysis of costs from the Mexican island experience, overwhelmingly demonstrates the importance of investing in biosecurity prevention measures. Recent rodent eradications in Mexico, show that, on average, it costs 20 times more to perform an eradication project than to prevent the arrival of IAS (Aguirre-Muñoz, et al., 2017b).

Early detection is of critical importance to discover any elusive individual that managed to escape the prevention measures. Thus, it also helps to evaluate the prevention strategy. Local capacity building, strong partnerships and straightforward communication between local communities, island managers and other stakeholders (e.g. tourist operators) is critical for a swift and effective incursion response. Furthermore, the *ad hoc* design and wide distribution of outreach materials for each island is vital to raise awareness of the problem of IAS.

As our National Biosecurity Programme unfolds, we have had two effective incursion response events that have successfully stopped the establishment of rodents in Arrecife Alacranes. This is a positive sign that the outreach campaign and workshops are having an effect, and that people are now aware that islands should be IAS-free and their involvement is needed to achieve that (Latofski-Robles, et al., 2016; Matos, et al., 2018). Much has been learnt from incursion events, and the lessons must be adopted nationwide to strengthen prevention measures and community involvement.

## INSTITUTIONALISING BIOSECURITY

Building capacity amongst protected area managers and users regarding island biosecurity methods and techniques is crucial to protect the islands from the impacts of IAS. The threat of IAS is considered as important in most of the protected areas management plans; however, preventing their accidental introduction is not commonly featured.

The first step toward building biosecurity capacities for the Mexican islands was the "Island Biosecurity Workshop for managers, park rangers and users of protected areas" in 2014. It was held by GECI with funding from the US Fish & Wildlife Service and the CONABIO. Twenty-six people from all island protected areas in Mexico, gathered in Ensenada, Baja California for three days, during which we discussed biosecurity measures and practiced with early detection devices in Todos Santos Sur Island. Representatives from all agencies regarding islands came together. There were people from CONANP, CONABIO, the Mexican Navy, and the SEMARNAT Office for Wildlife (DGVS). We also analysed the challenges and opportunities to implement biosecurity protocols, prevention measures and early detection systems (Méndez-Sánchez, et al., 2014).

Moreover, GECI has had a solid collaboration history with the Mexican Navy (Secretaría de Marina, Armada de Mexico). They are invaluable partners in the conservation of the Mexican islands, always providing their support on projects (Aguirre-Muñoz, et al., 2017b). We have also had talks with their central offices about the need to adopt biosecurity measures in every port and for all ships. During our restoration projects, we give talks to personnel at SEMARs stations at the islands, but we also strive to provide training, so that there is always at least one person who knows about surveillance methods and early detection techniques on all islands with Navy stations.

The successful two-decade trajectory of island restoration in Mexico contributes to meet the country's goals in sustainable development and conservation (Aguirre-Muñoz, et al., 2016a). The National Biosecurity Programme must become a formally recognised, institutionalised, inter-agency, inter-sectorial agreement for it to be effective. We need to establish collaboration arrangements with several agencies, such as CONANP, SEMAR, SEMARNAT, the Federal Agency for Environmental Protection (PROFEPA), and port authorities. Once we are all working hand in hand, the restoration efforts for Mexico's island biodiversity will be reinforced and protected over the long term.

## RECOMMENDATIONS AND LESSONS LEARNT

Outreach and environmental learning campaigns are of the utmost importance, and hence need to be permanent and not just for short periods of time. Only then, will people become aware of the problem and actually adopt the habits required to prevent the accidental introduction of IAS.

Working with the Protected Areas Advisory Council is the best strategy to strengthen biosecurity protocols. It also helps the project to become integrated with the area manager's work.

Communities that recently participated on an eradication project are more likely to be interested and active in keeping the island free of IAS.

Incursion response cases may have economic costs that are not specifically budgeted for, so the creation of a national biosecurity fund for emergencies is an important step forward.

Early detection alerts are a way of evaluating if the outreach campaign is working, so that even if it turns out to be just a false alarm, we now know people are aware that they should report if they see something different.

We need to sign and publish institutional collaboration agreements between government agencies in order to reinforce biosecurity measures and make sure all stakeholders comply with them.

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## REFERENCES

- Aguirre-Muñoz, A., Samaniego-Herrera, A., Luna-Mendoza, L., Ortiz-Alcaraz, A., Rodríguez-Malagón, M., Méndez-Sánchez, F., Félix-Lizárraga, M., Hernández-Montoya, J.C., González-Gómez, R., Torres-García, F., Barredo-Barberena, J.M. and Latofski-Robles, M. (2011a). 'Island restoration in Mexico: ecological outcomes after systematic eradications of invasive mammals'. In: C.R. Veitch, M.N. Clout and D.R. Towns (eds.) *Island invasives: eradication and management*, pp. 250–258. Occasional Paper SSC no. 42. Gland, Switzerland: IUCN and Auckland, New Zealand: CBB.
- Aguirre-Muñoz, A., Samaniego-Herrera, A., Luna-Mendoza, L., Ortiz-Alcaraz, A., Rodríguez-Malagón, M., Félix-Lizárraga, M., Méndez-Sánchez, F., González-Gómez, R., Torres-García, F., Hernández-Montoya, J.C., Barredo-Barberena, J.M. and Latofski-Robles, M. (2011b). 'Eradications of invasive mammals on islands in Mexico: the roles of history and the collaboration between government agencies, local communities and a non-government organisation'. In: C.R. Veitch, M.N. Clout and D.R. Towns (eds.) *Island invasives: eradication and management*, pp. 386–394. Occasional Paper SSC no. 42. Gland, Switzerland: IUCN and Auckland, New Zealand: CBB.

- Aguirre-Muñoz, A., Méndez-Sánchez, F., De la Rosa-Conroy, L., Latofski-Robles, M. and Manríquez-Ayub, A. (2013). *Diagnóstico de especies exóticas invasoras en las reservas de la biosfera y áreas naturales protegidas insulares seleccionadas, a fin de establecer actividades de manejo para las mismas*. Tercer informe de actividades presentado a la Comisión Nacional para el Conocimiento y Uso de la Biodiversidad dentro de la fase preparatoria del proyecto GEF "Aumentar las capacidades de México para manejar especies exóticas invasoras". Grupo de Ecología y Conservación de Islas, A.C. Ensenada, Baja California, México. 128 pp + 2 Anexos. <<http://www.biodiversidad.gob.mx/especies/Invasoras/gef/pdf/04-diagnostico-seleccion-grupos-islas.pdf>>.
- Aguirre-Muñoz, A., Méndez-Sánchez, F. and Latofski-Robles, M. (2016a). 'Conservación y restauración de las islas Mexicanas'. In: M. Llano and H. Fernández (eds.) *Análisis y Propuestas para la Conservación de la Biodiversidad en México*, Pp. 66–71. Ciudad de México.
- Aguirre-Muñoz, A., Samaniego-Herrera, A., Luna-Mendoza, L., Ortiz-Alcaraz, A., Méndez-Sánchez, F. and Hernández-Montoya, J. (2016b). 'La restauración ambiental exitosa de las islas de México: una reflexión sobre los avances a la fecha y los retos por venir'. In: E. Ceccon and C. Martínez-Garza (eds.) *Experiencias Mexicanas en la Restauración de los Ecosistemas*, pp. 487–512. Ciudad de México: Comisión Nacional para el Conocimiento y Uso de la Biodiversidad. Universidad Nacional Autónoma de México. Universidad Autónoma del Estado de Morelos.
- Aguirre-Muñoz, A., Méndez-Sánchez, F., Latofski-Robles, M. and Salizzoni-Chávez, K. (2017a) 'Mejoras en el marco legal para la conservación y restauración integral de las islas de México'. In: *Reporte CESOP*, no. 103, Febrero 2017, pp. 19–23. Publicación mensual del Centro de Estudios Sociales y de Opinión Pública de la Cámara de Diputados.
- Aguirre-Muñoz, A., Méndez-Sánchez, F., Latofski-Robles, M., Salizzoni-Chávez, K., Luna-Mendoza, L., Ortiz-Alcaraz, A., Hernández-Montoya, J., Bedolla-Guzmán, Y. and Rojas-Mayoral, E. (2017b). 'Avances en la conservación y restauración integral de las islas de México y mejoras al marco legal para consolidar la trayectoria positiva'. In: G. Born-Schmidt, F. de Alba, J. Parpal and P. Koleff (eds.) *Principales Retos que Enfrenta México ante las Especies Exóticas Invasoras*, pp. 225–255. Ciudad de México: Centro de Estudios Sociales y de Opinión Pública. Cámara de Diputados / LXIII Legislatura.
- Aguirre-Muñoz, A., Bedolla-Guzmán, Y., Hernández-Montoya, J., Latofski-Robles, M., Luna-Mendoza, L., Méndez-Sánchez, F., Ortiz-Alcaraz, A., Rojas-Mayoral, E., and Samaniego-Herrera, A. (2018). 'The conservation and restoration of the Mexican Islands, a successful comprehensive and collaborative approach relevant for global biodiversity'. In: Ortega-Rubio, A. (ed). *Mexican natural resources management and biodiversity conservation*, pp. 177-192. Springer International Publisher AG, part of Springer Nature.
- Born-Schmidt, G., Parpal-Servole, J. and Koleff, P. (2017). 'De la elaboración a la implementación de la estrategia nacional sobre especies invasoras'. In: *Reporte CESOP*, no. 103, Febrero 2017, pp. 5–9. Publicación mensual del Centro de Estudios Sociales y de Opinión Pública de la Cámara de Diputados.
- Broome, K. (2009). 'Beyond Kapiti – a decade of invasive rodent eradications from New Zealand islands'. *Biodiversity* 10: 14–24.
- CANEI (Comité Asesor Nacional sobre Especies Invasoras). (2010). *Estrategia nacional sobre especies invasoras en México, prevención, control y erradicación*. Ciudad de México: Comisión Nacional para el Conocimiento y Uso de la Biodiversidad, Comisión Nacional de Áreas Naturales Protegidas, Secretaría de Medio Ambiente y Recursos Naturales.
- CANTIM (Comité Asesor Nacional sobre el Territorio Insular Mexicano). (2012). *Estrategia Nacional para la conservación y el desarrollo sustentable del territorio insular mexicano*. Ciudad de México y Ensenada, B.C: Secretaría de Medio Ambiente y Recursos Naturales, Instituto Nacional de Ecología, Comisión Nacional de Áreas Naturales Protegidas, Secretaría de Gobernación, Secretaría de Marina-Armada de México y Grupo de Ecología y Conservación de Islas, A.C.
- CBD (Convention on Biological Diversity). (2010). Strategic Plan for Biodiversity 2011–2020. *Aichi Targets*. <<https://www.cbd.int/sp/targets/>>. Accessed: 27 June 2017.
- DOF (Diario Oficial de la Federación). (2016). *Decreto por el que se declara área natural protegida, con el carácter de reserva de la biosfera, la región conocida como islas del pacífico de la península de Baja California*. Ciudad de México.
- González-Martínez, A.I., Barrios-Caballero, Y. and De Jesús, S. (2017). 'Análisis de riesgo para especies invasoras en México'. In: *Reporte CESOP*, no. 103, Febrero 2017, pp. 24–29. Publicación mensual del Centro de Estudios Sociales y de Opinión Pública de la Cámara de Diputados.
- IUCN (International Union for Conservation of Nature). (2017). *Commitments toward achieving the Honolulu Challenge*. <<https://www.iucn.org/theme/species/our-work/invasive-species/honolulu-challenge-invasive-alien-species/commitments-towards-achieving-honolulu-challenge>>. Accessed: 28 June 2017.
- Latofski-Robles, M., Aguirre-Muñoz, A., Méndez-Sánchez, F., Reyes-Hernández, H. and Schlüter, S. (2014). 'Prioritizing restoration actions for the islands of Mexico'. *Monographs of the Western North American Naturalist* 7: 435–441.
- Latofski-Robles, M., Méndez-Sánchez, F., Aguirre-Muñoz, A., Jáuregui-García, C. and Castro-Girón, A. (2016). *Diagnóstico de especies invasoras en seis áreas naturales protegidas insulares, a fin de establecer actividades para su manejo*. Reporte de actividades del año 1 (2015) dentro del proyecto GEF 0081866 "Aumentar las capacidades de México para manejar especies exóticas invasoras a través de la implementación de la Estrategia Nacional de Especies Invasoras". Grupo de Ecología y Conservación de Islas, A.C. Ensenada, B.C., México. <<http://www.biodiversidad.gob.mx/especies/Invasoras/gef/pdf/2.1-1-reporte-extenso-gef-2015.pdf>>.
- Latofski-Robles, M., Méndez-Sánchez, F., Aguirre-Muñoz, A., Jáuregui-García, C., Salizzoni-Chávez, K. and Fernández-Ham, G. (2017). *Diagnóstico de especies exóticas invasoras en seis áreas naturales protegidas insulares, a fin de establecer actividades para su manejo*. Reporte de actividades del año 2 (2016) dentro del proyecto GEF 0081866 "Aumentar las capacidades de México para manejar especies exóticas invasoras a través de la implementación de la Estrategia Nacional de Especies Invasoras". Grupo de Ecología y Conservación de Islas, A.C. Ensenada, B.C., México. <<http://www.biodiversidad.gob.mx/especies/Invasoras/gef/pdf/2.1-1-reporte-extenso-gef-2016.pdf>>.
- Llorente-Bousquets, J. and Ocegueda-Cruz, S. (2008). 'Estado del conocimiento de la biota'. In: J. Soberón, G. Halffter, and J. Llorente-Bousquets, (Eds.), *Capital natural de México Vol. I Conocimiento actual de la biodiversidad*, pp. 283–322. México, D.F.: Comisión Nacional para el Conocimiento y Uso de la Biodiversidad.
- Matos, J., Little, A., Broome, K., Kennedy, E., Méndez-Sánchez, F., Latofski-Robles, M., Irvine, R., Gill, C., Espinoza, A., Howald, G., Olthof, K., Ball, M. and Boser, C.L. (2018). 'Connecting island communities on a global scale: Case studies in island biosecurity'. *Monographs of the Western North American Naturalist* 78(4): 959-972.
- Méndez-Sánchez, F., Aguirre-Muñoz, A., Latofski-Robles, M., Jáuregui-García, C., Luna-Mendoza, L., Ramos-Rendón, K., De la Rosa-Conroy, L., Félix-Lizárraga, M., Manríquez-Ayub, A., Castañeda-Rodríguez, I. and Guzmán-Cázares, E. (2014). *Curso-taller de bioseguridad insular para administradores guardaparques y usuarios de áreas naturales protegidas*. Final Report to U.S. Fish & Wildlife Service, Wildlife Without Borders, Division of International Conservation. Grupo de Ecología y Conservación de Islas, A.C. Ensenada, B.C. 28 pp + 1 Anexo.
- Moore, J.L., Rout, T.M., Hauser, C.E., Moro, D., Jones, M., Wilcox, C. and Possingham, H.P. (2010). 'Protecting islands from pest invasion: optimal allocation of biosecurity resources between quarantine and surveillance'. *Biological Conservation*, 143(5):1068–1078.
- PII (Pacific Invasives Initiative). (2013). *Biosecurity Plan Template*. Resource Kit for Rodent and Cat Eradication. <<http://rce.pacificinvasivesinitiative.org/tools/Templates.html>>. Accessed 3 April 2018.
- Parkes, J. (2013). *Strategies to detect and manage incursions of exotic species on Mexican islands*. Report presented to UNDP-Mexico and CONABIO as part of the preparatory phase of the GEF-ENCIS Project. Christchurch, New Zealand: Kurahaupo Consulting. <<http://www.biodiversidad.gob.mx/especies/Invasoras/gef/pdf/09-edrr-islands-en.pdf>>.
- Reaser, J.K., Meyerson, L.A., Cronk, Q., De Poorter, M., Eldrege, L.G., Green, E. and Vaiutu, L. (2007). 'Ecological and socioeconomic impacts of invasive alien species in island ecosystems'. *Environmental Conservation* 34: 98–111.
- Roberts, A. (2003). *Island biosecurity SOP Best Practice Manual*. Southland, New Zealand: Department of Conservation.
- Russell, J.C., Towns, D.R. and Clout, M.N. (2008). 'Review of Rat Invasion Biology: Implications for Island Biosecurity'. *Science for Conservation* 286. Wellington, NZ: Department of Conservation.
- Towns, D.R. (2011). 'Eradications of vertebrate pests from islands around New Zealand: what have we delivered and what have we learned?'. In: C.R. Veitch, M.N. Clout and D. Towns (eds.) *Island invasives: eradication and management*, pp. 364–371. Occasional Paper SSC no. 42. Gland, Switzerland: IUCN and Auckland, New Zealand: CBB.
- Whittaker, R.J. and Fernández-Palacios, J.M. (2007). *Island Biogeography: Ecology, Evolution, and Conservation*. Oxford: Oxford University Press.